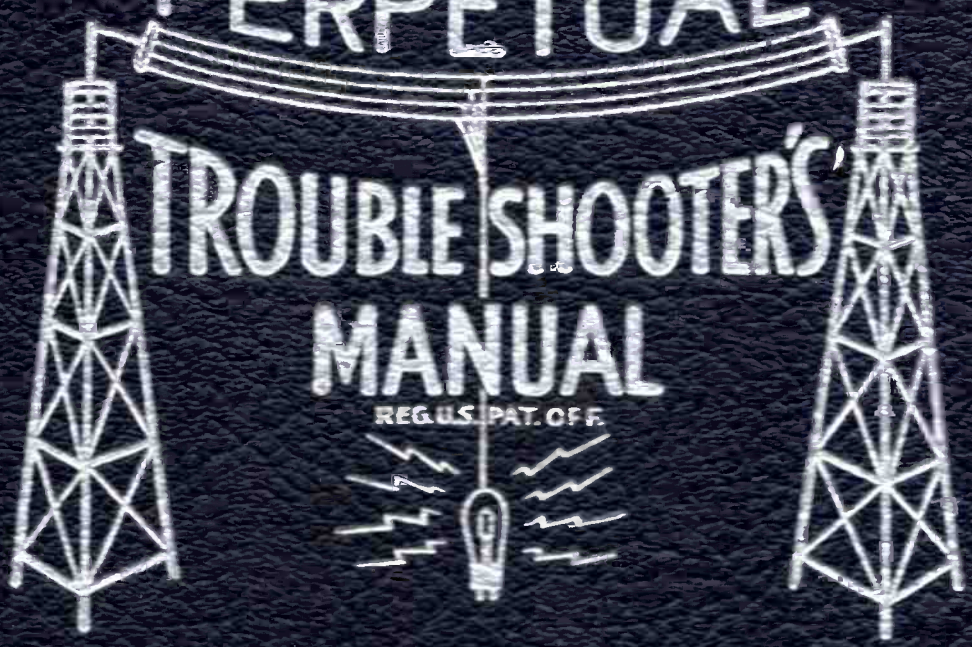
VOLUME XX

PERPETUAL TROUBLE SHOOTER'S MANUAL

REG. U.S. PAT. OFF.



JOHN F. RIDER

MODEL 130, Playfellow,
Ch. CR-215

SPECIFICATIONS

Power supply	117 volts 60 cycles AC
Power consumption	58 watts
Power output	1.9 watts
Intermediate frequency	455 kc.
Tuning frequency range	540-1620 kc.
Tubes:	
Converter	12SA7
I-F Amplifier	12SK7
Detector, AVC and First Audio	12SQ7
Power output	50L6GT
Rectifier	35Z5GT
PM Speaker:	
Voice coil impedance (400 cycles)	3.0 ohms
Output transformer	2,000/3 ohms

ALIGNMENT PROCEDURE

The alignment of this receiver requires the use of an accurately calibrated r-f signal generator and an output meter. All trimmer condenser locations are shown on the chassis layout diagram. The radio volume control should be turned to maximum and the signal generator output kept as low as possible during alignment to prevent the AVC from operating and giving false readings. All alignment adjustments can be made with the loop antenna leads connected.

I-F ALIGNMENT

1. Connect the output of the signal generator to the control grid (pin No. 8) of the 12SA7 tube through a .00025 mfd. capacitor. The ground on the signal generator should be connected to the radio chassis.

2. Turn the condenser gang until it is completely meshed (low-frequency end of dial calibration) and set the input selector switch to RADIO.

3. Adjust the signal generator to EXACTLY 455 kc. and peak the second i-f transformer and the first i-f transformer in that order.

BROADCAST BAND ALIGNMENT

1. Check the tuning dial pointer adjustment. When the plates of the tuning condenser are completely meshed the dial pointer must be in line with the last calibration mark at the low frequency end of the dial. If it is not, remove escutcheon plate and move.

2. Form three turns of wire into a loop, connect this loop to the signal generator, and loosely couple it to the receiver loop antenna in the cabinet lid.

3. Set the signal generator and the radio receiver to 1400 kc. and adjust the 1400 kc. oscillator trimmer.

4. Set the signal generator and dial to 600 kc. While rocking the gang back and forth around 600 kc. adjust the oscillator coil slug for maximum output.

5. Check the 1400 calibration and correct if necessary with the oscillator trimmer.

SPECIAL SERVICE INFORMATION

The following information is provided for the service man who has a vacuum tube voltmeter or a similar measuring instrument available.

STAGE GAINS*

R-F on Converter to I-F Grid at:	
600 kc.	47
I-F on Converter Grid to I-F Grid at:	
455 kc. (gang closed)	59
I-F Grid to Detector Plate at:	
455 kc.	50

OSCILLATOR OUTPUT VOLTAGE

The DC voltage developed across the Oscillator Grid Resistor at:

600 kc. ..... 7.0 V.

or 0.32 ma. through 22,000 ohm Oscillator Grid Resistor.

AUDIO GAIN

Voltage required across the Volume Control to produce 0.5 watt speaker output** at 400 cycles is .19 volt with Input Selector Switch in RAD setting.

*Variations of ± 20% are permissible. All readings made with sufficient input signal to provide 0.5 watt speaker output.

**0.5 watt speaker output at 400 cycles is equivalent to a reading of 1.22 volts as measured by a high resistance AC voltmeter across the voice coil of speaker.

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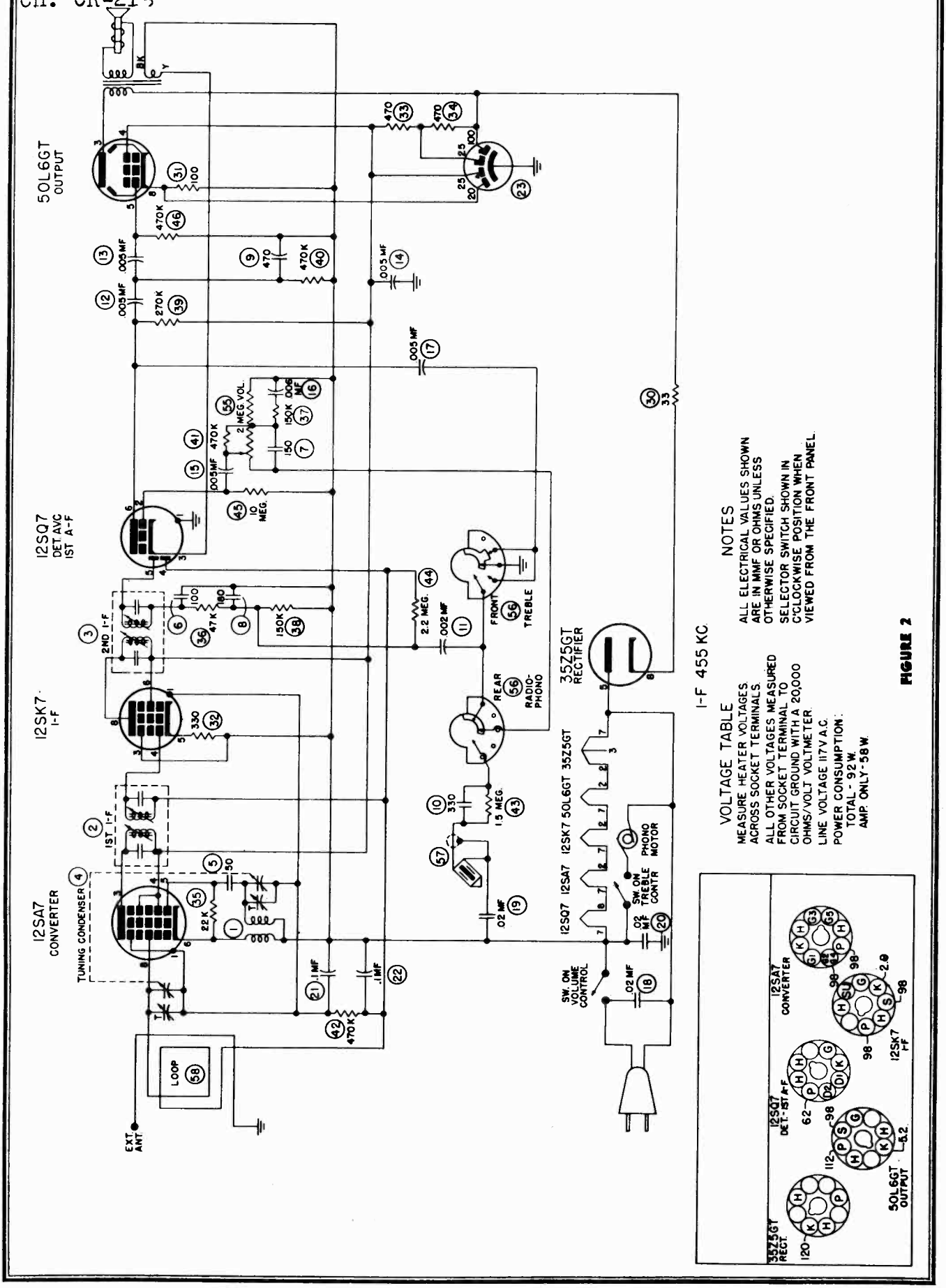


VOLTAGE TABLE

MEASURE HEATER VOLTAGES ACROSS SOCKET TERMINALS

ALL OTHER VOLTAGES MEASURED FROM SOCKET TERMINAL TO CIRCUIT GROUND WITH A 20,000 OHMS/VOLT VOLTMETER.

LINE VOLTAGE 117 V A.C.

POWER CONSUMPTION:
TOTAL - 92 W.
AMP ONLY - 58 W.

NOTES

ALL ELECTRICAL VALUES SHOWN ARE IN MMF OR OHMS UNLESS OTHERWISE SPECIFIED.

SELECTOR SWITCH SHOWN IN C'CLOCKWISE POSITION WHEN VIEWED FROM THE FRONT PANEL.

FIGURE 2

MODEL 130, Playfellow,
Ch. CR-215

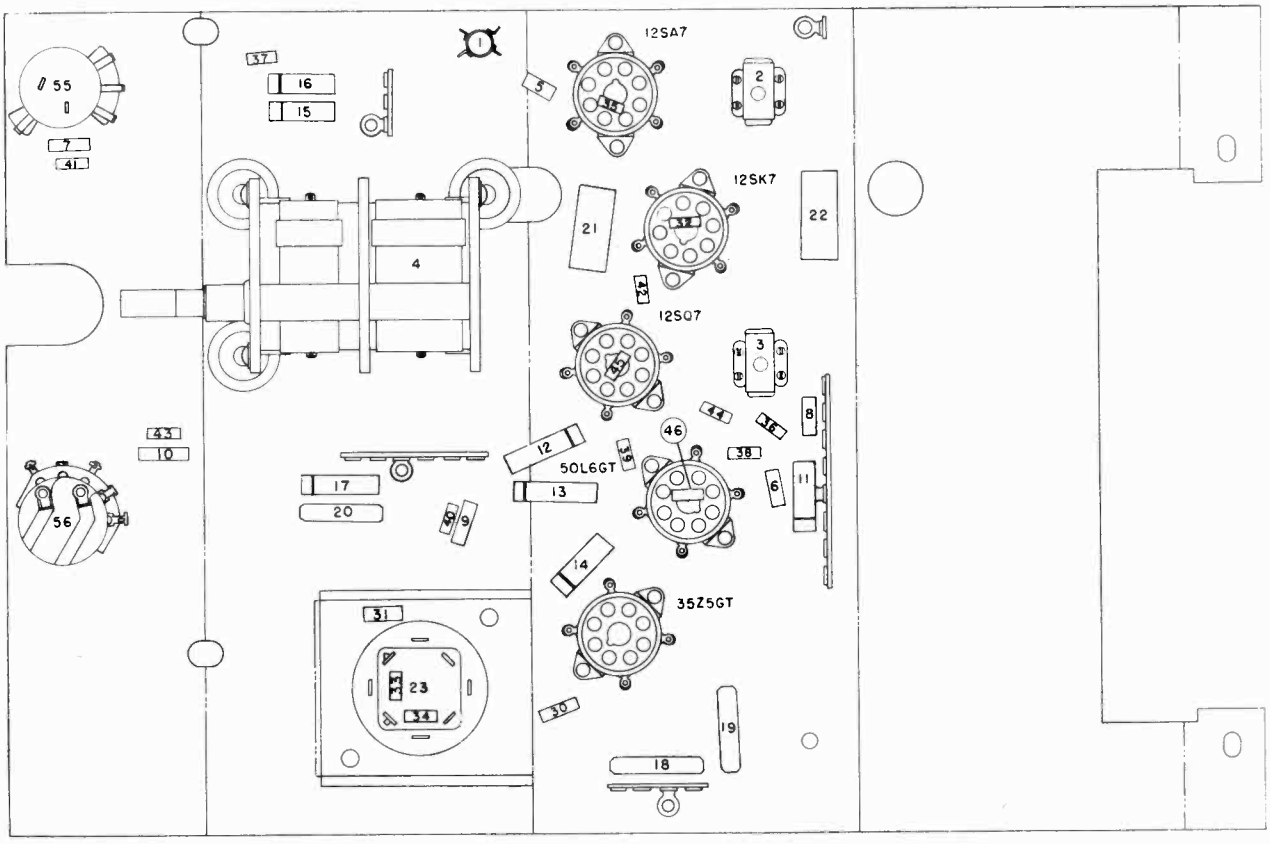


FIGURE 3

MODEL 130, Playfellow,
Ch. CR-215

PARTS LIST

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil, oscillator	360343–1
2	Transformer, first i-f	360342–1
3	Transformer, second i-f	360342–1
4	Condenser, two-gang tuning	260102–1
5	Capacitor, ceramic, 50 mmf. ±10%, 500V	250088–39
6	Capacitor, mica, 100 mmf.	250159–98
7	Capacitor, mica, 150 mmf. ±10%	250159–84
8	Capacitor, mica, 180 mmf. ±10%	250159–85
9	Capacitor, mica, 470 mmf. 500 V.	250159–102
10	Capacitor, mica, 330 mmf. ±10%	250159–88
11	Capacitor, paper, .002 mfd. 600 V.	250152–44
12	Capacitor, paper, .005 mfd. ±10%, 400 V.	250169–14
13	Capacitor, paper, .005 mfd. ±10%, 400 V.	250169–14
14	Capacitor, tubular, .005 mfd. 600 V.	250152–41
15	Capacitor, tubular, .005 mfd. 600 V.	250152–41
16	Capacitor, paper, .006 mfd. ±10%, 400 V.	250169–15
17	Capacitor, paper, .005 mfd. 600 V.	250152–41
18	Capacitor, paper, .02 mfd. 600 V.	250129–3
19	Capacitor, paper, .02 mfd. 600 V.	250129–3
20	Capacitor, paper, .02 mfd. 600 V.	250129–3
21	Capacitor, tubular, .1 mfd. 200 V.	250152–13
22	Capacitor, tubular, .1 mfd. 200 V.	250152–13
23	Capacitor, electrolytic, 100 mfd. 150 V., 25 mfd. 150 V., 25 mfd. 150 V., 20 mfd. 25 V.	270021–19
30	Resistor, composition, 33 ohms, ½ W.	230084–4
31	Resistor, composition, 100 ohms, 1 W.	230085–7
32	Resistor, composition, 330 ohms, ½ W.	230084–10
33	Resistor, composition, 470 ohms, ½ W.	230084–11
34	Resistor, composition, 470 ohms, ½ W.	230084–11
35	Resistor, composition, 22,000 ohms, ½ W.	230084–21
36	Resistor, composition, 47,000 ohms, ½ W.	230084–23
37	Resistor, composition, 150,000 ohms, ±10%, ½ W.	230084–88
38	Resistor, composition, 150,000 ohms, ½ W.	230084–26
39	Resistor, composition, 270,000 ohms, ±10%, ½ W.	230084–91
40	Resistor, composition, 470,000 ohms, ±10%, ½ W.	230084–94
41	Resistor, composition, 470,000 ohms, ½ W.	230084–29
42	Resistor, composition, 470,000 ohms, ½ W.	230084–29
43	Resistor, composition, 1.5 megohm, ½ W.	230084–32
44	Resistor, composition, 2.2 megohm, ½ W.	230084–33
45	Resistor, composition, 10 megohm, ½ W.	230084–37
46	Resistor, composition, 470,000 ohms, ±10%, ½ W.	230084–94
55	Control, volume with AC switch, 2 megohm	220074–6
56	Switch, radio phono, with AC switch	160193–1
57	Crystal pickup, QVR-12	560101–7
58	Antenna loop assembly	*

*The part number of the loop antenna assembly changes with different cabinets, therefore it is important that you specify the STYLE NUMBER of the instrument when ordering a replacement loop antenna assembly.

ALIGNMENT PROCEDURE

Alignment of this receiver requires the use of an accurately calibrated RF signal generator, range 455 kc. to 107 mc., an output meter, and a vacuum tube voltmeter of greater than 10 megohm input impedance. All trimmer condensers can be identified by stampings on the chassis and gang condenser cover and are shown on the chassis layout diagram.

The pointer on the radio dial should line up with the first vertical mark on the low frequency end of the dial glass. If the pointer does not line up, loosen the pointer on the dial string and move it to correct position. Re-tighten and re-cement the pointer to the string. Be sure the gang is fully meshed for this pointer alignment. Align AM first.

AM ALIGNMENT

I-F ALIGNMENT

1. Set volume, treble, and bass controls to maximum. Set Band Switch to Broadcast position, and dial pointer to 1000 kc.
2. Tune the signal generator to EXACTLY 455 kc.
3. Connect output of modulated signal generator to the signal grid of the 6BE6 (pin 7) through a .01 mfd. capacitor and signal generator ground to radio chassis.
4. AM and FM i-f transformers on this model are separate and can be identified on the chassis layout diagram Figure 3.
5. Connect output meter across voice coil of speaker and adjust the i-f transformers for peak output as indicated on the output meter.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Connect 455 kc. sweep generator having approximately 20 kc. sweep to signal grid of 6BE6 (pin 7) through a .01 mfd. capacitor. Connect an oscilloscope through a 1 megohm isolating resistor across the 150,000 ohm diode load resistor. Align for best possible peak and symmetry.

R-F ALIGNMENT

1. Remove the signal generator lead from the 6BE6 grid and connect it across H and L on terminal strip on the rear of the chassis. The high side of the signal generator should be connected to H and the signal generator ground to L.
2. Check the tuning dial pointer adjustment. When the plates of the tuning condenser are completely meshed, the dial pointer must be in line with the last calibration mark at the low frequency end of the dial. If it is not, slide the pointer on its string to the correct position. Be sure to crimp the lugs (on the rear of the pointer) tightly around the string to hold the pointer in adjustment.
3. Set the signal generator and the radio receiver to 1400 kc., adjust the 1400 kc. oscillator trimmer and the 1400 kc. r-f trimmer for maximum output.
4. Set the signal generator and radio receiver to 600 kc. Adjust the oscillator and r-f coil slugs for maximum output. If considerable adjustment was necessary re-check the 1400 kc. trimmer settings.
5. Replace chassis in cabinet and connect loop antenna leads to proper terminals on the rear of the chassis.
6. Form three turns of wire into a loop, connect this loop to the signal generator and loosely couple it to the receiver loop antenna.
7. With the signal generator and dial at 1400 kc., adjust the loop antenna trimmer for maximum output.

MODEL CR-216

FM ALIGNMENT

DISCRIMINATOR ALIGNMENT

1. Tune signal generator to EXACTLY 10.775 mc. and connect to pin 4 of the 6SH7 Limiter tube socket through a .01 mfd. capacitor.

2. Connect a DC vacuum tube voltmeter between point "B" on schematic diagram and ground (across .00047 mfd. capacitor—Pin 6 on 6H6 to ground).

3. Peak both discriminator slugs at 10.775 mc.

4. Retune signal generator to exactly 10.7 mc. and adjust bottom slug for zero volts.

5. The DC voltage at 10.625 mc. should be within 10% of the voltage at 10.775 mc. and of opposite polarity.

Note: If the signal generator is not capable of sufficient output to produce a readable DC voltage, the amplification of the last i-f stage can be used to increase the signal input to the limiter for discriminator alignment. To accomplish this, align the last i-f stage as indicated in "IF Alignment". Then align discriminator as above leaving the signal generator connected to the grid of the 6SG7 2nd i-f tube.

I-F ALIGNMENT

1. Connect high side of signal generator, through a .01 mfd. capacitor and a 1000 ohm resistor in series, to pin 4 of the 6SG7 2nd i-f tube. Connect low side of generator to chassis.

2. Close gang condenser and connect vacuum tube voltmeter across 220,000 ohm limiter grid resistor; (Point "A" on schematic to ground). Adjust signal generator output until a reading of at least 3 volts is obtained. In order to reduce regeneration caused by the vacuum tube voltmeter leads, a 1-megohm isolating resistor, connected with as short leads as possible to point "A" should be used in series with the vacuum tube voltmeter. Align the 3rd i-f transformer for best peak as indicated on voltmeter.

3. Repeat above for each succeeding transformer by connecting signal generator to signal grid of first i-f tube 6SG7 then to the signal grid of 6BE6 converter. The i-f stages should be aligned in this order.

WARNING—After each i-f stage has been aligned, do not repeak with the signal into the grid of the 6BE6.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Replace signal generator with sweep generator having approximately 300 kc. sweep and tune generator to 10.7 mc. Connect oscilloscope across 220,000 ohm limiter grid resistor through a 1-megohm isolating resistor. The order of alignment is the same as when using a vacuum tube voltmeter. Each i-f transformer should be individually aligned for best peak and symmetry.

R-F ALIGNMENT

1. Connect vacuum tube voltmeter across limiter grid resistor as in FM I-F alignment.

2. Ground one side of the FM Antenna by placing a wire jumper from one FM connection on the antenna terminal strip to the ground connection.

3. Connect unmodulated signal generator through a 300 ohm resistor to ungrounded antenna post and chassis, and tune signal generator to 107 mc.

4. Set radio dial to 107 mc. and tune oscillator trimmer to peak output on vacuum tube voltmeter. Adjust signal generator output until a reading of at least 3 volts is obtained.

5. Tune 107 mc. r-f and antenna trimmers for maximum indication on voltmeter—it may be necessary to rock the dial while adjusting the r-f trimmer.

SPECIAL SERVICE INFORMATION

The following information is provided for the service man who has a vacuum tube voltmeter or a similar measuring instrument available.

STAGE GAINS*

Antenna Post to R-F Grid at:

600 kc.	5.00
98 mc.	1.15

R-F Grid to Converter Grid at:

600 kc.	14.5
98 mc.	9.4

R-F on Converter Grid to 455 kc. on I-F Grid at:

600 kc.	25.0
98 mc.	3.2

I-F on Converter Grid to 1st I-F Grid at:

455 kc. (gang closed)	28.0

1st I-F Grid to 2nd I-F Grid** at:

455 kc.	95
10.7 mc.	33

2nd I-F Grid to Limiter Grid at:

10.7 mc.	33.4

OSCILLATOR OUTPUT VOLTAGE

The DC voltage developed across the Oscillator Grid Resistor (105) at:

600 kc.	6.6V.
98 mc.	6.0V.

or 0.3 ma. through 22,000 ohm Oscillator Grid Resistor at 600 kc. and 0.27 ma. at 98 mc.

AUDIO GAIN

Voltage required across the Volume Control to produce 0.1 watt speaker output*** at 400 cycles is .016 volt with Input Selector Switch in BDCST. setting.

*Variations of ±20% are permissible. All readings made with sufficient input signal to provide 0.5 watt speaker output. 0.5 speaker output at 400 cycles is equivalent to a reading of 1.25V. as measured by a high resistance AC voltmeter across the voice coil of the speaker.

**Detector Plate on AM.

***0.1 watt speaker output at 400 cycles is equivalent to a reading of 0.55 volts as measured by a high resistance AC voltmeter across the voice coil of speaker.

DIAL CORD REPLACEMENT

Two separate drive cables are used in the CR-216 dial assembly. One cable is used to transmit the motion from the tuning knob to the large pulley that is coupled to the condenser gang; the other cable actuates the dial pointer whenever the large pulley on the condenser gang is rotated. Separate instructions for replacing either of these cables is given in the following paragraphs.

CONDENSER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out four screws on each side of chassis. Slide a short length (approximately ½ inch) of sleeving over one end of a length of dial cable, form a small loop and tie a knot in the manner shown on Figure 1. Tie spring to opposite end of cable making length excluding spring 19½ inches. Hook loop over the metal hook in pulley "D" and lace the cable through the pulley slot and around the pulley in a counterclockwise direction when viewed from the rear of the dial assembly keeping the cable to the rear of the pulley groove. Lace the cable around the smaller diameter portion of the tuning control shaft wrapping 2½ turns *from front to back;* then around the opposite side of pulley "D" into the pulley through the slot. Hook the end of tension spring "F" in the hole provided in pulley "D", completing this operation.

DIAL POINTER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out four screws on each side of chassis. Slip a one-half inch length of sleeving over a 42-inch length of dial cable. Tie the two ends to the loop end of the cable spring "E" securely so that the cable doubled measures 19⅝ inches end to end excluding spring.

Place spring hook in top hole and draw cable through slot of pulley "D". Loop one end of cable around pulley "D" in a clockwise direction in front of condenser drive cable (viewing dial assembly from front) then loop the remaining end around pulley in a counterclockwise direction. Secure both ends of cable to chassis at edge of pulley slot with scotch tape, keeping piece of sleeving on remaining loop of cable.

Replace dial assembly and loop cable over pulley "A". While holding cable taut remove scotch tape and loop cable over pulleys "B" and "C" as shown in Figure 1.

Turn the tuning control shaft until the condenser gang is completely meshed and slide the dial pointer on its track until it is in line with the last calibration mark at the low frequency end of the dial. The short piece of sleeving installed prior to the stringing operation should be slid to the rear of the dial pointer and the crimping lug on the pointer pressed over the sleeving. After checking to make certain that the condenser gang is completely meshed and the dial pointer is in the position specified previously, apply a few drops of cement to each end of the sleeving to which the dial pointer is fastened. This completes the operation.

MODEL CR-216

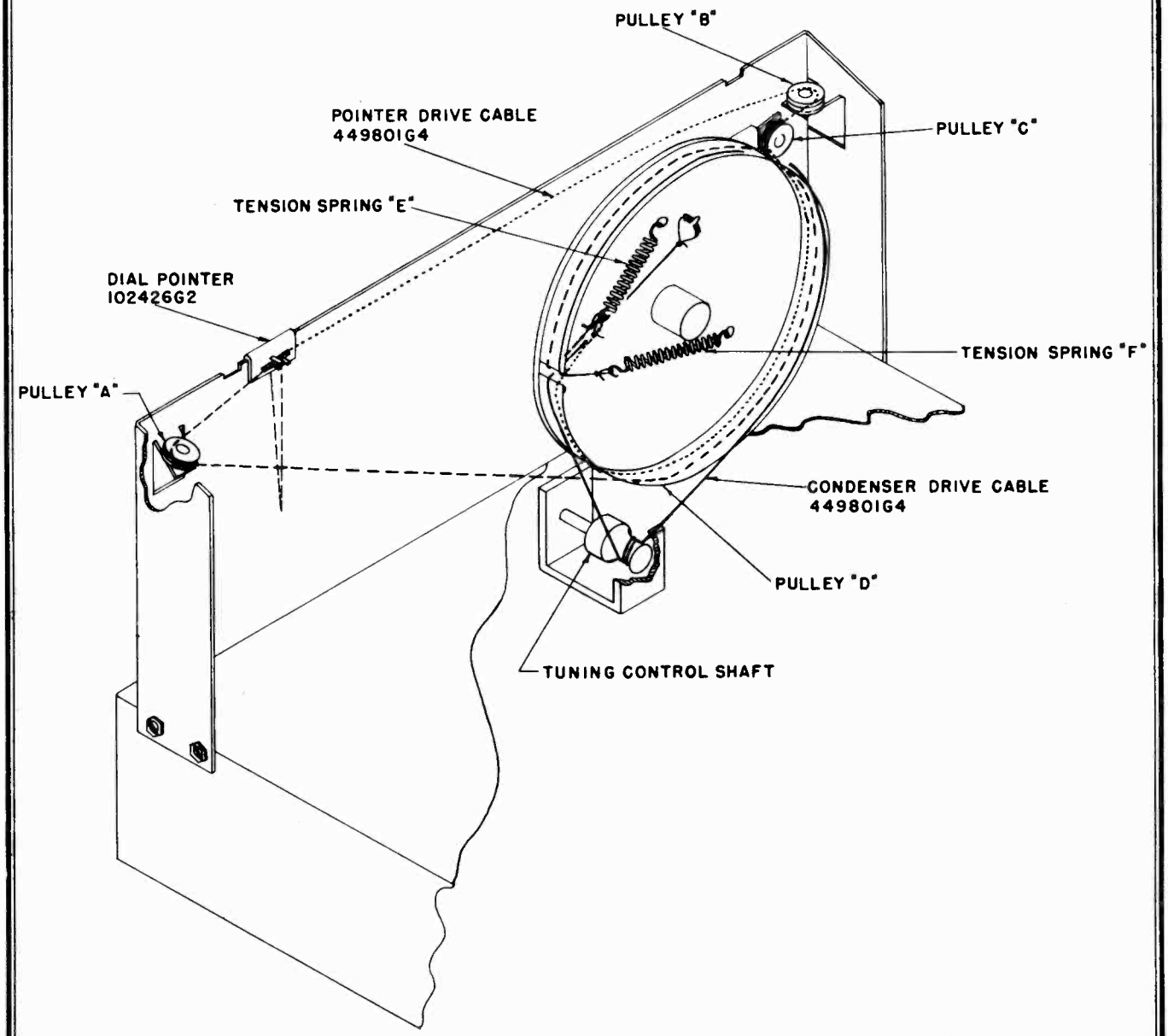


FIGURE 1

MODEL CR-216

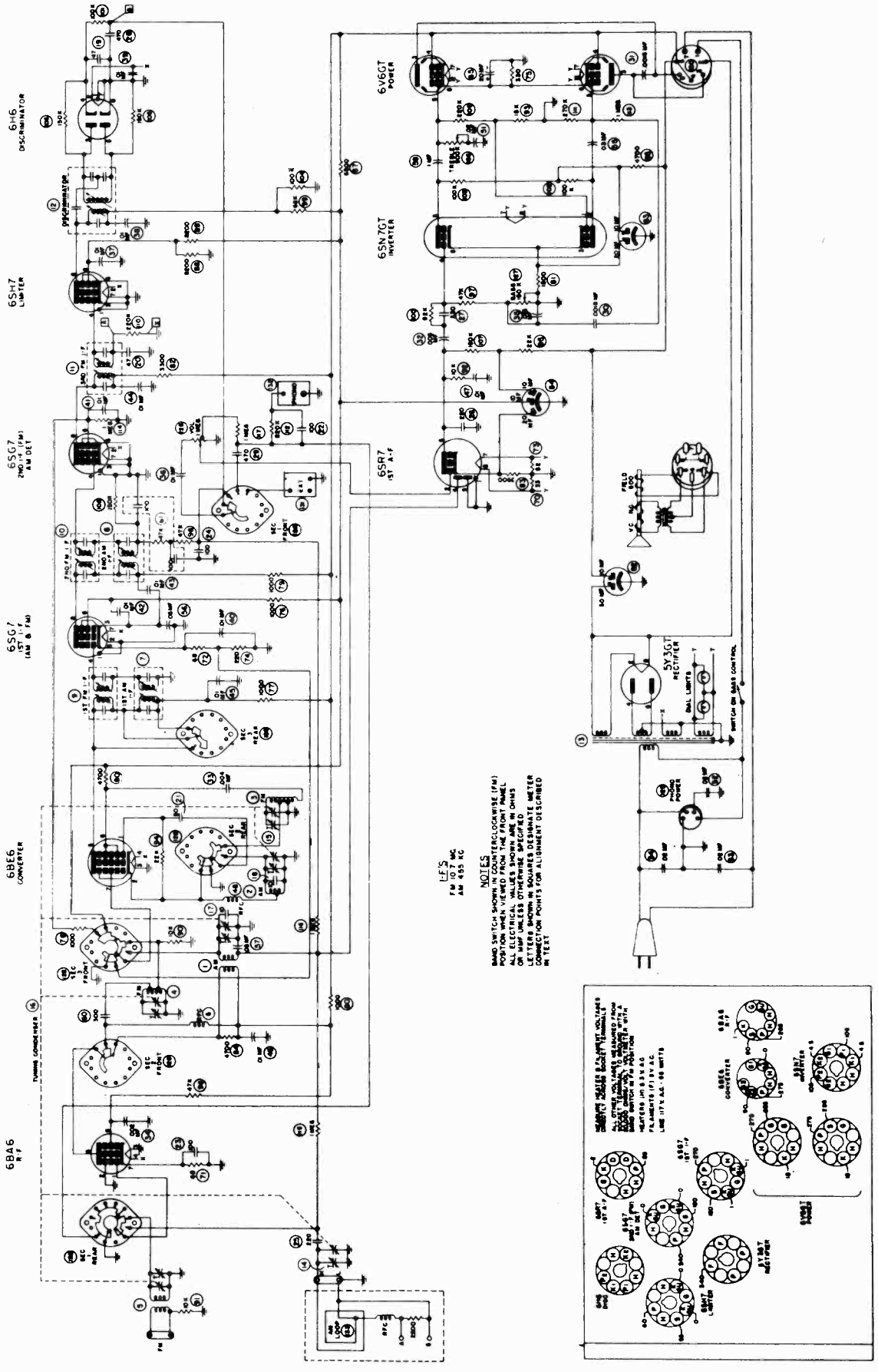


FIGURE 2

MODEL CR-216

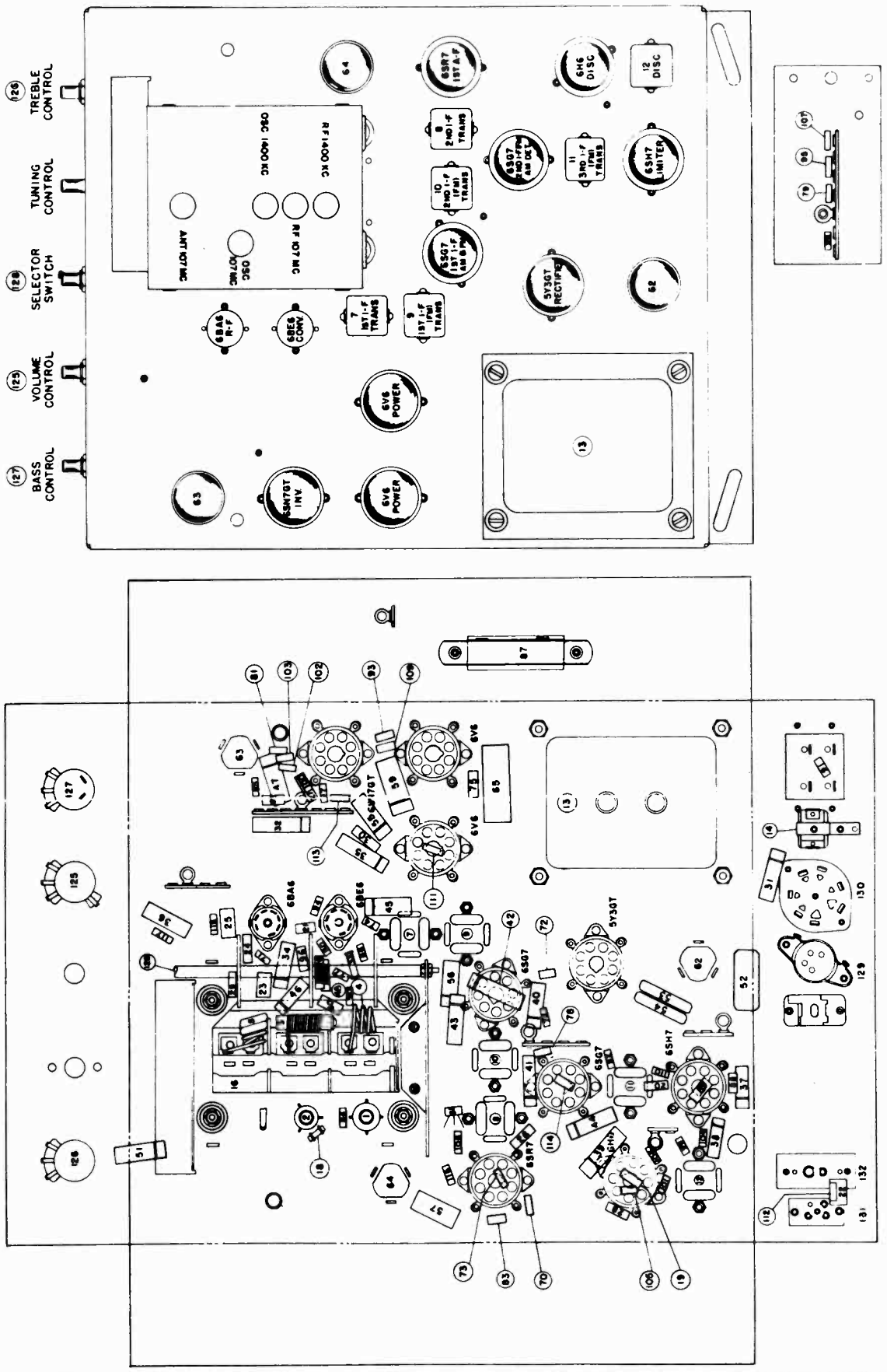


FIGURE 3

PARTS LIST

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil assembly, r-f (AM)	360348G1
2	Coil assembly, oscillator (AM)	360349G1
3	Coil assembly, oscillator (FM)	360323G1
4	Coil assembly, r-f (FM)	360322G2
5	Coil assembly, antenna (FM)	360321G2
6	Coil, choke	360284G1
7	Transformer, first i-f	360350G1
8	Transformer, second i-f	360350G2
9	Transformer, first i-f (FM)	360351G1
10	Transformer, second i-f (FM)	360351G1
11	Transformer, third i-f (FM)	360351G1
12	Transformer, discriminator	360352G1
13	Transformer, power	300050G1
14	Capacitor, variable trimmer	250046G2
15	Capacitor, variable trimmer	260067G5
16	Capacitor, three-gang tuning	260103G1
17	Capacitor, ceramic, 10 mmf. ± 5%, 500 V.	250088G8
18	Capacitor, ceramic, 10 mmf. ±5%, 500 V.	250088G8
19	Capacitor, mica, 47 mmf. 500 V.	250159G96
20	Capacitor, mica, 47 mmf. 500 V.	250159G96
21	Capacitor, ceramic, 50 mmf. ±10%, 500 V.	250088G39
22	Capacitor, mica, 100 mmf. ±10%, 500 V.	250159G82
23	Capacitor, mica, 100 mmf. 500 V.	250159G98
24	Capacitor, mica, 100 mmf. 500 V.	250159G98
25	Capacitor, mica, 220 mmf. 500 V.	250159G100
26	Capacitor, mica, 220 mmf. 500 V.	250159G100
27	Capacitor, mica, 330 mmf. ±10%, 500 V.	250159G88
28	Capacitor, mica, 470 mmf. 500 V.	250159G102
29	Capacitor, mica, 470 mmf. ±10%, 500 V.	250159G90
30	Capacitor, mica, 1800 mmf. ±5%, 500 V.	250160G44
31	Capacitor, paper, .0015 mfd. ±10%, 600 V.	250169G1
32	Capacitor, paper, .005 mfd. 600 V.	250152G41
33	Capacitor, ceramic, .004 mfd. 350 V.	250088G34
34	Capacitor, paper, .002 mfd. 600 V.	250152G44
35	Capacitor, paper, .015 mfd. ±10%, 200 V.	250169G5
36	Capacitor, paper, .01 mfd. 200 V.	250152G18
37	Capacitor, paper, .01 mfd. 200 V.	250152G18
38	Capacitor, paper, .01 mfd. 200 V.	250152G18
39	Capacitor, paper, .01 mfd. 200 V.	250152G18
40	Capacitor, paper, .01 mfd. 200 V.	250152G18
41	Capacitor, paper, .01 mfd. 600 V.	250152G38
42	Capacitor, paper, .01 mfd. 600 V.	250152G38
43	Capacitor, paper, .01 mfd. 600 V.	250152G38
44	Capacitor, paper, .01 mfd. 600 V.	250152G38
45	Capacitor, paper, .01 mfd. 600 V.	250152G38

MODEL CR-216

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
46	Capacitor, paper, .01 mfd. 600 V.	250152G38
47	Capacitor, paper, .01 mfd. 600 V.	250152G38
48	Coil, choke	360284G1
51	Capacitor, paper, .02 mfd. 200 V.	250152G17
52	Capacitor, paper, .02 mfd. 600 V.	250129G3
53	Capacitor, paper, .02 mfd. 600 V.	250129G3
54	Capacitor, paper, .02 mfd. 600 V.	250129G3
55	Capacitor, paper, .03 mfd. 600 V.	250152G36
56	Capacitor, paper, .05 mfd. 200 V.	250152G15
57	Capacitor, paper, .05 mfd. 200 V.	250152G15
59	Capacitor, paper, .1 mfd. 600 V.	250152G33
60	Capacitor, ceramic, 500 mmf.	250088G31
61	Capacitor-resistor filter	250170G1
62	Capacitor, electrolytic, 30-10 mfd. 475 V.	270023G2
63	Capacitor, electrolytic, 10 mfd. 450 V.—20 mfd. 25 V.	270023G6
64	Capacitor, electrolytic, 10-10 mfd. 450 V.—20 mfd. 25 V.	270023G7
65	Capacitor, electrolytic, 20 mfd. 25 V.	270027G2
70	Resistor, composition, 33 ohms, ½ W.	230084G4
71	Resistor, composition, 68 ohms, ½ W.	230084G6
72	Resistor, composition, 68 ohms, ½ W.	230084G6
73	Resistor, composition, 82 ohms, ±10%, ½ W.	230084G49
74	Resistor, composition, 220 ohms, ½ W.	230084G9
75	Resistor, composition, 330 ohms, 2 W.	230086G56
76	Resistor, composition, 1000 ohms, ½ W.	230084G13
77	Resistor, composition, 1000 ohms, ½ W.	230084G13
78	Resistor, composition, 1000 ohms, ½ W.	230084G13
79	Resistor, composition, 1000 ohms, ½ W.	230084G13
80	Resistor, composition, 1000 ohms, ½ W.	230084G13
81	Resistor, composition, 1500 ohms, ½ W.	230084G14
82	Resistor, composition, 3300 ohms, ½ W.	230084G16
83	Resistor, composition, 3900 ohms, ½ W. ±10%	230084G69
84	Resistor, composition, 4700 ohms, ½ W.	230084G17
85	Resistor, composition, 4700 ohms, ½ W.	230084G17
86	Resistor, composition, 4700 ohms, ½ W.	230084G17
87	Resistor, wire wound, 6500 ohms, ±10%	240035G9
88	Resistor, composition, 8200 ohms, ±10%, 1 W.	230085G73
89	Resistor, composition, 8200 ohms, ±10%, 1 W.	230085G73
90	Resistor, composition, 10,000 ohms, ½ W.	230084G19
91	Resistor, composition, 10,000 ohms, ½ W.	230084G19
92	Resistor, composition, 10,000 ohms, 1 W.	230085G19
93	Resistor, composition, 15,000 ohms, ±5%, ½ W.	230084G187
94	Resistor, composition, 22,000 ohms, ½ W.	230084G21
95	Resistor, composition, 22,000 ohms, ½ W.	230084G21
96	Resistor, composition, 47,000 ohms, 1 W.	230085G23
97	Resistor, composition, 47,000 ohms, ½ W.	230084G23
98	Resistor, composition, 47,000 ohms, ½ W.	230084G23
99	Resistor, composition, 68,000 ohms, ±10%, ½ W.	230084G84
100	Resistor, composition, 82,000 ohms, ±10%, ½ W.	230084G85
101	Resistor, composition, 100,000 ohms, ±10%, ½ W.	230084G86
102	Resistor, composition, 100,000 ohms, ½ W.	230084G25

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
103	Resistor, composition, 100,000 ohms, ½ W.	230084G25
104	Resistor, composition, 100,000 ohms, ½ W.	230084G25
105	Resistor, composition, 150,000 ohms, ±10%, ½ W.	230084G88
106	Resistor, composition, 150,000 ohms, ±10%, ½ W.	230084G88
107	Resistor, composition, 150,000 ohms, ½ W.	230084G26
108	Resistor, composition, 150,000 ohms, ½ W.	230084G26
109	Resistor, composition, 220,000 ohms, ±5%, ½ W.	230084G215
110	Resistor, composition, 220,000 ohms, ½ W.	230084G27
111	Resistor, composition, 270,000 ohms, ±10%, ½ W.	230084G91
112	Resistor, composition, 820,000 ohms, ±10%, ½ W.	230084G97
113	Resistor, composition, 1 megohm, ±5%, ½ W.	230084G231
114	Resistor, composition, 1 megohm, ½ W.	230084G31
115	Resistor, composition, 1 megohm, ½ W.	230084G31
116	Resistor, composition, 1 megohm, ½ W.	230084G31
117	Resistor, composition, 1 megohm, ½ W.	230084G31
125	Control, volume	220074G1
126	Control, treble	220072G8
127	Control, bass, with switch	220073G5
128	Switch, selector	160194G1
129	Socket, motor	180501G5
130	Socket, speaker	180504G16
131	Socket, external	180060G1
132	Socket, phono	189741G1
133	Loop antenna	*

SPECIFICATIONS

Power supply	117 volts 50/60 cycles AC
Power consumption	95 watts
Power output	10 watts
Intermediate frequency	455 kc./10.7 mc.
Tuning frequency range:	
Broadcast Band	540-1620 kc.
FM Band	88—108 mc.
Tubes:	
R-F Amplifier	6BA6
Converter	6BE6
1st I-F Amplifier (AM-FM)	6SG7
2nd I-F (FM), Detector and AVC (AM)	6SG7
Limiter	6SH7
Discriminator	6H6
First Audio	6SR7
Inverter	6SN7GT
Power output (push-pull stage)	(2) 6V6GT
Rectifier	5Y3GT
Dial Lamps	Mazda No. 44
Speaker:	
Field coil resistance	500 ohms
Voice coil impedance (400 cycles)	3.0 ohms
Output transformer	8,000/3 ohms

MODEL CR-217

GENERAL

Model CR-217 radio chassis is an AM-FM tuner that must be used in conjunction with a power amplifier such as the AMP-116 for speaker operation. Heater and plate voltages for the CR-213 radio chassis are supplied from the amplifier chassis; it is therefore essential that the radio and amplifier chassis be interconnected during alignment or for other electrical service operations.

METHOD OF REMOVING CHASSIS FROM CABINET

Model CR-217 radio chassis is designed for easy removal from the cabinet in which it is installed. As the radio panel is permanently fastened to the chassis, the control knobs need not be removed when the chassis is taken out of the cabinet for service.

To remove the chassis, first remove the antenna leads from their terminals and all plugs from the receptacles on the rear of the chassis. Then remove the two Phillips-head screws from the angular slots in the flange at the rear of the chassis.

In the Embassy the chassis is removed through the front panel opening. Remove the three wood cleats (secured by wood screws) in front of the chassis panel. Lift the rear of the chassis about an inch and pull it straight back enough to disengage the two hook plates from the chassis tray and then remove the chassis through the front of the cabinet. Never remove the chassis tray from the cabinet it has been properly positioned to bring the radio panel in place when the chassis is replaced.

To replace the chassis slide it into the cabinet from the front and push it in far enough for the hook plates on the chassis to engage the slots in the chassis tray. With the chassis in this position install the three wood cleats in front of the chassis panel. Push the chassis forward until the panel is approximately 1/16" from the back of the cleats and secure in position with tho two Phillips head screws.

CAUTION: Make sure the chassis panel does not touch the wood cleats or acoustic feedback may result. Replace all plugs in their receptacles and the antenna leads on their correct terminals. The antenna terminal board for the loop antenna connections is designated L-H. The two terminals on the loop are designated L and H; the leads connected to these terminals should be wired to the corresponding terminals (L and H) on the chassis.

ALIGNMENT PROCEDURE

Alignment of this receiver requires the use of an accurately calibrated RF signal generator, range 455 kc. to 107mc., an output meter, and a vacuum tube voltmeter of approximately 10 megohm input impedance. All trimmer condensers can be identified by stampings on the chassis and gang condenser cover and are shown on the chassis layout diagram.

The pointer on the radio dial should line up with the first horizontal mark on the low frequency end of the dial glass. If the pointer does not line up, loosen the screws on the pointer drive pulley at the end of the tuning gang and adjust the pointer setting; tighten the screws after this adjustment. Be sure the gang is fully meshed for this pointer alignment.

AM ALIGNMENT

I-F ALIGNMENT

1. Set range control to position No. 1. Set volume, treble and bass controls to maximum, the Band Switch to Broadcast position, and dial pointer to 1000 kc.

2. Tune the signal generator to EXACTLY 455 kc.

3. Connect output of modulated signal generator to the signal grid of the 6SB7Y (pin 8) through a .01 mfd. capacitor and signal generator ground to radio chassis.

4. All i-f transformers on this chassis are slug-tuned. Both slug adjustments for 455 kc. are located on top of the transformers; the 10.7 mc. adjustments are accessible on the bottom.

5. Connect output meter across voice coil of 15-inch speaker and peak in order the third, second and first i-f transformers.

6. Use only enough signal input to give a readable indication on voltmeter so that the AVC will not operate and give false readings.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Connect 455 kc. sweep generator having approximately 40 kc. sweep to signal grid of 6SB7Y (pin 8) through a .01 mfd. capacitor. Connect an oscilloscope through a 1 megohm isolating resistor across the 220,000 ohm diode load resistor. Align for best possible peak with range switch in position No. 1, and symmetry in position No. 4.

BROADCAST BAND R-F ALIGNMENT

1. Connect signal generator through .00025 mfd. capacitor to antenna and ground terminals on antenna terminal strip on rear of chassis. Be sure "Ant-loop" switch on top of the chassis is in the ANT. position. Connect output meter as for AM i-f alignment.

2. Tune signal generator to 1400 kc.

3. Set dial to 1400 kc. and adjust oscillator, r-f and antenna trimmers for maximum indication on meter.

4. Set signal generator to 600 kc. and tune radio to signal. Adjust the 600 kc. padder to maximum output while simultaneously rocking the gang.

5. 1400 kc. calibration should then be checked and re-adjusted if necessary with the 1400 kc. oscillator trimmer.

SHORT WAVE BAND R-F ALIGNMENT

1. Set the Band Switch to Short Wave and replace the .00025 mfd. capacitor in series with the signal generator lead to the antenna terminal, with a 400-ohm resistor.

2. Set the signal generator and the receiver to 15 mc. and adjust the oscillator, r-f and antenna trimmers for maximum indication on the meter. While adjusting the 15 mc. oscillator trimmer, two peaks may be observed; only one is the correct peak for 15 mc alignment. To obtain the correct peak, screw trimmer in to maximum capacitance, then decrease until the first peak is observed. This is the correct one.

Another method for checking for the correct peak is to tune the receiver to 15.91 mc. with signal generator at 15 mc. and with the output increased. If the 15 mc. oscillator trimmer is properly adjusted, the signal will be received at 15.91 mc. If incorrectly aligned, the signal will be received at 14.09 mc.

FM ALIGNMENT

DISCRIMINATOR ALIGNMENT

1. Tune signal generator to EXACTLY 10.775 mc. and connect to pin 4 of the 6SH7 limiter tube socket through a .01 mfd. capacitor.

2. Connect a DC vacuum tube voltmeter from Pin 4 on 6H6 tube socket to ground through a 1 megohm isolating resistor.

3. Peak both discriminator slugs at 10.775 mc.

4. Retune signal generator to exactly 10.7 mc. and adjust bottom slug for zero volts.

5. The DC voltage at 10.625 mc. should be within 10% of the voltage at 10.775 mc. and of opposite polarity.

Note: If the signal generator is not capable of sufficient output to produce a readable DC voltage, the amplification of the last i-f stage can be used to increase the signal input to the limiter for discriminator alignment. To accomplish this, align the last i-f stage as indicated in "IF Alignment". Then align discriminator as above leaving the signal generator connected to the grid of the 6SG7 2nd i-f tube.

I-F ALIGNMENT

1. Connect high side of signal generator, through a .01 mfd. capacitor and a 1000 ohm resistor in series, to pin 4 of the 6SG7 2nd i-f tube. Connect low side of generator to chassis.

2. Close gang condenser and connect vacuum tube voltmeter across 220,000 ohm limiter grid resistor, (Points "A" to "X" on schematic). Adjust signal generator output until a reading of at least 3 volts is obtained. In order to reduce regeneration caused by the vacuum tube voltmeter leads, a 1-megohm isolating resistor, connected with as short leads as possible to point "A" should be used in series with the vacuum tube voltmeter. Align the 3rd i-f transformer for best peak as indicated on voltmeter.

3. Repeat above for the 2nd and 1st transformer by connecting signal generator to signal grid of first i-f tube 6SG7 then to the signal grid of 6SB7Y converter. The i-f stages should be aligned in this order.

WARNING—After each i-f stage has been individually aligned, do not repeak with the signal into the grid of the 6SB7Y.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Replace signal generator with sweep generator having approximately 300 kc. sweep and tune generator to 10.7 mc. Connect oscilloscope across 220,000 ohm limiter grid resistor through a 1-megohm isolating resistor. The order of alignment is the same as when using a vacuum tube voltmeter. Each i-f transformer should be individually aligned for best peak and symmetry.

R-F ALIGNMENT

1. Connect vacuum tube voltmeter across limiter grid resistor as in FM I-F alignment. Adjust signal generator output until a reading of at least 3 volts is obtained.

2. Ground one side of the FM Antenna by placing a wire jumper from one FM connection on the antenna terminal strip to the ground connection.

3. Connect unmodulated signal generator through a 300 ohm resistor to ungrounded antenna post and chassis, and tune signal generator to 107 mc.

4. Set radio dial to 107 mc. and tune oscillator trimmer to peak output on vacuum tube voltmeter.

5. Tune 107 mc. r-f and antenna trimmers for maximum indication on voltmeter—it may be necessary to rock the gang while adjusting the r-f trimmer.

SPECIAL SERVICE INFORMATION

The following information is provided for the service man who has a vacuum tube voltmeter or a similar measuring instrument available.

STAGE GAINS*

Antenna Post to R-F Grid at:

600 kc.	5.8
6.5 mc.	2.9
98 mc.	1.0

R-F Grid to Converter Grid at:

600 kc.	11.6
6.5 mc.	9.5
98 mc.	6.8

R-F on Converter Grid to 455 kc. on I-F Grid at:

600 kc.	1.7
6.5 mc.	2.4
98 mc.	6.8

I-F on Converter Grid to 1st I-F Grid at:

455 kc. (dial pointer at 600 kc.)	2.6

1st I-F Grid to 2nd I-F Grid at:

455 kc.	20.5
10.7 mc.	37

2nd I-F Grid to Limiter Grid at:

10.7 mc.	34.5

AUDIO GAIN

Voltage required across the Volume Control to produce 0.1 watt speaker output** at 400 cycles is:

.013 volt with Amplifier AMP-116

with Band Switch in BDCST setting.

OSCILLATOR OUTPUT VOLTAGE

The DC voltage developed across the Oscillator Grid Resistor (105) at:

600 kc.	4.5V.
6.5 mc.	4.6V.
98 mc.	5.4V.

or 0.3 ma. through 15,000 ohm Oscillator Grid Resistor at 600 kc., 0.31 ma. at 6.5 mc. and 0.36 ma. at 98 mc.

*Variations of ± 20% are permissible. All AM readings made with sufficient input signal to provide 0.5 watt speaker output. 0.5 watt speaker output at 400 cycles is equivalent to a reading of 2.75V. as measured by a high resistance AC voltmeter across the voice coil of the 15-inch speaker.

**0.1 watt speaker output at 400 cycles is equivalent to a reading of 1.22 volts as measured by a high resistance AC voltmeter across the voice coil of 15-inch speaker.

10 KC. FILTER ADJUSTMENT

This chassis incorporates a 10 kc. filter circuit to eliminate the beat note heard as a whistle between stations on the broadcast band. If the trimmer is out of adjustment the following procedure should be observed:

1. Adjust the range control switch to the No. 3 setting.

2. Remove the phono pickup plug from the radio chassis and connect the output of an audio oscillator to the phonograph pickup socket. Adjust the oscillator to exactly 10,000 cycles.

3. Set the band selector to PHONO and adjust the 10 kc. trimmer for minimum output.

4. If an audio oscillator is not available for making this adjustment set the band selector to BDCST, set the range control to position 4, connect the antenna to the receiver and set the gang condenser to a point between two stations on adjacent channels having approximately the same power. If the 10 kc. trimmer is out of adjustment, a whistle will be heard. Adjust the trimmer until the whistle is eliminated.

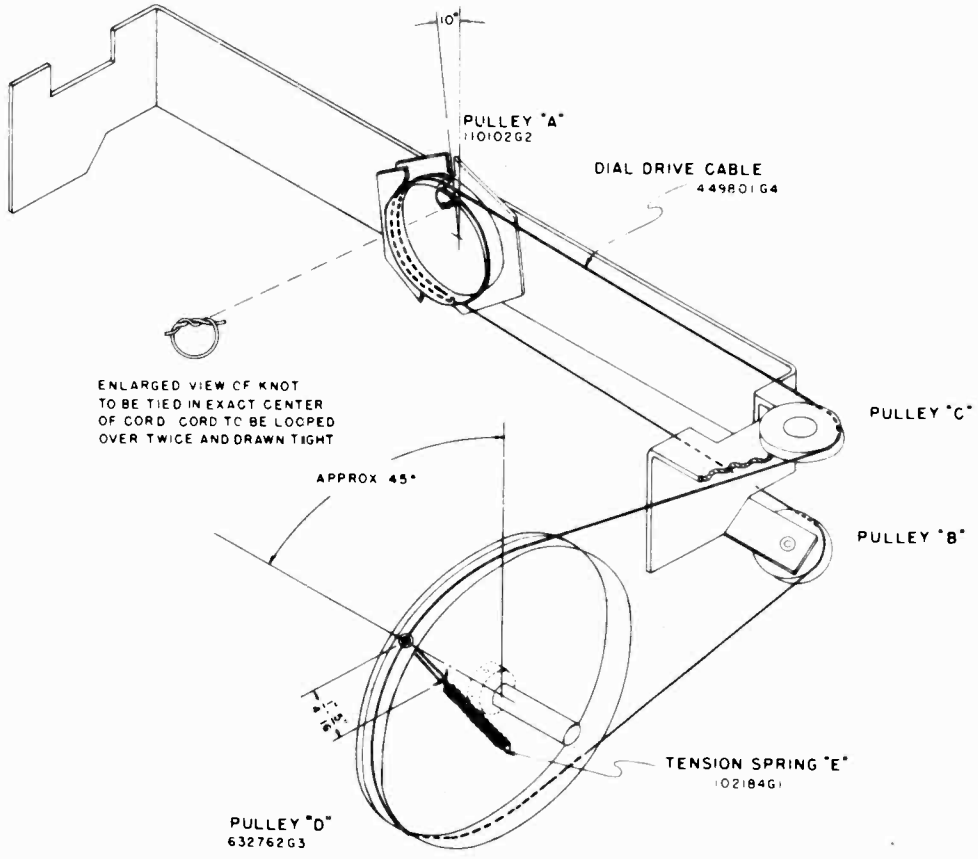


FIGURE 1

DIAL CORD REPLACEMENT

Rotate the brass pulley designated "A" in Figure 1 until the dial pointer strikes the stop at the high frequency end of the dial calibration. In this condition the slot in pulley "A" should be approximately ten degrees to the left of being vertical—see Figure 1. If the slot in the pulley is in some other position under the above mentioned conditions, the pointer set screw is probably loose and has allowed the pointer to slip.

To correct this condition, first remove the glass dial and loosen the pointer screw. Then while holding pulley "A" so that its slot is approximately ten degrees to the left of vertical (when viewed from the rear) adjust the pointer until it is resting against the stop at the high frequency end of its travel. Then tighten the pointer set screw securely and replace the glass dial.

Completely unmesh the condenser gang and check the location of the hole or slot in pulley "D". If this hole is not approximately 45 degrees back from vertical as shown on Figure 1, loosen the two No. 6 Allen set screws in the hub of pulley "D" and slip the pulley on its shaft (while holding the condenser gang unmeshed) until the specified adjustment is obtained; then tighten one of the set screws securely. It will be shown later that this is a temporary setting. Next, tie a double knot in the exact center of a 25-inch length of dial cable and fold the cable back on itself so that the knot is at one end. The correct method for tying this knot is shown as an inset on Figure 1. Grasp the cable near the knotted end and slide it into the pulley slot so that the knot is against the inside rim of the pulley as shown in the sketch. The piece of cable nearest the dial frame should be wound in the direction shown for one-half turn; then over the lower pulley "B", around the bottom of the large pulley "D" and into the hole. Pull the cable

taut and wrap the end around the small hook on pulley "D" temporarily.

The remaining piece of cable should be wound around pulley "A" in the direction shown, for one complete turn, over the upper pulley "C", and over the top of pulley "D". Thread the end through the small hole in pulley "D" and pull both ends of the cable taut. With one end of tension spring "E" fastened to the hook on pulley "D" lace the two free ends of the cable through the opposite end of the spring and tie a knot at a point that will allow 1/4" to 5/16" of cable between the spring and the inside rim of pulley "D". Be sure to tie the knot around one coil of the spring in the manner shown.

Now with the condenser gang completely meshed, check the position of the dial pointer. If it is not in line with the last calibration mark at the low frequency end of the dial, loosen the set screw in pulley "D" and turn it until the pointer is in the specified position. Be sure that the condenser gang does not move during this adjustment. Then tighten the two screws in pulley "D" securely completing the operation.

CONDENSER GANG DRIVE ADJUSTMENTS

Whenever any of the mechanical parts in the condenser gang drive assembly require replacement due to rough handling or for any other reason, it is extremely important that clearances and adjustments shown on Figures 2 and 3 are correct; otherwise, the tuning mechanism will be sluggish or it may slip during operation.

In reassembling the mechanism after any part was replaced, follow the procedure outlined below:

1. Assemble the Tuning Shaft, Drive Collar, Compression Spring and Flywheel in the order shown on Figure 3. The distance between the front of the Drive Collar and the front of the Tuning Shaft must be 1 1/8

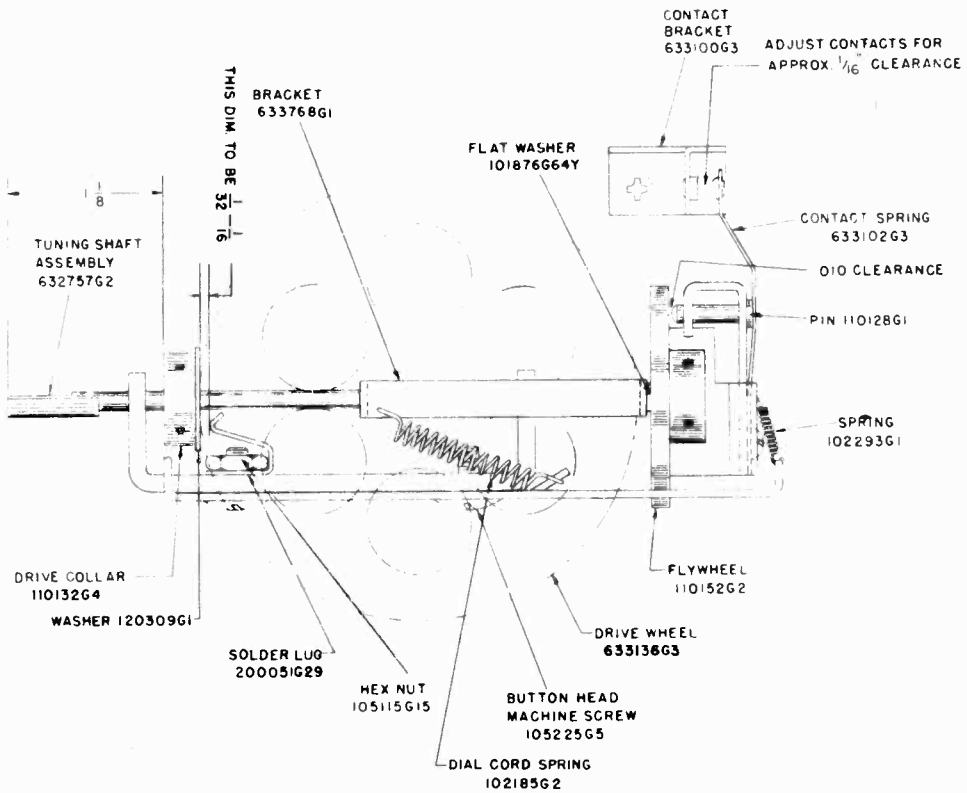


FIGURE 2

inches as specified on Figure 2. Install the Flywheel on the rear of the Tuning Shaft and slide it forward until it nearly touches the edge of the Drive Wheel; then tighten one of the set screws in the Flywheel hub. Insert a .010" gauge between the Flywheel and the Pin, and while holding the gauge in this position, loosen the set screw in the Flywheel hub that was previously tightened. The Compression Spring should force the Flywheel back against the gauge—when this occurs, tighten both set screws in the Flywheel hub.

2. Adjust the Muting Switch contact clearance by loosening the two screws in the Contact Bracket and sliding the bracket in the required direction until a 1/16" clearance is obtained. If this adjustment cannot be obtained in the manner prescribed, bend the Contact Bracket until proper clearance is realized.

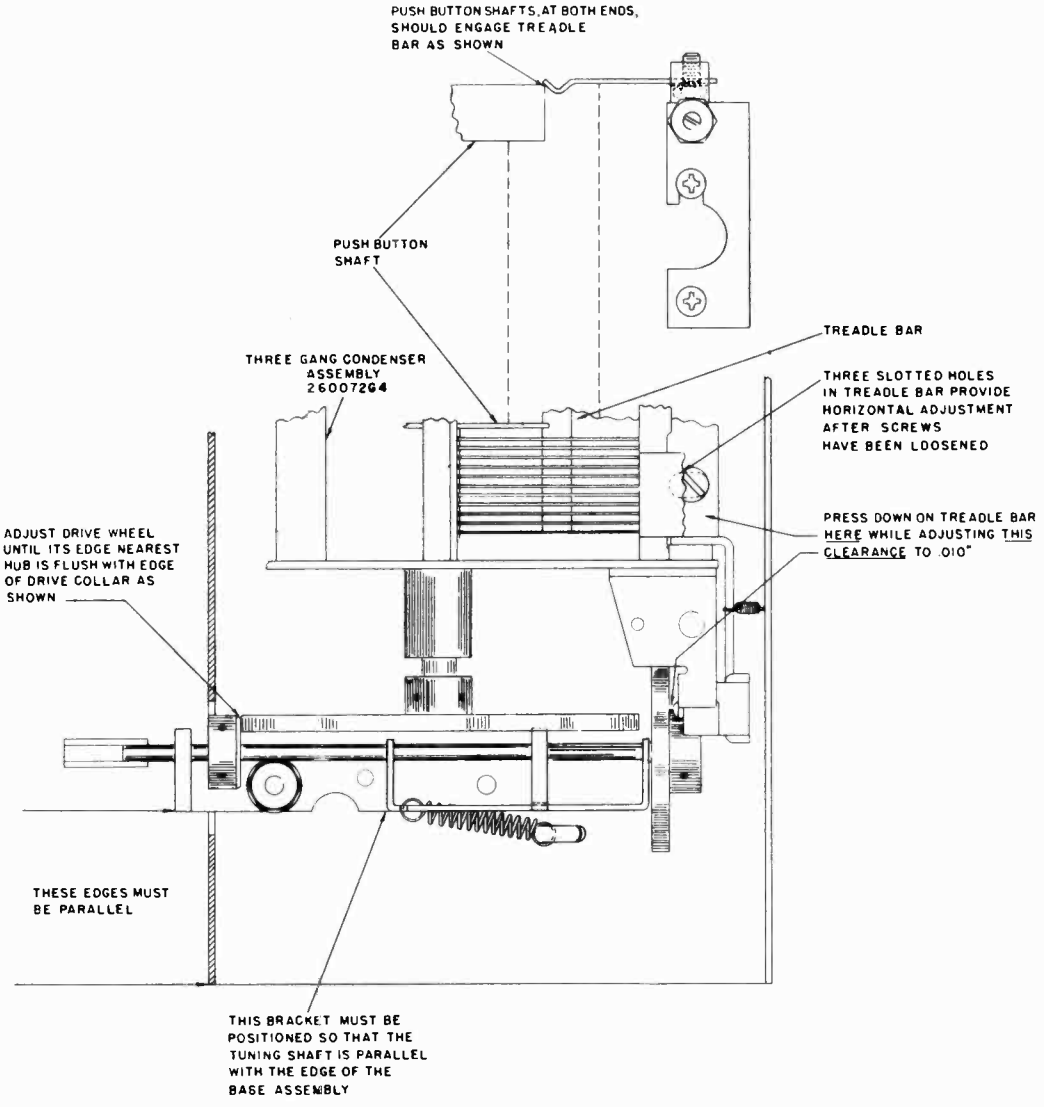


FIGURE 3

3. The Drive Wheel is properly located on its shaft when its edge nearest the hub is in line with the outside edge of the Drive Collar as shown on Figure 3. Two Allen set screws in the Drive Wheel hub provide a means of adjusting the position of this wheel.

4. When the adjustment outlined in paragraph 2 is correct, the proper contact clearance will automatically be obtained when the Muting Switch is to be "unmuted" while the push buttons are being set. While pressure is applied to any one of the push buttons while they are being set up, a pressure applied simultaneously to the Tuning Control knob will cause the Muting Switch contacts to open. Detailed instructions on setting up these push buttons are shown elsewhere in this bulletin.

5. If the push button shafts at both ends do not engage the Treadle Bar as shown on Figure 3, the three screws in the Treadle Bar must be loosened and the Treadle Bar should be moved until the required condition is obtained.

MODEL CR-217

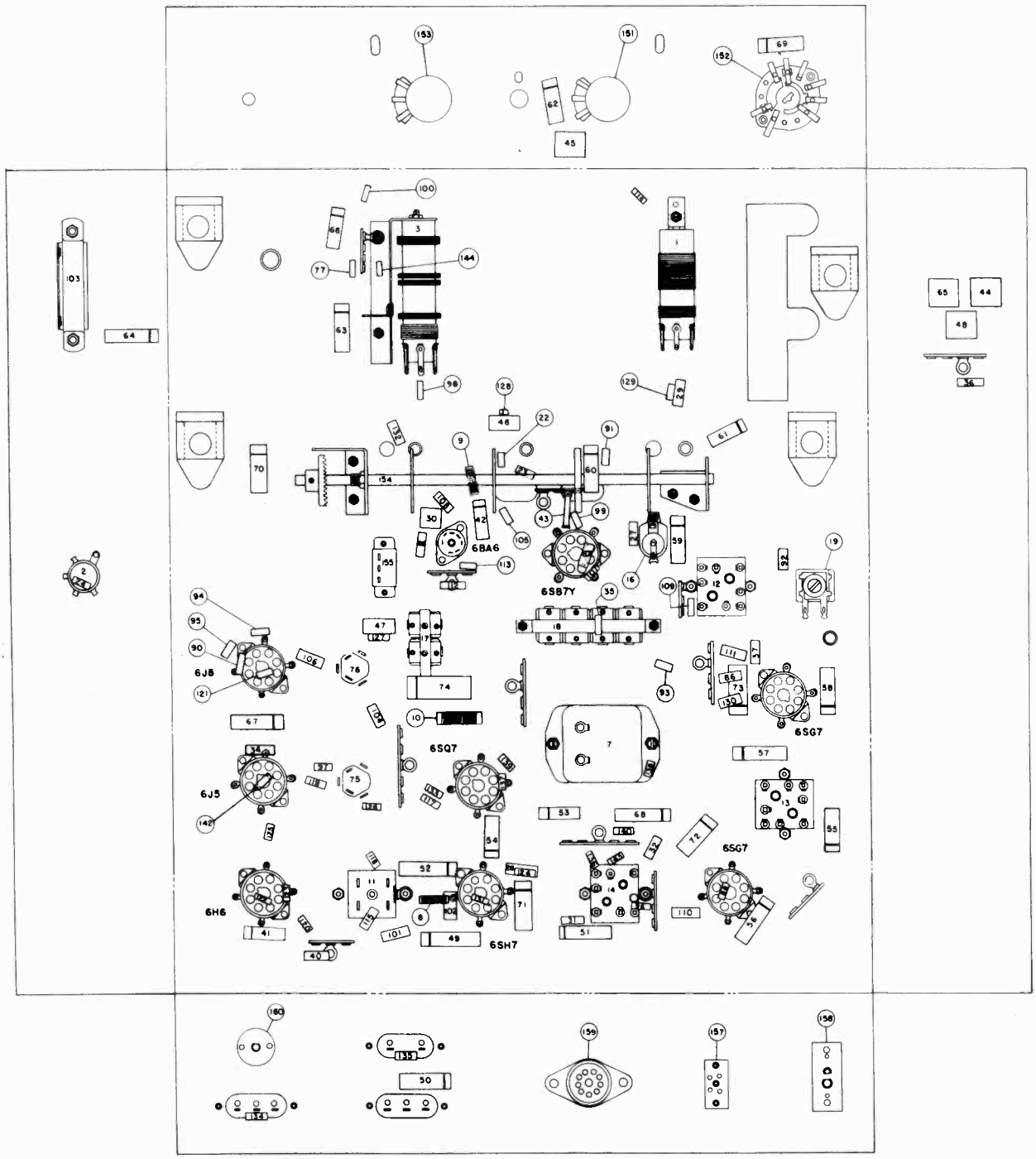
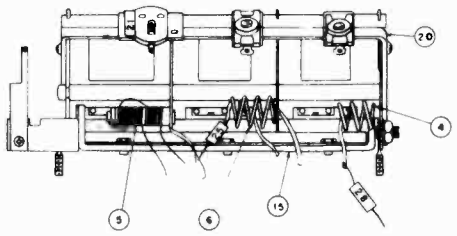
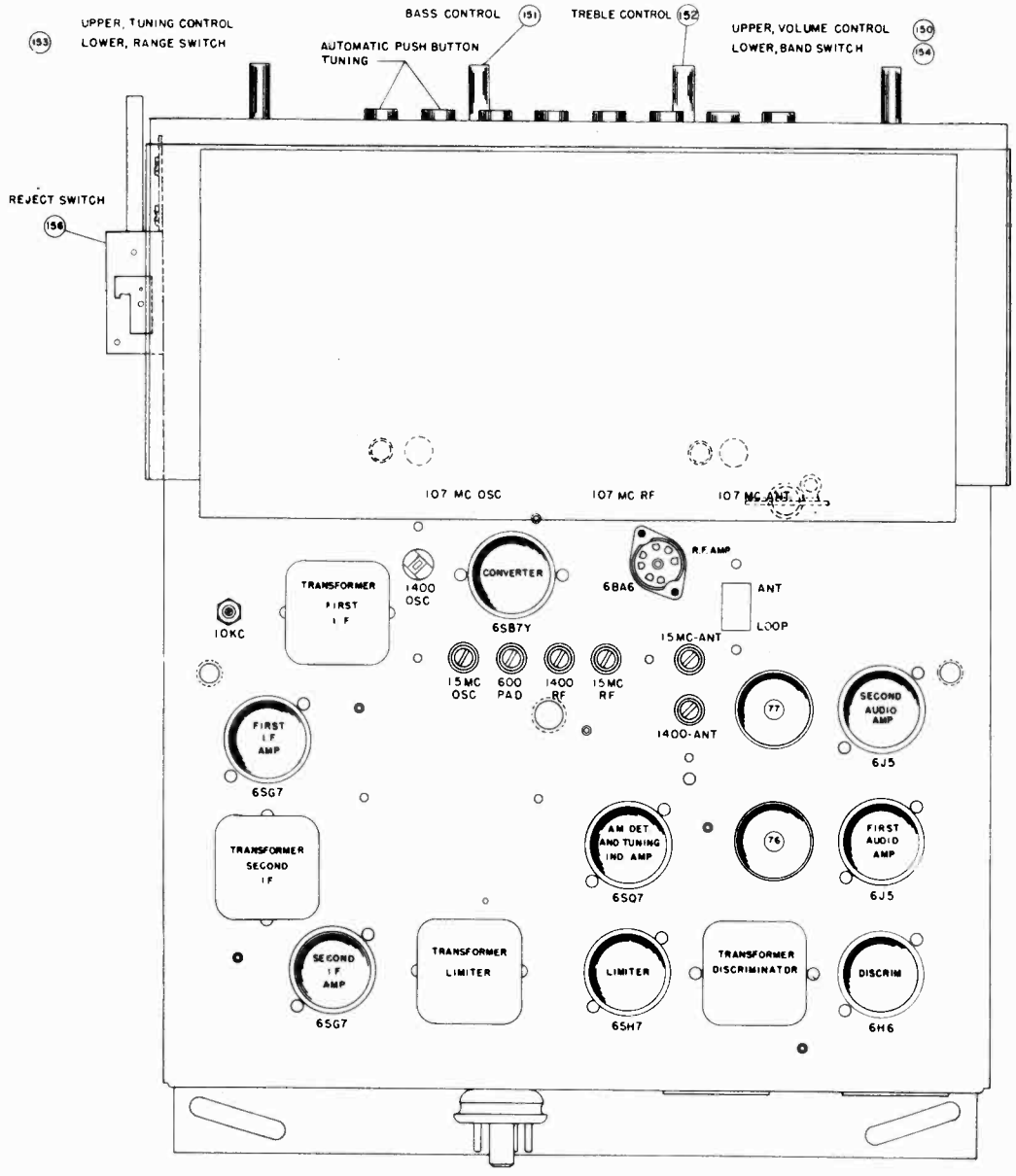


FIGURE 5





MODEL CR-217

PARTS LIST

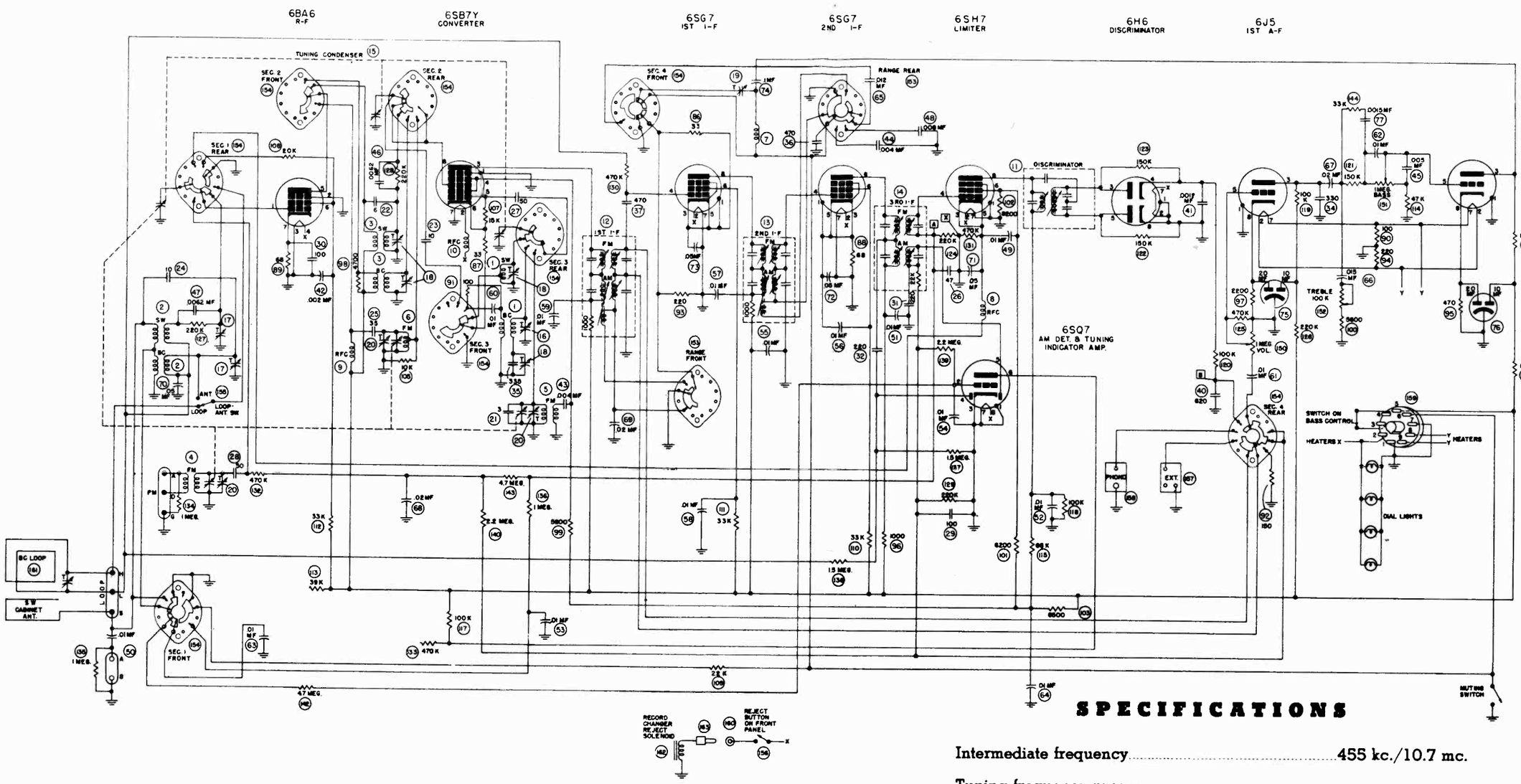
REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil Assembly, Oscillator (AM)	360298G1
2	Coil Assembly, Antenna (AM)	360299G1
3	Coil Assembly, R.F. (AM)	360300G1
4	Coil Assembly, Antenna (FM)	360296G3
5	Coil Assembly, Oscillator (FM)	360295G1
6	Coil Assembly, R.F. (FM)	360297G3
7	Coil Assembly, 10 K.C.	360244G1
8	Choke Coil	360284G1
9	Choke Coil	360284G1
10	Choke Coil, Filament	360264G1
11	Transformer (Discriminator)	360305G1
12	Transformer, I.F.	360285G1
13	Transformer, I.F.	360285G1
14	Transformer, Limiter	360286G1
15	Capacitor, Variable, Three Gang Tuning	260075G1
16	Capacitor, Variable, Oscillator Trimmer (Broadcast)	260067G4
17	Capacitor, Variable, 2 Trimmer	260080G1
18	Capacitor, Variable, 4 Trimmer and Oscillator Padder	260082G1
19	Capacitor, Variable, 10 K.C. Trimmer	259610G2
20	Capacitor, Trimmer Assembly	260084G1
21	Capacitor, Ceramic, 3mmf.	250088G38
22	Capacitor, Ceramic & Composition, 6 mmf.	250164G2
23	Capacitor, Ceramic & Composition, 10 mmf.	250164G3
24	Capacitor, Ceramic & Composition, 10 mmf.	250164G3
25	Capacitor, Ceramic, 35 mmf.	250088G40
26	Capacitor, Mica, 47 mmf.	250159G96
27	Capacitor, Ceramic, 50 mmf.	250088G39
28	Capacitor, Ceramic, 50 mmf.	250088G39
29	Capacitor, Mica, 100 mmf.	250159G98
30	Capacitor, Mica, 100 mmf.	250159G98
31	Capacitor, Mica, 220 mmf.	250159G100
32	Capacitor, Mica, 220 mmf.	250159G100
34	Capacitor, Mica, 330 mmf.	250159G101
35	Capacitor, Silver Mica, 335 mmf., ±1%	250085G38
36	Capacitor, Mica, 470 mmf.	250159G102
37	Capacitor, Mica, 470 mmf.	250159G102
40	Capacitor, Mica, 820 mmf., ±10%	250159G132
41	Capacitor, Paper, .0012 mfd., ±10%, 600 V.	250169G12
42	Capacitor, Paper, .002 mfd., 600 V.	250152G44
43	Capacitor, Ceramic, .004 mfd.	250088G34
44	Capacitor, Molded Paper, .004 mfd., 600 V.	250129G7
45	Capacitor, Molded Paper, .005 mfd., 400 V.	250129G10
46	Capacitor, Mica, .0062 mfd., ±5%	250161G27
47	Capacitor, Mica, .0062 mfd., ±5%	250161G27
48	Capacitor, Molded Paper, .008 mfd., 400 V.	250129G11
49	Capacitor, Paper, .01 mfd., 600 V.	250152G38
50	Capacitor, Paper, .01 mfd., 600 V.	250152G38
51	Capacitor, Paper, .01 mfd., 600 V.	250152G38
52	Capacitor, Paper, .01 mfd., 600 V.	250152G38
53	Capacitor, Paper, .01 mfd., 600 V.	250152G38

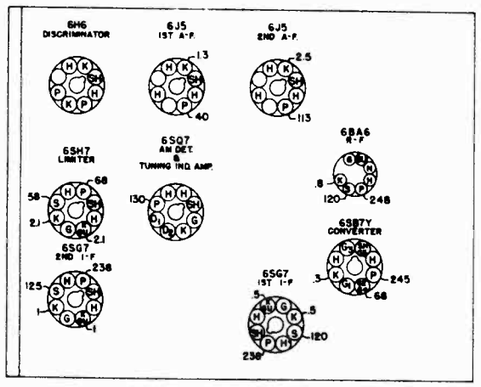
REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
54	Capacitor, Paper, .01 mfd., 600 V.	250152G38
55	Capacitor, Paper, .01 mfd., 600 V.	250152G38
56	Capacitor, Paper, .01 mfd., 600 V.	250152G38
57	Capacitor, Paper, .01 mfd., 600 V.	250152G38
58	Capacitor, Paper, .01 mfd., 600 V.	250152G38
59	Capacitor, Paper, .01 mfd., 600 V.	250152G38
60	Capacitor, Paper, .01 mfd., 600 V.	250152G38
61	Capacitor, Paper, .01 mfd., 600 V.	250152G38
62	Capacitor, Paper, .01 mfd., 600 V.	250152G38
63	Capacitor, Paper, .01 mfd., 600 V.	250152G38
64	Capacitor, Paper, .01 mfd., 600 V.	250152G38
65	Capacitor, Molded Paper, .012 mfd., 200 V.	250129G13
66	Capacitor, Paper, .015 mfd., ±10%, 200 V.	250169G5
67	Capacitor, Paper, .02 mfd., 600 V.	250152G37
68	Capacitor, Paper, .02 mfd., 600 V.	250152G37
69	Capacitor, Paper, .02 mfd., 600 V.	250152G37
70	Capacitor, Paper, .05 mfd., 200 V.	250152G15
71	Capacitor, Paper, .05 mfd., 200 V.	250152G15
72	Capacitor, Paper, .05 mfd., 200 V.	250152G15
73	Capacitor, Paper, .05 mfd., 200 V.	250152G15
74	Capacitor, Paper, .1 mfd., 600 V.	250152G33
75	Capacitor, Electrolytic, 10 mfd., 450 V. 20 mfd., 25 V.	270023G6
76	Capacitor, Electrolytic, 10 mfd., 450 V. 20 mfd., 25 V.	270023G6
77	Capacitor, Mica, 1500 mmf., ±10%, 500 V.	250160G66
86	Resistor, Composition, 33 Ohms, ½ W.	230084G4
87	Resistor, Composition, 33 Ohms, ½ W.	230084G4
88	Resistor, Composition, 68 Ohms, ½ W.	230084G6
89	Resistor, Composition, 68 Ohms, ½ W.	230084G6
90	Resistor, Composition, 100 Ohms, ±10%, ½ W.	230084G50
91	Resistor, Composition, 100 Ohms, ½ W.	230084G7
92	Resistor, Composition, 150 Ohms, ½ W.	230084G8
93	Resistor, Composition, 220 Ohms, ½ W.	230084G9
94	Resistor, Composition, 220 Ohms, ±10%, ½ W.	230084G54
95	Resistor, Composition, 470 Ohms, ½ W.	230084G11
96	Resistor, Composition, 1000 Ohms, ½ W.	230084G13
97	Resistor, Composition, 2200 Ohms, ½ W.	230084G15
98	Resistor, Composition, 4700 Ohms, ½ W.	230084G17
99	Resistor, Composition, 5600 Ohms, ±10%, ½ W.	230084G71
100	Resistor, Composition, 5600 Ohms, ±10%, ½ W.	230084G71
101	Resistor, Composition, 8200 Ohms, ±10%, 1 W.	230085G73
102	Resistor, Composition, 8200 Ohms, ±10%, 1 W.	230085G73
103	Resistor, Wire Wound, 8500 Ohms	240035G5
104	Resistor, Composition, 10,000 Ohms, 1 W.	230085G19
105	Resistor, Composition, 10,000 Ohms, ½ W.	230084G19
106	Resistor, Composition, 15,000 Ohms, 1 W.	230085G20
107	Resistor, Composition, 15,000 Ohms, ½ W.	230084G20
108	Resistor, Composition, 20,000 Ohms, ±5%, 1 W.	230085G190
109	Resistor, Composition, 22,000 Ohms, ½ W.	230084G21
110	Resistor, Composition, 33,000 Ohms, 1 W.	230085G22
111	Resistor, Composition, 33,000 Ohms, 1 W.	230085G22
112	Resistor, Composition, 33,000 Ohms, ±10%, 2 W.	230086G80
113	Resistor, Composition, 39,000 Ohms, ±10%, W.	230084G81

MODEL CR-217

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
114	Resistor, Composition, 47,000 Ohms, ½ W.	230084G23
115	Resistor, Composition, 68,000 Ohms, ±10%, ½ W.	230084G84
117	Resistor, Composition, 100,000 Ohms, ½ W.	230084G25
118	Resistor, Composition, 100,000 Ohms, ½ W.	230084G25
119	Resistor, Composition, 100,000 Ohms, ½ W.	230084G25
120	Resistor, Composition, 100,000 Ohms, ±10%, ½ W.	230084G86
121	Resistor, Composition, 150,000 Ohms, ½ W.	230084G26
122	Resistor, Composition, 150,000 Ohms, ±10%, ½ W.	230084G88
123	Resistor, Composition, 150,000 Ohms, ±10%, ½ W.	230084G88
124	Resistor, Composition, 220,000 Ohms, ½ W.	230084G27
125	Resistor, Composition, 470,000 Ohms, ±10%, ½ W.	230084G94
126	Resistor, Composition, 220,000 Ohms, ½ W.	230084G27
127	Resistor, Composition, 220,000 Ohms, ½ W.	230084G27
128	Resistor, Composition, 220,000 Ohms, ½ W.	230084G27
129	Resistor, Composition, 220,000 Ohms, ½ W.	230084G27
130	Resistor, Composition, 470,000 Ohms, ½ W.	230084G29
131	Resistor, Composition, 470,000 Ohms, ½ W.	230084G29
132	Resistor, Composition, 470,000 Ohms, ½ W.	230084G29
133	Resistor, Composition, 470,000 Ohms, ½ W.	230084G29
134	Resistor, Composition, 1 Megohm, ½ W.	230084G31
135	Resistor, Composition, 1 Megohm, ½ W.	230084G31
136	Resistor, Composition, 1 Megohm, ½ W.	230084G31
137	Resistor, Composition, 1.5 Megohm, ½ W.	230084G32
138	Resistor, Composition, 1.5 Megohm, ½ W.	230084G32
139	Resistor, Composition, 2.2 Megohm, ½ W.	230084G33
140	Resistor, Composition, 2.2 Megohm, ½ W.	230084G33
142	Resistor, Composition, 4.7 Megohm, ½ W.	230084G35
143	Resistor, Composition, 4.7 Megohm, ½ W.	230084G35
144	Resistor, Composition, 33,000 Ohms, ±10%, ½ W.	230084G80
150	Control, Volume, 1 Megohm	220044G24
151	Control, Bass, 1 Megohm, With Switch	220073G6
152	Control, Treble	160178G1
153	Switch, Range	220044G26
154	Switch, Rotary Band Switch	160179G1
155	Switch, Ant.-Loop	160176G1
156	Switch, Reject	160188G1
157	Socket, External Input	180060G1
158	Socket, Phono.	189741G1
159	Socket, Amplifier	180427G2
160	Socket, Solenoid	182776G1
161	Antenna Loop Assembly	*
162	Solenoid	360313G1
163	Plug, Solenoid	189147G1
	Dial Glass Assembly	150303G1
	Push Button Assembly for Gang	260093G1

*The part number of the loop antenna assembly changes with different Cabinets. It is therefore important that you specify the STYLE NUMBER of the instrument when ordering a replacement loop antenna assembly.





VOLTAGE TABLE

MEASURE HEATER VOLTAGES ACROSS SOCKET TERMINALS.

ALL OTHERS MEASURED FROM SOCKET TERMINAL TO GROUND WITH A 20,000 OHMS/VOLT VOLTMETER WITH BAND SWITCH IN SHORT WAVE POSITION.

HEATERS (H) 6.3 V A.C.

LINE VOLTAGE 117 V. A.C.

I-F'S

AM 455 KC. FM 10.7 MC.

NOTES

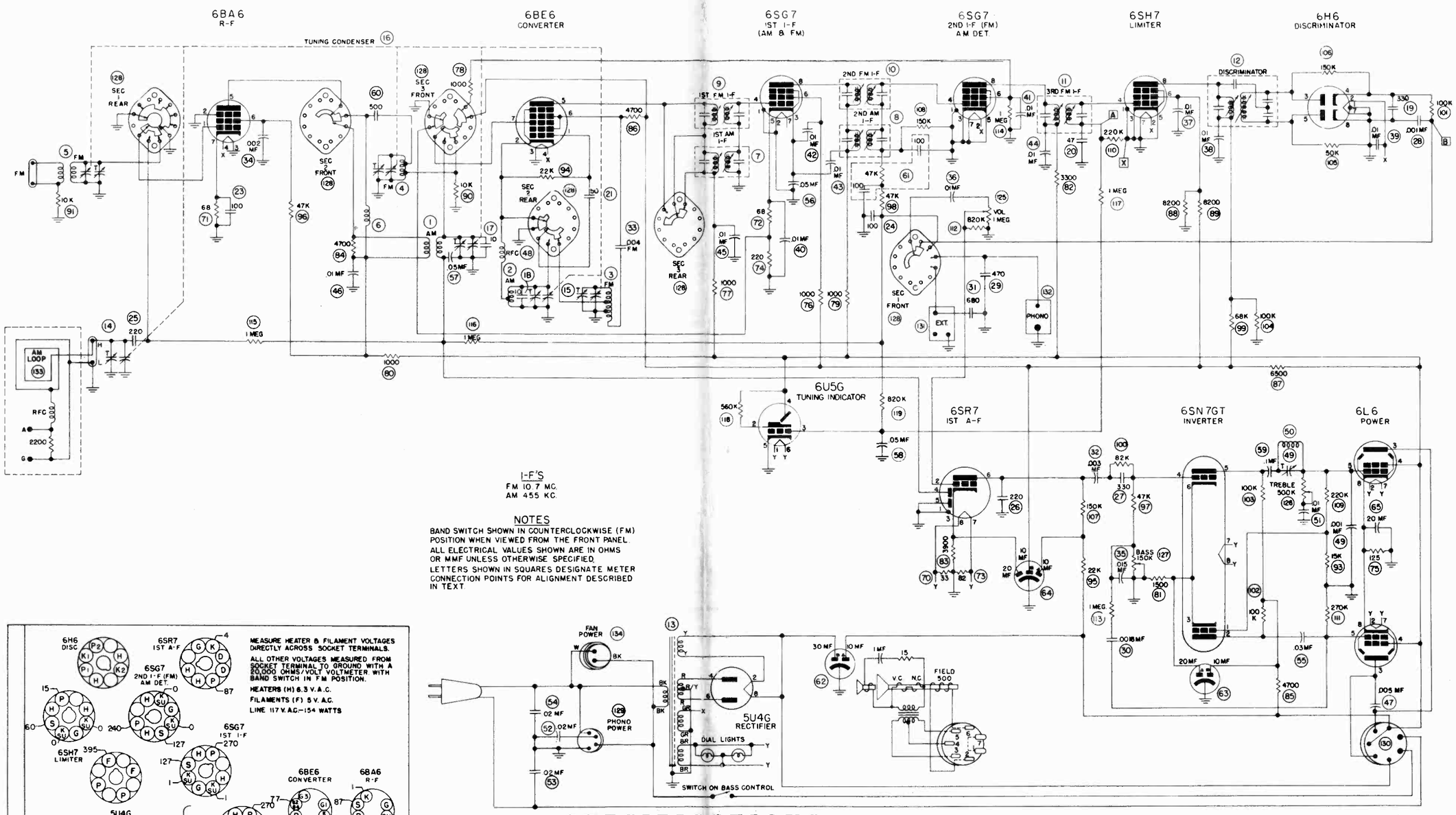
1. BANDSWITCH, ITEM 154, SHOWN IN CLOCKWISE POSITION (BAND-SWITCH KNOB IN C'CLOCKWISE POSITION WHEN VIEWED FROM THE FRONT PANEL.
2. ALL ELECTRICAL VALUES SHOWN ARE IN MMF OR OHMS UNLESS OTHERWISE SPECIFIED.
3. LETTERS SHOWN IN SQUARES DESIGNATE METER CONNECTION POINTS FOR ALIGNMENT AS DESCRIBED IN TEXT.
4. RANGE SWITCH, ITEM 153, SHOWN IN C'CLOCKWISE POSITION WHEN VIEWED FROM THE FRONT PANEL.

FIGURE 4

SPECIFICATIONS

Intermediate frequency	455 kc./10.7 mc.
Tuning frequency range:	
Broadcast Band	540—1620 kc.
Short Wave Band	5.9—17.3 mc.
FM Band	88—108 mc.
Tubes:	
R-F Amplifier	6BA6
Converter	6SB7Y
1st I-F Amplifier (AM-FM)	6SG7
2nd I-F Amplifier (AM-FM)	6SG7
Limiter	6SH7
Discriminator	6H6
Detector and AVC (AM) and Tuning Indicator Amplifier	6SQ7
First Audio	6J5
Second Audio	6J5
Dial Lamps	Mazda No. 44

MODEL CR-223



I-F'S
FM 10.7 MC.
AM 455 KC.

NOTES

BAND SWITCH SHOWN IN COUNTERCLOCKWISE (FM) POSITION WHEN VIEWED FROM THE FRONT PANEL.
ALL ELECTRICAL VALUES SHOWN ARE IN OHMS OR MMF UNLESS OTHERWISE SPECIFIED.
LETTERS SHOWN IN SQUARES DESIGNATE METER CONNECTION POINTS FOR ALIGNMENT DESCRIBED IN TEXT.

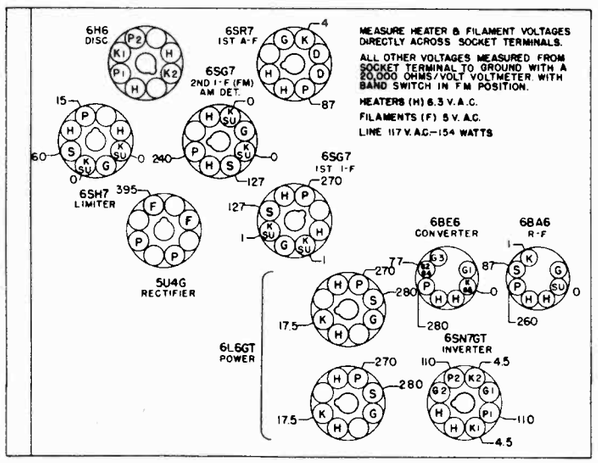


FIGURE 2

SPECIFICATIONS

Power supply	117 volts 50/60 cycles AC
Power consumption	160 watts
Power output	20 watts
Intermediate frequency	455 kc./10.7 mc.
Tuning frequency range:	
Broadcast Band	540-1620 kc.
FM Band	88—108 mc.
Tubes:	
R-F Amplifier	6BA6
Converter	6BE6
1st I-F Amplifier (AM-FM)	6SG7
2nd I-F (FM), Detector and AVC (AM)	6SG7
Limiter	6SH7
Discriminator	6H6
First Audio	6SR7
Inverter	6SN7GT
Power output (push-pull stage)	(2) 6L6
Rectifier	5U4G
Tuning Indicator	6U5
Dial Lamps	Mazda No. 44
Speaker: coaxial	15" Dynamic 5" PM
Field coil resistance	500 ohms None
Voice coil impedance (400 cycles)	15 ohms 3.8 ohms
Output transformer	5000/15

GENERAL

It frequently becomes necessary to make minor changes in the electrical circuit of a chassis to provide the correct response for different cabinets or speaker systems.

When this becomes necessary such a variation from the original chassis is indicated by a suffix letter; example: 500B.

Whenever necessary Service Bulletin Supplements will be issued with latest schematic drawings and parts lists indicating these changes.

METHOD FOR REMOVING CHASSIS FROM CABINET

Model CR-223 radio chassis is designed for easy removal from the cabinet in which it is installed. As the radio panel is permanently fastened to the chassis, the control knobs need not be removed when the chassis is taken out of the cabinet for service.

To remove the chassis, first remove the antenna leads from their terminals and all plugs from the receptacles on the rear of the chassis. Then remove the two Phillips-head screws from the angular slots in the flange at the rear of the chassis. Lift the rear of the chassis about one inch and pull it straight back. Never remove the chassis tray from the cabinet—it has been properly positioned to bring the radio panel in place when the chassis is replaced. In replacing the chassis, slide it so that the small hooks near the front, ride inside the flanges on the sides of the chassis tray. Push the chassis forward as far as it will go and the hook should then engage the slots in the chassis tray. Replace the two Phillips-head screws and nuts and tighten securely. Replace all plugs in their receptacles and the antenna leads on their correct terminals. The antenna terminal board for the loop antenna connections is designated L-H. The two terminals on the loop are designated L and H; the leads connected to these terminals should be wired to the corresponding terminals (L and H) on the chassis.

ALIGNMENT PROCEDURE

Alignment of this receiver requires the use of an accurately calibrated r-f signal generator, range 455 kc. to 107 mc., an output meter, and a vacuum tube voltmeter of greater than 10 megohm input impedance. All trimmer condensers can be identified by stampings on the chassis and gang condenser cover and are shown on the chassis layout diagram.

The pointer on the radio dial should line up with the first vertical mark on the low frequency end of the dial glass. If the pointer does not line up, loosen the pointer on the dial string and move it to correct position. Re-tighten and re-cement the pointer to the string. Be sure the gang is fully meshed for this pointer alignment. Align AM first.

AM ALIGNMENT

I-F ALIGNMENT

1. Set volume, treble, and bass controls to maximum. Set Band Switch to Broadcast position, and dial pointer to 1000 kc.
2. Tune the signal generator to EXACTLY 455 kc.
3. Connect output of modulated signal generator to the signal grid of the 6BE6 (pin 7) through a .01 mfd. capacitor and signal generator ground to radio chassis.
4. AM and FM i-f transformers on this model are separate and can be identified on the chassis layout diagram Figure 3.
5. Connect output meter across voice coil of speaker and adjust the i-f transformers for peak output as indicated on the output meter.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Connect 455 kc. sweep generator having approximately 20 kc. sweep to signal grid of 6BE6 (pin 7) through a .01 mfd. capacitor. Connect an oscilloscope through a 1 megohm isolating resistor across the 150,000 ohm diode load resistor. Align for best possible peak and symmetry.

R-F ALIGNMENT

1. Remove the signal generator lead from the 6BE6 grid and connect it across H and L on terminal strip on the rear of the chassis. The high side of the signal generator should be connected to H and the signal generator ground to L.

2. Set the signal generator and the radio receiver to 1400 kc., adjust the 1400 kc. oscillator trimmer and the 1400 kc. r-f trimmer for maximum output.

3. Set the signal generator and radio receiver to 600 kc. Adjust the oscillator and r-f coil slugs for maximum output. If considerable adjustment was necessary re-check the 1400 kc. trimmer settings.

4. Replace chassis in cabinet and connect loop antenna leads to proper terminals on the rear of the chassis.

5. Form three turns of wire into a loop, connect this loop to the signal generator and loosely couple it to the receiver loop antenna.

6. With the signal generator and dial at 1400 kc., adjust the loop antenna trimmer for maximum output.

FM ALIGNMENT

DISCRIMINATOR ALIGNMENT

1. Tune signal generator to EXACTLY 10.775 mc. and connect to pin 4 of the 6SH7 Limiter tube socket through a .01 mfd. capacitor.

2. Connect a DC vacuum tube voltmeter between point "B" on schematic diagram and ground (across .00047 mfd. capacitor–Pin 6 on 6H6 to ground).

3. Peak both discriminator slugs at 10.775 mc.

4. Retune signal generator to exactly 10.7 mc. and adjust bottom slug for zero volts.

5. The DC voltage at 10.625 mc. should be within 10% of the voltage at 10.775 mc. and of opposite polarity.

Note: If the signal generator is not capable of sufficient output to produce a readable DC voltage, the amplification of the last i-f stage can be used to increase the signal input to the limiter for discriminator alignment. To accomplish this, align the last i-f stage as indicated in "IF Alignment". Then align discriminator as above leaving the signal generator connected to the grid of the 6SG7 2nd i-f tube.

I-F ALIGNMENT

1. Connect high side of signal generator, through a .01 mfd. capacitor and a 1000 ohm resistor in series, to pin 4 of the 6SG7 2nd i-f tube. Connect low side of generator to chassis.

2. Close gang condenser and connect vacuum tube voltmeter across 220,000 ohm limiter grid resistor; (Point "A" on schematic to ground). Adjust signal generator output until a reading of at least 3 volts is obtained. In order to reduce regeneration caused by the vacuum tube voltmeter leads, a 1-megohm isolating resistor, connected with as short leads as possible to point "A" should be used in series with the vacuum tube voltmeter. Align the 3rd i-f transformer for best peak as indicated on voltmeter.

3. Repeat above for each succeeding transformer by connecting signal generator to signal grid of first i-f tube 6SG7 then to the signal grid of 6BE6 converter.

The i-f stages should be aligned in this order.

WARNING–After each i-f stage has been aligned, do not repeak with the signal into the grid of the 6BE6.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Replace signal generator with sweep generator having approximately 300 kc. sweep and tune generator to 10.7 mc. Connect oscilloscope across 220,000 ohm limiter grid resistor through a 1-megohm isolating resistor. The order of alignment is the same as when using a vacuum tube voltmeter. Each i-f transformer should be individually aligned for best peak and symmetry.

R-F ALIGNMENT

1. Connect vacuum tube voltmeter across limiter grid resistor as in FM I-F alignment.

2. Ground one side of the FM Antenna by placing a wire jumper from one FM connection on the antenna terminal strip to the ground connection.

3. Connect unmodulated signal generator through a 300 ohm resistor to ungrounded antenna post and chassis, and tune signal generator to 107 mc.

4. Set radio dial to 107 mc. and tune oscillator trimmer to peak output on vacuum tube voltmeter. Adjust signal generator output until a reading of at least 3 volts is obtained.

5. Tune 107 mc. r-f and antenna trimmers for maximum indication on voltmeter–it may be necessary to rock the dial while adjusting the r-f trimmer.

SPECIAL SERVICE INFORMATION

The following information is provided for the service man who has a vacuum tube voltmeter or a similar measuring instrument available.

STAGE GAINS*

Antenna Post to R-F Grid at:

600 kc.	5.00
98 mc.	1.15

R-F Grid to Converter Grid at:

600 kc.	14.5
98 mc.	9.4

R-F on Converter Grid to 455 kc. on I-F Grid at:

600 kc.	25.0
98 mc.	3.2

I-F on Converter Grid to 1st I-F Grid at:

455 kc. (gang closed)	28.0

1st I-F Grid to 2nd I-F Grid** at:

455 kc.	95
10.7 mc.	33

2nd I-F Grid to Limiter Grid at:

10.7 mc.	33.4

OSCILLATOR OUTPUT VOLTAGE

The DC voltage developed across the Oscillator Grid Resistor (105) at:

600 kc.	6.6V
98 mc.	6.0V

or 0.3 ma. through 22,000 ohm Oscillator Grid Resistor at 600 kc. and 0.27 ma. at 98 mc.

AUDIO GAIN

Voltage required across the Volume Control to produce 0.1 watt speaker output*** at 400 cycles is .016 volt with Input Selector Switch in BDCST. setting.

*Variations of ±20% are permissible. All readings made with sufficient input signal to provide 0.5 watt speaker output. 0.5 watt speaker output at 400 cycles is equivalent to a reading of 2.74V. as measured by a high resistance AC voltmeter across the output transformer secondary.

**Detector Plate on AM.

***0.1 watt speaker output at 400 cycles is equivalent to a reading of 1.25 volts as measured by a high resistance AC voltmeter across the voice coil of speaker.

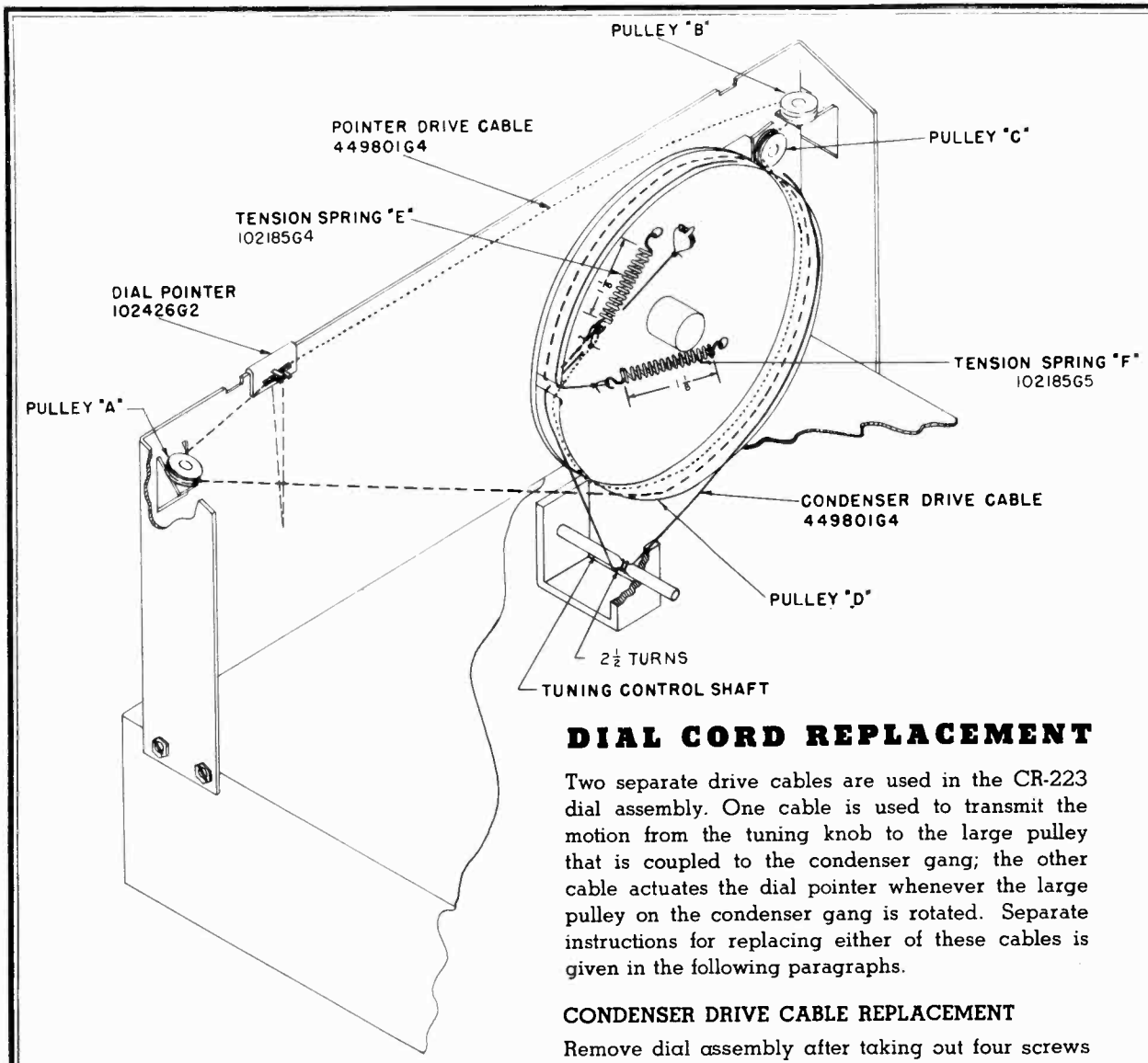


FIGURE 1

DIAL CORD REPLACEMENT

Two separate drive cables are used in the CR-223 dial assembly. One cable is used to transmit the motion from the tuning knob to the large pulley that is coupled to the condenser gang; the other cable actuates the dial pointer whenever the large pulley on the condenser gang is rotated. Separate instructions for replacing either of these cables is given in the following paragraphs.

CONDENSER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out four screws on each side of chassis. Slide a short length (approximately ½ inch) of sleeving over one end of a length of dial cable, form a small loop and tie a knot in the manner shown on Figure 1. Tie spring to opposite end of cable making length excluding spring 19½ inches. Hook loop over the metal hook in pulley "D" and lace the cable through the pulley slot and around the pulley in a counterclockwise direction when viewed from the rear of the dial assembly keeping the cable to the rear of the pulley groove. Lace the cable around the smaller diameter portion of the tuning control shaft wrapping 2½ turns *from front to back;* then around the opposite side of pulley "D" into the pulley through the slot. Hook the end of tension spring "F" in the hole provided in pulley "D", completing this operation.

DIAL POINTER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out four screws on each side of chassis. Slip a one-half inch length of sleeving over a 42-inch length of dial cable. Tie the two ends to the loop end of the cable spring "E" securely so that the cable doubled measures 19⅝ inches end to end excluding spring.

Place spring hook in top hole and draw cable through slot of pulley "D". Loop one end of cable around pulley "D" in a clockwise direction in front of condenser drive cable (viewing dial assembly from front) then loop the remaining end around pulley in a counterclockwise direction. Secure both ends of cable to chassis at edge of pulley slot with scotch tape, keeping piece of sleeving on remaining loop of cable.

Replace dial assembly and loop cable over pulley "A". While holding cable taut remove scotch tape and loop cable over pulleys "B" and "C" as shown in Figure 1.

Turn the tuning control shaft until the condenser gang is completely meshed and slide the dial pointer on its track until it is in line with the last calibration mark at the low frequency end of the dial. The short piece of sleeving installed prior to the stringing operation should be slid to the rear of the dial pointer and the crimping lug on the pointer pressed over the sleeving. After checking to make certain that the condenser gang is completely meshed and the dial pointer is in the position specified previously, apply a few drops of cement to each end of the sleeving to which the dial pointer is fastened. This completes the operation.

MODEL CR-223

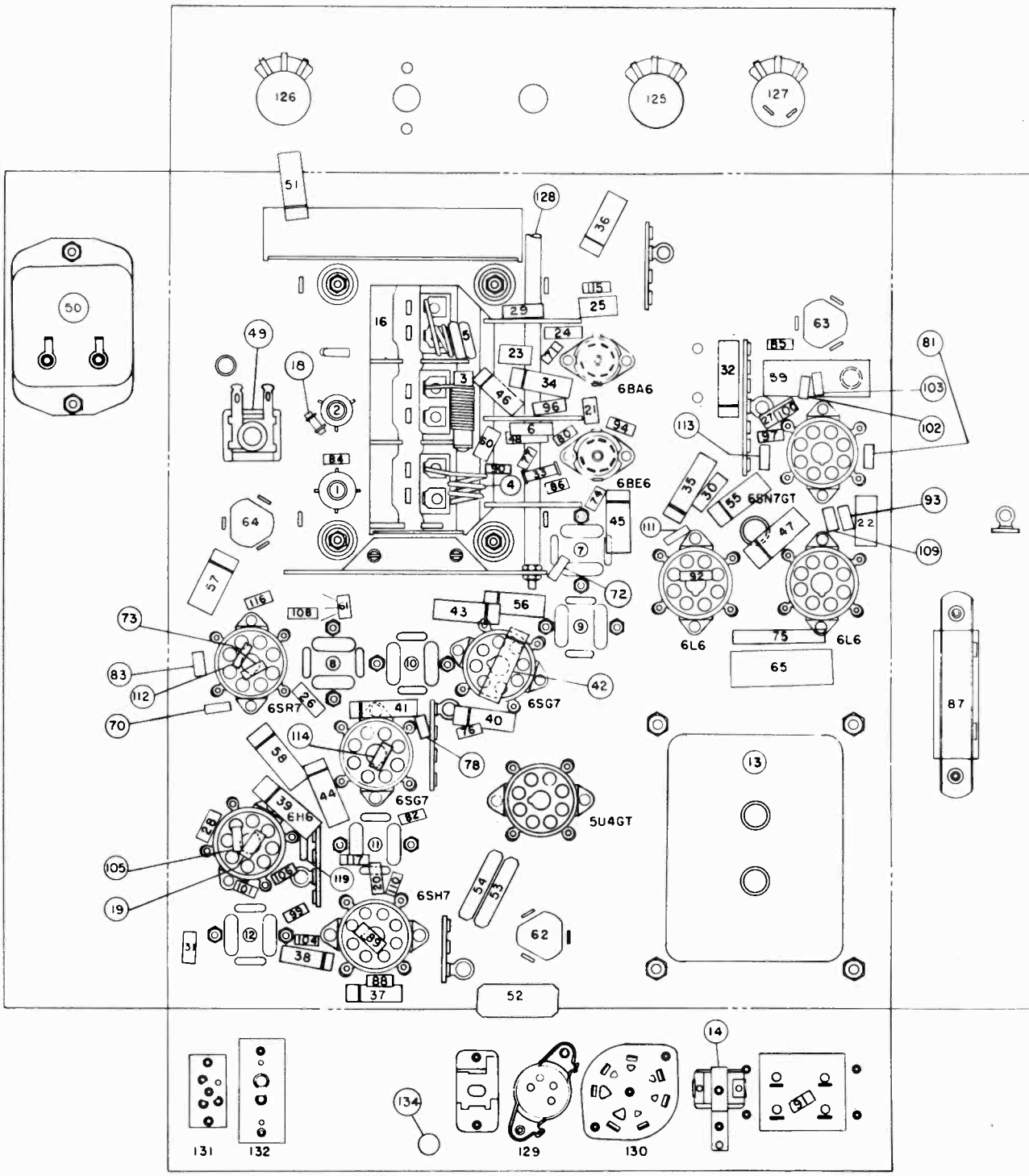
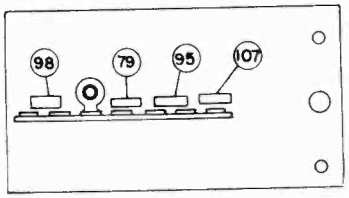
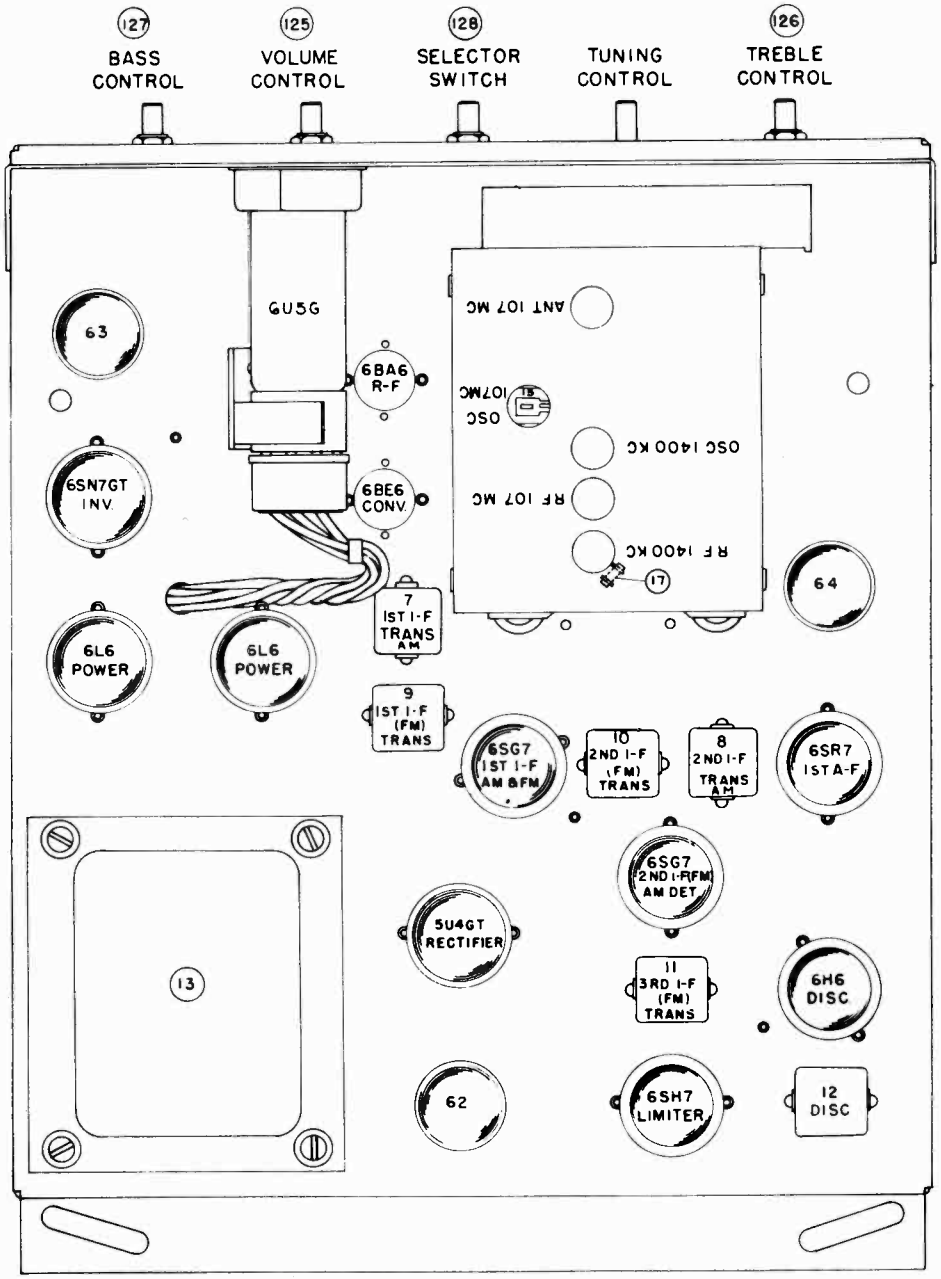


FIGURE 3





PARTS LIST

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil assembly, r-f (AM)	360348-1
2	Coil assembly, oscillator (AM)	360349-1
3	Coil assembly, oscillator (FM)	360323-1
4	Coil assembly, r-f (FM)	360322-2
5	Coil assembly, antenna (FM)	360321-2
6	Coil, choke	360284-1
7	Transformer, first i-f	360373-1
8	Transformer, second i-f	360373-2
9	Transformer, first i-f (FM)	360374-1
10	Transformer, second i-f (FM)	360374-1
11	Transformer, third i-f (FM)	360374-1
12	Transformer, discriminator	360375-1
13	Transformer, power	300052-2
14	Capacitor, variable trimmer	250046-2
15	Capacitor, variable trimmer	260067-5
16	Capacitor, three gang tuning	260103-1
17	Capacitor, ceramic, 10 mmf. ±5%, 500 V.	250088-8
18	Capacitor, ceramic, 10 mmf. ±5%, 500 V.	250088-8
19	Capacitor, mica, 330 mmf.	250159-101
20	Capacitor, mica, 47 mmf. 500 V.	250159-96
21	Capacitor, ceramic, 50 mmf. ±10%, 500 V.	250088-39
22	Capacitor, paper, .001 mfd. 600 V.	250152-45
23	Capacitor, mica, 100 mmf. 500 V.	250159-98
24	Capacitor, mica, 100 mmf. 500 V.	250159-98
25	Capacitor, mica, 220 mmf. 500 V.	250159-100
26	Capacitor, mica, 220 mmf. 500 V.	250159-100
27	Capacitor, mica, 330 mmf. ±10%, 5 V.	250159-88
28	Capacitor, paper, .001 mfd. 600 V.	250152-45
29	Capacitor, mica, 470 mmf. 500 V.	250159-102
30	Capacitor, mica, 1800 mmf. ±5%, 500 V.	250160-44
31	Capacitor, mica, 680 mmf. 500 V.	250159-136
32	Capacitor, paper, .003 mfd. 600 V.	250152-43
33	Capacitor, ceramic, .004 mfd. 350 V.	250088-34
34	Capacitor, paper, .002 mfd. 600 V.	250152-44
35	Capacitor, paper, .015 mfd. ±10%, 200 V.	250169-5
36	Capacitor, paper, .01 mfd. 200 V.	250152-18
37	Capacitor, paper, .01 mfd. 600 V.	250152-38
38	Capacitor, paper, .01 mfd. 600 V.	250152-38
39	Capacitor, paper, .01 mfd. 200 V.	250152-18
40	Capacitor, paper, .01 mfd. 200 V.	250152-18
41	Capacitor, paper, .01 mfd. 600 V.	250152-38
42	Capacitor, paper, .01 mfd. 600 V.	250152-38
43	Capacitor, paper, .01 mfd. 600 V.	250152-38
44	Capacitor, paper, .01 mfd. 600 V.	250152-38
45	Capacitor, paper, .01 mfd. 600 V.	250152-38
46	Capacitor, paper, .01 mfd. 600 V.	250152-38
47	Capacitor, paper, .005 mfd. 600 V.	250152-41
48	Coil, choke	360284-1
49	Trimmer, 10 kc.	259610-2
50	Coil, 10 kc.	360244-1
51	Capacitor, paper, .01 mfd. 200 V.	250152-18
52	Capacitor, paper, .02 mfd. 600 V.	250129-3
53	Capacitor, paper, .02 mfd. 600 V.	250129-3
54	Capacitor, paper, .02 mfd. 600 V.	250129-3
55	Capacitor, paper, .03 mfd. 600 V.	250152-36
56	Capacitor, paper, .05 mfd. 200 V.	250152-15
57	Capacitor, paper, .05 mfd. 200 V.	250152-15
58	Capacitor, paper, .05 mfd. 200 V.	250152-15
59	Capacitor, paper, .1 mfd. 400 V.	250152-33
60	Capacitor, ceramic, 500 mmf.	250088-31
61	Capacitor-resistor filter	250170-1
62	Capacitor, electrolytic, 30-10 mfd. 475 V.	270023-2
63	Capacitor, electrolytic, 10 mfd. 450 V.—20 mfd. 25 V.	270023-6
64	Capacitor, electrolytic, 10-10 mfd. 450 V.—20 mfd. 25 V.	270023-7
65	Capacitor, electrolytic, 20 mfd. 25 V.	270027-2
70	Resistor, composition, 33 ohms, ½ W.	230084-4
71	Resistor, composition, 68 ohms, ½ W.	230084-6
72	Resistor, composition, 68 ohms, ½ W.	230084-6
73	Resistor, composition, 82 ohms, ±10%, ½ W.	230084-49
74	Resistor, composition, 220 ohms, ½ W.	230084-9
75	Resistor, composition, 125 ohms, 5 W.	240021-11
76	Resistor, composition, 1000 ohms, ½ W.	230084-13
77	Resistor, composition, 1000 ohms, ½ W.	230084-13
78	Resistor, composition, 1000 ohms, ½ W.	230084-13
79	Resistor, composition, 1000 ohms, ½ W.	230084-13
80	Resistor, composition, 1000 ohms, ½ W.	230084-13
81	Resistor, composition, 1500 ohms, ½ W.	230084-14

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
82	Resistor, composition, 3300 ohms, 1/2 W.	230084-16
83	Resistor, composition, 3900 ohms, ±10%, 1/2 W.	230084-69
84	Resistor, composition, 4700 ohms, 1/2 W.	230084-17
85	Resistor, composition, 4700 ohms, 1/2 W.	230084-17
86	Resistor, composition, 4700 ohms, 1/2 W.	230084-17
87	Resistor, wire wound, 6500 ohms, ±10%	240035-9
88	Resistor, composition, 8200 ohms, ±10%, 1 W.	230085-73
89	Resistor, composition, 8200 ohms, ±10%, 1 W.	230085-73
90	Resistor, composition, 10,000 ohms, 1/2 W.	230084-19
91	Resistor, composition, 10,000 ohms, 1/2 W.	230084-19
93	Resistor, composition, 15,000 ohms, ±5%, 1/2 W.	230084-187
94	Resistor, composition, 22,000 ohms, 1/2 W.	230084-21
95	Resistor, composition, 22,000 ohms, 1/2 W.	230084-21
96	Resistor, composition, 47,000 ohms, 1 W.	230085-23
97	Resistor, composition, 47,000 ohms, 1/2 W.	230084-23
98	Resistor, composition, 47,000 ohms, 1/2 W.	230084-23
99	Resistor, composition, 68,000 ohms, ±10%, 1/2 W.	230084-84
100	Resistor, composition, 82,000 ohms, ±10%, 1/2 W.	230084-85
101	Resistor, composition, 100,000 ohms, ±10%, 1/2 W.	230084-86
102	Resistor, composition, 100,000 ohms, 1/2 W.	230084-25
103	Resistor, composition, 100,000 ohms, 1/2 W.	230084-25
104	Resistor, composition, 100,000 ohms, 1/2 W.	230084-25
105	Resistor, composition, 150,000 ohms, ±10%, 1/2 W.	230084-88
106	Resistor, composition, 150,000 ohms, ±10%, 1/2 W.	230084-88
107	Resistor, composition, 150,000 ohms, 1/2 W.	230084-26
108	Resistor, composition, 150,000 ohms, 1/2 W.	230084-26
109	Resistor, composition, 220,000 ohms, ±5%, 1/2 W.	230084-215
110	Resistor, composition, 220,000 ohms, 1/2 W.	230084-27
111	Resistor, composition, 270,000 ohms, ±10%, 1/2 W.	230084-91
112	Resistor, composition, 820,000 ohms, ±10%, 1/2 W.	230084-97
113	Resistor, composition, 1 megohm, ±5%, 1/2 W.	230084-231
114	Resistor, composition, 1 megohm, 1/2 W.	230084-31
115	Resistor, composition, 1 megohm, 1/2 W.	230084-31
116	Resistor, composition, 1 megohm, 1/2 W.	230084-31
117	Resistor, composition, 1 megohm, 1/2 W.	230084-31
118	Resistor, composition, 560,000 ohms, 1/2 W., ±10% (in tuning eye)	230084-95
119	Resistor, composition, 820,000 ohms, 1/2 W., ±10%	230084-97
125	Control, volume	220072-18
126	Control, treble	220072-8
127	Control, bass, with switch	220073-5
128	Switch, selector	160194-1
129	Socket, motor	180501-5
130	Socket, speaker	180504-16
131	Socket, external	180060-1
132	Socket, phono	189741-1
133	Loop antenna	*
134	AC socket and cable assembly for fan power	180505-5

*The part number of the Loop Antenna Assembly changes with different cabinets. It is therefore important that you specify the style number of the instrument when ordering a replacement Loop Antenna Assembly.

GENERAL

It frequently becomes necessary to make minor changes in the electrical circuit of a chassis to provide the correct response for different cabinets or speaker systems.

When this becomes necessary such a variation from the original chassis is indicated by a suffix letter; example: 500B.

Whenever necessary Service Bulletin Supplements will be issued with latest schematic drawings and parts lists indicating these changes.

METHOD FOR REMOVING CHASSIS FROM CABINET

Model CR-229 radio chassis is designed for easy removal from the cabinet in which it is installed. As the radio panel is permanently fastened to the chassis, the control knobs need not be removed when the chassis is taken out of the cabinet for service.

To remove the chassis, first remove the antenna leads from their terminals and all plugs from the receptacles on the rear of the chassis. Then remove the two Phillips-head screws from the angular slots in the flange at the rear of the chassis. Lift the rear of the chassis about one inch and pull it straight back. Never remove the chassis tray from the cabinet—it has been properly positioned to bring the radio panel in place when the chassis is replaced. In replacing the chassis, slide it so that the small hooks near the front, ride inside the flanges on the sides of the chassis tray. Push the chassis forward as far as it will go and the hook should then engage the slots in the chassis tray. Replace the two Phillips-head screws and nuts and tighten securely. Replace all plugs in their receptacles and the antenna leads on their correct terminals. The antenna terminal board for the loop antenna connections is designated L-H. The two terminals on the loop are designated L and H; the leads connected to these terminals should be wired to the corresponding terminals (L and H) on the chassis.

ALIGNMENT PROCEDURE

Alignment of this receiver requires the use of an accurately calibrated RF signal generator, range 455 kc. to 107 mc., an output meter, and a vacuum tube voltmeter of greater than 10 megohm input impedance. All trimmer condensers can be identified by stampings on the chassis and gang condenser cover and are shown on the chassis layout diagram.

The pointer on the radio dial should line up with the first vertical mark on the low frequency end of the dial glass. If the pointer does not line up, loosen the pointer on the dial string and move it to correct position. Re-tighten and re-cement the pointer to the string. Be sure the gang is fully meshed for this pointer alignment. Align AM first.

AM ALIGNMENT

I-F ALIGNMENT

1. Set volume, treble, and bass controls to maximum. Set Band Switch to Broadcast position, and dial pointer to 1000 kc.
2. Tune the signal generator to EXACTLY 455 kc.
3. Connect output of modulated signal generator to the signal grid of the 6BE6 (pin 7) through a .01 mfd. capacitor and signal generator ground to radio chassis.
4. AM and FM i-f transformers on this model are separate and can be identified on the chassis layout diagram Figure 3.
5. Connect output meter across voice coil of speaker and adjust the i-f transformers for peak output as indicated on the output meter.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Connect 455 kc. sweep generator having approximately 20 kc. sweep to signal grid of 6BE6 (pin 7) through a .01 mfd. capacitor. Connect an oscilloscope through a 1 megohm isolating resistor across the 150,000 ohm diode load resistor. Align for best possible peak and symmetry.

R-F ALIGNMENT

1. Remove the signal generator lead from the 6BE6 grid and connect it across H and L on terminal strip on the rear of the chassis. The high side of the signal generator should be connected to H and the signal generator ground to L.
2. Check the tuning dial pointer adjustment. When the plates of the tuning condenser are completely meshed, the dial pointer must be in line with the last calibration mark at the low frequency end of the dial. If it is not, slide the pointer on its string to the correct position. Be sure to crimp the lugs (on the rear of the pointer) tightly around the string to hold the pointer in adjustment.
3. Set the signal generator and the radio receiver to 1400 kc., adjust the 1400 kc. oscillator trimmer and the 1400 kc. r-f trimmer for maximum output.
4. Set the signal generator and radio receiver to 600 kc. Adjust the oscillator and r-f coil slugs for maximum output. If considerable adjustment was necessary re-check the 1400 kc. trimmer settings.
5. Replace chassis in cabinet and connect loop antenna leads to proper terminals on the rear of the chassis.
6. Form three turns of wire into a loop, connect this loop to the signal generator and loosely couple it to the receiver loop antenna.
7. With the signal generator and dial at 1400 kc., adjust the loop antenna trimmer for maximum output.

FM ALIGNMENT

DISCRIMINATOR ALIGNMENT

1. Tune signal generator to EXACTLY 10.775 mc. and connect to pin 4 of the 6SH7 Limiter tube socket through a .01 mfd. capacitor.

2. Connect a DC vacuum tube voltmeter between point "B" on schematic diagram and ground (across .00047 mfd. capacitor—Pin 6 on 6H6 to ground).

3. Peak both discriminator slugs at 10.775 mc.

4. Retune signal generator to exactly 10.7 mc. and adjust bottom slug for zero volts.

5. The DC voltage at 10.625 mc. should be within 10% of the voltage at 10.775 mc. and of opposite polarity.

Note: If the signal generator is not capable of sufficient output to produce a readable DC voltage, the amplification of the last i-f stage can be used to increase the signal input to the limiter for discriminator alignment. To accomplish this, align the last i-f stage as indicated in "IF Alignment". Then align discriminator as above leaving the signal generator connected to the grid of the 6SG7 2nd i-f tube.

I-F ALIGNMENT

1. Connect high side of signal generator, through a .01 mfd. capacitor and a 1000 ohm resistor in series, to pin 4 of the 6SG7 2nd i-f tube. Connect low side of generator to chassis.

2. Close gang condenser and connect vacuum tube voltmeter across 220,000 ohm limiter grid resistor; (Point "A" on schematic to ground). Adjust signal generator output until a reading of at least 3 volts is obtained. In order to reduce regeneration caused by the vacuum tube voltmeter leads, a 1-megohm isolating resistor, connected with as short leads as possible to point "A" should be used in series with the vacuum tube voltmeter. Align the 3rd i-f transformer for best peak as indicated on voltmeter.

3. Repeat above for each succeeding transformer by connecting signal generator to signal grid of first i-f tube 6SG7 then to the signal grid of 6BE6 converter. The i-f stages should be aligned in this order.

WARNING—After each i-f stage has been aligned, do not repeak with the signal into the grid of the 6BE6.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Replace signal generator with sweep generator having approximately 300 kc. sweep and tune generator to 10.7 mc. Connect oscilloscope across 220,000 ohm limiter grid resistor through a 1-megohm isolating resistor. The order of alignment is the same as when using a vacuum tube voltmeter. Each i-f transformer should be individually aligned for best peak and symmetry.

R-F ALIGNMENT

1. Connect vacuum tube voltmeter across limiter grid resistor as in FM I-F alignment.

2. Ground one side of the FM Antenna by placing a wire jumper from one FM connection on the antenna terminal strip to the ground connection.

3. Connect unmodulated signal generator through a 300 ohm resistor to ungrounded antenna post and chassis, and tune signal generator to 107 mc.

4. Set radio dial to 107 mc. and tune oscillator trimmer to peak output on vacuum tube voltmeter. Adjust signal generator output until a reading of at least 3 volts is obtained.

5. Tune 107 mc. r-f and antenna trimmers for maximum indication on voltmeter—it may be necessary to rock the dial while adjusting the r-f trimmer.

SPECIAL SERVICE INFORMATION

The following information is provided for the service man who has a vacuum tube voltmeter or a similar measuring instrument available.

STAGE GAINS*

Antenna Post to R-F Grid at:

600 kc.	5.00
98 mc.	1.15

R-F Grid to Converter Grid at:

600 kc.	14.5
98 mc.	9.4

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600 kc.	6.6V.
98 mc.	6.0V.

or 0.3 ma. through 22,000 ohm Oscillator Grid Resistor at 600 kc. and 0.27 ma. at 98 mc.

AUDIO GAIN

Voltage required across the Volume Control to produce 0.1 watt speaker output*** at 400 cycles is .016 volt with Input Selector Switch in BDCST. setting.

*Variations of ±20% are permissible. All readings made with sufficient input signal to provide 0.5 watt speaker output. 0.5 speaker output at 400 cycles is equivalent to a reading of 1.25V. as measured by a high resistance AC voltmeter across the voice coil of the speaker.
**Detector Plate on AM.
***0.1 watt speaker output at 400 cycles is equivalent to a reading of 0.55 volts as measured by a high resistance AC voltmeter across the voice coil of speaker.

R-F on Converter Grid to 455 kc. on I-F Grid at:

600 kc.	25.0
98 mc.	3.2

I-F on Converter Grid to 1st I-F Grid at:

455 kc. (gang closed)	28.0

1st I-F Grid to 2nd I-F Grid** at:

455 kc.	95
10.7 mc.	33

2nd I-F Grid to Limiter Grid at:

10.7 mc.	33.4

OSCILLATOR OUTPUT VOLTAGE

The DC voltage developed across the Oscillator Grid Resistor (105) at:

DIAL CORD REPLACEMENT

Two separate drive cables are used in the CR-229 dial assembly. One cable is used to transmit the motion from the tuning knob to the large pulley that is coupled to the condenser gang; the other cable actuates the dial pointer whenever the large pulley on the condenser gang is rotated. Separate instructions for replacing either of these cables is given in the following paragraphs.

CONDENSER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out four screws on each side of chassis. Slide a short length (approximately ½ inch) of sleeving over one end of a length of dial cable, form a small loop and tie a knot in the manner shown on Figure 1. Tie spring to opposite end of cable making length excluding spring 19½ inches. Hook loop over the metal hook in pulley "D" and lace the cable through the pulley slot and around the pulley in a counterclockwise direction when viewed from the rear of the dial assembly keeping the cable to the rear of the pulley groove. Lace the cable around the smaller diameter portion of the tuning control shaft wrapping 2½ turns *from front to back;* then around the opposite side of pulley "D" into the pulley through the slot. Hook the end of tension spring "F" in the hole provided in pulley "D", completing this operation.

DIAL POINTER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out four screws on each side of chassis. Slip a one-half inch length of sleeving over a 42-inch length of dial cable. Tie the two ends to the loop end of the cable spring "E" securely so that the cable doubled measures 19⅝ inches end to end excluding spring.

Place spring hook in top hole and draw cable through slot of pulley "D". Loop one end of cable around pulley "D" in a clockwise direction in front of condenser drive cable (viewing dial assembly from front) then loop the remaining end around pulley in a counterclockwise direction. Secure both ends of cable to chassis at edge of pulley slot with scotch tape, keeping piece of sleeving on remaining loop of cable.

Replace dial assembly and loop cable over pulley "A". While holding cable taut remove scotch tape and loop cable over pulleys "B" and "C" as shown in Figure 1.

Turn the tuning control shaft until the condenser gang is completely meshed and slide the dial pointer on its track until it is in line with the last calibration mark at the low frequency end of the dial. The short piece of sleeving installed prior to the stringing operation should be slid to the rear of the dial pointer and the crimping lug on the pointer pressed over the sleeving. After checking to make certain that the condenser gang is completely meshed and the dial pointer is in the position specified previously, apply a few drops of cement to each end of the sleeving to which the dial pointer is fastened. This completes the operation.

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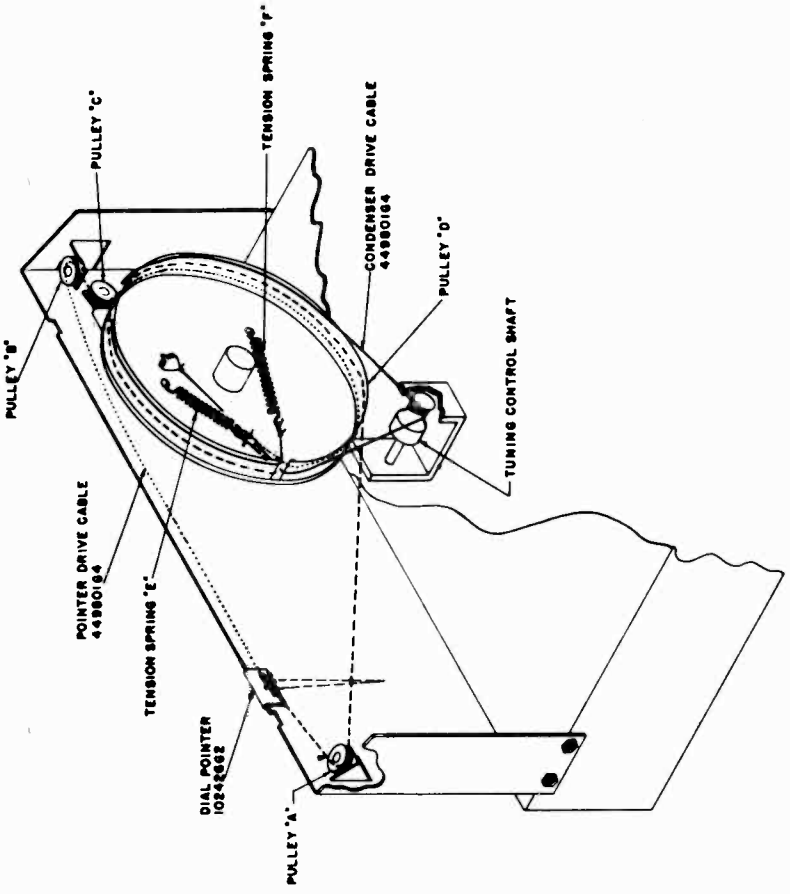
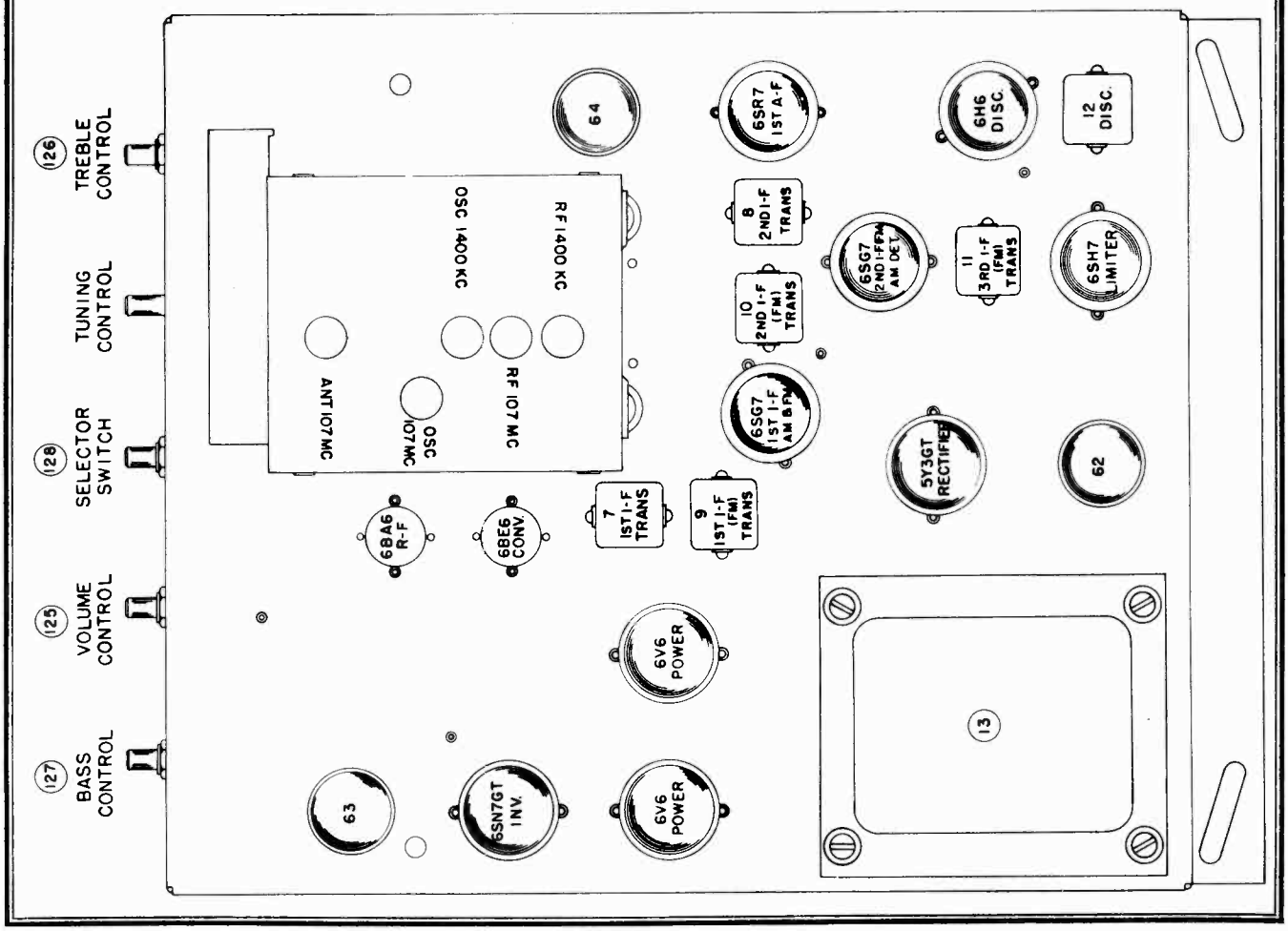


FIGURE 1



MODEL CR-229

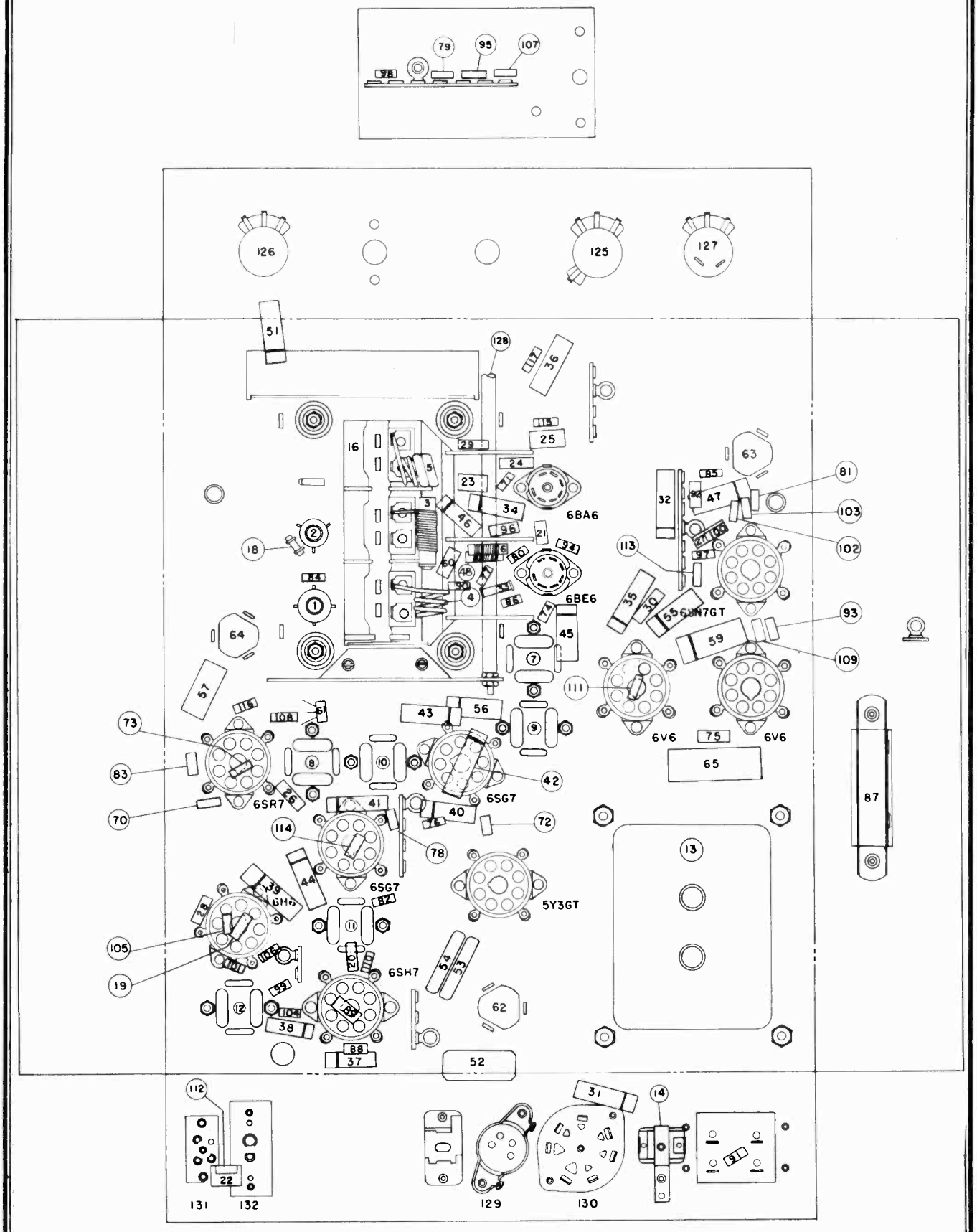


FIGURE 3

PARTS LIST

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil assembly, r-f (AM)	360348-1
2	Coil assembly, oscillator (AM)	360349-1
3	Coil assembly, oscillator (FM)	360323-1
4	Coil assembly, r-f (FM)	360322-2
5	Coil assembly, antenna (FM)	360321-2
6	Coil, choke	360284-1
7	Transformer, first i-f	360350-1
8	Transformer, second i-f	360350-2
9	Transformer, first i-f (FM)	360351-1
10	Transformer, second i-f (FM)	360351-1
11	Transformer, third i-f (FM)	360351-1
12	Transformer, discriminator	360352-1
13	Transformer, power	300050-2
14	Capacitor, variable trimmer	250046-2
15	Capacitor, variable trimmer	260067-5
16	Capacitor, three-gang tuning	260103-1
17	Capacitor, ceramic, 10 mmf. ±5%, 500 V.	250088-8
18	Capacitor, ceramic, 10 mmf. ±5%, 500 V.	250088-8
19	Capacitor, mica, 47 mmf. 500 V.	250159-96
20	Capacitor, mica, 47 mmf. 500 V.	250159-96
21	Capacitor, ceramic, 50 mmf. ±10%, 500 V.	250088-39
22	Capacitor, mica, 100 mmf. ±10%, 500 V.	250159-82
23	Capacitor, mica, 100 mmf. 500 V.	250159-98
24	Capacitor, mica, 100 mmf. 500 V.	250159-98
25	Capacitor, mica, 220 mmf. 500 V.	250159-100
26	Capacitor, mica, 220 mmf. 500 V.	250159-100
27	Capacitor, mica, 330 mmf. ±10%, 500 V.	250159-88
28	Capacitor, mica, 470 mmf. 500 V.	250159-102
29	Capacitor, mica, 470 mmf. ±10%, 500 V.	250159-90
30	Capacitor, mica, 1800 mmf. ±5%, 500 V.	250160-44
31	Capacitor, paper, .0015 mfd. ±10%, 600 V.	250169-1
32	Capacitor, paper, .005 mfd. 600 V.	250152-41
33	Capacitor, ceramic, .004 mfd. 350 V.	250088-34
34	Capacitor, paper, .002 mfd. 600 V.	250152-44
35	Capacitor, paper, .015 mfd. ±10%, 200 V.	250169-5
36	Capacitor, paper, .01 mfd. 200 V.	250152-18
37	Capacitor, paper, .01 mfd. 600 V.	250152-38
38	Capacitor, paper, .01 mfd. 600 V.	250152-38
39	Capacitor, paper, .01 mfd. 200 V.	250152-18
40	Capacitor, paper, .01 mfd. 200 V.	250152-18
41	Capacitor, paper, .01 mfd. 600 V.	250152-38
42	Capacitor, paper, .01 mfd. 600 V.	250152-38
43	Capacitor, paper, .01 mfd. 600 V.	250152-38
44	Capacitor, paper, .01 mfd. 600 V.	250152-38
45	Capacitor, paper, .01 mfd. 600 V.	250152-38
46	Capacitor, paper, .01 mfd. 600 V.	250152-38
47	Capacitor, paper, .01 mfd. 600 V.	250152-38
48	Coil, choke	360284-1
51	Capacitor, paper, .02 mfd. 200 V.	250152-17
52	Capacitor, paper, .02 mfd. 600 V.	250129-3
53	Capacitor, paper, .02 mfd. 600 V.	250129-3
54	Capacitor, paper, .02 mfd. 600 V.	250129-3
55	Capacitor, paper, .03 mfd. 600 V.	250152-36
56	Capacitor, paper, .05 mfd. 200 V.	250152-15
57	Capacitor, paper, .05 mfd. 200 V.	250152-15
59	Capacitor, paper, .1 mfd. 600 V.	250152-33
60	Capacitor, ceramic, 500 mmf.	250088-31
61	Capacitor, resistor filter	250170-1
62	Capacitor, electrolytic, 30-10 mfd. 475 V.	270023-2
63	Capacitor, electrolytic, 10 mfd. 450 V.—20 mfd. 25 V.	270023-6
64	Capacitor, electrolytic, 10-10 mfd. 450 V.—20 mfd. 25 V.	270023-7
65	Capacitor, electrolytic, 20 mfd. 25 V.	270027-2
70	Resistor, composition, 33 ohms, ½ W.	230084-4
71	Resistor, composition, 68 ohms, ½ W.	230084-6
72	Resistor, composition, 68 ohms, ½ W.	230084-6
73	Resistor, composition, 82 ohms, ±10%, ½ W.	230084-49
74	Resistor, composition, 220 ohms, ½ W.	230084-9
75	Resistor, composition, 330 ohms, 2 W.	230086-56
76	Resistor, composition, 1000 ohms, ½ W.	230084-13
77	Resistor, composition, 1000 ohms, ½ W.	230084-13
78	Resistor, composition, 1000 ohms, ½ W.	230084-13
79	Resistor, composition, 1000 ohms, ½ W.	230084-13
80	Resistor, composition, 1000 ohms, ½ W.	230084-13
81	Resistor, composition, 1500 ohms, ½ W.	230084-14
82	Resistor, composition, 3300 ohms, ½ W.	230084-16
83	Resistor, composition, 3900 ohms, ±10%, ½ W.	230084-69
84	Resistor, composition, 4700 ohms, ½ W.	230084-17
85	Resistor, composition, 4700 ohms, ½ W.	230084-17
86	Resistor, composition, 4700 ohms, ½ W.	230084-17
87	Resistor, wire wound, 6500 ohms, ±10%	240035-9
88	Resistor, composition, 8200 ohms, ±10%, 1 W.	230085-73
89	Resistor, composition, 8200 ohms, ±10%, 1 W.	230085-73
90	Resistor, composition, 10,000 ohms, ½ W.	230084-19
91	Resistor, composition, 10,000 ohms, ½ W.	230084-19
92	Resistor, composition, 10,000 ohms, 1 W.	230085-19
93	Resistor, composition, 15,000 ohms, ±5%, ½ W.	230084-187

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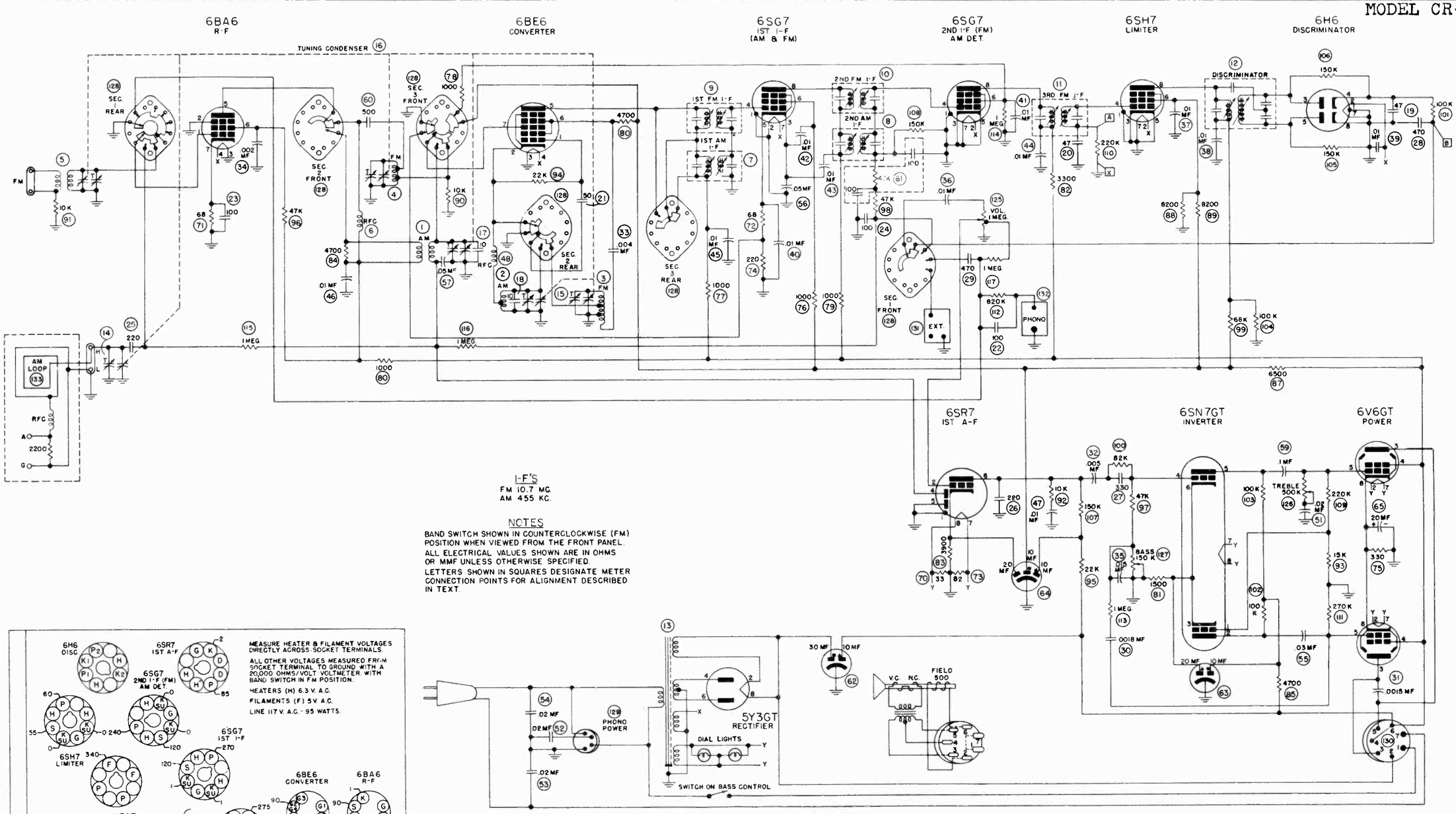
REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
94	Resistor, composition, 22,000 ohms, ½ W.	230084-21
95	Resistor, composition, 22,000 ohms, ½ W.	230084-21
96	Resistor, composition, 47,000 ohms, 1 W.	230085-23
97	Resistor, composition, 47,000 ohms, ½ W.	230084-23
98	Resistor, composition, 47,000 ohms, ½ W.	230084-23
99	Resistor, composition, 68,000 ohms, ±10%, ½ W.	230084-84
100	Resistor, composition, 82,000 ohms, ±10%, ½ W.	230084-85
101	Resistor, composition, 100,000 ohms, ±10%, ½ W.	230084-86
102	Resistor, composition, 100,000 ohms, ½ W.	230084-25
103	Resistor, composition, 100,000 ohms, ½ W.	230084-25
104	Resistor, composition, 100,000 ohms, ½ W.	230084-25
105	Resistor, composition, 150,000 ohms, ±10%, ½ W.	230084-88
106	Resistor, composition, 150,000 ohms, ±10%, ½ W.	230084-88
107	Resistor, composition, 150,000 ohms, ½ W.	230084-26
108	Resistor, composition, 150,000 ohms, ½ W.	230084-26
109	Resistor, composition, 220,000 ohms, ±5%, ½ W.	230084-215
110	Resistor, composition, 220,000 ohms, ½ W.	230084-27
111	Resistor, composition, 270,000 ohms, ±10%, ½ W.	230084-91
112	Resistor, composition, 820,000 ohms, ±10%, ½ W.	230084-97
113	Resistor, composition, 1 megohm, ±5%, ½ W.	230084-231
114	Resistor, composition, 1 megohm, ½ W.	230084-31
115	Resistor, composition, 1 megohm, ½ W.	230084-31
116	Resistor, composition, 1 megohm, ½ W.	230084-31
117	Resistor, composition, 1 megohm, ½ W.	230084-31
125	Control, volume	220074-1
126	Control, treble	220072-8
		220044-22
127	Control, bass, with switch	220073-5
		220045-8
128	Switch, selector	160194-1
129	Socket, motor	180501-5
130	Socket, speaker	180504-16
131	Socket, external	180060-1
132	Socket, phono	189741-1
133	Loop antenna	*

*The part number of the Loop Antenna Assembly changes with different cabinets. It is therefore important that you specify the style number of the instrument when ordering a replacement Loop Antenna Assembly.

MODEL CR-229



I-F'S
FM 10.7 MC.
AM 455 KC.

NOTES

BAND SWITCH SHOWN IN COUNTERCLOCKWISE (FM) POSITION WHEN VIEWED FROM THE FRONT PANEL.

ALL ELECTRICAL VALUES SHOWN ARE IN OHMS OR MMF UNLESS OTHERWISE SPECIFIED.

LETTERS SHOWN IN SQUARES DESIGNATE METER CONNECTION POINTS FOR ALIGNMENT DESCRIBED IN TEXT.

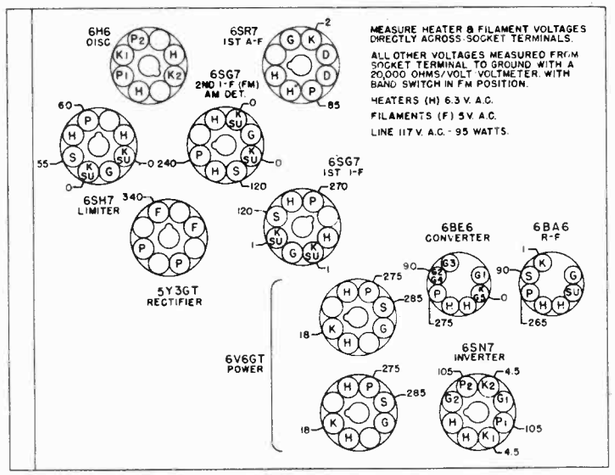


FIGURE 2

SPECIFICATIONS

Power supply	117 volts 50/60 cycles AC
Power consumption	95 watts
Power output	10 watts
Intermediate frequency	455 kc./10.7 mc.
Tuning frequency range:	
Broadcast Band	540-1620 kc.
FM Band	88–108 mc.
Tubes:	
R-F Amplifier	6BA6
Converter	6BE6
1st I-F Amplifier (AM-FM)	6SG7
2nd I-F (FM), Detector and AVC (AM)	6SG7
Limiter	6SH7
Discriminator	6H6
First Audio	6SR7
Inverter	6SN7GT
Power output (push-pull stage)	(2) 6V6GT
Rectifier	5Y3GT
Dial Lamps	Mazda No. 44
Speaker:	
Field coil resistance	500 ohms
Voice coil impedance (400 cycles)	3.0 ohms
Output transformer	8,000/3 ohms

MODEL CR-231

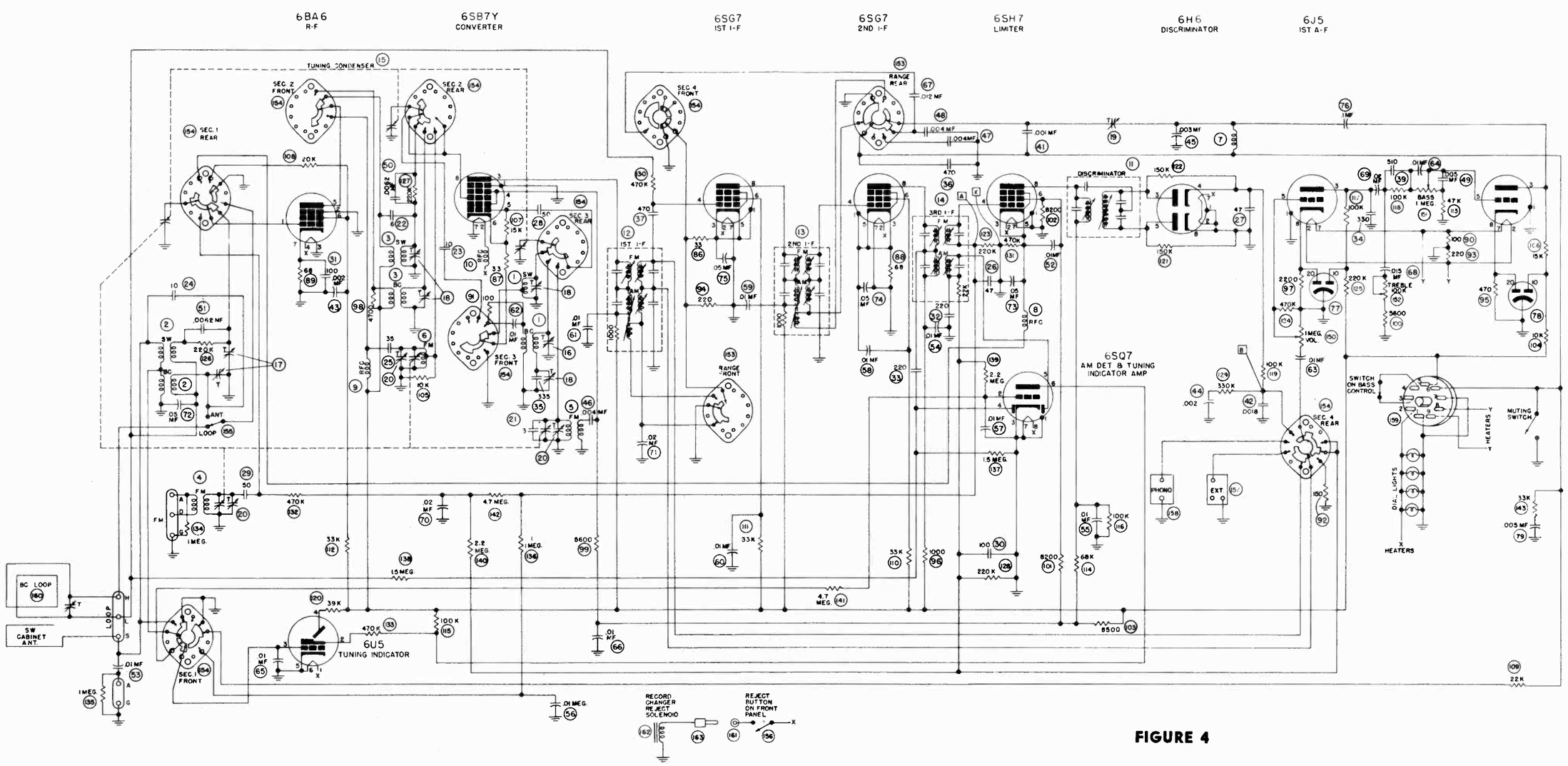
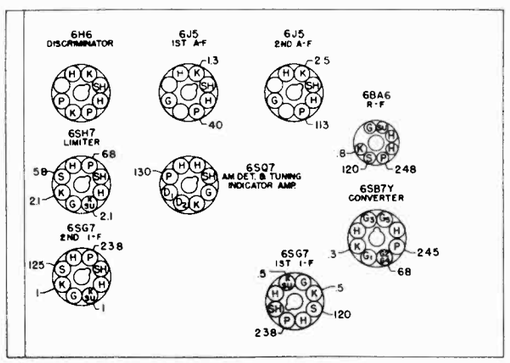
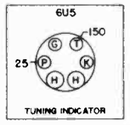


FIGURE 4





VOLTAGE TABLE

MEASURE HEATER VOLTAGES ACROSS SOCKET TERMINALS.

ALL OTHERS MEASURED FROM SOCKET TERMINAL TO GROUND WITH A 20,000 OHMS/VOLT VOLTMETER WITH BAND SWITCH IN SHORT WAVE POSITION

HEATERS (H) 6.3 V. A.C.

LINE VOLTAGE 117 V. A.C.

I-F'S

AM 455 KC. FM 10.7 MC

NOTES

1. BANDSWITCH, ITEM 154, SHOWN IN CLOCKWISE POSITION (BAND-SWITCH KNOB IN C'CLOCKWISE POSITION WHEN VIEWED FROM THE FRONT PANEL.
2. ALL ELECTRICAL VALUES SHOWN ARE IN MMF OR OHMS UNLESS OTHERWISE SPECIFIED.
3. LETTERS SHOWN IN SQUARES DESIGNATE METER CONNECTION POINTS FOR ALIGNMENT AS DESCRIBED IN TEXT.
4. RANGE SWITCH, ITEM 153, SHOWN IN C'CLOCKWISE POSITION WHEN VIEWED FROM THE FRONT PANEL.

SPECIFICATIONS

Intermediate frequency	455 kc./10.7 mc.
Tuning frequency range:	
Broadcast Band	540—1620 kc.
Short Wave Band	5.9—17.3 mc.
FM Band	88—108 mc.

Tubes:

R-F Amplifier	6BA6
Converter	6SB7Y
1st I-F Amplifier (AM-FM)	6SG7
2nd I-F Amplifier (AM-FM)	6SG7
Limiter	6SH7
Discriminator	6H6
Detector and AVC (AM) and Tuning Indicator Amplifier	6SQ7
First Audio	6J5
Second Audio	6J5
Tuning Indicator	6U5
Dial Lamps	Mazda No. 44

GENERAL

Model CR-231 radio chassis is an AM-FM tuner that must be used in conjunction with a power amplifier such as the AMP-111 for speaker operation. Heater and plate voltages for the CR-231 radio chassis are supplied from the amplifier chassis; it is therefore essential that the radio and amplifier chassis be interconnected during alignment or for other electrical service operations.

METHOD OF REMOVING CHASSIS FROM CABINET

Model CR-231 radio chassis is designed for easy removal from the cabinet in which it is installed. As the radio panel is permanently fastened to the chassis, the control knobs need not be removed when the chassis is taken out of the cabinet for service.

To remove the chassis, first remove the antenna leads from their terminals and all plugs from the receptacles on the rear of the chassis. Then remove the two Phillips-head screws from the angular slots in the flange at the rear of the chassis. Lift the rear of the chassis about one inch and pull it straight back. Never remove the chassis tray from the cabinet—it has been properly positioned to bring the radio panel in place when the chassis is replaced. In replacing the chassis, slide it so that the small hooks near the front ride inside the flanges on the sides of the chassis tray. Push the chassis forward as far as it will go and the hook should then engage the slots in the chassis tray. Replace the two Phillips-head screws and nuts and tighten securely. Replace all plugs in their receptacles and the antenna leads on their correct terminals. The antenna terminal board for the loop antenna connections is designated L-H. The two terminals on the loop are designated L and H; the leads connected to these terminals should be wired to the corresponding terminals (L and H) on the chassis.

ALIGNMENT PROCEDURE

Alignment of this receiver requires the use of an accurately calibrated RF signal generator, range 455 kc. to 107 mc., an output meter, and a vacuum tube voltmeter of approximately 10 megohm input impedance. All trimmer condensers can be identified by stampings on the chassis and gang condenser cover and are shown on the chassis layout diagram.

The pointer on the radio dial should line up with the first horizontal mark on the low frequency end of the dial glass. If the pointer does not line up, loosen the screws on the pointer drive pulley at the end of the tuning gang and adjust the pointer setting; tighten the screws after this adjustment. Be sure the gang is fully meshed for this pointer alignment.

AM ALIGNMENT

I-F ALIGNMENT

1. Set range control to position No. 1. Set volume, treble and bass controls to maximum, the Band Switch to Broadcast position, and dial pointer to 1000 kc.

2. Tune the signal generator to EXACTLY 455 kc.

3. Connect output of modulated signal generator to the signal grid of the 6SB7Y (pin 8) through a .01 mfd. capacitor and signal generator ground to radio chassis.

4. All i-f transformers on this chassis are slug-tuned. Both slug adjustments for 455 kc. are located on top of the transformers; the 10.7 mc. adjustments are accessible on the bottom.

5. Connect output meter across voice coil of 15-inch speaker and peak in order the third, second and first i-f transformers.

6. Use only enough signal input to give a readable indication on voltmeter so that the AVC will not operate and give false readings.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Connect 455 kc. sweep generator having approximately 40 kc. sweep to signal grid of 6SB7Y (pin 8) through a .01 mfd. capacitor. Connect an oscilloscope through a 1 megohm isolating resistor across the 220,000 ohm diode load resistor. Align for best possible peak with range switch in position No. 1, and symmetry in position No. 4.

BROADCAST BAND R-F ALIGNMENT

1. Connect signal generator through .00025 mfd. capacitor to antenna and ground terminals on antenna terminal strip on rear of chassis. Be sure "Ant-loop" switch on top of the chassis is in the ANT. position. Connect output meter as for AM i-f alignment.

2. Tune signal generator to 1400 kc.

3. Set dial to 1400 kc. and adjust oscillator, r-f and antenna trimmers for maximum indication on meter.

4. Set signal generator to 600 kc. and tune radio to signal. Adjust the 600 kc. padder to maximum output while simultaneously rocking the gang.

5. 1400 kc. calibration should then be checked and re-adjusted if necessary with the 1400 kc. oscillator trimmer.

SHORT WAVE BAND R-F ALIGNMENT

1. Set the Band Switch to Short Wave and replace the .00025 mfd. capacitor in series with the signal generator lead to the antenna terminal, with a 400-ohm resistor.

2. Set the signal generator and the receiver to 15 mc. and adjust the oscillator, r-f and antenna trimmers for maximum indication on the meter. While adjusting the 15 mc. oscillator trimmer, two peaks may be observed; only one is the correct peak for 15 mc. alignment. To obtain the correct peak, screw trimmer in to maximum capacitance, then decrease until the first peak is observed. This is the correct one.

Another method for checking for the correct peak is to tune the receiver to 15.91 mc. with signal generator at 15 mc. and with the output increased. If the 15 mc. oscillator trimmer is properly adjusted, the signal will be received at 15.91 mc.—if incorrectly aligned, the signal will be received at 14.09 mc.

FM ALIGNMENT

DISCRIMINATOR ALIGNMENT

1. Tune signal generator to EXACTLY 10.775 mc. and connect to pin 4 of the 6SH7 limiter tube socket through a .01 mfd. capacitor.

2. Connect a DC vacuum tube voltmeter from Pin 4 on 6H6 tube socket to ground through a 1 megohm isolating resistor.

3. Peak both discriminator slugs at 10.775 mc.

4. Retune signal generator to exactly 10.7 mc. and adjust bottom slug for zero volts.

5. The DC voltage at 10.625 mc. should be within 10% of the voltage at 10.775 mc. and of opposite polarity.

Note: If the signal generator is not capable of sufficient output to produce a readable DC voltage, the amplification of the last i-f stage can be used to increase the signal input to the limiter for discriminator alignment. To accomplish this, align the last i-f stage as indicated in "IF Alignment". Then align discriminator as above leaving the signal generator connected to the grid of the 6SG7 2nd i-f tube.

I-F ALIGNMENT

1. Connect high side of signal generator, through a .01 mfd. capacitor and a 1000 ohm resistor in series, to pin 4 of the 6SG7 2nd i-f tube. Connect low side of generator to chassis.

2. Close gang condenser and connect vacuum tube voltmeter across 220,000 ohm limiter grid resistor; (Points "A" to "X" on schematic). Adjust signal generator output until a reading of at least 3 volts is obtained. In order to reduce regeneration caused by the vacuum tube voltmeter leads, a 1-megohm isolating resistor, connected with as short leads as possible to point "A" should be used in series with the vacuum tube voltmeter. Align the 3rd i-f transformer for best peak as indicated on voltmeter.

3. Repeat above for the 2nd and 1st transformer by connecting signal generator to signal grid of first i-f tube 6SG7 then to the signal grid of 6SB7Y converter. The i-f stages should be aligned in this order.

WARNING—After each i-f stage has been individually aligned, do not repeak with the signal into the grid of the 6SB7Y.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Replace signal generator with sweep generator having approximately 300 kc. sweep and tune generator to 10.7 mc. Connect oscilloscope across 220,000 ohm limiter grid resistor through a 1-megohm isolating resistor. The order of alignment is the same as when using a vacuum tube voltmeter. Each i-f transformer should be individually aligned for best peak and symmetry.

R-F ALIGNMENT

1. Connect vacuum tube voltmeter across limiter grid resistor as in FM I-F alignment. Adjust signal generator output until a reading of at least 3 volts is obtained.

2. Ground one side of the FM Antenna by placing a wire jumper from one FM connection on the antenna terminal strip to the ground connection.

3. Connect unmodulated signal generator through a. 300 ohm resistor to ungrounded antenna post and chassis, and tune signal generator to 107 mc.

4. Set radio dial to 107 mc. and tune oscillator trimmer to peak output on vacuum tube voltmeter.

5. Tune 107 mc. r-f and antenna trimmers for maximum indication on voltmeter—it may be necessary to rock the gang while adjusting the r-f trimmer.

SPECIAL SERVICE INFORMATION

The following information is provided for the service man who has a vacuum tube voltmeter or a similar measuring instrument available.

STAGE GAINS*

Antenna Post to R-F Grid at:
- 600 kc. 5.8
- 6.5 mc. 2.9
- 98 mc. 1.0

R-F Grid to Converter Grid at:
- 600 kc. 11.6
- 6.5 mc. 9.5
- 98 mc. 6.8

R-F on Converter Grid to 455 kc. or I-F Grid at:
- 600 kc. 1.7
- 6.5 mc. 2.4
- 98 mc. 6.8

I-F on Converter Grid to 1st I-F Grid at:
- 455 kc. (dial pointer at 600 kc.) 2.6

1st I-F Grid to 2nd I-F Grid at:
- 455 kc. 20.5
- 10.7 mc. 37

2nd I-F Grid to Limiter Grid at:
- 10.7 mc. 34.5

AUDIO GAIN

Voltage required across the Volume Control to produce 0.1 watt speaker output** at 400 cycles is:

.013 volt with Amplifier AMP-111A

.008 volt with Amplifier AMP-111B or C

with Band Switch in BDCST setting.

OSCILLATOR OUTPUT VOLTAGE

The DC voltage developed across the Oscillator Grid Resistor (105) at:
- 600 kc. ..... 4.5V.
- 6.5 mc. ..... 4.6V.
- 98 mc. ..... 5.4V.

or 0.3 ma. through 15,000 ohm Oscillator Grid Resistor at 600 kc., 0.31 ma. at 6.5 mc. and 0.36 ma. at 98 mc.

*Variations of ± 20% are permissible. All AM readings made with sufficient input signal to provide 0.5 watt speaker output. 0.5 watt speaker output at 400 cycles is equivalent to a reading of 2.75V. as measured by a high resistance AC voltmeter across the voice coil of the 15-inch speaker.

**0.1 watt speaker output at 400 cycles is equivalent to a reading of 1.22 volts as measured by a high resistance AC voltmeter across the voice coil of 15-inch speaker.

10 KC. FILTER ADJUSTMENT

This chassis incorporates a 10 kc. filter circuit to eliminate the beat note heard as a whistle between stations on the broadcast band. If the trimmer is out of adjustment the following procedure should be observed:

1. Adjust the range control switch to the No. 3 setting.

2. Connect the output of an audio oscillator to the phonograph pickup socket. Adjust the oscillator to exactly 10,000 cycles.

3. Set the band selector to PHONO and adjust the 10 kc. trimmer for minimum output.

4. If an audio oscillator is not available for making this adjustment set the band selector to BDCST, set the range control to position 3, connect the antenna to the receiver and set the gang condenser to a point between two stations on adjacent channels having approximately the same power. If the 10 kc. trimmer is out of adjustment, a whistle will be heard. Adjust the trimmer until the whistle is eliminated.

DIAL CORD REPLACEMENT

Rotate the brass pulley designated "A" in Figure 1 until the dial pointer strikes the stop at the high frequency end of the dial calibration. In this condition the slot in pulley "A" should be approximately ten degrees to the left of being vertical—see Figure 1. If the slot in the pulley is in some other position under the above mentioned conditions, the pointer set screw is probably loose and has allowed the pointer to slip.

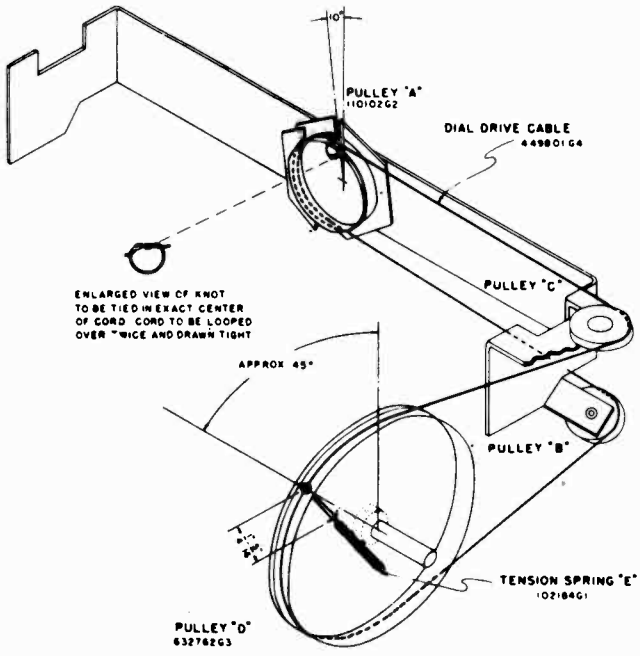


FIGURE 1

To correct this condition, first remove the glass dial and loosen the pointer screw. Then while holding pulley "A" so that its slot is approximately ten degrees to the left of vertical (when viewed from the rear) adjust the pointer until it is resting against the stop at the high frequency end of its travel. Then tighten the pointer set screw securely and replace the glass dial.

Completely unmesh the condenser gang and check the location of the hole or slot in pulley "D." If this hole is not approximately 45 degrees back from vertical as shown on Figure 1, loosen the two No. 6 Allen set screws in the hub of pulley "D" and slip the pulley on its shaft (while holding the condenser gang unmeshed) until the specified adjustment is obtained; then tighten one of the set screws securely. It will be shown later that this is a temporary setting. Next, tie a double knot in the exact center of a 25-inch length of dial cable and fold the cable back on itself so that the knot is at one end. The correct method for tying this knot is shown as an inset on Figure 1. Grasp the cable near the knotted end and slide it into the pulley slot so that the knot is against the inside rim of the pulley as shown in the sketch. The piece of cable nearest the dial frame should be wound in the direction shown for one-half turn; then over the lower pulley "B," around the bottom of the large pulley "D" and into the hole. Pull the cable taut and wrap the end around the small hook on pulley "D" temporarily.

The remaining piece of cable should be wound around pulley "A" in the direction shown, for one complete turn, over the upper pulley "C," and over the top of pulley "D." Thread the end through the small hole in pulley "D" and pull both ends of the cable taut. With one end of tension spring "E" fastened to the hook on pulley "D" lace the two free ends of the cable through the opposite end of the spring and tie a knot at a point that will allow 1/4" to 5/16" of cable between the spring and the inside rim of pulley "D." Be sure to tie the knot around one coil of the spring in the manner shown.

Now with the condenser gang completely meshed, check the position of the dial pointer. If it is not in line with the last calibration mark at the low frequency end of the dial, loosen the set screw in pulley "D" and turn it until the pointer is in the specified position. Be sure that the condenser gang does not move during this adjustment. Then tighten the two screws in pulley "D" securely completing the operation.

CONDENSER GANG DRIVE ADJUSTMENTS

Whenever any of the mechanical parts in the condenser gang drive assembly require replacement due to rough handling or for any other reason, it is extremely important that clearances and adjustments shown on Figures 2 and 3 are correct; otherwise, the tuning mechanism will be sluggish or it may slip during operation.

In reassembling the mechanism after any part was replaced, follow the procedure outlined below:

1. Assemble the Tuning Shaft, Drive Collar, Bracket, Tension Spring, Washer, and Flywheel in the order shown on Figure 3. The distance between the front of the Drive Collar and the front of the Tuning Shaft must be 1⅛ inches as specified on Figure 2. Install

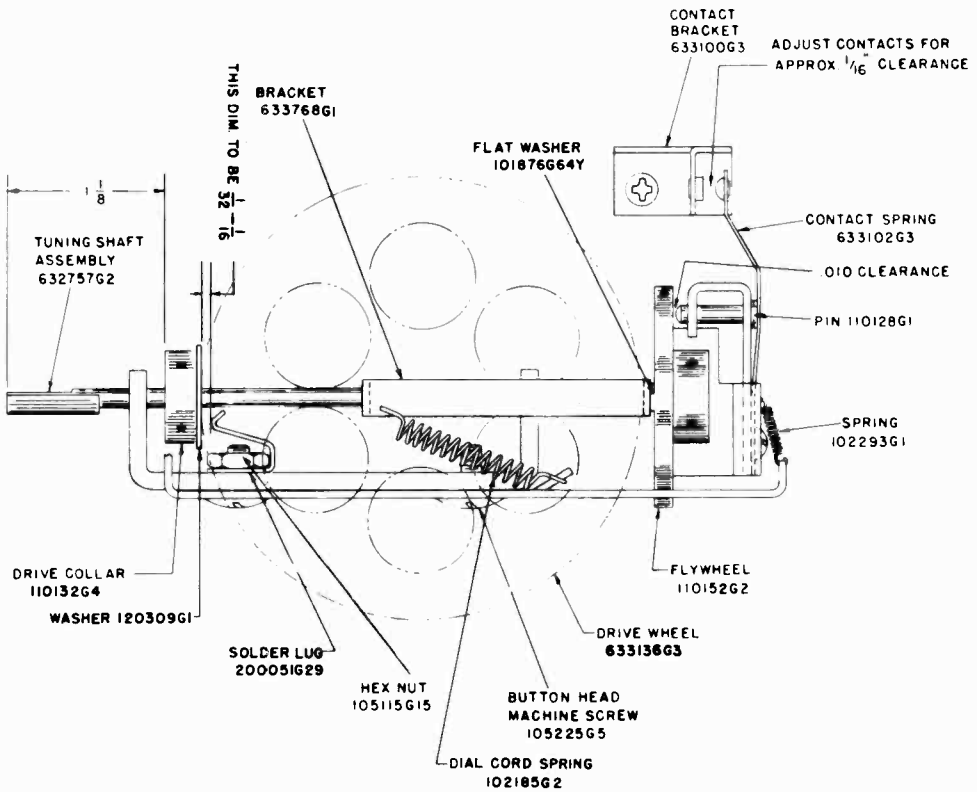


FIGURE 2

the Flywheel on the rear of the Tuning Shaft and slide it forward until it nearly touches the edge of the Drive Wheel; then tighten one of the set screws in the Flywheel hub. Insert a .010" gauge between the Flywheel and the Pin, and while holding the gauge in this position, loosen the set screw in the Flywheel hub that was previously tightened. The Tension Spring should force the Flywheel back against the gauge—when this occurs, tighten both set screws in the Flywheel hub.

2. Adjust the Muting Switch contact clearance by loosening the two screws in the Contact Bracket and sliding the bracket in the required direction until a 1/16" clearance is obtained. If this adjustment cannot be obtained in the manner prescribed, bend the Contact Bracket until proper clearance is realized.

3. The Drive Wheel is properly located on its shaft when its edge nearest the hub is in line with the outside edge of the Drive Collar as shown on Fig-

ure 3. Two Allen set screws in the Drive Wheel hub provide a means of adjusting the position of this wheel.

4. When the adjustment outlined in paragraph 2 is correct, the proper contact clearance will automatically be obtained when the Muting Switch is to be "unmuted" while the push buttons are being set. While pressure is applied to any one of the push buttons while they are being set up, a pressure applied simultaneously to the Tuning Control knob will cause the Muting Switch contacts to open. Detailed instructions on setting up these push buttons are shown elsewhere in this bulletin.

5. If the push button shafts at both ends do not engage the Treadle Bar as shown on Figure 3, the three screws in the Treadle Bar must be loosened and the Treadle Bar should be moved until the required condition is obtained.

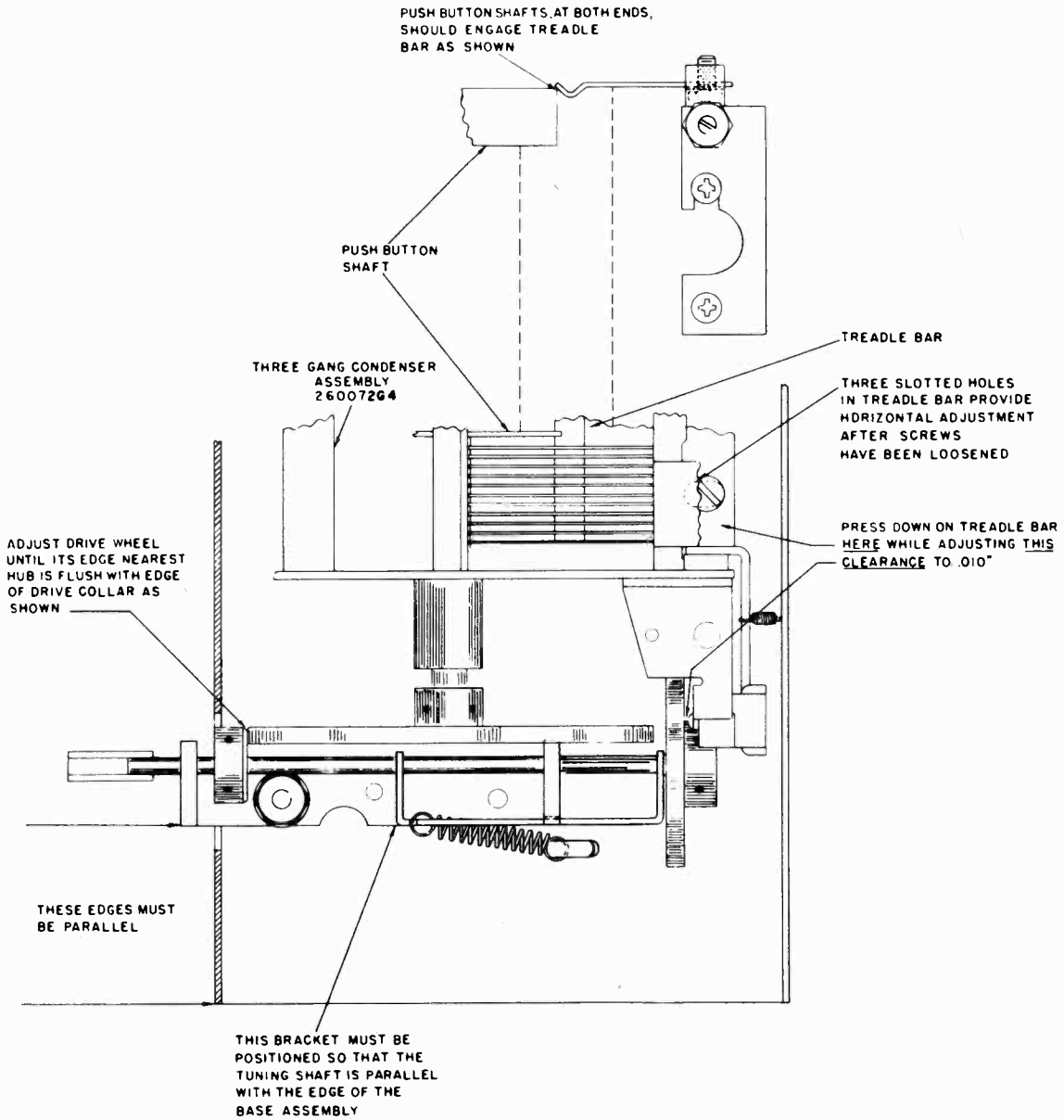
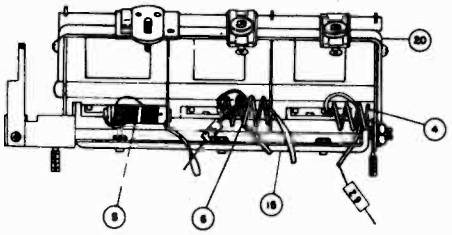
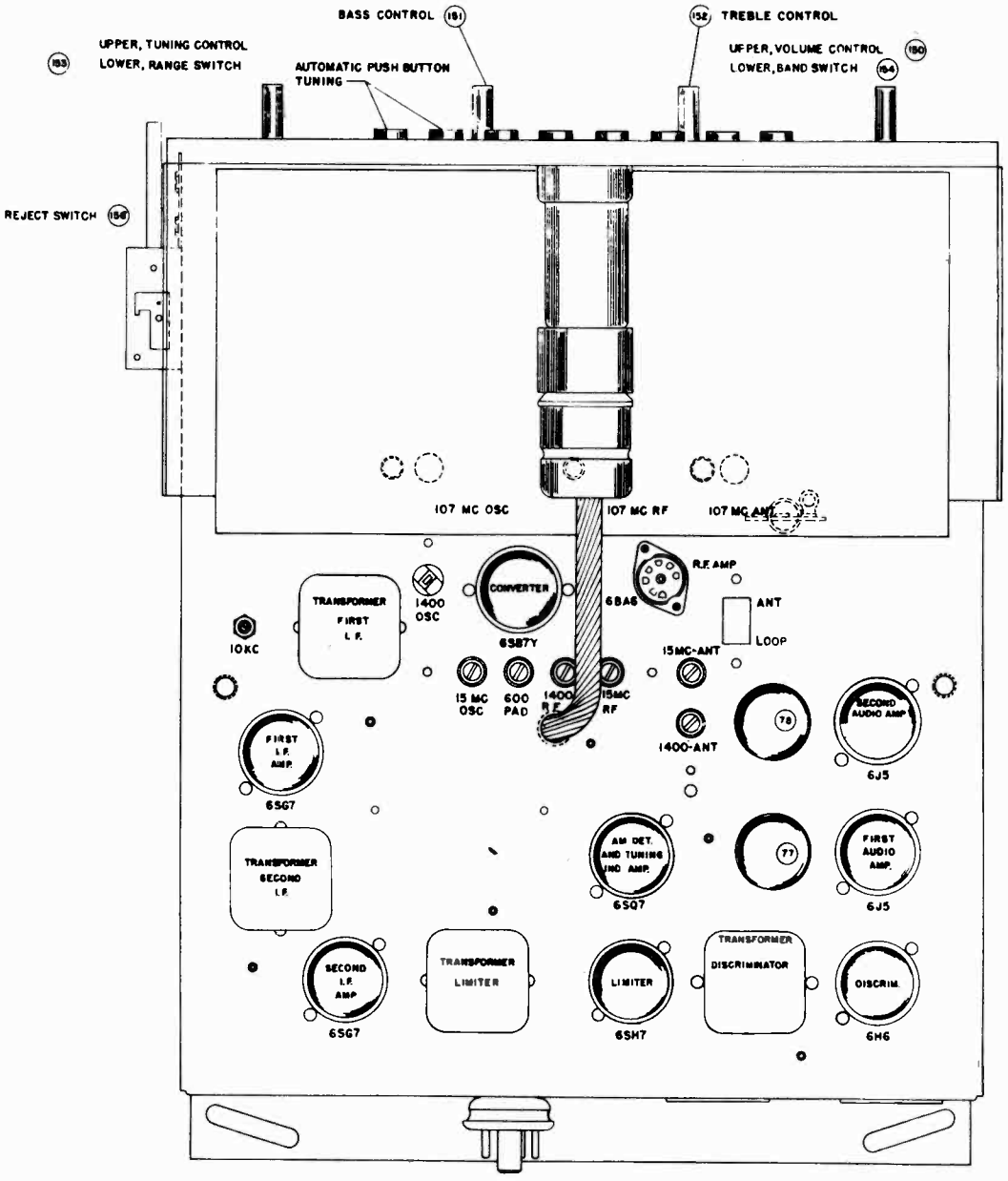


FIGURE 3





MODEL CR-231

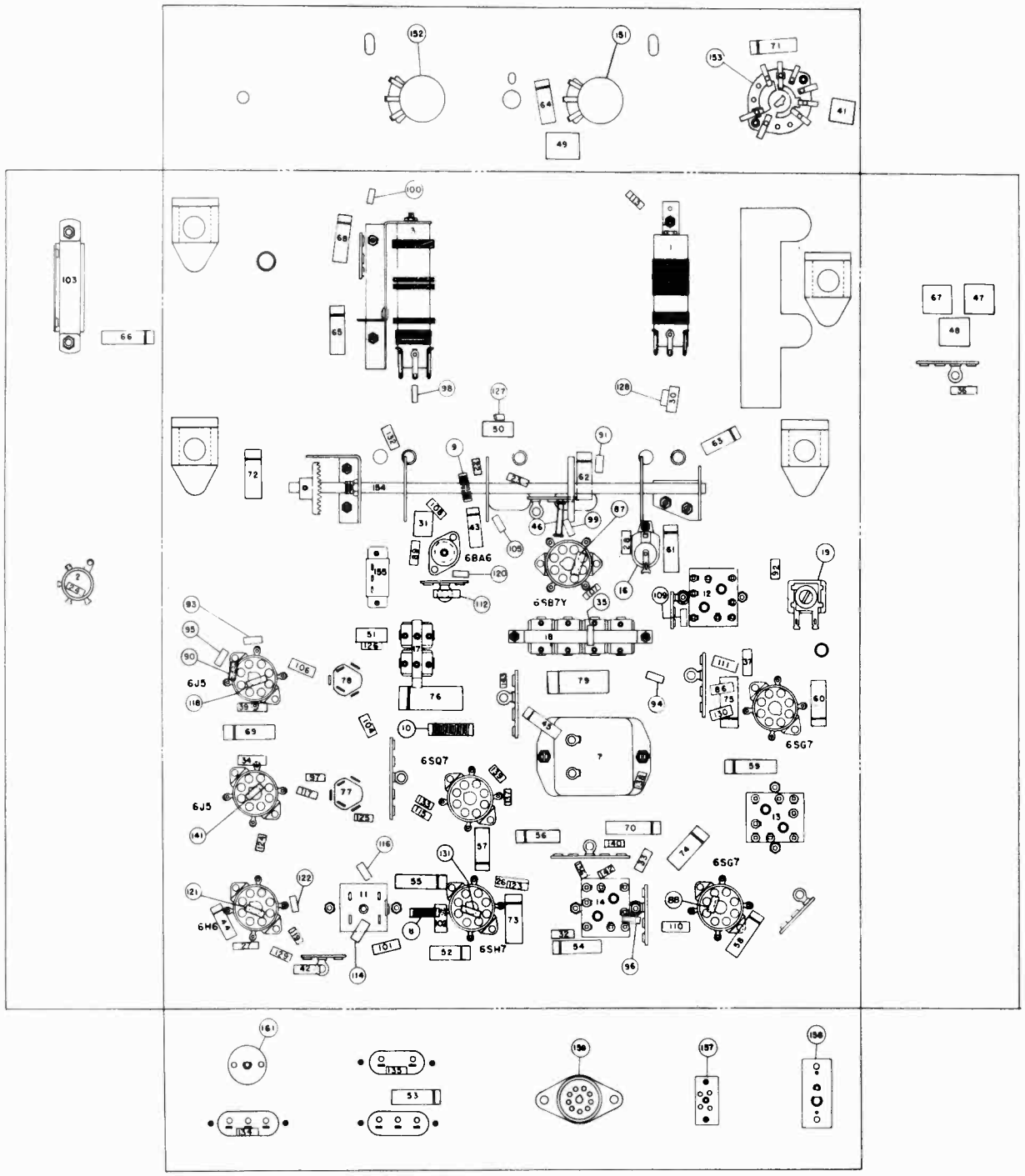


FIGURE 5

MODEL CR-231

PARTS LIST

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil Assembly, oscillator, AM	360298-1
2	Coil Assembly, antenna, AM	360299-1
3	Coil Assembly, r-f, AM	360300-1
4	Coil Assembly, antenna, FM	360296-3
5	Coil Assembly, oscillator, FM	360295-1
6	Coil Assembly, r-f, FM	360297-3
7	Coil Assembly, 10 kc.	360244-1
8	Coil, choke	360284-1
9	Coil, choke	360284-1
10	Coil, choke filament	360264-1
11	Transformer, discriminator	360305-1
12	Transformer, i-f	360285-1
13	Transformer, i-f	360285-1
14	Transformer, limiter	360286-1
15	Capacitor, variable, three gang tuning	260075-1
16	Capacitor, variable, oscillator trimmer, broadcast	260067-4
17	Capacitor, variable, 2 gang trimmer	260080-1
18	Capacitor, variable, 4 gang trimmers and oscillator padder	260082-1
19	Capacitor, variable, 10 kc. trimmer	259610-2
20	Capacitor, trimmer assembly	260084-1
21	Capacitor, ceramic, 3 mmf.	250088-38
22	Capacitor, ceramic & composition, 6 mmf.	250164-2
23	Capacitor, ceramic & composition, 10 mmf.	250164-3
24	Capacitor, ceramic & composition, 10 mmf.	250164-3
25	Capacitor, ceramic, 35 mmf.	250088-40
26	Capacitor, mica, 47 mmf.	250159-96
27	Capacitor, mica, 47 mmf.	250159-96
28	Capacitor, ceramic, 50 mmf.	250088-39
29	Capacitor, ceramic, 50 mmf.	250088-39
30	Capacitor, mica, 100 mmf.	250159-98
31	Capacitor, mica, 100 mmf.	250159-98
32	Capacitor, mica, 220 mmf.	250159-100
33	Capacitor, mica, 220 mmf.	250159-100
34	Capacitor, mica, 330 mmf.	250159-101
35	Capacitor, silver mica, 335 mmf., ±1%	250085-38
36	Capacitor, mica, 470 mmf.	250159-102
37	Capacitor, mica, 470 mmf.	250159-102
39	Capacitor, mica, 510 mmf., ±5%	250159-64
41	Capacitor, mica, 1000 mmf.	250160-82
42	Capacitor, mica, 1800 mmf., ±10%	250160-67
43	Capacitor, paper, .002 mfd., 600 V.	250152-44
44	Capacitor, paper, .002 mfd., 600 V., ±10%	250169-2
45	Capacitor, paper, .003 mfd., 600 V., ±10%	250169-6
46	Capacitor, ceramic, .004 mfd.	250088-34
47	Capacitor, molded paper, .004 mfd., 600 V.	250129-7
48	Capacitor, molded paper, .004 mfd., 600 V.	250129-7
49	Capacitor, molded paper, .005 mfd., 400 V.	250129-10
50	Capacitor, mica, .0062 mfd., ±5%	250161-27
51	Capacitor, mica, .0062 mfd., ±5%	250161-27
52	Capacitor, paper, .01 mfd., 600 V.	250152-38
53	Capacitor, paper, .01 mfd., 600 V.	250152-38
54	Capacitor, paper, .01 mfd., 600 V.	250152-38
55	Capacitor, paper, .01 mfd., 600 V.	250152-38

MODEL CR-231

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
56	Capacitor, paper, .01 mfd., 600 V.	250152-38
57	Capacitor, paper, .01 mfd., 600 V.	250152-38
58	Capacitor, paper, .01 mfd., 600 V.	250152-38
59	Capacitor, paper, .01 mfd., 600 V.	250152-38
60	Capacitor, paper, .01 mfd., 600 V.	250152-38
61	Capacitor, paper, .01 mfd., 600 V.	250152-38
62	Capacitor, paper, .01 mfd., 600 V.	250152-38
63	Capacitor, paper, .01 mfd., 600 V.	250152-38
64	Capacitor, paper, .01 mfd., 600 V.	250152-38
65	Capacitor, paper, .01 mfd., 600 V.	250152-38
66	Capacitor, paper, .01 mfd., 600 V.	250152-38
67	Capacitor, molded paper, .012 mfd., 200 V.	250129-13
68	Capacitor, paper, .015 mfd., ±10%, 200 V.	250169-5
69	Capacitor, paper, .02 mfd., 600 V.	250152-37
70	Capacitor, paper, .02 mfd., 600 V.	250152-37
71	Capacitor, paper, .02 mfd., 600 V.	250152-37
72	Capacitor, paper, .05 mfd., 200 V.	250152-15
73	Capacitor, paper, .05 mfd., 200 V.	250152-15
74	Capacitor, paper, .05 mfd., 200 V.	250152-15
75	Capacitor, paper, .05 mfd., 200 V.	250152-15
76	Capacitor, paper, .1 mfd., 600 V.	250152-33
77	Capacitor, electrolytic, 10 mfd., 450 V.—20 mfd., 25 V.	270023-6
78	Capacitor, electrolytic, 10 mfd., 450 V.—20 mfd., 25 V.	270023-6
79	Capacitor, molded paper, .005 mfd., 400 V.	250152-41
86	Resistor, composition, 33 ohms, ½ W.	230084-4
87	Resistor, composition, 33 ohms, ½ W.	230084-4
88	Resistor, composition, 68 ohms, ½ W.	230084-6
89	Resistor, composition, 68 ohms, ½ W.	230084-6
90	Resistor, composition, 100 ohms, ±10%, ½ W.	230084-50
91	Resistor, composition, 100 ohms, ½ W.	230084-7
92	Resistor, composition, 150 ohms, ½ W.	230084-8
93	Resistor, composition, 220 ohms, ±10%, ½ W.	230084-54
94	Resistor, composition, 220 ohms, ½ W.	230084-9
95	Resistor, composition, 470 ohms, ½ W.	230084-11
96	Resistor, composition, 1000 ohms, ½ W.	230084-13
97	Resistor, composition, 2200 ohms, ½ W.	230084-15
98	Resistor, composition, 4700 ohms, ½ W.	230084-17
99	Resistor, composition, 5600 ohms, ±10%, ½ W.	230084-71
100	Resistor, composition, 5600 ohms, ±10%, ½ W.	230084-71
101	Resistor, composition, 8200 ohms, 1 W., ±10%	230085-73
102	Resistor, composition, 8200 ohms, 1 W., ±10%	230085-73
103	Resistor, strip, 8500 ohms	240035-5
104	Resistor, composition, 10,000 ohms, 1 W.	230085-19
105	Resistor, composition, 10,000 ohms, ½ W.	230084-19
106	Resistor, composition, 15,000 ohms, 1 W.	230085-20
107	Resistor, composition, 15,000 ohms, ½ W.	230084-20
108	Resistor, composition, 20,000 ohms, 1 W., ±5%	230085-190
109	Resistor, composition, 22,000 ohms, ½ W.	230085-21
110	Resistor, composition, 33,000 ohms, 1 W.	230085-22
111	Resistor, composition, 33,000 ohms, 1 W.	230085-22
112	Resistor, composition, 33,000 ohms, 2 W., ±10%	230086-80
113	Resistor, composition, 47,000 ohms, ½ W.	230084-23

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
114	Resistor, composition, 68,000 ohms, ½ W., ±10%	230084-84
115	Resistor, composition, 100,000 ohms, ½ W.	230084-25
116	Resistor, composition, 100,000 ohms, ½ W.	230084-25
117	Resistor, composition, 100,000 ohms, ½ W.	230084-25
118	Resistor, composition, 100,000 ohms, ½ W.	230084-25
119	Resistor, composition, 100,000 ohms, ½ W., ±10%	230084-86
120	Resistor, composition, 39,000 ohms, ½ W., ±10%	230084-81
121	Resistor, composition, 150,000 ohms, ½ W., ±10%	230084-88
122	Resistor, composition, 150,000 ohms, ½ W., ±10%	230084-88
123	Resistor, composition, 220,000 ohms, ½ W.	230084-27
124	Resistor, composition, 470,000 ohms, ±10%, ½ W.	230084-94
125	Resistor, composition, 220,000 ohms, ½ W.	230084-27
126	Resistor, composition, 220,000 ohms, ½ W.	230084-27
127	Resistor, composition, 220,000 ohms, ½ W.	230084-27
128	Resistor, composition, 220,000 ohms, ½ W.	230084-27
129	Resistor, composition, 330,000 ohms, ½ W., ±10%	230084-92
130	Resistor, composition, 470,000 ohms, ½ W.	230084-29
131	Resistor, composition, 470,000 ohms, ½ W.	230084-29
132	Resistor, composition, 470,000 ohms, ½ W.	230084-29
133	Resistor, composition, 470,000 ohms, ½ W.	230084-29
134	Resistor, composition, 1 megohm, ½ W.	230084-31
135	Resistor, composition, 1 megohm, ½ W.	230084-31
136	Resistor, composition, 1 megohm, ½ W.	230084-31
137	Resistor, composition, 1.5 megohm, ½ W.	230084-32
138	Resistor, composition, 1.5 megohm, ½ W.	230084-32
139	Resistor, composition, 2.2 megohm, ½ W.	230084-33
140	Resistor, composition, 2.2 megohm, ½ W.	230084-33
141	Resistor, composition, 4.7 megohm, ½ W.	230084-35
142	Resistor, composition, 4.7 megohm, ½ W.	230084-35
143	Resistor, composition, 33,000 ohms, ½ W., ±10%	230084-80
150	Control, volume, 1 megohm	220044-24
151	Control, bass, 1 megohm with switch	230073-6
		230045-7
152	Control, treble	160178-1
153	Control, range	220044-26
		220072-12
154	Switch, rotary, band switch	160179-1
155	Switch, slide SPDT	160176-1
156	Switch, reject	160188-1
157	Socket, external input	180060-1
158	Socket, phono	189741-1
159	Socket, amplifier	180427-2
160	Antenna Loop Assembly	460637-1
161	Socket, solenoid	182776-1
162	Solenoid	360313-1
163	Plug, solenoid	189147-1
	Dial Glass Assembly	150303-1
	Push Button Assembly for gang	260093-1

MODEL CR-233

GENERAL

It frequently becomes necessary to make minor changes in the electrical circuit of a chassis to provide the correct response for different cabinets or speaker systems.

When this becomes necessary such a variation from the original chassis is indicated by a suffix letter; example: 500B.

Whenever necessary Service Bulletin Supplements will be issued with latest schematic drawings and parts lists indicating these changes.

METHOD FOR REMOVING CHASSIS FROM CABINET

Model CR-233 radio chassis is designed for easy removal from the cabinet in which it is installed. As the radio panel is permanently fastened to the chassis, the control knobs need not be removed when the chassis is taken out of the cabinet for service.

To remove the chassis, first remove the antenna leads from their terminals and all plugs from the receptacles on the rear of the chassis. Then remove the two Phillips-head screws from the angular slots in the flange at the rear of the chassis. Lift the rear of the chassis about one inch and pull it straight back. Never remove the chassis tray from the cabinet—it has been properly positioned to bring the radio panel in place when the chassis is replaced. In replacing the chassis, slide it so that the small hooks near the front, ride inside the flanges on the sides of the chassis tray. Push the chassis forward as far as it will go and the hook should then engage the slots in the chassis tray. Replace the two Phillips-head screws and nuts and tighten securely. Replace all plugs in their receptacles and the antenna leads on their correct terminals. The antenna terminal board for the loop antenna connections is designated L-H. The two terminals on the loop are designated L and H; the leads connected to these terminals should be wired to the corresponding terminals (L and H) on the chassis.

ALIGNMENT PROCEDURE

Alignment of this receiver requires the use of an accurately calibrated r-f signal generator, range 455 kc. to 107 mc., an output meter, and a vacuum tube voltmeter of greater than 10 megohm input impedance. All trimmer condensers can be identified by stampings on the chassis and gang condenser cover and are shown on the chassis layout diagram.

The pointer on the radio dial should line up with the first vertical mark on the low frequency end of the dial glass. If the pointer does not line up, loosen the pointer on the dial string and move it to correct position. Re-tighten and re-cement the pointer to the string. Be sure the gang is fully meshed for this pointer alignment. Align AM first.

AM ALIGNMENT

I-F ALIGNMENT

1. Set volume, treble, and bass controls to maximum. Set Band Switch to Broadcast position, and dial pointer to 1000 kc.
2. Tune the signal generator to EXACTLY 455 kc.
3. Connect output of modulated signal generator to the signal grid of the 6BE6 (pin 7) through a .01 mfd. capacitor and signal generator ground to radio chassis.
4. AM and FM i-f transformers on this model are separate and can be identified on the chassis layout diagram Figure 3.
5. Connect output meter across voice coil of speaker and adjust the i-f transformers for peak output as indicated on the output meter.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Connect 455 kc. sweep generator having approximately 20 kc. sweep to signal grid of 6BE6 (pin 7) through a .01 mfd. capacitor. Connect an oscilloscope through a 1 megohm isolating resistor across the 150,000 ohm diode load resistor. Align for best possible peak and symmetry.

R-F ALIGNMENT

1. Remove the signal generator lead from the 6BE6 grid and connect it across H and L on terminal strip on the rear of the chassis. The high side of the signal generator should be connected to H and the signal generator ground to L.

2. Set the signal generator and the radio receiver to 1400 kc., adjust the 1400 kc. oscillator trimmer and the 1400 kc. r-f trimmer for maximum output.

3. Set the signal generator and radio receiver to 600 kc. Adjust the oscillator and r-f coil slugs for maximum output. If considerable adjustment was necessary re-check the 1400 kc trimmer settings.

4. Replace chassis in cabinet and connect loop antenna leads to proper terminals on the rear of the chassis.

5. Form three turns of wire into a loop, connect this loop to the signal generator and loosely couple it to the receiver loop antenna.

6. With the signal generator and dial at 1400 kc., adjust the loop antenna trimmer for maximum output.

FM ALIGNMENT

DISCRIMINATOR ALIGNMENT

1. Tune signal generator to EXACTLY 10.775 mc. and connect to pin 4 of the 6SH7 Limiter tube socket through a .01 mfd. capacitor.

2. Connect a DC vacuum tube voltmeter between point "B" on schematic diagram and ground (across .00047 mfd. capacitor—Pin 6 on 6H6 to ground).

3. Peak both discriminator slugs at 10.775 mc.

4. Retune signal generator to exactly 10.7 mc. and adjust bottom slug for zero volts.

5. The DC voltage at 10.625 mc. should be within 10% of the voltage at 10.775 mc. and of opposite polarity.

Note: If the signal generator is not capable of sufficient output to produce a readable DC voltage, the amplification of the last i-f stage can be used to increase the signal input to the limiter for discriminator alignment. To accomplish this, align the last i-f stage as indicated in "IF Alignment". Then align discriminator as above leaving the signal generator connected to the grid of the 6SG7 2nd i-f tube.

I-F ALIGNMENT

1. Connect high side of signal generator, through a .01 mfd. capacitor and a 1000 ohm resistor in series, to pin 4 of the 6SG7 2nd i-f tube. Connect low side of generator to chassis.

2. Close gang condenser and connect vacuum tube voltmeter across 220,000 ohm limiter grid resistor; (Point "A" on schematic to ground). Adjust signal generator output until a reading of at least 3 volts is obtained. In order to reduce regeneration caused by the vacuum tube voltmeter leads, a 1-megohm isolating resistor, connected with as short leads as possible to point "A" should be used in series with the vacuum tube voltmeter. Align the 3rd i-f transformer for best peak as indicated on voltmeter.

3. Repeat above for each succeeding transformer by connecting signal generator to signal grid of first i-f tube 6SG7 then to the signal grid of 6BE6 converter. The i-f stages should be aligned in this order.

WARNING—After each i-f stage has been aligned, do not repeak with the signal into the grid of the 6BE6.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Replace signal generator with sweep generator having approximately 300 kc. sweep and tune generator to 10.7 mc. Connect oscilloscope across 220,000 ohm limiter grid resistor through a 1-megohm isolating resistor. The order of alignment is the same as when using a vacuum tube voltmeter. Each i-f transformer should be individually aligned for best peak and symmetry.

R-F ALIGNMENT

1. Connect vacuum tube voltmeter across limiter grid resistor as in FM I-F alignment.

2. Ground one side of the FM Antenna by placing a wire jumper from one FM connection on the antenna terminal strip to the ground connection.

3. Connect unmodulated signal generator through a 300 ohm resistor to ungrounded antenna post and chassis, and tune signal generator to 107 mc.

4. Set radio dial to 107 mc. and tune oscillator trimmer to peak output on vacuum tube voltmeter. Adjust signal generator output until a reading of at least 3 volts is obtained.

5. Tune 107 mc. r-f and antenna trimmers for maximum indication on voltmeter—it may be necessary to rock the dial while adjusting the r-f trimmer.

SPECIAL SERVICE INFORMATION

The following information is provided for the service man who has a vacuum tube voltmeter or a similar measuring instrument available.

STAGE GAINS*

Antenna Post to R-F Grid at:

600 kc.	5.00
98 mc.	1.15

R-F Grid to Converter Grid at:

600 kc.	14.5
98 mc.	9.4

MODEL CR-233

R-F on Converter Grid to 455 kc. on I-F Grid at:
600 kc. 25.0
98 mc. 3.2

I-F on Converter Grid to 1st I-F Grid at:
455 kc. (gang closed) 28.0

1st I-F Grid to 2nd I-F Grid** at:
455 kc. 95
10.7 mc. 33

2nd I-F Grid to Limiter Grid at:
10.7 mc. 33.4

OSCILLATOR OUTPUT VOLTAGE

The DC voltage developed across the Oscillator Grid Resistor (105) at:

600 kc. ..... 6.6V.
98 mc. ..... 6.0V.

or 0.3 ma. through 22,000 ohm Oscillator Grid Resistor at 600 kc. and 0.27 ma. at 98 mc.

AUDIO GAIN

Voltage required across the Volume Control to produce 0.1 watt speaker output*** at 400 cycles is .012 volt with Input Selector Switch in BDCST. setting.

*Variations of ±20% are permissible. All readings made with sufficient input signal to provide 0.5 watt speaker output. 0.5 speaker output at 400 cycles is equivalent to a reading of 1.25V. as measured by a high resistance AC voltmeter across the voice coil of the speaker.
**Detector Plate on AM.
***0.1 watt speaker output at 400 cycles is equivalent to a reading of 0.55 volts as measured by a high resistance AC voltmeter across the voice coil of speaker.

DIAL CORD REPLACEMENT

Two separate drive cables are used in the CR-233 dial assembly. One cable is used to transmit the motion from the tuning knob to the large pulley that is coupled to the condenser gang; the other cable actuates the dial pointer whenever the large pulley on the condenser gang is rotated. Separate instructions for replacing either of these cables is given in the following paragraphs.

CONDENSER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out four screws on each side of chassis. Slide a short length (approximately ½ inch) of sleeving over one end of a length of dial cable, form a small loop and tie a knot in the manner shown on Figure 1. Tie spring to opposite end of cable making length excluding spring 19½ inches. Hook loop over the metal hook in pulley "D" and lace the cable through the pulley slot and around the pulley in a counterclockwise direction when viewed from the rear of the dial assembly keeping the cable to the rear of the pulley groove. Lace the cable around the smaller diameter portion of the tuning control shaft wrapping 2½ turns *from front to back;* then around the opposite side of pulley "D" into the pulley through the slot. Hook the end of tension spring "F" in the hole provided in pulley "D", completing this operation.

DIAL POINTER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out four screws on each side of chassis. Slip a one-half inch length of sleeving over a 42-inch length of dial cable. Tie the two ends to the loop end of the cable spring "E" securely so that the cable doubled measures 19⅝ inches end to end excluding spring.

Place spring hook in top hole and draw cable through slot of pulley "D". Loop one end of cable around pulley "D" in a clockwise direction in front of condenser drive cable (viewing dial assembly from front) then loop the remaining end around pulley in a counterclockwise direction. Secure both ends of cable to chassis at edge of pulley slot with scotch tape, keeping piece of sleeving on remaining loop of cable.

Replace dial assembly and loop cable over pulley "A". While holding cable taut remove scotch tape and loop cable over pulleys "B" and "C" as shown in Figure 1.

Turn the tuning control shaft until the condenser gang is completely meshed and slide the dial pointer on its track until it is in line with the last calibration mark at the low frequency end of the dial. The short piece of sleeving installed prior to the stringing operation should be slid to the rear of the dial pointer and the crimping lug on the pointer pressed over the sleeving. After checking to make certain that the condenser gang is completely meshed and the dial pointer is in the position specified previously, apply a few drops of cement to each end of the sleeving to which the dial pointer is fastened. This completes the operation.

MODEL CR-233

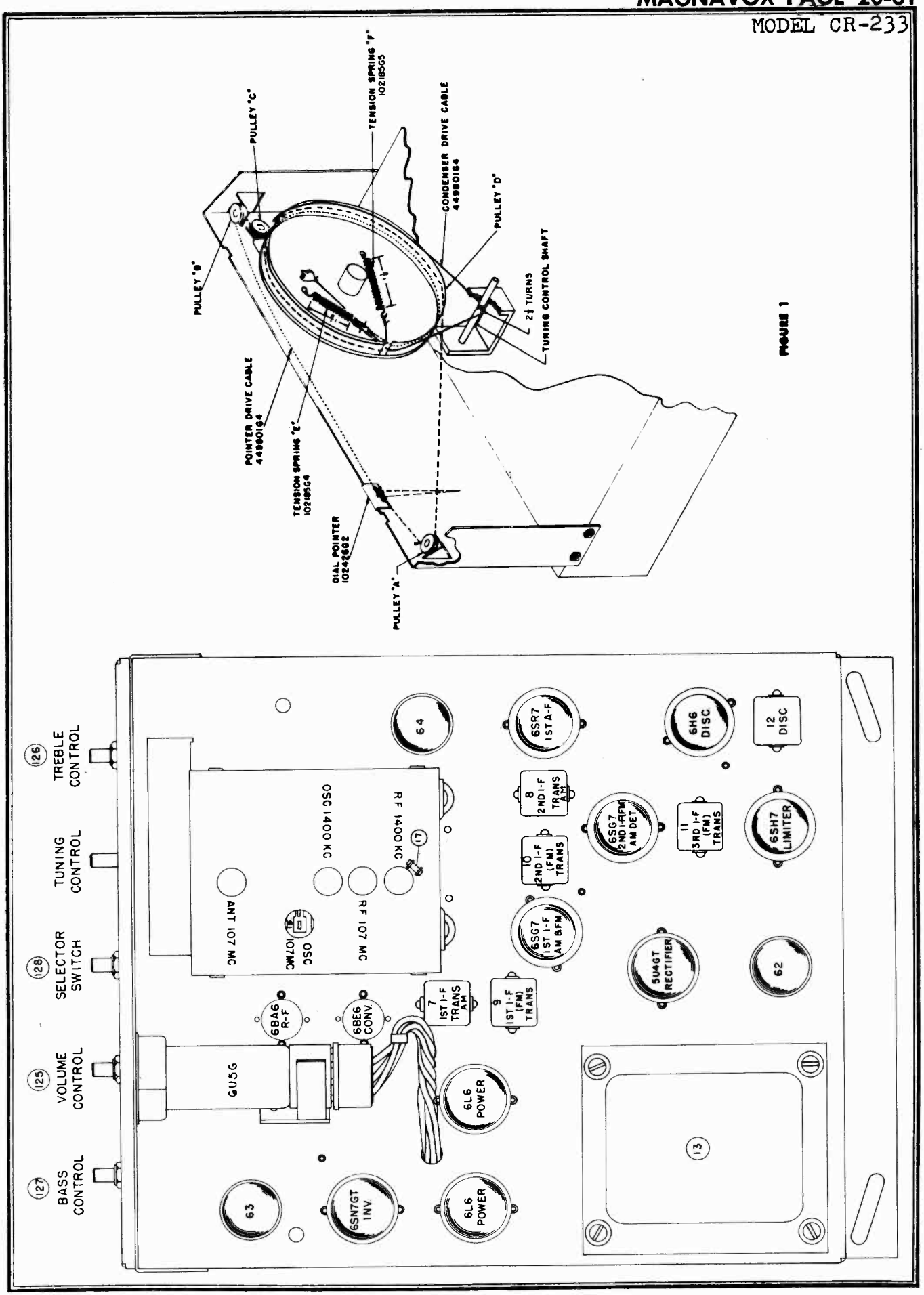


FIGURE 1

MODEL CR-233

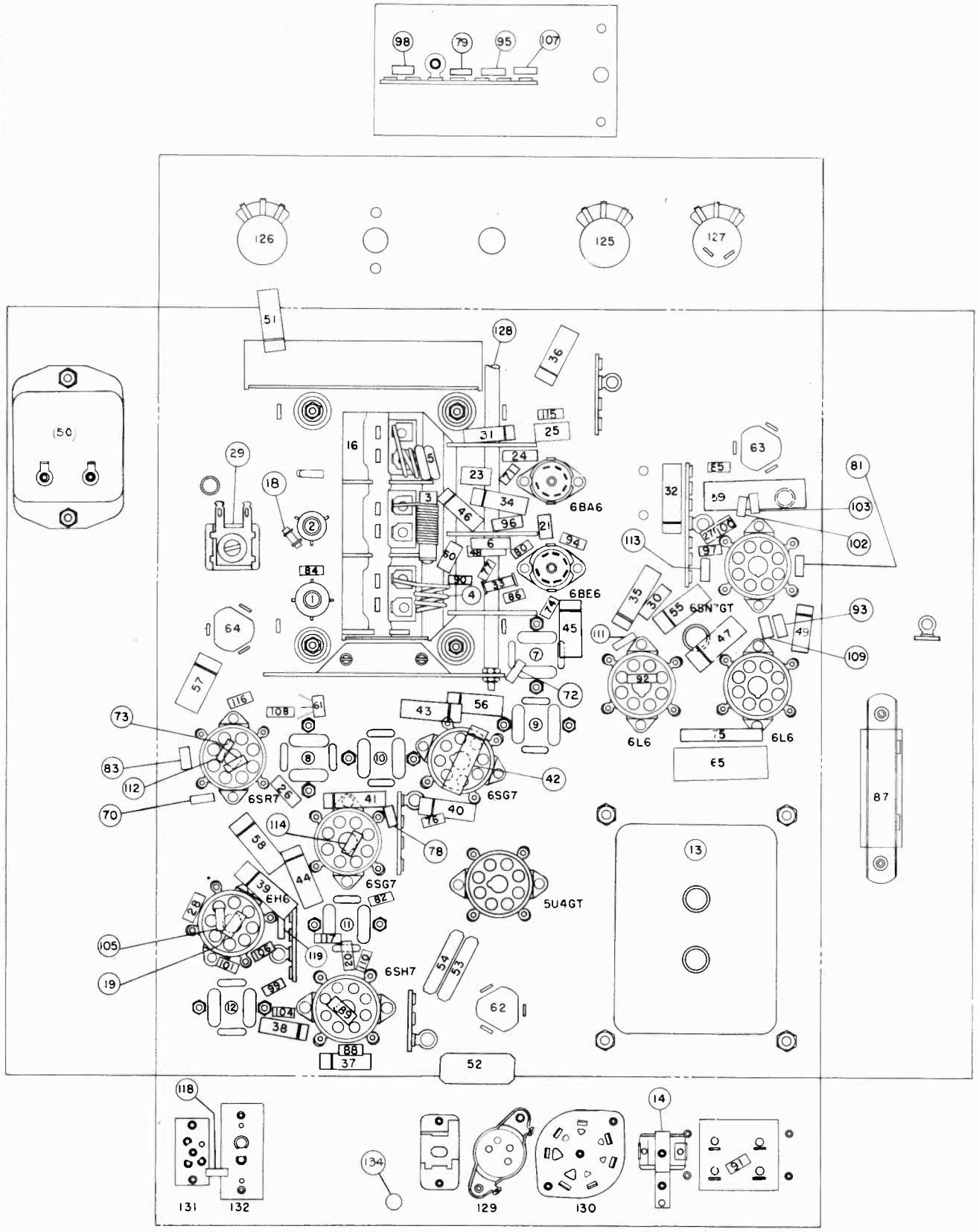
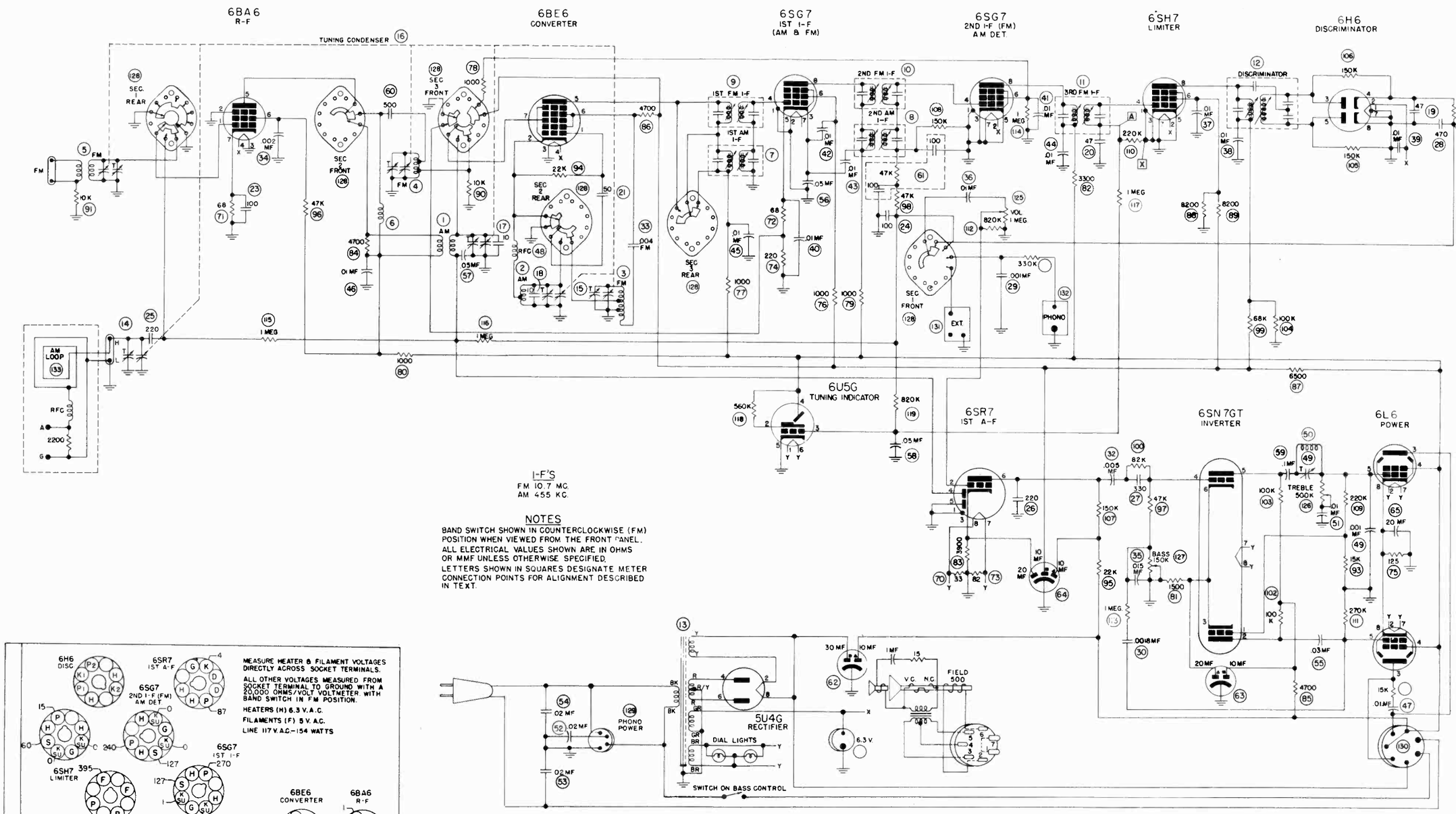


FIGURE 3



I-F'S
F.M. 10.7 MC.
AM 455 KC.

NOTES

BAND SWITCH SHOWN IN COUNTERCLOCKWISE (F.M.) POSITION WHEN VIEWED FROM THE FRONT PANEL.
ALL ELECTRICAL VALUES SHOWN ARE IN OHMS OR MMF UNLESS OTHERWISE SPECIFIED.
LETTERS SHOWN IN SQUARES DESIGNATE METER CONNECTION POINTS FOR ALIGNMENT DESCRIBED IN TEXT.

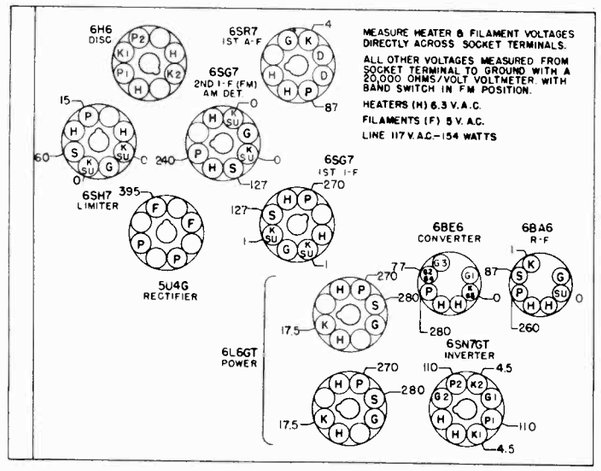


FIGURE 2

SPECIFICATIONS

Power supply	117 volts 50/60 cycles AC
Power consumption	160 watts
Power output	20 watts
Intermediate frequency	455 kc./10.7 mc.
Tuning frequency range:	
Broadcast Band	540-1620 kc.
FM Band	88—108 mc.
Tubes:	
R-F Amplifier	6BA6
Converter	6BE6
1st I-F Amplifier (AM-FM)	6SG7
2nd I-F (FM), Detector and AVC (AM)	6SG7
Limiter	6SH7
Discriminator	6H6
First Audio	6SR7
Inverter	6SN7GT
Power output (push-pull stage)	(2) 6L6
Rectifier	5U4G
Tuning Indicator	6U5
Dial Lamps	Mazda No. 44

Speaker:	No. 583248	No. 583247
Field coil resistance	250 ohms	250 ohms
Voice coil impedance (400 cycles)	5.7 ohms	5.4 ohms
Output transformer	5000/3 ohms	

MODEL CR-233

PARTS LIST

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil assembly, r-f (AM)	360348-1
2	Coil assembly, oscillator (AM)	360349-1
3	Coil assembly, oscillator (FM)	360323-1
4	Coil assembly, r-f (FM)	360322-2
5	Coil assembly, antenna (FM)	360321-2
6	Coil, choke	360284-1
7	Transformer, first i-f	360373-1
8	Transformer, second i-f	360373-2
9	Transformer, first i-f (FM)	360374-1
10	Transformer, second i-f (FM)	360374-1
11	Transformer, third i-f (FM)	360374-1
12	Transformer, discriminator	360375-1
13	Transformer, power	300052-2
14	Capacitor, variable trimmer	250046-2
15	Capacitor, variable trimmer	260067-5
16	Capacitor, three gang tuning	260103-1
17	Capacitor, ceramic, 10 mmf. ±5%, 500 V.	250088-8
18	Capacitor, ceramic, 10 mmf. ±5%, 500 V.	250088-8
19	Capacitor, mica, 47 mmf. 500 V.	250159-96
20	Capacitor, mica, 47 mmf. 500 V.	250159-96
21	Capacitor, ceramic, 50 mmf. ±10%, 500 V.	250088-39
23	Capacitor, mica, 100 mmf. 500 V.	250159-98
24	Capacitor, mica, 100 mmf. 500 V.	250159-98
25	Capacitor, mica, 220 mmf. 500 V.	250159-100
26	Capacitor, mica, 220 mmf. 500 V.	250159-100
27	Capacitor, mica, 330 mmf. ±10%, 500 V.	250159-88
28	Capacitor, mica, 470 mmf. 500 V.	250159-102
29	Capacitor, trimmer, 10 kc.	259610-2
30	Capacitor, mica, 1800 mmf. ±5%, 500 V.	250160-44
31	Capacitor, paper, .001 mfd. ±10%, 600 V.	250152-45
32	Capacitor, paper, .005 mfd. 600 V.	250152-41
33	Capacitor, ceramic, .004 mfd. 350 V.	250088-34
34	Capacitor, paper, .002 mfd. 600 V.	250152-44
35	Capacitor, paper, .015 mfd. ±10%, 200 V.	250169-5
36	Capacitor, paper, .01 mfd. 200 V.	250152-18
37	Capacitor, paper, .01 mfd. 600 V.	250152-38
38	Capacitor, paper, .01 mfd. 600 V.	250152-38
39	Capacitor, paper, .01 mfd. 200 V.	250152-18
40	Capacitor, paper, .01 mfd. 200 V.	250152-18
41	Capacitor, paper, .01 mfd. 600 V.	250152-38
42	Capacitor, paper, .01 mfd. 600 V.	250152-38
43	Capacitor, paper, .01 mfd. 600 V.	250152-38
44	Capacitor, paper, .01 mfd. 600 V.	250152-38
45	Capacitor, paper, .01 mfd. 600 V.	250152-38
46	Capacitor, paper, .01 mfd. 600 V.	250152-38
47	Capacitor, paper, .01 mfd. 600 V.	250152-38
48	Choke coil	360284-1
49	Capacitor, paper, .001 mfd. ±10%, 600 V.	250152-45
50	Coil assembly, 10 kc.	360244-2
51	Capacitor, paper, .01 mfd. 200 V.	250152-18
52	Capacitor, paper, .02 mfd. 600 V.	250129-3
53	Capacitor, paper, .02 mfd. 600 V.	250129-3
54	Capacitor, paper, .02 mfd. 600 V.	250129-3
55	Capacitor, paper, .03 mfd. 600 V.	250152-36
56	Capacitor, paper, .05 mfd. 200 V.	250152-15
57	Capacitor, paper, .05 mfd. 200 V.	250152-15
58	Capacitor, paper, .05 mfd. 200 V.	250152-15
59	Capacitor, paper, .1 mfd. 400 V.	250152-22
60	Capacitor, ceramic, 500 mmf.	250088-31
61	Capacitor-resistor filter	250170-1
62	Capacitor, electrolytic, 30-10 mfd. 475 V.	270023-2
63	Capacitor, electrolytic, 10 mfd. 450 V.—20 mfd. 25 V.	270023-6
64	Capacitor, electrolytic, 10-10 mfd. 450 V.—20 mfd. 25 V.	270023-7
65	Capacitor, electrolytic, 20 mfd. 25 V.	270027-2
70	Resistor, composition, 33 ohms, ½ W.	230084-4
71	Resistor, composition, 68 ohms, ½ W.	230084-6
72	Resistor, composition, 68 ohms, ½ W.	230084-6
73	Resistor, composition, 82 ohms, ±10%, ½ W.	230084-49
74	Resistor, composition, 220 ohms, ½ W.	230084-9
75	Resistor, composition, 125 ohms, 5 W.	240021-11
76	Resistor, composition, 1000 ohms, ½ W.	230084-13
77	Resistor, composition, 1000 ohms, ½ W.	230084-13
78	Resistor, composition, 1000 ohms, ½ W.	230084-13
79	Resistor, composition, 1000 ohms, ½ W.	230084-13
80	Resistor, composition, 1000 ohms, ½ W.	230084-13
81	Resistor, composition, 1500 ohms, ½ W.	230084-14
82	Resistor, composition, 3300 ohms, ½ W.	230084-16
83	Resistor, composition, 3900 ohms, ±10%, ½ W.	230084-69
84	Resistor, composition, 4700 ohms, ½ W.	230084-17
85	Resistor, composition, 4700 ohms, ½ W.	230084-17
86	Resistor, composition, 4700 ohms, ½ W.	230084-17
87	Resistor, wire wound, 6500 ohms, ±10%	240035-9
88	Resistor, composition, 8200 ohms, ±10%, 1 W.	230085-73
89	Resistor, composition, 8200 ohms, ±10%, 1 W.	230085-73
90	Resistor, composition, 10,000 ohms, ½ W.	230084-19
91	Resistor, composition, 10,000 ohms, ½ W.	230084-19
92	Resistor, composition, 15,000 ohms, 1 W.	230085-20
93	Resistor, composition, 15,000 ohms, ±5%, ½ W.	230084-187
94	Resistor, composition, 22,000 ohms, ½ W.	230084-21
95	Resistor, composition, 22,000 ohms, ½ W.	230084-21
96	Resistor, composition, 47,000 ohms, 1 W.	230085-23
97	Resistor, composition, 47,000 ohms, ½ W.	230084-23
98	Resistor, composition, 47,000 ohms, ½ W.	230084-23
99	Resistor, composition, 68,000 ohms, ±10%, ½ W.	230084-84
100	Resistor, composition, 82,000 ohms, ±10%, ½ W.	230084-85
101	Resistor, composition, 100,000 ohms, ±10%, ½ W.	230084-86
102	Resistor, composition, 100,000 ohms, ½ W.	230084-25
103	Resistor, composition, 100,000 ohms, ½ W.	230084-25
104	Resistor, composition, 100,000 ohms, ½ W.	230084-25
105	Resistor, composition, 150,000 ohms, ±10%, ½ W.	230084-88
106	Resistor, composition, 150,000 ohms, ±10%, ½ W.	230084-88
107	Resistor, composition, 150,000 ohms, ½ W.	230084-26
108	Resistor, composition, 150,000 ohms, ½ W.	230084-26
109	Resistor, composition, 220,000 ohms, ±5%, ½ W.	230084-215
110	Resistor, composition, 220,000 ohms, ½ W.	230084-27
111	Resistor, composition, 270,000 ohms, ±10%, ½ W.	230084-91
112	Resistor, composition, 820,000 ohms, ±10%, ½ W.	230084-97
113	Resistor, composition, 1 megohm, ±5%, ½ W.	230084-231
114	Resistor, composition, 1 megohm, ½ W.	230084-31
115	Resistor, composition, 1 megohm, ½ W.	230084-31
116	Resistor, composition, 1 megohm, ½ W.	230084-31
117	Resistor, composition, 1 megohm, ½ W.	230084-31
118	Resistor, composition, 330,000 ohms, ±10%, ½ W.	230084-92
119	Resistor, composition, 820,000 ohms, ½ W.	230084-97
120	Resistor, composition, 560,000 ohms, ½ W. ±10% (in tuning eye)	230084-95
125	Control, volume	220072-18
126	Control, treble	220072-8
127	Control, bass, with switch	220073-5
128	Switch, selector	160194-1
129	Socket, motor	180501-5
130	Socket, speaker	180504-16
131	Socket, external	180060-1
132	Socket, phono	189741-1
133	Loop antenna	*
134	6 Volt socket and cable for cabinet pilot light	180458-2

*The part number of the Loop Antenna Assembly changes with different cabinets. It is therefore important that you specify the style number of the instrument when ordering a replacement Loop Antenna Assembly.

MODEL CR-233

MODEL 7FM867,
Ch. 7C13D

ALIGNMENT

Before aligning, set the dial pointer as follows: close the tuning gang condenser (plates fully closed). Set pointer in line with the last mark at the low frequency end of the dial scale. Set volume control on full, keep the signal output as low as possible to prevent AVC action and false readings.

STEP DUMMY ANT. TEST OSC.

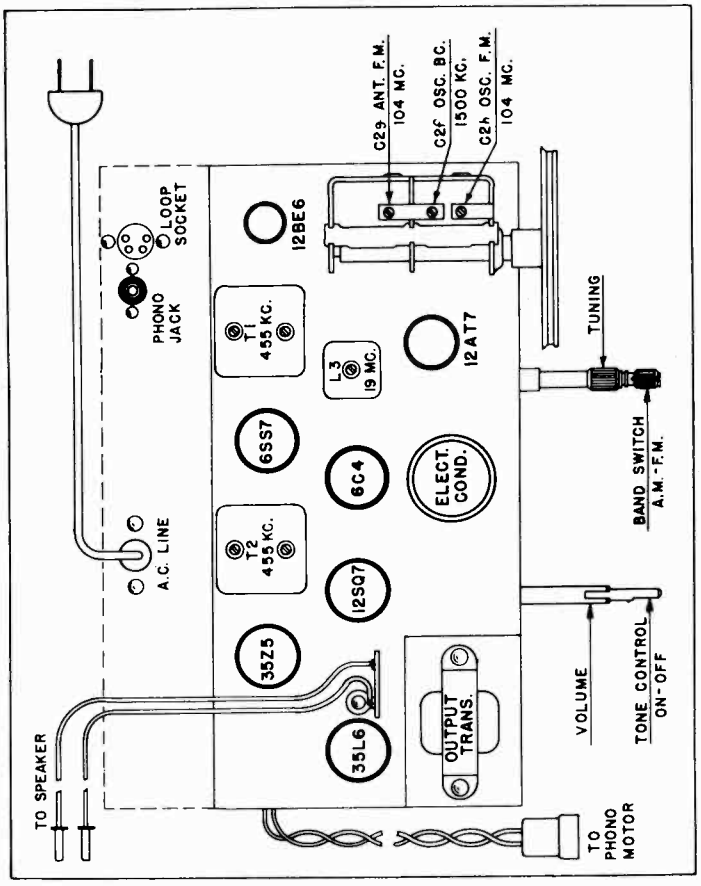
STEP	DUMMY ANT.	TEST OSC. CONNECTION	TEST OSC. FREQUENCY	RECEIVER DIAL	ADJUST	REMARKS
1	.01 mf.	Ant.	455KC Modulated	Any quiet spot	D-C-B-A for max. output	Repeat in reverse order
2	--	*Loop	1500KC Modulated	150	C2F for max. output	--
3	--	*Loop	1500KC Modulated	150	C1 for max. output	Rock Gang while tuning
4	300 ohms.	*FM terminals	19M.C. Unmodulated	Any quiet spot	L3 for min. output	Min. noise in speaker
5	300 ohms	FM terminals	104M.C. Unmodulated	104	C2h for min. output	Min. noise in speaker
6	300 ohms	FM terminals	104M.C. Unmodulated	104	C2g for min. output	Rock Gang while tuning

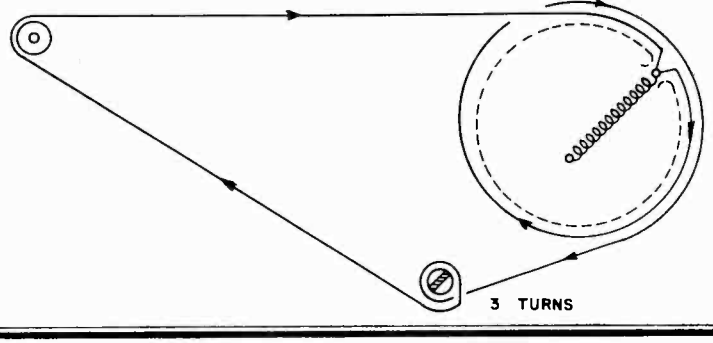
*All Steps: Connect output meter across speaker.
Step 2 & 3: Make a 2 turn loop & connect to signal generator. Loosely couple the 2 turn loop to receiver loop.
Step 4: Disconnect lug if present from FM dipole terminal. Connect hot side of generator through 300 ohm resistor to dipole terminal where lug was connected.

VOLTAGE TABLE
D. C. VOLTAGES MEASURED TO COMMON GROUND

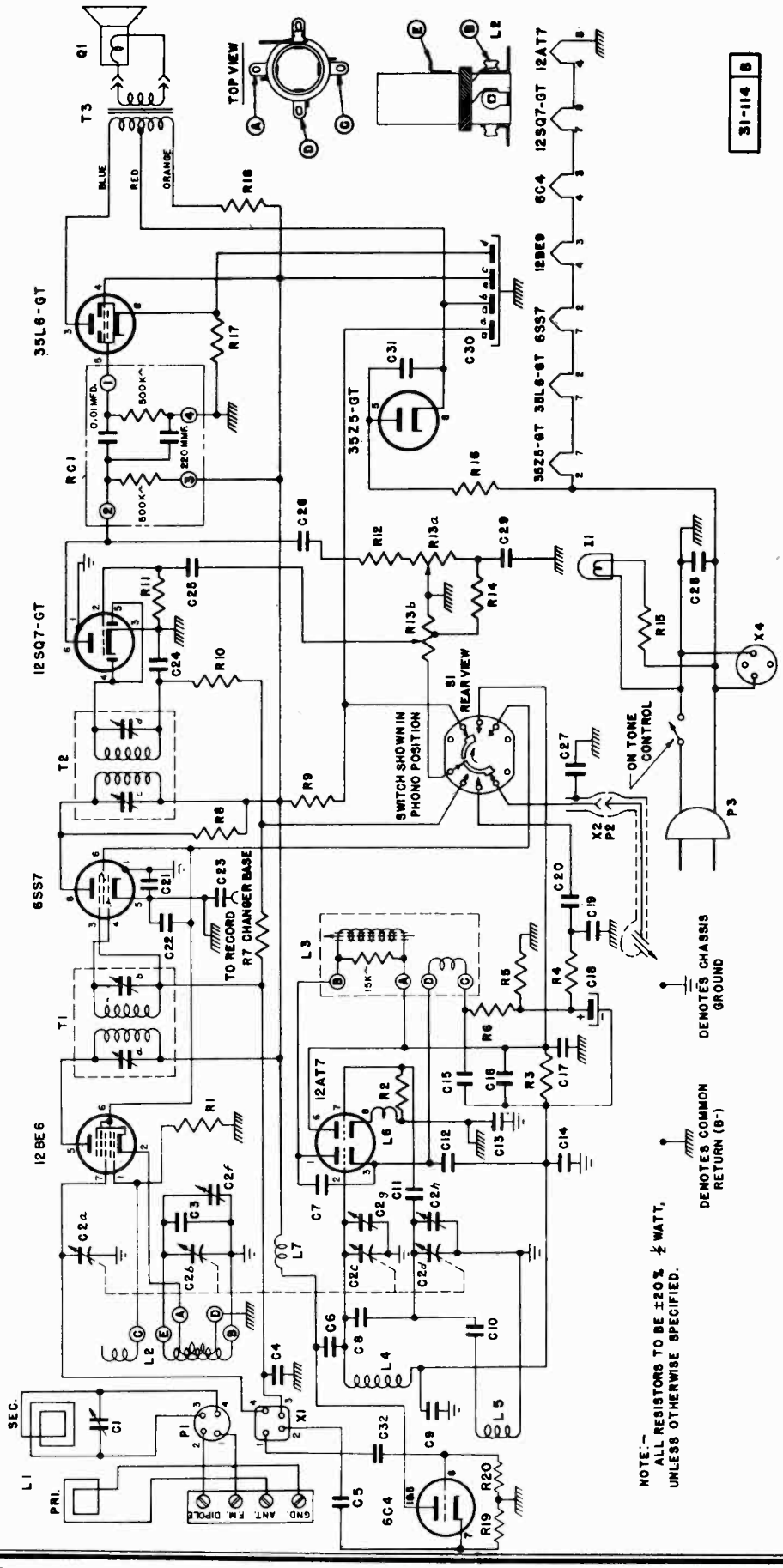
TUBE	ELEMENT	PIN	VOLTS
12BE6 Converter	Plate	5	87
	Cathode	2	0
	Screen Grid	6	78
	Control Grid	1&7	.8
6SS7 I.F.Amplifier	Plate	8	87
	Cathode	5	0
	Screen Grid	6	78
	Control Grid	4	.8
12SQ7 Det-AVC 1st Audio Amplifier	Plate	6	56
	Cathode	3	0
	Control Grid	2	.9
	Diodes	4&5	.6 - .8
35L6 Output	Plate	3	105
	Cathode	8	5.3
	Screen	4	87
	Control Grid	5	0
35Z5 Rectifier	Cathode	8	112
FM 12AT7 Det. Section	Plate	1	99
	Cathode	3	37
	Grid	2	34
FM 12AT7 OSC. Section	Plate	6	99
	Cathode	8	0
	Grid	7	.4
6C4 F.M. R.F.	Plate	1&5	AM.87 F.M 100
	Cathode	7	1.5
	Grid	6	0

All Measurements made with line voltage at 117 A.C., volume control at minimum, no signal, using a vacuum tube volt meter.





MODEL 7FM867,
Ch. 7C13D



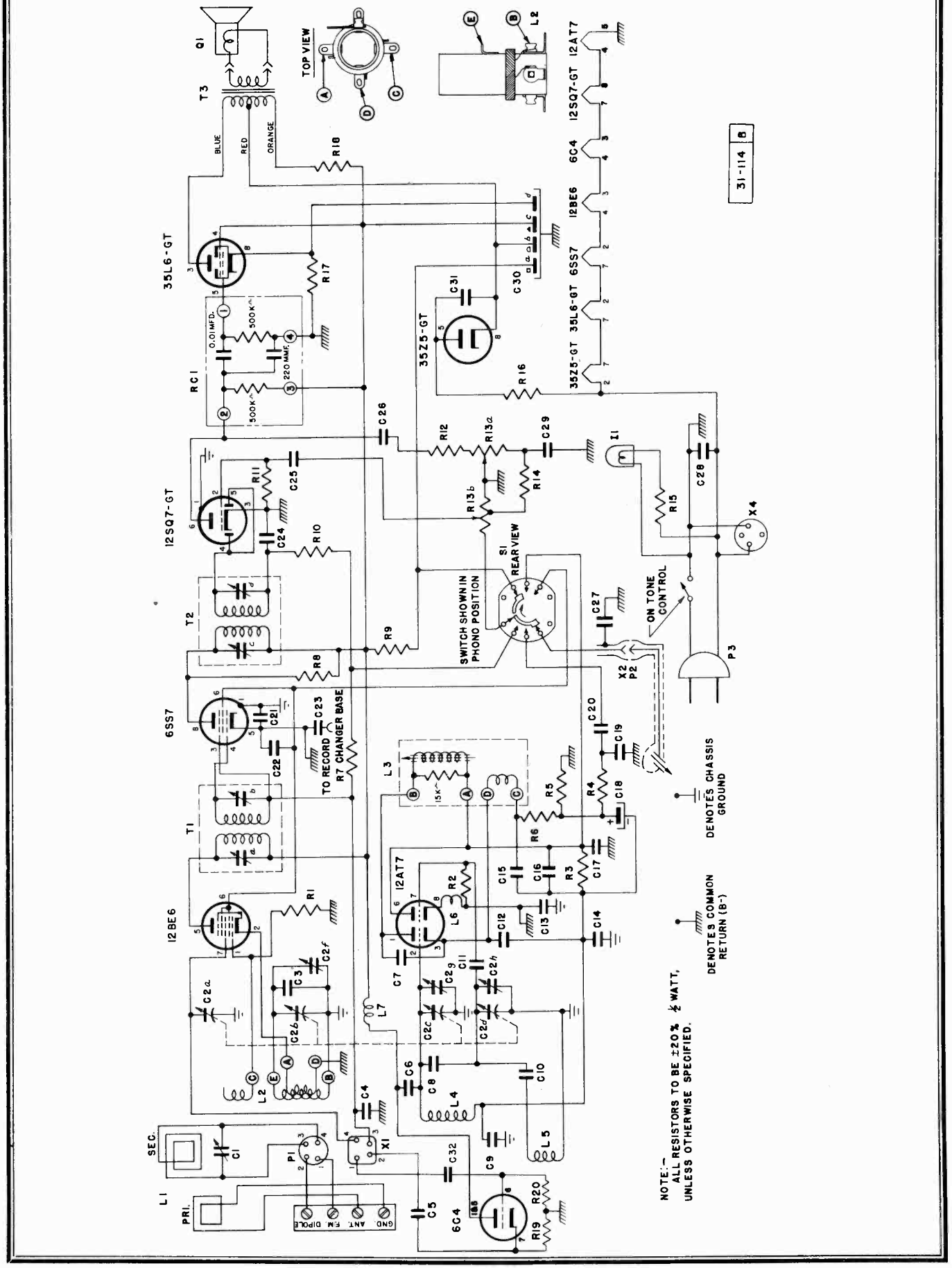
MODEL 7FM867,
Ch. 7C13D

Symbol Desig.	Part No.	Description
C1	8-59	Condenser Trimmer 2-30uuf.
C2a,b,c, d,f,g&h	7-33	" Variable gang tuning
C3	6-88	" Ceramic 15uuf. 500V
C4,23,27	015-8	" Paper .05uuf. 200v
C5,14,19 22,31,32	4-6	" Ceramic 1000uuf. 500v 20%
C6	4-36	" " 5uuf. 500v ±.5uuf
C7,11,12	4-5	" " 30uuf. 500v 20%
C8	6-134	" Bakelite 2.2uf. 500v
C9,13	020-67	" Mica 470uuf. 500v
C10	4-8	" Ceramic 68uuf. 500v 5%
C15	021-38	" Mica 3300uuf. 500v
C16	4-4	" Ceramic 5000uuf. 500v 20%
C17	6-228	" Mica 700uuf. 500v
C18	19-58	" Electrolytic 10uf. 25v
C20	015-6	" Paper .02uf. 200v
C21	5-51	" " .2uf. 200v
C24	020-53	" Mica 220uuf. 500v
C25	016-5	" Paper .01uf. 400v
C26	017-4	" " .005uf. 600v
C28	016-8	" " .05uf. 400v
C29	015-5	" " .01uf. 200v
C30a,b,c,d	19-61	Condenser, electrolytic (a) 40uf (b) 100uf (c) 40uf @ 150v (d) 100uf @ 10v
		(Unless specified all Resistors to be ± 20%)
R1,5,10	02-143	Resistor 22,000 ohm ½ watt
R2	02-150	" 33,000 ohm ½ "
R3	02-178	" 150,000 " ½ "
R4,8	02-171	" 100,000 " ½ "
R6	02-94	" 1,500 " ½ "
R7	02-234	" 3.3 megohm ½ "
R19,18	03-90	" 1,200 ohm 1 " ± 10%
R11	02-255	" 10 megohm ½ "
R12 (1st run)	02-118	" 5,600 ohm ½ "
R12 (2nd run)	02-160	" 56,000 " ½ "
R13a,b	13-30	(a) Tone control 2 Megohm (b) Volume Control 500,000 ohm
R14	02-132	Resistor 12,000 ohm ½ watt 10%
R15	04-69	" 390 " 2 " 10%
R16	02-17	" 22 " ½ "
R17	02-52	" 150 " ½ "
R19,20	02-58	" 220 " ½ "
I1	26-21	Pilot Lite, 110 volt baynet base
L1	S-2017	Loop Antenna assembly

MODEL 7FM867,
Ch. 7C13D

Symbol Desig.	Part No.	Description
L2	S-1684	Oscillator coil assembly . . . . .
L3	S-1678	S.R. F. M. " " . . . . .
L4 (1st run)	3-209	F.M. Antenna " " (inc'l coil form) . . .
L4 (2nd run)	3-209	" " " (less " ") . . .
L5 (1st run)	3-208	" Oscillator coil ass'y (inc'l coil form) . . .
L5 (2nd run)	3-208	" " " (less coil form) . . .
L6,L7	S-1928	Choke Coil assembly . . . . .
P1	18-32	Plug, 4 prong (Ant.) . . . . .
P2	18-47/ 140-6	Plug, Phono Pick-up . . . . .
P3	27-201	AC Line Cord & Plug (8') . . . . .
Q1	22-26	Speaker, 5" PM. . . . .
RC-1	37-1	Printed Plaque (Audio Coupling) . . . . .
S1	11-81	Band switch, (Phono & Band) . . . . .
T1	3-116	1st I.F. Transformer . . . . .
T2	3-117	2nd I.F. Transformer . . . . .
T3	2-40	Output transformer . . . . .
X1	15-96	Socket, Loop (4 contacts) . . . . .
X2	15-87	" Phono-Pick-up . . . . .
X4	15-118	" Phono-Motor (2-#25-87 Pins) . . . . .
	15-168	" Tube Minature Molded (12AT7) . . . . .
	15-167	" " " " (6C4) . . . . .
	15-81	" " Octal . . . . .
	117-114	Dial Scale Glass . . . . .
	117-109	" " Blackground . . . . .
	129-65	" " Mtg. Clip (6 REQ'D) . . . . .
	135-36	Dial Pointer . . . . .
	S-1892	Cord & Eyelet Ass'y (37½" of #134-7) . . . . .
	115-67	Cabinet, Chairside Combination (Aero Cut-Out) Mahogany . . . . . Blond . . . . .
	21-36	Record changer (Aero Black) . . . . .
	101-494	" " Mtg. screw (3 REQ'D) . . . . .
	122-56	Escutcheon Plate . . . . .
	128-63	Knob (Tuning) . . . . .
	128-101	" (Off-Tone) (Gold) . . . . .
	128-69	" (Volume) . . . . .
	128-100	" (Band SW-Phono) (Gold) . . . . .
	129-60	Compression Spring, Knob (2 REQ'D) . . . . .
	123-44	Cabinet Back (Less Loop) . . . . .
	S-2102	Cabinet Dipole Ass'y. . . . .

MODELS 7FM877, 7FM888;
Ch. 7C11D



MODELS 7FM877, 7FM888;
Ch. 7C11D

ALIGNMENT

Before aligning, set the dial pointer as follows: close the tuning gang condenser (plates fully closed). Set pointer in line with the last mark at the low frequency end of the dial scale. Set volume control on full, keep the signal output as low as possible to prevent AVC action and false readings.

STEP DUMMY ANT. TEST OSC.

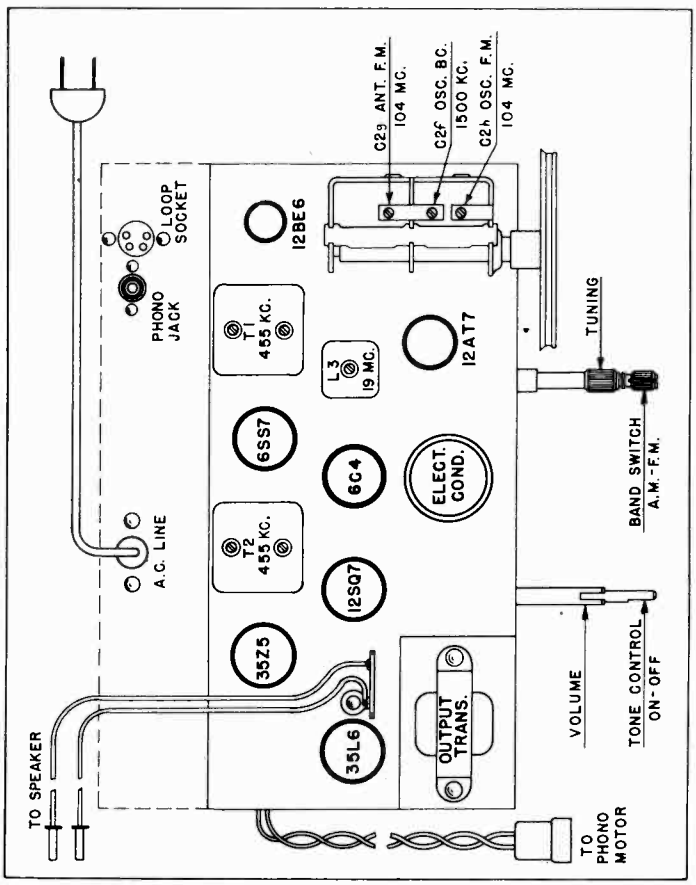
STEP	DUMMY ANT.	TEST OSC. CONNECTION	TEST OSC. FREQUENCY	RECEIVER DIAL	ADJUST	REMARKS
1	.01 mf.	Ant.	455KC Modulated	Any quiet spot	D-C-B-A for max. output	Repeat in reverse order
2	--	*Loop	1500KC Modulated	150	C2F for max. output	--
3	--	*Loop	1500KC Modulated	150	C1 for max. output	Rock Gang while tuning
4	300 ohms.	*FM terminals	19M.C.Unmodulated	Any quiet spot	L3 for min. output	Min. noise in speaker
5	300 ohms	FM terminals	104M.C.Unmodulated	104	C2h for min. output	Min. noise in speaker
6	300 ohms	FM terminals	104M.C.Unmodulated	104	C2g for min. output	Rock Gang while tuning

*All Steps: Connect output meter across speaker.
Step 2 & 3: Make a 2 turn loop & connect to signal generator. Loosely couple the 2 turn loop to receiver loop.
Step 4: Disconnect lug if present from FM dipole terminal. Connect hot side of generator through 300 ohm resistor to dipole terminal where lug was connected.

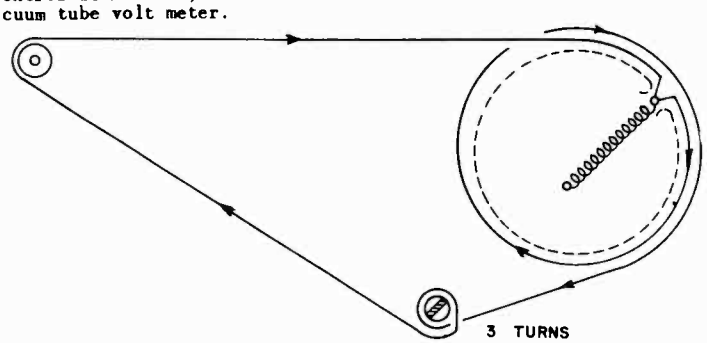
VOLTAGE TABLE

D. C. VOLTAGES MEASURED TO COMMON GROUND

TUBE	ELEMENT	PIN	VOLTS
12BE6 Converter	Plate	5	87
	Cathode	2	0
	Screen Grid	6	78
	Control Grid	1&7	.8
6SS7 I.F.Amplifier	Plate	8	87
	Cathode	5	0
	Screen Grid	6	78
	Control Grid	4	.8
12SQ7 Det-AVC 1st Audio Amplifier	Plate	6	56
	Cathode	3	0
	Control Grid	2	.9
	Diodes	4&5	.6 - .8
35L6 Output	Plate	3	105
	Cathode	8	5.3
	Screen	4	87
	Control Grid	5	0
35Z5 Rectifier	Cathode	8	112
FM 12AT7 Det. Section	Plate	1	99
	Cathode	3	37
	Grid	2	34
FM 12AT7 OSC. Section	Plate	6	99
	Cathode	8	0
	Grid	7	.4
6C4 F.M. R.F.	Plate	1&5	AM.87 F.M 100
	Cathode	7	1.5
	Grid	6	0



All Measurements made with line voltage at 117 A.C., volume control at minimum, no signal, using a vacuum tube volt meter.



MODELS 7FM877, 7FM888;
Ch. 7C11D

PARTS LIST

Symbol Desig.	Part No.	Description
C1	8-59	Condenser Trimmer 2-30uuf.
C2a, b, c, d, f, g&h	7-33	" Variable gang tuning
C3	6-88	" Ceramic 15uuf. 500V
C4, 23, 27	015-8	" Paper .05uuf. 200v
C5, 14, 19, 22, 31, 32	4-6	" Ceramic 1000uuf. 500v 20%
C6	4-36	" " 5uuf 500v ± .5uuf
C7, 11, 12	4-5	" " 30uuf 500v ±20%
C8	6-134	" Bakelite 2.2uf 500v
C9, 13	020-67	" Mica 470uuf 500v
C10	4-8	" Ceramic 68uuf 500v 5%
C15	021-38	" Mica 3300uuf 500v
C16	4-4	" Ceramic 5000uuf 500v 20%
C17	6-228	" Mica 700uuf 500v
C18	19-58	" Electrolytic 10uf 25v
C20	015-6	" Paper .02uf 200v
C21	5-51	" " .2uf 200v
C24	020-53	" Mica 220uuf 500v
C25	016-5	" Paper .01uf 400v
C26	017-4	" " .005uf 600v
C28	016-8	" " .05uf 400v
C29	015-5	" " .01uf 200v
C30a, b, c, d (1st. run)	19-59	" Electrolytic ab&c 40uf 150v d 100 uf 10v.
	19-32	(In addition to above (b) section condenser electrolytic 20uf 150v to be parallel across b)
C30a, b, c, d (2nd. run)	19-61	Condenser, electrolytic (a) 40uf (b) 100uf (c) 40uf 150v (d) 100uf 10v..
		(Unless specified all Resistors to be 20%)
R1, 5, 10	02-143	Resistor 22,000 ohm ½ watt
R2	02-150	" 33,000 ohm ½ "
R3	02-178	" 150,000 " ½ "
R4, 8	02-171	" 100,000 " ½ "
R6	02-94	" 1,500 " ½ "
R7	02-234	" 3.3 Megohm " ½ "
R19, 18	03-90	" 1,200 " 1 " ± 10%
R11	02-255	" 10 Megohm ½ "
R12 (1st run)	02-118	" 5,600 " ½ "
R12 (2nd run)	02-160	" 56,000 " ½ "
R13a, b	13-30	(a) Tone control 2 Megohm (b) Volume Control 500,000 ohm
R14	02-132	Resistor 12,000 ohm ½ watt 10%
R15	04-69	" 390 " 2 " 10%
R16	02-17	" 22 " 1 watt
R17	02-52	" 150 " ½ "
R19, 20	02-58	" 220 " ½ "
I1	26-21	Pilot Lite, 110 volt baynet base
L1	S-1686	Loop Antenna assembly (less back)
L2	S-1684	Oscillator coil assembly
L3	S-1678	S.R. Coil Assembly
L4	3-209	F.M. Antenna Coil
L5	3-208	Coil, F.M. Oscillator
L6&7	S-1928	Choke, Coil Ass'y.

MODELS 7FM877, 7FM888;
Ch. 7C11D

Parts List (Cont'd.)

Symbol Desig.	Part No.	Description
P1	18-32	Plug, 4 prong (Ant.)
P2	18-47/140-6	Plug, Phono Pick-up
P3	27-201	AC Line Cord & Plug (8')
Q1	22-61	Speaker, 10" PM.
RC-1	37-1	Printed Plaque (Audio Coupling)
S1	11-81	Band switch, (Phono & Band)
T1	3-116	1st I.F. Transformer
T2	3-117	2nd I.F. Transformer
T3	2-40	Output transformer
X1	15-96	Socket, Loop (4 contacts)
X2	15-87	" Phono-Pick-up
X4	15-118	" Phono-Motor (2-#25-87 Pins)
	15-163	" Tube Minature Molded (12AT7)
	15-167	" " " " (6C4)
	15-81	" " Octal.
	117-110	Dial Scale Glass
	117-109	" " Background
	129-65	" " Mtg. Clip (6 REQ'D)
	135-34 (1st RUN)	Dial Pointer
	135-36 (2nd RUN)	Dial Pointer
	S-1892	Cord & Eyelet Ass'y (37½" of #134-7)
	115-60	Cabinet, Console (Model 7FM877) (Aero Cut-Out) Mahogany / Blond
	115-54	Cabinet, Console (Model 7FM888) (Aero Cut-Out) Mahogany / Blond
	21-36	Record changer (Aero Black)
	101-494	" " Mtg. screw (3 REQ'D)
	22-61	Speaker 10" PM
	122-56	Escutcheon Plate
	128-63	Knob (Tuning)
	128-68	" (Off-Tone)
	128-69	" (Volume)
	128-80	" (Band SW-Phono)
	129-60	Compression Spring, Knob (2 REQ'D)
	123-44	Cabinet Back (Less Loop)
	S-2020	Cabinet Dipole Ass'y.

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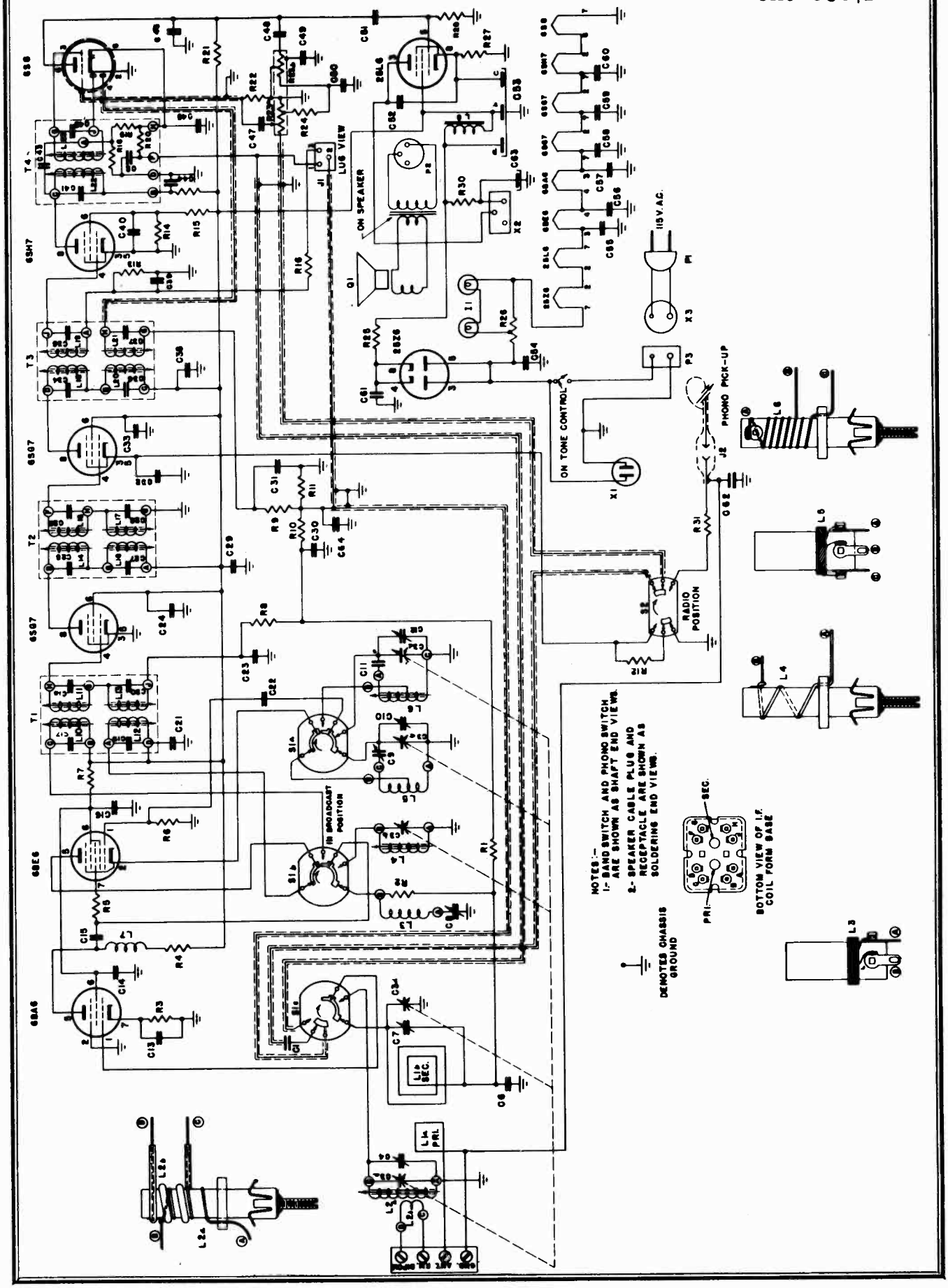
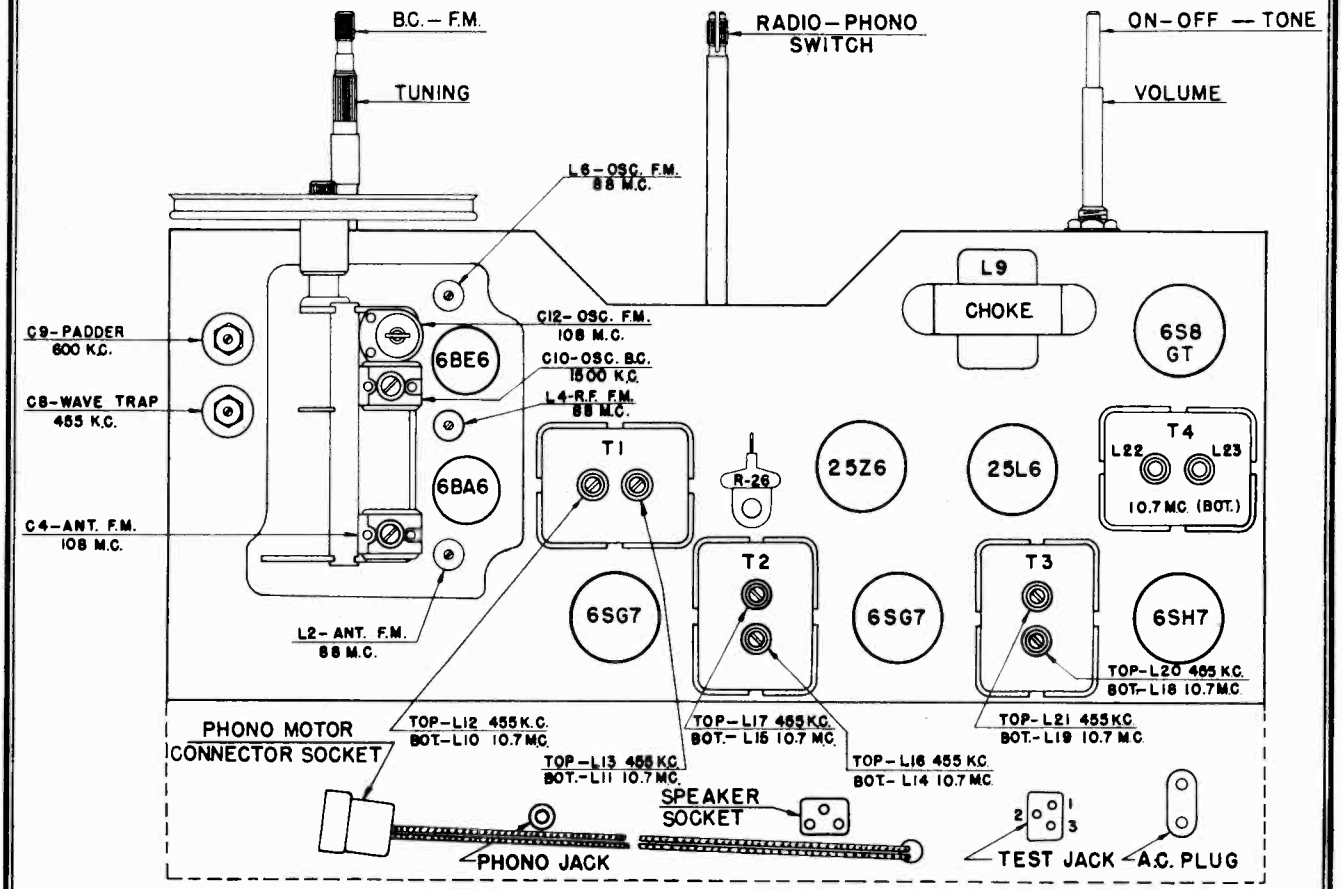
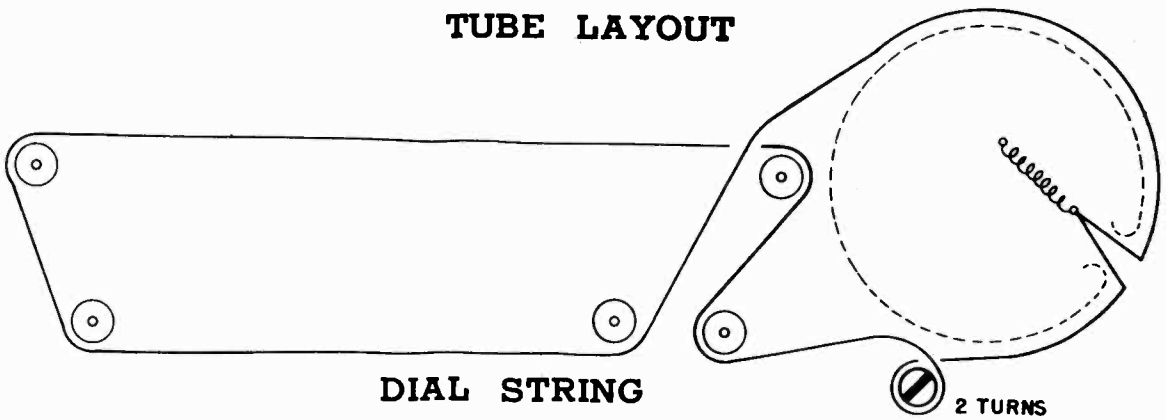


MODEL 8FM889,
Ch. 8C07D



TUBE LAYOUT



DIAL STRING

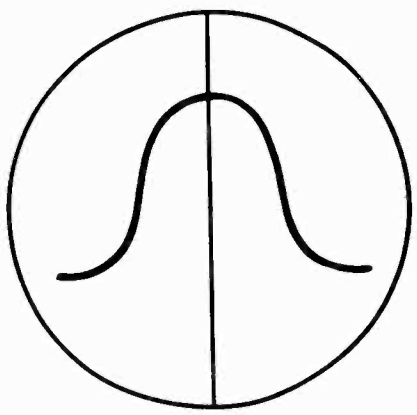


FIGURE 1

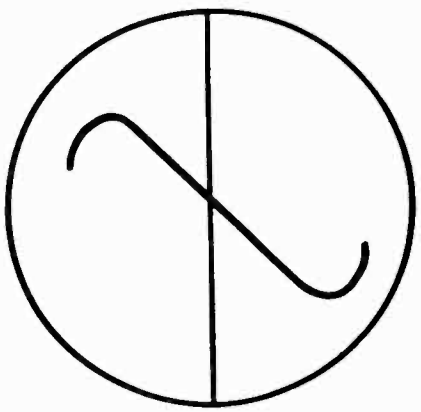


FIGURE 2

ALIGNMENT

OPERATION	CONNECT TEST OSCILLATOR TO	DUMMY ANTENNA	INPUT SIGNAL FREQUENCY	BAND	SET DIAL TO	ADJUST TRIMMERS	PURPOSE
1	Stator Plates of C3d	.05mfd.	455 KC	BC	600 KC	L12, L13, L16, L17, L20, L21	Align if channel for maximum output.
2	Stator Plates of C3d	.05mfd.	455 KC Modulated	BC	600 KC	C8	Adjust wave trap for maximum output.
3	2 TURNS 8" DIAMETER COUPLED LOOSELY TO LOOP ANTENNA	------	1500 KC Modulated	BC	1500 KC	C10	Set oscillator to dial scale.
4		------	1500 KC Modulated	BC	1500 KC	C7	Align antenna for maximum output.
5		------	600 KC Modulated	BC	600 KC	C9	Rock gang to track BC padder
6(a)	Pin 4 (Grid) on 6SH7 Limiter Socket	.05mfd.	10.7 MC Unmodulated	FM	------	L22 Coil Slug Primary Discriminator	Align Primary of discriminator for maximum reading.
7(b)	Pin 4 (Grid) on 6SH7 Limiter Socket	.05mfd.	10.7 MC Unmodulated	FM	------	L23 Coil Slug Secondary Discriminator	Adjust secondary of discriminator for zero reading.
8(c)	Pin 4 (Grid) on 6SG7 2nd IF Socket	.05mfd.	10.7 MC Unmodulated	FM	------	L18 and L19, Pri. and Sec. 3rd IF Coil	Align 3rd IF Transformer for maximum reading.
9(c)	Pin 4 (Grid) on 6SG7 1st IF Socket	.05mfd.	10.7 MC Unmodulated	FM	------	L14 and L15 Pri. and Sec. 2nd IF Coil	Align 2nd IF Transformer for maximum reading.
10(c)	Lug "B" on Coil L4	.05mfd.	10.7 MC Unmodulated	FM	------	L10 and L11 Pri. and Sec. 1st IF Coil	Align 1st IF Transformer for maximum reading.
11(c)	Antenna Terminals	300ohm Resistorr	106 MC Unmodulated	FM	106 MC	C12 Oscillator Trimmer	Set oscillator to dial scale.
12(c)	Antenna Terminals	300ohm Resistor	106 MC Unmodulated	FM	106 MC	C4 Antenna Trimmer	Align antenna stage for maximum reading.
13(c)	Antenna Terminals	300ohm Resistor	88 MC Unmodulated	FM	88 MC	L6 Oscillator Slug	Set Oscillator to dial scale.
14(c)	Antenna Terminals	300ohm Resistor	88 MC Unmodulated	FM	88 MC	L4, L2 Slugs	Align Antenna and RF stages for maximum reading.
15(c)	Antenna Terminals	Repeat steps 11, 12, 13, and 14 until tracking is perfect at 88 and 106 MC.					

IMPORTANT: Alignment of this chassis will in most cases be unnecessary unless an IF or RF transformer is replaced or the adjustment has been tampered with. A vacuum tube voltmeter must be used for FM alignment. An AC output meter connected across the primary or secondary of the output transformer will be satisfactory for all AM adjustments. The signal generator output should be kept just high enough to get an indication on the meter.

NOTES: (a) Vacuum tube voltmeter pin "A" on discriminator transformer to chassis (half discriminator load).
(b) Vacuum tube voltmeter pin 1 of test jack to chassis (full discriminator load).
(c) Vacuum tube voltmeter pin 3 of test jack to chassis (limiter grid load).

A much more satisfactory IF and discriminator alignment may be obtained by using a 10.7 MC signal generator, frequency modulated at an audio frequency and swept approximately 600 KC (±300 KC). An oscilloscope should be connected to test jack pin 3 and all IF slugs adjusted for a symetrical pattern of highest amptitude. See Fig. 1. For discriminator alignment, connect oscilloscope to test jack pin 1 and adjust T4 for highest linear symetrical pattern. See Fig. 2.

MODEL 8FM889,
Ch. 8C07D

VOLTAGE TABLE

TUBE	FUNCTION	PLATE	CATHODE	SCREEN	GRID
6BA6	RF Amplifier	80	0.5	78	----
6BE6	Converter	100	0	78	----
6SG7	1st IF Amplifier	100	0	100	-0.6
6SG7	2nd IF Amplifier	100	.7	100	----
6SH7	Limiter Amplifier	70	0	21	-0.4
6S8GT	Discriminator, Det., AVC	50	0	---	----
25L6	Power Amplifier	105	7	100	----
2525	Rectifier	117AC	105	---	----

PARTS LIST

ITEM	PART NO.	DESCRIPTION
C1,C48	017-4	.005 mfd, 600V
C2,C14,C16,C55, C56,C57	6-230	1000 mmf, 300V Ceramic
C3,a,b,c,d,e	7-25	Gang Tuning Condenser FM-AM.
C4,C10	8-35	Trimmer, 2.5 - 30 mmf.
C6,C62	015-8	.05 mfd, 200V.
C7	8-59	Trimmer, 2-30 mmf.
C8	8-63	Trimmer, 1.5-115 mmf
C9	8-65	200 - 600 mmf Padder
C11	6-218	1000 mmf. 500V, Mica
C12	8-38	Trimmer, 3-13 mmf.
C13,C15,C22	6-159	47 mmf, 500V Ceramic
C17,C41	6-247	24 mmf, Ceramic Special.
C18,C25,C26,C34,C35 C19,C20,C27,C28,C36	6-246	33 mmf, Ceramic Special.
C37	6-250	750 mmf Mica Special
C21,C29,C38,C44,C51	016-5	.01 mfd, 400V.
C23,C30,C32,C49,C50	015-5	.01 mfd, 200V.
C24,C33,C40,C58,C59, C60	6-259	.005 mfd minimum, disc-type Ceramic
C31,C46,C61,C64	020-53	220 mmf, 500V Mica
C39,C45	020-39	100 mmf, 500V Mica
C42	6-249	62 mmf, Ceramic, Special
C43	6-248	15 mmf, Ceramic, Special
C47	017-2	.002 mfd, 600V
C52	017-5	.01 mfd, 600V.
C53,a,b,c	19-37	(a) 100 mfd—,150V, (b) 20 mfd - 150V, (c) 200 mfd - 10V. Electrolytic
C54	016-8	.05 mfd, 400V
C63	19-32	20 mfd 150V Electrolytic
R1,R8,R11,R16 R21,R28	01-199	470K ohm, 1/4 watt
R2,R13,R17,R20	01-157	47K ohm, 1/4 watt.
R3,R12	01-37	68 ohm, 1/4 watt
R4,R14	02-108	3300 ohm, 1/2 watt
R5	01-3	10 ohm, 1/4 watt
R6,R9	01-143	22K ohm, 1/4 watt.
R7	01-101	2200 ohm, 1/4 watt
R10,R31	01-227	2.2 meg ohm, 1/4 watt.
R15	02-132	12K ohm, 1/2 watt.
R18,R19	01-174	120K ohm, 1/4 watt
R22	01-255	10 meg ohm, 1/4 watt

(Continued on next page)

MODEL 8FM889,
Ch. 8C07D

ITEM	PART NO.	DESCRIPTION
R23 a & b	13-32	(a) Volume - (b) Tone Control with switch.
R24	01-132	12K ohm, 1/4 watt.
R25	02-20	27 ohm, 1/2 watt
R26	9-332	100 ohm candohm.
R27	02-52	150 ohm, 1/2 watt.
R30	01-45	100 ohms, 1/4 watt
L1	S-1400	Loop Antenna Assembly.
L2	S-1407	FM Antenna Coil.
L3	S-1410	Wave Trap Coil
L4	S-1408	FM RF Coil
L5	S-1411	AM Oscillator Coil
L6	S-1409	FM Oscillator Coil
L7	S-1384	R.F. Plate Choke
L8	2-32	Filter Choke
T1	S-1389	1st. I.F. Transformer.
T2	S-1390	2nd. I.F. Transformer.
T3	S-1391	3rd. I.F. Transformer.
T4	S-1392	Discriminator Transformer.
Q1	22-62	Speaker 12" PM (Incl. Transformer)
I1	26-2	Dial Lamp, #47 Brown Bead (2 req'd.)
J1	15-91	Test Jack.
J2	15-87	Phono jack
S1	11-71	Switch Shaft
S1a	11-71-1	Switch Wafer, Section 1.
S1b	11-71-2	Switch Wafer, Section 2.
S1c	11-71-3	Switch Wafer, Section 3.
S2	11-72	Phono Switch
P1	27-201	Plug & Line cord (8 ft.)
X1	15-123	A.C. Receptacle (Phono).
X2	15-91	Speaker Receptacle
P3	18-50	Plug, power connector.
X3	15-137	Socket, power connector.
	18-81	Tube, Socket, Octal.
	15-114	Socket, miniature tube
	16-34	Miniature tube shield.
	16-39	Tube Shield, 6S8 tube.
	34-20	I.F. Iron Core
	38-5	Insulator, Phono Pickup Socket
	38-8	Insulator, Shaft
	38-9	Insulator, Plug.
	38-14	Insulator, Cabinet Chassis
	117-106	Dial Scale & Glass
	129-21	Dial Cord Spring
	S-1524	Dial Cord Ass'y.
	135-21R	Dial Pointer (White)
	115-55-1	Cabinet, Console Comb.
		(State Color) Mahogany
		Blond
	S-2027	Back, Cabinet back & line cord ass'y.
	21-24	Record Changer, Oak.
	122-55	Escutcheon
	128-91	Knob (Volume).
	128-92	Knob (Tuning).
	128-93	Knob (Phono-Radio)
	128-94	Knob (On-Off Tone)
	128-95	Knob (Band Switch)
	129-60	Ring, (For Plain Knobs)

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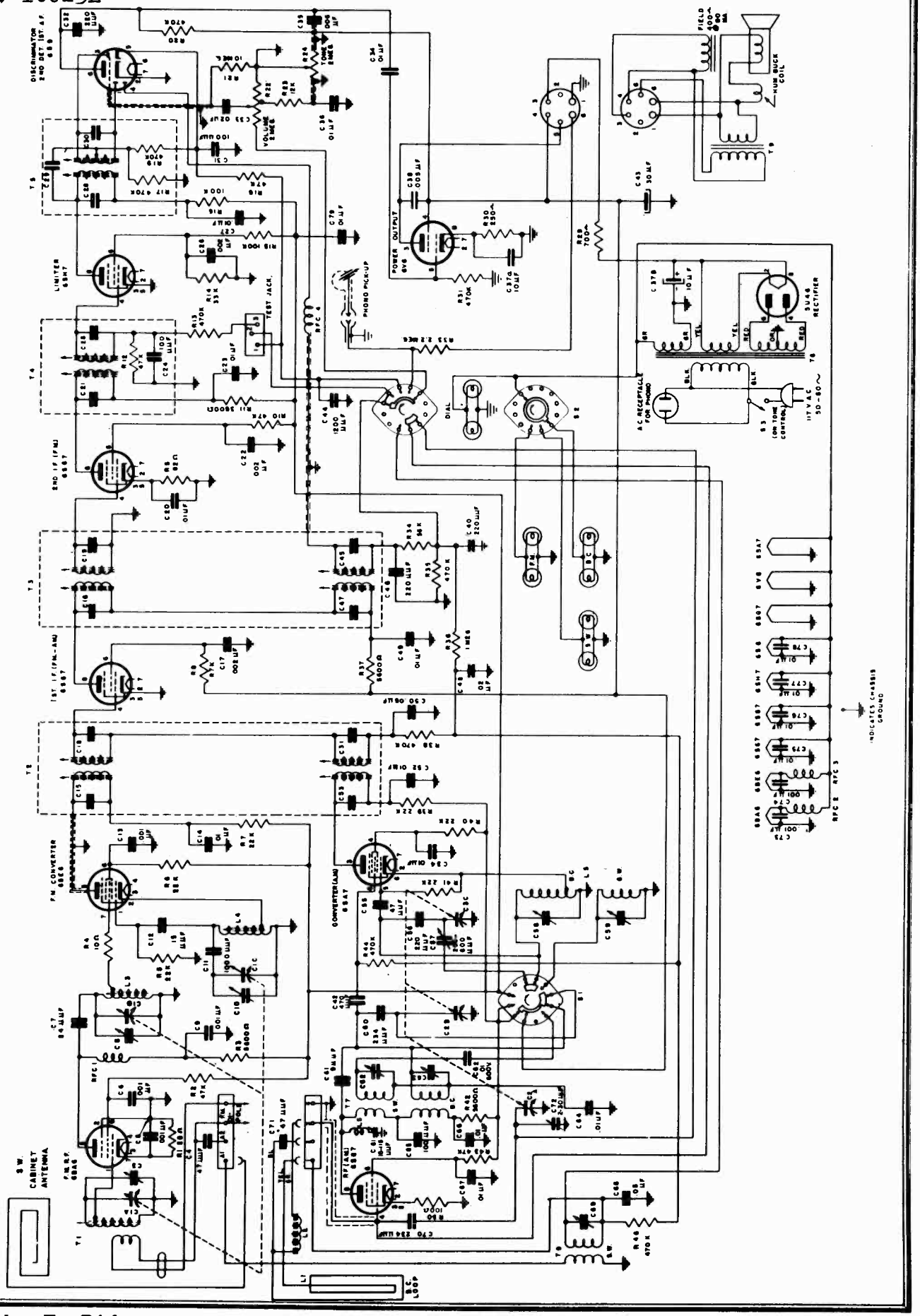
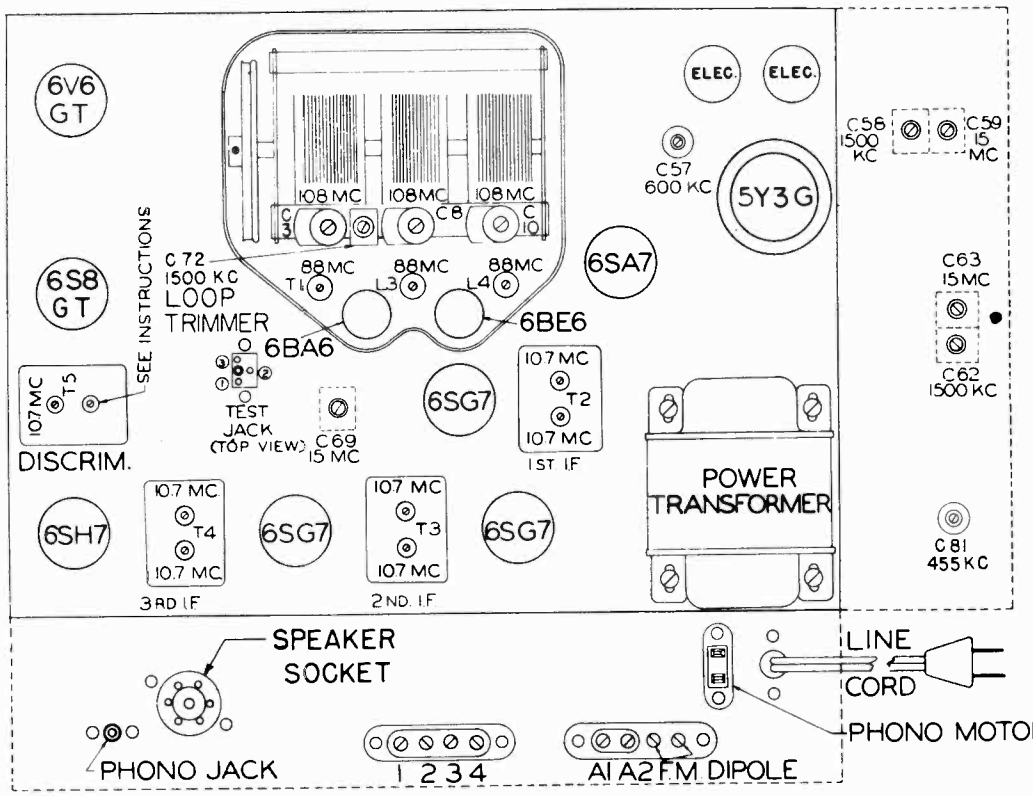
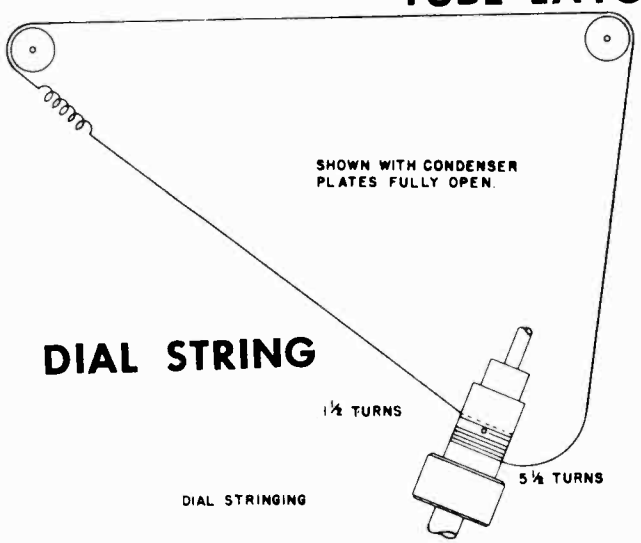


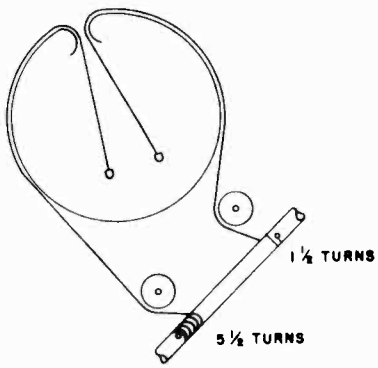
MODEL 10FM891,
Ch. 10C23E



TUBE LAYOUT



DIAL STRINGING



CONDENSER DRIVE

FIGURE 1

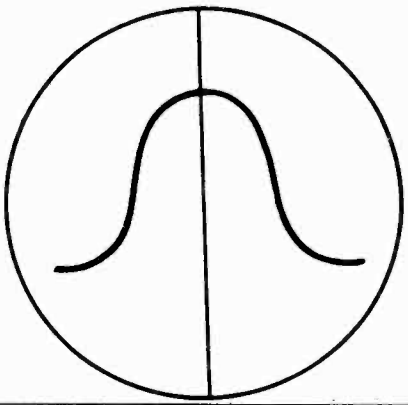
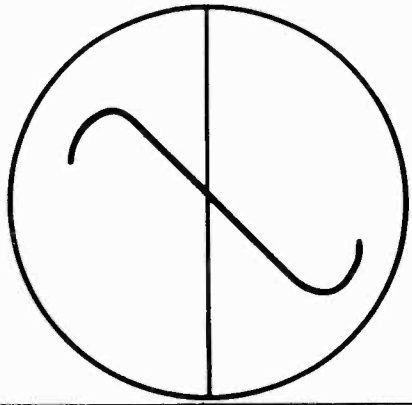


FIGURE 2



ALIGNMENT

OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIGNAL FREQUENCY	BAND	SET DIAL AT	TRIMMERS	PURPOSE
1	Conv. Grid	.01mfd	455 KC	BC	600 KC	T2,T3 Bottom	Align I.F.'s
2	ONE TURN LOOP MADE WITH GENERATOR LEADS		455 KC	BC	600KKC	C81	I.F. trap adjustment for minimum I.F. signal
3			1500 KC	BC	1500 KC	C58	Set BC osc. to scale at 1500 KC
4			1500 KC	BC	1500 KC	C62,C72	Align BC RF. and Loop
5			600 KC	BC	600 KC	C57	Rock Gang to track BC padder
6	Al-Gnd.	400ohn	15 MC	SW	15 MC	C59	Scale osc. at 15 MC
7	Al-Gnd.	400ohn	15 MC	SW	15 MC	C63,C69	Align SW RF and Ant.
8	6SG7 2nd I.F. Grid	.01mfd.	10.7 MC	FM	88 MC	T4 top	Align for max. voltage at test jack pin 3 Rock gen. over 10.7 MC to check for symmetrical I.F.. response.
9	6SG7 1st. I.F. Grid	.01mfd.	10.7 MC	FM	88 MC	T3 top	Align for max. voltage at test jack pin 3 Rock gen. over 10.7 MC to check for symmetrical I.F. response.
10	Converter	.01mfd.	10.7 MC	FM	88 MC	T2 top	Align for max. voltage at text jack pin 3 Rock gen. over 10.7 MC to check for symmetrical I.F. response. Re-check peaking of T4, and T3.
11	Converter grid 6BE6	.01mfd.	10.7 MC	FM	88 MC	T5 primary	Align for max. voltage across ½ discriminator Load (un-used Lug bottom of T5 to ground)
12	Converter grid 6B6E	.01mfd.	10.7 MC	FM	88 MC	T5 secondary	Align for zero voltage across full discriminator load (Test jack pin 1 to ground)
13	FM ant.term.	direct	108 MC	FM	108 MC	C10	Scale OSC at 108 MC (max. voltage Test jack pin 3.
14	FM ant.term.	direct	108 MC	FM	108 MC	C8,C3	Align FM RF and Ant. (max. voltage Test jack pin 3.
15	FM ant.term.	direct	88 MC	FM	88 MC	L4	Scale osc. at 88 MC.
16	FM ant.term.	direct	88 MC	FM	88 MC	L3,T1	Align RF and Ant. at 88 MC repeat steps 13, 14, 15, 16 as necessary.

NOTE: 1. A much more satisfactory IF and discriminator alignment may be obtained by using a 10.7 MC Signal generator frequency modulated at an audio frequency and swept approximately 600 KC (±300 KC). An oscilloscope should be connected to Test jack pin 3 and all IF screws adjusted for a symmetrical pattern of highest amptitude. See Fig. 1. For discriminator alignment, connect scope to Test jack pin 1 and adjust T5 for highest symmetrical pattern. See Fig. 2.

NOTE: 2. In all FM alignment calling for a voltage measurement at Test jack pin 3 (limiter grid resistor) keep signal generator output to such a value as will result in approximately 2 volts measured with a vacuum Tube voltmeter such as the Voltohmyst, Vomax or equiv.

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VOLTAGE CHART

Measurements made at 117 volts line; volume control at minimum; zero signal input. Measurements made to chassis ground with vacuum tube voltmeter.

TUBE	ELEMENT	PIN NO.	VOLTAGE
6BA6 R.F. AMP.(F.M.)	plate screen grid cathode control grid	5 6 7 1	175 83 .95 0
6BE6 CONVERTER (F.M.)	plate screen grid cathode control grid osc. injector grid	5 6 2 7 1	180 97 0 0 * 3.2 to 3.5
6SG7 R.F. AMP.(A.M.)	plate screen grid cathode control grid	8 6 5 & 3 4	240 195 .7 -.7
6SA7 CONVERTER (A.M.)	plate screen grid cathode control grid osc. injector grid	3 4 6 8 5	215 90 0 -1.0 * -13 to +3.6
6SG7 1st I.F. AMP.	plate screen grid cathode control grid	8 6 5 & 3 4	215 130 0 -1.3
6SG7 2nd I.F. AMP.	plate screen grid cathode control grid	8 6 5 & 3 4	190 105 1.2 0
6SH7 LIMITER	plate screen grid cathode control grid	8 6 5 & 3 4	27 40 0 0
6S8 DISC. -AM DET. 1st I.F. AMP.	plate cathode control grid	6 2 top cap	84 0 -0.8
6V6 OUTPUT	plate screen grid cathode control grid	3 4 8 5	230 270 13 0
5Y3/5U4	plate plate filament	4 6 8/2	350-A.C. 350-A.C. 325-350 D.C.

80 MA -'B Drain.

* The Following chart is reference oscillator grid; Oscillator voltage varies with frequency.

Band sw.	Tube	Frequency	Voltage
A.M.	6SA7	600 KC	-11
		1000 KC	-12.5
		1500 KC	-13
S.W.	6SA7	10 MC	4.2
		15 MC	3.6
F.M.	6BE6	88 MC	3.2
		103 MC	3.4
		108 MC	3.5

PARTS LIST

ITEM NO	PART NO.	DESCRIPTION
C1a,b,c. C2a,b,C3c.	7-17	Ganged Tuning Condenser A.M. & F.M. . . . .
C3,C8,C10.	8-38	Trimmer 3-13 mmf (Gang trimmers). . . . .
C4,C55,C71	6-159	47 mmf., 500 V ceramic 20% Condenser. . . . .
C5,C6,C9,C13,C73,C74.	6-230	.001 mfd 400 V ceramic 10% Condenser. . . . .
C7	6-143	24 mmf 500 V ceramic 10% Condenser. . . . .
C11	021-15	1000 mmf 500 V mica 5% Condenser. . . . .
C12	6-199	15 mmf 500 V ceramic 5% Condenser . . . . .
C14,C20,C23,C27,C34, C36,C48,C52,C54,C64, C66,C67,C79,C82.	017-5	.01 mfd 600 V paper Condenser . . . . .
C15,C16,C51,C53.	.....	Part of T2, 1st I.F. transformer. . . . .
C17,C22,C26	6-231	.002 mfd 400 V ceramic 10% Condenser . . . . .
C18,C19,C45,C47.	.....	Part of T3, 2nd I.F. transformer. . . . .
C21,C24,C25	.....	Part of T4, 3rd I.F. transformer. . . . .
C28,C29,C30	.....	Part of T5, Discriminator transformer . . . . .
C31	020-39	100 mmf 500 V mica 20% Condenser. . . . .
C32,C40,C46	020-53	220 mmf 500 V mica 20% Condenser. . . . .
C33,C49	016-6	.02 mfd 400 V paper Condenser . . . . .
C35	5-69	.006 mfd 600 V paper Condenser. . . . .
C37a,b	19-34	10-10 mfd 450 V electrolytic Condenser. . . . .
C38	017-4	.005 mfd 600 V paper Condenser. . . . .

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ITEM NO.	PART NO.	DESCRIPTION
C42	020-67	470 mmf 500 V mica 20% Condenser.
C43	19-35	30 mfd 450 V electrolytic Condenser
C44	021-20	1200 mmf 500 V mica Condenser
C50, C68	016-8	.05 mfd 500 V paper Condenser
C56	6-207	220 mmf 500 V ceramic condenser
C57	8-65	200-600 mmf padder condenser.
C58, C59	.....	Part of L5 coil assembly.
C60, C70	6-208	234 mmf 500 V mica condenser.
C61, C62, C63, C65	.....	Part of T7 coil assembly.
C69	.....	Part of T8 coil assembly.
C71	.....	Part of L1 coil assembly (47 mmf.).
C72	8-35	2½-30 mmf ceramic trimmer
C75, C76, C77, C78	021-74	.01 mfd 500 V mica 20% condenser.
C81	8-63	15-115 mmf trimmer (wave trap).
L1	20-27	Broadcast loop assembly (less cover #20-28)
L2	.....	Loading coil (part of 20-27 loop)
L3	3-184	F.M. B.F. coil.
L4	3-189	F.M. oscillator coil.
L5	3-171	A.M. oscillator coil.
L6	S-1468	Wave trap coil.
R1	02-37	68 ohms ½ watt 10% resistor
R2	03-157	47,000 ohms 1 watt 20% resistor
R3, R11, R37, R42	03-118	5600 ohms 1 watt 10% resistor
R4	01-2	10 ohms ¼ watt 10% resistor
R5, R41	01-143	22,000 ohms ¼ watt 20% resistor
R6, R40	04-143	22,000 ohms 2 watt 20% resistor
R7, R39	02-143	22,000 ohms ½ watt 20% resistor
R8, R10, R43	02-156	47,000 ohms ½ watt 10% resistor
R9	02-41	82 ohms ½ watt 10% resistor
R12	.....	Part of T4 assembly (47,000 ohms ¼ w 10%)
R13, R20, R31, R35, R38, R44, R45	02-199	470,000 ohms ½ watt 20% resistor.
R14	02-149	33,000 ohms ½ watt 10% resistor
R15, R16	02-170	100,000 ohms ½ watt 10% resistor.
R17, R19	.....	Part of T5 assembly (470,000 ohms ¼ w 10%).
R18	02-157	47,000 ohms ½ watt 20% resistor
R21	02-255	10 megohm ½ watt 20% resistor
R22	13-25	Volume control, 2 megohm with tap
R23	02-132	12,000 ohm ½ watt 10% resistor.
R24	14-7	Tone control 2 megohm, with switch.
R36	02-213	1 megohm ½ watt 20% resistor.
R30	9-290	250 ohm 5 watt 10% wire wound resistor.
R33	02-226	2.2 megohm ½ watt 10% resistor.
R34	01-160	56,000 ohm ¼ watt 10% resistor.
R50	02-44	100 ohm ½ watt 10% resistor
RFC-1	3-187	6BA6 plate choke.
RFC-2, RFC-3	3-188	Filament choke.
RFC-4	3-104	Diode plate choke
S1	11-58	Band switch (R.F.).
S2	11-59	Band switch (pilot lites & audio)
S3	.....	Part of Tone control assembly, A.C. switch.
T1	3-183	F.M. antenna transformer.
T2	3-173	1st I.F. transformer.
T3	3-174	2nd I.F. transformer.
T4	3-175	3rd I.F. transformer.
T5	3-176	Discriminator transformer
T6	2-9	Power Transformer (1st. run)
T6	2-19	Power Transformer (2nd. run).
T7	3-186	B.C.-S.W. R.F. transformer.
T8	3-185	S.W. antenna transformer.
T9	52-58	Output transformer (part of speaker ass'y.)
	15-81	Tube socket (octal)
	15-87	Phono pick-up socket.
	15-135	Phono A.C. receptacle socket.
	26-2	Dial lite (#47 brown bead).
	26-7	Dial lite (#44 blue bead)
	16-34	Tube shield for 6BA6 & 6BE6 tubes
	135-35	Dial pointer ass'y.
	138-15	Dial scale separater.
	129-56	Dial cord tension spring.
	S1329	Dial cord, 62 inches long (#134-7).
	S1328	Dial cord (for condenser gang).
	S1863	R.F. shelf & tuning condenser ass'y.
	117-63	Dial scale F.M.
	117-90	Dial scale B.C.
	117-91	Dial scale S.W.
	**22-58	Speaker, 12" complete with output transformer
	115-62	Cabinet, combination console (Specify color) Walnut / Mahogany / Blond
	S-1610	Cabinet dipole antenna ass'y.
	21-15	Record changer VM-400 (1st. run).
	21-37	Record changer VM-402 (2nd. run).
	122-53	Dial escutcheon clamp
	122-54	Escutcheon glass (large).
	117-103	Dial Masking plate.
	128-89	Knob, (tone, tuning, volume).
	128-90	Knob, Band switch).
	129-46	Spring, for band switch knob.

** Speakers marked with a BLUE X have a change of wiring; ref; speaker plug and chassis socket, pin #2 interchanged with pin #5. Change refers to EARLY RUN SETS ONLY.

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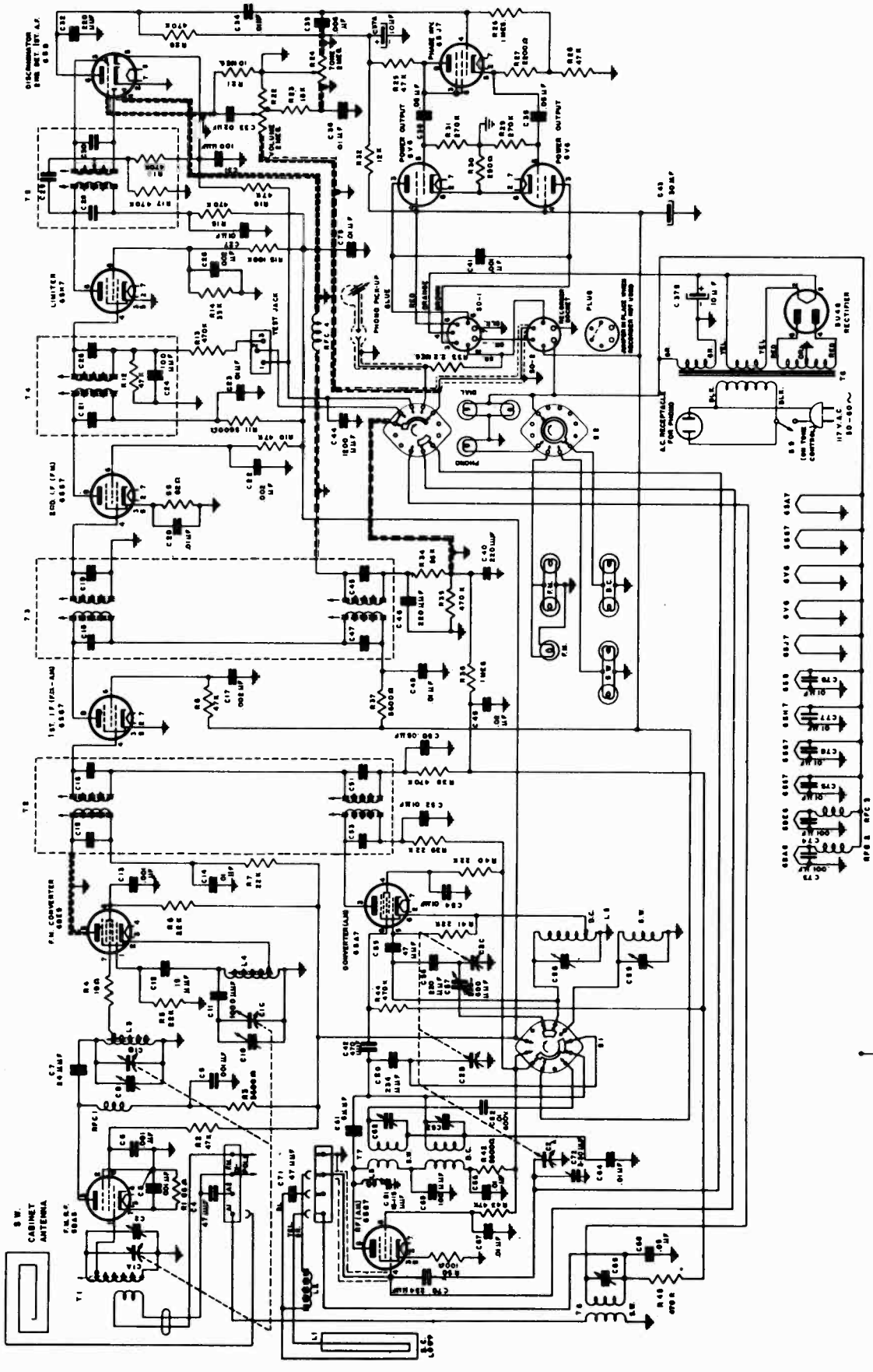

RECORD CHANGER: See V-M Model 400, Page RCD.CH. 15-1
through RCD.CH. 15-3

MODEL 12FM895,
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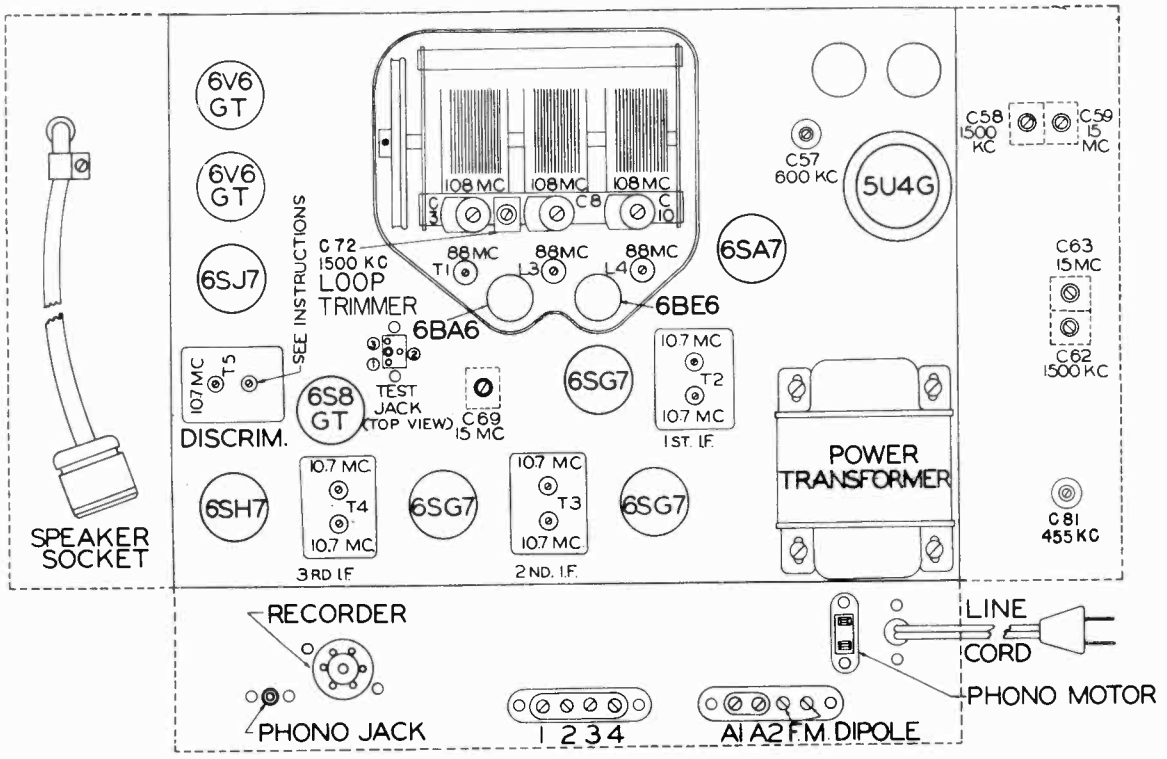
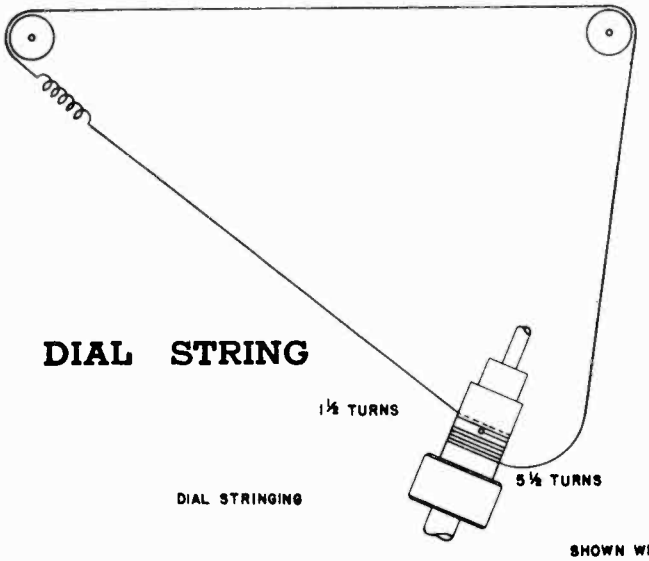
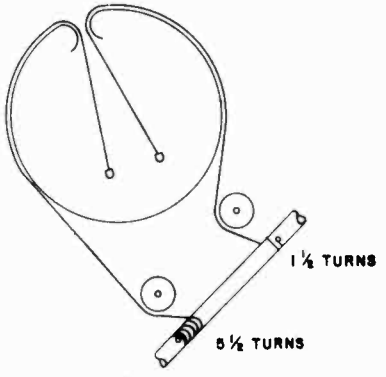






SHOWN WITH CONDENSER PLATES FULLY OPEN.

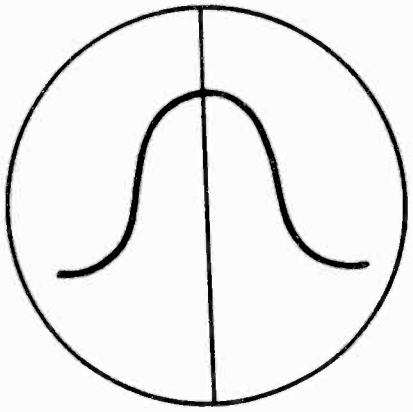


FIGURE 1

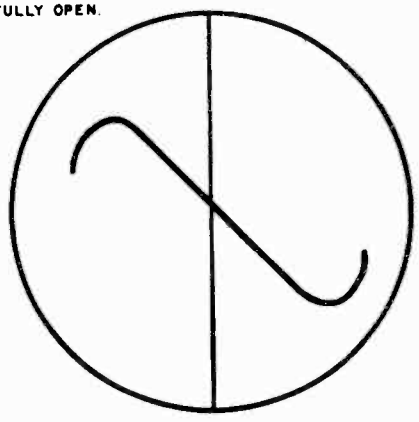


FIGURE 2

ALIGNMENT

OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIGNAL FREQUENCY	BAND	SET DIAL AT	TRIMMERS	PURPOSE
1	Conv. Grid	.01mfd	455 KC	BC	600 KC	T2,T3 Bottom	Align I.F.'s
2	ONE TURN LOOP MADE WITH GENERATOR LEADS		455 KC	BC	600KKC	C81	I.F. trap adjustment for minimum I.F. signal
3			1500 KC	BC	1500 KC	C58	Set BC osc. to scale at 1500 KC
4			1500 KC	BC	1500 KC	C62, C72	Align BC RF. and Loop
5			600 KC	BC	600 KC	C57	Rock Gang to track BC padder
6	A1-Gnd.	400ohn	15 MC	SW	15 MC	C59	Scale osc. at 15 MC
7	A1-Gnd.	400ohn	15 MC	SW	15 MC	C63, C69	Align SW RF and Ant.
8	6SG7 2nd I.F. Grid	.01mfd.	10.7 MC	FM	88 MC	T4 top	Align for max. voltage at test jack pin 3 Rock gen. over 10.7 MC to check for symmetrical I.F. response.
9	6SG7 1st. I.F. Grid	.01mfd.	10.7 MC	FM	88 MC	T3 top	Align for max. voltage at test jack pin 3 Rock gen. over 10.7 MC to check for symmetrical I.F. response.
10	Converter	.01mfd.	10.7 MC	FM	88 MC	T2 top	Align for max. voltage at text jack pin 3 Rock gen. over 10.7 MC to check for symmetrical I.F. response. Re-check peaking of T4, and T3.
11	Converter grid 6BE6	.01mfd.	10.7 MC	FM	88 MC	T5 primary	Align for max. voltage across ½ discriminator Load (un-used Lug bottom of T5 to ground)
12	Converter grid 6B6E	.01mfd.	10.7 MC	FM	88 MC	T5 secondary	Align for zero voltage across full discriminator load (Test jack pin 1 to ground)
13	FM ant.term.	direct	108 MC	FM	108 MC	C10	Scale OSC at 108 MC (max. voltage Test jack pin 3.
14	FM ant.term.	direct	108 MC	FM	108 MC	C8,C3	Align FM RF and Ant. (max. voltage Test jack pin 3.
15	FM ant.term.	direct	88 MC	FM	88 MC	L4	Scale osc. at 88 MC.
16	FM ant.term.	direct	88 MC	FM	88 MC	L3,T1	Align RF and Ant. at 88 MC repeat steps 13, 14, 15, 16 as necessary.

NOTE: 1. A much more satisfactory IF and discriminator alignment may be obtained by using a 10.7 MC Signal generator frequency modulated at an audio frequency and swept approximately 600 KC (±300 KC). An oscilloscope should be connected to Test jack pin 3 and all IF screws adjusted for a symmetrical pattern of highest amptitude. See Fig. 1. For discriminator alignment, connect scope to Test jack pin 1 and adjust T5 for highest symmetrical pattern. See Fig. 2.

NOTE: 2. In all FM alignment calling for a voltage measurement at Test jack pin 3 (limiter grid resistor) keep signal generator output to such a value as will result in approximately 2 volts measured with a vacuum Tube voltmeter such as the Voltohmyst, Vomax or equiv.

MODEL 12FM895,
Ch. 12C22E

VOLTAGE TABLE

Measurements made at 117 volts line; volume control at minimum; zero signal input. Measurements made to chassis ground with vacuum tube voltmeter.

FUNCTION	TYPE	E_F	E_P	E_S	E_K	E_G
FM RF AMP.	6BA6	6.3	210	90	1	0
FM CONVERTER	6BE6	6.3	210	100	0	0
AM RF AMP.	6SG7	6.3	260	180	1	-1
AM CONVERTER	6SA7	6.3	250	90	0	---
1ST IF AMP.	6SG7	6.3	240	125	0	-1
2ND IF AMP.	6SG7	6.3	240	125	1	0
LIMITER	6SH7	6.3	3	60	0	-.6
DISC.; 2ND AM DET: AUDIO	6S8GT	6.3	80	---	0	-.8
PHASE INVERTER	6SJ7	6.3	160	---	80	0
POWER AMP.	6V6GT	6.3	260	270	15	
POWER AMP.	6V6GT	6.3	260	270	15	
RECTIFIER	5V4G	5	---	---	300	

TOTAL B CURRENT FROM RECTIFIER 120 MA.

PARTS LIST

ITEM NO.	PART NO.	DESCRIPTION
C1a,b,c.		
C2a,b,C3c.	7-17	Ganged Tuning Condenser A.M. & F.M.
C3,C8,C10	8-38	Trimmer 3-13 mmf (Gang trimmers).
C4,C55,C71	6-159	47 mmf., 500 V ceramic 20% Condenser.
C5,C6,C9,C13,C73,C74.	6-230	.001 mfd., 400 V ceramic 10% Condenser
C7	6-143	24 mmf 500 V ceramic 10% Condenser
C11	021-15	1000 mmf 500 V mica 5% Condenser.
C12	6-199	15 mmf 500 V ceramic 5% Condenser
C14,C20,C23,C27,C34, C36,C48,C52,C54,C64, C66,C67,C79,C82.	017-5	.01 mfd 600 V paper Condenser
C15,C16,C51,C53.	.....	Part of T2,1st I.F. transformer
C17,C22,C26	6-231	.002 mfd 400 V ceramic 10% Condenser.
C18,C19,C45,C47	.....	Part of T3, 2nd I.F. transformer.
C21,C24,C25	.....	Part of T4, 3rd I.F. transformer.
C28,C29,C30	.....	Part of T5, Discriminator transformer
C31	020-39	100 mmf 500 V mica 20% Condenser.
C32,C40,C46	020-53	220 mmf 500 V mica 20% Condenser.
C33,C49	016-6	.02 mfd 400 V paper Condenser
C35	5-69	.006 mfd 600 V paper Condenser.
C37 a, b	19-34	10-10 mfd 450 V electrolytic Condenser.
C38,C39	017-8	.05 mfd 600 V paper Condenser
C41	5-84	.001 mfd 1600 V paper Condenser
C42	020-67	470 mmf 500 V mica 20% Condenser.
C43	19-35	30 mfd 450 V electrolytic Condenser
C44	021-20	1200 mmf 500 V mica Condenser
C50,C68	016-8	.05 mfd 500 V paper Condenser
C56	6-207	220 mmf 500 V ceramic condenser
C57	8-65	200-600 mmf padder condenser.
C58,C59	.....	Part of L5 coil assembly.
C60,C70	6-208	234 mmf 500 V mica condenser.
C61,C62,C63,C65	.....	Part of T7 coil assembly.
C69	.....	Part of T8 coil assembly.
C71	.....	Part of L1 coil assembly (47 mmf)
C72	8-35	2½-30 mmf ceramic trimmer
C75,C76,C77,C78	021-74	.01 mfd 500 V mica 20% condenser.
C81	8-63	15-115 mmf trimmer (wave trap).
L1	20-27	Broadcast loop assembly (less cover #20-28)
L2	.....	Loading coil (part of 20-27 loop)
L3	3-184	F.M. R.F. coil.
L4	3-189	F.M. oscillator coil.
L5	3-171	A.M. oscillator coil.
L6	S-1468	Wave trap coil.
R1	02-37	68 ohms ½ watt 10% resistor
R2	03-157	47,000 ohms 1 watt 20% resistor
R3,R11,R37,R42	03-118	5600 ohms 1 watt 10% resistor
R4	01-2	10 ohms ½ watt 10% resistor
R5,R41	01-143	22,000 ohms ½ watt 20% resistor

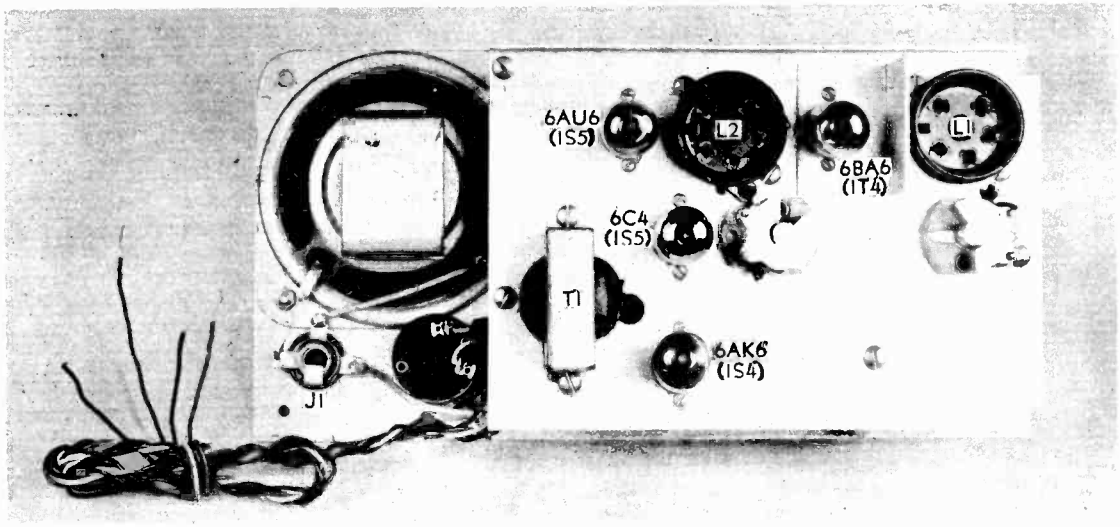
(Continued on next page.)

MODEL 12FM895,
Ch. 12C22E

PARTS LIST--Continued

ITEM	PART NO.	DESCRIPTION
R6,R40	04-143	22,000 ohms 2 watt 20% resistor
R7,R39	02-143	22,000 ohms ½ watt 20% resistor
R8, R10, R25, R28,R43	02-156	47,000 ohms ½ watt 10% resistor
R9	02-41	82 ohms ½ watt 10% resistor
R12		Part of T4 assembly (47,000 ohms ½ w 10%)
R13,R16,R20,R35, R38,R44,R45	02-199	470,000 ohms ½ watt 20% resistor
R14	02-149	33,000 ohms ½ watt 10% resistor
R15	02-170	100,000 ohms ½ watt 10% resistor
R17, R19		Part of T5 assembly (470,000 ohms ½ w 10%)
R18	02-157	47,000 ohms ½ watt 20% resistor
R21	02-255	10 megohm ½ watt 20% resistor
R22	13-25	Volume control, 2 megohm with tap
R23	01-139	18,000 ohm ½ watt 10% resistor
R24	14-7	Tone control 2 megohm, with switch
R26,R36	02-213	1 megohm ½ watt 20% resistor
R27	02-100	2200 ohms ½ watt 10% resistor
R29, R31	01-188	270,00 ohms ½ watt 10% resistor
R30	9-290	250 ohm 5 watt 10% wire wound resistor
R32	02-132	12,000 ohms ½ watt
R33	02-226	2.2 megohm ½ watt 10% resistor
R34	01-160	56,000 ohm ½ watt 10% resistor
R50	02-44	100 ohm ½ watt 10% resistor
RFC-1	3-187	6BA6 plate choke
RFC-2,RFC-3	3-188	Filament choke
RFC-4	3-104	Diode plate choke
S1	11-58	Band switch (R.F.)
S2	11-59	Band switch (pilot lites & audio)
S3		Part of Tone control assembly, A.C. switch
T1	3-183	F.M. antenna transformer
T2	3-173	1st I.F. transformer
T3	3-174	2nd I.F. transformer
T4	3-175	3rd I.F. transformer
T5	3-176	Discriminator transformer
T6	2-19	Power transformer
T7	3-186	B.C.-S.W. R.F. transformer
T8	3-185	S.W. antenna transformer
T9	52-43	Output transformer (part of speaker ass'y)
	15-81	Tube socket, octal.
	15-87	Socket, phono. pick-up
	15-98/135	Receptacle, AC phono
	26-7	Pilot lite #44 Blue Bead
	26-2	Pilot lite #47 Brown Bead
	129-56	Spring, dial cord tension
	134-7	Dial cord, silk (62 inches)
	S-1329	Cord, dial (require 62" of #134-7)
	135-35	Dial pointer
	117-63	Dial scale FM
	117-90	Dial scale BC
	117-91	Dial scale SW
	22-43	Speaker 12" Electro-dynamic inc'l cable
	115-58-1	Cabinet-walnut VM cut-out
		Cabinet-mahogany-VM cut-out
		Cabinet-blond-VM cut-out
	122-53	Escutcheon glass clamp
	122-54	Escutcheon glass (large)
	21-15	Record changer, VM400
	117-103	Dial masking plate
	128-89	Knob (tone, tuning, volume)
	128-90	Knob (band switch)
	129-46	Spring, for band switch knob
	S-1610	Cabinet dipole antenna ass'y.

MODEL 801



DESCRIPTION: Model 801 Receivers hew rigorously to the line of maximum sensitivity and general utility for the minimum of tubes, circuits and power consumption. They differ only in power requirements and frequency range. Model 801 employs new miniature 6.3 volt heater tubes for operation from batteries or a.c. power supply.

The two circuit diagrams show the basic similarity of the two models. Each consists of a high-gain pentode r.f. amplifier stage tuned by L1 and C1, the latter controlled by the ANT. knob. On short waves the tuning of this r.f. stage is not particularly critical, and the ANT. knob may be regarded as a trimmer rather than as a second tuning control. Following the r.f. amplifier is a pentode regenerative detector. It's tuned circuit is L2, C1a. At and around critical regeneration, detector tuning is very sharp. C1a is controlled by the main dial marked TUNE upon the panel. Connected to C1a through 16:1 preloaded gears, the main dial makes eight revolutions for each tuning range to yield 800 well-spaced dial divisions per band. Revolutions of this dial are counted by a secondary dial numbered 0 through 8, with the number of dial turns in use indicated by the figure visible through the panel window at the upper left of the dial. Logging of stations received is effected by noting down the numbers of the coils in use at L1 and L2: the setting of the ANT. knob and the window-visible number followed by the TUNE dial setting. Setting of the REG. knob may also be recorded, since it affects TUNE dial setting slightly.

Detector regeneration is controlled by varying screen voltage by means of P1. Regenerative tickler is in detector plate circuit, with a.f. load R5 isolated from r.f. by two-section filter C3, R2, C3A. This method of control gives extremely smooth variation of regeneration just below, at and immediately beyond critical regeneration. Stickiness, drag and fringe-howl are pleasingly absent.

The detector is followed by a.f. VOLume control P2 and two stages of high-gain pentode audio amplification. The 2nd (power output) stage feeds the self-contained loud-speaker: unless a 2-circuit phone plug is inserted in the PHONES jack when the speaker is muted and output fed through the plug to headphones.

ACCESSORIES REQUIRED: Accessories required, but not supplied, to put either receiver into operation are as follows:

MODEL 801: Antenna and ground - antenna may be a single wire about 50 ft. long plus 20 to 30 ft. of leadin, and well up in the air. Ground connection should be to a cold water pipe scraped bare at point of connection.

1 each 6BA6, 6AU6, 6C4 and 6AK6 tubes

1 a.c. power supply furnishing 6.3 volts at .9 amperes and 180 volts at 35 ma. filtered d.c. ——or storage or dry batteries (4 Burgess #4FA, or equal, 1½ volt batteries connected in series to provide 6 volts for tube heaters and 4 Burgess #5308, or equal, 45 volt "B" batteries in series to provide 180 volts).

INSTALLATION: Insert tubes in sockets as indicated in rear-view illustration. Erect antenna using #14 to #18 bare, enameled or insulated wire as high and clear of surrounding objects as practicable. If a single wire is used, fasten far end to glass or ceramic insulator fastened to tree, pole or building with rope. Thread leadin end of antenna wire through second insulator, twist back on itself, and carry free end of wire down to receiver (antenna and leadin one piece of wire). Fasten second insulator to tree, pole or building as convenient with rope. Keep antenna and leadin free and clear of nearby objects. Connect leadin to wire projecting from receiver and terminated at #2 contact of L1 socket (upper left, as seen from front).

Insert coils for desired frequency range in L1 and L2 sockets. NOTE that while the two coils for each range are identical, small electrical differences will affect dial logging if they are interchanged. Therefore, scratch identifying marks, such as "L1", "L2" upon each coil of each pair so as to be sure to get the same coil in the same socket every time.

MODEL 801

Connect batteries to MODEL 801 receiver (a.c. power supply to MODEL 801 only) by means of color-coded twisted cable projecting from receiver cabinet. Follow wire colors and connection legend found at bottom of appropriate circuit diagram. Connect ground lead to BLACK receiver cable wire at battery or a.c. power supply connection point. ON-OFF switch in YELLOW wire opens filament circuit of Model 801B; switch in RED wire of Model 801 opens B+ circuit when REG. knob is turned to OFF.

OPERATION: Set ANT. knob to about 50, TUNE dial to about 4-0, set VOL. knob to about 10. Advance REG. knob slowly from OFF toward 10, listening carefully for the beginning of a faint rushing sound in the speaker. Advance REG. knob to just beyond the point where this rushing noise is just heard, and which indicates that the detector has passed the point of critical regeneration and has gone into oscillation. Rotate TUNE dial slowly until a squeal is heard evidencing reception of a signal. If this squeal is broken up into dots and dashes it is a CW telegraph station: if the squeal is continuous, it is a broadcast or phone station.

Adjust ANT. knob for loudest signal. Carefully adjust TUNE dial and REG. knob for loudest telegraph signal. Adjust VOL. knob for desired loudness of signal.

To initially locate phone or broadcast stations, proceed as above (REG. knob advanced so signal is first heard as a continuous uninterrupted squeal). Once the signal is so found, retard REG. knob together with the slight adjustment of TUNE dial required to "hold" the signal until the detector stops oscillating, the squeal disappears, and voice or music is heard.

Greatest sensitivity and selectivity obtains when the REG. knob is advanced to just above the point at which a signal is heard as a squeal when it is a CW telegraph signal. Greatest sensitivity and selectivity for phone, broadcast and modulated telegraph reception obtains when REG. knob is set to just below the point where such signals turn into squeals. The range of mechanical movement of the REG. knob is much greater than its useful electrical range. Its useful operating range is from just below to just above the point where signals are heard as squeals. This point will move about upon the REG. scale for different coils and different frequencies. ALWAYS operate with REG. knob just below signal-squeal point for phone, just above for CW telegraph reception. DO NOT control volume with REG. knob — control volume with VOL. knob.

As with all t.r.f.-regenerative detector receivers, selectivity is a function of REGeneration setting, is greatest for weak signals and at critical regeneration. For the regular broadcast band selectivity is adequate to separate weak distant from strong local stations only when using a very short antenna—maybe 10 to 15 ft. long. The 50 ft. antenna may be electrically shortened by disconnecting it metalically from the receiver antenna lead, then twisting the leadin about the insulated receiver antenna wire for a couple of turns — just enough to give maximum selectivity without serious loss of sensitivity. On short waves this problem is not particularly serious, and good selectivity will usually obtain with a 50 ft. antenna. Good reception can be had with a shorter antenna in most cases, however.

PHONES jack is for private listening — does not yield more volume than loud speaker. If more volume on headphones is desired the receiver output circuit may be altered upon addition of a 10,000 ohm, 1 watt resistor and a .1 mfd., 400 volt tubular condenser. To make such alteration disconnect lead of T1 going to long spring of J1; disconnect short spring of J1 from speaker voice-coil lug. Connect freed lead of T1 directly to speaker voice-coil lug, leaving both lugs of J1 momentarily unconnected. Disconnect lead of T1 going to plate of 6AK6 (or 1S4) tube socket and connect this lead to short spring of J1. Connect long spring of J1 to one lead of .1 mfd. condenser; other lead of condenser to plate lug of 6AK6 (or 1S4) socket. Connect 10,000 ohm resistor between plate lug of 6AK6 (or 1S4) socket and receiver B+ circuit (to B+ 180 V. for Model 801; to B+ 90 V. for Model 801B).

NOTE: At and around critical REGeneration the detector circuit is extremely sharp in tuning. Upon loud signals from the loud speaker mechanical vibration feedback between speaker and Cla may occur. This may cause howling, with howl masking signal. Do not turn VOL. knob up so signal becomes loud enough to cause such feedback — or use headphones for reception.

ALTERNATE ANTENNA: If it is desired to use a 1/2-wave doublet, or other antenna having a two-wire leadin, disconnect contact#1 from contact #3 on L1 socket. Connect two-wire leadin to L1 socket contacts #1 and #2. Use or omit ground connection to water-pipe ground as results dictate.

PARTS LIST

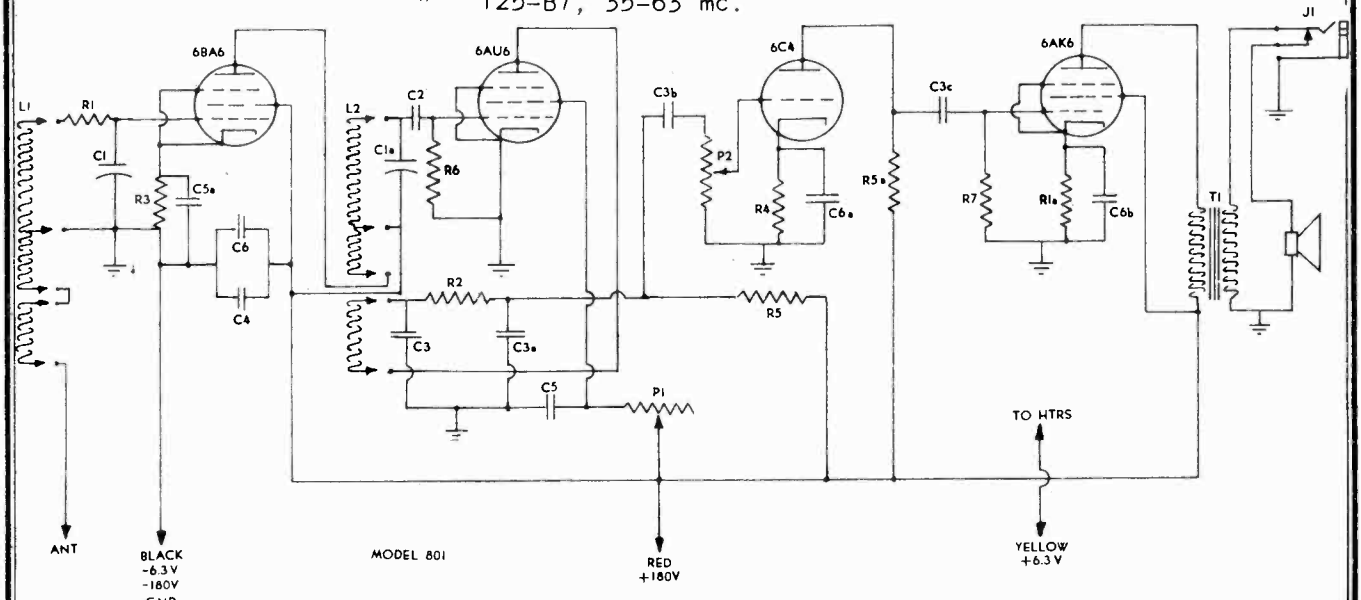
(Exact values subject to change)

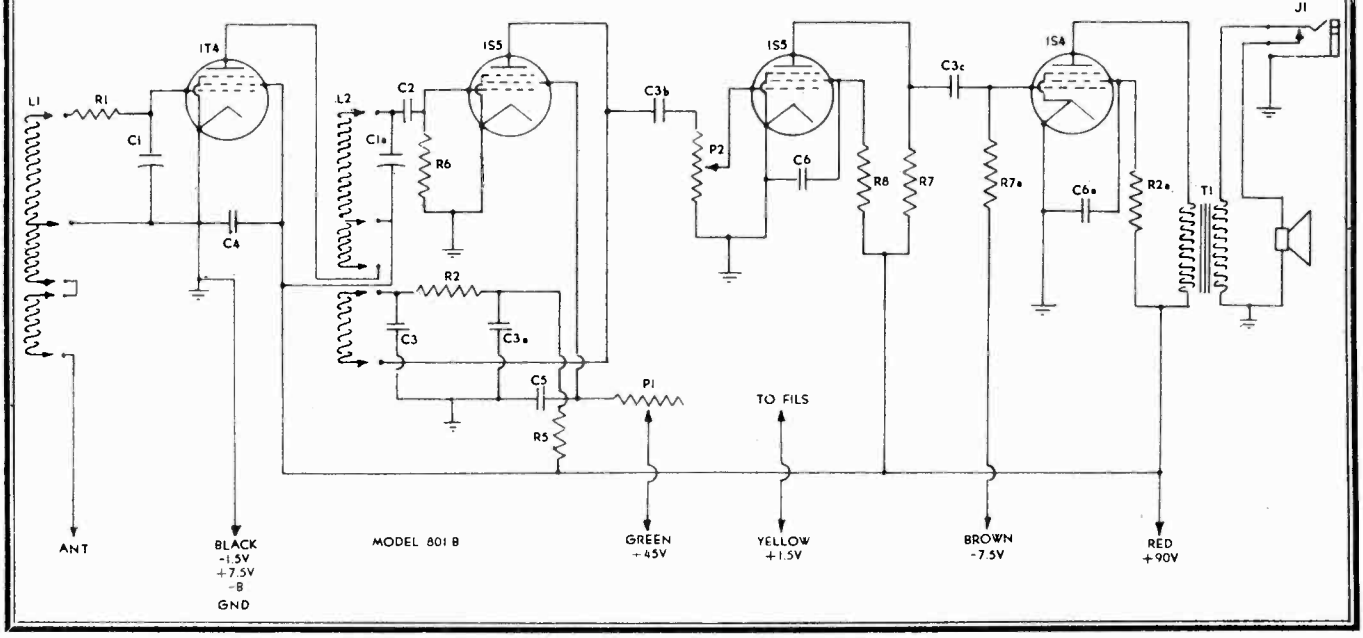
C1, C1a – 6/106 mmfd. air capacitor
C2 – 58 mmfd. mica capacitor ±20%
C3, C3a, C3b, C3c – 1000 mmfd. mica capacitor ±20%
C4 – 2500 mmfd. mica capacitor ±20%
C5, C5a – .01 mfd., 400 V. paper capacitor ±20%
C6, C6a, C6b – 8 mfd., 350 V. electrolytic capacitor ±20%

R1, R1a – 510 Ω, ½ watt resistor ±20%
R2, R2a – 25 KΩ, ½ watt resistor ±20%
R3 – 110 Ω, ½ watt resistor ±20%
R4 – 3500 Ω, ½ watt resistor ±20%
R5, R5a – 50 KΩ, ½ watt resistor ±20%
R6 – 150 KΩ, ½ watt resistor ±20%
R7, R7a – 750 KΩ, ½ watt resistor ±20%
R8 – 3 meg Ω, ½ watt resistor ±20%
P1 – 3 meg Ω potentiometer
P2 – 750 KΩ potentiometer

COIL RANGES: Nominal coil tuning ranges are as follows:

MODEL 801: Type 125-B1, 430-830 kc.
" 125-B2, 750-1700 kc.
" 125-B3, 3.2-7 mc.
" 125-B4, 6.2-12.8 mc.
" 125-B5, 11.5-23.8 mc.
" 125-B6, 19-36 mc.
" 125-B7, 35-63 mc.





MODEL 802

DESCRIPTION: Model 802 receiver is designed to cover the 80, 40, 20, 16, 11/10 and 6 meter amateur bands only. Following A.R.R.L. Handbook teachings thru employment of controllable regeneration in its 735 kc. i.f. amplifier to provide extreme and variable selectivity, its excellence in this respect is equalled by the extreme of band-spread it provides upon each amateur band. Five new miniature u.h.f. tubes, three of them dual-function, yield effective 8-tube complement. Each amateur band occupies the major portion of the eight-revolution, 0/100 division 3½" diameter main tuning dial, which with the secondary "turn-counting" dial visible thru the panel window gives 88" of effective dial length. A series-valve noise-limiter is effective in reducing ignition and other noise interference. Noise control, P3, is accessible upon the interior channel upon lifting cabinet lid.

The circuit consists basically of a 6BE6 pentagrid converter having antenna input circuit L1 inductively tuned by the relatively non-critical ANT. knob, and local heterodyne oscillator with inductive tuning of L2 by the main TUNE dial. A single stage of dual-air-tuned i.f. amplification employs a 6BA6 tube, with regeneration controlled by REG. knob P1, (which also carries an on-off switch for control of external power supply). A 6J6 dual triode functions as non-loading infinite impedance second detector and series-valve noise-limiter. This is followed by a second 6J6 functioning as first a.f. amplifier and beat-oscillator, pitch of which may be adjusted for single-signal CW reception by internal air capacitor C5d. A.f. power amplifier is a 6AK6, with VOLume controlled by P2. A PM dynamic speaker and output transformer T1 are built into Model 802, together with headphone jack J1. Band change is effected by inserting appropriate plug-in coils in sockets accessible upon lifting cabinet lid. Coils are individually adjusted for each particular receiver, and are shipped with it.

ACCESSORIES REQUIRED: Accessories required, but not supplied as a part of Model 802, to put the receiver into operation are as follows:

Antenna and ground — antenna may be a single wire 20 to 70 ft. long, including leadin (or may be a suitable doublet), erected as high in the air and clear of surrounding objects as practicable. Ground may be a connection to a well-scrapped cold water pipe.

1 each 6BE6, 6BA6, 6AK6 tubes
2 -- 6J6 tubes
1 pair of 2,000 ohm headphones (if desired)
1 Power supply to provide 100/105 volts at 35 ma. d.c., 180 to 250 volts d.c. at 18 ma. and 6.3 volts a.c. or d.c. at 1.65 amperes. Power supply may be a well-filtered a.c. unit assembled from standard broadcast receiver replacement parts, a 6-volt storage battery and suitable Vibropack or dry B batteries, or entirely dry batteries in emergency.

INSTALLATION: Insert vacuum tubes in their sockets as indicated in Fig. 1. Make sure each is fully seated in its socket, and that shield body encloses 6BA6 i.f. amplifier. Erect suitable antenna and connect its leadin to one of two wires projecting from L1 socket thru hole in rear of cabinet. Connect ground lead to the second of these two wires and to BLACK wire (B-, A-). Connect power supply to twisted colored leads projecting from receiver cabinet, being careful to follow exactly color indications upon Fig. 2 for each wire. On-off switch upon REG. control is not wired into receiver circuit, but is brought out thru the two BLUE wires of power cable. It may be connected as desired to control the power supply, as in the 115 volt primary circuit of an a.c. power supply, etc.

Insert coils for desired amateur band in sockets. Coil marked "ANT" must go into upper left socket; coil marked "OSC" must go into center socket. Seat coils fully in sockets, not at an angle. Take care in inserting or removing coils NOT TO BEND THE COPPER VANES controlled by ANT. and TUNE knobs. Tuning range and relogging calibration will be shifted if vanes are bent, and unless coils are inserted in sockets exactly the same way each time they are changed. Coils can be most easily removed by inserting a knife-blade or screw-driver tip between socket and coil base, then prying coil form back sufficiently to free it for easy finger removal. BEFORE CHANGING COILS BE SURE ANT. AND TUNE KNOBS ARE SO TURNED THAT THEIR COPPER VANES ARE OUT OF THE WAY AND DO NOT IMPEDE COIL REMOVAL OR INSERTION.

OPERATION: With tubes and coils for desired band in place, power supply connected and power turned on, antenna and ground connected, proceed as follows: Set B.F.O. switch OFF, N.L. switch OFF, VOL. to 10. Advance REG. knob from 0 toward 10 until a rushing noise is heard from the speaker indicating that the i.f. amplifier is regenerating, possibly even oscillating. Turn REG. knob up just enough so stations may be tuned in on the main TUNE dial as a squeal. Set ANT. knob for greatest volume, retarding VOL. knob if volume is so great as to cause microphonic howling from speaker.

Greatest sensitivity — and selectivity — is with REG. knob set just below the point where signals are heard as squeals. KEEP IT BELOW THIS POINT OF OSCILLATION. While CW signals can be received with B.F.O. OFF by pushing REG. knob up to oscillating point of i.f. amplifier, this does not give best results. Use REG. knob to control sensitivity and selectivity — always set it below point of i.f. oscillation, else when B.F.O. is turned ON more squeals and "birdies" will be heard than signals.

Having operated Model 802 for possibly half an hour to find out how it works and controls, (using oscillating i.f. as above in this initial test only to make CW signals audible, or to locate weak phone stations by their carrier squeals), set REG. about ½ division below point of oscillation and turn B.F.O. ON. Tune in CW signals as on any receiver; locate weak phone stations by tuning to their squeal, then turn B.F.O. OFF to make speech audible and clear. Note the extreme selectivity possible -- the muffling of speech quality as REG. knob is advanced toward i.f. oscillation. This is side-band cutting due to the extraordinary selectivity possible to a regenerative i.f. system.

It is this extreme sensitivity that gives Model 802 the advantages of "single-signal" CW telegraph reception — which mutes one of the two audio beats found on each side of carrier resonance. B.F.O. may be set by adjustment of C5d, either to exact i.f. resonance for locating weak phone stations, or preferably about 1,000 cycles to one side of resonance for "single-signal" CW. When so set, if REG. knob is operated just below i.f. oscillation, one of the two audio beats associated with each CW signal will be muted almost to inaudibility — giving crystal selectivity without the annoying "pinging" quality associated with crystal filters. To set B.F.O. for single-signal reception, tune in a weak phone station, or a telegraph station which can be heard as key-clicks or "thumps", with B.F.O. off and REG. set just below squeal point.

Turn ON B.F.O. and rotate rotor of C5d using the eraser on the end of a lead pencil to turn same, until the audible beat note is at about 1,000 cycles. Now tune thru the signal, and note that the second audio beat note is practically inaudible -- much weaker than the other. This condition can obtain for two settings of C5d; use the one with the rotor of C5d turned furthest in.

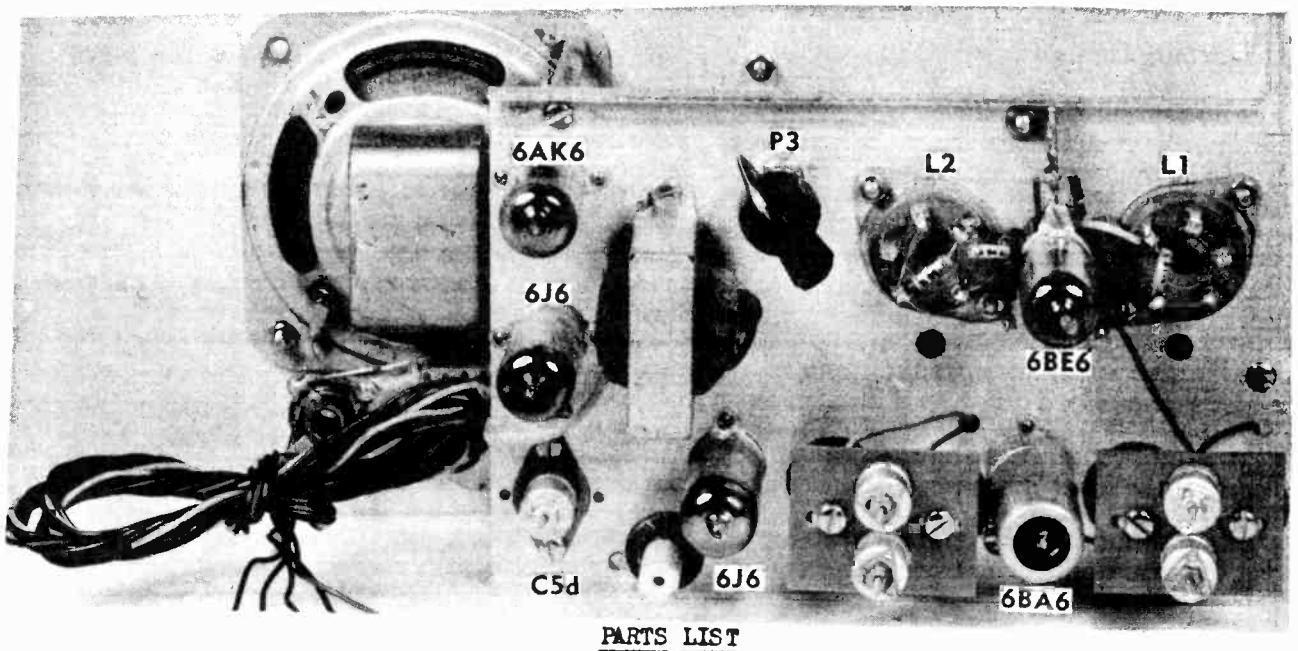
It is desirable to read the section of the A.R.R.L. Handbook describing operation of series-valve noise limiters to gain understanding thereof. The series-valve noise limiter of Model 802 Receiver (right hand triode of center 6J6, Fig. 2) may be thought of as a "gate", which may be opened, partially closed or fully closed by adjustment of P3. Full open, the gate passes both signals and noise; closed it will cut off both; partially closed it can cut out noise louder than a desired signal to improve signal readability.

To use the noise limiter, set NOISE switch S1 to ON after tuning in a weak signal markedly "down" in local noise interference. Slowly rotate P3 until signal volume is neither reduced nor signal quality distorted but noise is reduced to a point where it is no louder than signal. Advancing P3 further will reduce both noise and signal volume together. Operate with P3 set to reduce noise as much as possible without impairing signal. Adjust P3 for each signal received. Set NOISE switch S1 OFF in tuning for signals, switching noise limiter into circuit only when required. Leaving NOISE switch ON when tuning will result in distortion of signals louder than the one for which it was set.

MAINTENANCE: Model 802 is so basically simple that, outside of customary long-time tube deterioration, there is little to go wrong with it. Its relatively high 735 kc. i.f. frequency results in good image rejection without an r.f. stage. When operated near powerful local broadcast stations operating on 730 or 740 kc., interference therefrom may sometimes be experienced. This may be eliminated by tuning the i.f. amplifiers (adjust capacitors C5, C5a, C5b, C5c and C5d) to a new i.f. frequency just sufficiently away from 735 kc. to cut out such interference.

Care must be taken NOT TO BEND the copper tuning vanes actuated by ANT and TUNE knobs. Each affects the field of the coil (L1, L2) with which it is associated. If vanes are bent, or coils are not seated fully and identically in their sockets each time they are changed, logging of stations tuned in previously will not repeat exactly upon TUNE dial. Accidental bending of vanes can shift tuning range so it will no longer be as originally established. Should this occur, vanes may be repositioned by gently bending them to or away from coil ends. Do this ONLY if they are accidentally bent, and then to bring tuning back correctly upon ANT and TUNE scales for stations first at high, then at low, frequency ends of each coil tuning range.

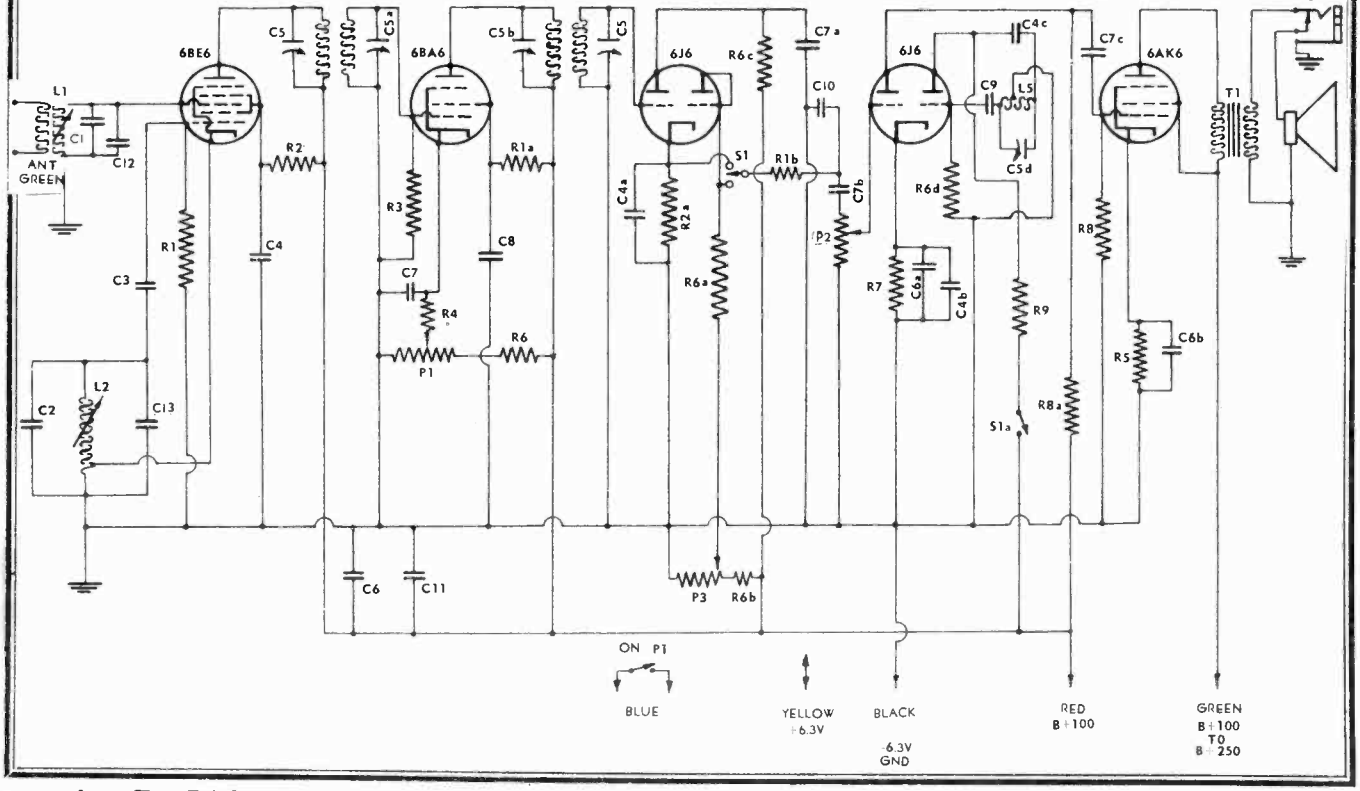
MODEL 802



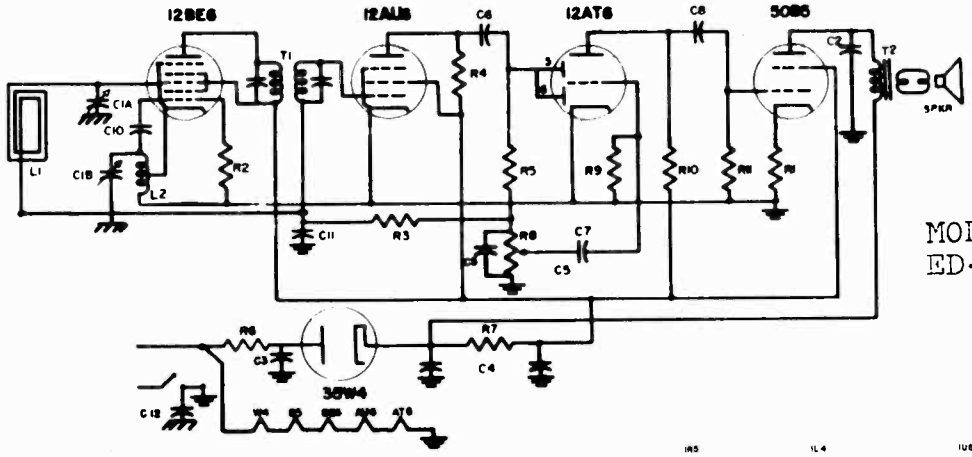
PARTS LIST

C1 — 50 mmfd. ceramic
C2 — 50 mmfd. ceramic
C3 — 50 mmfd. mica or ceramic
C4, C4a, C4b, C4c — 100 mmfd. mica or ceramic
C5, C5a, C5b, C5c, C5d — Silver #619, 30/30 mmfd. air condenser
C6, C6a, C6b — 8 mfd., 350 V electrolytic
C7, C7a, C7b, C7c — .02 mfd. tubular paper
C8 — .0039 mfd. mica
C9 — 17 mmfd. mica or ceramic
C10 — 400 mmfd. mica or ceramic
C11 — 820 mmfd. mica or ceramic
C12 — In #125-C1, 125-C2, 125-C3 ANT.
C13 — In #125-C1, 125-C2, 125-C3 OSC.

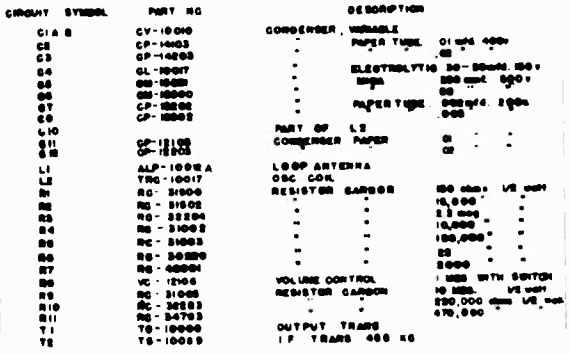
R1, R1a, R1b — 21 kΩ, 1/2 watt
R2, R2a — 150 kΩ, 1/2 watt
R3 — 10 kΩ, 1/2 watt
R4 — 250 Ω, 1/2 watt
R5 — 250 Ω, 1 watt
R6, R6a, R6b, R6c, R6d — 47 kΩ, 1/2 watt
R7 — 1500 Ω, 1/2 watt
R 8, R8a — 100 kΩ, 1/2 watt
R9 — 1 megΩ, 1/2 watt
P1 — 5000 Ω, w/w, with switch
P2 — 500 kΩ, audio volume control
P3 — 100 kΩ, noise limiter
S1, S1a — S.P.D.T. slide switch

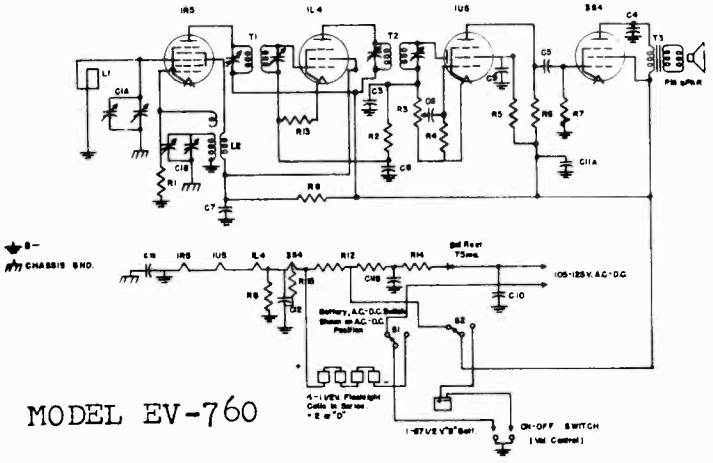


MODELS EC-720, ED-721, Ch. 5A9;
MODEL EV-760; MODELS 4B7, 4F8

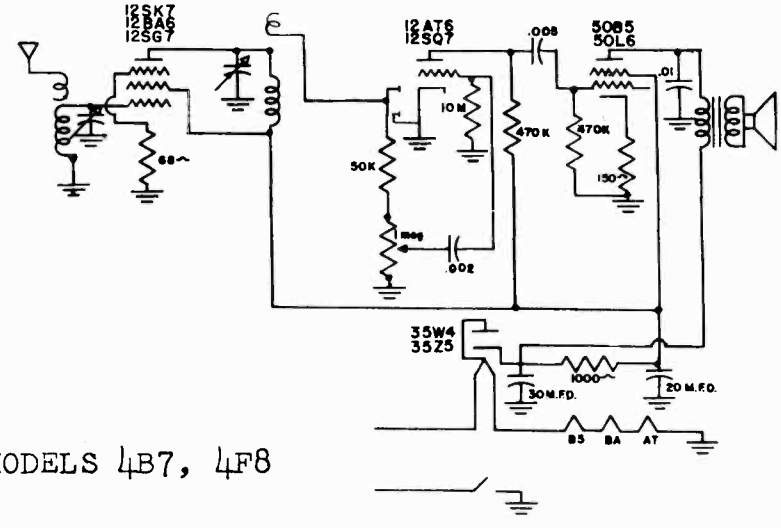


MODELS EC-720,
ED-721; Ch. 5A9



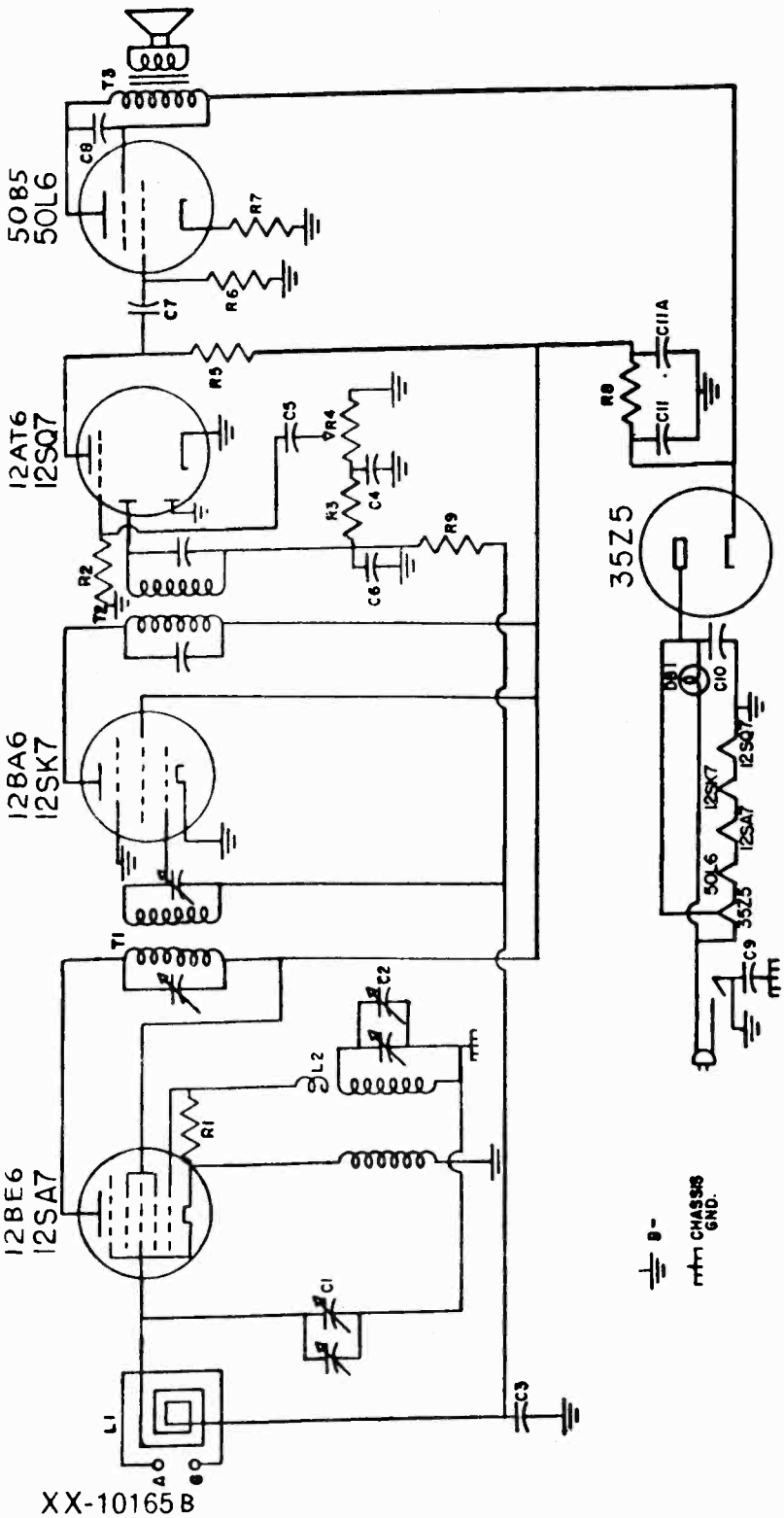


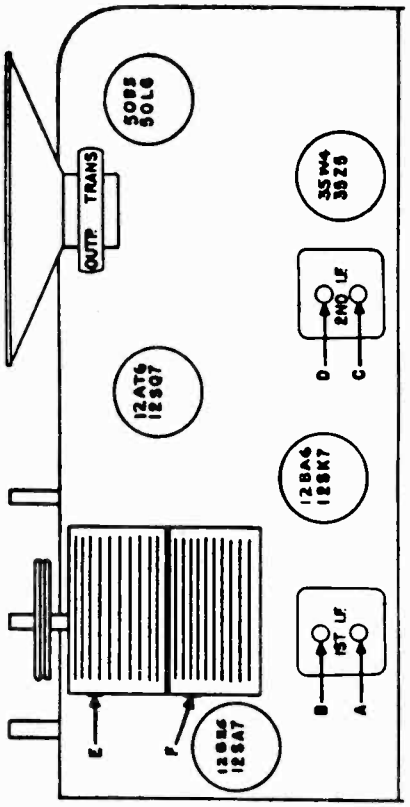
MODEL EV-760



MODELS 4B7, 4F8

MODELS EF-730, EG-731

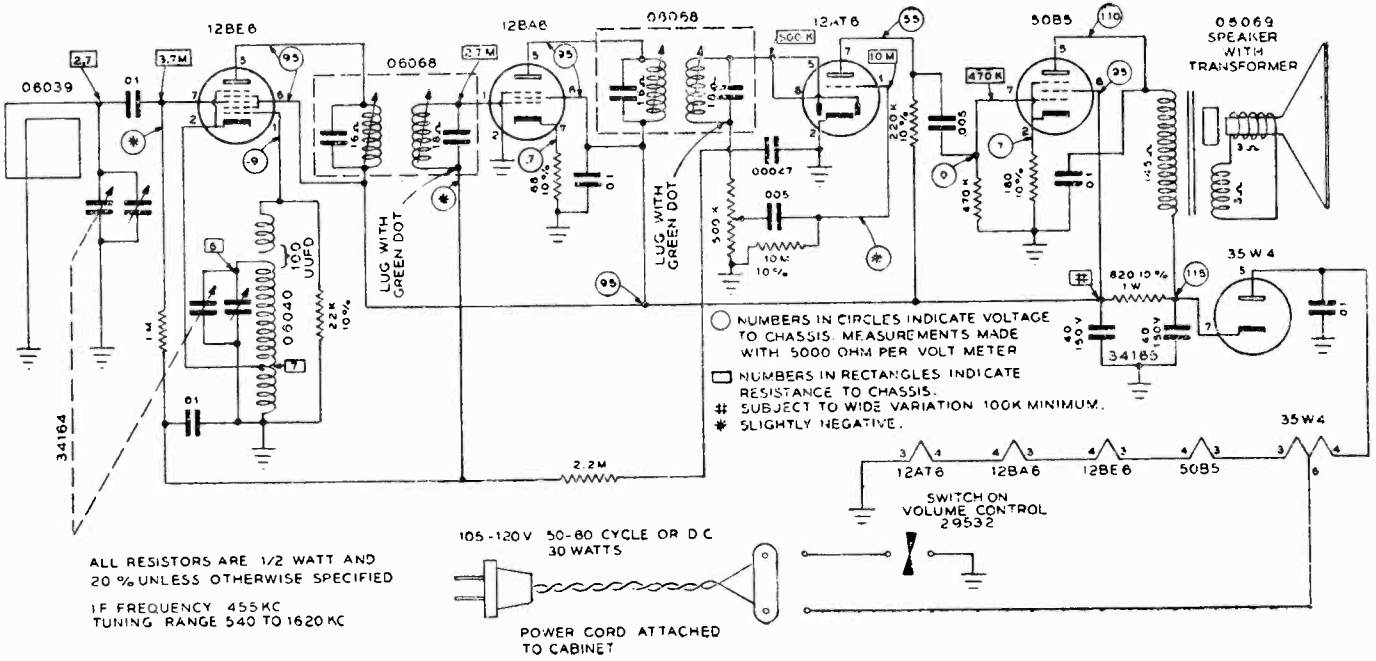




TECHNICAL INFORMATION FOR SERVICE

ALIGNMENT PROCEDURE

1. Connect a suitable signal generator to the R.F. section of the tuning condenser. Connect the ground side of the generator to the frame of the condenser. Use a .05 condenser to isolate the generator from the R.F. section.
2. Connect a suitable output meter to the voice coil leads of the speaker.
3. With the variable condenser open, apply a 455 Kc. signal. Use the lowest level consistent with good output indication.
4. Adjust trimmers A, B, C, and D for maximum response, reducing the input signal as required to keep the output meter on scale.
5. Connect the generator to terminals A & G through a 400 ohm dummy antenna. Apply a 1720 Kc. signal and adjust trimmer E to maximum.
6. Set the signal generator to 1400 Kc. Tune the receiver dial to maximum response, then adjust trimmer F to maximum response. This completes the alignment.



Power Supply: 105-120 volts 50-60 cycles AC, or
105-120 volts DC.

DC Operation: When using DC supply if receiver does not operate, reverse the line cord plug in the power outlet.

Antenna: An unusually efficient built-in antenna is used in this receiver, making an outisde antenna unnecessary. For this reason no provision is made for connecting an outisde antenna.

Ground: Do not attempt to connect a ground to this receiver.

CAUTION: One side of the power line is connected to chassis in this receiver. Do not attempt to operate the receiver out of its cabinet.

MEISSNER FM RECEPTOR
MODEL 8C, 8CK Rev.

ANTENNAS

This receptor has been designed to use a 300 ohm antenna, either indoor or outdoor type.

The indoor antenna (Fig. 1) is for compact installation and is recommended only for local station receoption. Such an antenna may be purchased or may be built according to Figure 1. This indoor antenna is a folded dipole omnidirectional antenna intended for operation in a horizontal plane. The drawing shows the bottom view. Cut off a 5 foot length of 300 ohm transmission line and secure it to the mounting board, following dimensions shown in Figure 1. Measure 2" from each end of the transmission line and remove the dielectric material back to this point. Twist the bared wires together and solder. Locate the center point. Cut the outside strand of the two wire line. Remove the insulating material from the wires, leaving approximately 1/2" bare lead, to which the lead-in line is attached and soldered.

In some locations an indoor antenna is unsatisfactory, particularly in building having steel in their construction or in areas where large masses of metal are present. In the installation of an outdoor antenna, it should be remembered that radio waves of the frequencies used for FM transmission travel in straight lines, and for best reception, the antenna should be located above all obstructions which might block or alter the path of incoming signals. A high quality 300 ohm transmission line should be used to connect the antenna to the receptor. If low loss line is used, there will be no appreciable loss of signal in the line if the line itself is kept reasonably short and direct to the antenna.

An outdoor antenna may be purchased from your dealer or may be constructed as shown in Figure 2. This outdoor antenna is a 300 ohm folded dipole which will show some directional characteristic. Four conduit clamps are used to secure the 11/16" conduit to the support post. Each wire in the 300 ohm lead-in line is connected to an end of the antenna element. This may be done by carefully soldering each wire to the conduit and leaving a small amount of slack before securing the lead-in line to the support post.

AC OUTLET

The Meissner Model 8C FM receptor has a power outlet on the rear skirt of the chassis into which the associated power amplifier may be plugged. Power to this outlet is controlled by the 8C power switch and the associated amplifier may thus be switched "on" or "off" coincidental with the receptor.

CAUTION: Power drawn from this receptacle should not exceed 2.5 amperes at 115 volts.

CONNECTIONS TO AN AC RECEIVER

Although the receptor will operate with any radio receiver, large or small, that has terminals for a phonograph pickup, the audio quality inherent in the frequency modulation system will be more apparent when it is used with a regular type radio receiver having a large speaker and baffle as well as a good audio amplifier. The receptor may also be connected directly to power amplifiers which have high impedance inputs and which will give full output with 3 volts RMS input. The receptor should not be connected to a microphone input. The shielded rubber-covered lead from the receptor carries the audio output of the unit and is to be connected to the phonograph input terminals of the radio receiver or to the high impedance high level input of the power amplifier.

It is not recommended that the receptor be connected to an input designed for the new magnetic type pickups. These pickups have an output many times below that of the receptor and are fed into a preamplifier having a very high gain and usually some bass compensation which might not complement the receptor. Should the receptor be fed into such a preamplifier, the receptor output would need to be reduced to a very low level in order to prevent overloading and under this condition the hum and extraneous noises coming from the receptor and being picked up by the connecting cable might become objectionable.

The audio output of the receptor with maximum volume control setting is approximately 3 volts RMS with minimum usable signal input. For greater signal inputs, output voltages as high as 15 volts RMS may be obtained with negligible distortion. OUTPUT is high impedance and should be worked into a load of from 100,000 to 500,000 ohms. This data should be borne in mind when connecting the receptor to a radio receiver or power amplifier.

Various input arrangements will be encountered in radio receivers and amplifiers of different manufacture, such as jacks of various types, terminal strips and binding posts. Your dealer will be able to supply an appropriate plug to make connections to your receiver or amplifier. For instance, if the unit with which it is to be used is provided with a phonograph "jack", the corresponding type "plug" should be connected to the shielded lead, the outside metal shielding being connected to the frame or ground side of the plug and the inside insulated wire being connected to the high (tip) side of the plug. With the receptor placed conveniently close to the associated receiver or amplifier, the phonograph plug may be inserted and the receptor is ready for use. (See PHONO FEED THROUGH below.) When terminal strips or binding posts are used, the shielded lead from the receptor connects directly to these points without additional parts. In all cases, the outside shielding connects to the terminal which connects directly (or through a coupling capacitor) to the chassis.

If the receiver has no "Phone" or "Television Sound" terminals, the additional switch and terminals can be installed by any competent radio service man.

CONNECTIONS TO AN AC-DC RECEIVER

This receptor is not recommended for use with AC-DC receivers or amplifiers of the "hot chassis" type because of the shock and fire hazards involved. It may, however, be used with AC-DC receivers or amplifiers of the type in which the power line is isolated from the chassis. Connection to such a receiver or amplifier should be made only with the approval of a competent service man. In using the receptor with such a receiver or amplifier, the line cord plug should be reversed in the power outlet to find the position which causes least hum. In some instances it may be found that operation from power lines which are not properly grounded will not be satisfactory.

PHONO FEED THROUGH

To eliminate the necessity of installing additional switches or the bother of disconnecting the receptor when it is desired to use the phonograph, the Meissner Model 8C FM Receptor now has a phono feed-through switch. A standard phono input jack will be found on the rear skirt of the receptor chassis and the phonograph may be plugged directly into this jack. A single pole double throw switch with click filter is actuated by a cam on the shaft of the combination volume on-off switch of the receptor. When the receptor is turned 'off' the switch is so thrown that the phono output simply goes through the receptor and comes out the audio out-

put cable of the receptor which is connected to the receiver or amplifier. When the receptor is turned 'on' the phono output is disconnected and normal operation of the receptor is obtained.

No attempt should be made to feed the output of the new magnetic pickups through the receptor. The additional length of shielded cable and the unshielded switch contacts and connecting wires may result in excessive hum and extraneous noises. Furthermore, it was pointed out that the receptor should not be operated into a preamplifier of the type used in conjunction with these magnetic pickups.

OPERATING THE RECEPTOR

Turn the left hand control knob clockwise until the click is heard and the dial scale is illuminated. The radio receiver or amplifier to which the receptor is connected must also be turned on and its selector switch set to the appropriate position, that is, to "Phonograph" in case the receptor is connected to the phono input. Allow period of about 30 seconds warm-up time. Now with the receptor volume control turned counter-clockwise, advance the volume control of the receiver or amplifier until the hum level is objectionable; then back up the control until the hum level reaches an acceptable level. This is the correct operating point for the receiver or amplifier volume control and it should be returned to approximately this setting whenever the receptor is used. If the above procedure is not used for determining the correct setting of the receiver or amplifier volume control, then unsatisfactory reception may be the result due to the overload and distortion in the receptor. Stations are selected by the right hand or tuning knob. Proper tuning will be accomplished when maximum volume level and maximum noise reduction have been attained. Although these points are very nearly coincident, tuning should always be accomplished by tuning for the "no noise" point after the maximum volume point has been located.

It is characteristic of FM receptors using the "ratio detector" system to show three points of tuning, located very close together on the dial, for each station. Only the center point of these three points will give best noise reduction, and this is the one that should always be chosen.

ALIGNMENT

The equipment required for proper alignment of this receptor is an unmodulated RF signal generator which will cover 10.7 megacycles and a range of 88 to 108 megacycles, and a DC voltmeter having a low range of 1 to 5 volts DC.

Connect the positive lead of the DC voltmeter to pin #5 of the 6AL5 detector tube, and the negative lead to pin #7 of the 6AL5. Apply an unmodulated 10.7 megacycle signal to the grid of the second 6BA6 IF amplifier tube, through an .05 microfarad coupling condenser. Tune the bottom adjustment screw of the detector coil for maximum indication on the DC voltmeter. This completes this part of the adjustment.

Next, locate the 220 ohm resistor which is connected to the center lug of three lugs of the detector coil (on the side next to the 6AL5 socket). Connect the negative lead of the DC voltmeter to the junction of this 220 ohm resistor and the lug on the support post. Connect the positive lead of the voltmeter to the receptor chassis. With the 10.7 megacycle signal still applied to the grid of the second 6BA6, tune the top adjustment screw of the detector coil for a point of zero voltage. If more than a half turn adjustment was necessary in either of the preceding steps, then both of the adjustments should be repeated.

I F ALIGNMENT

Without changing the signal generator frequency, introduce the 10.7

megacycle signal at a relatively high level into the antenna terminals. Connect the DC voltmeter between pins #5 and #7 of the 6AL5 detector tube. Rotate the tuning knob slightly to determine that the receptor is not receiving a harmonic of the signal generator, and is receiving the 10.7 megacycle signal. Adjust both top and bottom screws of the two IF transformers for maximum DC indication on the meter, keeping the signal level from the generator low enough so that this DC voltage does not exceed 5 volts.

R F ALIGNMENT

The RF section contains a double converter system in which the oscillator operates at one half signal frequency, minus 5.35 megacycles. The image frequency is so far away from the signal frequency that it is normally not necessary to locate or pay any particular attention tc the image during the alignment procedure. The DC voltmeter should be connected to pins #5 and #7 of the 6AL5 as it was during the alignment of the IF. Since the chassis must be removed from the cabinet and away from the dial scale for any alignment work, index points have been stamped on the dial backing plate to facilitate alignment. Rotate the tuning knob until the gang condenser is in the fully meshed position. and index the pointer with the calibration marker line farthest from the dial drum. Now rotate the gang condenser until the pointer is indexed with the marker line nearest the dial drum. The receptor should now be tuned to 108 megacycles. If the signal generator indicates that it is not tuned to 108 megacycles, rotate the oscillator trimmer (nearest the dial drum) a small amount until the signal is tuned in with the maximum voltage indication on the meter. The receptor is now properly calibrated to the dial markers and the antenna trimmer (farthest from the dial drum) and the converter trimmer (center) should be adjusted for maximum voltage indication on the DC voltmeter. The converter trimmer has a slight effect on the oscillator circuit and the tuning knob should be rocked back and forth slightly during the alignment of the converter trimmer in order to locate the point of maximum output. This completes the alignment of the receptor. The sensitivity should be checked over the band and normally should not vary more than approximately 6 db.

SERVICE DATA

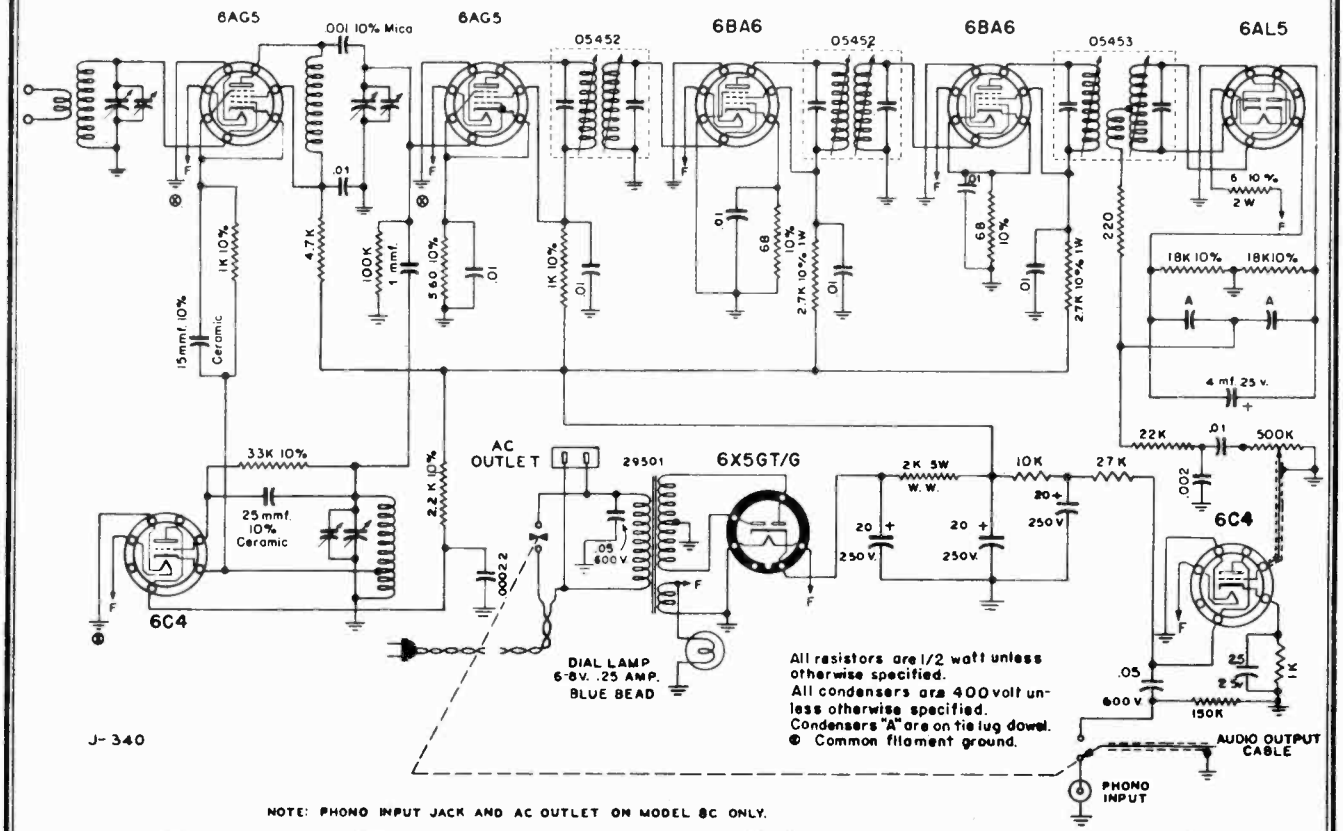
Power consumption - 35 watts (at normal Line)
Intermediate Frequency - 10.7 megacycles
Tuning range - 88 to 108 megacycles

Voltage Chart - The voltages tabulated in the table below are the correct voltages which should be measured between the socket terminal and chassis with nominal line voltage and no signal. All voltages measured with a high impedance voltmeter. Allowance should be made for loading if a low impedance voltmeter is used for checking.
*Electronic type meters may indicate a slightly negative voltage at this terminal.

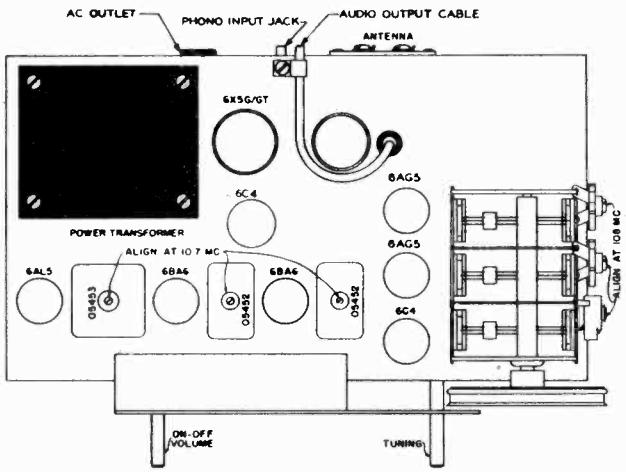
VOLTAGE CHART

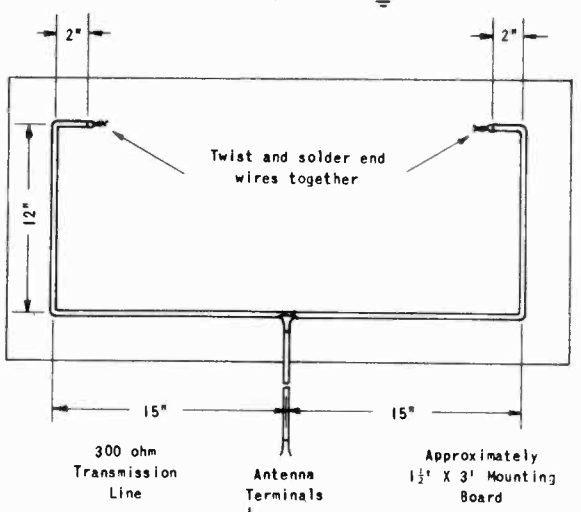
Terminal Number	1	2	3	4	5	6	7	8
6AG5 1st Converter	0	2.5	6.3AC	0	100	100	2.5	
6AG5 2nd Converter	0	1.8	6.3AC	0	110	110	1.8	
6C4 Oscillator	98	---	6.3AC	0	98	---	0	
6BA6 1st IF Amp.	0	0	6.3AC	0	77	77	0.7	
6BA6 2nd IF Amp.	0	0.8	6.3AC	0	80	80	0.8	
6AL5 Detector	0	0	4.7AC	0	Slightly plus	0	Slightly plus	
6X5GT Rectifier	0	0	170AC	Tie point	170AC	114	6.3AC	187 AC line
6C4 Audio	55	0	6.3AC	0	55	0*	2.0	

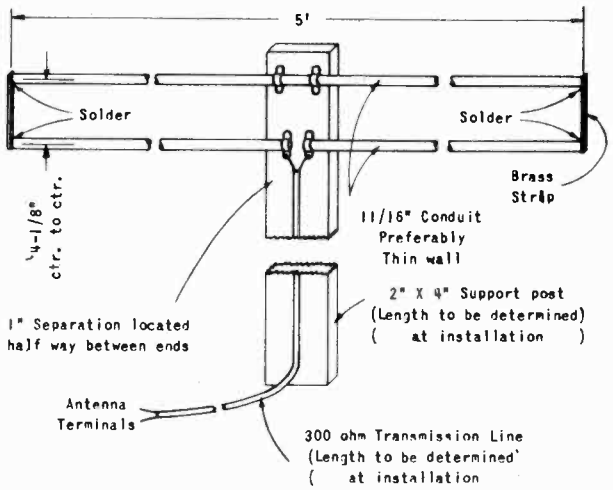
MODELS 8C, 8CK, Rev.



NOTE: PHONO INPUT JACK AND AC OUTLET ON MODEL 8C ONLY.







MEISSNER AM-FM RADIO-PHONOGRAPH
MODEL 16A

Installation-Operation Instructions

Specifications

Power Supply: 105-120 volts, 50-60 cycles.
CAUTION: DO NOT ATTEMPT TO OPERATE ON OTHER SUPPLY.
Power Consumption: 130 watts.
Type of Circuit: Superheterodyne.
Intermediate Frequencies: AM 455 kc.
FM 10.7 mc.
Pointer Travel: 9".
Tuning Knob Ratio: 18:1.
Antenna Impedance: Broadcast - Standard
F M - 300 ohms

Nominal Performance

Sensitivity: 5 microvolts AM.
Approximately 10 microvolts for 30 db quieting on FM.
Audio Fidelity: Flat within ±2 db from 100 to 10,000 cycles, tone controls clockwise.
Band Width at 1000 kc - 7 kc at 2X down.
Output: 8 watts at 5% distortion.
Tone Control Action:
Bass boost at 40 cycles plus 18 db.
Treble suppression at 8,000 cycles - 13 db.
Hum: 58 db below full output, full bass boost (on phono).

Antenna - Ground

There is a 5 terminal strip near the back of the chassis for connection to the FM antenna, AM antenna, and ground. the FM antenna may be indoors or outdoors, preferably of the folded dipole type. The two left-hand terminals marked FM are for connection of the twin lead 300 ohm transmission line from the FM antenna.

A separate AM antenna may be used by connecting to the AM antenna terminal at the right, or the FM antenna and transmission line may be used as the AM antenna. This is done by connecting a jumper wire between terminal X and the AM antenna terminal.

A heavy ground connection, as short as possible, should be connected to the ground terminal at the center. Cold water pipes or a galvanized rod driven several feet into the ground make good grounds, but the use of hot water, steam pipes, or metal conduit should be avoided. The use of a good ground connection will do much to minimize the pickup of electrical interference carried into the tuner by way of the power line.

Tone Controls

Bass: 18 db control at 40 cycles, 12 db at 100 cycles.
Treble: 10 db control at 6000 cycles, 15 db at 10,000 cycles.

RESISTANCE READINGS in ohms

Pins to Chassis

Sw. Pos.	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
AM	6BA6 R F	2.2 Meg.	0	--	0	5.1K	5.1K	68		
AM	6BE6 Conv.	22K	0.5	--	0	5.1K	5.1K	2.2 Meg.		
AM	6BA6 1st IF	2.2 Meg.	470	--	0	5.1K	52K	470		
AM	6BA6 2nd IF	680K	470	--	0	6.1K	52K	470		
AM	6AL5 Det.	0	1.1 Meg.	--	0	470	Inf.	130K		
AM	12AY7	35K	500K Vol.Cont.	1K	--	--	21K	470K	1K	0
FM	6AG5 R F	0	120	--	0	14.4K	14.4K	120		
FM	12AT7 Conv.	14.4K	470K	2.2K	---	--	14.4K	10K	0	0
FM	6BA6 1st IF	1.0 Approx.	0	--	0	16.1K	16.1K	68		
FM	6BA6 2nd IF	1.0 Approx.	0	--	0	16.1K	16.1K	68		
FM	6AL5 Det.	Inf.	Inf.	2.0 Approx.	0	6.8K	Inf.	6.8K		
FM	12AY7	40K	500K Vol.Cont.	1K	--	--	24K	470K	1K	0
PHONO	12AY7	40K	500K	1K	--	--	24K	470K	1K	0

Power Amplifier

		Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
FM	6J5	0	--	94.6K	Tie Lug 40K	1 Meg.	Tie Lug 47K	0	50.kK
FM	6SN7	470K	116K	3.3K	470K	116K	3.3K	0	--
FM	6V6GT #1	0	*	16.1K	15.6K	220K	0	*	AVE 290
FM	6V6GT #2	0	*	16.1K	15.6K	220K	Inf.	*	AVE 290
FM	5V4G	Inf.	16.2K	Inf.	70	Inf.	70	Inf.	16.2K

* Pins 2 and 7 are not returned to chassis.

VOLTAGE CHART

AC with 1,000 ohms/volt
DC with 20,000 ohms/volt

117 V AC Line

Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
			A.M.	No Signal					
6BA6 R F	Slightly negative	0	6.3AC	0	88	88	1.0		
6BE6 Conv.	Slightly negative	0	6.3AC	0	88	88	Slightly negative		
6BA6 1st IF	Slightly negative	1.6	6.3AC	0	88	47	1.6		
6BA6 2nd IF	Slightly negative	1.5	6.3AC	0	1.5 1.5	45	1.5		
6AL5 Det.	0	Slightly negative	6.3AC	0	1.5	0	Slightly negative		
12AY7 Aud.	80	0	1.7	6.3AC	6.3AC	55	0	0.85	0
				F.M.					
6AG5 R F	0	1.0	6.3AC	0	92	92	1.0		
12AT7 Conv.	100	0	2.4	6.3AC	6.3AC	97	Slightly negative	0	0
6BA6 1st IF	0	0	6.3AC	0	73	73	0.7		
6BA6 2nd IF	0	0	6.3AC	0	73	73	0.7		
6AL5 Det.	Slightly negative	Slightly positive	4.6AC	0	Slightly positive	0	Slightly negative		
12AY7	87	0	1.9	6.3AC	6.3AC	60	0	0.92	0
				PHONO					
12AY7	160	0	3.4	6.3AC	6.3AC	108	0	1.6	0
				P.A. with Set on A.M.					
6J5	0	6.4AC	173	Tie Lug 245	10.5	Tie Lug 72	0	75	
6SN7	0	155	7.1	0	155	7.1	0	6.4VAC	
6V6GT #1	0	*6.4AC	290	270	0	0	*6.4AC	15	
6V6GT #2	0	*6.4AC	290	270	0	0	*6.4AC	14	

*Measured between pins 2 and 7.

MODEL 16A

AM Alignment

I F Alignment

Set selector switch on receiver to AM. Set tuning dial to 1600 kc.
Set signal generator to 455 kc with 30% modulation at 400 c.p.s.
Connect high side of signal generator to pin 7 of 6BE6 through 0.1 mfd. condenser, low side to chassis. Connect output meter to high side of volume control and chassis.
Using as low output from signal generator as possible, adjust top and bottom cores of the three AM I F transformers for maximum output.

R F Alignment

Fully mesh gang condenser and adjust pointer position to match scratch mark at left on dial backing plate.
Set receiver and signal generator to 1400 kc.
Move high side of signal generator to antenna terminal through 200 μμfd. condenser. Adjust antenna and R F trimmers for maximum output.
Adjust oscillator trimmer at top of large front gang section for maximum output. Adjust R F trimmer at top of large middle gang section for maximum output.

FM Alignment

I F Alignment, using FM signal generator and oscilloscope.

Set selector switch on receiver to FM.
Connect high side of FM signal generator through .01 mfd. condenser to pin 1 of 6BA6 2nd I F amplifier. Connect low side to chassis. Connect vertical input of oscilloscope to point A, the ground to chassis. Connect horizontal input of oscilloscope to "Sync" terminal, the ground to ground terminal of signal generator, using a phasing control to compensate for phase shift.
Set deviation to 200 kc at 400 c.p.s. modulation on 10.7 mc. Set output to approximately 0.1 volt. Set horizontal sweep selector of oscilloscope to horizontal amplifier. Adjust both cores of ratio detector coil, bottom slug for maximum amplitude and top slug for symmetrical pattern with a linear center portion.
Move high side of signal generator to pin 1 of 6BA6 1st I F amplifier, using same dummy. Set deviation to 150 kc. Adjust both cores of 2nd I F transformer for maximum amplitude and symmetry of pattern.
Move high side of signal generator to pin 2 of 12AT7 converter tube, using same dummy. Adjust both cores of 1st I F transformer for maximum amplitude and symmetry of pattern.
With same signal generator connection, check adjustment of cores of 2nd I F transformer. Ordinarily, readjustment of the ratio detector cores is unnecessary. If the pattern is not symmetrical with a linear center portion, the entire alignment procedure must be repeated.

I F Alignment, using AM signal generator and V T V M.

Set selector switch on receiver to FM.
Connect high side of signal generator to pin 1 of 6BA6 2nd IF amplifier through .01 mfd. condenser. Connect low side to chassis. Set generator to 10.7 mc. with no modulation and set output to about 0.1 volt. Connect d.c. probe of VTVM to pin 7 of 6AL5 ratio detector and connect common to chassis. Adjust bottom core of ratio detector coil for maximum negative reading.
Connect d.c. probe to point "A" and adjust top core for zero reading. Repeat these two steps.
Connect d.c. probe to pin 7 of 6AL5. Connect high side of signal generator to pin 1 of 6BA6 1st IF amplifier, using same dummy. Adjust top and bottom cores of 2nd IF transformer for maximum negative reading.

Connect signal generator to pin 2 of 12AT7 converter, using same dummy. Adjust top and bottom cores of 1st IF transformer for maximum negative reading.

With same signal generator connections, re-check core adjustments of 2nd IF transformer for maximum negative reading.

Connect d.c. probe to point "A" and re-check for zero reading. Little or no further adjustment of the top core of the ratio detector coil should be necessary. If the reading is much off from zero, the entire alignment procedure should be repeated.

R F Alignment

Set selector switch on receiver to FM.

Connect high side of FM signal generator through .01 mfd. condenser to pin 2 of 12AT7 converter. Connect low side to chassis.

Set signal generator and receiver to 108 mc. Set deviation to 75 mc at 400 c.p.s. modulation.

Connect output meter to point "A" and chassis.

Carefully adjust oscillator trimmer, at top of small front gang section, for maximum output, starting at minimum trimmer capacity and selecting the first response reached. Use as low output from signal generator as is practical.

Set signal generator and receiver to 88 mc. Squeeze or spread oscillator coil to obtain maximum output.

Repeat the above two steps until no further improvement results.

Connect high side of signal generator to pin 1 of 6AG5 RF amplifier, using same dummy. Set signal generator and receiver to 108 mc. Adjust RF trimmer at top of small center gang section, for maximum output, rocking tuning dial slightly to compensate for oscillator pulling. Reset oscillator trimmer to match pointer to 108 mc. dial scale mark.

Set signal generator and receiver to 88 mc. Squeeze or spread RF coil to obtain maximum output, rocking tuning dial. Repeat RF trimmer adjustment at 108 mc. and coil adjustment at 88 mc. until no further improvement results, resetting oscillator trimmer if necessary.

Connect terminals of signal generator to antenna terminals, using a 150 ohm carbon (non-inductive) resistor in series with each terminal.

Set signal generator and receiver to 108 mc. Adjust antenna trimmer, at top of small rear gang section for maximum output.

Set signal generator and receiver to 88 mc. Squeeze or spread antenna coil secondary for maximum output. Repeat last two steps until no further improvement results.

Operation

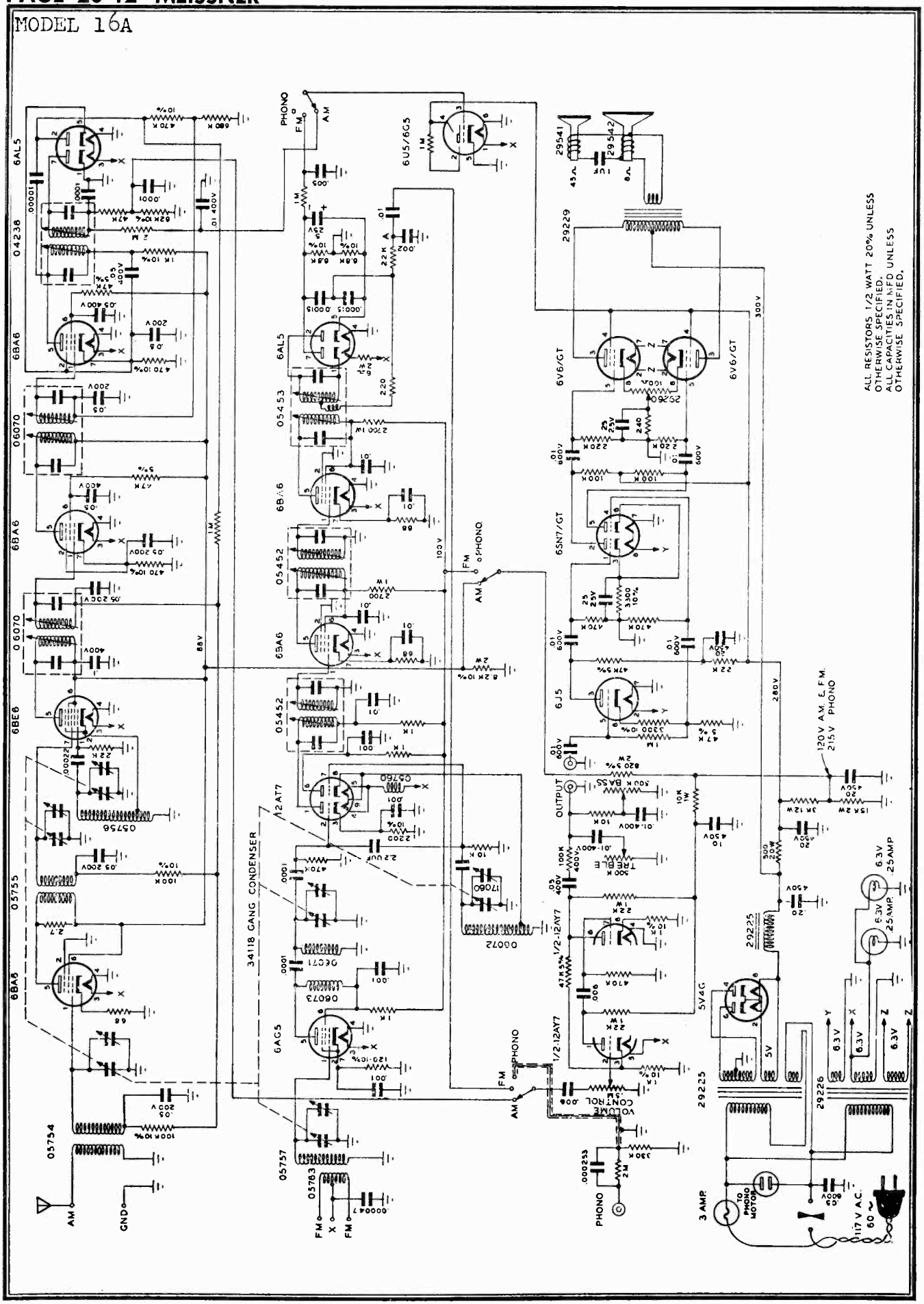
AM reception is obtained by turning the selector switch counter-clockwise to the AM position. The tuning knob is rotated to select stations. Proper tuning is indicated by maximum closing of the tuning eye.

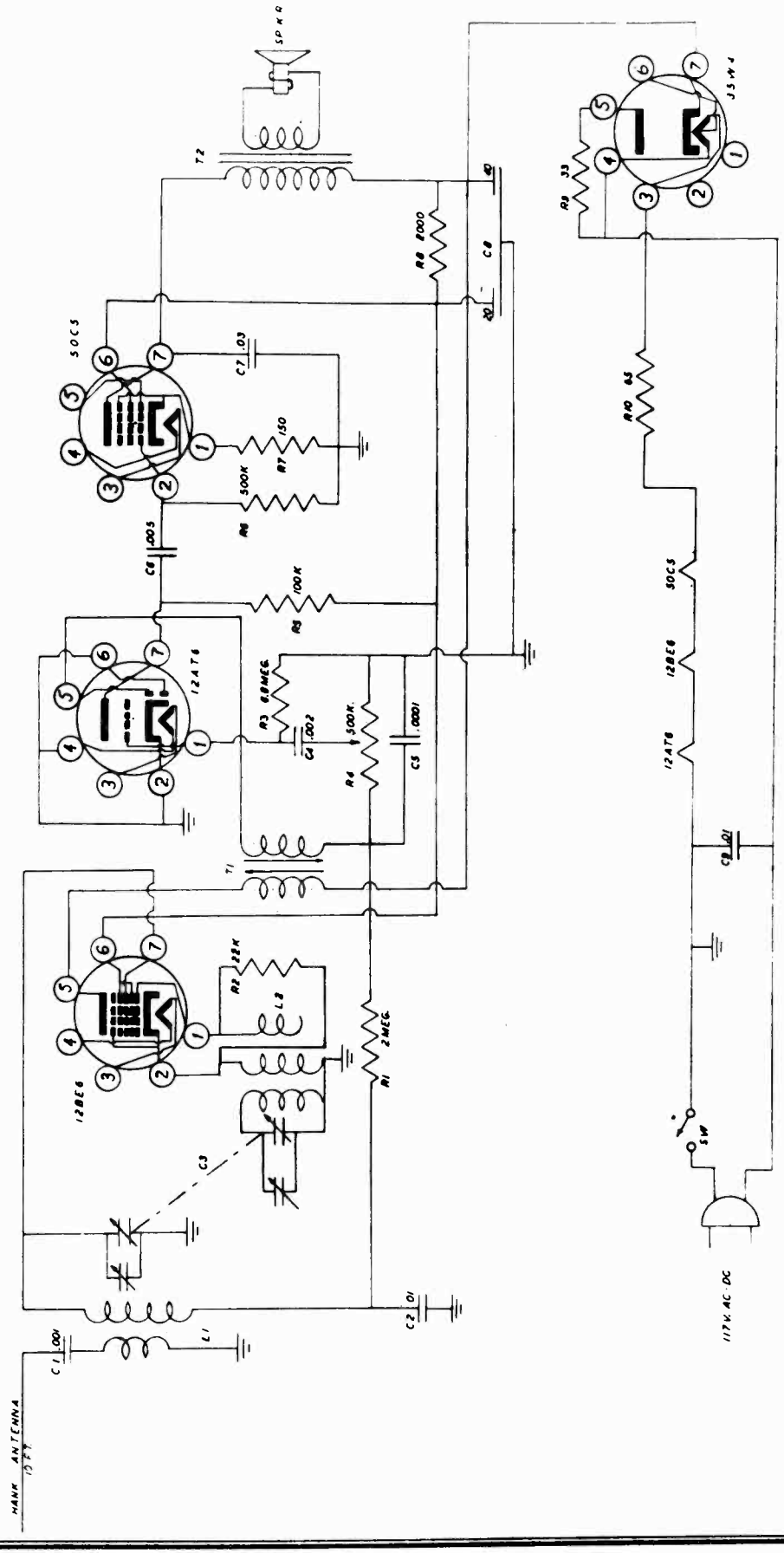
FM reception is obtained by turning the selector switch to the FM position. Tuning is accomplished as for AM, normally, three points of reception close together will be observed on FM stations. The correct point for reception is the center one, as indicated by the tuning eye.

Phonograph operation is obtained by turning the selector switch clockwise to the phono position and operating the automatic record-changer according to instructions.

Bass boost is obtained by rotating the bass control counterclockwise. Treble suppression is obtained by rotating the treble control counter-clockwise.

MODEL 16A

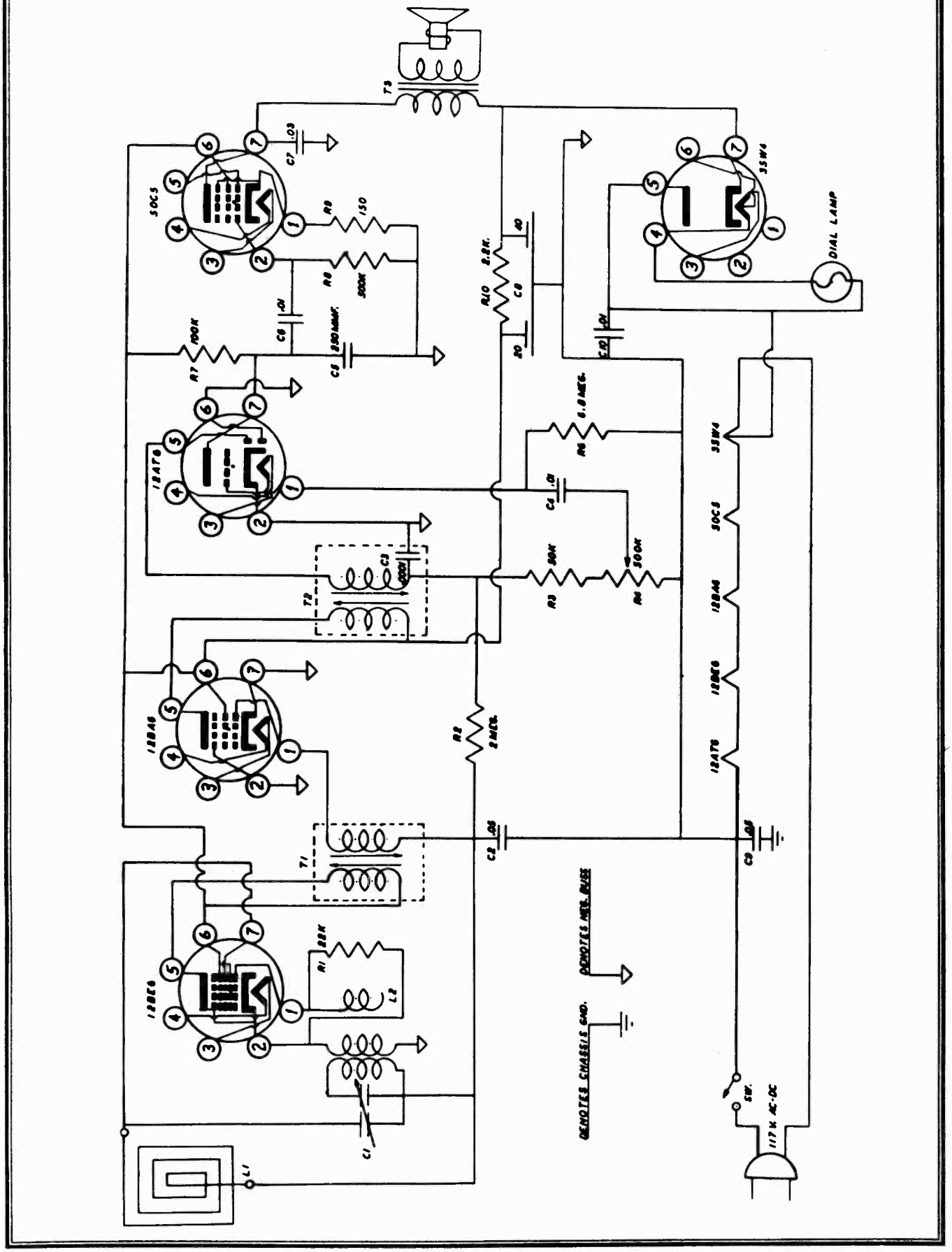




MODEL 1010

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., ½ watt
R2		Resistor, composition, 22k., ½ watt
R3		Resistor, composition, 6.8 meg., ½ watt
R4	26G008	Resistor, variable, 500k ohms
R5		Resistor, composition, 100k., ½ watt
R6		Resistor, composition, 500k., ½ watt
R7		Resistor, composition, 150 ohms, 1 watt
R8		Resistor, composition, 2k., 1 watt
R9		Resistor, composition, 33 ohms, ½ 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'K'R	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

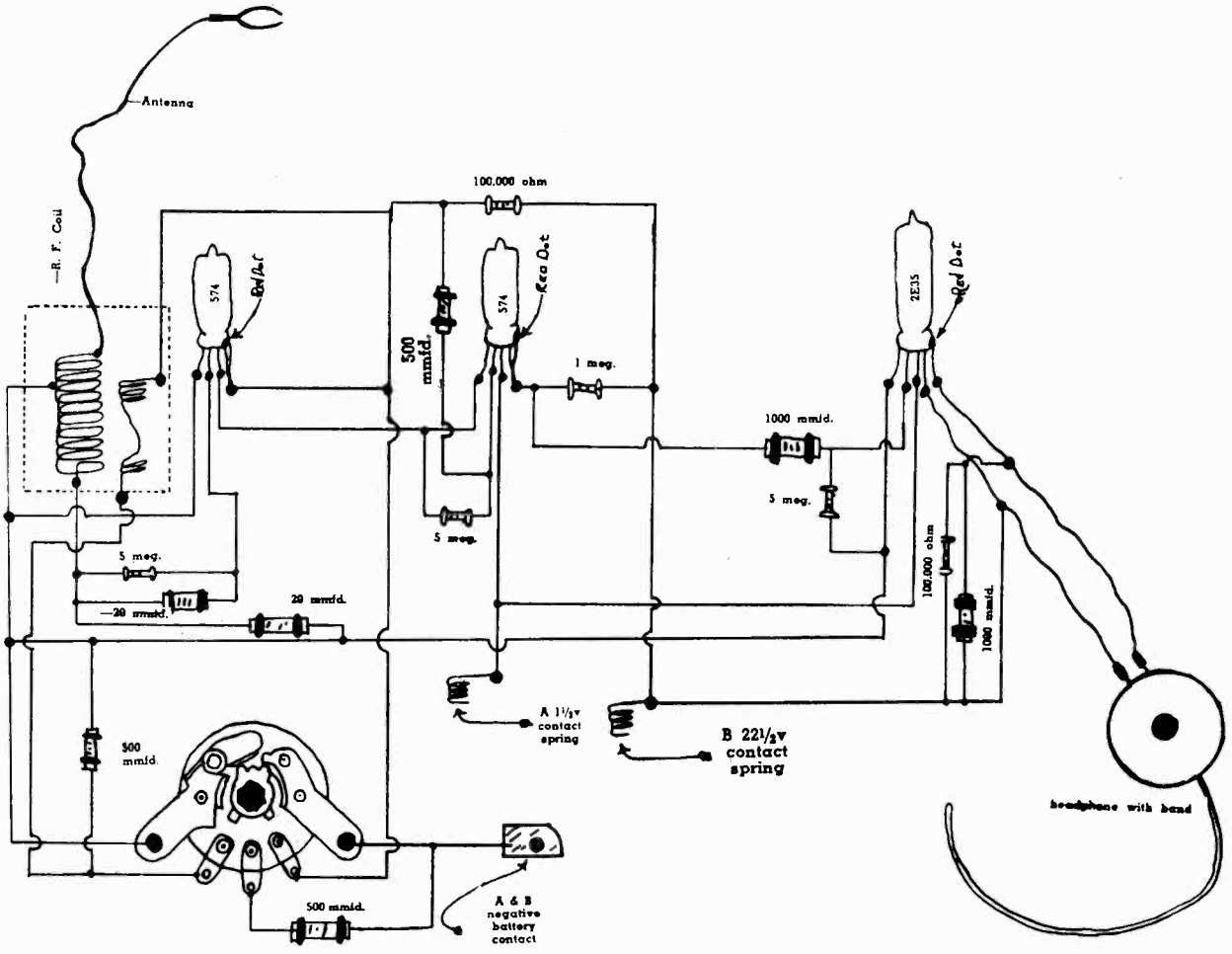


MODEL 1020

	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 min. cap.	across V.C.	Adjust T2 top & bottom slug for max output. Adjust T1 top and bottom slugs for max. output
2.	50mmf	Connect gen. Hi side to antenns 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, ½ w.
R2		Resistor, composition, 2 meg., ½ w.
R3		Resistor, composition, 50k, ½ w.
R4	26G009	Resistor, variable, 500k, w/switch
R6)		
C4)	40L103	Caprister, 6.8 meg., ½w. .01 mfd, 400v
R7&C5	40L101	Caprister, 100k, ½ w., 250mmf., 400v.
R8&C6	40L102	Caprister, 500k, ½w., .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, 100mmf., 400v., (inT2)
C7		Condenser, paper tubular, .03mfd., 400v.
C8	31E003	Condenser, electrolytic, 40X20mfd, 150v.
C10		Condenser, paper tubular, .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	15D001	Transformer, audio output
SPEAKER	19H101	Speaker, 4" P.M.
Dial Lamp		Lamp, dial. miniature bayonet No. 47
Sw.		Switch, off-on, on vol. cotrol R4
	40B008	Cabnet, plastic, walnut
	40B009	Cabinet, plastic, ivory
	2R100	Pointer, dial
	2Q103	Glass, dial plate with calibration
	5D008	Knob, push on, split knurl
1 2BE6		12BE6
12BA6		L 12BA6
12AT6		12AT6
		50C5
50C5		35W4
35W4		
	11G006	Cover, back, chipboard

MODEL Micro
Pocket Radio



Your Micro Radio kit contains all the necessary parts for building the complete set.

You will also need solder, soldering iron, and a screw driver.

The pictorial schematic diagram and photographs of both sides of the chassis show correct plocement of parts.

To construct your set—

1. Solder in wires that compose the circuit.
2. Install condensers.
3. Install resistors.
4. Install tubes—IMPORTANT! The plate lead on these tubes are color coded with a red dot on the side of the glass tube envelope. This will be referred to as No. 5 lead. The leads of each tube are:
   - No. 5—Plate.
   - No. 4—Screen .
   - No. 3—Filament positive.
   - No. 2—Control grid.
   - No. 1—Filament negative.
5. Attach RF coil to the chassis as shown in photo.
   This coil must be attached in such a manner that it misses the large screw hole on the bottom of the chassis, to allow the radio to be cased without damage to the coil.
6. Solder the headphone leads to the screen and plate of the output tube.
7. Attach the two contact springs for battery positive contacts.
8. Solder in antenna.
10. Attach clip to the other end of antenna wire.

The instrument is now ready to be tested. Place the chassis in the bottom half of the case, and insert the four self-tapping screws through the case and the chassis. This will allow the chassis to be held firmly in place, and thus enable you to insert the batteries to make contact with the negative and positive contacts.

Attach the metal clip on the antenna to an aerial connection—such as the metal portion of a

MODEL Micro
Pocket Radio

telephone, lamp, outside antenna, or similar object. Now insert the batteries, making certain that the metal plate on the bottom of the case slide touches the bottom of both batteries, and the small metal plate on the chassis below coil. Now put the iron core (slug) halfway in the RF coil. It is wise to attach the small plastic button temporarily on the bent screw in the iron core for easier tuning.

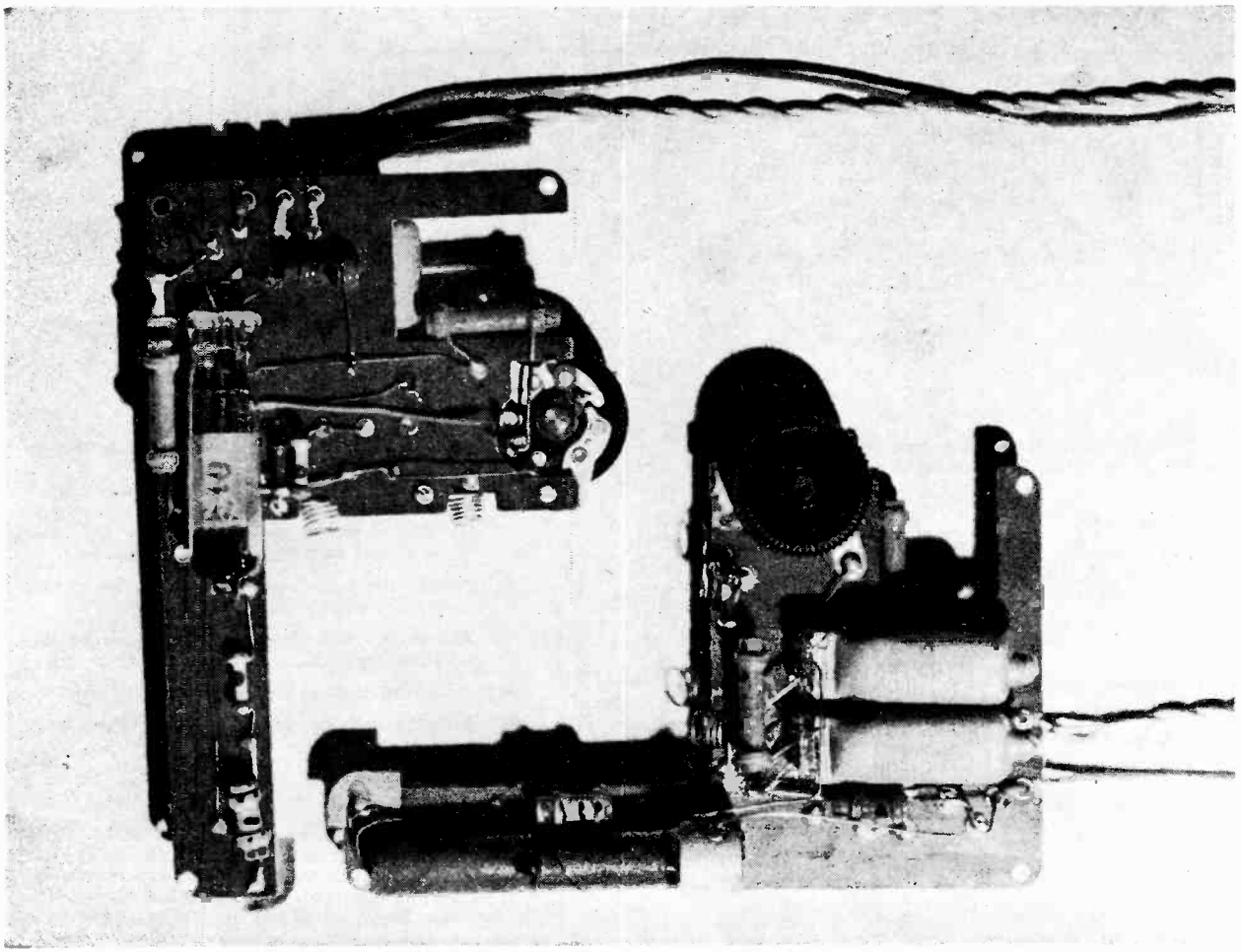
Turn the switch on, and slide the slug slowly back and forth in the coil until you hear a whistle, which is the signal of a radio station. (If this whistle is not heard, you probably have the connections to the tickler winding reversed).

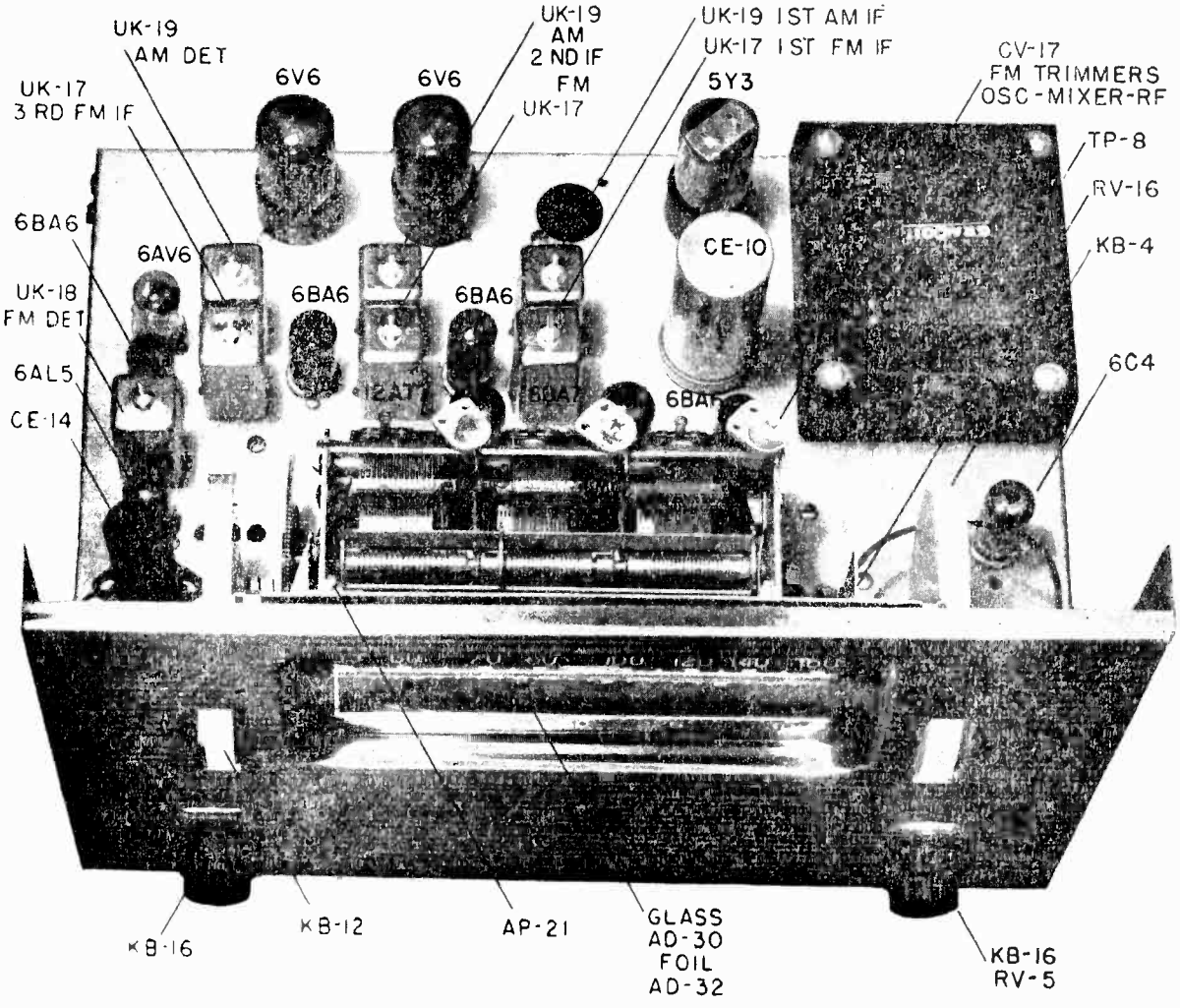
After you hear the whistle, back the volume control down until the whistle disappears, then retune by moving the iron core back and forth just a trifle until the station is properly tuned in.

If your radio brings in stations, it is now ready to be cased. Remove the batteries, then place the spring over the bent brass screw of the slug, and the brass washer on top of this spring. Now put the top half of the case in place, in such a manner that hte end of the brass screw in the slug will come through the slot provided for tuning.

Tighten the four screws in the case. Cut off the brass screw so that it does not extend beyond the outside of the case more than 1/16". Screw the plastic tuning knob to the threaded portion of the brass screw.

After this is done, place the batteries back in the instrument in the proper manner, making sure that the metal portion of the bottom of the slide makes contact with the bottom of the A battery, the bottom of the B battery, and the metal plate—and your Micro Radio is complete.





SPECIFICATIONS

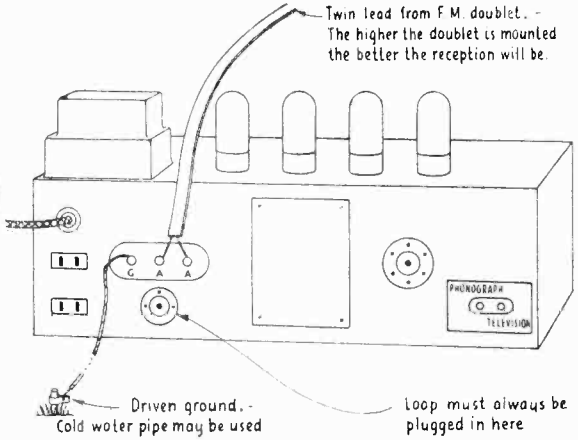
Power Requirement: 120 volts, 50 to 60 cycles, 110 watts.
Frequency Coverage:
AM Band – 540 to 1600 KC
FM Band – 88 to 108 MC
Audio Sensitivity: .05 volts for ½ watt output.
Maximum Undistorted Audio: 10 watts.
AM Sensitivity: 2 to 4 microvolts.
FM Sensitivity: 100 microvolts, quieting signal.
10 microvolts, minimum signal.

Tube Complement:

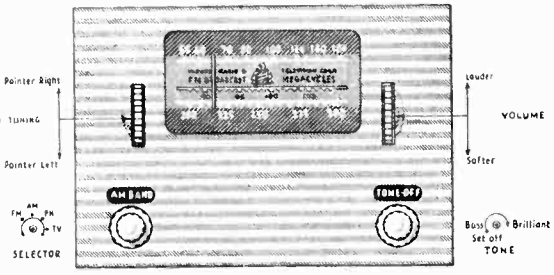
RF	6BA6	FM Detector	6AL5
Mixer	6BA7	1st AF & AM Det.	6AV6
Oscillator & AFC	12AT7	Phase Inv.	6C4
1st IF	6BA6	AF output	6V6GT
2nd IF	6BA6	AF output	6V6GT
3rd IF, FM	6BA6	Rectifier	5Y3GT

INSTALLATION

The Midwest Radio & Television receivers have built-in antennae for satisfactory reception of signals on the broadcast band, short wave and FM bands where the location is not unfavorable. In homes or apartments where steel is used extensively, such as for beams and concrete reinforcements or lath, or in rural areas distant from the broadcasting stations an FM doublet must be installed. The straight doublet antenna is directional only on the FM broadcast band so that it need be oriented only with respect to the FM transmitter location. The Midwest Model **DP** di-pole is a special design which is not directional and we recommend it for use with Midwest receivers for FM, broadcast and short wave reception.



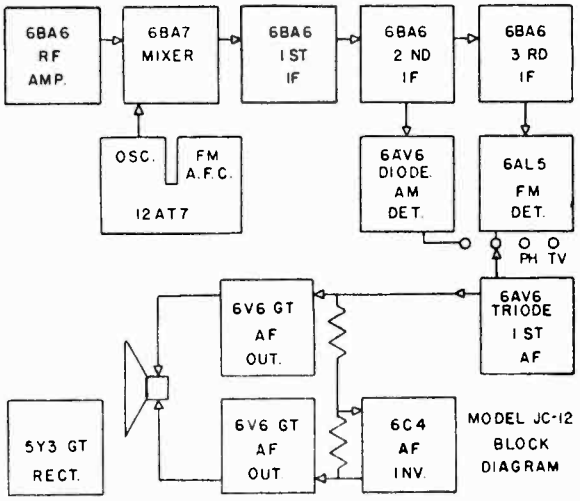
PRECAUTIONS. Be sure that the speaker and Magna Tenna Loop are plugged in; also the flexible dipole leads must be connected to screw strip at "A–A". A ground wire may be connected to "G" but it is usually not needed.



MODELS C-12, RC-12, SK-12; Ch. JC-12

Noise and interference is usually due to causes external to the receiver and requires diagnosis and correction by the local service technician.

Trouble may be diagnosed for this receiver as a standard superheterodyne. The block diagram is printed here.



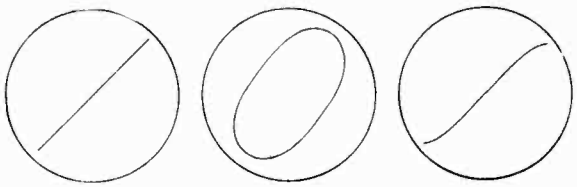
ALIGNMENT

The alignment points are shown on the top and bottom views of the chassis as well as certain parts numbers.

AM IF should be aligned at 456 KC. There are three transformers and six adjustments; the transformers are coupled with less than critical coupling and there is only one peak. Couple the generator into the mixer grid and use either AVC or audio for the output meter.

FM IF should be aligned at 10.7 MC. There are four transformers and eight adjustments; the transformers are over-coupled and must be aligned with a scope and sweep generator.

1. Connect generator to 3rd IF grid and vertical output of scope to the audio of the receiver at any point where sufficient signal is available and phasing can be properly adjusted.
2. Adjust the top screw for greatest length of straight line. This is the secondary winding, the bottom screw should give improvement in signal level.



A B C

A does not have the hook indicating that the sweep generator has a greater deviation than the detactor capability.

B shows improper phasing of the horizontal sweep with the audio output of the receiver.

C is preferred because it shows the limits of deviation and you obtain it simply by adjusting the deviation (sweep width) control on the signal generator. Approximately 150 KC is normal.

3. Connect generator to 2nd IF gird and adjust the 2nd IF slugs for maximum signal **and** band width. This you can be sure of by the amount of hook at the ends of the line on the scope. Repeat this procedure for 1st IF grid and mixer grid. Adjust for greatest signal without appreciable loss of band width.

Alternate Method: The IF response of the 1st, 2nd and 3rd transformer may be observed more directly if you use a crystal detector at the plate of the 3rd IF tube and feed the vertical plates of the scope from that point. Use a CW marker at 10.7 to be sure the double peaked response curve straddles the ratio detector response. Observe each stage separately.

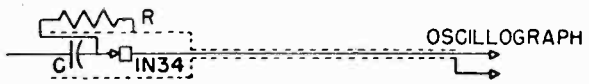
Notice: Do not use AM or CM signal to peak the FM transformers. Regeneration may result and bandwidth and noise rejector will be poor, although signal strength will increase.

FM RF should be trimmed at 105 MC. There should not be any reason to adjust the low end but if this is necessary it can be done by distorting the FM coils on the tuning gang.

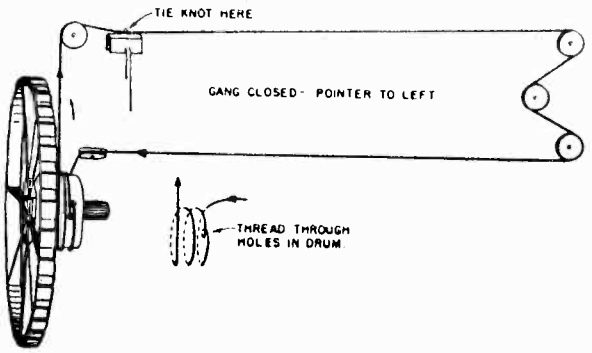
AM RF should be peaked at the high end with the trimmer and at the low end by core adjustment.

Notice: Use as low signal input as possible for readable output indication. Feed signal in from FM RF generator through 150 ohms in each lead to "A-A." Use 400 ohms in lead from AM RF generator and connect to either "A" terminal.

A very convenient design is shown here schematically of a Crystal probe for detection of resonant response for display on the oscillograph and your available materials will decide the physical design; most important feature is the ability to change the load resistor, R.



The value for C is limited by the physical size, any capacity greater than 100 mmfd will be satisfactory, the value of R should be 470 ohms when the probe is used in the IF stages to obtain the response of the grid circuit without effects from the tuned plate circuit whereas a value of 470K ohms is alright for general use,



For dial stringing use a light weight dial cord such as Bevin-Wilcox 6-18 Imperial silk cord.

Radio Band	Coil Adj.	Trimmer Adj.
AM	560 KC	1500 KC
FM	.....	105 MC

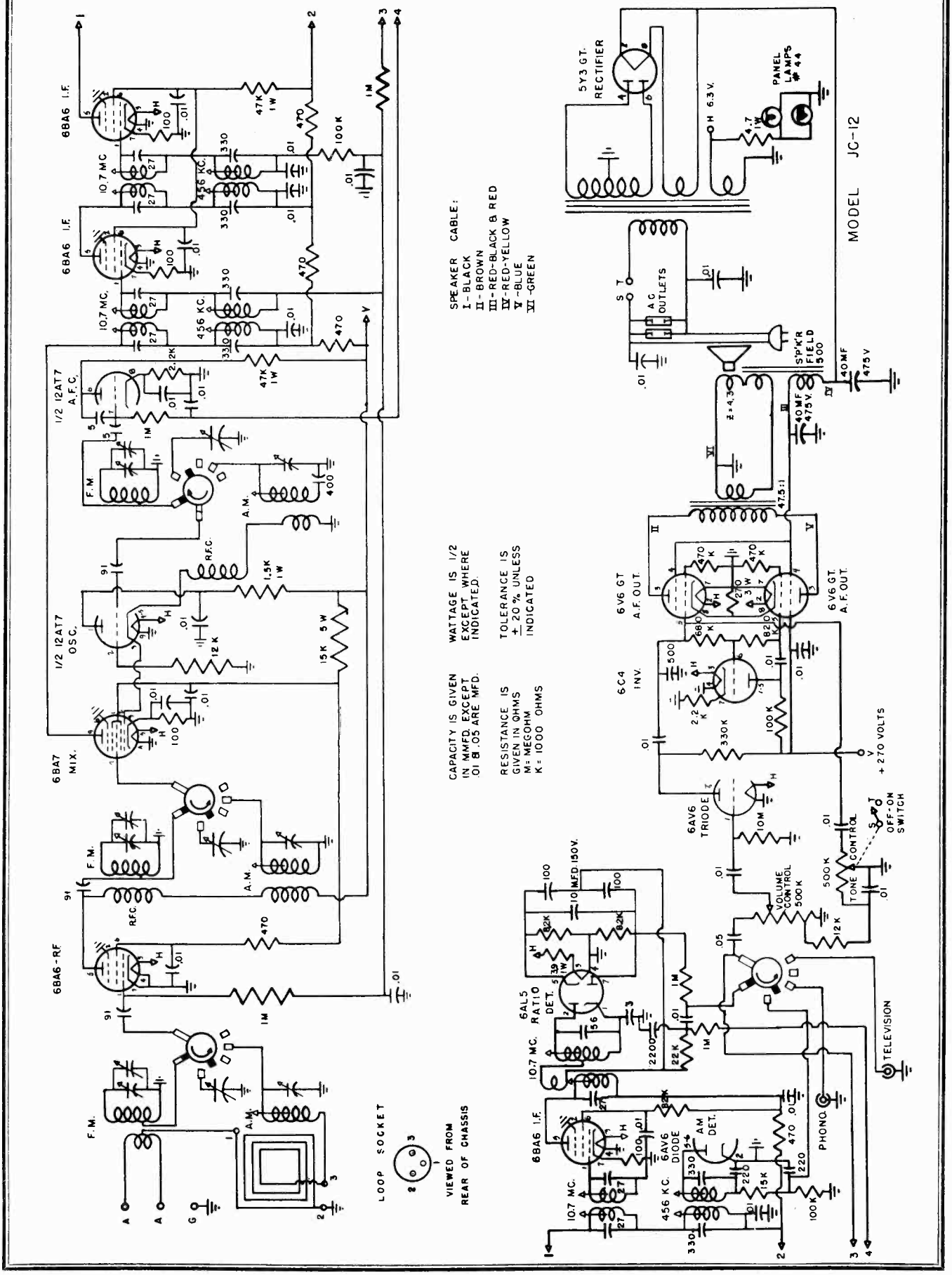
If replacement parts of identical manufacture and rating are not available for service repairs these should be ordered from Midwest Radio & Television Corporation, giving model number and serial number of the chassis and name of the part.

Repair data for the record changer mechanism is available separately, please specify Model.

The dial calibration for the Band Standard Broadcast, is from 55 to 160; if you add a zero to these numbers they will represent kilocycles. For example 700 kilocycles, WLW, appears on the dial as 70.

Your FM Broadcast band is calibrated in channel numbers; these channel numbers were assigned by the Federal Communications Commission for the convenience of the general public. However, in many parts o fthe country FM stations use a frequency designation so that we repeat the calibration in megacycles on the foil dial.

MODELS C-12, RC-12, SK-12; Ch. JC-12



MODELS C-16, RC-16, SK-16; Ch. JC-16

SPECIFICATIONS

Power Requirement: 120 volts, 50 to 60 cycles, 110 watts.
Frequency Coverage:

Band A – 540 to 1600 KC, AM
Band B – 1.6 to 4.7 MC
Band C – 4.7 to 10 MC
Band D – 11 to 22 MC
Band E – 88 to 108 MC, FM

Audio Sensitivity: .05 volts for ½ watt output.

Maximum Undistorted Audio: 10 watts.

AM Sensitivity: 2 to 4 microvolts all bands.

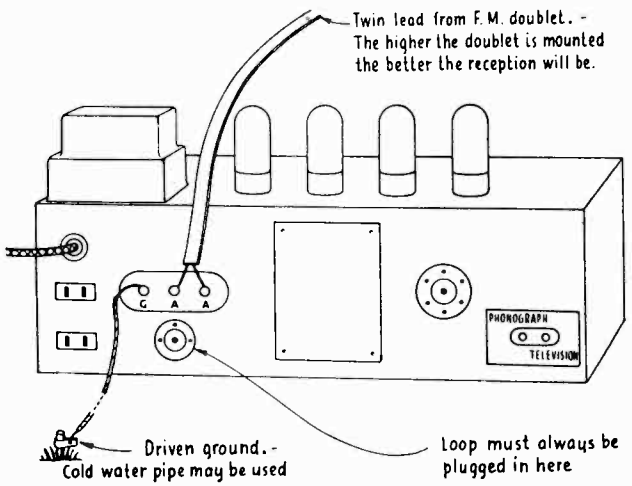
FM Sensitivity: 100 microvolts, quieting signal.
10 microvolts, minimum signal.

Tube Complement:

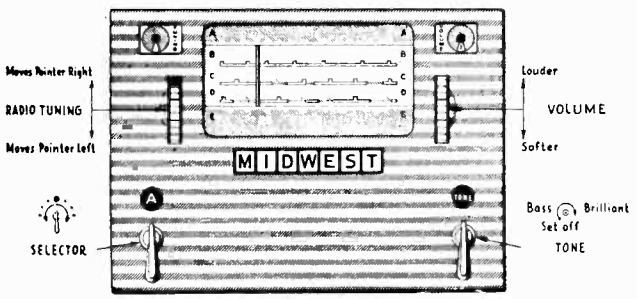
RF	6BA6	FM Detector	6AL5
Mixer	6BA7	1st AF	6C4
Oscillator	½ 12AT7	2nd AF	6C4
AFC	½ 12AT7	Phase Inv.	6C4
1st IF	6BA6	AF output	6V6GT
2nd IF	6BA6	AF output	6V6GT
AM Detector	6AL5	Rectifiers, two	5Y3GT
3rd IF, FM	6BA6	Tuning Ind.	6U5

INSTALLATION

The Midwest Radio & Television receivers have built-in antennae for satisfactory reception of signals on the broadcast band, short wave and FM bands where the location is not unfavorable. In homes or apartments where steel is used extensively, such as for beams and concrete reinforcements or lath, or in rural areas distant from the broadcasting stations an FM doublet must be installed. The straight doublet antenna is directional only on the FM broadcast band so that it need be oriented only with respect to the FM transmitter location. The Midwest Model **DP** di-pole is a special design which is not directional and we recommend it for use with Midwest receivers for FM, broadcast and short wave reception.



PRECAUTIONS. Be sure that the speaker and Magna Tenna Loop are plugged in, also the flexible dipole leads must be connected to screw strip at "A–A". A ground wire may be connected to "G" but it is usually not needed.



The controls are two wheels whose rims extend through the panel on either side of the dial, and two chrome levers.

Operation is actually simple as ABC if you follow the steps as outlined here.

A. To turn set **ON** rotate the **TONE** lever to the right. Adjust for most pleasing tone after your program is tuned in.

B. Turn **SELECTOR** lever so that desired Radio Band, Phonograph or Television adapter is indicated in the round window above this lever. Note that A is the Standard Broadcast Band.

C. Tune to the desired station by rotating the **TUNING WHEEL** up or down to move the pointer across the dial. For your convenience a **TUNING INDICATOR** is placed above the Tuning Wheel. It may not close entirely or may flicker on noise; the minimum dark area is the point of correct tuning.

D. To increase volume rotate the **VOLUME WHEEL** up. To decrease volume rotate wheel downwards. The **VOLUME INDICATOR** shows a number from 1 to 8 and by noting the number you can set the volume before the set warms up and thus avoid too much or too little volume.

These same steps are described here in greater detail, with suggestions and further information about the use of the controls. Your Midwest receiver provides radio reception, phonograph reproduction and a television adapter position. Radio reception includes the standard American Broadcast band (AM), the FM Broadcast band and three short wave bands where you may receive Amateur, Police, and Commercial stations plus broadcasts on seven International Broadcast bands. These seven International Broadcast bands are indicated in red on the dial.

The automatic record changer will play automatically all records, all speeds and all sizes. After the stack of records is played the changer automatically shuts off. To turn the receiver **ON** rotate the **TONE** control lever clockwise. The **OFF-ON** switch is operated by the first few degrees of rotation of the **TONE** control, after which it serves to change the tone, reducing bass and boosting highs as it is rotated clockwise. Since the best fidelity is obtained when this control is at the intermediate position it is best to leave it in this position until all adjustments are completed. After which it may be returned to the setting most pleasing to you. This will depend somewhat upon the kind of program being received.

The next step to select the type of entertainment you wish is to turn the **SELECTOR** lever. The lever has seven positions where the following letters appear in the round window directly above it: **TV, PH, A, B, C, D** and **E**. The letters represent television adaptor, phonograph, and radio bands A–Standard American Broadcast, BCD–short wave bands and E–FM Broadcast.

Having selected one of the radio bands, preferably the American Broadcast band A for first trial, roll the **VOLUME** control wheel up to increase volume until some sound or signal is heard. The position of the volume control is indicated by the numeral in the window above this control.

To tune to any station roll the radio **TUNING** control wheel up or down; upwards motion moves the dial pointer to the right and downwards rotation of the **TUNING** drum moves the pointer to the left.

The dial calibration for the A band, Standard Broadcast, is from 55 to 160; if you add a zero to these numbers they will represent kilocycles. For example 700 kilocycles, WLW, appears on the dial as 70.

Above the tuning control is a rectangular window for the tuning indicator. This feature has been added to assist you in correctly tuning in the station; unless the station is properly "tuned-in" distortion, noise, low volume and poor tone will result. As you tune into a station you will notice that the dark segment closes, as you pass the station the dark segment begins to open again. Proper tuning is indicated when the segment is smallest. You will notice that the indicator will close tighter on the stronger stations or will flicker shut on noise; it is not the amount of closing but the point of minimum dark area that indicates correct tuning for that particular station. Strong stations may cause the tuning indicator to not only close but perhaps even overlap; the correct tuning is then the point of maximum overlap.

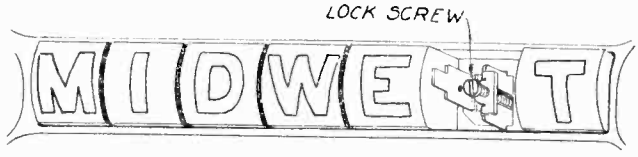
The tuning indicator is connected on the FM and Television bands but is not as reliable as on the Standard Broadcast and short wave bands. Many FM and Television signals of acceptable strength will not cause the indicator to close. Stronger signals may produce two points where the tuning indicator begins to close and in this case you should tune between these points; this is quite accurate.

The short wave bands cover completely all frequencies above the Broadcast band to 22 megacycles in three bands. These are all calibrated in megacycles. Amateur, Police and Commercial transmissions will be heard on band B. This type of transmission is usually on intermittently and you may spend considerable time locating stations. Bands C and D provide reception in seven International Broadcast Frequency Bands in addition to government, amateur and commercial stations.

The International Frequency bands are indicated on the dial by solid red areas in the calibration base line; as suggested on the dial, band C will be most active at night and band D most active by day. Because of the great distances involved and effects of weather and solar radiation on high frequency transmissions the reception on these bands is not always uniform but will vary greatly. Foreign reception may be excellent on one International Band and non-existant on another, this condition will change from one hour to the next and also with the time of year.

Your FM Broadcast band is marked E and is calibrated in channel numbers; these channel numbers were assigned by the Federal Communications Commission for the convenience of the general public. However in many parts of the country FM stations use a frequency designation so that we reprint at the end of this Manual a conversion chart to show the relation between channel number and frequency in megacycles.

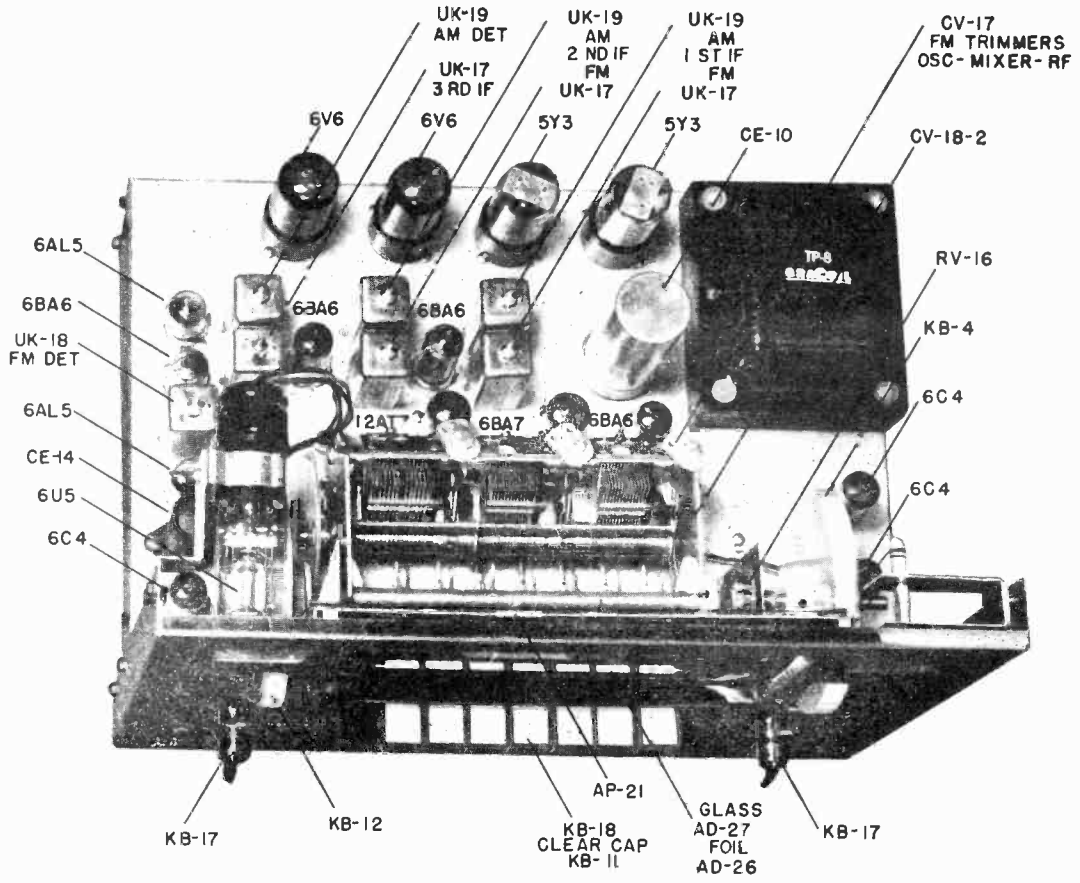
The push buttons are for your convenience in selecting stations without the bother of making the exact tuning adjustments necessary for best reception. There are seven buttons and each button may be set for a station at any point on the dial. We do not recommend the use of the push buttons for short wave stations. To set the push buttons this exact procedure should be followed. A screwdriver will be needed.

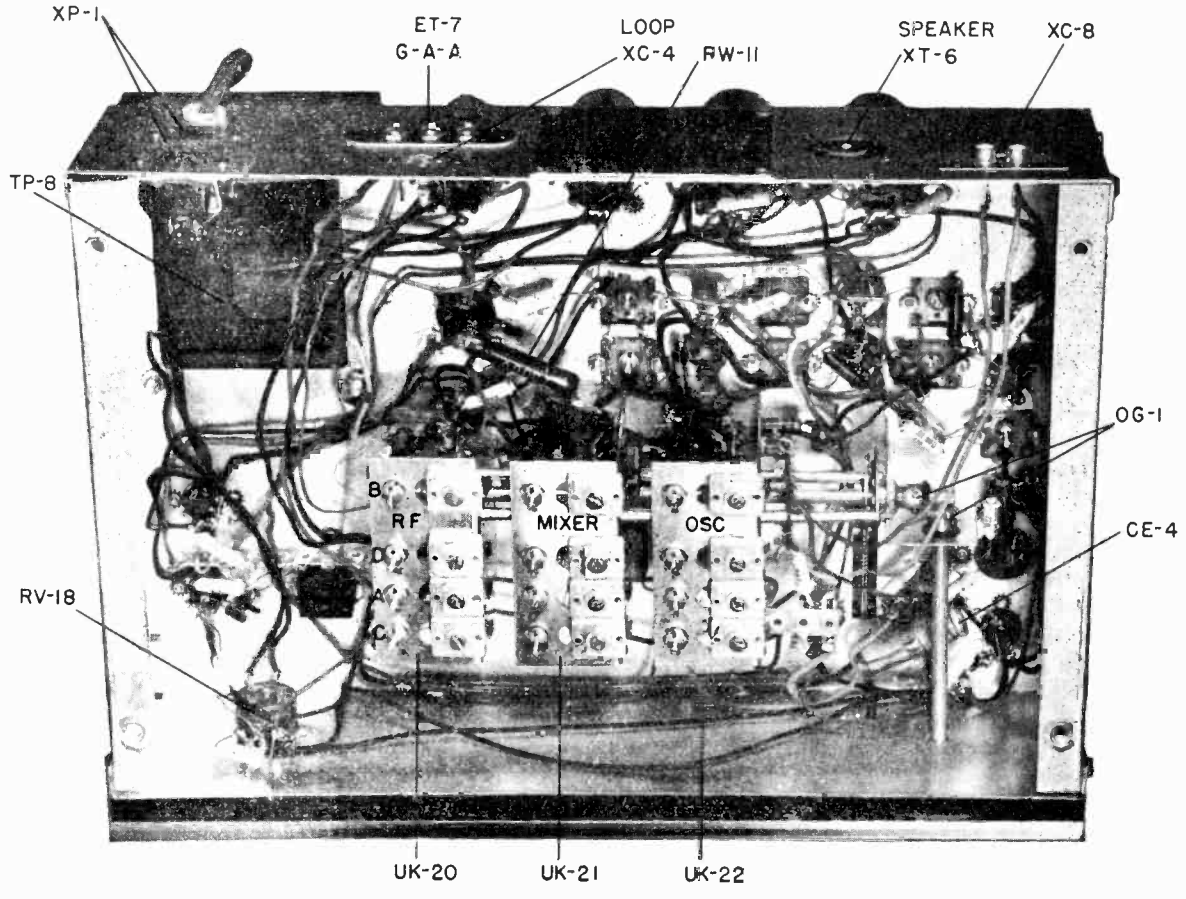


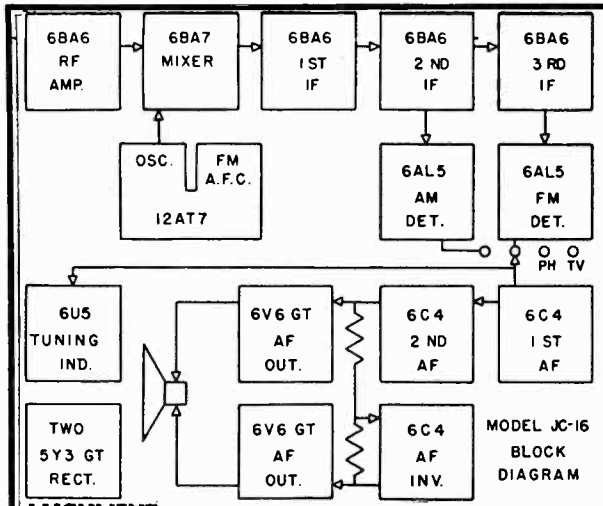
1. Turn on the receiver and allow ten minutes to warm up; more time is desirable.
2. Remove the push button by pulling straight out. A hooked instrument will be of assistance.
3. Loosen the **LOCK SCREW** at least one half turn.
4. Using the screwdriver with the blade in the screw slot, push the mechanism in firmly. Hold in during step 5. The mechanism may bind at first and you must use sufficient force to break it loose so that the push buttom and **TUNING** control wheel are independent, that is, the **TUNING** control does not try to push the button mechanism outward when the pointer is tuned across the dial.
5. Tune the pointer past the desired station, then back to the desired station and make the tuning adjustment as carefully as you know how.
6. Tighten the **LOCK SCREW.**
7. Check the setting of this push button by tuning away from the station manually then push the button down firmly maintaining pressure until the pointer moves to the position it had when the **LOCK SCREW** was tightened. If the station is not tuned in perfectly repeat steps 2 to 6 carefully.
8. Adjust each of the seven buttons, or as many as you need, exactly as outlined above.

Any button can be set for any pointer position, however, you will find it more desirable to select the button nearest the pointer position so that each button may be more easily identified with the station. For example, the "M" button will be set for a station at the left of the dial, the "W" button will be set for a station near the center, etc.

MODELS C-16, RC-16,
SK-16; Ch. JC-16







MODEL JC-16 BLOCK DIAGRAM

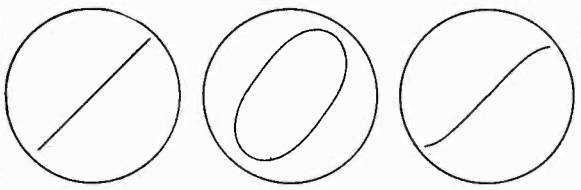
ALIGNMENT

The alignment points are shown on the top and bottom views of the chassis as well as certain parts numbers.

AM IF should be aligned at 456 KC. There are three transformers and six adjustments, the transformers are coupled with less than critical coupling and there is only one peak. Couple the generator into the mixer grid and use either AVC or audio for the output meter.

FM IF should be aligned at 10.7 MC. There are four transformers and eight adjustments, the transformers are over-coupled and must be aligned with a scope and sweep generator.

1. Connect generator to 3rd IF grid and vertical output of scope to the audio of the receiver at any point where sufficient signal is available and phasing can be properly adjusted.
2. Adjust the top screw for greatest length of straight line. This is the secondary winding, the bottom screw should give improvement in signal level.



A does not have the hook indicating that the sweep generator has a greater deviation than the detactor capability.

B shows improper phasing of the horizontal sweep with the audio output of the receiver.

C is preferred because it shows the limits of deviation and you obtain it simply by adjusting the deviation (sweep width) control on the signal generator. Approximately 150 KC is normal.

3. Connect generator to 2nd IF gird and adjust the 2nd IF slugs for maximum signal **and** band width. This you can be sure of by the amount of hook at the ends of the line on the scope. Repeat this procedure for 1st IF grid and mixer grid. Adjust for greatest signal without appreciable loss of band width.

Alternate Method: The IF response of the 1st, 2nd and 3rd transformer may be observed more directly if you use a crystal detector at the plate of the 3rd IF tube and feed the vertical plates of the scope from that point. Use a CW marker at 10.7 to be sure the double peaked response curve straddles the ratio detector response. Observe each stage separately.

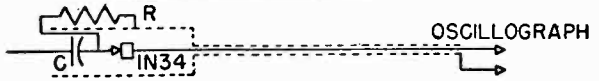
Notice: Do not use AM or CM signal to peak the FM transformers. Regeneration may result and bandwidth and noise rejector will be poor, although signal strength will increase.

FM RF should be trimmed at 105 MC. There should not be any reason to adjust the low end but if this is necessary it can be done by distorting the FM coils on the tuning gang.

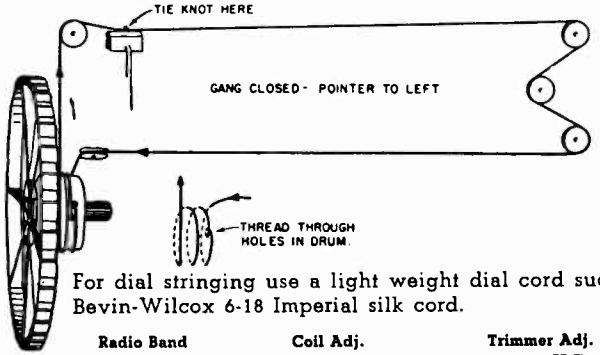
AM RF should be peaked at the high end with the trimmer and at the low end by core adjustment.

Notice: Use as low signal input as possible for readable output indication. Feed signal in from FM RF generator through 150 ohms in each lead to "A-A." Use 400 ohms in lead from AM RF generator and connect to either "A" terminal.

A very convenient design is shown here schematically of a Crystal probe for detection of resonant response for display on the oscillograph and your available materials will decide the physical design, most important feature is the ability to change the load resistor, R.



The value for C is limited by the physical size, any capacity greater than 100 mmfd will be satisfactory, the value of R should be 470 ohms when the probe is used in the IF stages to obtain the response of the grid circuit without effects from the tuned plate circuit whereas a value of 470K ohms is alright for general use,

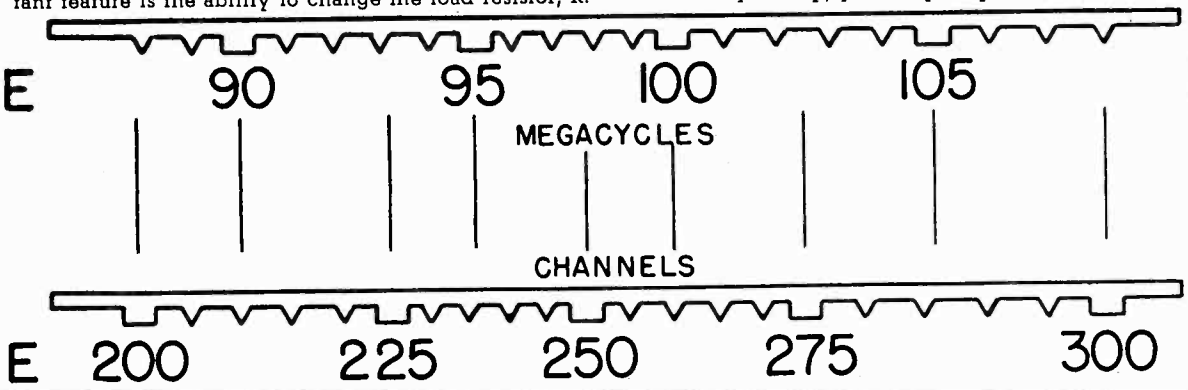


For dial stringing use a light weight dial cord such as Bevin-Wilcox 6-18 Imperial silk cord.

Radio Band	Coil Adj.	Trimmer Adj.
A	560 KC	1500 KC
B	1.6 MC	4.7 MC
C	5 MC	10 MC
D	11.5 MC	22 MC
E	.....	105 MC

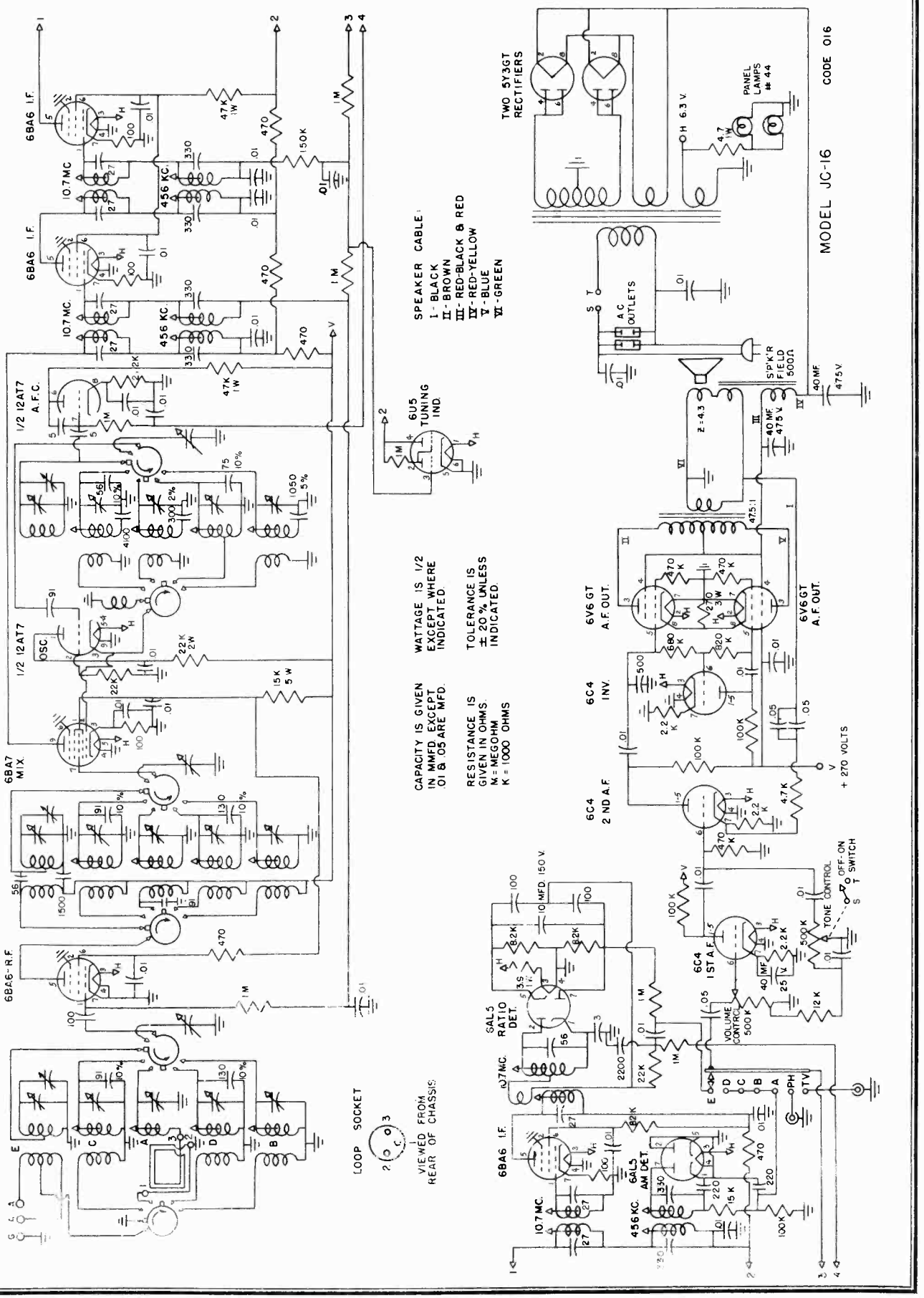
If replacement parts of identical manufacture and rating are not available for service repairs these should be ordered from Midwest Radio & Television Corporation, giving model number and serial number of the chassis and name of the part.

Repair data for the record changer mechanism is available separately, please specify Model.



MODELS C-16, RC-16, SK-16; Ch. JC-16

MODELS C-16, RC-16,
SK-16; Ch. JC-16



CONTROLS AND OPERATION

LAMP SWITCH. The switch located in lamp socket must be turned in a clockwise direction to secure the three intensities of light if a three light bulb is used. If a standard single light bulb is used only one intensity of light will be obtained.

TUNING RANGE

This receiver is designed to operate over the standard broadcast band which extends from 535 to 1720 Kilocycles (KC) (174 to 560 Meters) and includes some police channels.

REPLACEMENT OF TUBES

(See Figure 1)

Remove the shades and lamp bulb to prevent damage. Next loosen screw H and slip off washer G and the dial F. Next unscrew E and the screw next to it. (These screws have red heads). At the top of lamp just below the lamp socket, will be found nut A which must be loosened sufficiently to allow collar B to be moved high enough to allow the two halves of the lamp base to be separated.

If tubes are removed from their sockets for test or replacement purposes, make certain that each tube is placed in its proper socket. (See tube layout diagram in the base of the lamp).

Failure to replace the tubes in their proper sockets may result in damage to the tube, or the receiver, or both.

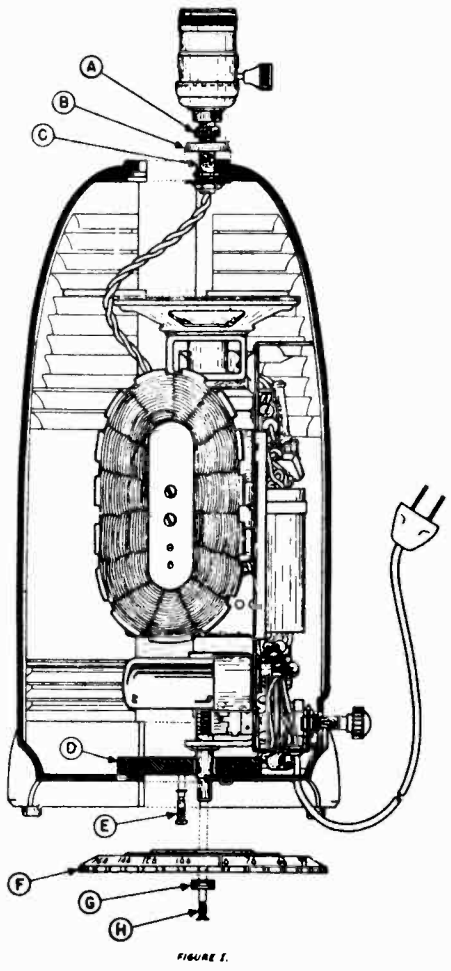


FIGURE 1.

SERVICE DATA

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, open or grounded bias resistor, bypass condenser, etc. Never attempt to realign set until all other possible sources of trouble have been first thoroughly investigated and definitely proved not to be the cause.

NOTE: IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER AND THAT THE PROCEDURE BE CAREFULLY FOLLOWED, OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT. THE TRIMMERS WILL BE REFERRED TO BY THEIR FUNCTION AS INDICATED ON THE PARTS DIAGRAM.

ALIGNMENT PROCEDURE

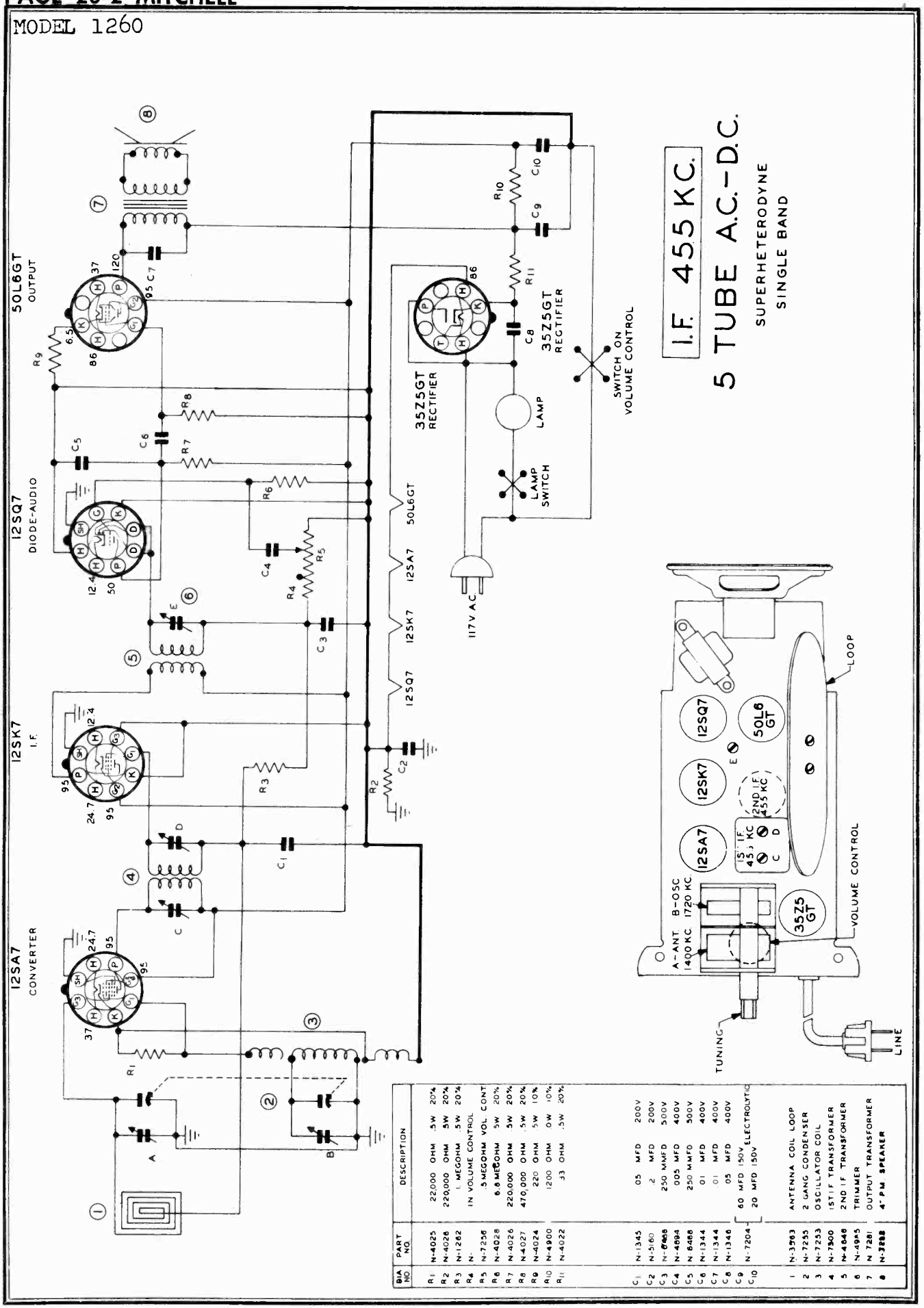
GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455, 600, 1400 and 1720 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the broadcast band should be adjusted.

I.F. ALIGNMENT. Remove the chassis and loop antenna from the cabinet and set them up on the bench so that they occupy exactly the same respective positions on the bench as they did in the cabinet. Care should be taken to have no iron or other metal near the loop. Do not make this set-up on a metal bench. With the gang condenser set at minimum, adjust the test oscillator to 455 KC and connect the output to the grid of the first detector tube (12SA7) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the ground buss, indicated on the circuit diagram. Align all three I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. Connect the test oscillator to a dummy loop which can be made by coiling 2 turns of hookup wire about 6" in diameter. Place this dummy loop about a foot from the loop on the receiver and in the same plane as the receiver loop. With the gang condenser set at minimum capacity, set the test oscillator at 1720 KC, and adjust the oscillator (or 1720 KC trimmer) on the gang condenser. Next—set the test oscillator at 1400 KC, and tune in the signal on the gang condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in signal on condenser to check alignment of coils.

MODEL 1260



DIA NO	PART NO	DESCRIPTION
R1	N-4025	22,000 OHM .5W 20%
R2	N-4026	220,000 OHM .5W 20%
R3	N-1262	1 MEGOHM .5W 20%
R4	N-	1 MEGOHM VOL CONTROL
R5	N-7256	.5 MEGOHM VOL CONT
R6	N-4028	6.8 MEGOHM .5W 20%
R7	N-4026	220,000 OHM .5W 20%
R8	N-4027	470,000 OHM .5W 20%
R9	N-4024	220 OHM .5W 10%
R10	N-4900	1200 OHM 0W 10%
R11	N-4022	33 OHM .5W 20%
C1	N-1345	.05 MFD 200V
C2	N-5160	.2 MFD 200V
C3	N-7208	250 MMFD 500V
C4	N-4094	005 MFD 400V
C5	N-8486	250 MMFD 500V
C6	N-1344	.01 MFD 400V
C7	N-1344	.01 MFD 400V
C8	N-1346	.05 MFD 400V
C9	N-7204	60 MFD 150V ELECTROLYTIC
C10		20 MFD 150V
1	N-3563	ANTENNA COIL LOOP
2	N-7255	2 GANG CONDENSER
3	N-7253	OSCILLATOR COIL
4	N-7500	1ST I.F TRANSFORMER
5	N-4848	2ND I.F TRANSFORMER
6	N-4945	TRIMMER
7	N 7281	OUTPUT TRANSFORMER
8	N-3888	4" P.M SPEAKER

MODEL 84BR-2726B

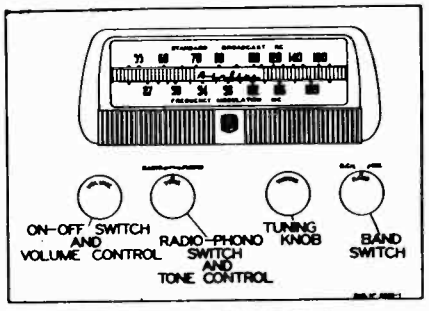
GENERAL DESCRIPTION

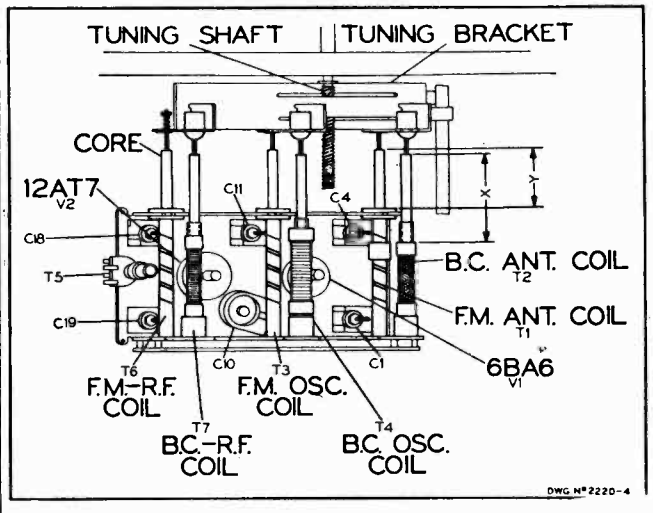
This is a 2-band, seven tube (plus rectifier) superheterodyne receiver for the reception of both AM and FM stations. It features the most advanced type of FM ratio detector, permeability tuning of both bands, combination double-frequency I.F. coils and miniature tubes. Built-in antennas are provided for broadcast and FM reception; provision is also made for connection of an external broadcast antenna as well as an FM antenna with a 300 ohm lead-in. Both antennas may be connected to the radio at the same time.

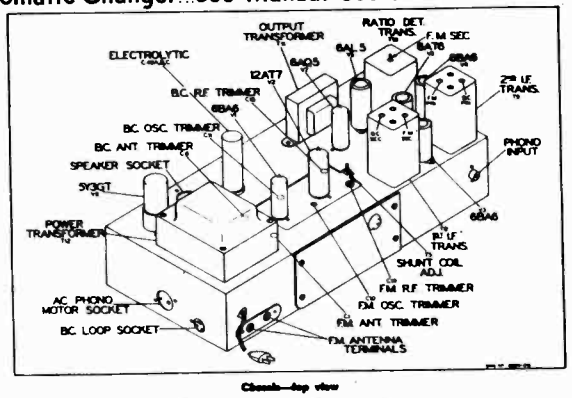
The phonograph is equipped with an automatic changer which plays up to ten 12-inch records or twelve 10-inch records at one loading.

ELECTRICAL SPECIFICATIONS

Power Supply	105 to 125 volts, AC, 60-cycles; Chassis only 75 watts. With phono operation 100 watts.
Frequency Ranges	Broadcast Band—535 to 1620 kc. FM Band— 88 to 108 mc.
Intermediate Freq.	AM-455 kc.; FM-10.7 mc.
Selectivity	AM-42 kc. broad at 1000 times signal, measured at 1000 kc. I.F. FM-200 kc. broad at 2 times down. I.F. FM-400 kc. broad at 10 times down.
AM Sensitivity	(For .5 watt output with external antenna)—5 microvolts average.
FM Sensitivity	(For .5 watt output)—25 microvolts average.
Power Output	2 watts, 10% distortion. 4 watts maximum.
Loud Speaker	12" electrodynamic. Voice coil impedance 3.2 ohms, 400 cycles.
Tube and Lamp Complement	6BA6, FM—AM R.F. stage. 12AT7, FM—AM oscillator and mixer. 6BA6, FM—AM 1st I.F. 6BA6, FM—2nd I.F. 6AL5, FM ratio detector. 6AT6, AM detector. A.F. AMP. and A.V.C. 6AQ5, Audio output. 5Y3, rectifier. T-44 dial lamp (2 used).
Automatic Changer	See Manual 5068A.







Chassis—top view

TUNER ADJUSTMENT

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

MODEL 84BR-2726B

ALIGNMENT PROCEDURE

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

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

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

AM - I. F. ALIGNMENT

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

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

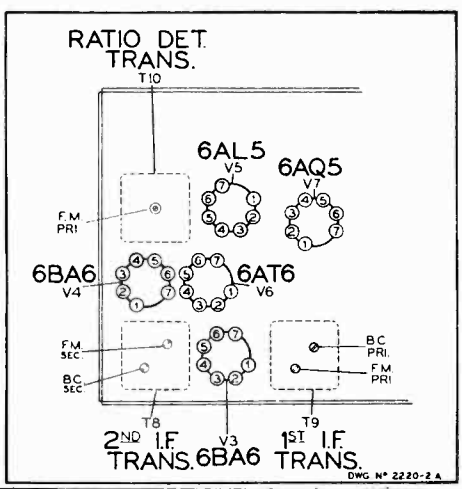
BROADCAST BAND - R. F. ALIGNMENT

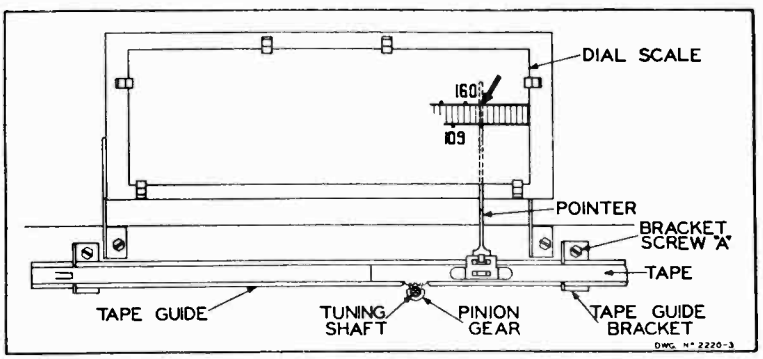
Check pointer so that it coincides with the marker to the extreme right when iron cores are all the way out. For adjustment, see dial mechanism illustration.

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

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

Procedure for disassembly and assembly of dial mechanism.





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

MODEL 84BR-2726B

ALIGNMENT PROCEDURE

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

A non-metallic alignment tool must be used.

IMPORTANT

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

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

NOTE

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

A standard AM signal generator is required.

FM - I. F. ALIGNMENT

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

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

NOTE ON FM - I.F. ALIGNMENT

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

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

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

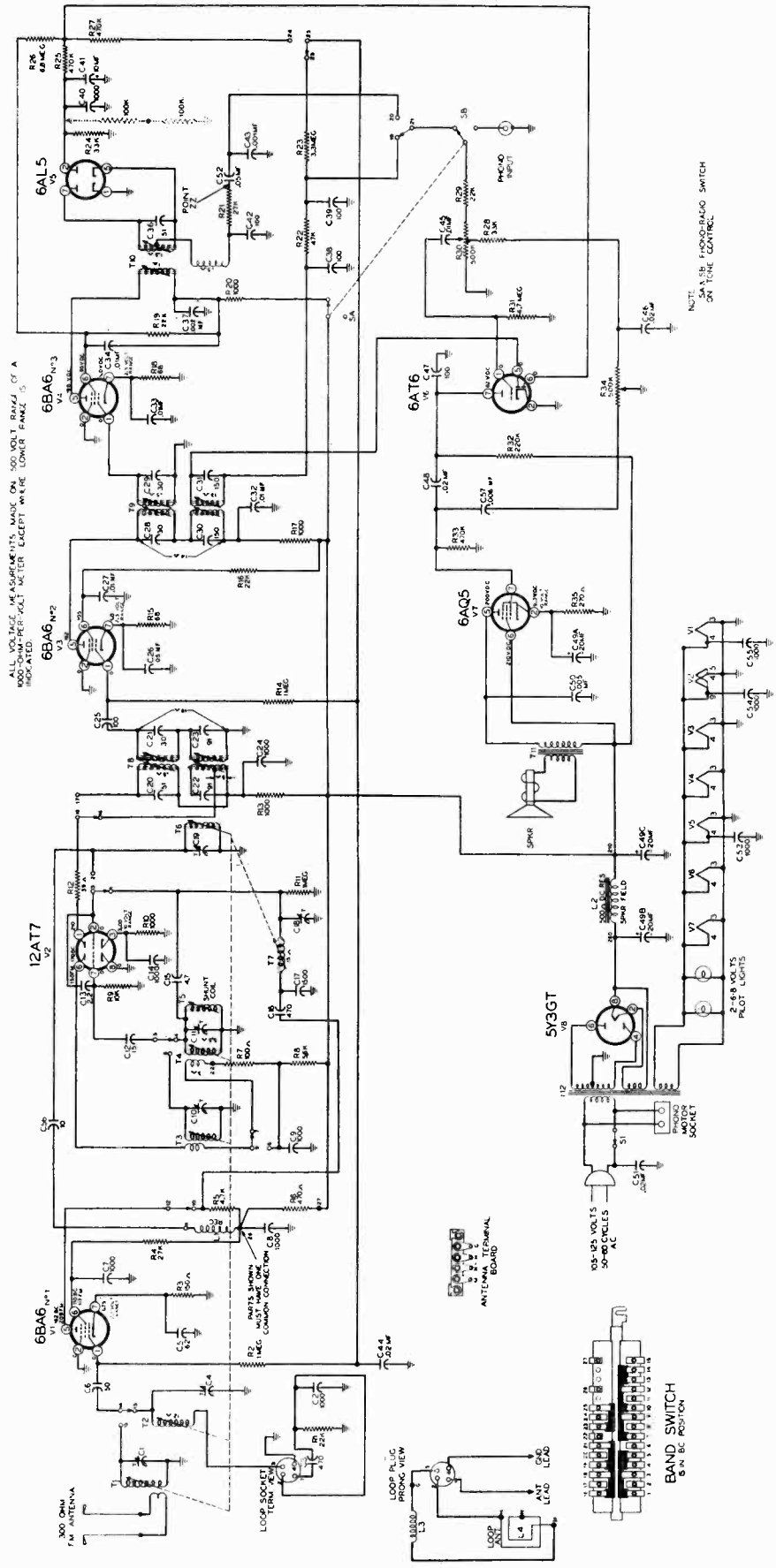
FM - R. F. ALIGNMENT

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

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

NOTE: If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use harmonics. Use extreme care in picking harmonics. An alternate procedure is to use a local station carrier of known frequency to align the FM Band and to use the vacuum tube volt-meter as above for resonance indication. A weak carrier, however will not produce 3 volts. NOTE: Connect 300 ohms in series with hot side of generator and connect to one screw. Connect cold side of generator to other screw.

MODEL 84BR-2726B



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

RECORD CHANGER: See Webster Model 246, Pages RCD.CH. 20-12

MODEL 84BR-2726B

REPLACEMENT PARTS LIST

TUNER CHASSIS PARTS

CONDENSERS

Ref. No.	Part No.	Description	Qty. Used In Set
C10	A-8E-13575	Trimmer condenser	1
C1, 4, 11, 19, 18	A-2M-12618	Trimmer cond. plate	5
C3, 16	C-8G-11732	470 mmf, ±20%	2
C2	C-8G-13695	1000 mmf, ±20%	1
C8, 7, 9, 14, 54, 55	C-8G-13201	1000 mmf, +20%—10%	6
C5	C-8G-13018	62 mmf, ±10%	1
C17	C-8G-11731	1500 mmf, ±20%	1
C12	C-8G-13017	15 mmf, +10%	1
C6	C-8G-11484	50 mmf, ±10%	1
C56	C-8G-11789	10 mmf, ±10%	1
C15	A-8G-12495-6	4.7 mmf, ±20%	1
C13	A-8G-12495-4	2.2 mmf, ±20%	1
C44	C-8D-11304	.02 mfd, 200 volts, ±20%	1

RESISTORS

R4	C-9B2-79	27K ohms, 1 watt, 10%	1
R1	C-9B1-21	22K ohms, 1/2 watt, 20%	1
R3	C-9B1-52	150 ohms, 1/2 watt, 10%	1
R5	C-9B1-17	4700 ohms, 1/2 watt, 20%	1
R6	C-9B1-11	470 ohms, 1/2 watt, 20%	1
R9	C-9B1-19	10K ohms, 1/2 watt, 20%	1
R2, 11	C-9B1-31	1 megohm, 1/2 watt, 20%	2
R10	C-9B1-62	1000 ohms, 1/2 watt, 10%	1
R23	C-9B1-34	3.3 megohms, 1/2 watt, 20%	1
R7	C-9B1-50	100 ohms, 1/2 watt, 10%	1
R12	C-9B1-45	39 ohms, 1/2 watt, 10%	1

COILS

T3	B-13D-13027	FM oscillator coil assembly	1
—	B-51B-13056	Core for FM oscillator coil	1
T1	B-13E-13028	FM antenna coil assembly	1
—	B-51A-13058	Core for FM antenna coil	1
T6	B-13C-13029	FM R.F. coil assembly	1
—	B-51A-13057	Core for FM R.F. coil	1
T4	B-13D-13030	AM oscillator coil assembly	1
—	B-51A-12722	Core for B.C. oscillator coil	1
—	B-51A-12723	Core for B.C. ant. and R.F. coil	1
T2	B-13E-13031	AM antenna coil assembly	1
T7	B-13C-13032	AM R.F. coil assembly	1
L1	A-16A-13033	Choke coil assembly	1
T5	B-13D-12974	AM osc. shunt coil assembly	1

MISCELLANEOUS

	B-208-13553 or B-201-12967	Band change slide switch	1
	A-15B-12997	7 prong, miniature tube socket	1
	A-15B-13430	9 prong, miniature tube socket	1
	C-2D-14437	Drive bracket assembly	1
	A-25A-13019	Core grommets, for AM Band	3
	A-3M-13020	Insert for core grommet	3
	A-49A-12394	Spiral spring for FM cores	3
	A-2J-11041	Pointer tension spring, "M" shaped	1
	B-2D-12316	Tape guide	1
	B-2J-12922	Rack tape, with teeth and pointer bracket	1
	B-2G-13613	Pointer	1
	A-200-15016	Drive, pinion and lead screw assembly	1

MAIN CHASSIS PARTS

CONDENSERS

C49B, 49C, 49A	A-8C-13555	Electrolytic, 20—20 x 350 volts; 20 x 25 volts	1
C50	C-8D-10935	.005 mf x 600 volts	1
C27, 32, 33, 34, 37, 45	C-8D-10761	.01 mf x 400 volts, 20%	6
C57	C-8D-10785	.006 mf x 600 volts, 20%	1
C41	A-8C-13132	Electrolytic, 10 mf x 50 volts	1
C43	C-8D-10787	.001 x 600 volts, 20%	1
C52, C26	C-8D-10770	.05 x 200 volts, 20%	2
C51, 46	C-8D-10774	.02 x 400 volts, 20%	2
C48	C-8J-11321	.02 x 600 volts, 20%	1
C25, 47	C-8G-13131	100 mmf, ceramic, 10%	2
C24, 40, 53	C-8G-13016	1000 mmf, ceramic, 20%	3
C42	C-8F3-225	100 mmf, mica, 5%	1
C38, 39	A-8F-13127	.0001 mf, dual mica, 20%	1
C22, 23	C-8G-12160	91 mmf, ceramic, 5%	2
C20	C-8G-13026	51 mmf, ceramic, 5%	1
C30, 31	C-8G-13025	150 mmf, ceramic, 5%	2
C21, 28, 29	C-8G-12159	30 mmf, ceramic, 5%	3
C36	C-8G-11891	51 mmf, ceramic	1

RESISTORS

R30, S1	A-10A-13114	Volume control (500K ohms) and switch	1
R34, SA, SB	A-11A-13115	Tone control (500K ohms) and radio-phono switch	1
R32	C-9B1-27	220K ohms, 1/2 watt, 20%	1
R15, 18	C-9B1-48	68 ohms, 1/2 watt, 10%	2
R14	C-9B1-31	1 megohm, 1/2 watt, 20%	1
R19, 16	C-9B2-78	22K ohms, 1 watt, 10%	2
R24, 28	C-9B1-80	33K ohms, 1/2 watt, 10%	2
R21	C-9B1-79	27K ohms, 1/2 watt, 10%	1
R8	C-9B2-71	5600 ohms, 1 watt, 10%	1
R22	C-9B1-23	47K ohms, 1/2 watt, 20%	1
R29	C-9B1-21	22K ohms, 1/2 watt, 20%	1
R31	C-9B1-35	4.7 megohms, 1/2 watt, 20%	1
R25, 27, 33	C-9B1-29	470K ohms, 1/2 watt, 20%	3
R35	C-9B1-55	270 ohms 1/2 watt, 10%	1
R26	C-9B1-36	6.8 megohms, 1/2 watt, 20%	1
R13, 20, 17	C-9B1-13	1000 ohms, 1/2 watt, 20%	2

COILS

T8	B-13A-15473	Input I.F. transformer, combination, 455 kc. and 10.7 mc.	1
T9	B-13B-15474	Second I.F. transformer, combination, 455 kc. and 10.7 mc.	1
T10	B-13M-15475	Ratio det. coil assembly 10.7 mc.	1
L3	A-16A-13243	Loop loading coil	1
L4	A-14MA-11066-1	Loop antenna ribbon	1

TRANSFORMERS

T12	B-12A-13120	Power transformer, primary, 50-60 cycles. 105-125 volts A.C.	1
T11	B-12C-13556	Output transformer, for speaker	1

SPEAKER

L2	B-18B-13585-1	Electrodynamic speaker, 12-inch, less output transformer	1

MISCELLANEOUS

	B-30A-13611	Dial scale	1
	B-5B-13744	Knob, mahog. or wal. "Volume"	1
	B-5B-13745	Knob, mahog. or wal. "Tone"	1
	B-5B-13746	Knob, mahog. or wal. "Tuning"	1
	B-5B-13747	Knob, mahog. or wal. "Band switch"	1
	B-2G-13612	Escutcheon, mahog. or walnut	1
	B-14M-11479	Line cord and plug	1
	A-3A-12933-1	Band switch shaft	1
	A-55C-12935	Ball bearing	1
	B-47A-11094-4	Pilot lite and bracket assembly	1
	A-46A-11739	Pilot lite, 6-8 volts, T-44	2
	A-15C-13174	Miniature socket, 7 prong	5
	A-15B-10440	Octal socket, 8 prong	1
	A-19B-12644	Loop antenna socket	1
	B-7B-13050	FM terminal strip	1
	A-15B-11538	Speaker socket	1
	A-19B-12468	Phono motor socket	1
	A-19B-12170	Phono input socket	1

RECORD CHANGER

	B-201-16345	246 Changer with cartridge	1
		Webster V42-2 cartridge	1
		NE-214 Tandem point needle	1

MODEL 84BR-2733A

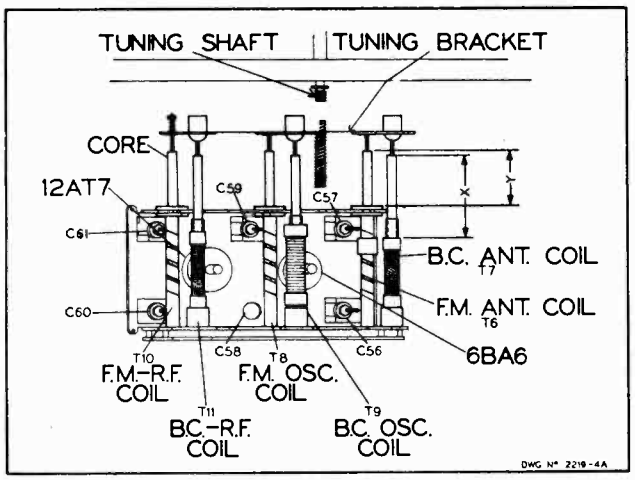
GENERAL DESCRIPTION

This is a 2-band, nine tube (plus rectifier) superheterodyne receiver for the reception of both AM and FM stations. It features the most advanced type of FM ratio detector, permeability tuning of both bands, combination double-frequency I.F. coils and miniature tubes. Built-in antennas are provided for broadcast and FM reception; provision is also made for connection of an external broadcast antenna as well as an FM antenna with a 300 ohm lead-in. Both antennas may be connected to the radio at the same time.

The phonograph is equipped with an automatic changer which plays up to ten 12-inch records or twelve 10-inch records at one loading.

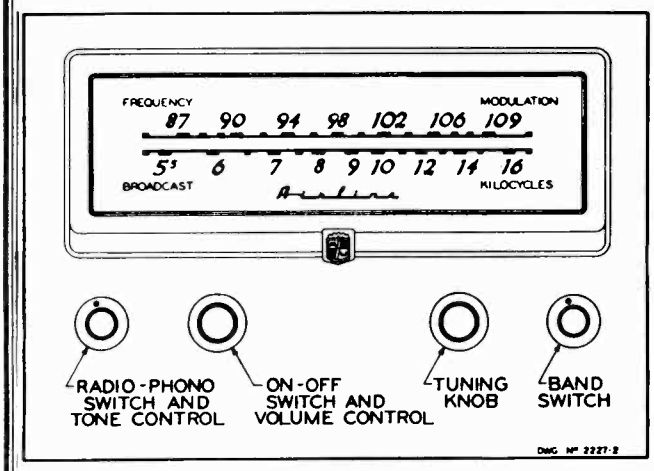
ELECTRICAL SPECIFICATIONS

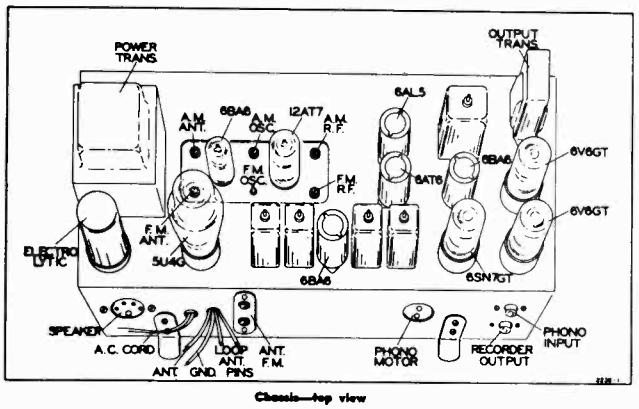
Power Supply	105 to 125 volts, AC, 60-cycles; Chassis only 122 watts. With phono operation 150 watts.
Frequency Ranges	Broadcast Band—535 to 1620 kc. FM Band—88 to 108 mc.
Intermediate Freq.	AM-455 kc.; FM-10.7 mc.
Selectivity	AM-48 kc. broad at 1000 times signal, measured at 1000 kc. I.F. FM-180 kc. broad at 2 times down. I.F. FM-320 kc. broad at 10 times down.
AM Sensitivity	(For .5 watt output with external antenna)—3 microvolts average
FM Sensitivity	(For .5 watt output—10 microvolts average.
Power Output	8 watts, 10% distortion. 10 watts maximum.
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	See Manual 5068A.



TUNER ADJUSTMENT

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





Chassis—top view

MODEL 81LBR-2733A

ALIGNMENT PROCEDURE

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

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

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

AM - I. F. ALIGNMENT

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

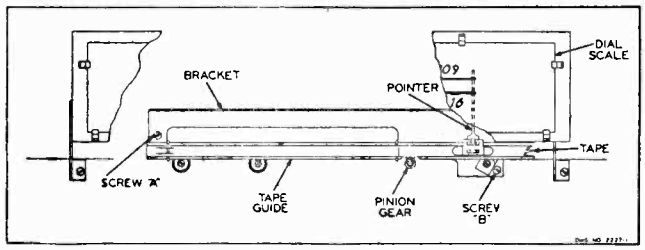
SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
455 Kc. Use 1000 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Primary and Secondary of T4 AM windings. See IF views	Maximum output Should be ½ watt
455 Kc. Use 30 microvolts	Pin No. 2 of 12AT7 and ground	Primary and Secondary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

BROADCAST BAND - R. F. ALIGNMENT

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

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST
1620 Kc. Use 3 microvolts	AM Antenna and Ground	200 mmf.	C59, C57, C61 For maximum, ½ watt

Procedure for disassembly and assembly of dial mechanism



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

MODEL 84BR-2733A

ALIGNMENT PROCEDURE

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

A non-metallic alignment tool must be used.

IMPORTANT

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

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

NOTE

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

A standard AM signal generator is required.

FM - I. F. ALIGNMENT

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

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	Pin no. 2 of 6AL5 and ground	Primary of T5	Resonance should be about 3 volts
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	See note "A"	Secondary of T5	Zero. Use zero center scale. See note "B"
10.7 Mc. Use about 3300 microvolts	Pin No. 1 of 6BA6 no. 2 and ground	Pin no. 2 of 6AL5 and ground	Primary and Secondary of T4A 10.7 m.c. windings See IF views	Resonance should be about 3 volts
10.7 Mc. Use about 200 microvolts	Pin no. 2 of 12AT7 and ground	Pin no. 2 of 6AL5 and ground	Primary and Secondary of 10.7 m.c. windings of T3A See IF views	Resonance should be about 3 volts

NOTES ON FM—I.F. ALIGNMENT

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

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

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

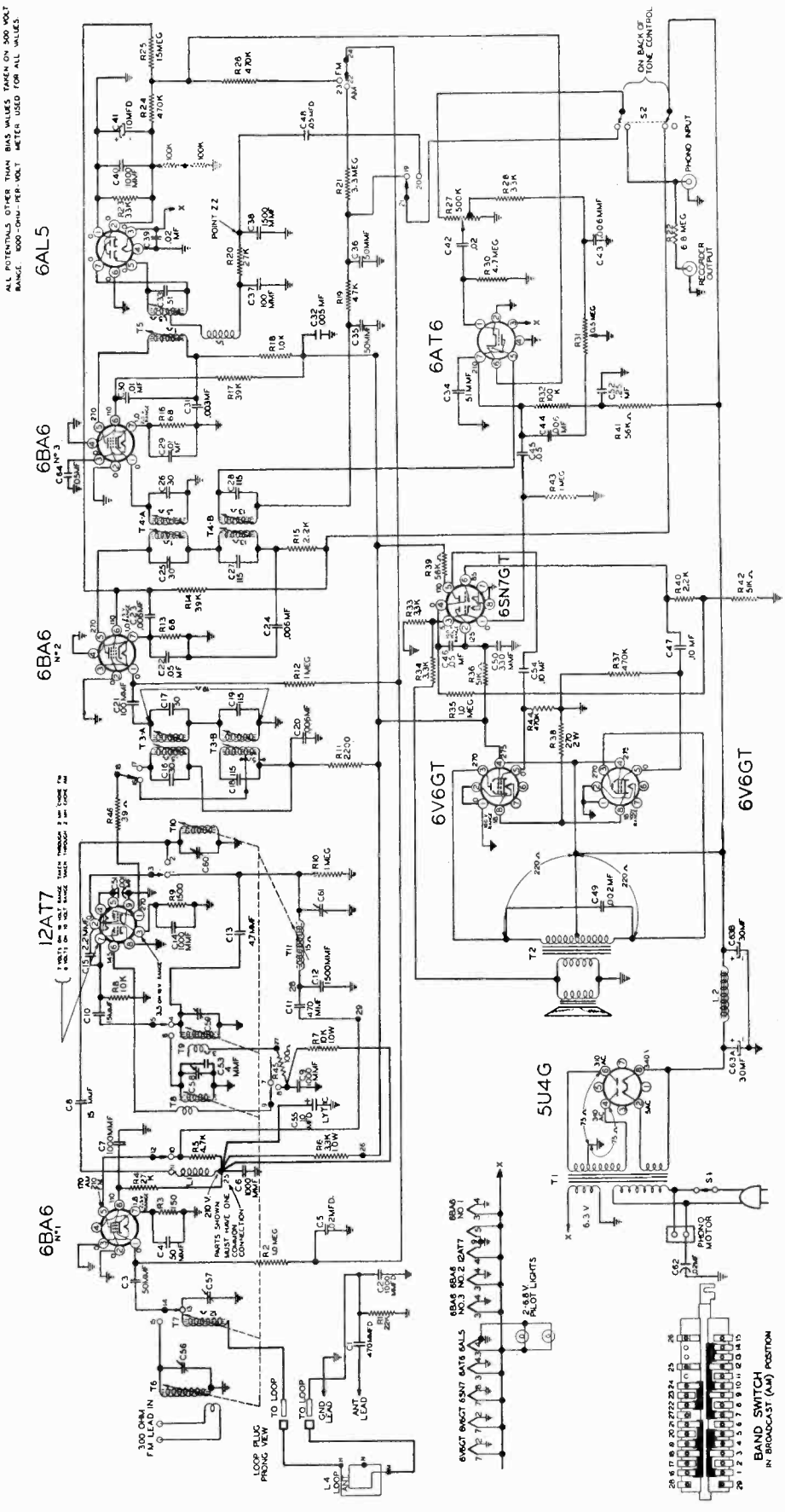
FM - R. F. ALIGNMENT

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

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

NOTE: If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use harmonics. Use extreme care in picking harmonics. An alternate procedure is to use a local station carrier of known frequency to align the FM Band and to use the vacuum tube volt-meter as above for resonance indication. A weak carrier, however will not produce 3 volts. NOTE: Connect 300 ohms in series with hot side of generator and connect to one screw. Connect cold side of generator to other screw

MODEL 84BR-2733A



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: B.C. Oscillator Coil T9 and number 7 terminal of slide switch should be connected together.

NOTE: Resistor R22 removed; with shielded wire from recorder output jack to radio side of radio-phono switch S2 added.

RECORD CHANGER: See Webster Model 246, Pages RCD.CH. 20-12

Ref. No.	Part No.	Description	Qty. Used In Set
		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-11304	.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	FM oscillator coil	1
—	B-51A-13056	Core for FM 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 miniature tube socket	1
	A-15B-13430	9-prong miniature, tube socket	1
	B-3A-15415	Lead screw	1
	A-3J-12309	Pinion gear	1
	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-2G-16040	Pointer	1
	C-2D-15062	Yoke and bracket	1
	A-25A-13019	Core grommet, for AM	3
	A-3M-13020	Insert for core grommet	3
		MAIN CHASSIS PARTS	
		CONDENSERS	
C63A, C63B	B-8C-11629	Electrolytic filter condenser, 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
C45, 46	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-2G-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
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
C55	A-8C-12154	Electrolytic, 10 mfd, 450 volts	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
		COILS	
T3B	B-13A-15680	Input I.F. transformer, 455 kc.	1
T4B	B-13B-15681	Output I.F. transformer, 455 kc.	1
T3A	B-13A-15682	Input I.F. transformer, 10.7 megohms	1
T4A	B-13B-15683	Second I.F. transformer, 10.7 megohms	1
T5	B-13M-15684	Ratio detector, 10.7 megohms	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	
B-30A-15996	[illegible]	Dial scale	1
	B-5B-14153-37	Knob, small, with dot, walnut	2
	B-5B-14153-41	Knob, small, with dot, mahogany	2
	B-5B-13308-37	Knob. large, without dot, walnut	2
	B-5B-13308-41	Knob, large, without dot, mahog.	2
	A-2G-14482	Escutcheon	1
	B-14M-11479	A.C. line cord	1
	A-3A-15630	Switch shaft	1
	A-2D-12313	Detent bracket	1
	A-43D-12934	"U" speed clip	1
	A-55C-12935	Ball bearing	1
	B-47A-11094-5	Pilot lite assembly	1
	A-46A-11739	Pilot lite, 6-8 volts, T-44	2
	A-25G-13448	Rubber chassis mounting cushion	4
	32K10-14306	10 - 32 x 1" Chassis mtg. bolts	4
	A-15C-10717	7 prong, miniature tube socket	4
	A-15B-10440	8 prong, octal socket	4
	A-19B-12644	Antenna socket	1
	A-7B-13050	FM dipole, 2-screw strip	1
	A-15B-11538	Speaker socket	1
	A-19B-12468	Phono motor socket	1
	A-19B-12170	Phono input socket	1
	A-19B-11044	Recorder socket	1
		RECORD CHANGER	
	B-201-16345	246 Record Changer with cartridge	1
		Webster V42-2 cartridge	1
		NE-214 Tandem point needle	1

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.

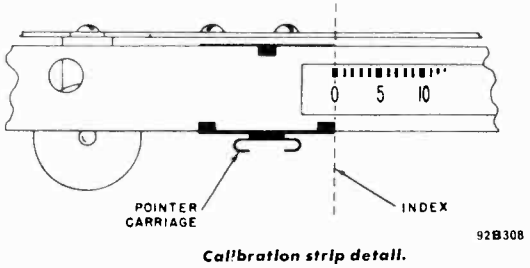
To use these calibration strips, it is necessary to remove the dial plate (brown metal cover) in the following manner:

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.

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

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

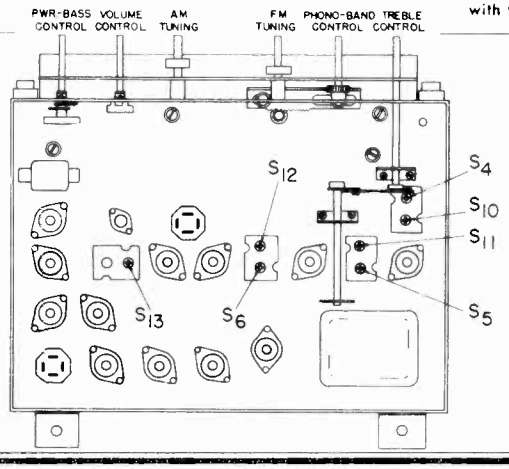


Calibration strip detail.

ALIGNMENT CHART

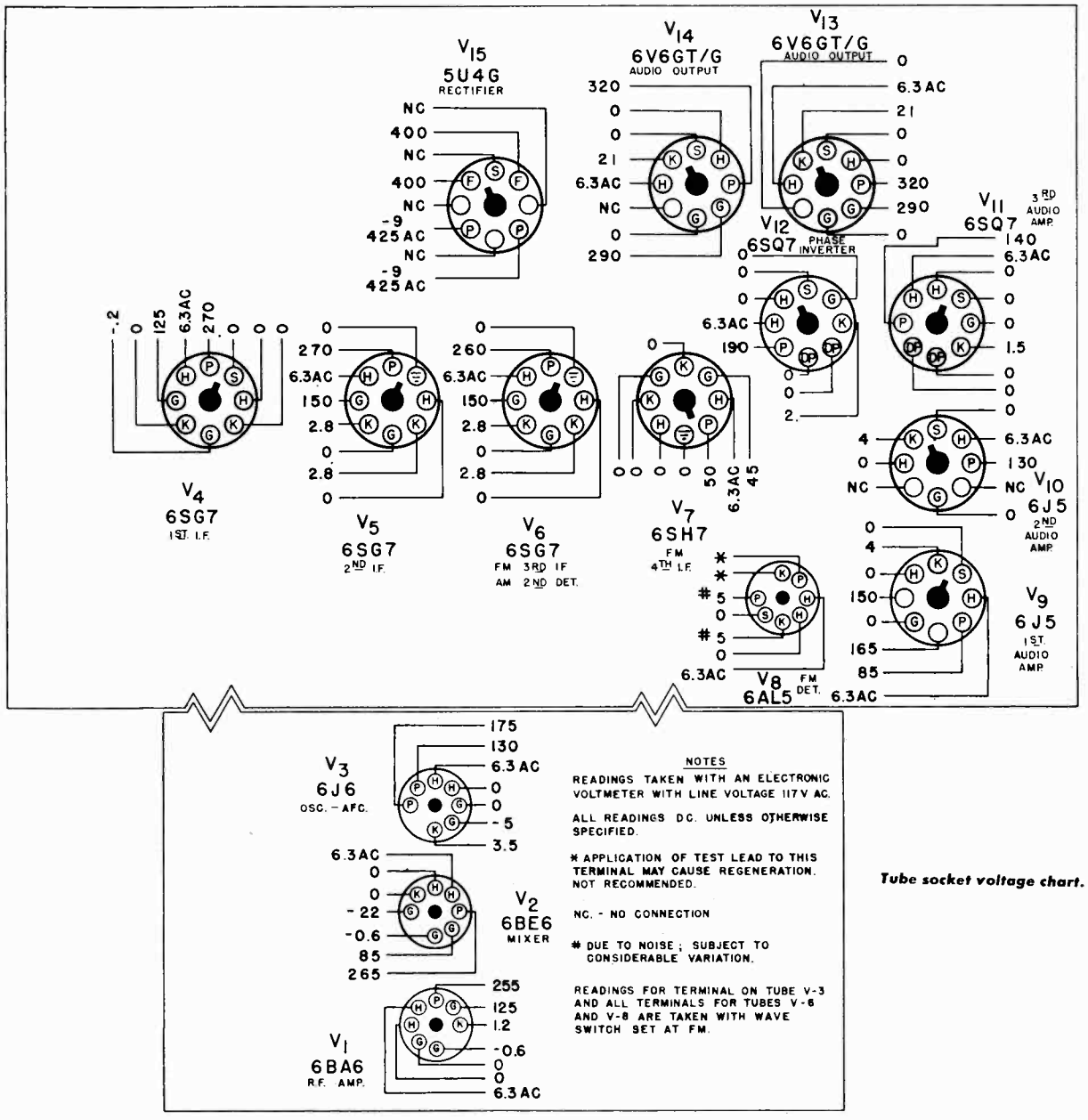
Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Pos.	Radio Tuned To	Cal. No.	Adjust	Remarks
1	0.01 mfd. cap.	To stator plates of center section of AM tuning cap.	455 kc	"BC"	1000 kc	55	S3, S6, S2, S5, S1 & S4	Adjust for max. output. TREBLE tone control set at No. 1.
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 a 20,000 ohm per volt meter.
3	0.01 mfd. cap.	To stator plates of center section of FM tuning cap.	10.7 mc (No modulation)	"FM"	Mid-scale	55	S14	Adjust for zero voltage as measured between junction L16 and C34 and ground with a 20,000 ohm per volt meter.
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.
			600 kc	"BC"	600 kc	15.5	G*	
5	Std. RMA dummy	To terminals "A" and "G" on ant. term. strip. TS_1.	16 mc	"C"	16 mc	84	E*, R, and S	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.
			9 mc	"B"	9 mc	6.5	D*, L	
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.



Bottom view showing alignment points.

BOTTOM VIEW OF CHASSIS



NOTES

READINGS TAKEN WITH AN ELECTRONIC VOLTMETER WITH LINE VOLTAGE 117 V AC.

ALL READINGS DC. UNLESS OTHERWISE SPECIFIED.

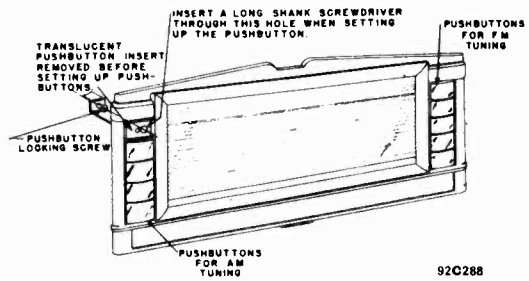
* APPLICATION OF TEST LEAD TO THIS TERMINAL MAY CAUSE REGENERATION. NOT RECOMMENDED.

NC. - NO CONNECTION

DUE TO NOISE; SUBJECT TO CONSIDERABLE VARIATION.

READINGS FOR TERMINAL ON TUBE V-3 AND ALL TERMINALS FOR TUBES V-6 AND V-8 ARE TAKEN WITH WAVE SWITCH SET AT FM.

Tube socket voltage chart.

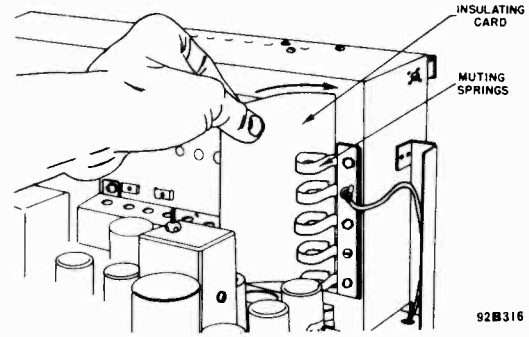


View showing pushbutton setup.

BUTTON SETTING

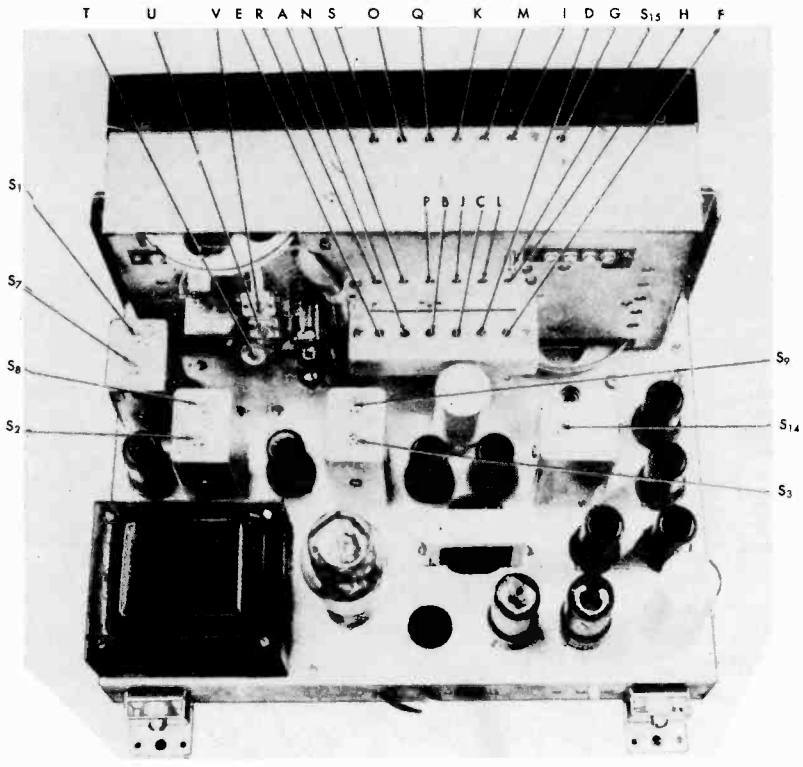
Insulate the muting switch contacts before setting the left hand group of AM pushbuttons. See Fig. 2. The right hand group of pushbuttons do not require insulation.

1. Select any one pushbutton.
2. Pull translucent insert straight out.
3. Insert screw driver blade through large hole of push-button 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 as shown in Fig. 3.

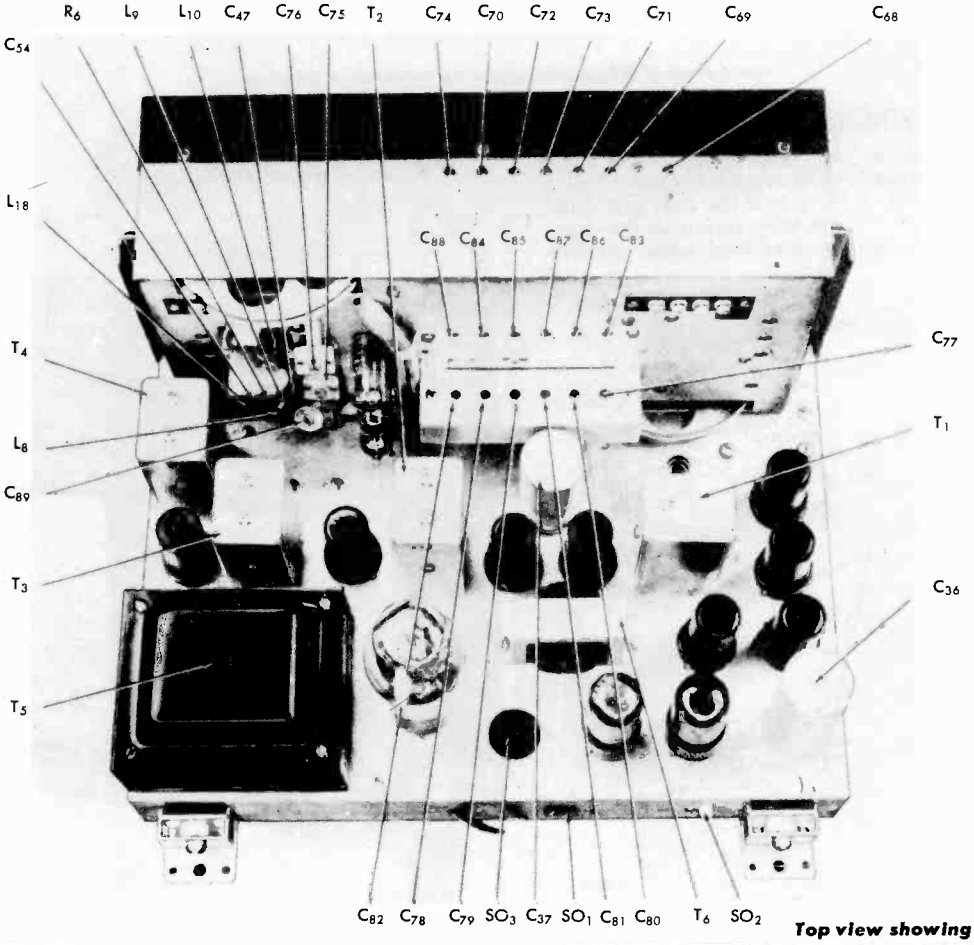


Insulating the muting switch contracts.

MODEL 8HA-2725A

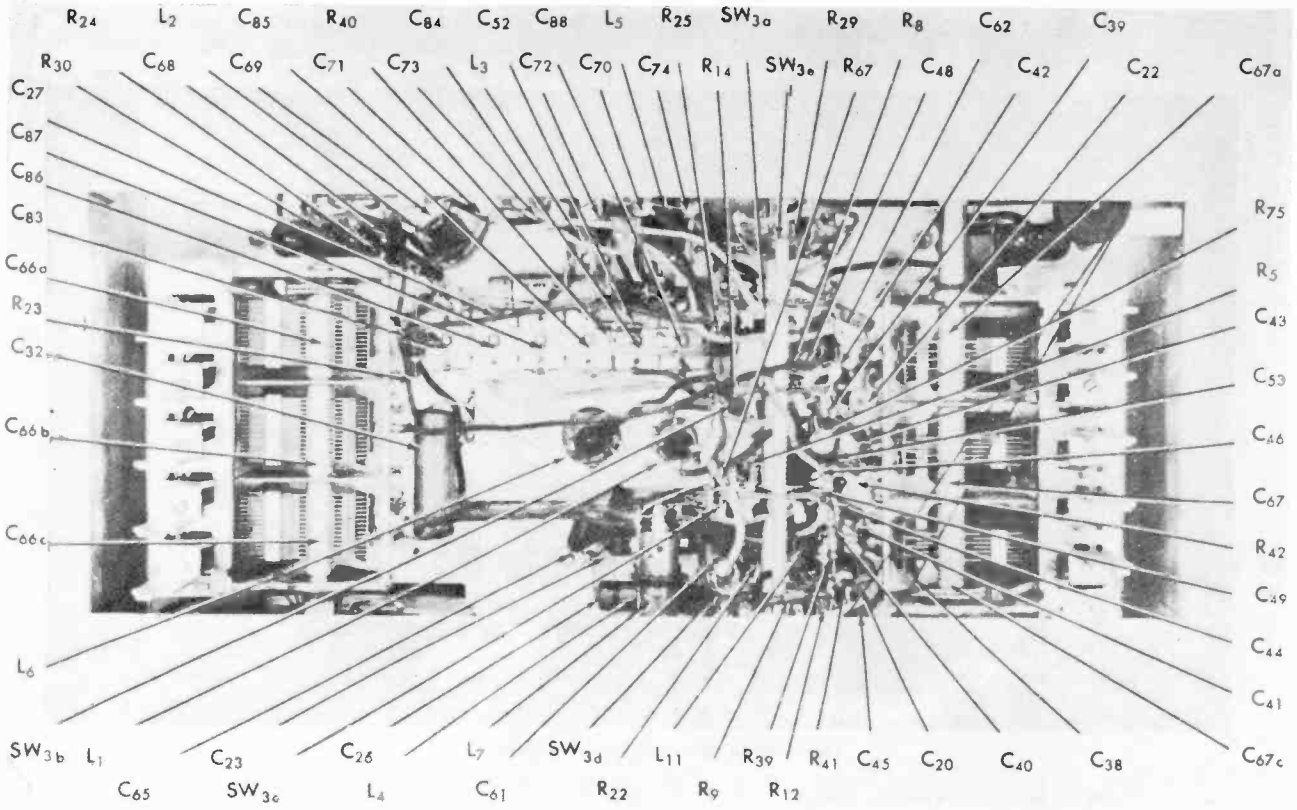


Top view showing alignment points.



Top view showing component location.

MODEL 84HA-2725A

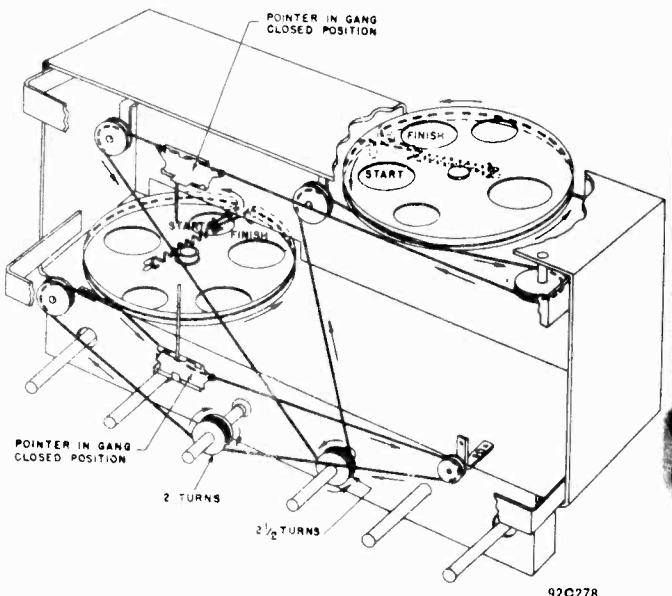


Front view of R.F. chassis showing component location.

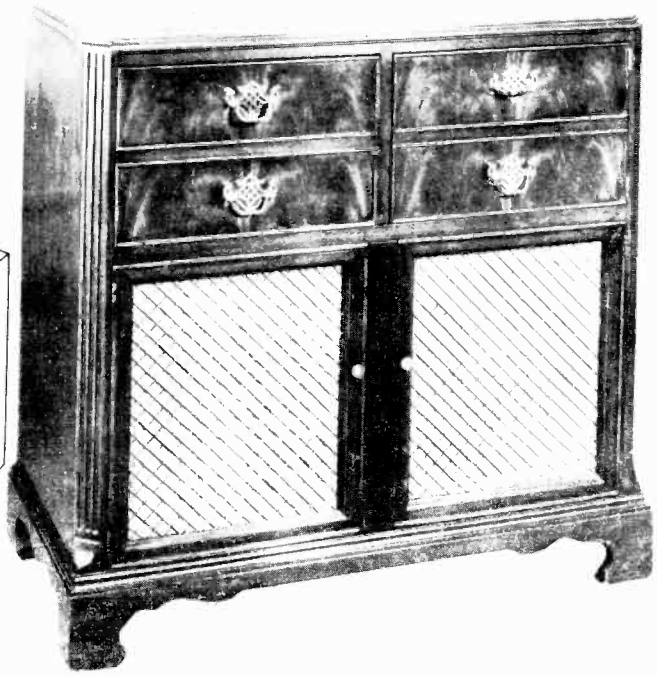
DIAL CORD STRINGING INSTRUCTIONS

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.

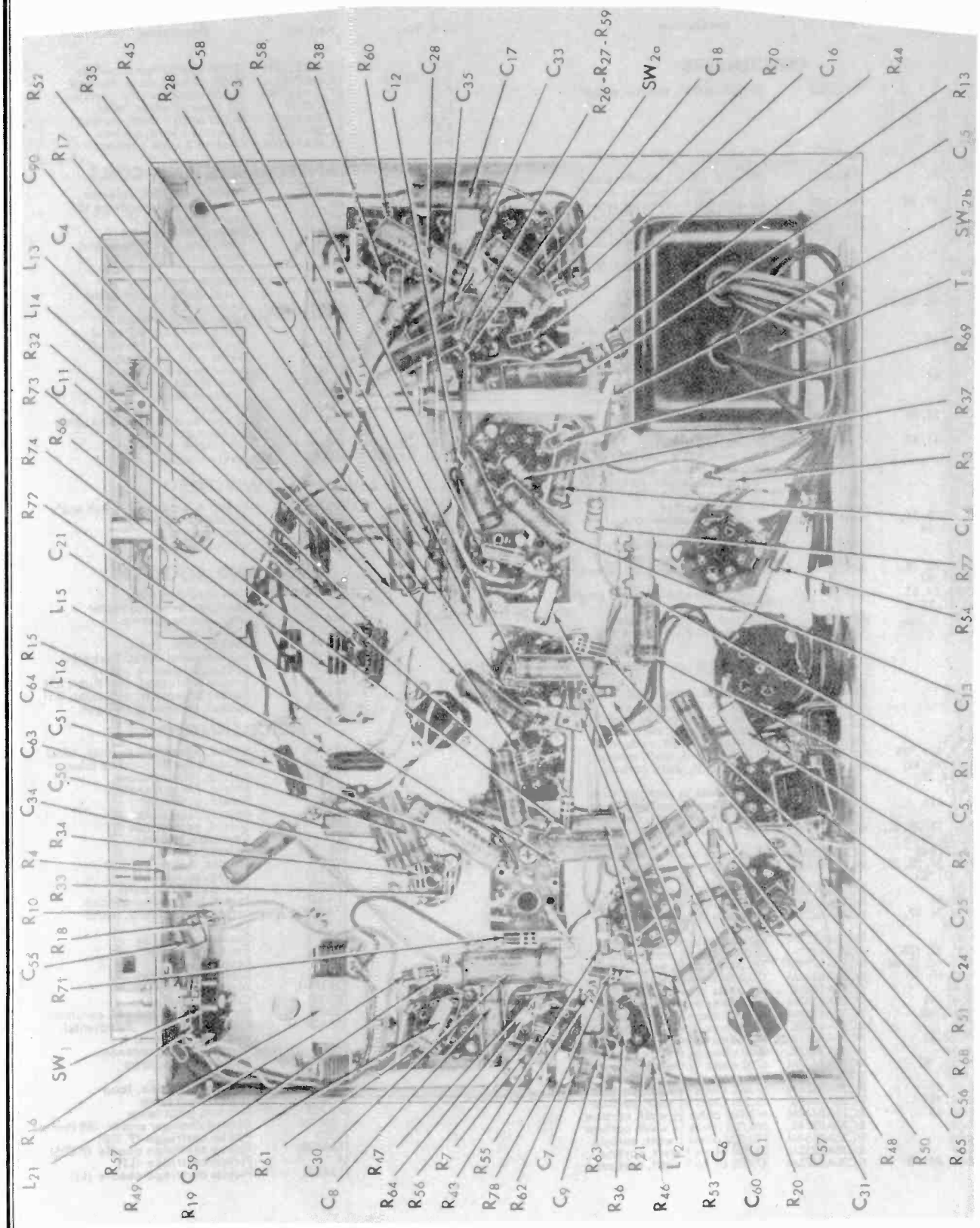
Index the pointer carriage as described under ALIGNMENT PROCEDURE.



Dial cable stringing procedure.



MODEL 84HA-2725A



Bottom view of receiver showing component location.

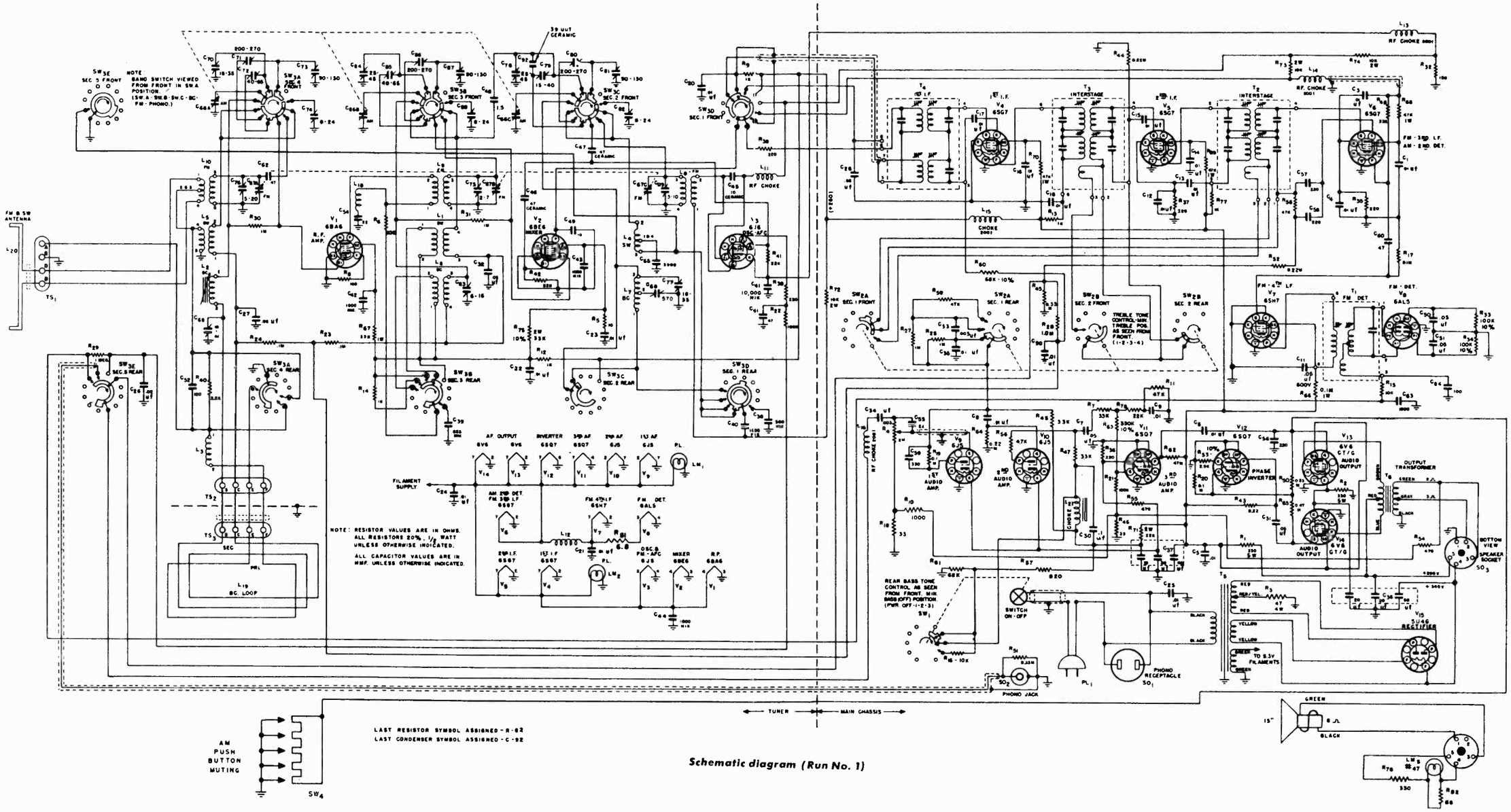
MODEL 84HA-2725A

Ref. No.	Part No.	Description
CONDENSERS		
C-1, 3, 4, 5, 6, 8, †9, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 35, 90	46AZ103F	.01 mfd. 600 V., tubular paper
†C-7, 11, 31, 32, 50, 51, *93	46AY503F	.05 mfd. 600 V., tubular paper
*C-7, 34	46AZ302J	.003 mfd. 600 V., tubular paper
C-25	46AG103J	.01 mfd. 600 V., molded paper
C-26, 27, 28	46AY203F	.02 mfd. 600 V., tubular paper
†C-30	46AU104H	.1 mfd. 200 V., tubular paper
C-33	46AZ502J	.005 mfd. 600 V., tubular paper
C-36	45B099	60-20 mfd. 450 V., 20 mfd. 30 V., electrolytic
C-37	45B100	40-10 mfd. 450 V., 20 mfd. 30 V., electrolytic
C-38, 39	47A147	500 mmf. 500 V., ceramic
C-40, 42, 43, 44	47A148	1000 mmf. 500 V., ceramic
C-41	47B32103N1	10,000 mmf. 150 V., ceramic
C-45	47A149	10 mmf. 500 V., ceramic
C-46, 47	47A150	47 mmf. 500 V., ceramic
C-48	47A160-3	1.5 mmf. ceramic
C-49	CM20A100K	10 mmf. 500 V., mica
C-52, 64	CM20A101M	100 mmf. 500 V. mica
C-54	CM20A220K	22 mmf. 500 V., mica
C-55	CM20A220M	22 mmf. 500 V., mica
C-56, 57, 58	CM20A221M	220 mmf. 500 V., mica
†C-59	CM20A331M	330 mmf. 500 V., mica
C-60, 61, 62	CM20A470M	47 mmf. 500 V., mica
C-63	CM30A102M	1000 mmf. 500 V., mica
C-65	CM35A392J	3900 mmf. 500 V., mica
C-66	48C176	Tuning condenser, AM
C-67	48C175	Tuning condenser, FM
C-68	44A189	570 mmf. trimmer
C-69, 70, 71, 72, 73, 74	44B190	Trimmer assembly, ant. stage
C-75	44A192	Trimmer, FM, mixer stage
C-76	44A194	Trimmer, FM, ant. stage
C-77, 78, 79, 80, 81, 82	44B195	Trimmer assembly, osc. stage
C-83, 84, 85 86, 87, 88	44B196	Trimmer assembly, mixer stage
C-89	44A218	Trimmer, FM, osc. stage
C-92	CC30SH390M	39 mmf. 500 V., ceramic
RESISTORS		
R-1, 2	24A864	330 ohms 5 watts, WW
R-3	RC65CE470M	47 ohms 4 watts, carbon
R-4	25A571	2 meg-ohms, volume control
R-5	RC20AE100M	10 ohms ½ watt, carbon
R-6, 8	RC20AE101M	100 ohms ½ watt, carbon
†R-7, †49, *79	RC20AE333M	33,000 ohms ½ watt, carbon
R-9, †10, 12, 13, 14, 77	RC20AE102M	1000 ohms ½ watt, carbon
†R-11	RC20AE473M	47,000 ohms ½ watt, carbon
R-15, †16	RC20AE103M	10,000 ohms ½ watt, carbon
*R-16	RC20AE153M	15,000 ohms ½ watt, carbon
R-17, 19, 20, 21, 22, 23, 24	RC20AE104M	100,000 ohms ½ watt, carbon
†R-18, †46	RC20AE330M	33 ohms ½ watt, carbon
R-26, 27, 28, 29, 30, 31, *83	RC20AE105M	1 meg-ohm ½ watt, carbon
R-32	RC20AE151M	150 ohms ½ watt, carbon
R-33, 34	RC20AE104K	100,000 ohms ½ watt, carbon
R-35, 36, 37, 38, 39	RC20AE221M	220 ohms ½ watt, carbon
R-40	RC20AE222M	2200 ohms ½ watt, carbon
R-41, 42, †78	RC20AE223M	22,000 ohms ½ watt, carbon
R-43, 44, 52, 64	RC20AE224M	220,000 ohms ½ watt, carbon
R-45, 50, 51	RC20AE334M	330,000 ohms ½ watt, carbon
*R-46	RC20AE681K	680 ohms ½ watt, carbon
†R-47, 48	RC20AE332M	3300 ohms ½ watt, carbon
*R-47, *49	RC20AE154M	150,000 ohms ½ watt, carbon
R-53	RC20AE392K	3900 ohms ½ watt, carbon
†R-54, 55	RC20AE471M	470 ohms ½ watt, carbon
*R-54	RC20AE822K	8200 ohms ½ watt, carbon
†R-56, *82	RC20AE472M	4700 ohms ½ watt, carbon
†R-57	RC20AE821K	820 ohms ½ watt, carbon
R-58, 59	RC20AE473M	47,000 ohms ½ watt, carbon
R-60, †61	RC20AE683K	68,000 ohms ½ watt, carbon
R-62, 65	RC20AE474M	470,000 ohms ½ watt, carbon
R-63	RC20AE394K	390,000 ohms ½ watt, carbon
R-66	RC30AE104M	100,000 ohms 1 watt, carbon
R-67	RC30AE333M	33,000 ohms 1 watt, carbon
R-68, 69, 70	RC30AE473M	47,000 ohms 1 watt, carbon
R-71	RC40AE223M	22,000 ohms 1 watt, carbon
R-72, 73, 74	RC40AE103M	10,000 ohms 2 watts, carbon
R-75	RC40AE333K	33,000 ohms 2 watts, carbon
R-76	24BG331E	330 ohms 10 watts, WW
*R-80	RC30AE683K	68,000 ohms 1 watt, carbon
R-81	RC30AE068K	6.8 ohms 1 watt, carbon
R-84	RC40AE680M	68 ohms 2 watt, carbon
TRANSFORMERS AND COILS		
T-1	50C208	Transformer, FM detector
T-2, 3	50C209	Transformer, interstage IF
T-4	50C210	Transformer, 1st IF
T-5	52C151	Transformer, power
T-6	55B086	Transformer, audio output
L-1	51B905	Mixer coil, SW band
L-2	51B906	Antenna coil, BC band
L-3	51B907	Loading coil, loop
L-4	51B908	Oscillator coil, SW band
L-5	51B909	Antenna coil, SW band
L-6	51B910	Mixer coil, BC band
L-7	51B911	Oscillator coil, BC band
L-8	51B914	Oscillator coil, FM band
L-9	51B915	Mixer coil, FM band
L-10	51B916	Antenna coil, FM band
L-11	53B008	Plate choke, osc. stage
L-12	53B009	Filament choke
L-13, 14, 15, 16	53A106	RF choke
L-18	53A115	RF choke, antenna stage plate
L-19	57C106	BC loop antenna
L-20	57C108-1	FM folded doublet
†L-21	56B082	Audio choke
SWITCHES		
SW-1	60B265	Power & Bass tone switch ass'y
SW-2	60B264	Treble switch ass'y
SW-3	60C266	Band switch
SW-4	18A092	Muting switch
PLUGS AND SOCKETS		
PL-1	87B1625	Line cord and plug
SO-1	10A015	Receptacle, phono motor
SO-2	36A034	Jack, phono pick-up
SO-3	6A277	Socket, speaker
	6A190	Socket, octal (tube)
	6A296	Socket, octal (6V6GT tubes)
	6B297	Socket, miniature (tube)
	86A046	Socket & bracket, dial light, L.H.
	86A047	Socket & bracket, dial light, R.H.
	86B050-1	Socket, cabinet pilot light
MISCELLANEOUS		
	69A169	Shield, tube base (miniat. tube)
	69A104	Shield, tube (miniature tube)
	75A076	Spring, tube retainer
	69C172	Shield, FM coil section
	86A037	Shield, dial light
	69A197	Shield, pilot light
	69B217	Shield, escutcheon
	67B645	Carriage, pointer
	82B139	Pointer, FM
	82B143	Pointer, AM
	75A132	Spring, pointer
	17B028	Push-button (brown)
	17A027	Insert, push-button, lucite
	17A029	Insert, push-button, metal
	17A025	Call letters
	75A006	Spring, dial drive
	38A017	Cord, dial drive
	7D039	Escutcheon
	22D178	Dial glass, upper
	22B179-1	Dial glass, lower
	76A331	Clips, dial glass
	15B093	Knob (Tuning and vol. controls)
	15A129	Knob & pin ass'y (Bandswitch and tone controls)
TS-1	880277	Terminal strip, antenna
TS-2	88A278	Terminal strip, loop
	85C056-1	Speaker ass'y
	87A1615-1	Transmission line, loop
	86A057	Jewel, pilot lamp
	67A765	Bracket, pilot lamp
	L-230200	Record changer motor (60 cycles)
	P-30S	Pickup cartridge (P-30S)
	115A020	Pickup cartridge needle (P-30S)
	LT	Pickup cartridge (LT)
	115A021	Pickup cartridge needle (LT)

† NOTE—Used only on chassis stamped RUN No. 1.

* NOTE—Used only on chassis stamped RUN No. 2.

Run Numbers are stamped on rear chassis apron.



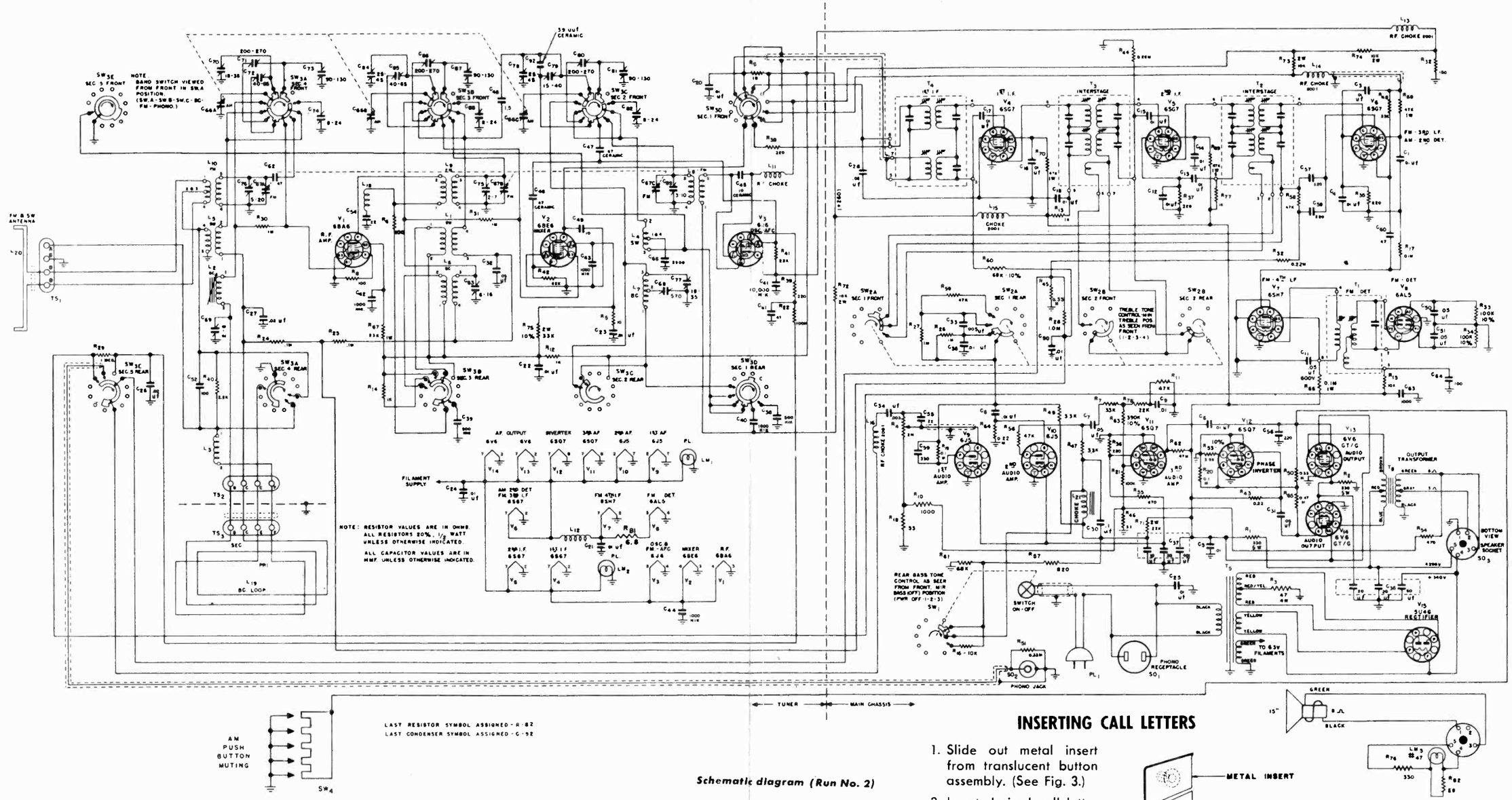
Schematic diagram (Run No. 1)

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles, 180 watts, 200 watts with record changer
Frequency Ranges	Broadcast 540-1700 KC Frequency Modulation 88-108 MC Short Wave "A" 15-18 MC "B" 9-12 MC "C" 5.8-18 MC
Intermediate Frequency	AM - 455 KC FM - 10.7 MC
Antennas	AM - Built-in Loop FM - Built-in Doublet Provision for external antennas
Power Output	10 watts (Undistorted)
Speaker	15-inch P.M.
Voice Coil Impedance	8 ohms
Record Changer	See Manual No. 5046
Tube and Dial Lamp Complement	6BA6 R.F. Amplifier 6BE6 Mixer 6J6 Oscillator/A.F.C. 6SG7 1st I.F. Amplifier 6SG7 2nd I.F. Amplifier 6SG7 { FM - I.F. Amplifier / AM - 2nd Detector 6SH7 FM I.F. Amplifier 6AL5 FM Detector 6J5 1st Audio Amplifier 6J5 2nd Audio Amplifier 6SQ7 3rd Audio Amplifier 6SQ7 Phase Inverter 6V6GT/G } 6V6GT/G } Power Amplifier 5U4G Rectifier Mazda No. 44 Dial Lamps Mazda No. 47 Pilot Lamp

RECORD CHANGER: See Seeburg Model L, Pages RCD.CH. 15-18 through RCD.CH. 15-38.

MODEL 84HA-2725A



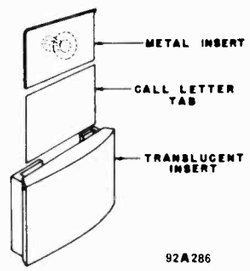
Schematic diagram (Run No. 2)

GENERAL DESCRIPTION

This model is a 14 tube (plus rectifier tube) superheterodyne console radio with an automatic record changer. A built-in loop provides signal pick-up for the standard (540-1700 kc) broadcast band. A built-in folded doublet type antenna with 300-ohm transmission line serves primarily as the FM antenna and also as a pick-up for the shortwave bands. Separate manual tuning controls are provided for FM and AM (including SW) reception. Two sets of five mechanical pushbuttons are provided for FM and AM automatic tuning. Automatic frequency control is provided for FM reception to compensate for thermal drift and mistuning encountered with pushbutton control. Separate bass and treble controls are used to provide maximum tone control over the response of the audio system. The band switch provides for selection of five frequency channels and phono operation. The five frequency channels consist of the FM band (88-108 mc), the AM or broadcast band (540-1700 kc) and three SW (shortwave) bands (15-18 mc) (9-12 mc) and (5.8-18 mc). The first two shortwave bands are "spread bands" to provide more desirable tuning in the SW broadcast bands.

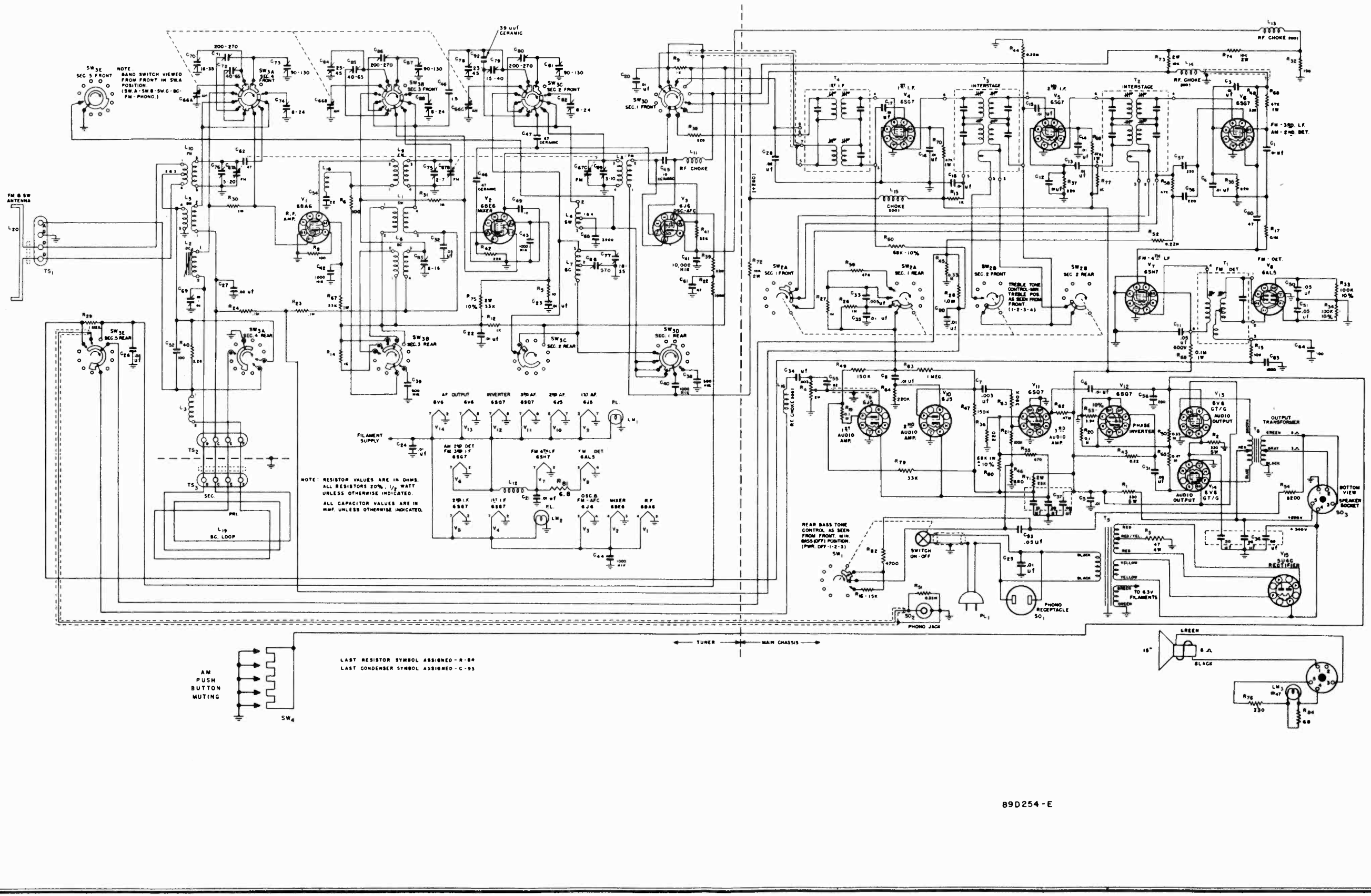
INSERTING CALL LETTERS

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



Call letter installation.

MODEL 84HA-2727A



MODEL 84HA-2727A

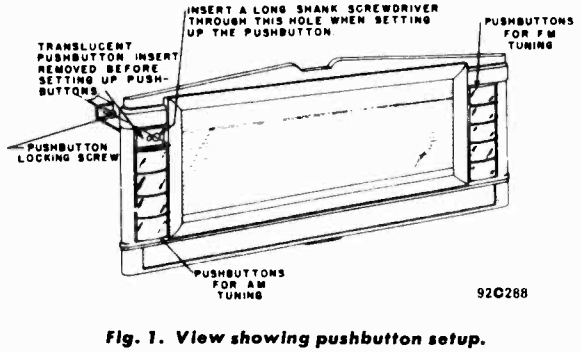


Fig. 1. View showing pushbutton setup.

BUTTON SETTING

Insulate the muting switch contacts before setting the lower group of AM pushbuttons. See Fig. 2. The upper group of pushbuttons do not require insulation.

1. Select any one pushbutton.
2. Pull translucent insert straight out.
3. Insert screw driver blade through large hole of push-button 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 as shown in Fig. 3.

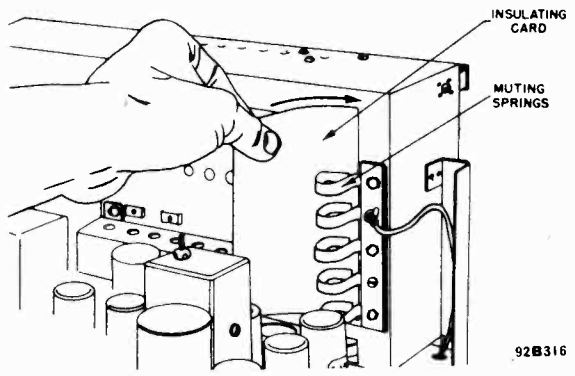


Fig. 2. Insulating the muting switch contracts.

INSERTING CALL LETTERS

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

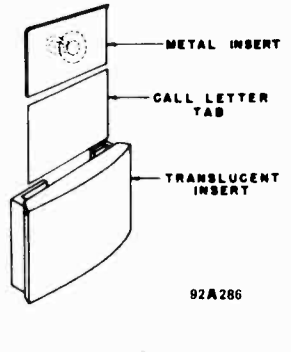


Fig. 3. Call letter installation.

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.

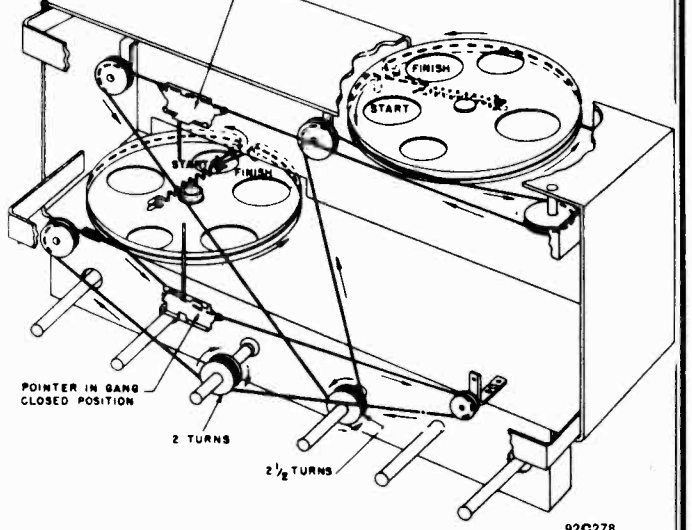


Fig. 4. Dial cable stringing procedure.

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

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

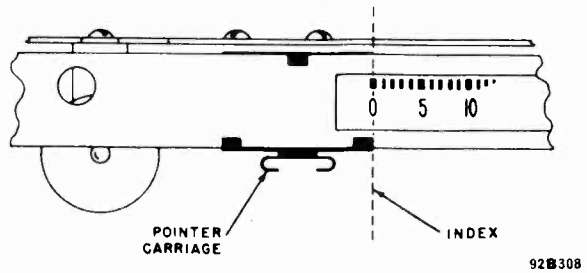


Fig. 5. Calibration strip detail.

MODEL 84HA-2727A

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 a 20,000 ohm per volt meter.
3	0.01 mfd. cap.	To stator plates of center section of FM tuning cap.	10.7 mc (No modulation)	"FM"	Mid-scale	55	S14	Adjust for zero voltage as measured between junction L16 and C34 and ground with a 20,000 ohm per volt meter.
4	Std. RMA dummy	To terminals "A" and "G" on ant. term. strip. TS_1.	1500 kc 600 kc	"BC" "BC"	1500 kc 600 kc	82 15.5	F*, H, and I G*	Adjust for max. output as in step 1.
5	Std. RMA dummy	To terminals "A" and "G" on ant. term. strip. TS_1.	16 mc	"C"	16 mc	84	E*, R, and S	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 15 mc	"A" "A"	18 mc 15 mc	94.5 7.5	A*, O, and N B*, P and Q	Adjust for max. output as in step 1.
7	Std. RMA dummy	To terminals "A" and "G" on ant. term. strip. TS_1.	12 mc 9 mc	"B" "B"	12 mc 9 mc	91.5 6.5	C*, J, and K D*, L	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.

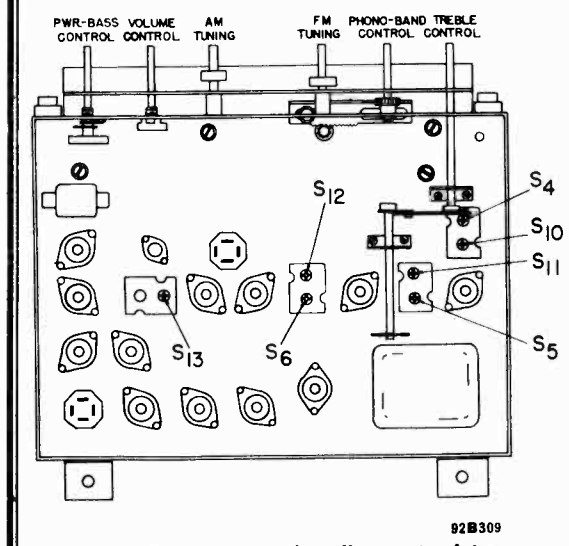


Fig. 7. Bottom view showing alignment points.

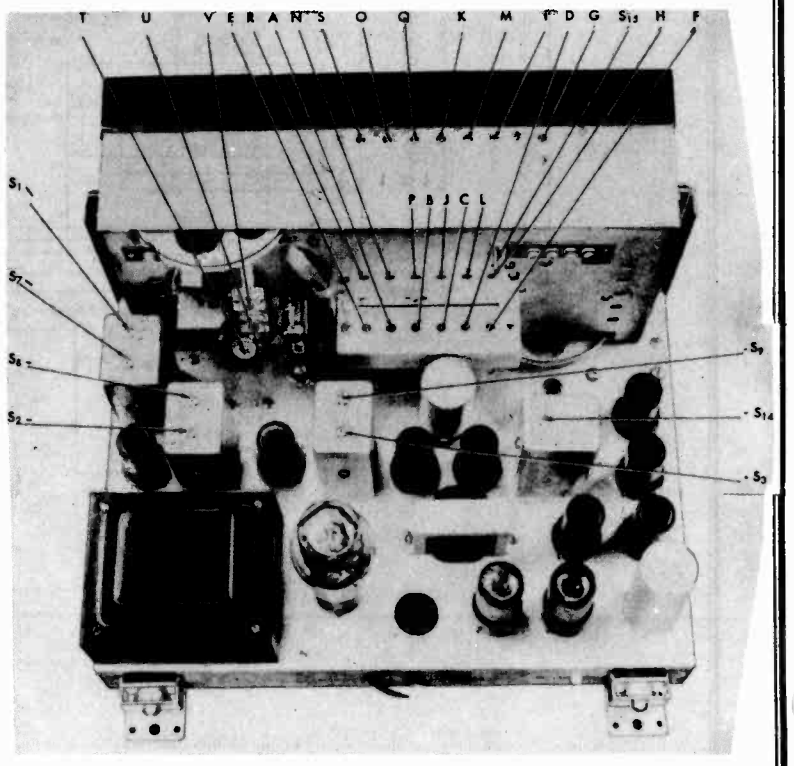


Fig. 6. Top view showing alignment points.

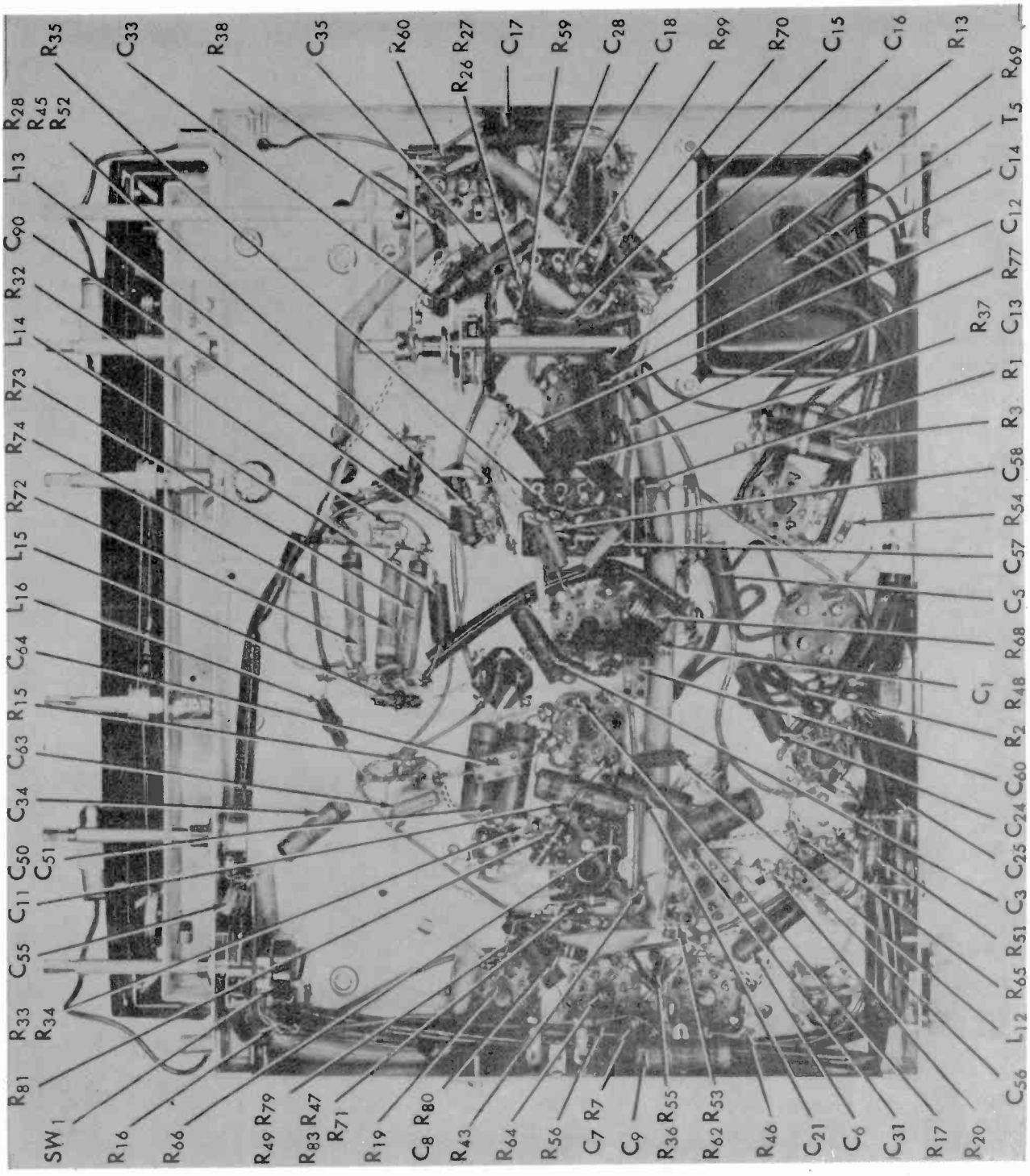


Fig. 8. Bottom view of receiver showing component location.

MODEL 84HA-2727A

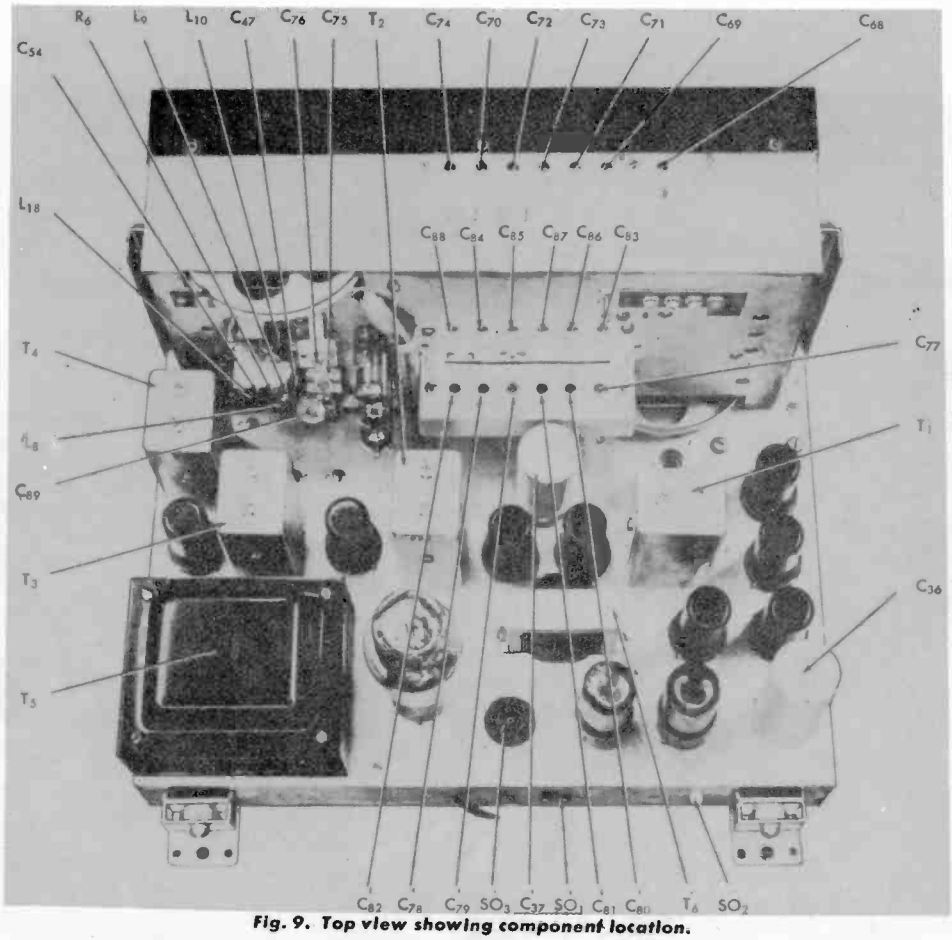
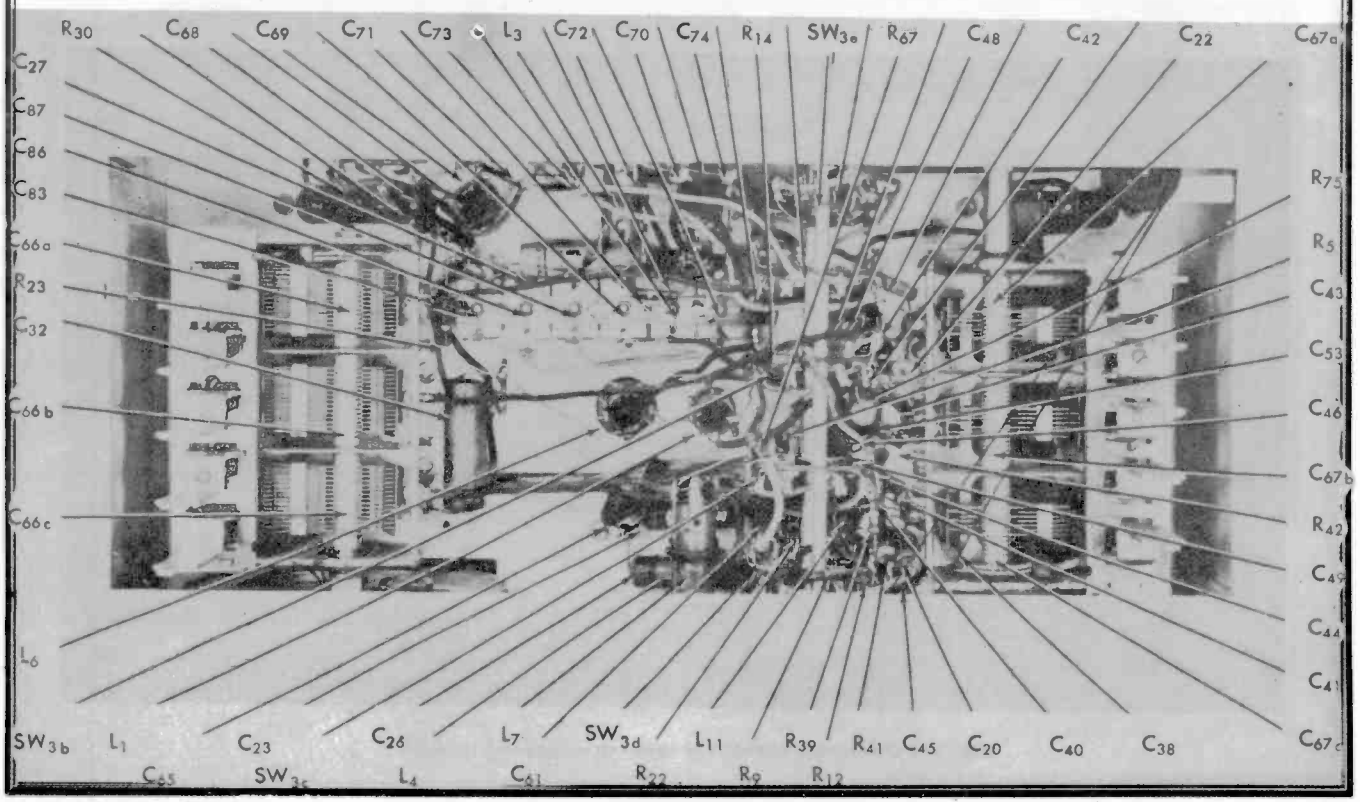


Fig. 9. Top view showing component location.

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



MODEL 84HA-2727A

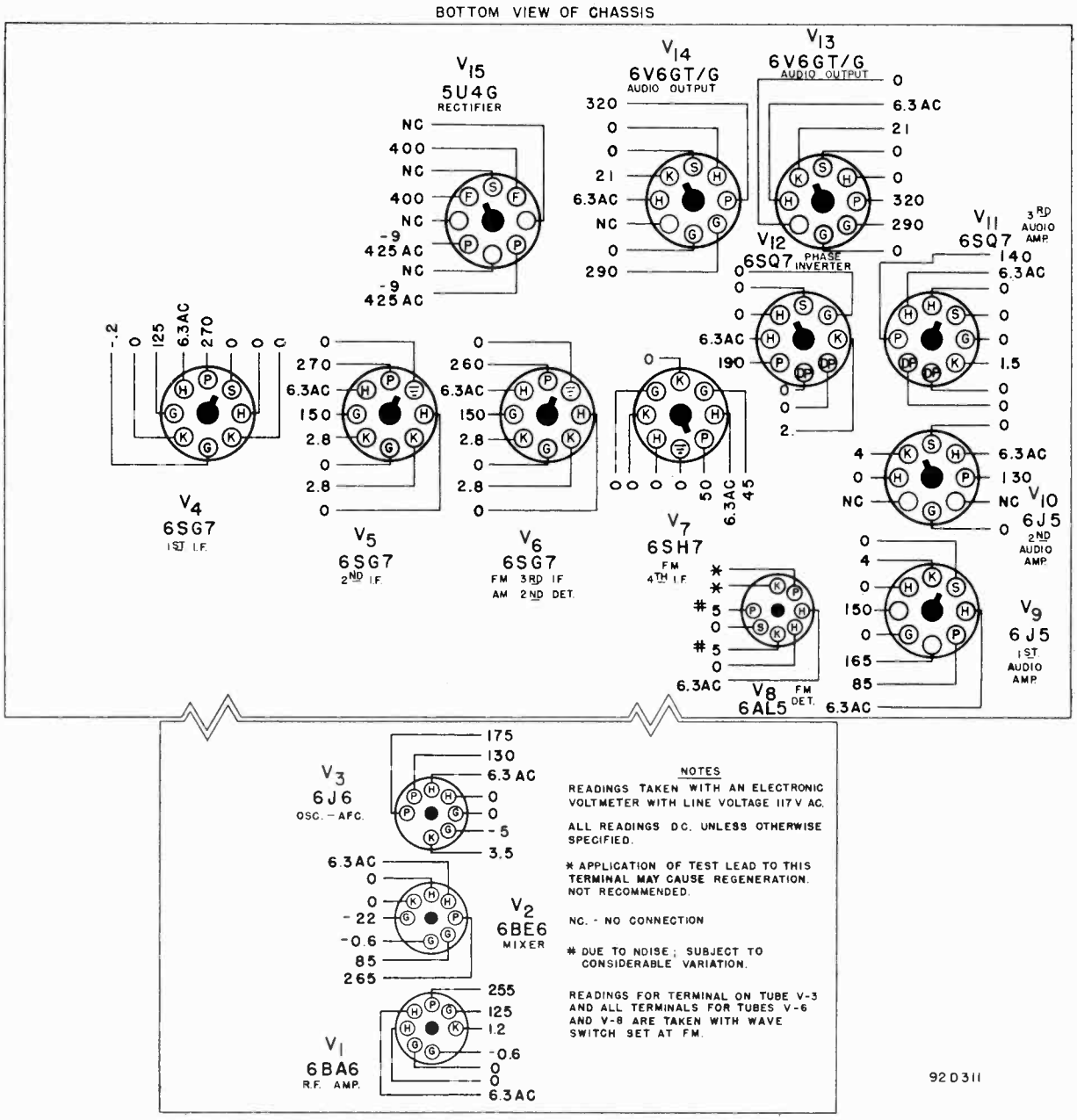


Fig. 11. Tube socket voltage chart.

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles, 180 watts, 200 watts with record changer
Frequency Ranges	Broadcast 540-1700 KC Frequency Modulation 88-108 MC Short Wave "A" 15-18 MC "B" 9-12 MC "C" 5.8-18 MC
Intermediate Frequency	AM - 455 KC FM - 10.7 MC
Antennas	AM - Built-in Loop FM - Built-in Doublet Provision for external antennas
Power Output	10 watts (Undistorted)
Speaker	15-inch P.M.
Voice Coil Impedance	8 ohms
Record Changer	See Manual No. 5046
Tube and Dial Lamp Complement	6BA6 R.F. Amplifier 6BE6 Mixer 6J6 Oscillator/A.F.C. 6SG7 1st I.F. Amplifier 6SG7 2nd I.F. Amplifier 6SG7 { FM - I.F. Amplifier / AM - 2nd Detector 6SH7 FM I.F. Amplifier 6AL5 FM Detector 6J5 1st Audio Amplifier 6J5 2nd Audio Amplifier 6SQ7 3rd Audio Amplifier 6SQ7 Phase Inverter 6V6GT/G, 6V6GT/G } Power Amplifier 5U4G Rectifier Mazda No. 44 Dial Lamps Mazda No. 47 Pilot Lamp

MODEL 84HA-2727A

CONDENSERS

Ref. No.	Part No.	Description
C-1, 3, 4, 5, 6, 8, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 35, 90	46AZ103F	.01 mfd. 600 V., tubular paper
C-7, 34	46AZ302J	.003 mfd. 600 V., tubular paper
C-11, 31, 32, 50, 51, 93	46AY503F	.05 mfd. 600 V., tubular paper
C-25	46AG103J	.01 mfd. 600 V., molded paper
C-26, 27, 28	46AY203F	.02 mfd. 600 V., tubular paper
C-33	46AZ502J	.005 mfd. 600 V., tubular paper
C-36	45B099	60-20 mfd. 450 V., 20 mfd. 30 V., electrolytic
C-37	45B100	40-10 mfd. 450 V., 20 mfd. 30 V., electrolytic
C-38, 39	47A147	500 mmf. 500 V., ceramic
C-40, 42, 43, 44	47A148	1000 mmf. 500 V., ceramic
C-41	47B32103N1	10,000 mmf. 150 V., ceramic
C-45	47A149	10 mmf. 500 V., ceramic
C-46, 47	47A150	47 mmf. 500 V., ceramic
C-48	47A160-3	1.5 mmf. ceramic
C-49	CM20A100K	10 mmf. 500 V., mica
C-52, 64	CM20A101M	100 mmf. 500 V. mica
C-54	CM20A220K	22 mmf. 500 V., mica
C-55	CM20A220M	22 mmf. 500 V., mica
C-56, 57, 58	CM20A221M	220 mmf. 500 V., mica
C-60, 61, 62	CM20A470M	47 mmf. 500 V., mica
C-63	CM30A102M	1000 mmf. 500 V., mica
C-65	CM35A392J	3900 mmf. 500 V., mica
C-66	48C176	Tuning condenser, AM
C-67	48C175	Tuning condenser, FM
C-68	44A189	570 mmf. trimmer
C-69, 70, 71, 72, 73, 74	44B190	Trimmer assembly, ant. stage
C-75	44A192	Trimmer, FM, mixer stage
C-76	44A194	Trimmer, FM, ant. stage
C-77, 78, 79, 80, 81, 82	44B195	Trimmer assembly, osc. stage
C-83, 84, 85 86, 87, 88	44B196	Trimmer assembly, mixer stage
C-89	44A218	Trimmer, FM, osc. stage
C-92	CC30SH390M	39 mmf. 500 V., ceramic

RESISTORS

R-1, 2	24A864	330 ohms 5 watts, WW
R-3	RC65CE470M	47 ohms 4 watts, carbon
R-4	25A571	2 meg-ohms, volume control
R-5	RC20AE100M	10 ohms ½ watt, carbon
R-6, 8	RC20AE101M	100 ohms ½ watt, carbon
R-9, 12, 13, 14, 77	RC20AE102M	1000 ohms ½ watt, carbon
R-15	RC20AE103M	10,000 ohms ½ watt, carbon
R-16	RC20AE153M	15,000 ohms ½ watt, carbon
R-17, 19, 20, 21, 22, 23, 24	RC20AE104M	100,000 ohms ½ watt, corbon
R-26, 27, 28, 29, 30, 31, 83	RC20AE105M	1 meg-ohm ½ watt, carbon
R-32	RC20AE151M	150 ohms ½ watt, carbon
R-33, 34	RC20AE104K	100,000 ohms ½ watt, carbon
R-35, 36, 37, 38, 39	RC20AE221M	220 ohms ½ watt, carbon
R-40	RC20AE222M	2200 ohms ½ watt, carbon
R-41, 42	RC20AE223M	22,000 ohms ½ watt, carbon
R-43, 44, 52, 64	RC20AE224M	220,000 ohms ½ watt, carbon
R-45, 50, 51	RC20AE334M	330,000 ohms ½ watt, carbon
R-46	RC20AE681K	680 ohms ½ watt, carbon
R-47, 49	RC20AE154M	150,000 ohms ½ watt, carbon
R-48	RC20AE332M	3300 ohms ½ watt, carbon
R-53	RC20AE392K	3900 ohms ½ watt, carbon
R-54	RC20AE822K	8200 ohms ½ watt, carbon
R-55	RC20AE471M	470 ohms ½ watt, carbon
R-58, 59	RC20AE473M	47,000 ohms ½ watt, carbon
R-60	RC20AE683K	68,000 ohms ½ watt, carbon
R-62, 65	RC20AE474M	470,000 ohms ½ watt, carbon
R-63	RC20AE394K	390,000 ohms ½ watt, carbon
R-66	RC30AE104M	100,000 ohms 1 watt, carbon
R-67	RC30AE333M	33,000 ohms 1 watt, carbon
R-68, 69, 70	RC30AE473M	47,000 ohms 1 watt, carbon
R-71	RC40AE223M	22,000 ohms 1 watt, carbon
R-72, 73, 74	RC40AE103M	10,000 ohms 2 watts, carbon
R-75	RC40AE333K	33,000 ohms 2 watts, carbon
R-76	24BG331E	330 ohms 10 watts, WW
R-79	RC20AE333M	33,000 ohms ½ watt, carbon
R-80	RC30AE683K	68,000 ohms 1 watt, carbon
R-81	RC30AE068K	6.8 ohms 1 watt, carbon
R-82	RC20AE472M	4700 ohms ½ watt, carbon
R-84	RC40AE680M	68 ohms 2 watt, carbon

TRANSFORMERS AND COILS

T-1	50C208	Transformer, FM detector
T-2, 3	50C209	Transformer, interstage IF
T-4	50C210	Transformer, 1st IF
T-5	52C151	Transformer, power
T-6	55B086	Transformer, audio output
L-1	51B905	Mixer coil, SW band
L-2	51B906	Antenna coil, BC band
L-3	51B907	Loading coil, loop
L-4	51B908	Oscillator coil, SW band
L-5	51B909	Antenna coil, SW band
L-6	51B910	Mixer coil, BC band
L-7	51B911	Oscillator coil, BC band
L-8	51B914	Oscillator coil, FM band
L-9	51B915	Mixer coil, FM band
L-10	51B916	Antenna coil, FM band
L-11	53B008	Plate choke, osc. stage
L-12	53B009	Filament choke
L-13, 14, 15, 16	53A106	RF choke
L-18	53A115	RF choke, antenna stage plate
L-19	57C106	BC loop antenna
L-20	57C108-1	FM folded doublet

SWITCHES

SW-1	60B265	Power & Bass tone switch ass'y
SW-2	60B264	Treble switch ass'y
SW-3	60C266	Band switch
SW-4	18A092	Muting switch

PLUGS AND SOCKETS

PL-1	87B1625	Line cord and plug
SO-1	10A015	Receptacle, phono motor
SO-2	36A034	Jack, phono pick-up
SO-3	6A277	Socket, speaker
	6A190	Socket, octal (tube)
	6A296	Socket, octal (6V6GT tubes)
	6B297	Socket, miniature (tube)
	86A046	Socket & bracket, dial light, L.H.
	86A047	Socket & bracket, dial light, R.H.
	86B050-1	Socket, cabinet pilot light

MISCELLANEOUS

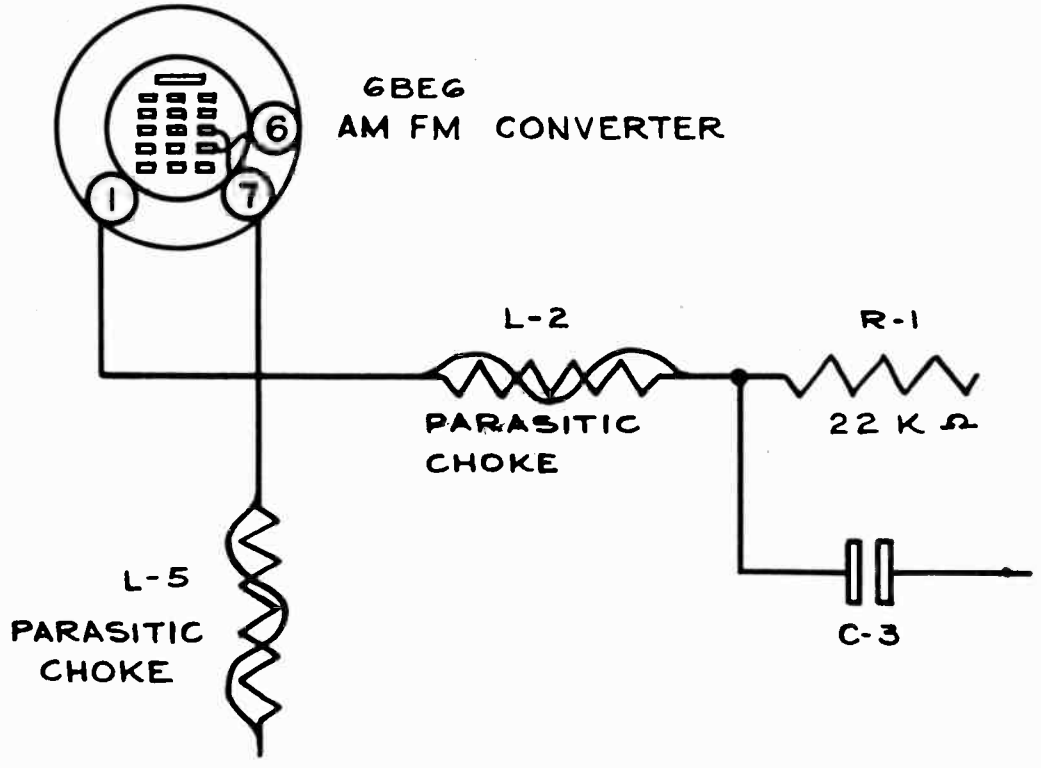
	69A169	Shield, tube base (miniat. tube)
	69A104	Shield, tube (miniature tube)
	75A076	Spring, tube retainer
	69C172	Shield, FM coil section
	86A037	Shield, dial light
	69A197	Shield, pilot light
	69B217	Shield, escutcheon
	67B645	Carriage, pointer
	82B139	Pointer, FM
	82B143	Pointer, AM
	75A132	Spring, pointer
	17B028	Push-button (brown)
	17A027	Insert, push-button, lucite
	17A029	Insert, push-button, metal
	17A026	Call letters
	75A006	Spring, dial drive
	38A017	Cord, dial drive
	7D039	Escutcheon
	22D192-1	Dial glass, calibrated
	22B177	Dial glass, control identification
	76A331	Clips, dial glass
	15B093	Knob (Tuning and vol. controls)
	15A129	Knob & pin ass'y (Bandswitch and tone controls)
TS-1	880277	Terminal strip, antenna
TS-2	88A278	Terminal strip, loop
	85C056-1	Speaker ass'y
	87A1615-1	Transmission line, loop
	86A057	Jewel, pilot lamp
	67A765	Bracket, pilot lamp
	L-230200	Record changer motor (60 cycles)
	P-30S	Pickup cartridge (P-30S)
	11SC020	Pickup cartridge needle (P-30S)
	LT	Pickup cartridge (LT)
	115A021	Pickup cartridge needle (LT)

A choke has been added to the circuit to eliminate parasitic oscillation on the FM Band.

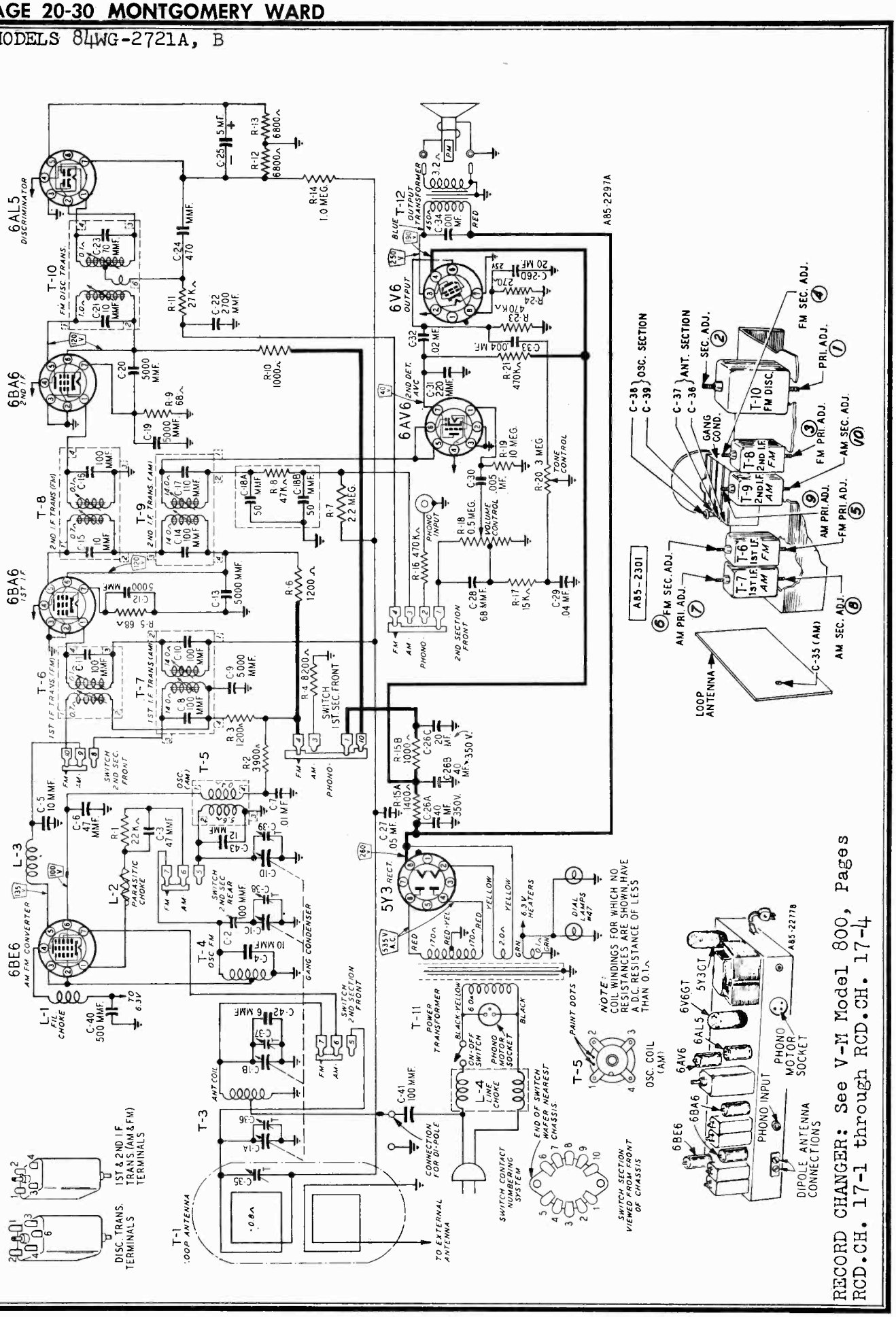
PARTS LIST ADDITION

Ref. No.	Part No.	Description	Qty. Used
L-5	9A1967	Parasitic Choke	1

The circuit connection of L-5 is shown in the partial schematic below.

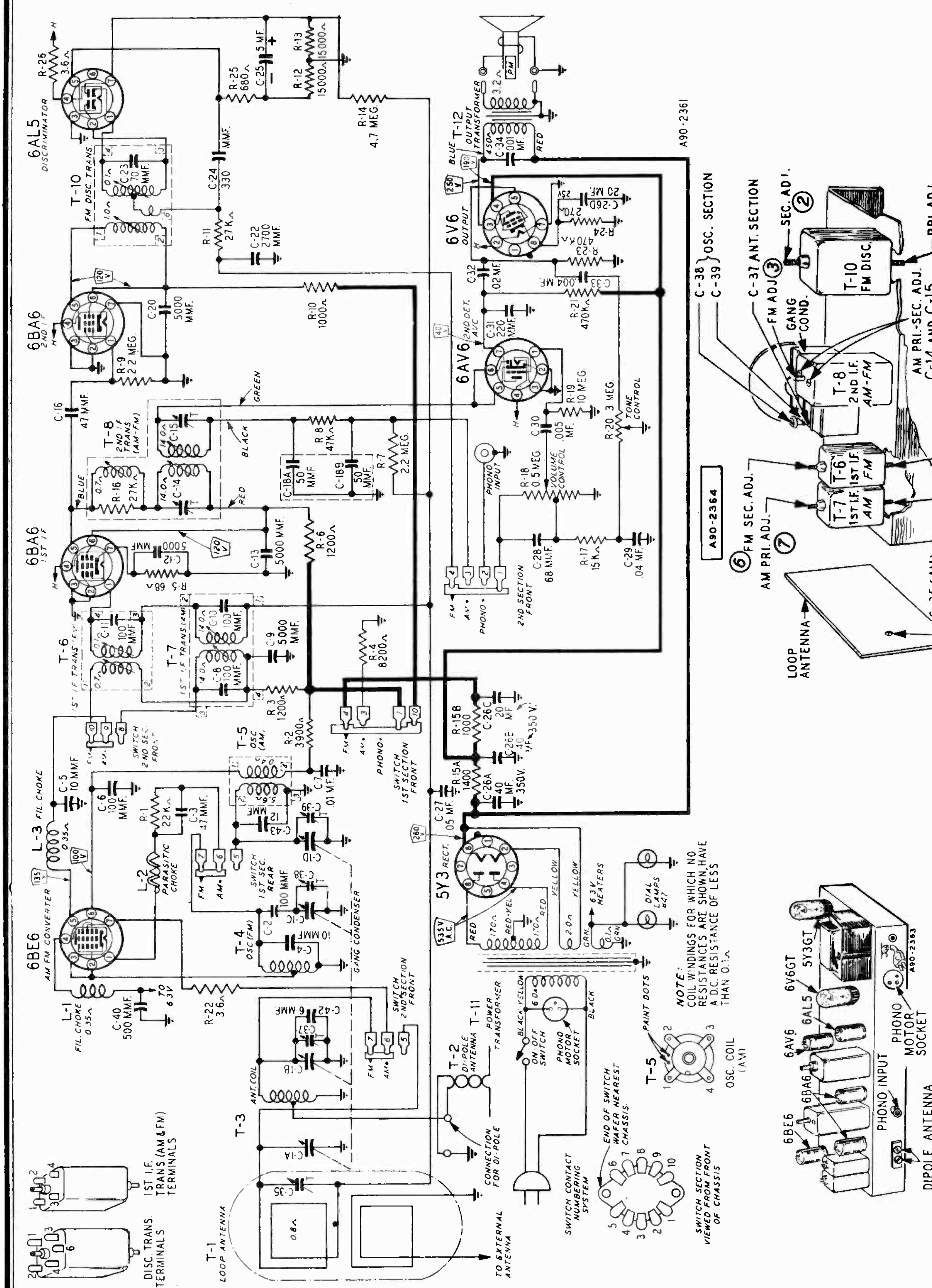


MODELS 84WG-2721A, B



RECORD CHANGER: See V-M Model 800, Pages RCD.CH. 17-1 through RCD.CH. 17-4

MODEL 84WG-2721C



RECORD CHANGER: See V-M Model 800, Pages RCD.CH. 17-1 through RCD. CH. 17-4

MODELS 84WG-2721A, B, C

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 Generctor with a Short Heavy Lead.
Allow Chassis and Signal Generatar to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. and Sec. (9) and (10)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. and Sec. (7) and (8)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-39	Maximum Output
1400 KC	External Antenna Lead	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-35	Maximum Output

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

FM STAGES

The following is required for aligning:
An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.
Non-metallic screwdriver.
Dummy Antennas and I-F Loading Resistor — .01 mf, 300 ohms and 100K ohms
Zero center scale DC vacuum tube voltmeter having a range 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	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	
I-F	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	2nd I-F Pri. (3) 2nd I-F Sec. (4) Note C	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 line 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 A.V.C. line at the 27 K. ohm resistor (R-11) and its junctian with terminal strip. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from A.V.C. and connect it at the audio takeoff point at the 1 megohm resistor (R-14) and its junction with the 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.

RECEIVER STAGE SENSITIVITIES
AM AND AUDIO STAGES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of 1.26 volts across this resistor will be equivalent to a .5 watt output.

The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

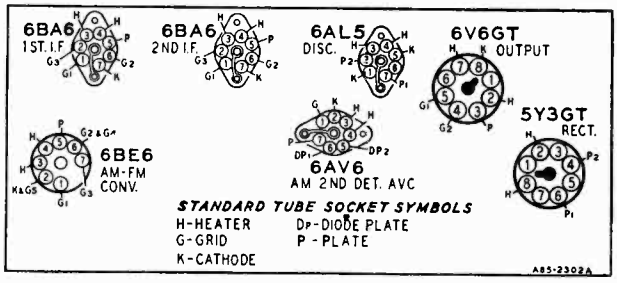
SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	
1000 KC	200 mmf or RMA Dummy Antenna	External Antenna Lead	Chassis	25 Microvolts
1000 KC	.05 mf	6BE6 Converter Pin 7	Chassis	60 Microvolts
455 KC	.05 mf	6BE6 Converter Pin 7	Chassis	58 Microvolts
455 KC	.05 mf	6BA6 1st I-F Pin 1	Chassis	2400 Microvolts
400 cycles	.05 mf	6AV6 1st A-F Pin 1	Chassis	.07 Volt
400 cycles	.05 mf	6V6GT Output Pin 5	Chassis	3.2 Volts

FM STAGES

The tables below lists the sensitivity for the FM stages of the receiver. The receiver must be tuned to 98 MC for all readings. Measurements are based on a .5 watt output the same as for the AM and Audio stoge measurements.

The signal source must be an accurately calibrated signal generator capable of supplying a 98 MC signal modulated by a 400 cycle audio signal. For these measurements the generator must be adjusted for a 22.5 KC deviation. This will correspond to 30% AM modulation.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING TO RECEIVER	CONNECTION TO RECEIVER	GROUND CONNECTION	
98 MC	300 ohms	External Antenna Terminal	Chassis	200 Microvolts
10.7 MC	.01 mf	6BA6 1st I-F Pin 1	Chassis	1,000 Microvolts
10.7 MC	.01 mf	6BA6 2nd I-F Pin 1	Chassis	40,000 Microvolts



TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were token 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 60 cycles, 60 watts, 80 watts with record changer.

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

MODELS 84WG-2721A, B

Ref. No.	Part No.	Description	Qty. Used in Set
C-36, C-37, C-39		Part of C-1 Gang Condenser	
C-38	26A469	1-8 mmf Trimmer	1
C-40	47X508	500 mmf Ceramic	1
C-41	47X476	100 mmf Molded	1
C-42	47X521	6 mmf Ceramic	1
C-43	47X522	12 mmf Ceramic	1

RESISTORS

Ref. No.	Part No.	Ohms	Watts		Qty. Used in Set
R-1	B84223	22 K	0.5	Carbon	1
R-2	E83392	3900	0.5	Carbon	1
R-3, R-6	E84122	1200	0.5	Carbon	2
R-4	D84822	8200	2.0	Carbon	1
R-5, R-9	B83680	68	0.5	Carbon	2
R-7	B85225	2.2 meg.	0.5	Carbon	1
R-8		47 K	(Part of 76X1 Resistor-Capacitor Combination)		
R-10	B84102	1000	0.5	Carbon	1
R-11	B84273	27 K	0.5	Carbon	1
R-12, R-13	B84682	6800	0.5	Carbon	2
R-14	B85105	1 meg.	0.5	Carbon	1
R-15A	43X224	1400	6.0	Wire Wound	1
R-15B		1000	4.0		
R-16, R-21, R-23	B85474	470 K	0.5	Carbon	3
R-17	B84153	15 K	0.5	Carbon	1
R-18	36X372	.5 meg.		Volume control and switch	1
R-19	B85106	10 meg.	0.5	Carbon	1
R-20	40X285	3 meg.		Tone Control	1
R-24	B84271	270	0.5	Carbon	1

TRANSFORMERS AND COILS

Ref. No.	Part No.	Description	Qty. Used in Set
L-1, L-3	9A1882	Filament Choke	2
L-2	9A1940	Parasitic Choke	1
L-4	9A1930	Line Choke	1
T-1	26A478	"B" Range Loop Antenna Assembly	1
T-3	9A1956	Antenna Coil Assembly	1
T-4	9A1938	Oscillator Coil (FM)	1
T-5	9A1929	Oscillator Coil Assembly (AM)	1
T-6	9A1932	1st I.F. Transformer (FM)	1

CAPACITORS

Ref. No.	Part No.				Qty. Used in Set
C-1A, C-1B, C-1C, C-1D	14A204	Gang Condenser & Pulley			1
C-2	47X511	100 mmf		Ceramic	1
C-3	47X517	47 mmf		Ceramic	1
C-4	47X523	10 mmf		Ceramic	1
C-5	47X512	10 mmf		Ceramic	1
C-6	47X463	47 mmf		Ceramic	1
C-7	D66103	.01 mf	400 V	Tubular	1
C-8, C-10		Part of T-7 (1st I.F. Trans.—AM)			
C-11		Part of T-6 (1st I.F. Trans.—FM)			
C-9, C-12, C-13, C-19, C-20	47X507	5000 mmf		Silvered Ceramic	5
C-14, C-17		Part of T-9 (2nd I.F. Trans.—AM)			
C-15, C-16		Part of T-8 (2nd I.F. Trans.—FM)			
C-18A, C-18B		50-50 mmf (Part of 76X1 Resistor-Capacitor Combination)			
C-21, C-23		Part of T-10 (Discriminator Trans.)			
C-22	47X492	2700 mmf		Molded Mica	1
C-24	47X510	470 mmf		Silvered Mica	1
C-25	45X361	5 mf	100 V	Dry Electrolytic	1
C-26A	45X359	40 mf	350 V	Dry Electrolytic	1
C-26B		40 mf	350 V		
C-26C		20 mf	350 V		
C-26D		20 mf	25 V		
C-27	B66503	.05 mf	200 V	Tubular	1
C-28	47X471	68 mmf		Molded Mica	1
C-29	B66403	.04 mf	200 V	Tubular	1
C-30	D66502	.005 mf	400 V	Tubular	1
C-31	47X468	220 mmf		Ceramic	1
C-32	D66203	.02 mf	400 V	Tubular	1
C-33	B66402	.004 mf	200 V	Tubular	1
C-34	H66102	.001 mf	800 V	Tubular	1
C-35	17A235	2-24 mmf		Trimmer	1

Model "B" receivers differ from the Model "A" receivers by the change in value of resistors R-12 and R-13. The new part number and description follows:

Ref. No.	Part No.	Description	Qyy. Used
R-12, R-13	B84153	15,000 ohms 0.5 W Carbon	2

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Ref. No.	Part No.	Description	Qty. Used in Set
		TRANSFORMERS AND COILS (Cont.)	
T-7	9A1934	1st I.F. Transformer (AM)	1
T-8	9A1933	2nd I.F. Transformer (FM)	1
T-9	9A1935	2nd I.F. Transformer (AM)	1
T-10	9A1936	Discriminator Coil Assembly	1
T-11	53X290	Power Transformer	1
T-12	51X134	Output Transformer	1
		MISCELLANEOUS	
	76X1	Resistor-Capacitor Combination	1
	12A480	10" P.M. Speaker	1
	3A303	Tube Socket—Octal (8 prong) Molded	2
	3A426	Tube Socket—Miniature	4
	3A427	Tube Socket—Miniature (for AM-FM Converter Tube)	1
	3A304	Phono Motor Socket	1
	3A305	Phono Socket—Single Pin Tip	1
	2A375	Band Change Switch	1
	13X546	Line Cord and Plug Assembly	1
	10A651	Knob (Tuning)	1
	10A652	Knob (Volume Control and Switch)	1
	10A654	Knob (Tone)	1
	10A655	Knob (Phono—BC—FM)	1
	4X999	Escutcheon	1

Ref. No.	Part No.	Description	Qty. Used in Set
		DIAL AND DRIVE ASSEMBLY	
	58X699	Dial Glass	1
	24X446	Idler Pulley	2
	15X241	Pointer	1
	25X1569	Dial Bracket	1
	7A103	No. 47 Pilot Light Bulb	2
	7A202	Pilot Light Socket Assembly	1
	26X486	Drive Shaft	1
	41X26	Reflector, Dial Light	2
	28X113	Drive Cord Tension Spring	1
	10X66	Drive Cord Assembly	1
	19X192	"C" Washer (Mtg. drive shaft)	2
	6X21	Rubber Grommet (Mtg. gang cond.)	3
	20X260	Condenser Cushion Stud (Mtg. gang condenser)	3
	58X702	Dial background	1
		TYPE V-28A139 RECORD CHANGER PARTS	
	V-96T-B	Motor Assembly, 60 cycles, 115-120 V	1
	Shure P30-1	Crystal Cartridge and Semi-Permanent Needle Assembly	1
		Semi-Permanent Needle	1
		(Specify part number and letters stamped on crystal)	

84WG-2721A, B, C

GENERAL DESCRIPTION

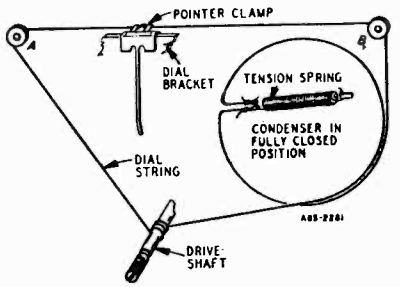
This is a two band, six tube (plus rectifier tube) receiver with automatic record changer, for the reception of both AM and FM stations. The I-F stages use the latest type high gain miniature type tubes and built-in Air Wave Aerials are provided for the FM and Broadcast bands. Features include, compensator 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 and record changer are housed in a console combination cabinet with controls provided for tuning, volume, tone and band or phono selection.

DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X66 drive cord assembly or a new length of cord 46 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



CAPACITORS

Ref. No.	Part No.	Description	Qty. Used in Set
C-1A, C-1B, C-1C, C-1D	14A204	Gang Condenser & Pulley	1
C-2	47X511	100 mmf Ceramic	1
C-3	47X517	47 mmf Ceramic	1
C-4	47X523	10 mmf Ceramic	1
C-5	47X512	10 mmf Ceramic	1
C-6	47X476	100 mmf Molded Mica	1
C-7	D66103	.01 mf 400 V Tubular	1
C-8, C-10		Part of T-7 (1st I.F. Trans.—AM)	
C-11		Part of T-6 (1st I.F. Trans.—FM)	
C-9, C-12, C-13, C-20	47X507	5000 mmf Silvered Ceramic	4
C-14, C-15		Part of T-8 (2nd I.F. Trans.—AM-FM)	
C-16	47X463	47 mmf Ceramic	1
C-18A, C-18B	47X112	50-50 mmf Dual Mica	1
C-22	47X492	2700 mmf Molded Mica	1
C-23		Part of T-10 (Discriminator Trans.)	
C-24	47X529	330 mmf Silvered Mica	1
C-25	45X361	5 mf 100 V Dry Electrolytic	1
C-26A	45X359	40 mf 350 V Dry Electrolytic	1
C-26B	45X359	40 mf 350 V Dry Electrolytic	1
C-26C	45X359	20 mf 350 V Dry Electrolytic	1
C-26D	45X359	20 mf 25 V Dry Electrolytic	1
C-27	B66503	.05 mf 200 V Tubular	1
C-28	47X471	68 mmf Molded Mica	1
C-29	B66403	.04 mf 200 V Tubular	1
C-30	D66502	.005 mf 400 V Tubular	1
C-31	47X468	220 mmf Ceramic	1
C-32	D66203	.02 mf 400 V Tubular	1
C-33	B66402	.004 mf 200 V Tubular	1
C-34	H66102	.001 mf 800 V Tubular	1
C-35	17A235	2-24 mmf Trimmer	1
C-37, C-39		Part of C-1 Gang Condenser	
C-38	26A489	1-8 mmf Trimmer	1
C-40	47X508	500 mmf Ceramic	1
C-42	47X521	6 mmf Ceramic	1
C-43	47X522	12 mmf Ceramic	1

RESISTORS

Ref. No.	Part No.	Ohms	Watts		Qty. Used in Set
R-1	B84223	22 K	0.5	Carbon	1
R-2	B83392	3900	0.5	Carbon	1
R-3, R-6	B84122	1200	0.5	Carbon	2
R-4	D84822	8200	2.0	Carbon	1
R-5	B83680	68	0.5	Carbon	1
R-7, R-9	B85225	2.2 meg.	0.5	Carbon	2
R-8	B85473	47 K	0.5	Carbon	1
R-10	B84102	1000	0.5	Carbon	1
R-11	B84273	27 K	0.5	Carbon	1
R-12, R-13, R-17	B84153	15 K	0.5	Carbon	3
R-14	B85475	4.7 meg.	0.5	Carbon	1
R-15A	43X224	1400	6.0	Wire Wound	1
R-15B	43X224	1000	4.0	Wire Wound	1
R-16		Part of T-8 (2nd I.F. Transformer AM—FM)			
R-21, R-23	B85474	470 K	0.5	Carbon	2
R-18	36X372	.5 meg.		Volume control and switch	1
R-19	B85106	10 meg.	0.5	Carbon	1
R-20	40X285	3 meg.		Tone Control	1
R-22, R-26	43X233	3.6	0.5	Wire Wound	2
R-24	B84271	270	0.5	Carbon	1
R-25	B85681	680	0.5	Carbon	1

TRANSFORMERS AND COILS

Ref. No.	Part No.	Description	Qty. Used in Set
L-1, L-3	9A1882	Filament Choke	2
L-2	9A1940	Parasitic Choke	1
T-1	9A1972	"B" Range Loop Antenna Assembly	1
T-2	9A1900	Dipole Antenna Assembly	1
T-3	9A1956	Antenna Coil Assembly	1
T-4	9A1938	Oscillator Coil (FM)	1
T-5	9A1929	Oscillator Coil Assembly (AM)	1
T-6	9A1932	1st I.F. Transformer (FM)	1
T-7	9A1934	1st I.F. Transformer (AM)	1
T-8	9A1973	2nd I.F. Transformer (AM—FM)	1
T-10	9A1970	Discriminator Coil Assembly	1
T-11	53X290	Power Transformer	1
T-12	51X134	Output Transformer	1

MISCELLANEOUS

Part No.	Description	Qty. Used in Set
12A480	10" P.M. Speaker	1
3A303	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket—Miniature	4
3A427	Tube Socket—Miniature (for AM-FM Converter Tube)	1
3A304	Phono Motor Socket	1
3A305	Phono Socket—Single Pin Tip	1
2A375	Band Change Switch	1
13X546	Line Cord and Plug Assembly	1
10A695	Knob (Tuning)	1
10A696	Knob (Volume Control and Switch)	1
10A697	Knob (Tone)	1
10A698	Knob (Phono—BC—FM)	1
4X1020	Escutcheon	1

DIAL AND DRIVE ASSEMBLY

Part No.	Description	Qty. Used in Set
58X699	Dial Glass	1
24X446	Idler Pulley	2
15X241	Pointer	1
25X1569	Dial Bracket	1
7A103	No. 47 Pilot Light Bulb	2
7A202	Pilot Light Socket Assembly	1
26X486	Drive Shaft	1
41X26	Reflector, Dial Light	2
28X113	Drive Cord Tension Spring	1
10X66	Drive Cord Assembly	1
19X192	"C" Washer (Mtg. drive shaft)	2
6X21	Rubber Grommet (Mtg. gang cond.)	3
20X260	Condenser Cushion Stud (Mtg. gang condenser)	3

TYPE V-28A139 RECORD CHANGER PARTS

V-961-B	Motor Assembly, 60 cycles, 115-120 V	1
Shure P30-1	Crystal Cartridge and Semi-Permanent Needle Assembly	1
	Semi-Permanent Needle	1
	(Specify part number and letters stamped on crystal)	

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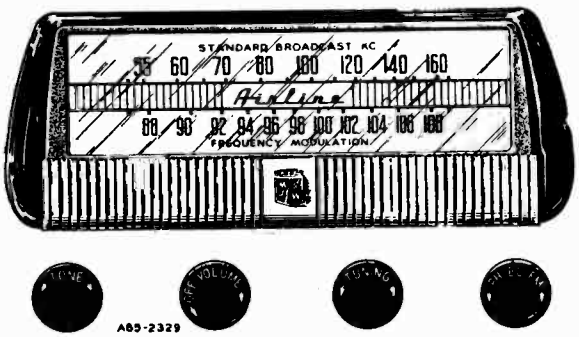


GENERAL DESCRIPTION

This is a two band, six tube (plus rectifier tube) receiver with automatic record changer 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 Air Wave 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 and record changer are housed in a console combination cabinet with controls provided for tuning, volume, tone and band or phono selection.

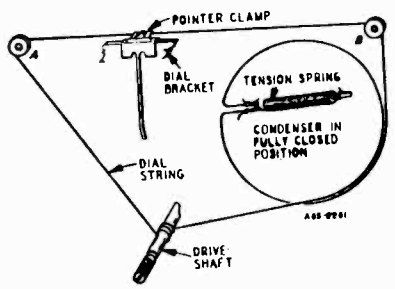
ELECTRICAL SPECIFICATIONS

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—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
Record Changer	See Manual No. 5050A
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

DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X66 drive cord assembly or a new length of cord 46 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



MISCELLANEOUS

12A480	10" P.M. Speaker	1
3A303	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket—Miniature	4
3A443	Tube Socket—Miniature (for AM-M Converter Tube)	1
3A304	Phono Motor Socket	1
3A305	Phono Socket—Single Pin Tip	1
2A384	Band Change Switch	1
13X546	Line Cord and Plug Assembly	1
10A695	Knob (Tuning)	1
10A696	Knob (Volume Control & Switch)	1
10A697	Knob (Tone)	1
10A698	Knob (Phono—BC—FM)	1
4X1020	Escutcheon	1

MODEL 84WG-2721D

RECEIVER STAGE SENSITIVITIES

AM AND AUDIO STAGES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of 1.26 volts across this resistor will be equivolent to a .5 watt output.

The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

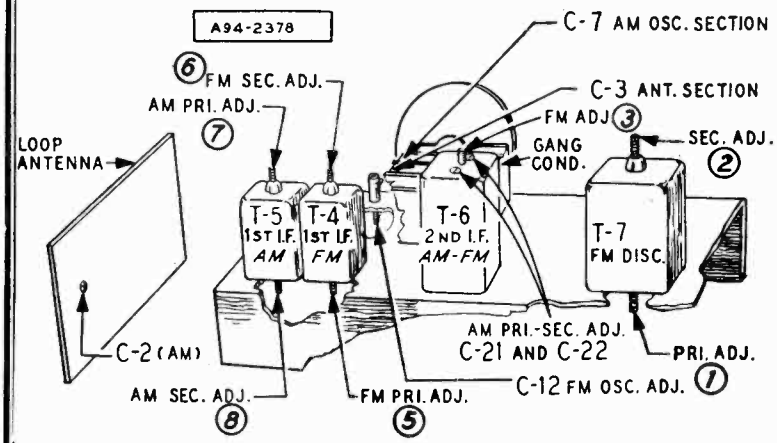
SIGNAL GENERATOR				
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	INPUT FOR .5 WATT OUTPUT
1000 KC	200 mmf or RMA Dummy Antenna	External Antenna Lead	Chassis	10 Microvolts
1000 KC	.01 mf	6BA7 Converter Pin 7	Chassis	40 Microvolts
455 KC	.01 mf	6BA7 Converter Pin 7	Chassis	35 Microvolts
455 KC	.01 mf	6BA6 1st I-F Pin 1	Chassis	2000 Microvolts
400 cycles	.01 mf	6AV6 1st A-F Pin 1	Chassis	.07 Volt
400 cycles	.01 mf	6V6GT Output Pin 5	Chassis	3.2 Volts

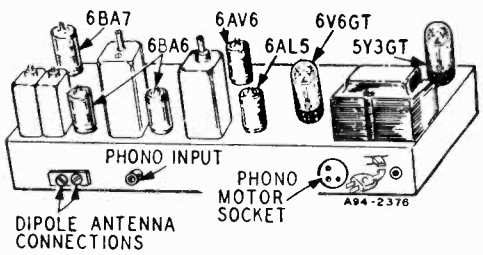
FM STAGES

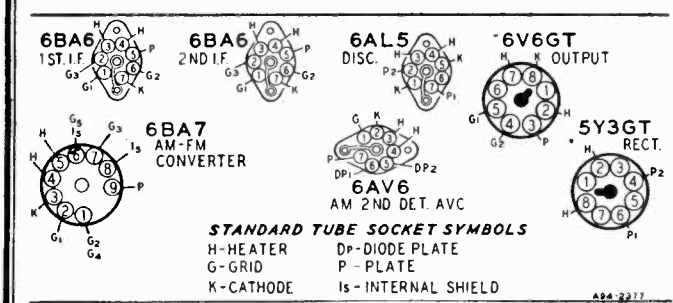
The table below lists the sensitivity for the FM stages of the receiver. The receiver must be tuned to 98 MC for all readings. Measurements are based on a .5 watt output the same as for the AM and Audio stage measurements.

The signal source must be an accurately calibrated signal generator capable of supplying a 98 MC signal modulated by a 400 cycle audio signal. For these measurements the generator must be adjusted for a 22.5 KC deviation. This will correspond to 30% AM modulation.

SIGNAL GENERATOR				
FREQUENCY	COUPLING TO RECEIVER	CONNECTION TO RECEIVER	GROUND CONNECTION	INPUT FOR .5 WATT OUTPUT
98 MC	300 ohms	External Antenna Terminal	Chassis	100 Microvolts
10.7 MC	.01 mf	6BA6 1st I-F Pin 1	Chassis	600 Microvolts
10.7 MC	2500 mmf	6BA6 2nd I-F Pin 1	Chassis	23,000 Microvolts







TUBE SOCKET VOLTAGES

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

Line voltage.....117 Volts AC

Signal Input.....None

A variation of ±10% is usually permissible.

MODEL 84WG-2721D

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 Pointer 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 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—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 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 severol 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 Chossis	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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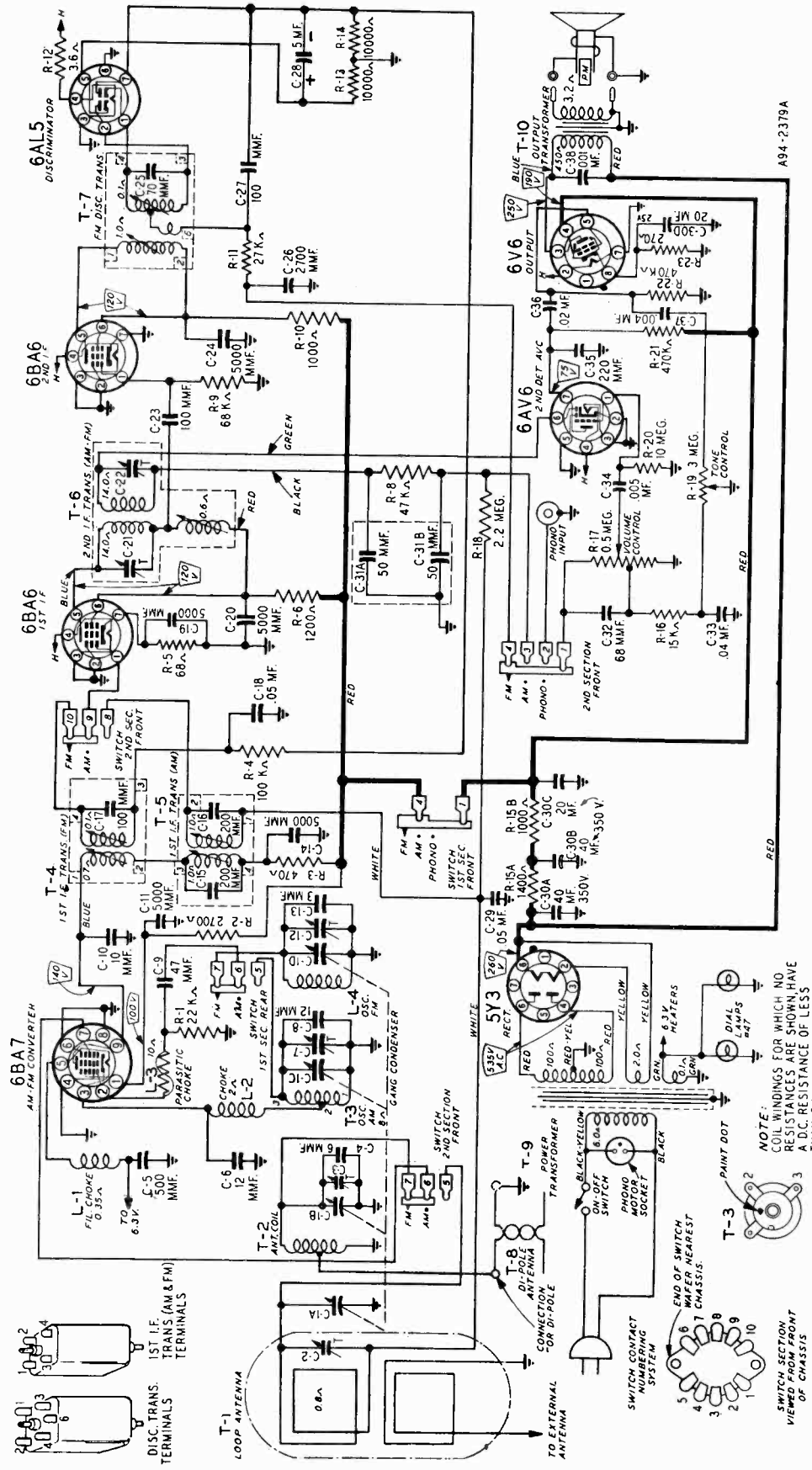

RESISTORS

		Ohms	Watts		
R-1	B84223	22 K	0.5	Carbon	1
R-2	B83272	2700	0.5	Carbon	1
R-3	B84471	470	0.5	Carbon	1
R-4	B85104	100 K	0.5	Carbon	1
R-5	B83680	68	0.5	Carbon	1
R-6	B84122	1200	0.5	Carbon	1
R-8	B85473	47 K	0.5	Carbon	1
R-9	B85683	68 K	0.5	Carbon	1
R-10	B84102	1000	0.5	Carbon	1
R-11	B84273	27 K	0.5	Carbon	1
R-12	43X233	3.6	0.5	Wire Wound	1
R-13 R-14	B84103	10 K	0.5	Carbon	2
R-15A	43X224	1400	6.0	Wire Wound	1
R-15B		1000	4.0		
R-16	B84153	15 K	0.5	Carbon	1
R-17	36X372	.5 meg.		Volume Control	1
R-18	B85225	2.2 meg.	0.5	Carbon	1
R-19	40X285	3 meg.		Tone Control	1
R-20	B85106	10 meg.	0.5	Carbon	1
R-21 R-22	B85474	470 K	0.5	Carbon	2
R-23	B84271	270	0.5	Carbon	1

TRANSFORMERS AND COILS

L-1	9A1882	Filament Choke Assembly	1
L-2	35A1	Insulated Choke	1
L-3	9A1940	Parasitic Choke Assembly	1
L-4	9A2021	Oscillotor Coil Assembly (FM)	1
T-1	9A1972	"B" Range Loop Antenna Assem.	1
T-2	9A1956	Antenna Coil Assembly	1
T-3	9A1997	Oscillator Coil Assembly (AM)	1
T-4	9A1932	1st I.F. Trans. (FM)	1
T-5	9A1998	1st I.F. Trans. (AM)	1
T-6	9A1999	2nd I.F. Trans. (AM-FM)	1
T-7	9A1970	Discriminator Coil Assembly	1
T-8	9A2004	Dipole Antenna	1
T-9	53X290	Power Transformer	1
T-10	51X134	Output Transformer	1

CAPACITORS

C-1A C-1B C-1C C-1D	14A204	Gang Condenser Assembly			1
C-2	17A235	2-24 mmf		Trimmer	1
C-3 C-7	Part of Gang Condenser				
C-4	47X521	6 mmf		Ceramic	1
C-5	47X508	500 mmf		Ceramic	1
C-6 C-8	47X522	12 mmf		Ceramic	2
C-9	47X517	47 mmf		Ceramic	1
C-10	47X512	10 mmf		Ceramic	1
C-11 C-14 C-19 C-20 C-24	47X507	5000 mmf		Silvered Ceramic	5
C-12	17A255	1-8 mmf		Trimmer	1
C-13	47X547	3 mmf		Ceramic	1
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	B66503	.05 mf	200 V	Tubular	2
C-21 C-22	Part of T-6 (2nd I.F. Trans.—AM-FM)				
C-23	47X497	100 mmf		Ceramic	1
C-25	Part of T-7 (Discriminator Trans.)				
C-26	47X492	2700 mmf		Molded Mica	1
C-27	47X526	100 mmf		Molded Mica	1
C-28	45X361	5 mf	100 V	Dry Electrolytic	1
C-30A	45X359	40 mf	350 V	Dry Electrolytic	1
C-30B		40 mf	350 V		
C-30C		20 mf	350 V		
C-30D		20 mf	25 V		
C-31A C-31B	47X112	50-50 mmf		Dual Mica	1
C-32	47X471	68 mmf		Molded Mica	1
C-33	B66403	.04 mf	200 V	Tubular	1
C-34	D66502	.005 mf	400 V	Tubular	1
C-35	47X468	220 mmf		Ceramic	1
C-36	D66203	.02 mf	400 V	Tubular	1
C-37	B66402	.004 mf	200 V	Tubular	1
C-38	H66102	.001 mf	800 V	Tubular	1

DIAL AND DRIVE ASSEMBLY

58X715	Dial Glass	1
24X446	Idler Pulley	2
15X241	Pointer	1
25X1559	Dial Bracket	1
7A103	No. 47 Pilot Light Bulb	2
7A202	Pilot Light Socket Assembly	1
26X486	Drive Shaft	1
41X26	Reflector, Dial Light	2
28X113	Drive Cord Tension Spring	1
10X66	Drive Cord Assembly	1
19X192	"C" Washer (Mtg. drive shaft)	2
6X21	Rubber Grommet (Mtg. gang cond.)	3
20X260	Condenser Cushion Stud (Mtg. gang condenser)	3

TYPE V-28A139 RECORD CHANGER PARTS

V-961-B	Motor Assembly, 60-cycles, 115-120 V	1
Shure P30-1	Crystal Cartridge and Semi-Permonent Needle Assembly	1
	Semi-Permanent Needle	1
	(Specify part number and letters stamped on crystal)	

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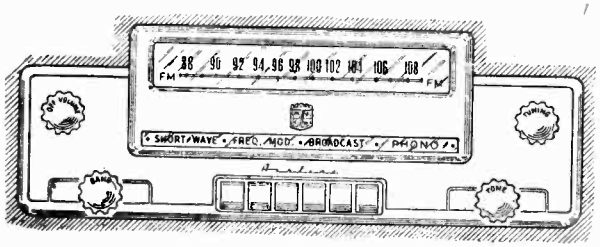
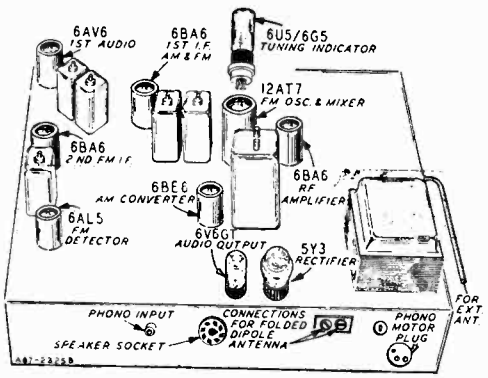




ELECTRICAL SPECIFICATIONS

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 Short Wave 5.8-18 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—37 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—700 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) Broadcast, 2 microvolts average Short Wave, 4 microvolts average
FM Sensitivity	(For .5 watt output) 25 microvolts average
Power Output	6.5 watts maximum 3.5 watts 10% distortion
Loud Speaker	12" Electro Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles
Record Changer	See Manual No. 5072A

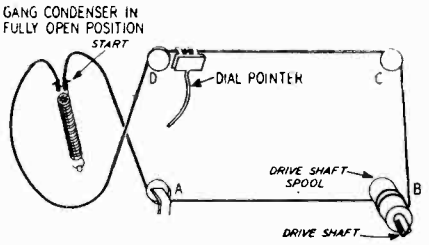
Tube and Dial Lamp Complement

1 6BA6 AM-FM R-F Amplifier
1 12AT7 FM Osc. & Mixer
1 6BE6 AM Converter
1 6BA6 FM-AM 1st I-F Amplifier
1 6BA6 FM 2nd I-F Amplifier
1 6AL5 FM Detector
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
1 6V6GT Audio Output
1 6U5/6G5 Tuning Indicator
1 5Y3 Rectifier
6 No. 47 Dial Lamps

DRIVE CORD REPLACEMENT

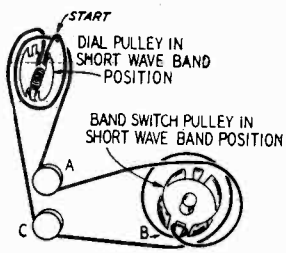
DIAL POINTER CORD

Use a new 10X66 drive cord assembly or a new length of cord 50 inches long for the installation. Install the cord as shown in the illustration, winding three turns counterclockwise around the drive shaft spool with the turns progressing towards the front end of the drive shaft. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



DIAL ROTATION CORD

Use a new 10X60 drive cord assembly or a new length of cord 20 inches long for the installation. Both the dial pulley and the band switch pulley must be turned to the short wave band position as shown in the illustration. Install the new cord exactly as shown then change the position of the band switch several times and note the movement of the dial.



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RECEIVER STAGE SENSITIVITIES

AM AND AUDIO STAGES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting an 8 ohm, 10 watt resistor across the secondary winding of the output transformer. A reading of 2 volts across this resistor will be equivalent to a .5 watt output.

The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	
1000 KC	200 mmf or RMA Dummy Antenna	External Antenna Lead	Chassis	2 Microvolts
1000 KC	.05 mf	6BA6 Interstage Pin 1	Chassis	8 Microvolts
1000 KC	.05 mf	6BE6 Converter Pin 7	Chassis	65 Microvolts
455 KC	.05 mf	6BE6 Converter Pin 7	Chassis	55 Microvolts
455 KC	.05 mf	6BA6 1st I-F Pin 1	Chassis	2500 Microvolts
400 cycles	.05 mf	6AV6 1st A-F Pin 1	Chassis	.05 Volt
400 cycles	.05 mf	6V6GT Output Pin 5	Chassis	2.8 Volts

FM STAGES

The table below lists the sensitivity for the FM stages of the receiver. The receiver must be tuned to 98 MC for all readings. Measurements are based on a .5 watt output the same as for the AM and Audio stage measurements.

The signal source must be an accurately calibrated signal generator capable of supplying a 98 MC signal modulated by a 400 cycle audio signal. For these measurements the generator must be adjusted for a 22.5 KC deviation. This will correspond to 30% AM modulation.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING TO RECEIVER	CONNECTION TO RECEIVER	GROUND CONNECTION	
98 Mc	300 ohms	External Antenna Terminal	External Ant. Terminal	25 Microvolts
10.7 MC	.01 mf	6BA6 1st I-F Pin 1	Chassis	2200 Microvolts
10.7 MC	.01 mf	6BA6 2nd I-F Pin 1	Chassis	50,000 Microvolts

ALIGNMENT PROCEDURE

AM BROADCAST AND SHORT WAVE BAND

The following is required for aligning:

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

Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, 200 mmf and 400 ohms.

Volume Control—Maximum all Adjustments.

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

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

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
I-F	455 kc	6BE6 Pin 7 and Chassis	.1 mf	Broadcast	Rotor Fully Open	1st I-F Pri. & Sec. (3) & (4) 2nd I.-F. Pri. & Sec. (1) & (2)	Maximum Output
Broadcast	1620 kc	External ant. lead	200 mmf	Broadcast	Rotor Fully Open	Broadcast Oscillator C-70B	
	1400 kc	External ant. lead	200 mmf	Broadcast	Turn Rotor to Max. Output Set painter to 1400 kc See Note A	Broadcast Interstage C-38B	
	1400 kc	External ant. lead	200 mmf	Broadcast		Loop Antenna C-33	
	600 kc	External ant. lead	200 mmf	Broadcast	Turn Rotor to Max. Output and Rock See Note B	600 kc padder C-56	
Repeat above oscillator adjustments at 1620 and 600 KC until readjusting the oscillator Range B Trimmer C-70B causes no further improvement in output.							
Short Wave	18.3 MC	External ant. lead	400 ohm	Short Wave	Rotor Fully Open	SW Oscillator C-70A	Maximum Output
	17 MC	External ant. lead	400 ohm	Short Wave	Turn Rotor to Max. Output	SW Interstage C-38A · "D" Antenna C-31	
Reassemble chassis in cabinet							
Broadcast	1400 kc	External ant. lead	200 mmf	Broadcast	Turn Rotor to Max. Output	Loop Antenna C-33	

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

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

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

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ALIGNMENT PROCEDURE

The following equipment is required for aligning:

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

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—.01 mf, 300 ohms and 5000 ohms.

FM STAGES

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

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

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

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (6) Note C	Zero Center
	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (6) Note C	Zero Center
I-F	10.7 MC Note F	6BA6 1st I-F, Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	2nd I-F Pri. Note A and D (7) 2nd I-F Sec. Note A and E (8)	Maximum Deflection
	10.7 MC Note F	FM-RF Gang Condenser terminal on top of chassis	.01 mf	FM	Rotor Fully Open	1st I-F Pri. (9) 1st I-F Sec. (10) Note A	Maximum Deflection
Recheck I-F Adjustments in order given							
R-F & Osc.	108.4	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Oscillator C-9 Note G	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	RF. C-5	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	Ant. C-2	Maximum Deflection
Recheck R-F and Osc. Adjustments in order given							

NOTE A—Test Equipment connections are as given in the table. The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line at the 1 megohm resistor R-40 and the band switch terminal for all adjustments except the discriminator secondary adjustment, for which see Note C.

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

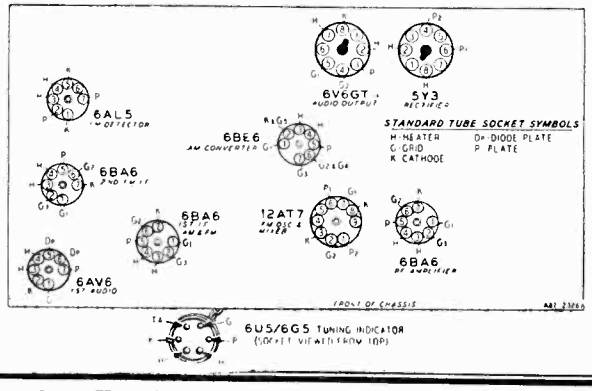
NOTE C—Disconnect zero center DC vacuum tube voltmeter from AVC and reconnect to junction of R-11, C-51 and C-52. Adjust for zero voltage indication.

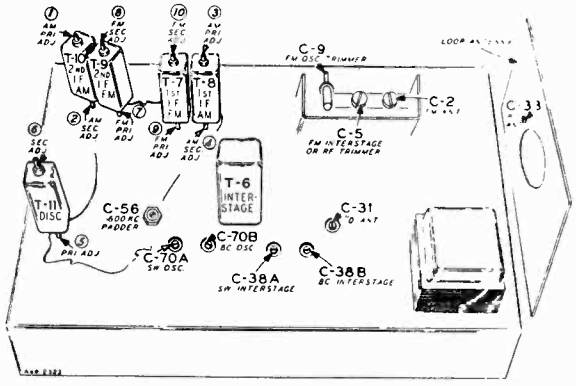
NOTE D—Before adjusting Pri. core connect 5000 ohm load resistor across the 2nd I.F. secondary terminals.

NOTE E—Disconnect 5000 ohm load resistor from secondary terminals and reconnect across the 2nd I.F. primary terminals.

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

NOTE G—Oscillator frequency below signal frequency.





TUBE SOCKET VOLTAGES

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

Line voltage.....117 Volts AC

Signal Input.....None

A variation of ±10% is usually permissible.

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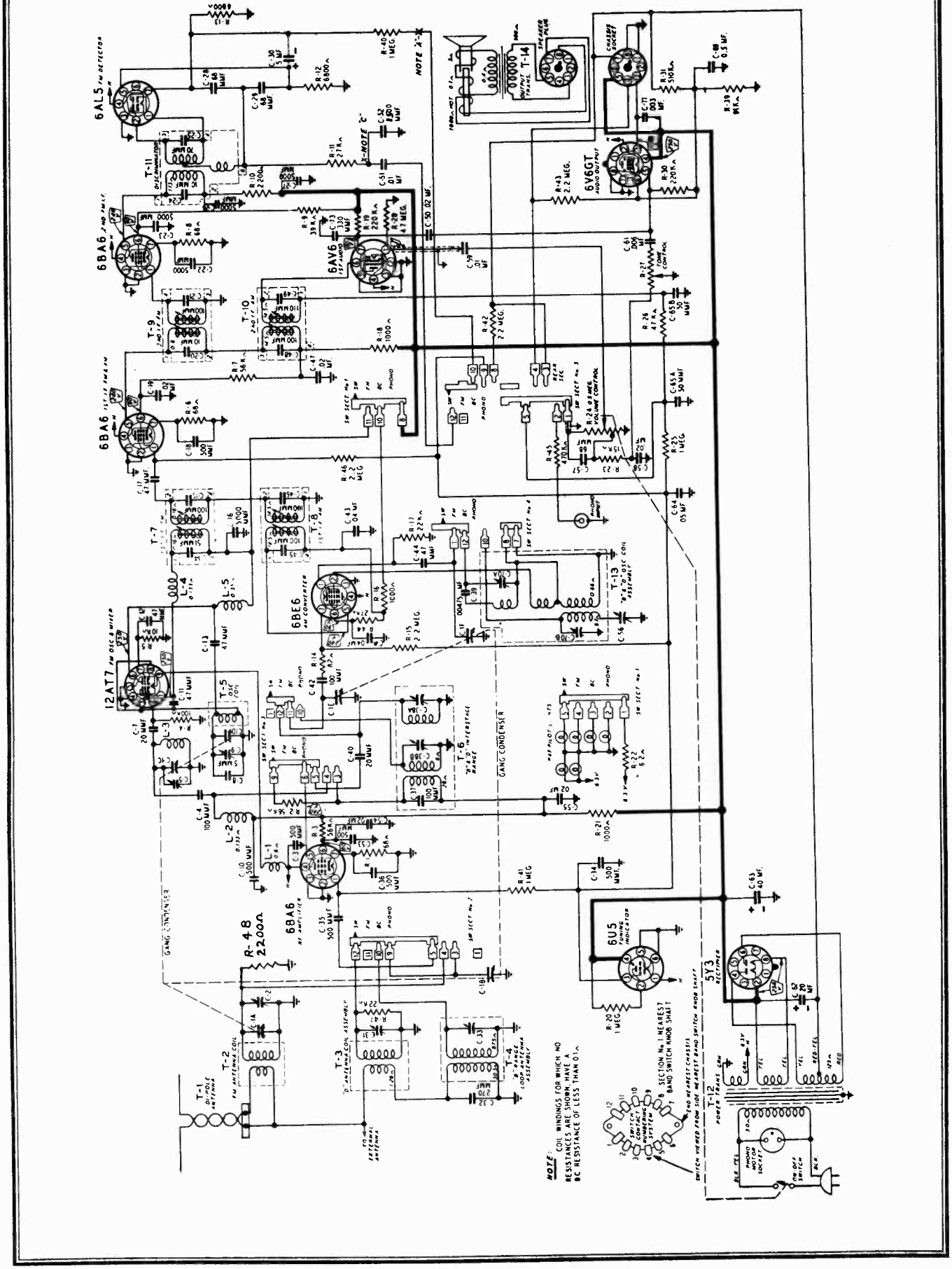

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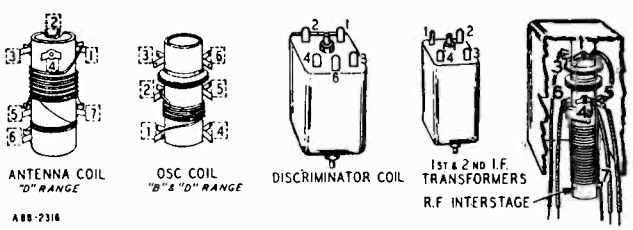
REPLACEMENT PARTS LIST

CAPACITORS

Ref. No.	Part No.	Description	Qty. Used in Set
C-1	26A483	Tuner and Gang Assembly	1
C-2, C-5	17A247	3.0-12 mmf Trimmer	2
C-3, C-10, C-18, C-34, C-35, C-36, C-53	47X496	500 mmf Ceramic	7
C-4, C-42	47X497	100 mmf Ceramic	2
C-7, C-40	47X516	20mmf Ceramic	2
C-8	47X500	5 mmf Ceramic	1
C-9	17A255	1-8 mmf Trimmer	1
C-11	47X499	47 mmf Ceramic	1
C-12, C-13, C-44	47X498	47 mmf Ceramic	3
C-14, C-15	Part of T-7 1st I-F (FM)		
C-16, C-22, C-23, C-26, C-27	47X507	5000 mmf Ceramic	5
C-17	47X495	47 mmf Ceramic	1
C-19, C-47, C-50, C-54, C-55	F66203	.02 mf 600 V Tubular	5
C-20, C-21	Part of T-9 2nd I-F (FM)		
C-24, C-25	Part of T-11 Discriminator		
C-28, C-29, C-57	47X501	68 mmf Ceramic	3
C-30	45X361	5 mf 100 V Dry Electrolytic	1
C-31	17A253	5-50 mmf Trimmer	1
C-32	47X445	270 mmf Molded	1
C-33	17A123	1.5-12 mmf Trimmer	1
C-37	47X57	100 mmf Molded	1
C-38A, C-38B	17A252	1.3-12 mmf Dual Trimmer	1
C-39	46X289	.00475 mf 180 V Tubular	1
C-41, C-43	D66403	.04 mf 400 V Tubular	2
C-45, C-46	Part of T-8 1st I-F (AM)		
C-48, C-49	Part of T-10 2nd I-F (AM)		
C-51, C-59	B66103	.01 mf 200 V Tubular	2
C-52	47X528	1500 mmf Molded	1
C-56	17A241	300-475 mmf Trimmer	1
C-58	B66203	.02 mf 200 V Tubular	1
C-61	D66602	.006 mf 400 V Tubular	1
C-62	45X351	20 mf 450 V Dry Electrolytic	1
C-63	45X302	40 mf 450 V Dry Electrolytic	1
C-64	B66503	.05 mf 200 V Tubular	1
C-65A, C-65B	47X112	50-50 mmf Dual Mica	1
C-69	A66504	.5 mf 100 V Tubular	1
C-70A, C-70B	17A246	3.2-35 mmf Dual Trimmer	1
C-71	D66302	.003 mf 400 V Tubular	1
C-73	47X470	330 mmf Molded	1

RESISTORS

Ref. No.	Part No.	Ohms	Watts	Description	Qty. Used in Set
R-1, R-6, R-8	B83680	68	0.5	Carbon	3
R-2	C85223	22K	1.0	Carbon	1
R-3	B85563	56K	0.5	Carbon	1
R-4	B84104	100K	0.5	Carbon	1
R-5	B84103	10K	0.5	Carbon	1
R-7	C84563	56K	1.0	Carbon	1
R-9	C84393	39K	1.0	Carbon	1
R-10	B85222	2200	0.5	Carbon	1
R-11	B84273	27K	0.5	Carbon	1
R-12, R-13	B83682	6800	0.5	Carbon	2
R-14	B84820	82	0.5	Carbon	1
R-15, R-42, R-46	B85225	2.2 meg.	0.5	Carbon	3
R-16, R-18, R-21	B85102	1000	0.5	Carbon	3



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REPLACEMENT PARTS LIST (continued)

Ref. No.	Part No.	Description			Qty. Used in Set
		Ohms	Watts		
R-17, R-47	B84223	22K	0.5	Carbon	2
R-19, R-30	B85224	220K	0.5	Carbon	2
R-20		Part of 13X549 Cable and Socket Assembly			
R-22	43X217	6.2	0.5	Wire Wound	1
R-23	B85153	15K	0.5	Carbon	1
R-24	36X363	.5 meg.		Volume Control	1
R-25, R-40, R-41	B85105	1 meg.	0.5	Carbon	3
R-26	B85473	47 K	0.5	Carbon	1
R-27	40X286	3 meg. Tone Control			1
R-28	B85475	4.7 meg.	0.5	Carbon	1
R-31	B83514	510K	0.5	Carbon	1
R-39	B83913	91 K	0.5	Carbon	1
R-43	B84225	2.2 meg.	0.5	Carbon	1
R-44	C84273	27K	1.0	Carbon	1
R-45	B85474	470K	0.5	Carbon	1
R-48	B84222	2200	0.5	Carbon	1

TRANSFORMERS AND COILS

L-1	9A1881	Filament Choke Assembly	1
L-2, L-4	9A1880	FM R-F Plate Choke	2
L-3	9A1946	FM R-F Coil	1
L-5	9A1882	FM Oscillator Plate Choke	1
T-1	9A2000	Di-Pole Antenna Assembly	1
T-2	9A1966	FM Antenna Coil	1
T-3	9A1957	"D" Antenna Coil Assembly	1
T-4	26A436	Loop Antenna Assembly	1
T-5	9A1948	Oscillator Coil (FM)	1
T-6	9A1947	Interstage "B" & "D" Range Coil Assembly	1
T-7	9A1950	1st I-F Transformer (FM)	1
T-8	9A1934	1st I-F Transformer (AM)	1
T-9	9A1933	2nd I-F Transformer (FM)	1
T-10	9A1935	2nd I-F Transformer (AM)	1
T-11	9A1936	Discriminator Coil	1
T-12	53X286	Power Transformer	1
T-13	9A1988	"B" & "D" Oscillator Coil Assembly	1
T-14		Output Transformer (See Miscellaneous)	1

MISCELLANEOUS

12A482	12" E.D. Speaker complete with output transformer	1
3A425	Tube socket (miniature)	5
3A303	Tube socket—octal (8 prong) molded	3
32X386	Tube shield (miniature)	6
32X388	Tube Shield (For 12AT7)	1
3A436	Tube socket (For 12AT7)	1
3A427	Tube socket (R-F Amp)	1
3A304	Phono Motor Socket	1
3A305	Phono socket—single pin	1
2A377	Band Switch	1

Ref. No.	Part No.	Description		Qty. Used in Set
	13X328	Line Cord and Plug Assembly		1
	26A486	Escutcheon and Crystal Assy. (Walnut)		1
	26A487	Escutcheon and Crystal Assy. (Blond)		1
	10A509	Tuner Buttons (Walnut)		6
	10A674	Tuner Buttons (Blond)		6
	28X320	Springs (Tuner Button)		6
	4X870	Escutcheon Eye (Walnut)		1
	4X1015	Escutcheon Eye (Bland)		1
	10A662	Knob, Band	Walnut	1
	10A667	Knob, Tuning	Walnut	1
	10A668	Knob, On-Off, Volume	Walnut	1
	10A669	Knob, Tone	Walnut	1
	10A670	Knob, Tuning	Blond	1
	10A671	Knob, Tone	Blond	1
	10A672	Knob, Band	Blond	1
	10A673	Knob, On-Off, Volume	Blond	1
	25X498	Tuning Eye Clamp		1
	25X1396	Tuning Eye Bracket		1
	13X549	Cable and Socket Assembly—Tuning Indicator		1
	6X21	Rubber Grommets	Mtg. Gang Cond.	4
	20X329	Condenser Cushion Stud	Mtg. Gang Cond.	4

DIAL AND DRIVE ASSEMBLY

26A435	Dial Bracket Assembly	1
26A484	Dial and Drum Assembly Complete with Dial Background, Collar, Dial Drum and Dial Scale	1
15X221	Pointer	1
26X500	Dial Drum Shaft	1
26A440	Pulley and Collar Assembly (For dial drum shaft)	1
26A437	Band Switch Pulley Assembly	1
26X468	Band Switch Shaft	1
26A441	Crown Gear Assembly (For Mtg. to Band Switch)	2
26A434	Idler Bracket Assembly	1
25X1389	Drive Shaft Bracket	1
26A494	Drive Shaft & Spool Assembly	1
10X60	Drive Cord Assembly (Band Change)	1
28X524	Tension Spring (Band Change)	1
10X66	Drive Card and Clip Assembly (Dial Drive)	1
28X530	Tension Spring (Dial Drive)	1
41X72	Light Shield (Band Indicator)	4
41X35	Light Shield (Dial)	2
7A103	No. 47 Pilot Light	6
7A187	Pilot Light Socket Assembly (Dual)	1
7A209	Indicator Light Socket Assembly	4

TYPE W-28A152 RECORD CHANGER PARTS

W-15X097-1	Motor Assembly, 60 cycles 115-120 V.	1
W-21P247	Crystal Cartridge	1
W-21P515	Semi-Permanent Twin Point Needle Assembly	1
W-11X368	Rubber Drive Wheel (33-1/3 R.P.M.)	1
W-11X366	Rubber Drive Wheel (78 R.P.M.)	1

MODELS 84WG-2732A,
84WG-2732B

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles, 110 watts, 130 watts with record changer
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC Short Wave 5.8-18 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—37 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—700 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) Broadcast, 2 microvolts average Short Wave, 4 microvolts average
FM Sensitivity	(For .5 watt output) 25 microvolts average
Power Output	12.0 watts maximum 9.0 watts 10% distortion
Loud Speaker	12" Electro Dynamic
Voice Coil Impedance	8.0 ohms 400 cycles
Record Changer	See Manual No. 5073A

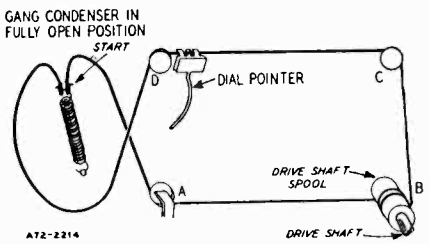
Tube and Dial Lamp Complement

1 6BA6 AM-FM R-F Amplifier
1 12AT7 FM Osc. & Mixer
1 6BE6 AM Converter
1 6BA6 FM-AM 1st I-F Amplifier
1 6BA6 FM 2nd I-F Amplifier
1 6AL5 FM Detector
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
2 6V6GT Audio Output
1 6U5/6G5 Tuning Indicator
1 5U4 Rectifier
1 6AV6 Phase Inverter
6 No. 47 Dial Lamps

DRIVE CORD REPLACEMENT

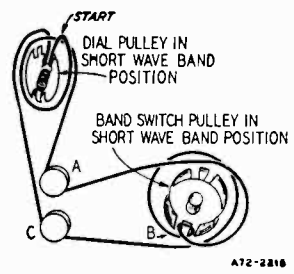
DIAL POINTER CORD

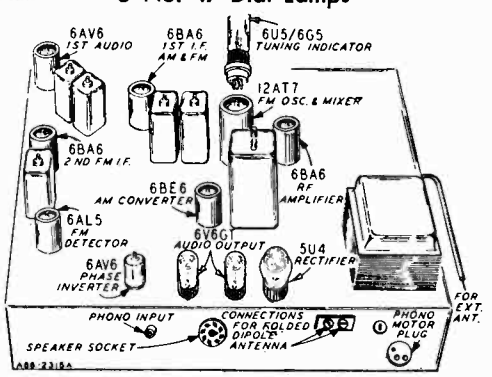
Use a new 10X66 drive cord assembly or a new length of cord 50 inches long for the installation. Install the cord as shown in the illustration, winding three turns counterclockwise around the drive shaft spool with the turns progressing towards the front end of the drive shaft. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



DIAL ROTATION CORD

Use a new 10X45 drive cord assembly or a new length of cord 20 inches long for the installation. Both the dial pulley and the band switch pulley must be turned to the short wave band position as shown in the illustration. Install the new cord exactly as shown then change the position of the band switch several times and note the movement of the dial.





MODELS 84WG-2732A,
84WG-2732B

RECEIVER STAGE SENSITIVITIES

AM AND AUDIO STAGES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting an 8 ohm, 10 watt resistor across the secondary winding of the output transformer. A reading of 2 volts across this resistor will be equivalent to a .5 watt output. The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	
1000 KC	200 mmf or RMA Dummy Antenna	External Antenna Lead	Chassis	2 Microvolts
1000 KC	.05 mf	6BA6 Interstage Pin 1	Chassis	8 Microvolts
1000 KC	.05 mf	6BE6 Converter Pin 7	Chassis	65 Microvolts
455 KC	.05 mf	6BE6 Converter Pin 7	Chassis	55 Microvolts
455 KC	.05 mf	6BA6 1st I-F Pin 1	Chassis	3500 Microvolts
400 cycles	.05 mf	6AV6 1st A-F Pin 1	Chassis	.045 Volt
400 cycles	.05 mf	6V6GT Output Pin 5	Chassis	1.65 Volts

FM STAGES

The table below lists the sensitivity for the FM stages of the receiver. The receiver must be tuned to 98 MC for all readings. Measurements are based on a .5 watt output the same as for the AM and Audio stage measurements.

The signal source must be an accurately calibrated signal generator capable of supplying a 98 MC signal modulated by a 400 cycle audio signal. For these measurements the generator must be adjusted for a 22.5 KC deviation. This will correspond to 30% AM modulation.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING TO RECEIVER	CONNECTION TO RECEIVER	GROUND CONNECTION	
98 Mc	300 ohms	External Antenna Terminal	External Ant. Terminal	25 Microvolts
10.7 MC	.01 mf	6BA6 1st I-F Pin 1	Chassis	2200 Microvolts
10.7 MC	.01 mf	6BA6 2nd I-F Pin 1	Chassis	50,000 Microvolts

ALIGNMENT PROCEDURE

AM BROADCAST AND SHORT WAVE BAND

The following is required for aligning:

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

Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, 200 mmf and 400 ohms.

Volume Control—Maximum all Adjustments.

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

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

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
I-F	455 kc	6BE6 Pin 7 and Chassis	.1 mf	Broadcast	Rotor Fully Open	1st I-F Pri. & Sec. (3) & (4) 2nd I.-F. Pri. & Sec. (1) & (2)	Maximum Output
Broadcast	1620 kc	External ant. lead	200 mmf	Broadcast	Rotar Fully Open	Broadcast Oscillator C-70B	
	1400 kc	External ant. lead	200 mmf	Broadcast	Turn Rotor to Max. Output Set pointer to 1400 kc See Note A	Broadcast Interstage C-38B	
	1400 kc	External ant. lead	200 mmf	Broadcast		Loop Antenna C-33	
	600 kc	External ant. lead	200 mmf	Broadcast	Turn Rotor to Max. Output and Rock See Note B	600 kc padder C-56	
	Repeat above oscillator adjustments at 1620 and 600 KC until readjusting the oscillator Range B Trimmer C-70B causes no further improvement in output.						
Short Wave	18.3 MC	External ant. lead	400 ohm	Short Wave	Rotor Fully Open	SW Oscillator C-70A	Maximum Output
	17 MC	External ant. lead	400 ohm	Short Wave	Turn Rotor to Max. Output	SW Interstage C-38A "D" Antenna C-31	
	Reassemble chassis in cabinet						
Broadcast	1400 kc	External ant. lead	200 mmf	Broadcast	Turn Rotor to Max. Output	Loop Antenna C-33	

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

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

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

MODELS 84WG-2732A,
84WG-2732B

ALIGNMENT PROCEDURE

FM STAGES

The following equrpment is required for aligning:

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

Non-metallic screwdriver.

Dummy Antennos and I-F Loading Resistor—.01 mf, 300 ohms and 5000 ohms.

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

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

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

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (6) Note C	Zero Cente
	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 Cente
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
	10.7 MC Note F	FM-RF Gang Condenser terminal on top of chassis	.01 mf	FM	Rotor Fully Open	1st I-F Pri. (9) 1st I-F Sec. (10) Note A	Maximum Deflection
Recheck I-F Adjustments in order given							
R-F & Osc.	108.4	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Oscillator C-9 Note G	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	RF. C-5	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	Ant. C-2	Maximum Deflection
Recheck R-F and Osc. Adjustments in order given							

NOTE A—Test Equipment connections are as given in the table. The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line at the 1 megohm resistor R-40 and the band switch terminal for all adjustments except the discriminator secondary adjustment, for which see Note C.

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

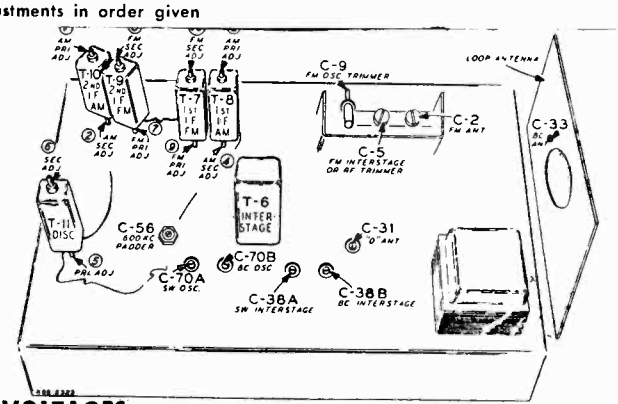
NOTE C—Disconnect zero center DC vacuum tube voltmeter from AVC and reconnect to junction of R-11, C-51 and C-52. Adjust for zero voltage indication.

NOTE D—Before adjusting Pri. core connect 5000 ohm load resistor across the 2nd I.F. secondary terminals.

NOTE E—Disconnect 5000 ohm load resistor from secondary terminals and reconnect across the 2nd I.F. primary terminals.

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

NOTE G—Oscillator frequency below signal frequency.



TUBE SOCKET VOLTAGES

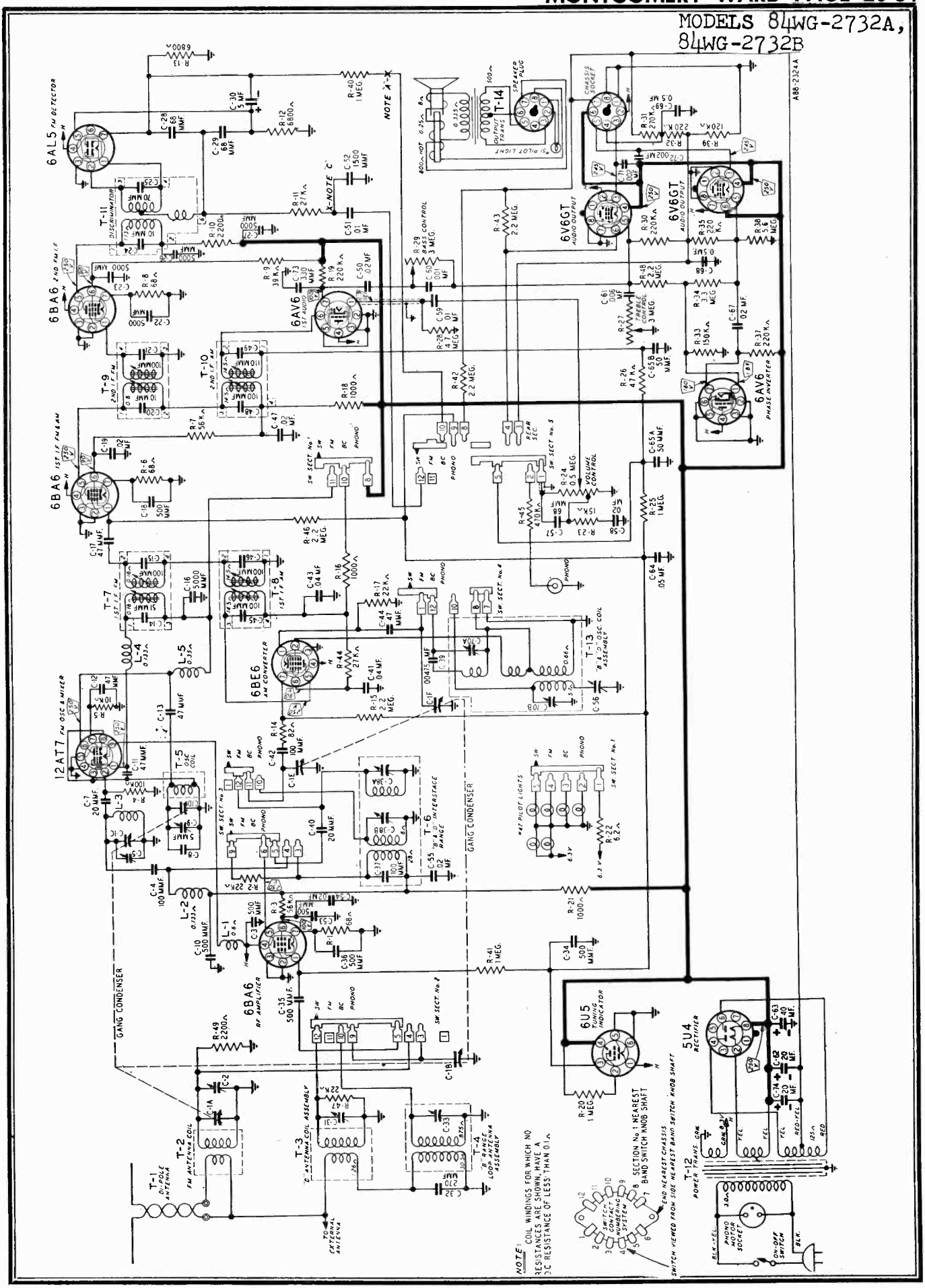
Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages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

Line voltage.....117 Volts AC

Signal Input.....None

A variation of ±10% is usually permissible.

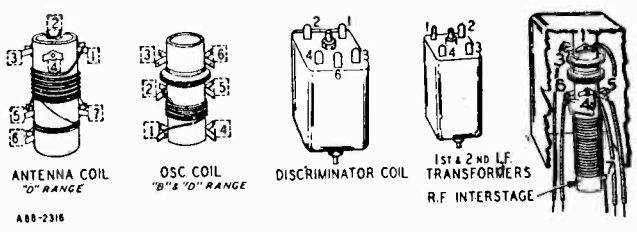
MODELS 84WG-2732A,
84WG-2732B

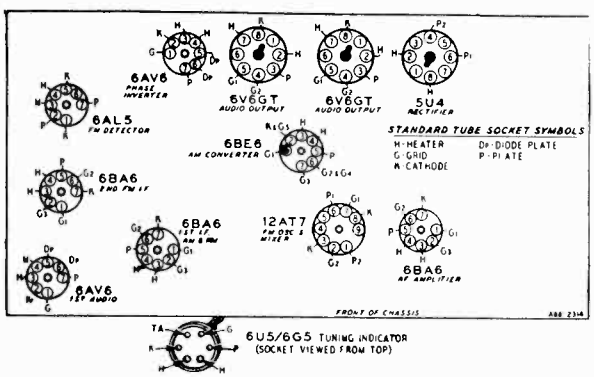


MODELS 84WG-2732A,
84WG-2732B

Ref. No.	Part No.	Description			Qty. Used in Set
		CAPACITORS			
C-1	26A483	Tuner and Gang Assembly			1
C-2, C-5	17A247	3.0-12 mmf		Trimmer	2
C-3, C-10, C-18, C-34, C-35, C-36, C-53	47X496	500 mmf		Ceramic	7
C-4, C-42	47X497	100 mmf		Ceramic	2
C-7, C-40	47X516	20mmf		Ceramic	2
C-8	47X500	5 mmf		Ceramic	1
C-9	17A255	1-8 mmf		Trimmer	1
C-11	47X499	47 mmf		Ceramic	1
C-12, C-13, C-44	47X498	47 mmf		Ceramic	3
C-14, C-15	Part of T-7 1st I-F (FM)				
C-16, C-22, C-23, C-26, C-27	47X507	5000 mmf		Ceramic	5
C-17	47X495	47 mmf		Ceramic	1
C-19, C-47, C-50, C-54, C-55, C-67	F66203	.02 mf	600 V	Tubular	6
C-20, C-21	Part of T-9 2nd I-F (FM)				
C-24, C-25	Part of T-11 Discriminator				
C-28, C-29, C-57	47X501	68 mmf		Ceramic	3
C-30	45X361	5 mf	100 V	Dry Electrolytic	1
C-31	17A253	5-50 mmf		Trimmer	1
C-32	47X445	270 mmf		Molded	1
C-33	17A123	1.5-12 mmf		Trimmer	1
C-37	47X57	100 mmf		Molded	1
C-38A, C-38B	17A252	1.3-12 mmf		Dual Trimmer	1
C-39	46X289	.00475 mf	180 V	Tubular	1

Ref. No.	Part No.	Description			Qty. Used in Set
C-41, C-43, C-45, C-46, C-48, C-49, C-51, C-59	D66403	.04 mf	400 V	Tubular	2
C-52	47X528	1500 mmf		Molded	1
C-56	17A241	300-475 mmf		Trimmer	1
C-58	B66203	.02 mf	200 V	Tubular	1
C-60	D66102	.001 mf	400 V	Tubular	1
C-61	D66602	.006 mf	400 V	Tubular	1
C-62	45X351	20 mf	450 V	Dry Electrolytic	1
C-63	45X302	40 mf	450 V	Dry Electrolytic	1
C-64	B66503	.05 mf	200 V	Tubular	1
C-65A, C-65B	47X112	50-50 mmf		Dual Mica	1
C-68, C-69	A66504	.5 mf	100 V	Tubular	2
C-70A, C-70B	17A246	3.2-35 mmf		Dual Trimmer	1
C-71, C-72	D66202	.002 mf	400 V	Tubular	2
C-73	47X470	330 mmf		Molded	1
C-74	45X373	20 mf	450 V	Dry Electrolytic	1
		RESISTORS			
		Ohms	Watts		
R-1, R-6, R-8	B83680	68	0.5	Carbon	3
R-2	C85223	22K	1.0	Carbon	1
R-3	B85563	56K	0.5	Carbon	1
R-4	B84104	100K	0.5	Carbon	1
R-5	B84103	10K	0.5	Carbon	1
R-7	C84563	56K	1.0	Carbon	1
R-9	C84393	39K	1.0	Carbon	1
R-10	B85222	2200	0.5	Carbon	1
R-11	B84273	27K	0.5	Carbon	1
R-12, R-13	B83682	6800	0.5	Carbon	2
R-14	B84820	82	0.5	Carbon	1
R-15, R-42, R-46, R-48, R-16	B85225	2.2 meg.	0.5	Carbon	4
R-18, R-21	B85102	1000	0.5	Carbon	3





MODELS 84WG-2732A, 84WG-2732B

REPLACEMENT PARTS LIST (continued)

Ref. No.	Part No.	Description	Qty. Used in Set
		Ohms Watts	
R-17, R-47	B84223	22K 0.5 Carbon	2
R-19, R-30, R-35, R-37	B85224	220K 0.5 Carbon	4
R-20		Part of 13X549 Cable and Socket Assembly	
R-22	43X217	6.2 0.5 Wire Wound	1
R-23	B85153	15K 0.5 Carbon	1
R-24	36X374	.5 meg. Volume Control	1
R-25, R-40, R-41	B85105	1 meg. 0.5 Carbon	3
R-26	B85473	47 K 0.5 Carbon	1
R-27, R-29	40X286	3 meg. Tone Control (Bass & Treble)	2
R-28	B85475	4.7 meg. 0.5 Carbon	1
R-31	B83274	270 K 0.5 Carbon	1
R-32	B83224	220 K 0.5 Carbon	1
R-33	B84154	150 K 0.5 Carbon	1
R-34	B85335	3.3 meg. 0.5 Carbon	1
R-38	B85565	5.6 meg. 0.5 Carbon	1
R-39	B83124	120 K 0.5 Carbon	1
R-43	B84225	2.2 meg. 0.5 Carbon	1
R-44	C84273	27K 1.0 Carbon	1
R-45	B85474	470K 0.5 Carbon	1
R-49	B84222	2200 0.5 Carbon	1

TRANSFORMERS AND COILS

L-1	9A1881	Filament Choke Assembly	1
L-2, L-4	9A1880	FM R-F Plate Choke	2
L-3	9A1946	FM R-F Coil	1
L-5	9A1882	FM Oscillator Plate Choke	1
T-1	9A2002	Di-Pole Antenna Assembly	1
T-2	9A1966	FM Antenna Coil	1
T-3	9A1957	"D" Antenna Coil Assembly	1
T-4	26A436	Loop Antenna Assembly	1
T-5	9A1948	Oscillator Coil (FM)	1
T-6	9A1947	Interstage "B" & "D" Range Coil Assembly	1
T-7	9A1950	1st I-F Transformer (FM)	1
T-8	9A1934	1st I-F Transformer (AM)	1
T-9	9A1933	2nd I-F Transformer (FM)	1
T-10	9A1935	2nd I-F Transformer (AM)	1
T-11	9A1936	Discriminator Coil	1
T-12	53X293	Power Transformer	1
T-13	9A1988	"B" & "D" Oscillator Coil Assembly	1
T-14		Output Transformer (See Miscellaneous)	1

MISCELLANEOUS

12A481	12" E.D. Speaker complete with output transformer	1
3A425	Tube socket (miniature)	6
3A303	Tube socket—octal (8 prong) molded	4
32X386	Tube shield (miniature)	6
32X388	Tube Shield (For 12AT7)	1
3A436	Tube socket (For 12AT7)	1
3A427	Tube socket (R-F Amp)	1
3A304	Phono Motor Socket	1
3A305	Phono socket—single pin	1
2A377	Band Switch	1
2A376	Rotary Snap Switch	1
13X328	Line Cord and Plug Assembly	1
26A485	Escutcheon and Crystal Assy.	1
10A509	Tuner Buttons	6
28X320	Springs (Tuner Button)	6
4X870	Escutcheon Eye	1
10A662	Knob, Band	1
10A667	Knob, Tuning	1
10A663	Knob, On-Off	1
10A664	Knob, Volume	1
10A665	Knob, Treble	1
10A666	Knob, Bass	1
25X498	Tuning Eye Clamp	1
25X1396	Tuning Eye Bracket	1
13X549	Cable and Socket Assembly—Tuning Indicator	1
6X21	Rubber Grommets (Mtg. Gang Cond.)	4
20X329	Condenser Cushion Stud (Mtg. Gang Cond.)	4
7A32	No. 51 Pilot Light (Jewel)	1
7A222	Jewel	1

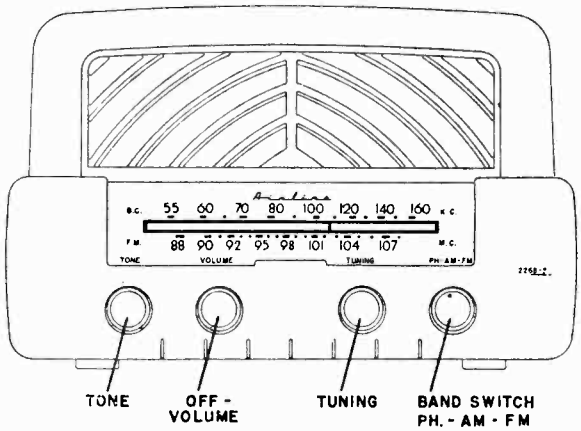
DIAL AND DRIVE ASSEMBLY

26A435	Dial Bracket Assembly	1
26A484	Dial and Drum Assembly Complete with Dial Background, Collar, Dial Drum and Dial Scale	1
15X221	Pointer	1
26X500	Dial Drum Shaft	1
26A440	Pulley and Collar Assembly (For dial drum shaft)	1
26A437	Band Switch Pulley Assembly	1
26X468	Band Switch Shaft	1
26A441	Crown Gear Assembly (For Mtg. to Band Switch)	2
26A434	Idler Bracket Assembly	1
25X1389	Drive Shaft Bracket	1
26A494	Drive Shaft & Spool Assembly	1
10X45	Drive Cord Assembly (Band Change)	1
28X524	Tension Spring (Band Change)	1
10X66	Drive Cord and Clip Assembly (Dial Drive)	1
28X530	Tension Spring (Dial Drive)	1
41X72	Light Shield (Band Indicator)	4
41X35	Light Shield (Dial)	2
7A103	No. 47 Pilot Light	6
7A187	Pilot Light Socket Assembly (Dual)	1
7A209	Indicator Light Socket Assembly	4

TYPE W-28A-153 RECORD CHANGER PARTS

W-15X097-1	Motor Assembly, 60 cycles 115-120 V.	1
W-21P247	Crystal Cartridge	1
W-21P515	Semi-Permanent Twin Point Needle Assembly	1
W-11X368	Rubber Drive Wheel (33-1/3 R.P.M.)	1
W-11X366	Rubber Drive Wheel (78 R.P.M.)	1

MODEL 94BR-1535A



OPERATION OF THE RADIO

BROADCAST BAND—This is the tuning band in which the standard broadcast stations operate. The upper scale on the dial covers the broadcast range of 535-1620 Kc., and is calibrated in channel numbers. To obtain the kilocycle reading, multiply the number on the dial by 10; thus 80 on the dial corresponds to 800 kilocycles.

FM BAND—The FM tuning range covers the newly allocated frequency-modulation band of 88 to 108 megacycles into which all FM stations are required to move. Check with your local newspaper to determine the frequency of your local FM stations.

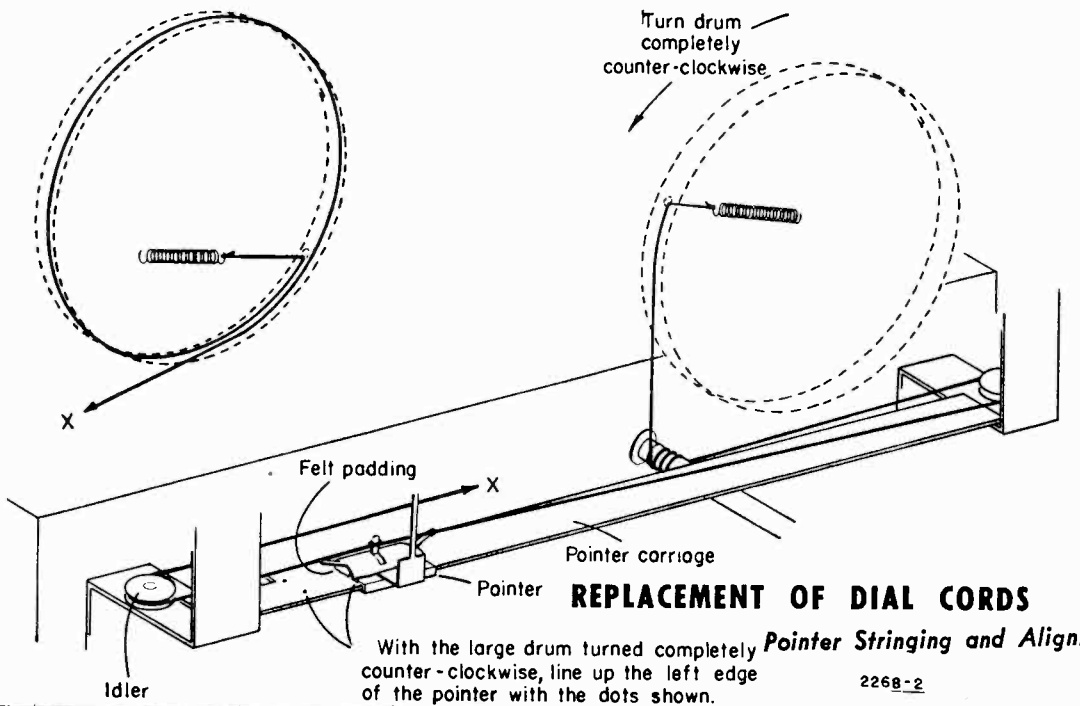
ON-OFF SWITCH AND VOLUME CONTROL—The knob second from the left is both the on-off switch and the volume control. When this control is turned all the way to the left the set is off. A slight rotation to the right will click the switch and turn the set on. The knob may then be used to regulate the volume. Be sure your set is turned completely off when not in use; otherwise the tubes will wear out unnecessarily.

TONE CONTROL—Rotating the extreme left hand knob gives a full variation of the tonal response from a deep bass to a brilliant treble.

TUNING KNOB—The knob second from the right is the tuning knob; rotation of this knob moves the indicator along the dial scales. When selecting a station turn the knob back and forth until the tone is clearest and loudest. Do not use the tuning knob to regulate volume; the volume control should be used for that purpose after the station has been tuned in properly. It is particularly important in FM reception to tune the station accurately; otherwise the tone is distorted and the background noise not eliminated.

BAND SWITCH—The knob on the extreme right is used to select FM BAND, BROADCAST BAND, or PHONO. When this knob is turned fully clockwise FM programs can be tuned in. In the center position STANDARD BROADCASTS can be heard.

PHONOGRAPH—To PLAY RECORDS through this radio, connect the "pickup lead" wire from record player to the "PHONO INPUT" on the cabinet back. Turn Bandswitch to PHONO and adjust volume as required.



REPLACEMENT OF DIAL CORDS

Pointer Stringing and Alignment

With the large drum turned completely counter-clockwise, line up the left edge of the pointer with the dots shown.

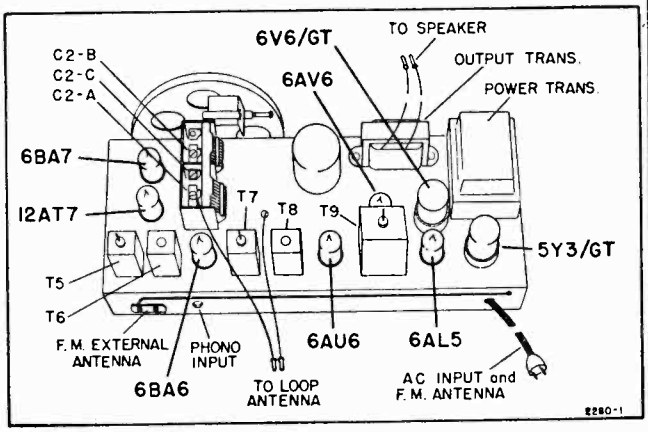
2268-2

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 500 milliwatts. 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 1.27 volts AC across this resistor will be approximately equivalent to 500 milliwatt output with the speaker connected. The volume control must be set at maximum. The tone control must be set for maximum treble.

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



Chassis View

AM—I. F. ALIGNMENT

Band Switch in AM Position, Gang Open, Dummy Antenna .1 Mfd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
400 cycles. Use 65 millivolts	High Side of Volume Control and chassis	None	Maximum output Should be 500 Milliwatts
455 Kc. Use 3300 microvolts	Pin 1 of 6BA6 I.F. Amp. and chassis	Primary and Secondary of T8. See chassis view.	Maximum output Should be 500 Milliwatts
455 Kc. Use 55 microvolts	Pin 7 of 6BA7 Converter and chassis	Primary and Secondary of T6. See chassis view.	Maximum output Should be 500 Milliwatts

BROADCAST BAND—R. F. ALIGNMENT

Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of dial marker at the extreme left when gang is closed.
For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	SET POINTER AT	CONNECT TO RADIO	ADJUST
1620 Kc.	Extreme Right Calibration Marker	RADIATION COUPLING Use six turn loop across generator output. Place close to cabinet back.	Oscillator trimmer C2-B for maximum
1400 Kc.	Third Calibration from Right		Antenna Trimmer C2-A for maximum

Check tracking at 1000 Kc, 600 Kc, and 535 Kc to be sure oscillator is set correctly.

ELECTRICAL SPECIFICATIONS

Power Supply..... 105 to 125 volts, AC, 60-cycles; Chassis only 75 watts.
Frequency Ranges..... Broadcast Band—535 to 1620 kc. FM Band—88 to 108 mc.
Intermediate Freq..... AM-455 kc.; FM-10.7 mc.
Selectivity..... AM-47 kc. broad at 1000 times signal, measured at 1000 kc.
I.F. FM-230 kc. broad at 2 times down.
I.F. FM-470 kc. broad at 10 times down.
AM Sensitivity..... (For .5 watt output)—200 microvolts per meter average.
FM Sensitivity..... (For .5 watt output)—30 microvolts average.
Power Output..... 1.5 watts. 10% distortion. 3.0 watts maximum.
Loud Speaker..... 5"x 7" PM. Voice coil impedance 3.2 ohms, 400 cycles.
Tube Complement.....
12AT7, FM-RF amp. mixer; 6BA7, AM converter, FM oscillator; 6BA7, IF amplifier; 6AU6, FM driver; 6AL5, FM detector; 6AV6, AM detector; 6V6 output; 5Y3, rectifier.

MODEL 94BR-1535A

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 voltmeter, can have both the positive and negative sides connected to points above ground and still give true readings. (See note "C" below.)

A standard AM signal generator is required.

FM —I. F. ALIGNMENT

Band Switch in FM Position. Dummy Antenna .1 Mfd

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
10.7 Mc. Use about .05 volt	Pin No. 1 of 6AU6	Pin No. 7 of 6AL5 and chassis	Bottom Core Primary of T9 Ratio Detector	Resonance should be about 3 volts
10.7 Mc. Use about .05 volt	Pin No. 1 of 6AU6	See note "A"	Top Core Secondary of T9 Ratio Detector	Zero. Use zero center scale See note "B"
10.7 Mc. Use about 1800 microvolts	Pin No. 1 of 6BA6	Pin No. 7 of 6AL5 and chassis	Primary and Secondary of T7. FM Driver IF See chassis view	Resonance should be about 3 volts
10.7 Mc. Use about 400 microvolts	Top end of C2-C	Pin No. 7 of 6AL5 and chassis	Primary and Secondary of T5. FM Input IF See chassis view	Resonance should be about 3 volts

NOTES ON FM — I. F. ALIGNMENT

NOTE "A"—Connect two resistors in series, 100K OHMS each, from Pin No. 7 of 6AL5 to chassis (Pin No. 5). These resitors must be matched within 5%. Connect vacuum tube voltmeter between the midpoint of the resistors and point ⧈.

NOTE "B"—If T9 has been tampered with, it is possible that no crossover point will be found at first. Careful adjustment of both primary and secondary is necesary.

NOTE "C"—To use a VTVM which does not have the "floating ground" feature, in step 2 above, connect "ground" side of VTVM to midpoint of resistors (Note "A") and "high" side to point ⧈.

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

FM—R. F. ALIGNMENT

Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of dial marker at the extreme left when gang is closed.

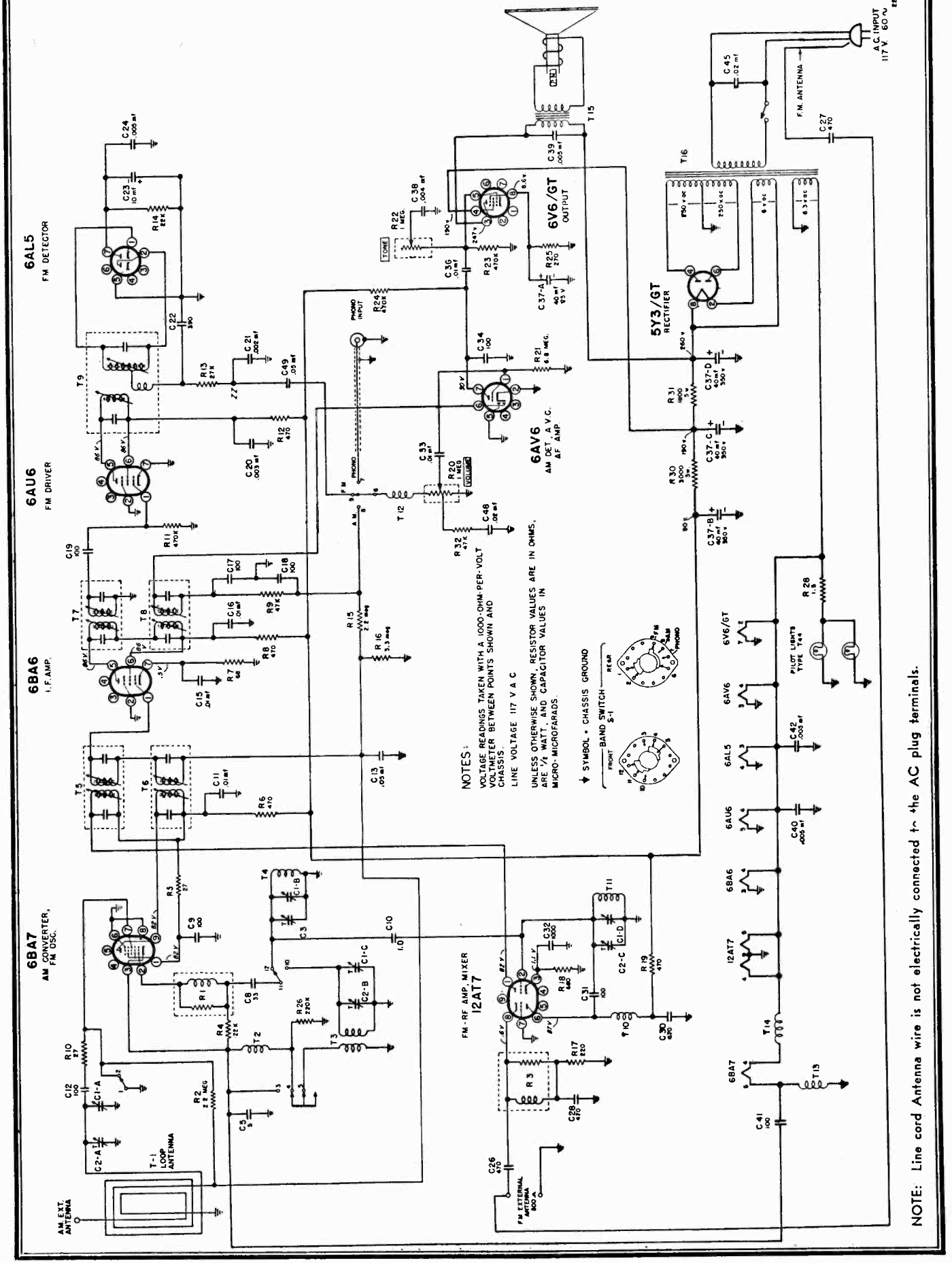
For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	POINTER	CONNECTION TO RADIO	ADJUST	V T V M CONNECTIONS
108 mc.	108 mc. Marker	FM antenna terminals	FM Osc. C3 for maximum	Pin No. 7 of 6AL5 to chassis.
98 mc.	Tune in Gen. Signal	See Note "B" below	FM Mixer C2-C for maximum	

NOTE "A"—If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use 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 voltmeter as above for resonance indication. A weak carrier, however, will not produce 3 volts.

NOTE "B"—Connect 300 ohms in series with "hot" side of generator and connect to left hand screw of external FM Antenna Terminals. Connect cold side of generator to right hand screw.

MODEL 94BR-1535A



MODEL 9LBR-1535A

REPLACEMENT PARTS LIST

CAPACITORS

Ref. No.	Part No.	Description	Qty.
C1A,B,C,D	B-8A-17673	Gang tuning condenser	1
C2A,B,C,		Trimmers on gang	3
C3	A-201-15142	Trimmer condenser	1
C5	C-8G-12166	5 mmf, ceramic, 10%	1
C8	C-8G-14172	33 mmf, ceramic, 10%	1
C9-31-41	C-8G-12759	100 mmf, ceramic, 10%	3
C10		1.0 mmf, ceramic, 20%	1
C11-16-36	C-8D-10761	.01 mfd, 400 volts, 20%	3
C12	C-8G-13131	100 mmf, ceramic, 10%	1
C13-49	C-8D-10770	.05 mfd, 200 volts, 20%	2
C15-33	C-8D-11738	.01 mfd, 200 volts, 20%	2
C17-18	A-8F-13127	.0001 mfd-dual mica, +30% —20%	1
C19-34	C-8G-11734	100 mmf, ceramic, 10%	2
C20	C-8D-11013	.003 mfd, 600 volts, 10%	1
C21	C-8G-16049	2000 mmf, ceramic, 10%	1
C22	C-8F3-120	390 mmf, mica, 10%	1
C23	A-8C-18128	10 mfd, 50 volts	1
C24-40-42	A-8G-13962	.005 mfd, ceramic	3
C26-27-28-30	C-8G-11732	470 mmf, ceramic, 20%	4
C32	C-8G-13201	1000 mmf, ceramic	1
C37-A-B-C-D	A-8C-18125	40-40-40 mfd x 350 volts, 40 mfd x 25 volts	1
C38	C-8D-10788	.004 mfd, 600 volts, 20%	1
C39	C-8D-10935	.005 mfd, 600 volts, +40% —15%	1
C45	C-8J-11321	.02 mfd, 600 volts, 20%	1
C48	C-8D-11304	.02 mfd, 200 volts, 20%	1

RESISTORS

Ref. No.	Part No.	Description	Qty.
R1	A-16B-16615	Suppressor	1
R2-15	C-9B1-33	2.2 megohms, 1/2 watt, 20%	2
R3	A-16B-16616	Suppressor	1
R4-14	C-9B1-78	22K ohms, 1/2 watt, 10%	2
R5-10	C-9B1-43	27 ohms, 1/2 watt, 10%	1
R6-8-12-19	C-9B1-58	470 ohms, 1/2 watt, 10%	4
R7	C-9B1-48	68 ohms, 1/2 watt, 10%	1
R9-32	C-9B1-82	47K ohms, 1/2 watt, 10%	2
R11-23-24	C-9B1-94	470K ohms, 1/2 watt, 10%	3
R13	C-9B1-79	27K ohms, 1/2 watt, 10%	1
R16	C-9B1-34	3.3 megohms, 1/2 watt, 20%	1
R17	C-9B1-54	220 ohms, 1/2 watt, 10%	1
R18	C-9B1-60	680 ohms, 1/2 watt, 10%	1
R20	A-10A-18117	1 megohm, (volume control and switch)	1
R21	C-9B1-36	6.8 megohms, 1/2 watt, 20%	1
R22	A-11B-15852	1 megohm, (tone control)	1
R25	C-9B1-55	270 ohms, 1/2 watt, 10%	1
R26	C-9B1-27	220K ohms, 1/2 watt, 20%	1
R28	C-9C2-1065	1.5 ohms, 1 watt, 10%	1
R30	C-9C12-2059	3000 ohms, 5 watts, 5%	1
R31	C-9C12-1102	1800 ohms, 5 watts, 10%	1

COILS, TRANSFORMERS, CHOKES

Ref. No.	Part No.	Description	Qty.
T1	C-13E-18179	Loop antenna assembly	1
T2-T13-T14	A-16B-16023	RF choke coil assembly	3
T3	B-13D-16611	Oscillator coil (AM)	1
T4	A-13D-16617	Oscillator coil (FM)	1
T5	B-13A-16612	Input IF transformer (FM)	1
T6	B-13A-16662	Input IF transformer (AM)	1
T7	B-13B-16000	Output IF transformer (FM)	1
T8	B-13A-16662	Output IF transformer (AM)	1
T9	B-13M-16001	Ratio detector transformer	1
T10	A-16B-16613	RF choke coil	1
T11	A-13E-16618	RF coil (FM)	1
T12	A-16A-16637	RF choke coil	1
T15	B-12C-18143	Output transformer	1
T16	B-12A-18137	Power transformer	1

MISCELLANEOUS

A-15B-13430	9-prong, miniature tube socket	2
A-15B-10440	8-prong, octal socket	2
A-15C-16007	7-prong, miniature tube socket	4
B-20A-18118	Band change switch	1
B-14M-18147	AC line cord and plug	1
A-23A-16328	Line cord lock	1
A-19B-12170	Phono pick-up socket	1
A-7B-13050	Dipole socket	1
A-3A-18116	Tuning shaft	1
A-2D-10033	Tuning shaft bracket	1
B-47A-18150	Pilot light assembly	1
A-46A-11739	Pilot light bulb, T-44	2
B-18A-17637	5"x7" PM speaker	1

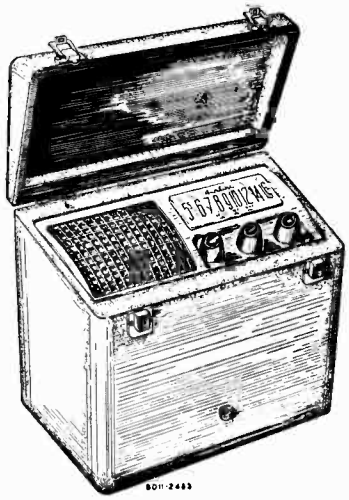
DIAL PARTS

C-6D-17737	Dial scale	1
A-2M-16034	Dial mounting bracket	2
B-6M-17622	Background diffuser	1
B-2M-16656	Pointer bar	1
A-2D-17627	Pointer bar bracket	1
A-3M-10299	Pulley	2
B-27A-10102	Shoulder rivet	2
A-53A-10989	Dial strings	60" yd.
B-2G-18119	Dial pointer	1
A-50A-16434	Felt strip for pointer	1
A-49A-11324	Tension spring	2

CABINET PARTS

R-5C-18159-36	Bakelite cabinet	1
B-24M-17623	Baffle board	1
A-23C-15453	M/W Crest	1
B-5B-1131-41	Knob	3
B-5B-16057-41	Knob (with dot)	1

MODEL 94WG-1059A



ELECTRICAL SPECIFICATIONS

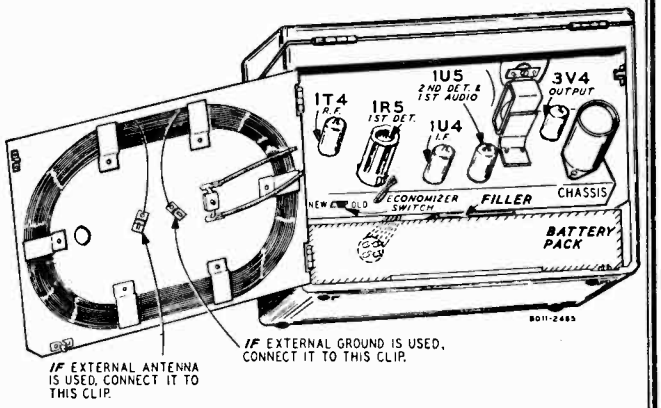
Power Supply	"A" Battery Supply—9 Volts, 50 Ma. "B" Battery Supply—90 Volts, 11 Ma. or 105-125 volts AC, 25-60 cycles, 12 watts or 105-125 volts DC
Battery Pack	Ward's Battery Pack No. 62-35
Frequency Range	540-1600 KC
Intermediate Frequency	455 KC
Selectivity	At 1000 KC, 45 KC wide at 1000 times signal
Sensitivity	(for .05 watt output with external antenna) 10 microvolts average
Power Output	0.3 watt maximum 0.125 watt 10% distortion
Loud Speaker	5¼" PM dynamic
Voice Coil Impedance	3.2 ohms at 400 cycles

Tube Complement

1 1R5 1st Detector
1 1U4 I-F Amplifier
1 1T4 R-F Amplifier
1 1U5 2nd Detector, AVC and 1st A-F Amplifier
1 3V4 Power Output

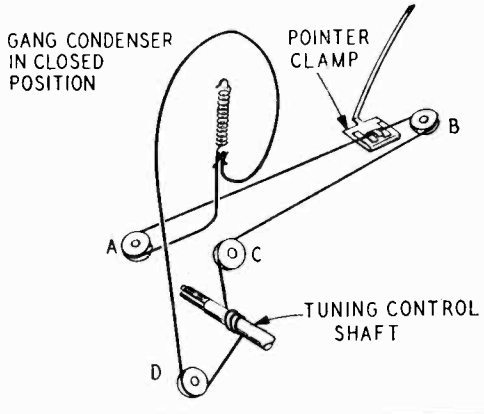
GENERAL DESCRIPTION

This model is a five tube AC-DC or battery operated portable radio. Controls are provided for tuning, volume and AC-DC or Battery selection. Other features include a built-in Air Wave Loop Aerial, automatic volume control, tuned R-F stage, PM dynamic speaker and a selenium rectifier for AC operation. The dial scale is calibrated to cover frequencies between 540 and 1600 kilocycles.



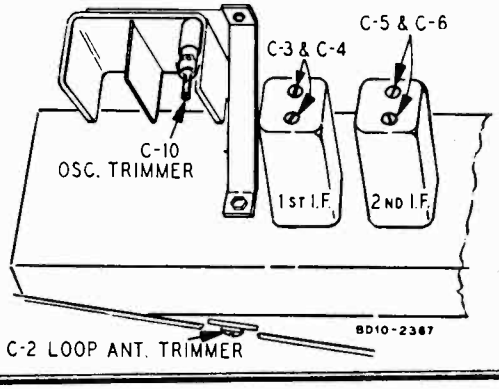
DRIVE CORD REPLACEMENT

Turn the gang condenser to the fully closed position. Use a new 10X52 Drive Cord Assembly and fasten one end to the tension spring. Fasten the other end of the tension spring to the hook on the drive pulley. Pass the cord through the slot in the drive pulley rim and continue around pulley rim ¼ turn clockwise. Pass cord around pulleys A, B, and C as shown in the illustration. Wind three turns clockwise (viewed from rear of chassis) around tuning control shaft. The turns must progress toward rear of chassis. Pass cord around pulley D and continue ¾ turn clockwise around large drive pulley. Pass cord through the slot in the pulley rim then stretch the tension spring and fasten free end of cord to it.



REMOVAL OF CHASSIS FROM CABINET

Pull off the three control knobs and disconnect the battery plug. Remove the two wood screws holding the safety switch in place. Remove the four screws that fasten the chassis to the cabinet (2 on the outside at each end of the cabinet). Withdraw the chassis from the cabinet.



MODEL 94WG-1059A

RECEIVER STAGE SENSITIVITIES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm 5 watt resistor across the secondary winding of the output transformer. A reading of .4 volt AC across this resistor will be equivalent to a 50 milliwatt output with the speaker connected. The volume control must be set to maximum.
The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Output variations of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR 50 MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Receiver	Ground Connection	
1000 kc	200 mmf or RMA Dummy Antenna	Loop Antenna—External antenna clip	Ext. Gnd. Clip	4.0 microvolts
1000 kc	.1 mf.	1T4 R-F—Pin 6	"X" Point	25 microvolts
455 kc	.1 mf.	1R5 1st Detector—Pin 6	"X" Point	90 microvolts
455 kc	.1 mf.	1U4 I-F—Pin 6	"X" Point	3500 microvolts
400 cycles	.1 mf.	1U5 1st A-F—Pin 6	"X" Point	.022 volt
400 cycles	.1 mf.	3V4 Output—Pin 3	"X" Point	1.8 volts

ALIGNMENT PROCEDURE

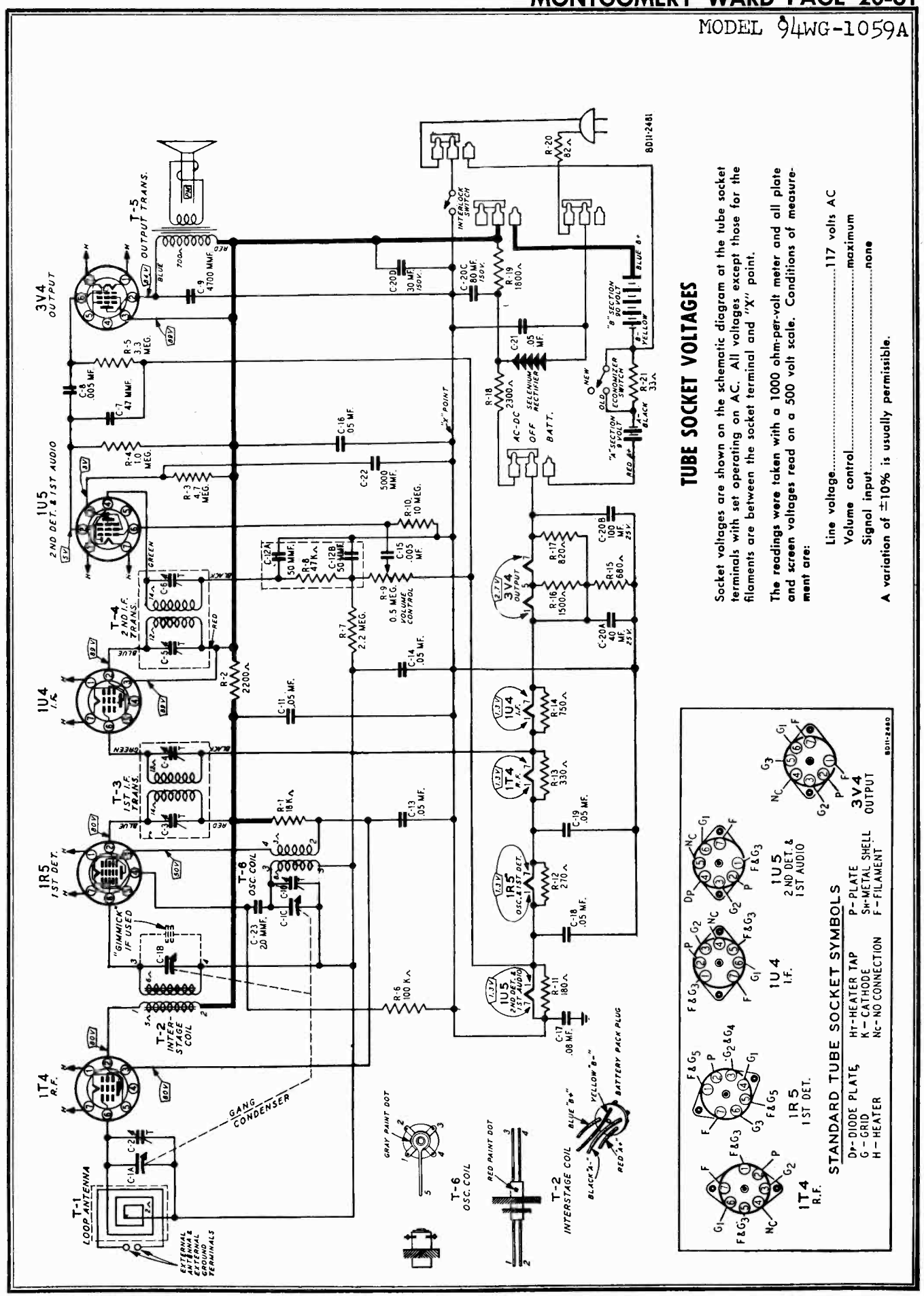
Volume Control—Maximum All Adjustments.
Allow Chassis and Signal Generator to "Heat Up" for several Minutes.
The equipment in column at right is required for aligning:
Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter; Non-Metallic Screwdriver.
Dummy Antenna—.1 mf., 50 mmf.

SIGNAL GENERATOR				CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM See Trimmer Illustration
Frequency Setting	Coupling Capacitor	Connection to Radio	Ground Connection		
455 kc	.1 mf	Control Grid 1U4 I-F Pin 6	"X" Point	Turn Rotor To Full Open	2nd I-F (C-5) & (C-6)
455 kc	.1 mf	Control Grid 1R5 1st Det. Pin 6	"X" Point	Turn Rotor To Full Open	1st I-F (C-3) & (C-4)
1620 kc	.1 mf	Control Grid 1T4 R-F Pin 6	"X" Point	Turn Rotor To Full Open	Oscillator (C-10)
1400 kc	50 mmf	External Antenna Clip On Loop See Note A	External Ground clip on loop	Turn Rotor To Max. Output. Set Indicator to 1400 KC See Note B	Antenna (C-2)

NOTE A—Re-assemble chassis in cabinet and close the cabinet back before making adjustment.

NOTE B—Tune in a 1400 KC signal. If pointer is not at the 1400 KC mark on the dial scale, move the pointer on the string to the 1400 KC mark.

MODEL 94WG-1059A



TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals with set operating on AC. All voltages except those for the filaments are between the socket terminal and "X" point.

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

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

A variation of ±10% is usually permissible.

REPLACEMENT PARTS LIST

TRANSFORMERS AND COILS

Ref. No.	Part No.	Description	Qty. Used in Set
T-1	9A2039	"B" Range Loop Antenna	1
T-2	9A1989	Interstage Coil Assembly	1
T-3	9A1991	1st I-F Transformer and Can Assembly	1
T-4	9A1992	2nd I-F Transformer and Can Assembly	1
T-5	51X143	Output Transformer	1
T-6	9A1990	Oscillator Coil Assembly	1

MISCELLANEOUS

12A492	5¼" P.M. Speaker	1
3A426	Tube Socket (Miniature)	5
32X386	Tube Shield (1R5-1U5)	2
2A175	Battery Saver Switch	1
2A390	AC-DC-Off-Batt. Switch	1
2A389	On-Off Switch	1
13X429	Battery Cable and Plug Assembly	1
10A733	Knob, Switch	1
10A732	Knob, Tuning & Volume	2
13X546	Line Cord and Plug Assembly	1
11X117	Shield, Volume Control and Switch (Paper)	1
32X368	Shield, Volume Control and Switch (Metal)	1
66X7	Selenium Rectifier	1
76X1	Resistor Capacitor Combination	1

DIAL AND DRIVE ASSEMBLY

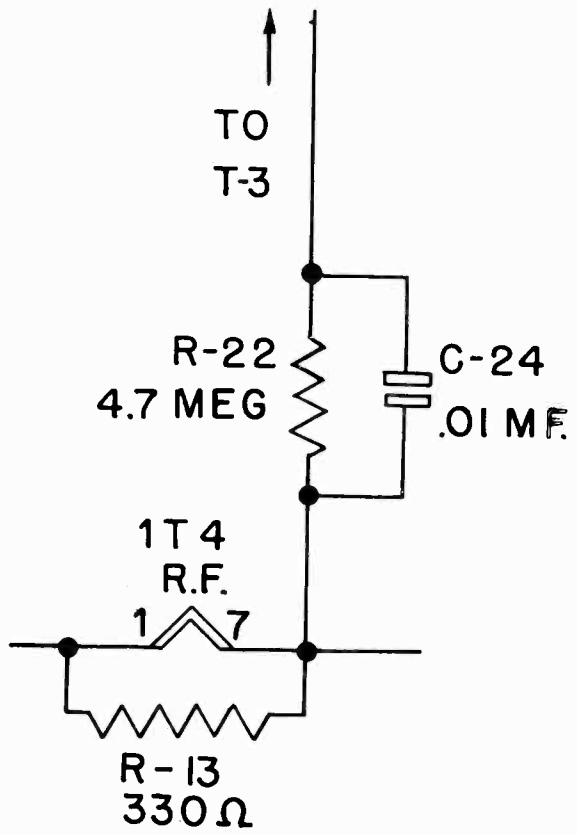
25X1504	Dial Brace Bracket	1
58X722	Dial Scale	1
17X97	Celluloid Crystal	1
15X248	Pointer	1
25X832	Gang Condenser Mounting Bracket	1
6X67	Grommet } Mtg. Gang Condenser	3
20X329	Cond. Cushion Stud } Mtg. Gang Condenser	3
28X95	Drive Cord Tension Spring	1
10X52	Drive Cord Assembly	1
4X1048	Escutcheon	1
26X511	Drive Shaft	1
19X192	"C" Washer for Drive Shaft	2

RESISTORS

		Ohms	Watts		
R-1	B84183	18K	.5	Carbon	1
R-2	B84222	2200	.5	Carbon	1
R-3	B85475	4.7 meg.	.5	Carbon	1
R-4	B84105	1 meg.	.5	Carbon	1
R-5	B85335	3.3 meg.	.5	Carbon	1
R-6	B84104	100K	.5	Carbon	1
R-7	B85225	2.2 meg.	.5	Carbon	1
R-8	Part of 76X1 Resistor Capacitor Combination				
R-9	36X382	.5 meg.		Volume Control	1
R-10	B85106	10 meg.	.5	Carbon	1
R-11	B84181	180	.5	Carbon	1
R-12	B84271	270	.5	Carbon	1
R-13	B84331	330	.5	Carbon	1
R-14	B84751	750	.5	Carbon	1
R-15	B84681	680	.5	Carbon	1
R-16	B84152	1500	.5	Carbon	1
R-17	B84821	820	.5	Carbon	1
R-18	43X237	2300	12.0	Wire Wound	1
R-19	B84182	1800	.5	Carbon	1
R-20	D84820	82	2.0	Carbon	1
R-21	B85330	33	.5	Carbon	1

CAPACITORS

C 1A, C-1B, C-1C	14A205	Gang Condenser & Drive Pulley			1
C-2	17A256	2—24 mmf		Trimmer	1
C-3, C-4	Part of T-3 (1st I.F. Transformer)				
C-5, C-6	Part of T-4 (2nd I.F. Transformer)				
C-7	47X463	47 mmf		Ceramic	1
C-8, C-15	B66502	.005 mf	200 V	Tubular	2
C-9	47X491	4700 mmf		Molded Mica	1
C-10	26A489	1-8 mmf		Trimmer Assy.	1
C-11, C-13, C-14, C-16, C-18, C-19	B66503	.05 mf	200 V	Tubular	6
C-12A, C-12B	Part of 76X1 Resistor Capacitor Combination				
C-17	B66803	.08	200 V	Tubular	1
C-20A	45X356	40 mf	25 V	Dry Electrolytic	1
C-20B		100 mf	25 V		
C-20C		80 mf	150 V		
C-20D		30 mf	150 V		
C-21	D66503	.05	400 V	Tubular	1
C-22	47X507	5000 mmf		Ceramic	1
C-23	47X516	20 mmf		Ceramic	1

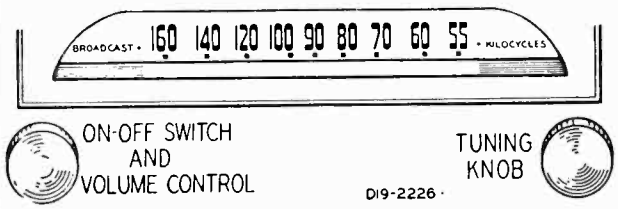


PARTS LIST ADDITION

The description of the new parts follows:

REF.NO.	PART NO.	DESCRIPTION
C-24	B66103	.01 MF 200 V.- Tubular
R-22	B85475	4.7 Meg. .5 W.- Carbon

MODEL 94WG-1804D



GENERAL DESCRIPTION

This model is a five tube (plus rectifier tube) AC-DC receiver housed in a wooden cabinet.

Controls are provided for tuning and volume. Other features include the built-in Air Wave Loop Aerial, automatic volume control, beam power audio output stage and a permanent magnet dynamic speaker. The dial scale is calibrated to cover frequencies between 540 and 1600 KC.

ELECTRICAL SPECIFICATIONS

Power Supply.....105-125 volts AC, 25-60 cycles, 35 watts or 105-125 volts DC
Frequency Range.....540-1600 KC
Intermediate Frequency.455 KC
Selectivity.....At 1000 KC, 50 KC wide at 1000 times signal
Sensitivity.....(for .05 watt output with external antenna) 15 microvolts average
Power Output.....1.3 watts maximum
.75 watt 10% distortion
Loud Speaker.....5" PM Dynamic
Voice Coil Impedance...3.2 ohms at 400 cycles

Tube and Dial Light Complement

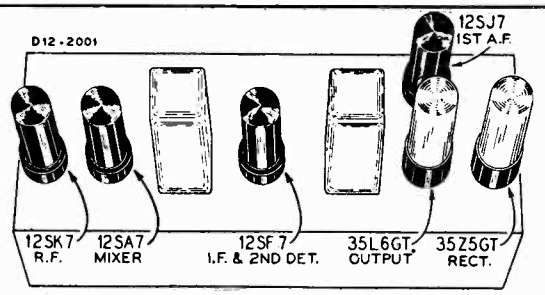
1 12SK7 R-F Amplifier
1 12SA7 Mixer
1 12SF7 I-F and 2nd Detector
1 12SJ7 1st A-F
1 35L6GT Power Output
1 35Z5GT Rectifier
1 47 Dial Lamp

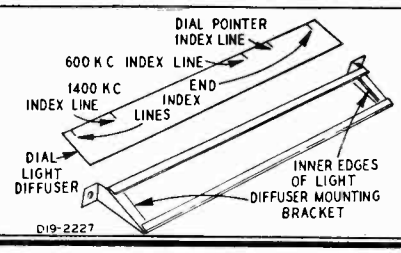
RECEIVER STAGE SENSITIVITIES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm 5 watt resistor across the secondary winding of the output transformer. A reading of .4 volt AC across this resistor will be equivalent to a 50 milliwatt output. The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR 50 MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Receiver	Ground Connection	
1000 kc	200 mmf or RMA Dummy Antenna	Loop Antenna—External antenna clip	Chassis	19.5 microvolts
1000 kc	.05 mf.	12SA7 Mixer—Pin 8	Point "X" (12SK7 Pin 3)	150 microvolts
455 kc	.05 mf	12SA7 Mixer—Pin 8	Same as above	100 microvolts
455 kc	.05 mf	12SF7 I-F—Pin 2	Same as above	3500 microvolts
400 cycles	.05 mf	12SJ7 1st A-F—Pin 4	Same as above	.042 volt
400 cycles	.05 mf	35L6GT Output—Pin 5	Same as above	1 volt





DIAL CALIBRATION

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

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

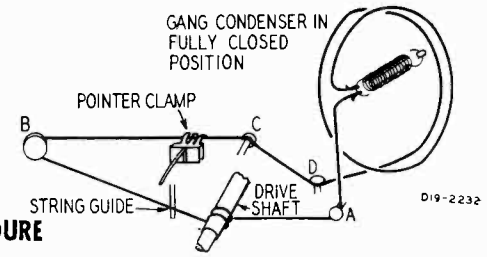
The 1400 KC index line is for use when aligning the receiver.

MODEL 94WG-1804D

DRIVE CORD REPLACEMENT

Turn the gang condenser to the fully closed position. Use a new 10X44 drive cord assembly and fasten one end to the tension spring. Hook the other end of the tension spring over the tab on the drive pulley. Pass the cord through the slot on the drive pulley rim, under stud A and wind two turns clockwise (from front of chassis) around the tuning shaft. Turns must progress away from chassis. Pass cord over pulley B and stud C under stud D. Pass cord under drive pulley and wind 4 turns counterclockwise around drive pulley Stretch tension spring and fasten free end of cord to spring.

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



ALIGNMENT PROCEDURE

Check dial pointer position, see Dial Calibration paragraph.

Volume Control—Maximum All Adjustments.

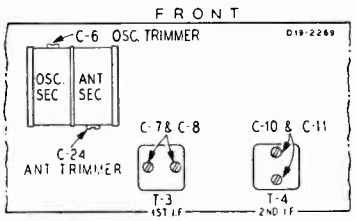
Allow Chassis and Signal Generator to "Heat Up" for several Minutes.

The equipment in column at right is required for aligning:

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

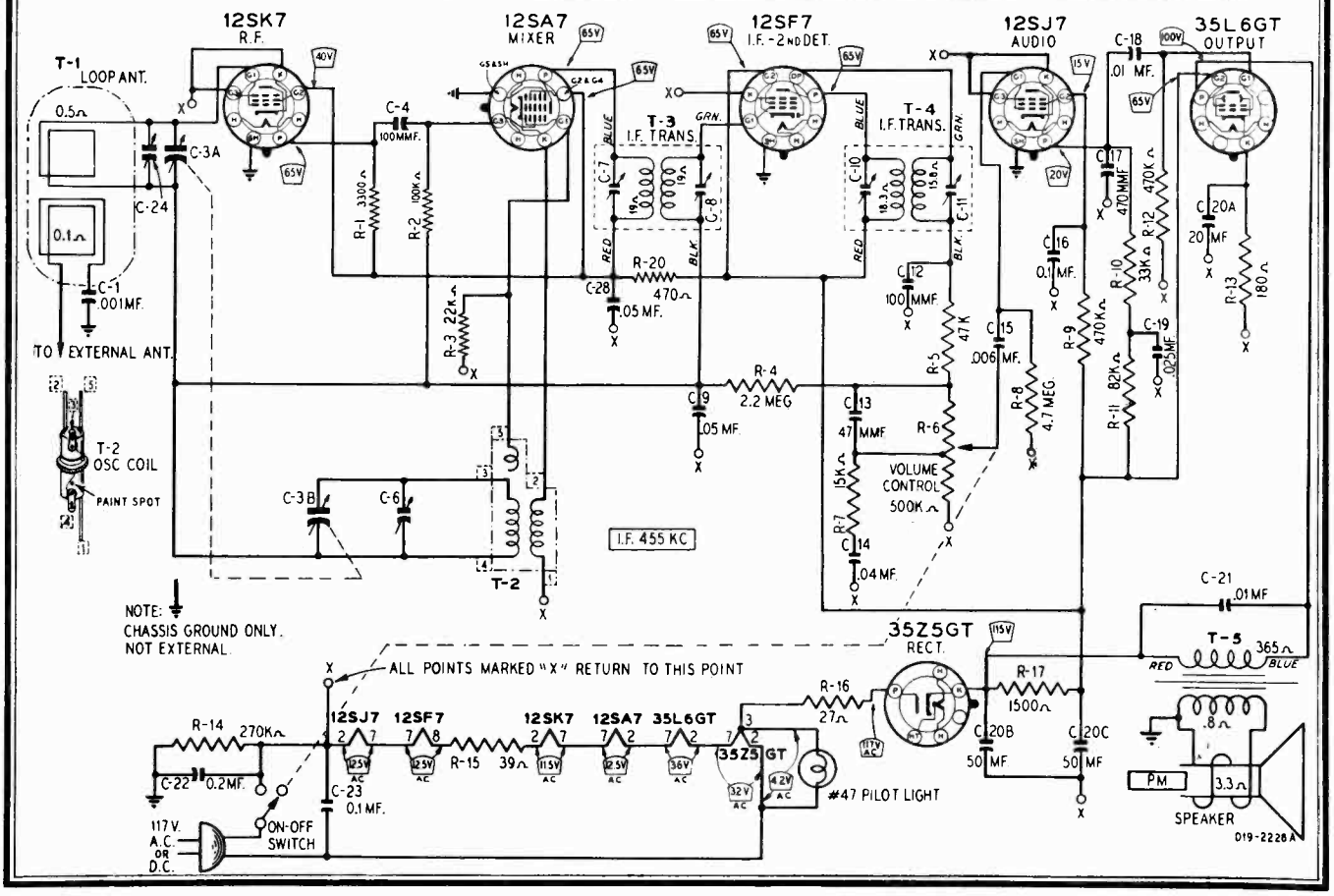
Output Indicating Meter; Non-Metallic Screwdriver.

Dummy Antennas—.1 mf., 50 mmf.



NOTE A:—Index line is on dial light diffuser strip. See DIAL CALIBRATION paragraph.

SIGNAL GENERATOR			Coupling Capacitor	DIAL SETTING	ADJUST TRIMMERS TO MAXIMUM OUTPUT IN ORDER SHOWN (See Trimmer Illustration)
Frequency Setting	Connection to Receiver	Ground Connection			
455 kc	Control Grid 12SF7—I-F (Prong No. 2)	Point "X" 12SK7—R-F (Prong No. 3)	.1 mf	Turn Rotor to full open	2nd I-F (C10) & (C11)
455 kc	Control Grid 12SA7 – 1st Det. (Prong No. 8)	Same as above	.1 mf	Turn Rotor to full open	1st I-F (C7) & (C8)
1620 kc	Control Grid 12SA7—1st Det. (Prong No. 8)	Same as above	.1 mf	Turn Rotor to fully open position	Oscillator (C6)
1400 kc	External Antenna Clip on Loop	Chassis	50 mmf	Turn Rotor to 1400 kc Index Line. See Note A	Antenna (C24)

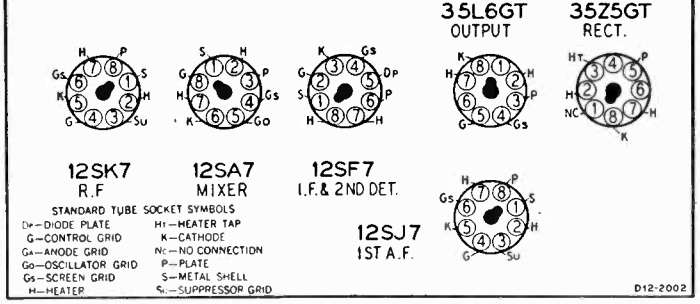


MODEL 94WG-1804D

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
CAPACITORS			
C-1	D67102	.001 mf 400 V Tubular	1
C-3A, C-3B	14A194	Gang condenser and pulley assembly	1
C-4, C-12	47X476	100 mmf Molded	2
C-6		Part of C-3	
C-7, C-8		Part of T-3, 1st I-F Transformer	
C-9	B66503	.05 mf 200 V Tubular	1
C-10, C-11		Part of T-4, 2nd I-F Transformer	
C-13	47X463	47 mmf Molded	1
C-14	B67403	.04 mf 200 V Tubular	1
C-15	B67602	.006 mf 200 V Tubular	1
C-16	B66104	.1 mf 200 V Tubular	1
C-17	47X467	470 mmf Molded	1
C-18, C-21	B66103	.01 mf 200 V Tubular	2
C-19	B67253	.025 mf 200 V Tubular	1
C-20A	45X344	20 mf 25 V Dry electrolytic	
C-20B		50 mf 150 V Condenser	1
C-20C		50 mf 150 V	
C-22	B67204	0.2 mf. 200 V Tubular	1
C-23	D67104	.1 mf 400 V Tubular	1
C-24		Part of C-3	
C-28	B67503	.05 mf 200 V Tubular	1
RESISTORS			
		Ohms Watts	
R-1	B84332	3300 0.5 Carbon	1
R-2	B85104	100,000 0.5 Carbon	1
R-3	B85223	22,000 0.5 Carbon	1
R-4	B85225	2.2 meg. 0.5 Carbon	1
R-5	B85473	47,000 0.5 Carbon	1
R-6	36X347	500,000 Volume control and switch	1
R-7	B84153	15,000 0.5 Carbon	1
R-8	B85475	4.7 meg. 0.5 Carbon	1
R-9	B84474	470,000 0.5 Carbon	1
R-10	B84333	33,000 0.5 Carbon	1
R-11	B84823	82,000 0.5 Carbon	1
R-12	B85474	470,000 0.5 Carbon	1
R-13	B83181	180 0.5 Carbon	1
R-14	B84274	270,000 0.5 Carbon	1
R-15	D84390	39 2.0 Carbon	1
R-16	B84270	27 0.5 Carbon	1
R-17	C84152	1500 1.0 Carbon	1
R-20	B85471	470 0.5 Carbon	1

Ref. No.	Part No.	Description	Qty. Used in Set
TRANSFORMERS AND COILS			
T-1	9A1944	"B" Range loop antenna	1
T-2	9A1911	Oscillator coil assembly	1
T-3	9A1775	1st I-F Transformer and can assembly	1
T-4	9A1776	2nd I-F Transformer and can assembly	1
T-5	51X116	Output transformer	1
DIAL AND DRIVE ASSEMBLY			
6X21		Rubber grommet } Gang cond.	3
20X329		Cond. cushion stud } mtg.	3
58X667		Dial	1
25X1461		Dial bracket	1
26A446		Pointer bracket assembly	1
15X217		Pointer	1
25X1398		Pilot light bracket	1
7A192		Pilot light socket assembly	1
7A103		Pilot light No. 47	1
10X44		Drive cord assembly	1
28X95		Drive cord tensian spring	1
26X464		Drive shaft	1
19X192		"C" washer (for drive shaft)	2
41X81		Dial light diffuser	1
AX884		Escutcheon (for Walnut Cabinet)	1
25X1460		Escutcheon mounting bracket	2
MISCELLANEOUS			
12A496		5" PM speaker with mtg. bracket	1
3A303		Tube socket—octal (8 prong) molded	5
3A421		Tube socket with shield	1
10A297		Knob (walnut) on-off switch, volume control and tuning	2
10A712		Knob (Mahogany)	2
28X292		Snap button (mtg. loop to cabinet)	2
		6 x ¼" slotted hex head P-K type "Z" screw mounting loop to chassis)	2
13X328		Line cord and plug assembly	1



TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages except those for the heater and dial lamp are between the socket terminal and "X" point.

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

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

A variation of ±10% is usually permissible.

MODEL 94WG-2742A

RECEIVER STAGE SENSITIVITIES

AM AND AUDIO STAGES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of 1.26 volts across this resistor will be equivalent to a .5 watt output.

The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

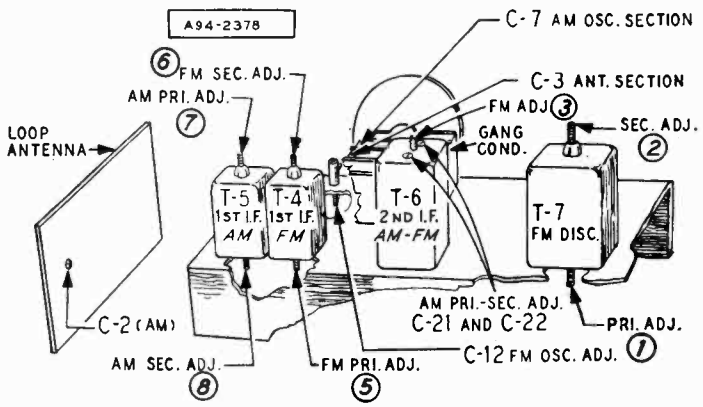
SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	
1000 KC	200 mmf or RMA Dummy Antenno	External Antenna Lead	Chassis	10 Microvolts
1000 KC	.01 mf	6BA7 Converter Pin 7	Chassis	40 Microvolts
455 KC	.01 mf	6BA7 Converter Pin 7	Chassis	35 Microvolts
455 KC	.01 mf	6BA6 1st I-F Pin 1	Chassis	2000 Microvolts
400 cycles	.01 mf	6AV6 1st A-F Pin 1	Chassis	.07 Volt
400 cycles	.01 mf	6V6GT Output Pin 5	Chassis	3.2 Volts

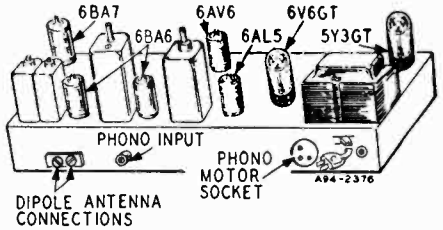
FM STAGES

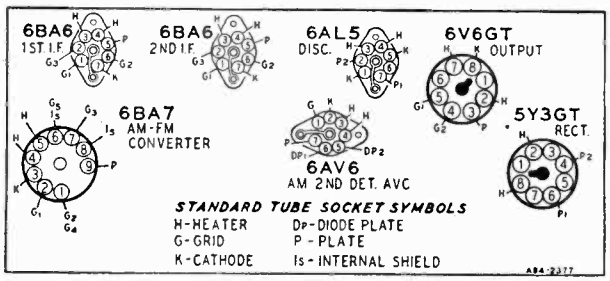
The table below lists the sensitivity for the FM stages of the receiver. The receiver must be tuned to 98 MC for all readings. Measurements are based on a .5 watt output the same as for the AM and Audio stage measurements.

The signal source must be an accurately calibrated signal generator capable of supplying a 98 MC signal modulated by a 400 cycle audio signal. For these measurements the generator must be adjusted for a 22.5 KC deviation. This will correspond to 30% AM modulation.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING TO RECEIVER	CONNECTION TO RECEIVER	GROUND CONNECTION	
98 MC	300 ohms	External Antenna Terminal	Chassis	100 Microvolts
10.7 MC	.01 mf	6BA6 1st I-F Pin 1	Chassis	600 Microvolts
10.7 MC	2500 mmf	6BA6 2nd I-F Pin 1	Chassis	23,000 Microvolts







TUBE SOCKET VOLTAGES

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

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

A variation of ±10% is usually permissible.

MODEL 94WG-2742A

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 Pointer 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 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—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		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	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 indiction.

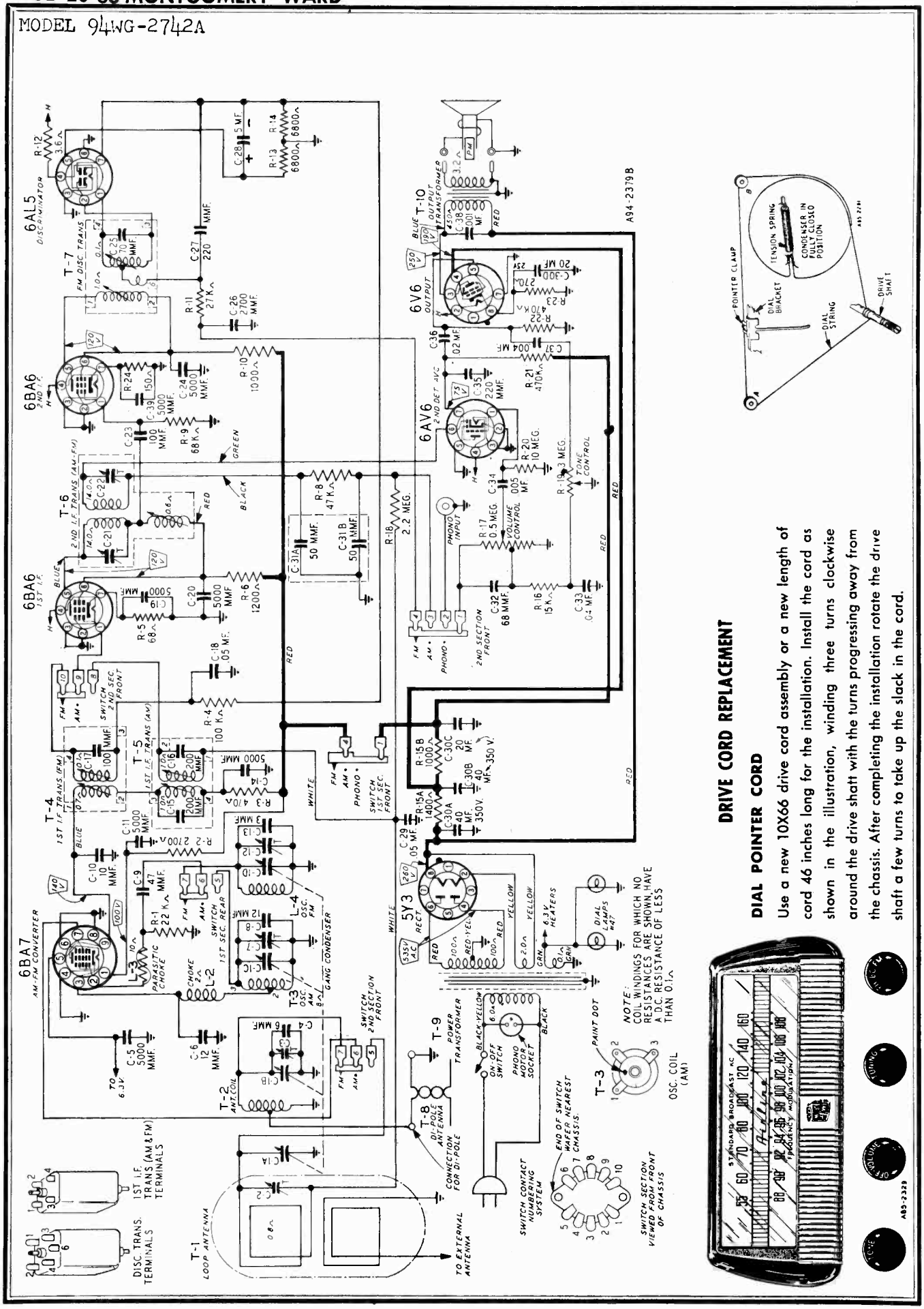
NOTE C—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

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 94WG-2742A



DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X66 drive cord assembly or a new length of cord 46 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.

MODEL 94WG-2742A

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—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

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

RESISTORS

Ref. No.	Part No.	Ohms	Watts		Qty. Used in Set
R-1	B84223	22 K	0.5	Carbon	1
R-2	B83272	2700	0.5	Carbon	1
R-3	B84471	470	0.5	Carbon	1
R-4	B85104	100 K	0.5	Carbon	1
R-5	B83680	68	0.5	Carbon	1
R-6	B84122	1200	0.5	Carbon	1
R-8	B85473	47 K	0.5	Carbon	1
R-9	B85683	68 K	0.5	Carbon	1
R-10	B84102	1000	0.5	Carbon	1
R-11	B84273	27 K	0.5	Carbon	1
R-12	43X233	3.6	0.5	Wire Wound	1
R-13 / R-14	B84682	6800	0.5	Carbon	2
R-15A / R-15B	43X224	1400 1000	6.0 4.0	Wire Wound	1
R-16	B84153	15 K	0.5	Carbon	1
R-17	36X372	.5 meg.		Volume Control	1
R-18	B85225	2.2 meg.	0.5	Carbon	1
R-19	40X285	3 meg.		Tone Control	1
R-20	B85106	10 meg.	0.5	Carbon	1
R-21 / R-22	B85474	470 K	0.5	Carbon	2
R-23	B84271	270	0.5	Carbon	1
R-24	B84151	150	0.5	Carbon	1

TRANSFORMERS AND COILS

L-1	9A1882	Filament Choke Assembly	1
L-2	35A1	Insulated Choke	1
L-3	9A1940	Parasitic Choke Assembly	1
L-4	9A2021	Oscillator Coil Assembly (FM)	1
T-1	9A1972	"B" Range Loop Antenna Assem.	1
T-2	9A1956	Antenna Coil Assembly	1
T-3	9A1997	Oscillator Coil Assembly (AM)	1
T-4	9A2027	1st I.F. Trans. (FM)	1
T-5	9A2038	1st I.F. Trans. (AM)	1
T-6	9A1999	2nd I.F. Trans. (AM-FM)	1
T-7	9A2036	Discriminator Coil Assembly	1
T-8	9A2004	Dipole Antenna	1
T-9	53X290	Power Transformer	1
T-10	51X134	Output Transformer	1

CAPACITORS

Ref. No.	Part No.			Qty. Used in Set
C-1A, C-1B, C-1C, C-1D	14A204	Gang Condenser Assembly		1
C-2	17A235	2-24 mmf	Trimmer	1
C-3, C-7		Part of Gang Condenser		
C-4	47X521	6 mmf	Ceramic	1
C-5, C-11, C-14, C-19, C-20, C-24, C-39	47X507	5000 mmf	Silvered Ceramic	7
C-6, C-8	47X522	12 mmf	Ceramic	2
C-9	47X517	47 mmf	Ceramic	1
C-10	47X512	10 mmf	Ceramic	1
C-12	17A255	1-8 mmf	Trimmer	1
C-13	47X547	3 mmf	Ceramic	1
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	B66503	.05 mf	200 V Tubular	2
C-21, C-22		Part of T-6 (2nd I.F. Trans.—AM-FM)		
C-23	47X497	100 mmf	Ceramic	1
C-25		Part of T-7 (Discriminator Trans.)		
C-26	47X492	2700 mmf	Molded Mica	1
C-27, C-35	47X468	220 mmf	Ceramic	2
C-28	45X361	5 mf	100 V Dry Electrolytic	1
C-30A C-30B C-30C C-30D	45X359	40 mf 40 mf 20 mf 20 mf	350 V 350 V 350 V 25 V Dry Electrolytic	1
C-31A, C-31B	47X112	50-50 mmf	Dual Mica	1
C-32	47X471	68 mmf	Molded Mica	1
C-33	B66403	.04 mf	200 V Tubular	1
C-34	D66502	.005 mf	400 V Tubular	1
C-36	D66203	.02 mf	400 V Tubular	1
C-37	B66402	.004 mf	200 V Tubular	1
C-38	H66102	.001 mf	800 V Tubular	1

MISCELLANEOUS

Ref. No.	Part No.	Description	Qty. Used in Set
	12A480	10" P.M. Speaker	1
	3A303	Tube Socket—Octal 8 prong) Molded	2
	3A426	Tube Socket—Miniature	4
	3A443	Tube Socket—Miniature for AM-FM Converter Tube	1
	3A304	Phono Motor Socket	1
	3A305	Phono Socket—Single Pin Tip	1
	2A384	Band Change Switch	1
	13X546	Line Cord and Plug Assembly	1
	10A695	Knob (Tuning)	1
	10A696	Knob (Volume Control & Switch)	1
	10A697	Knob (Tone)	1
	10A698	Knob (Phono—BC—FM)	1
	4X1020	Escutcheon	1

DIAL AND DRIVE ASSEMBLY

	58X715	Dial Glass	1
	24X446	Idler Pulley	2
	15X241	Pointer	1
	25X1569	Dial Bracket	1
	7A103	No. 47 Pilot Light Bulb	2
	7A202	Pilot Light Socket Assembly	1
	26X486	Drive Shaft	1
	41X26	Reflector, Dial Light	2
	28X113	Drive Cord Tension Spring	1
	10X66	Drive Cord Assembly	1
	19X192	"C" Washer (Mtg. drive shaft)	2
	6X21	Rubber Grommet (Mtg. gang cond.)	3
	20X260	Condenser Cushion Stud (Mtg. gang condenser)	3

TYPE V-28A159 RECORD CHANGER PARTS

V-2727	Motor Assembly, 60 Cycles 105-125 Volts AC	1
V-2749	Spindle Adapter (45 RPM)	1
Shure P-77	Crystal Cartridge	1
	Needle, Microgroove (Red)	1
	Needle, Regular	1

(When ordering needles, specify part number and letter stamped on cartridge.)

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—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
Record Changer	See Manual 5081A

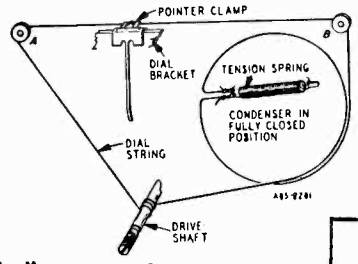
Tube and Dial Lamp Complement

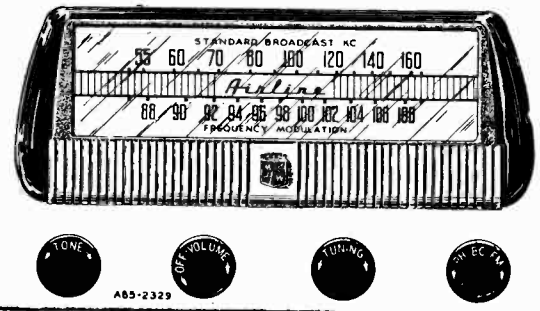
1 6BA7 FM-AM Converter
1 6BA6 1st I-F Amplifier
1 6BA6 2nd I-F Amplifier
1 6AL5 FM Discriminator
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
1 6V6GT Audio Output
1 5Y3GT Rectifier
2 No. 47 Dial Lamps

DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X66 drive cord assembly or a new length of cord 46 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.





Issue "D" chassis differ from the issue "C" chassis by a change in value of Condenser C-6 from 12 uuf to 15 uuf, the addition of Condenser C-40 and chokes L-5 and L-6.

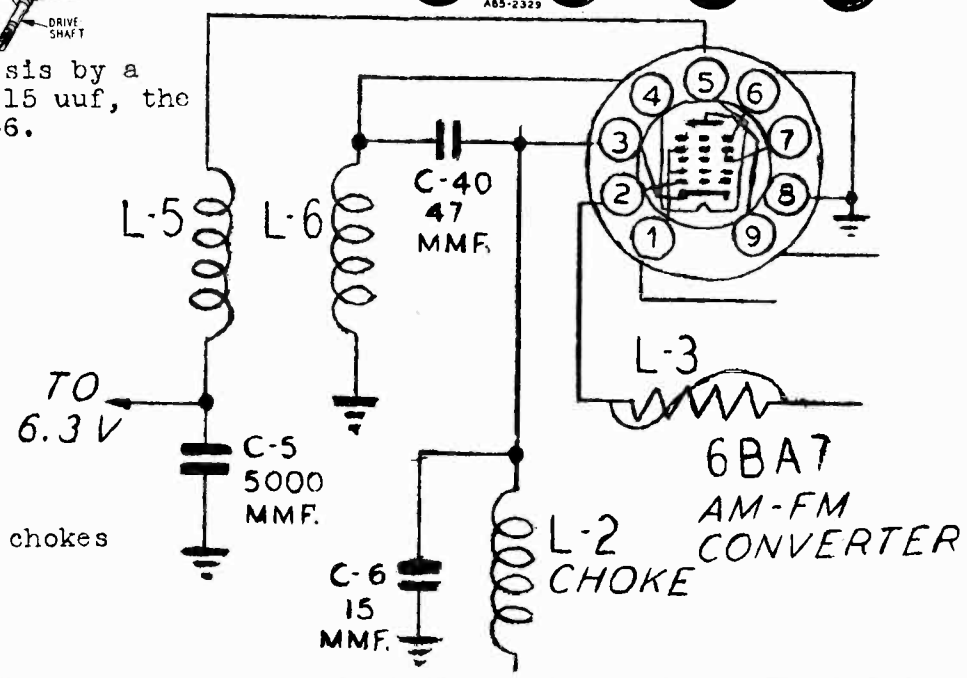
REMOVE FROM PARTS LIST AND SCHEMATIC

C-6 47X522 12MMF Ceramic Condenser

ADD TO PARTS LIST AND SCHEMATIC

C-6	47X552	15 MMF Ceramic Condenser
C-40	47X509	47 MMF Ceramic Condenser
L-5) L-6)	9A2044	Oscillator Filament Choke

The circuit connections of the condensers and chokes are shown in the partial schematic



MODELS 94WG-2742C, 94WG-2742D

RECEIVER STAGE SENSITIVITIES

AM AND AUDIO STAGES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of 1.26 volts across this resistor will be equivalent to a .5 watt output.

The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

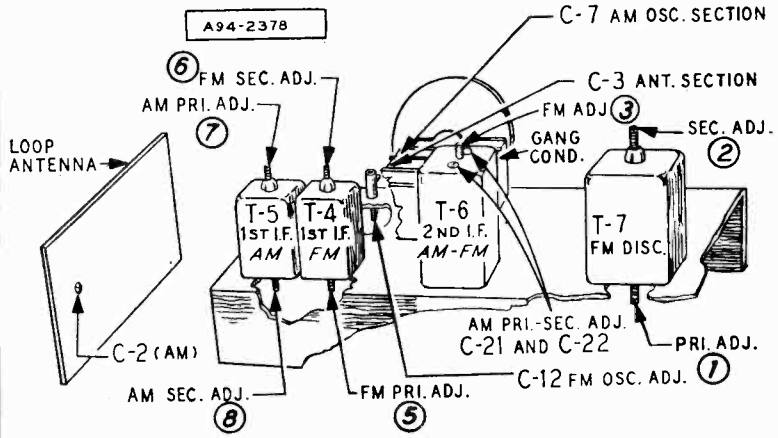
SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	
1000 KC	200 mmf or RMA Dummy Antenna	External Antenno Lead	Chassis	10 Microvolts
1000 KC	.01 mf	6BA7 Converter Pin 7	Chassis	40 Microvolts
455 KC	.01 mf	6BA7 Converter Pin 7	Chassis	35 Microvolts
455 KC	.01 mf	6BA6 1st I-F Pin 1	Chassis	2000 Microvolts
400 cycles	.01 mf	6AV6 1st A-F Pin 1	Chassis	.07 Volt
400 cycles	.01 mf	6V6GT Output Pin 5	Chassis	3.2 Volts

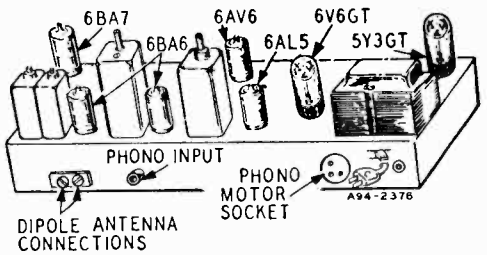
FM STAGES

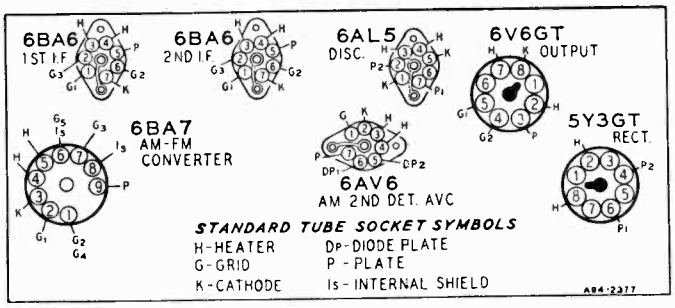
The table below lists the sensitivity for the FM stages of the receiver. The receiver must be tuned to 98 MC for all readings. Measurements are based on a .5 watt output the same as for the AM and Audio stage measurements.

The signal source must be an accurately calibrated signal generator capable of supplying a 98 MC signal modulated by a 400 cycle audio signal. For these measurements the generator must be adjusted for a 22.5 KC deviation. This will correspond to 30% AM modulation.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING TO RECEIVER	CONNECTION TO RECEIVER	GROUND CONNECTION	
98 MC	300 ohms	External Antenna Terminal	Chassis	100 Microvolts
10.7 MC	.01 mf	6BA6 1st I-F Pin 1	Chassis	600 Microvolts
10.7 MC	2500 mmf	6BA6 2nd I-F Pin 1	Chassis	23,000 Microvolts







TUBE SOCKET VOLTAGES

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

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

A variation of ±10% is usually permissible.

MODELS 94WG-2742C, 94WG-2742D

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 Pointer 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 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—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 valtmeter 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	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 valtmeter

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.

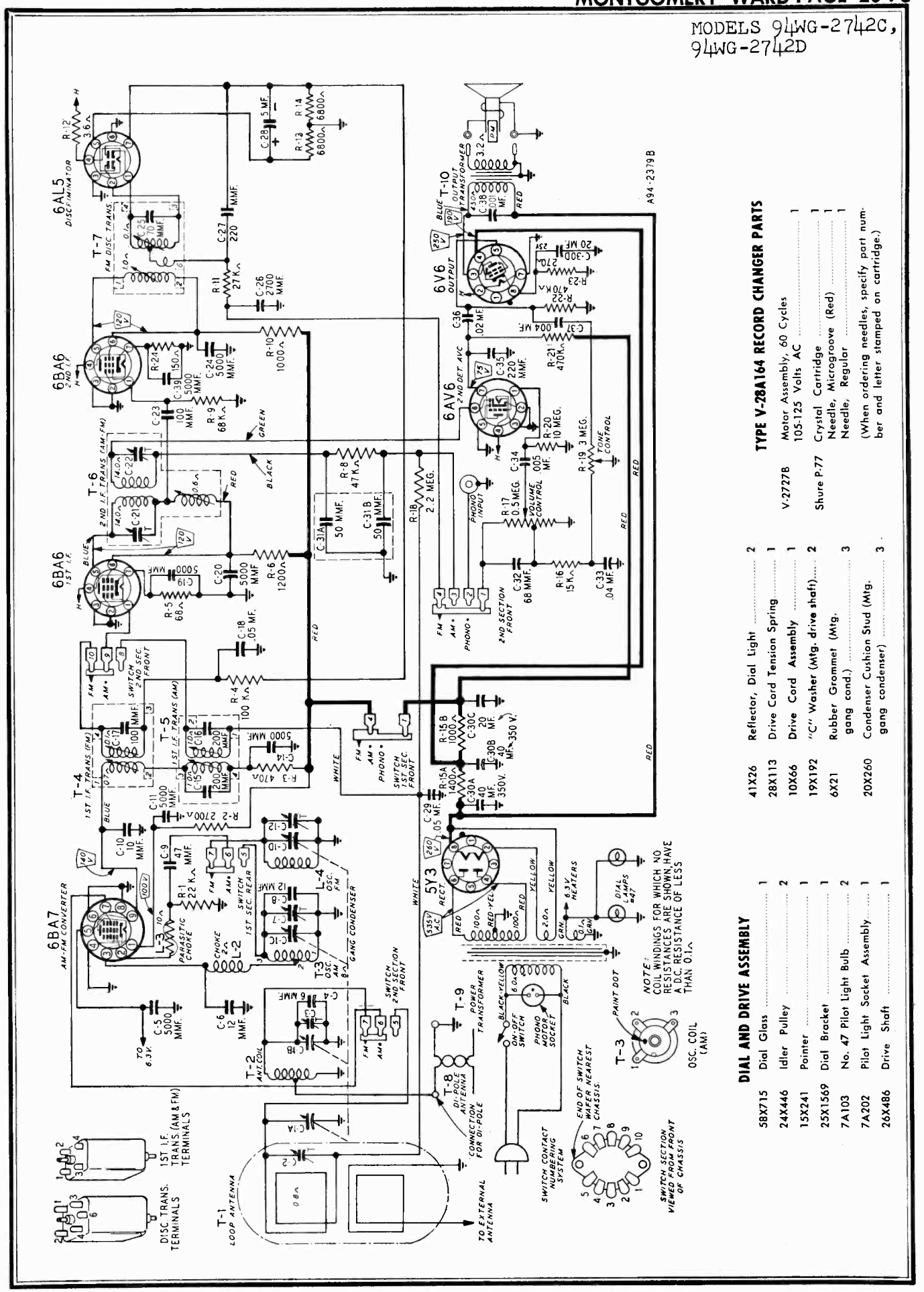
NOTE C—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

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.

MODELS 94WG-2742C, 94WG-2742D



DIAL AND DRIVE ASSEMBLY

58X715	Dial Glass	1
24X446	Idler Pulley	2
15X241	Pointer	1
25X1569	Dial Bracket	1
7A103	No. 47 Pilot Light Bulb	2
7A202	Pilot Light Socket Assembly	1
26X486	Drive Shaft	1
41X26	Reflector, Dial Light	2
28X113	Drive Cord Tension Spring	1
10X66	Drive Cord Assembly	1
19X192	"C" Washer (Mtg. drive shaft)	2
6X21	Rubber Grommet (Mtg. gang cond.)	3
20X260	Condenser Cushion Stud (Mtg. gang condenser)	3

TYPE V-28A164 RECORD CHANGER PARTS

V-2727B	Motor Assembly, 60 Cycles 105-125 Volts AC	1
Shure P-77	Crystal Cartridge	1
	Needle, Microgroove (Red)	1
	Needle, Regular	1

(When ordering needles, specify part number and letter stamped on cartridge.)

REPLACEMENT PARTS LIST

Use only genuine factory tested parts to insure service jobs you can depend on and to obtain original set performance

CAPACITORS

Ref. No.	Part No.	Description	Qty. Used in Set
C-1A, C-1B, C-1C, C-1D	14A204	Gang Condenser Assembly	1
C-2	17A235	2-24 mmf Trimmer	1
C-3, C-7		Part of Gang Condenser	
C-4	47X521	6 mmf Ceramic	1
C-5, C-11, C-14, C-19, C-20, C-24, C-39	47X507	5000 mmf Silvered Ceramic	7
C-6, C-8	47X522	12 mmf Ceramic	2
C-9	47X517	47 mmf Ceramic	1
C-10	47X512	10 mmf Ceramic	1
C-12	17A255	1-8 mmf Trimmer	1
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	B66503	.05 mf 200 V Tubular	2
C-21, C-22		Part of T-6 (2nd I.F. Trans.—AM-FM)	
C-23	47X497	100 mmf Ceramic	1
C-25		Part of T-7 (Discriminator Trans.)	
C-26	47X492	2700 mmf Molded Mica	1
C-27, C-35	47X468	220 mmf Ceramic	2
C-28	45X361	5 mf 100 V Dry Electrolytic	1
C-30A	45X359	40 mf 350 V Dry Electrolytic	1
C-30B		40 mf 350 V	
C-30C		20 mf 350 V	
C-30D		20 mf 25 V	

Ref. No.	Part No.	Description	Qty. Used in Set
C-31A, C-31B	47X112	50-50 mmf Dual Mica	1
C-32	47X471	68 mmf Molded Mica	1
C-33	B66403	.04 mf 200 V Tubular	1
C-34	D66502	.005 mf 400 V Tubular	1
C-36	D66203	.02 mf 400 V Tubular	1
C-37	B66402	.004 mf 200 V Tubular	1
C-38	H66102	.001 mf 800 V Tubular	1

RESISTORS

Ref. No.	Part No.	Ohms	Watts	Description	Qty. Used in Set
R-1	B84223	22 K	0.5	Carbon	1
R-2	B83272	2700	0.5	Carbon	1
R-3	B84471	470	0.5	Carbon	1
R-4	B85104	100 K	0.5	Carbon	1
R-5	B83680	68	0.5	Carbon	1
R-6	B84122	1200	0.5	Carbon	1
R-8	B85473	47 K	0.5	Carbon	1
R-9	B85683	68 K	0.5	Carbon	1
R-10	B84102	1000	0.5	Carbon	1
R-11	B84273	27 K	0.5	Carbon	1
R-12	43X233	3.6	0.5	Wire Wound	1
R-13, R-14	B84682	6800	0.5	Carbon	2
R-15A	43X224	1400	6.0	Wire Wound	1
R-15B		1000	4.0		
R-16	B84153	15 K	0.5	Carbon	1
R-17	36X372	.5 meg.		Volume Control	1
R-18	B85225	2.2 meg.	0.5	Carbon	1
R-19	40X285	3 meg.		Tone Control	1
R-20	B85106	10 meg.	0.5	Carbon	1
R-21, R-22	B85474	470 K	0.5	Carbon	2
R-23	B84271	270	0.5	Carbon	1
R-24	B84151	150	0.5	Carbon	1

TRANSFORMERS AND COILS

Ref. No.	Part No.	Description	Qty. Used in Set
L-1	9A1882	Filament Choke Assembly	1
L-2	35A1	Insulated Choke	1
L-3	9A1940	Parasitic Choke Assembly	1
L-4	9A2021	Oscillator Coil Assembly (FM)	1
T-1	9A1972	"B" Range Loop Antenna Assem.	1
T-2	9A1956	Antenna Coil Assembly	1
T-3	9A1997	Oscillator Coil Assembly (AM)	1
T-4	9A2037	1st I.F. Trans. (FM)	1
T-5	9A2038	1st I.F. Trans. (AM)	1
T-6	9A1999	2nd I.F. Trans. (AM-FM)	1
T-7	9A2036	Discriminator Coil Assembly	1
T-8	9A2004	Dipole Antenna	1
T-9	53X290	Power Transformer	1
T-10	51X134	Output Transformer	1

MISCELLANEOUS

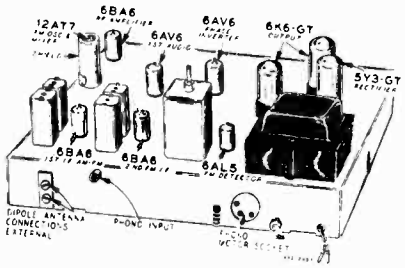
Part No.	Description	Qty. Used in Set
12A480	10" P.M. Speaker	1
3A303	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket—Miniature	4
3A443	Tube Socket—Miniature (for AM-FM Converter Tube)	1
3A304	Phono Motor Socket	1
3A305	Phono Socket—Single Pin Tip	1
2A384	Band Change Switch	1
13X546	Line Cord and Plug Assembly	1
10A695	Knob (Tuning)	1
10A696	Knob (Volume Control & Switch)	1
10A697	Knob (Tone)	1
10A698	Knob (Phono—BC—FM)	1
4X1020	Escutcheon	1

MODEL 94WG-2745A

GENERAL DESCRIPTION

This is a two band, nine tube (plus rectifier tube) AM and FM receiver with automatic record changer. The I-F stages use high gain miniature type tubes. Built-in Air Wave Aerials are provided for the FM and Broadcast bands. Features include, compensator circuits to prevent oscillator drift, automatic volume control, push-pull pentode power output stage, PM dynamic loud speaker and an electrostatic shield in the power transformer to reduce power line noise.

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



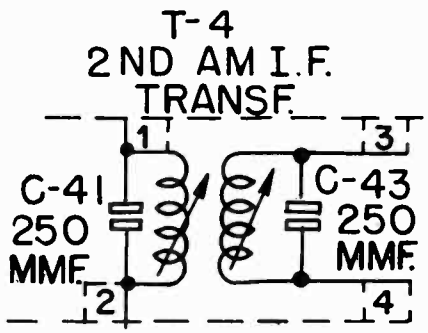
ELECTRICAL SPECIFICATIONS

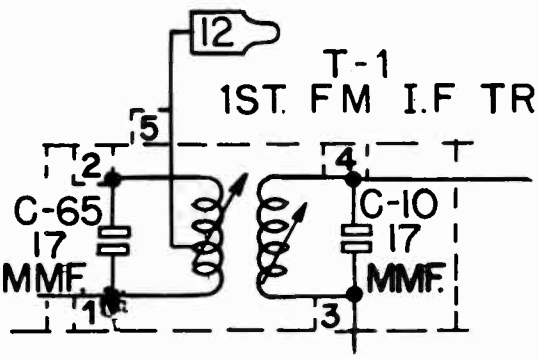
Power Supply	105-125 volts AC 60 cycles, 80 watts, 100 watts with record changer
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—43 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down 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	See Manual No. 5081A

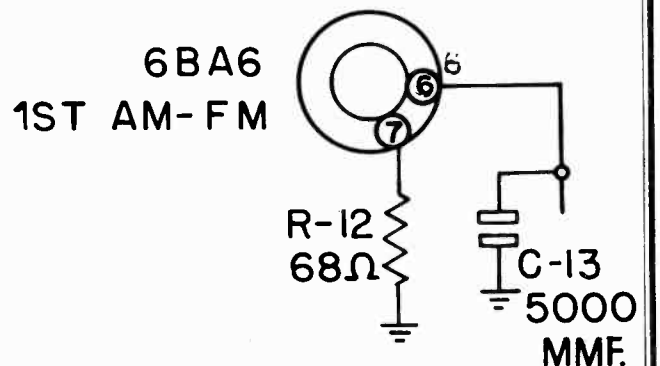
1. Condenser C-12 (5000 MMF) not used.

2. The 5000 MMF condenser C-13 is connected to ground instead of as shown in the circuit diagram.

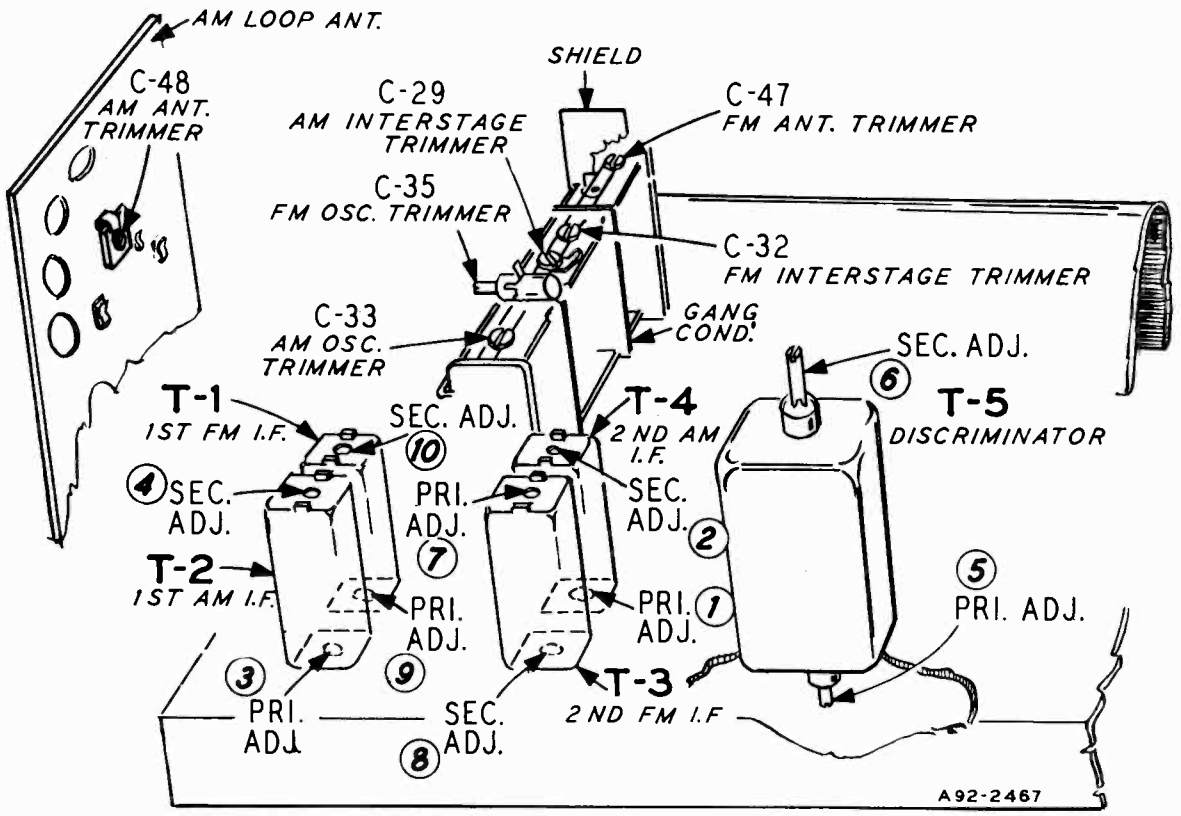
3. The circuit connections of transformers T-1 (1st FM I-F) and T-4 (2nd AM I-F) are shown erroneously in the circuit diagram. The corrected circuit connections are shown below.







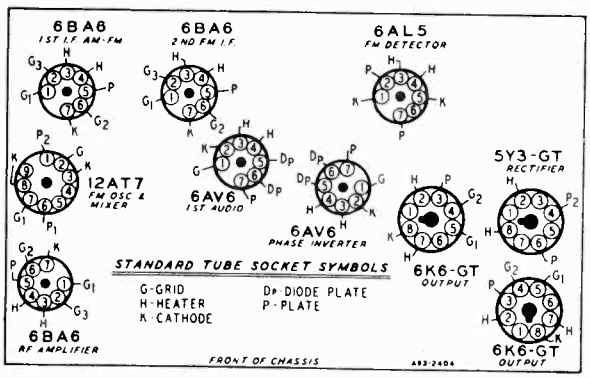
MODEL 94WG-2745A

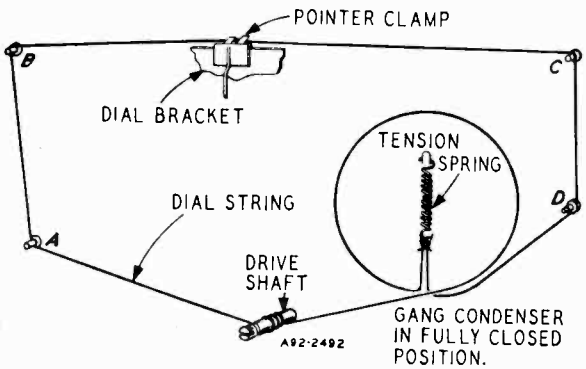


TUBE SOCKET VOLTAGES

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

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





DRIVE CORD REPLACEMENT

Use a new 10X54 drive cord assembly or a new length of cord 48 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.

MODEL 94WG-2745A

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							
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
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)	
Broadcast	1620 kc	External ant. lead	200 mmf	Broadcast	Rotor Fully Open	Broadcast Oscillator C-33	Maximum Output
	1400 kc	External ant. lead	200 mmf	Broadcast	Turn Rotor to Max. Output	Broadcast Interstage C-29	
	1400 kc	External ant. lead	200 mmf	Broadcast	Set pointer to 1400 kc See Note A	Loop Antenna C-48	

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						
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
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

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 secandary 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.

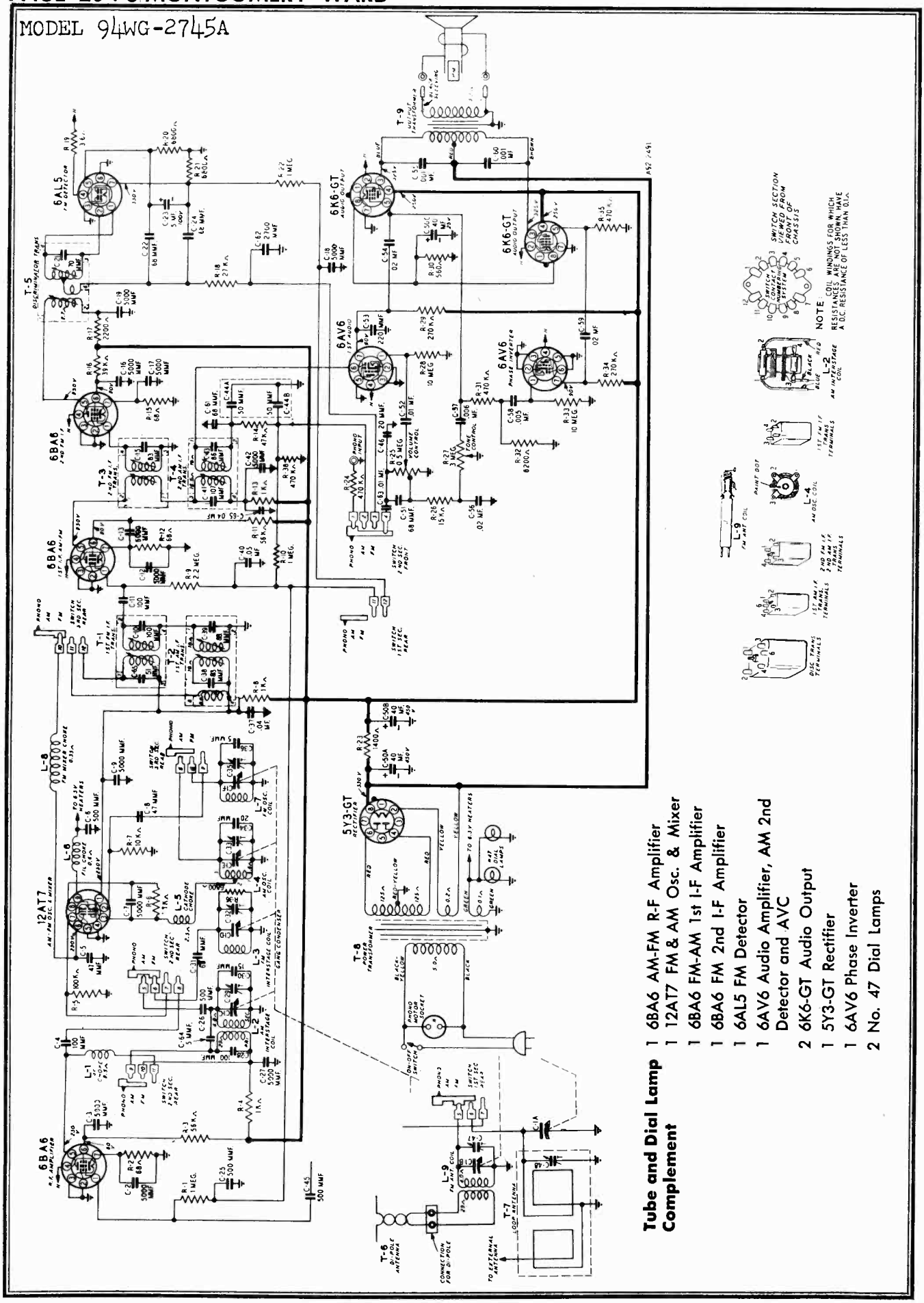
NOTE E—Disconnect 1000 ohm load resistor from secondary terminals and connect across the 2nd I.F. primary terminals. Input may have to be increased to .1 volt if receiver is *badly* mis-aligned.

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.

MODEL 94WG-2745A



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

REPLACEMENT PARTS LIST

CAPACITORS

Ref. No.	Part No.	Description	Qty. Used in Set
C-1	14A207	Gang Condenser	1
C-2, C-3, C-7, C-9, C-12, C-13, C-16, C-17, C-18, C-19, C-27, C-42	47X507	5000 mmf Ceramic	12
C-4	47X497	100 mmf Ceramic	1
C-5	47X499	47 mmf Ceramic	1
C-6, C-25, C-26, C-45	47X496	500 mmf Ceramic	4
C-8	47X498	47 mmf Ceramic	1
C-10, C-65	Part of T-1 1st I-F (FM)		
C-11, C-28	47X550	100 mmf Ceramic	2
C-15	Part of T-3 2nd I-F (FM)		
C-21	Part of T-5 Discriminator		
C-22, C-24, C-31, C-51	47X501	68 mmf Ceramic	4
C-23	45X361	5 mf 100 V Dry Electrolytic	1
C-29, C-32, C-33, C-47	Part of Gang Condenser		
C-30	47X552	15 mmf Ceramic	1
C-34, C-46	47X516	20 mmf Ceramic	2
C-35	26A489	1-8 mmf Trimmer	1
C-36, C-64	47X549	5 mmf Ceramic	2
C-37, C-65	F66403	.04 mf 600 V Tubular	2
C-38, C-39	Part of T-2 1st I-F (AM)		
C-40	B66503	.05 mf 200 V Tubular	1
C-41, C-43	Part of T-4 2nd I-F (AM)		
C-44A, C-44B	47X112	50-50 mmf Dual Mica	1
C-48	Part of T-7 (Loop Antenna)		
C-50A C-50B C-50C	45X374	40 mf 450 V 40 mf 450 V 40 mf 25 V Dry Electrolytic	1
C-52	F66103	.01 mf 600 V Tubular	1
C-53	47X468	220 mmf Ceramic	1
C-54, C-59	F66203	.02 mf 600 V Tubular	2
C-55, C-60	F66102	.001 mf 600 V Tubular	2
C-56	B66203	.02 mf 200 V Tubular	1
C-57	F66602	.006 mf 600 V Tubular	1
C-58	B66502	.005 mf 200 V Tubular	1
C-61	47X471	68 mmf Ceramic	1
C-62	47X492	2700 mmf Molded Mica	1
C-63	46X328	.01 mf 120 V Tubular	1

RESISTORS

		Ohms	Watts		
R-1, R-10, R-22	B85105	1 meg.	0.5	Carbon	3
R-2, R-12, R-15	B83680	68	0.5	Carbon	3
R-3, R-11	B84563	56K	0.5	Carbon	2
R-4, R-6, R-8, R-13	B84102	1000	0.5	Carbon	4
R-5	B85104	100K	0.5	Carbon	1
R-7	B84103	10K	0.5	Carbon	1
R-9	B85225	2.2 meg.	0.5	Carbon	1
R-14	B85473	47K	0.5	Carbon	1
R-16	C84393	39K	1.0	Carbon	1
R-17	B85222	2200	0.5	Carbon	1
R-18	B84273	27K	0.5	Carbon	1
R-19	43X233	3.6	0.5	Wire wound	1
R-20, R-21	B83682	6800	0.5	Carbon	2
R-23	43X242	1400	5.0	Wire wound	1
R-24, R-31, R-35, R-38	B85474	470K	0.5	Carbon	4
R-25	36X383	0.5 meg.		Volume Control	1
R-26	B85153	15K	0.5	Carbon	1
R-27	40X285	3 meg.		Tone Control	1
R-28, R-33	B85106	10 meg.	0.5	Carbon	2
R-29, R-34	B85274	270K	0.5	Carbon	2
R-30	D83561	560	2.0	Carbon	1
R-32	B84822	8200	0.5	Carbon	1
R-36	B84682	6800	0.5	Carbon	1

TRANSFORMERS AND COILS

L-1, L-5	35A5	Insulated Choke	2
L-2	9A2025	Interstage Coil (AM)	1
L-3	9A2024	Interstage Coil (FM)	1
L-4	9A2022	Oscillator Coil (AM)	1
L-6	9A1881	Filament Choke	1
L-7	9A2023	Oscillator Coil (FM)	1
L-8	35A7	Mixer Choke (FM)	1
L-9	9A2027	Antenna Coil (FM)	1
T-1	9A2043	1st I-F Trans. (FM)	1
T-2	9A2029	1st I-F Trans. (AM)	1
T-3	9A2030	2nd I-F Trans. (FM)	1
T-4	9A2042	2nd I-F Trans. (AM)	1
T-5	9A1970	Discriminator Coil	1
T-6	9A2004	Dipole Antenna	1
T-7	9A2041	"B" Range Loop Antenna	1
T-8	53X286	Power Transformer	1
T-9	51X142	Output Transformer	1

TYPE V-28A163 RECORD CHANGER PARTS

V-2727B	Motor Assembly, 60 Cycles 105-125 Volts AC	1
Shure P-77	Crystal Cartridge	1
	Needle, Microgroove (Red)	1
	Needle, Regular	1

(When ordering needles, specify part number and letter stamped on cartridge)

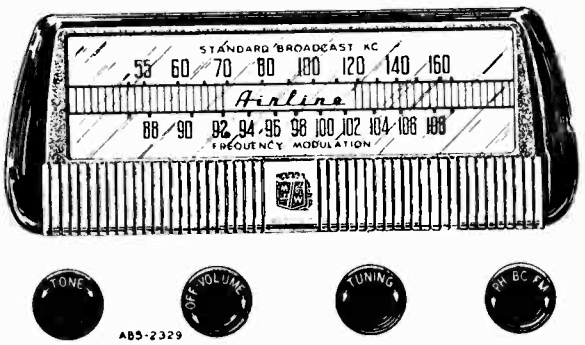
DIAL AND DRIVE ASSEMBLY

58X723	Dial Glass	1
25X1634	Dial Bracket	1
41X87	Dial Light Reflector	2
15X246	Pointer	1
10X54	Drive Cord Assembly	1
28X113	Drive Cord Spring	1
7A103	No. 47 Pilot Light	2
7A199	Pilot Light Socket Assembly	1
19X192	"C" Washer (mtg. Drive Shaft)	2
26X512	Drive Shaft	1
6X67	Rubber Grommet	4

MISCELLANEOUS

12A490	Speaker 12" P.M.	1
3A304	Phono Motor Socket	1
3A305	Phono Socket—Single Pin Tip	1
3A435	Tube Socket—Octal (8 prong) Molded	3
3A436	Tube Socket—Noval (miniature)	1
32X388	Tube Shield Noval	1
32X390	Tube Shield (miniature)	1
3A439	Tube Socket (miniature)	6
2A391	Band Change Switch	1
13X546	Line Cord & Plug Assembly	1
10A713	Knobs	4
4X1049	Escutcheon	1

MODEL 94WG-2746A,
94WG-2746B



GENERAL DESCRIPTION

This is a two band, six tube (plus rectifier tube) AM and FM receiver with automatic record changer. The I-F stages use high gain miniature type tubes. Built-in Air Wave 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 and record changer are housed in a console combination cabinet with controls provided for tuning, volume, tone and band or phono selection.

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles, 60 watts. 70 watts with record changer
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	8" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles
Record Changer	See Manual No. 5077A
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

Issue "B" chassis differ from the issue "A" chassis by a change in value of Condenser C-6 from 12 MMF to 15 MMF, the addition of Condenser C-40 and Oscillator Filament Chokes L-5 and L-6.

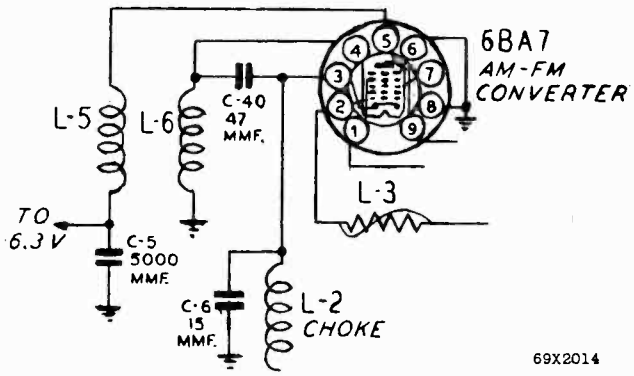
REMOVE FROM PARTS LIST AND SCHEMATIC

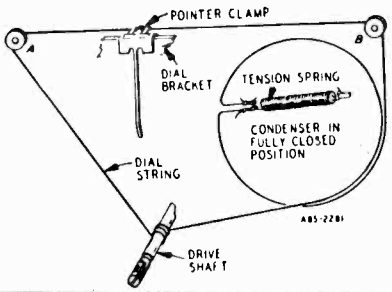
C-6	47X522	12 MMF	Ceramic Condenser

ADD TO PARTS LIST AND SCHEMATIC

C-6	47X552	15 MMF	Ceramic Condenser
C-40	47X509	47 MMF	Ceramic Condenser
L-5) L-6)	9A2044	Oscillator Filament Choke	

The circuit connections of the condenser and chokes are shown in the partial schematic below.





DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X66 drive cord assembly or a new length of cord 46 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.

MODEL 94WG-2746A,
94WG-2746B

RECEIVER STAGE SENSITIVITIES

AM AND AUDIO STAGES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of 1.26 volts across this resistor will be equivalent to a .5 watt output.

The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

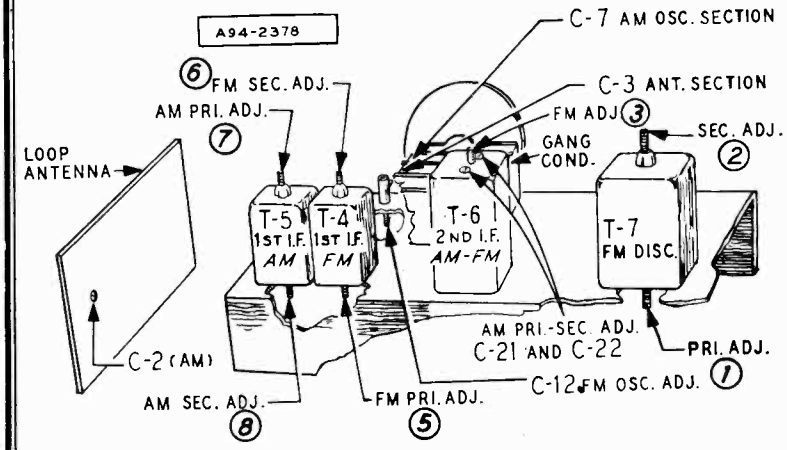
SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	
1000 KC	200 mmf or RMA Dummy Antenno	External Antenna Clip	Chassis	10 Microvolts
1000 KC	.01 mf	6BA7 Converter Pin 7	Chassis	40 Microvolts
455 KC	.01 mf	6BA7 Converter Pin 7	Chassis	35 Microvolts
455 KC	.01 mf	6BA6 1st I-F Pin 1	Chassis	2000 Microvolts
400 cycles	.01 mf	6AV6 1st A-F Pin 1	Chassis	.07 Volt
400 cycles	.01 mf	6V6GT Output Pin 5	Chassis	3.2 Volts

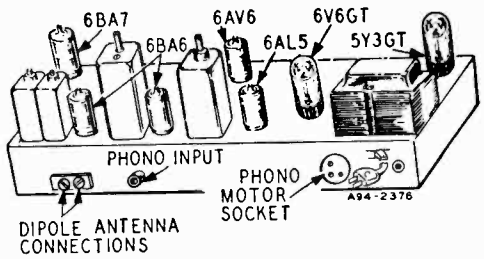
FM STAGES

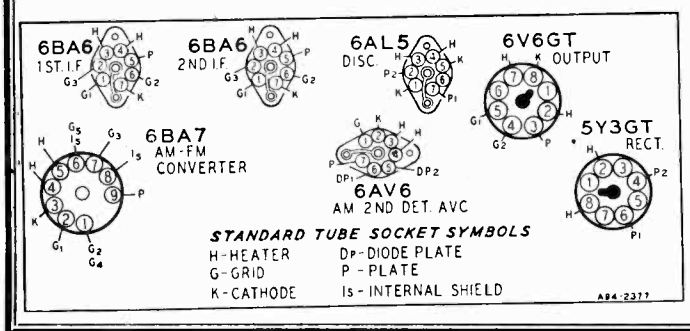
The table below lists the sensitivity for the FM stages of the receiver. The receiver must be tuned to 98 MC for all readings. Measurements are based on a .5 watt output the same as for the AM and Audio stage measurements.

The signal source must be an accurately calibrated signal generator capable of supplying a 98 MC signal modulated by a 400 cycle audio signal. For these measurements the generator must be adjusted for a 22.5 KC deviation. This will correspond to 30% AM modulation.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING TO RECEIVER	CONNECTION TO RECEIVER	GROUND CONNECTION	
98 MC	300 ohms	External Antenna Terminal	Chassis	100 Microvolts
10.7 MC	.01 mf	6BA6 1st I-F Pin 1	Chassis	600 Microvolts
10.7 MC	2500 mmf	6BA6 2nd I-F Pin 1	Chassis	23,000 Microvolts







TUBE SOCKET VOLTAGES

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

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

A variation of ±10% is usually permissible.

MODEL 94WG-2746A,
94WG-2746B

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 Clip	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer 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 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—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		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	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

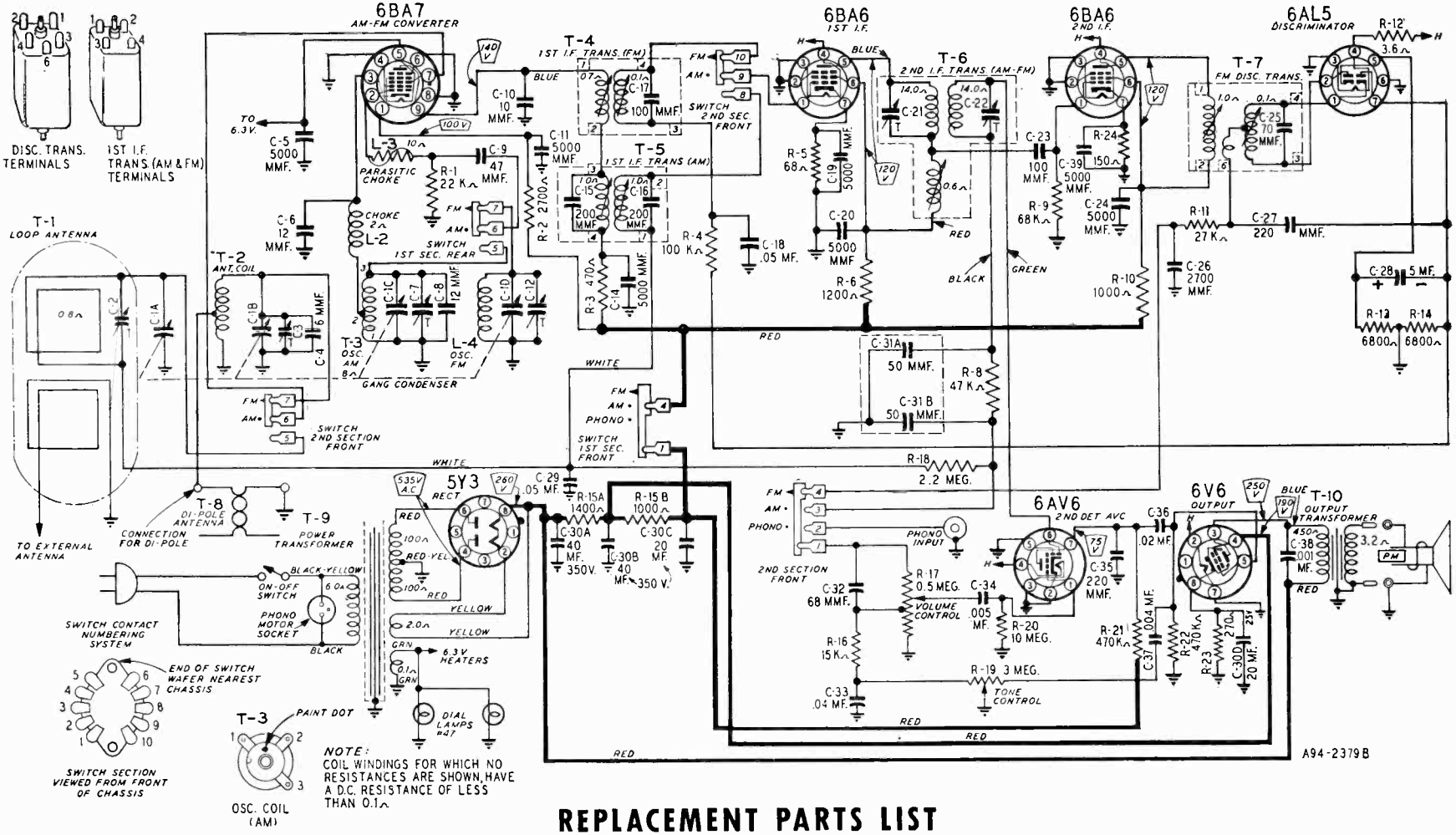
NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-11) and its junction with the terminal strip. Adjust for zero voltage indication.

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 ottempting to check the antenna and oscillator adjustments.



REPLACEMENT PARTS LIST

DIAL AND DRIVE ASSEMBLY

58X715	Dial Glass	1
24X446	Idler Pulley	2
15X241	Pointer	1
25X1569	Dial Bracket	1
7A103	No. 47 Pilot Light Bulb	2
7A202	Pilot Light Socket Assembly	1
26X486	Drive Shaft	1
41X26	Reflector, Dial Light	2
28X113	Drive Cord Tension Spring	1
10X66	Drive Cord Assembly	1
19X192	"C" Washer (Mtg. drive shaft)	2
6X21	Rubber Grommet (Mtg. gang cond.)	3
20X260	Condenser Cushion Stud (Mtg. gang condenser)	3

TYPE C-28A162 RECORD CHANGER PARTS

C-7R3	Motor Assembly, 60 Cycles 105-125 Volts AC	1
C-8R4-2	Crystal Cartridge	1
	Need'e	1

(When ordering needles, specify part number and letter stamped on cartridge)

MODEL 94WG-2746A, 94WG-2746B

REPLACEMENT PARTS LIST

Use only genuine factory tested parts to insure service jobs you can depend on and to obtain original set performance

CAPACITORS

Ref. No.	Part No.	Description	Qty. Used in Set
C-1A, C-1B, C-1C, C-1D	14A204	Gang Condenser Assemb'y	1
C-2	17A256	2-24 mmf Trimmer	1
C-3, C-7		Part of Gang Condenser	
C-4	47X521	6 mmf Ceramic	1
C-5, C-11, C-14, C-19, C-20, C-24, C-39	47X507	5000 mmf Silvered Ceramic	7
C-6, C-8	47X522	12 mmf Ceramic	2
C-9	47X517	47 mmf Ceramic	1
C-10	47X512	10 mmf Ceramic	1
C-12	17A255	1-8 mmf Trimmer	1
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	B66503	.05 mf 200 V Tubular	2
C-21, C-22		Part of T-6 (2nd I.F. Trans.—AM-FM)	
C-23	47X497	100 mmf Ceramic	1
C-25		Part of T-7 (Discriminator Trans.)	
C-26	47X492	2700 mmf Molded Mica	1
C-27, C-35	47X468	220 mmf Ceramic	2
C-28	45X361	5 mf 100 V Dry Electrolytic	1
C-30A	45X359	40 mf 350 V	
C-30B		40 mf 350 V	
C-30C		20 mf 350 V	
C-30D		20 mf 25 V Dry Electrolytic	1
C-31A, C-31B	47X112	50-50 mmf Dual Mica	1
C-32	47X471	68 mmf Molded Mica	1
C-33	B66403	.04 mf 200 V Tubular	1
C-34	D66502	.005 mf 400 V Tubular	1
C-36	D66203	.02 mf 400 V Tubular	1
C-37	B66402	.004 mf 200 V Tubular	1
C-38	H66102	.001 mf 800 V Tubular	1

RESISTORS

Ref. No.	Part No.	Ohms	Watts		Qty. Used in Set
R-1	B84223	22 K	0.5	Carbon	1
R-2	B83272	2700	0.5	Carbon	1
R-3	B84471	470	0.5	Carbon	1
R-4	B85104	100 K	0.5	Carbon	1
R-5	B83680	68	0.5	Carbon	1
R-6	B84122	1200	0.5	Carbon	1
R-8	B85473	47 K	0.5	Carbon	1
R-9	B85683	68 K	0.5	Carbon	1
R-10	B84102	1000	0.5	Carbon	1
R-11	B84273	27 K	0.5	Carbon	1
R-12	43X233	3.6	0.5	Wire Wound	1
R-13, R-14	B84682	6800	0.5	Carbon	2
R-15A	43X224	1400	6.0	Wire Wound	1
R-15B		1000	4.0		
R-16	B84153	15 K	0.5	Carbon	1
R-17	36X372	.5 meg.		Volume Control	1
R-18	B85225	2.2 meg.	0.5	Carbon	1
R-19	40X285	3 meg.		Tone Control	1
R-20	B85106	10 meg.	0.5	Carbon	1
R-21, R-22	B85474	470 K	0.5	Carbon	2
R-23	B84271	270	0.5	Carbon	1
R-24	B84151	150	0.5	Carbon	1

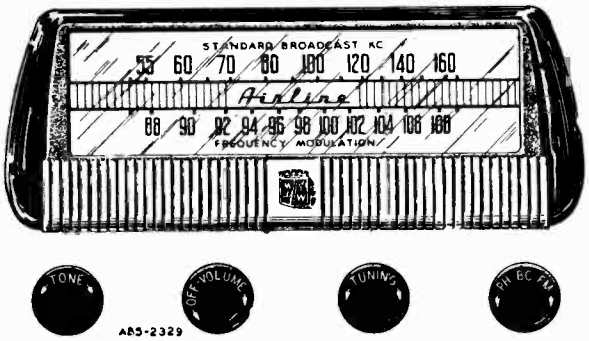
TRANSFORMERS AND COILS

Ref. No.	Part No.	Description	Qty. Used in Set
L-2	35A5	Insulated Choke	1
L-3	9A1940	Parasitic Choke Assembly	1
L-4	9A2021	Oscillator Coil Assembly (FM)	1
T-1	9A2047	"B" Range Loop Antenna Assem.	1
T-2	9A1956	Antenna Coil Assembly	1
T-3	9A1997	Oscillator Coil Assembly (AM)	1
T-4	9A2037	1st I.F. Trans. (FM)	1
T-5	9A2038	1st I.F. Trans. (AM)	1
T-6	9A1999	2nd I.F. Trans. (AM-FM)	1
T-7	9A2036	Discriminator Coil Assembly	1
T-8	9A2004	Dipole Antenna	1
T-9	53X290	Power Transformer	1
T-10	51X134	Output Transformer	1

MISCELLANEOUS

Part No.	Description	Qty. Used in Set
12A477	8" P.M. Speaker	1
3A303	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket—Miniature	4
3A443	Tube Socket—Miniature (for AM-FM Converter Tube)	1
3A304	Phono Motor Socket	1
3A305	Phono Socket—Single Pin Tip	1
2A384	Band Change Switch	1
13X546	Line Cord and Plug Assembly	1
10A695	Knob (Tuning)	1
10A696	Knob (Volume Control & Switch)	1
10A697	Knob (Tone)	1
10A698	Knob (Phono—BC—FM)	1
4X1020	Escutcheon	1

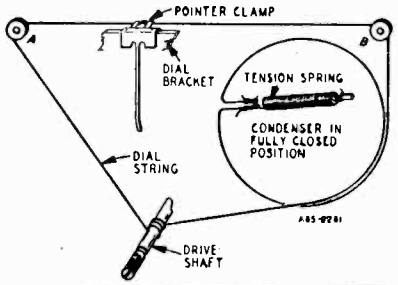
MODEL 94WG-2747A



DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X66 drive cord assembly or a new length of cord 46 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shatt 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, 60 watts. 80 watts with record changer
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	8" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles

CAPACITORS

Ref. No.	Part No.	Description	Qty. Used in Set
C-1A, C-1B, C-1C, C-1D	14A204	Gang Condenser Assembly	1
C-2	17A256	2-24 mmf Trimmer	1
C-3, C-7		Part of Gang Condenser	
C-4	47X521	6 mmf Ceramic	1
C-5, C-11, C-14, C-19, C-20, C-24, C-39	47X507	5000 mmf Silvered Ceramic	7
C-6	47X552	15 mmf Ceramic	1
C-8	47X522	12 mmf Ceramic	1
C-9	47X517	47 mmf Ceramic	1
C-10	47X512	10 mmf Ceramic	1
C-12	17A255	1-8 mmf Trimmer	1
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	B66503	.05 mf 200 V Tubular	2
C-21, C-22		Part of T-6 (2nd I.F. Trans.—AM-FM)	
C-23	47X497	100 mmf Ceramic	1
C-25		Part of T-7 (Discriminator Trans.)	
C-26	47X492	2700 mmf Molded Mica	1
C-27, C-35	47X468	220 mmf Ceramic	2
C-28	45X361	5 mf 100 V Dry Electrolytic	1
C-30A, C-30B, C-30C, C-30D	45X359	40 mf 350 V, 40 mf 350 V, 20 mf 350 V, 20 mf 25 V Dry Electrolytic	1
C-31A, C-31B	47X112	50-50 mmf Dual Mica	1
C-32	47X471	68 mmf Molded Mica	1
C-33	B66403	.04 mf 200 V Tubular	1
C-34	D66502	.005 mf 400 V Tubular	1
C-36	D66203	.02 mf 400 V Tubular	1
C-37	B66402	.004 mf 200 V Tubular	1
C-38	H66102	.001 mf 800 V Tubular	1
C-40	47X509	47 mmf Ceramic	1

MODEL 94WG-2747A

REPLACEMENT PARTS LIST (continued)

RESISTORS

Ref. No.	Part No.	Ohms	Watts	Description	Qty. Used in Set
R-1	B84223	22 K	0.5	Carbon	1
R-2	B83272	2700	0.5	Carbon	1
R-3	B84471	470	0.5	Carbon	1
R-4	B85104	100 K	0.5	Carbon	1
R-5	B83680	68	0.5	Carbon	1
R-6	B84122	1200	0.5	Carbon	1
R-8	B85473	47 K	0.5	Carbon	1
R-9	B85683	68 K	0.5	Carbon	1
R-10	B84102	1000	0.5	Carbon	1
R-11	B84273	27 K	0.5	Carbon	1
R-12	43X233	3.6	0.5	Wire Wound	1
R-13, R-14	B84682	6800	0.5	Carbon	2
R-15A	43X224	1400	6.0	Wire Wound	1
R-15B		1000	4.0		
R-16	B84153	15 K	0.5	Carbon	1
R-17	36X372	.5 meg.		Volume Control	1
R-18	B85225	2.2 meg.	0.5	Carbon	1
R-19	40X285	3 meg.		Tone Control	1
R-20	B85106	10 meg.	0.5	Carbon	1
R-21, R-22	B85474	470 K	0.5	Carbon	2
R-23	B84271	270	0.5	Carbon	1
R-24	B84151	150	0.5	Carbon	1

TRANSFORMERS AND COILS

Ref. No.	Part No.	Description	Qty. Used in Set
L-2	35A5	Insulated Choke	1
L-3	9A1940	Parasitic Choke Assembly	1
L-4	9A2021	Oscillator Coil Assembly (FM)	1
L-5, L-6	9A2044	Oscillator Filament Choke	2
T-1	9A2047	"B" Range Loop Antenna Assem.	1
T-2	9A1956	Antenna Coil Assembly	1
T-3	9A1997	Oscillator Coil Assembly (AM)	1
T-4	9A2037	1st I.F. Trans. (FM)	1
T-5	9A2038	1st I.F. Trans. (AM)	1
T-6	9A1999	2nd I.F. Trans. (AM-FM)	1
T-7	9A2036	Discriminator Coil Assembly	1
T-8	9A2004	Dipole Antenna	1
T-9	53X290	Power Transformer	1
T-10	51X134	Output Transformer	1

MISCELLANEOUS

Ref. No.	Part No.	Description	Qty. Used in Set
	12A477	8" P.M. Speaker	1
	3A303	Tube Socket—Octal (8 prong) Molded	2
	3A426	Tube Socket—Miniature	4
	3A443	Tube Socket—Miniature (for AM-FM Converter Tube)	1
	3A304	Phono Motor Socket	1
	3A305	Phono Socket—Single Pin Tip	1
	2A384	Band Change Switch	1
	13X546	Line Cord and Plug Assembly	1
	10A695	Knob (Tuning)	1
	10A696	Knob (Volume Control & Switch)	1
	10A697	Knob (Tone)	1
	10A698	Knob (Phono—BC—FM)	1
	4X1020	Escutcheon	1

DIAL AND DRIVE ASSEMBLY

Ref. No.	Part No.	Description	Qty. Used in Set
	58X715	Dial Glass	1
	24X446	Idler Pulley	2
	15X241	Pointer	1
	25X1569	Dial Bracket	1
	7A103	No. 47 Pilot Light Bulb	2
	7A202	Pilot Light Socket Assembly	1
	26X486	Drive Shaft	1
	41X26	Reflector, Dial Light	2
	28X113	Drive Cord Tension Spring	1
	10X66	Drive Cord Assembly	1
	19X192	"C" Washer (Mtg. drive shaft)	2
	6X21	Rubber Grommet (Mtg. gang cond.)	3
	20X260	Condenser Cushion Stud (Mtg. gang condenser)	3

TYPE V-28A163 RECORD CHANGER PARTS

Ref. No.	Part No.	Description	Qty. Used in Set
	V-2727B	Motor Assembly, 60 Cycles 105-125 Volts AC	1
	Shure P-77	Crystal Cartridge	1
		Needle, Microgroove (Red)	1
		Needle, Regular	1
		(When ordering needles, specify part number and letter stamped on cartridge.)	

MODEL 94WG-2747A

RECEIVER STAGE SENSITIVITIES

AM AND AUDIO STAGES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of 1.26 volts across this resistor will be equivalent to a .5 watt output.

The volume control must be set to maximum.

The signal source must be an accurately colibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

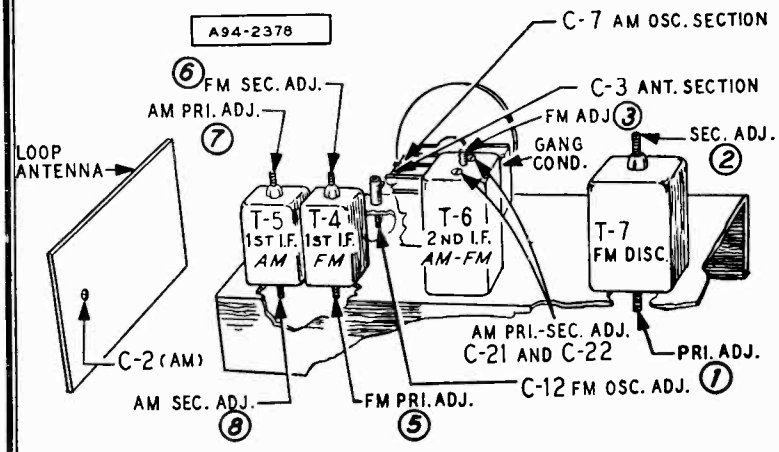
SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	
1000 KC	200 mmf or RMA Dummy Antenna	External Antenna Clip	Chassis	10 Microvolts
1000 KC	.01 mf	6BA7 Converter Pin 7	Chassis	40 Microvolts
455 KC	.01 mf	6BA7 Converter Pin 7	Chassis	35 Microvolts
455 KC	.01 mf	6BA6 1st I-F Pin 1	Chassis	2000 Microvolts
400 cycles	.01 mf	6AV6 1st A-F Pin 1	Chassis	.07 Volt
400 cycles	.01 mf	6V6GT Output Pin 5	Chassis	3.2 Volts

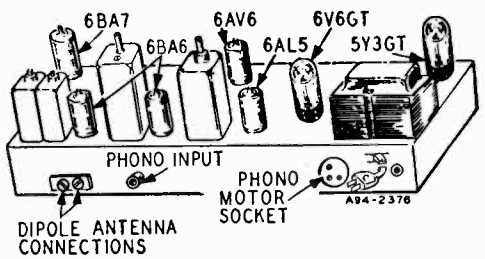
FM STAGES

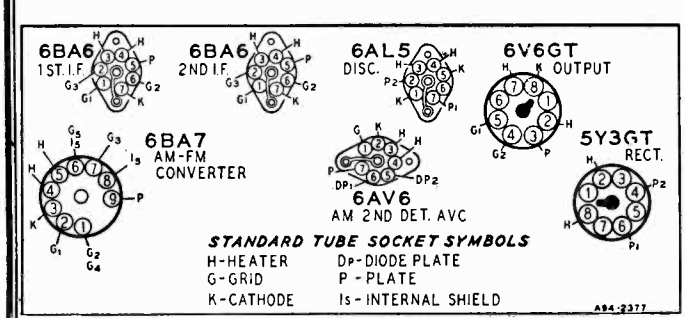
The table below lists the sensitivity for the FM stages of the receiver. The receiver must be tuned to 98 MC for all readings. Measurements are based on a .5 watt output the some as for the AM and Audio stage measurements.

The signal source must be an accurately calibrated signal generator capable of supplying a 98 MC signal modulated by a 400 cycle audio signal. For these measurements the generator must be adjusted for a 22.5 KC deviation. This will correspond to 30% AM modulation.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING TO RECEIVER	CONNECTION TO RECEIVER	GROUND CONNECTION	
98 MC	300 ohms	External Antenna Terminal	Chassis	100 Microvolts
10.7 MC	.01 mf	6BA6 1st I-F Pin 1	Chassis	600 Microvolts
10.7 MC	2500 mmf	6BA6 2nd I-F Pin 1	Chassis	23,000 Microvolts







TUBE SOCKET VOLTAGES

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

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

A variation of ±10% is usually permissible.

MODEL 94WG-2747A

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	Rotar Fully Open	Isl 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 Clip	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer 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 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.
Nan-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			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	2500 mmf	FM	Rotar Fully Open	Disc. Pri. (1) Nate A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (2) Nate 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 oudio takeoff point at the 27 K ohm resistor (R-11) and its junction with the terminal strip. Adjust for zero voltage indication.

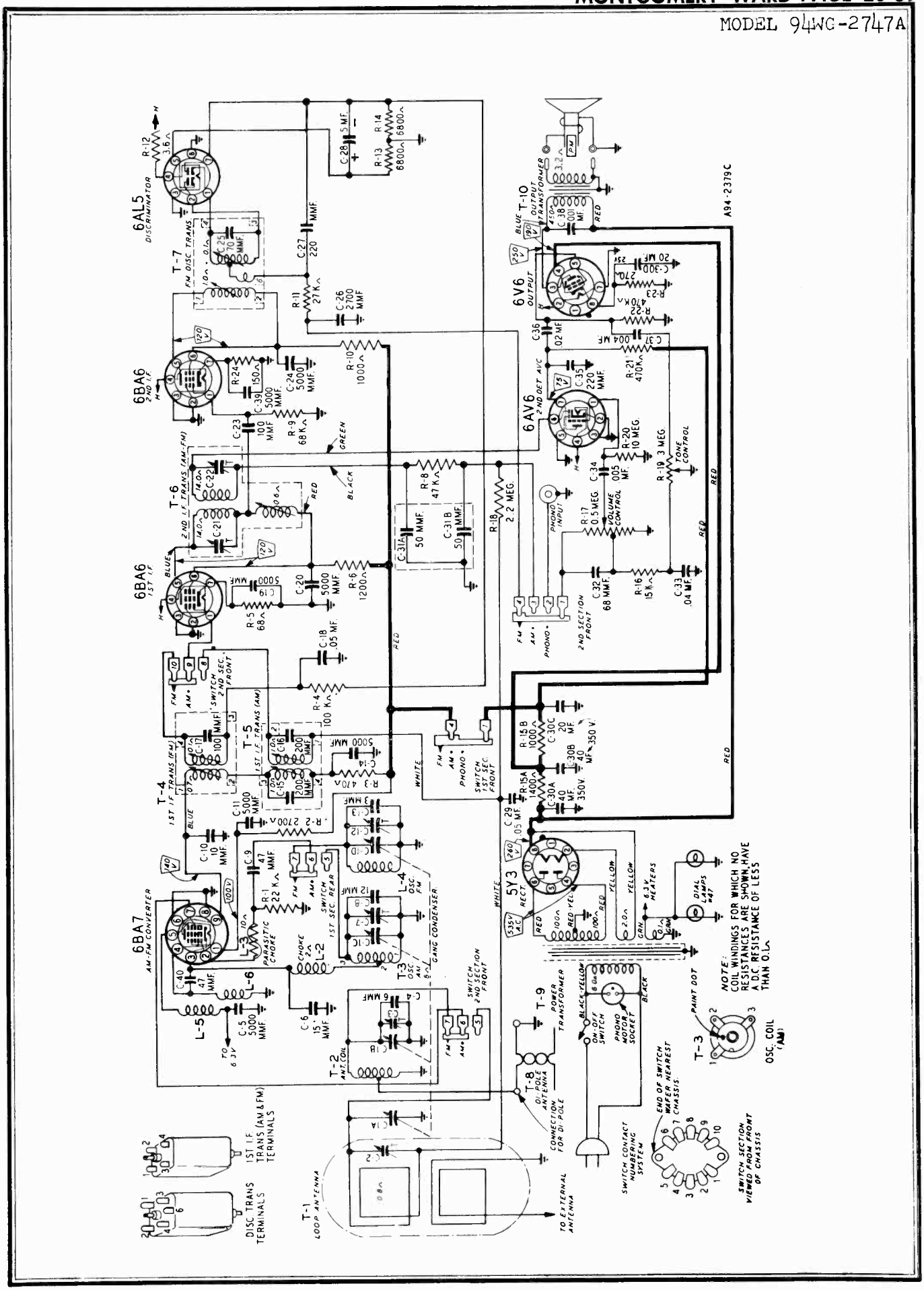
NOTE C—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

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

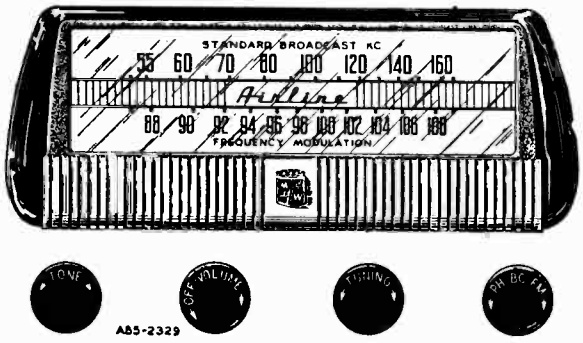
NOTE E—2nd I-F trimmers (AM) must be aligned before attempting to adjust 2nd I-F (FM) tuning slug.

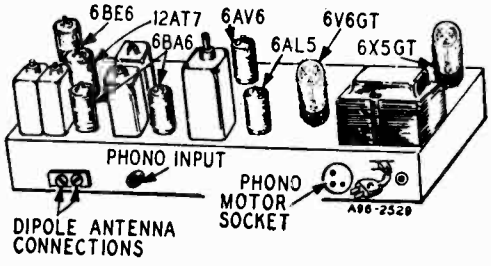
NOTE F—Remove the 3300 ohm load resistor before attempting to check the antenna and oscillator adjustments.

MODEL 94WG-2747A



MODELS 94WG-2748A,
94WG-2748B





GENERAL DESCRIPTION

This is a two band, seven tube (plus rectifier tube) AM and FM receiver with automatic record changer. The I-F stages use high gain miniature type tubes. Built-in Air Wave Aerials are provided for the FM and Broadcast bands. Features include, a grounded grid R-F amplifier stage on the FM band, 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 and record changer are housed in a console combination cabinet with controls provided for tuning, volume, tone and band or phono selection.

ELECTRICAL SPECIFICATIONS

Power Supply..... 105-125 volts AC 60 cycles, 40 watts. 60 watts with record changer

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) 20 microvolts average

FM Sensitivity..... (For .5 watt output)
25 microvolts average

Power Output..... 1.9 watts maximum
.8 watts 10% distortion

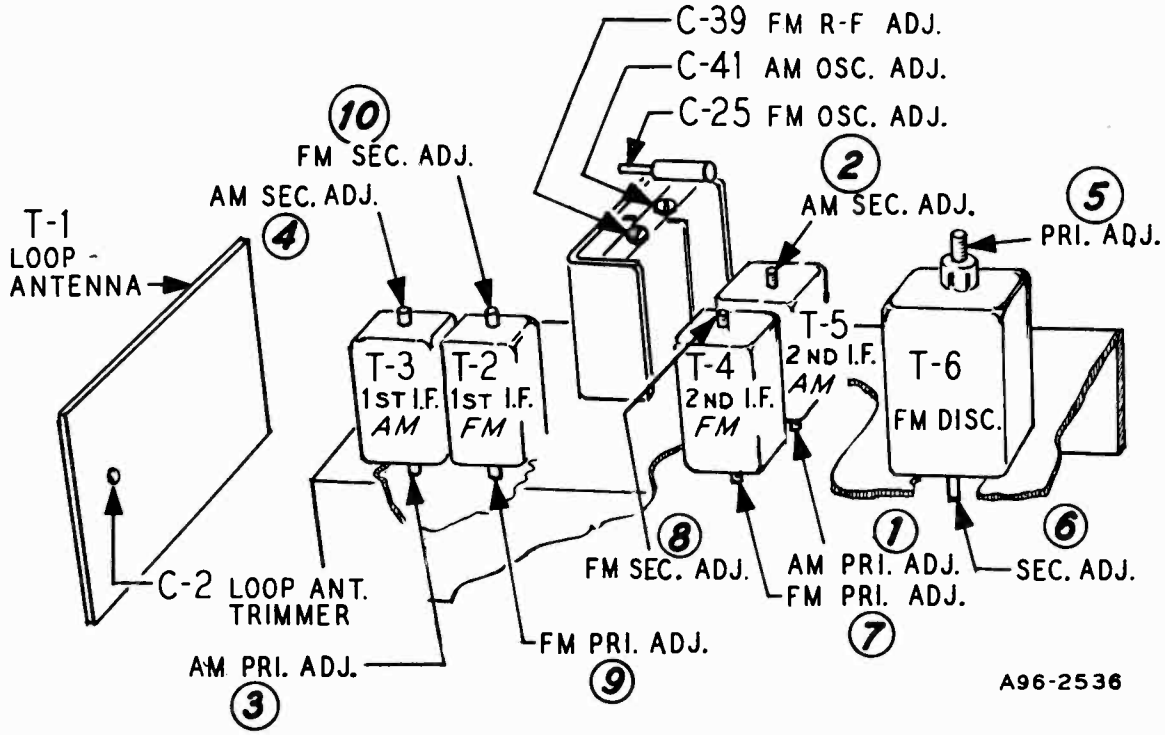
Loud Speaker..... 10" PM Dynamic

Voice Coil Impedance..... 3.2 ohms 400 cycles

Record Changer ..... See Manual No. 5087A

Tube and Dial Lamp Complement
1 6BE6 AM Converter & FM Osc.
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 12AT7 R-F Amplifier & Mixer
2 No. 47 Dial Lamps

MODEL 94WG-2748A



DRIVE CORD REPLACEMENT

DIAL POINTER CORD

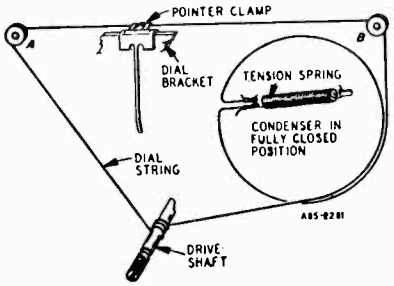
Use a new 10X56 drive cord assembly or a new length of cord 46 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shatt with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.

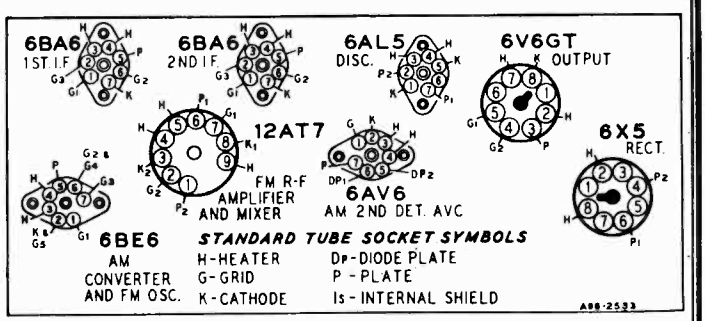
TUBE SOCKET VOLTAGES

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.





MODEL 94WG-2748A

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. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Contral Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I-F Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-41	Maximum Output
1400 KC	External Antenna Clip	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer 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 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—2500 mmf, 300 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							
	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. (5) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
I-F	10.7 MC Note C	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Pri. (7) Sec. (8) Note D	Maximum Deflection
Discriminator	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note D	Maximum Deflection
I-F	10.7 MC	Junction C-32A & B (Dual 100 mmf cond.) And chassis	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (9) & Sec. (10) 2nd I-F Pri. (7) & Sec. (8) Disc. Pri. (5) In Order Shown Note D	Maximum Deflection
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	Maximum Deflection
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN							
Oscillator	108.5	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-25	Maximum Deflection
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-39	Maximum Deflection
RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN							

FM ALIGNMENT NOTES

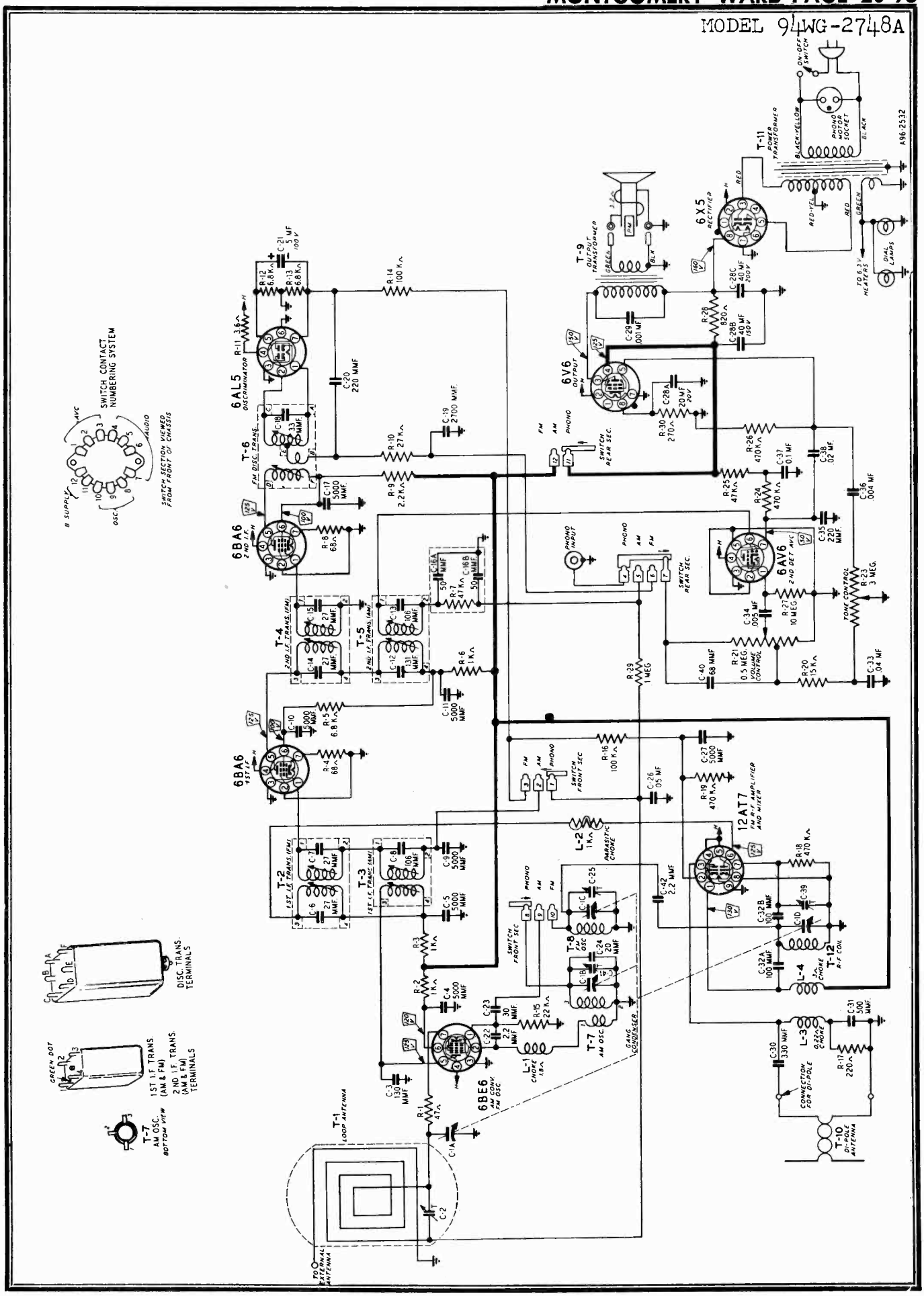
NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter

NOTE B—Disconnect zera center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-10) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—AM I-F coils must be aligned before attempting to align the FM I-F coils.

NOTE D—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.

MODEL 94WG-2748A



MODEL 94WG-2748A

REPLACEMENT PARTS LIST

CAPACITORS

Ref. No.	Part No.	Description	Qty. Used in Set
C-1	14A209	Gang Condenser Assembly	1
C-2	17A256	2-24 mmf Trimmer	1
C-3	47X559	130 mmf Ceramic	1
C-4, C-5, C-9, C-10, C-11, C-17, C-27	47X507	5000 mmf Ceramic	7
C-6, C-7		Part of T-2 (1st I-F Trans. FM)	
C-8		Part of T-3 (1st I-F Trans. AM)	
C-12, C-13		Part of T-5 (2nd I-F Trans. AM)	
C-14, C-15		Part of T-4 (2nd I-F Trans. FM)	
C-16A, C-16B	47X112	50-50 mmf Dual Mica	1
C-18		Part of T-6 (Discriminator Trans.)	
C-19	47X492	2700 mmf Molded Mica	1
C-20, C-35	47X468	220 mmf Ceramic	2
C-21	45X361	5 mf 100 V Dry Electrolytic	1
C-22, C-42	47X557	2.2 mmf Ceramic	2
C-23	47X558	30 mmf Ceramic	1
C-24	47X516	20 mmf Ceramic	1
C-25	17A255	1-8 mmf Trimmer	1
C-26	B66503	.05 mf 200 V Tubular	1
C-28A, C-28B, C-28C	45X360	20 mf 20 V, 40 mf 150 V, 40 mf 200 V Dry Electrolytic	1
C-29	H66102	.001 mf 800 V Tubular	1
C-30	47X470	330 mmf Molded Mica	1
C-31	47X508	500 mmf Ceramic	1
C-32A, C-32B	76X4	100 mmf Dual Ceramic	1
C-33	B66403	.04 mf 200 V Tubular	1
C-34	D66502	.005 mf 400 V Tubular	1
C-36	B66402	.004 mf 200 V Tubular	1
C-37	D66104	.1 mf 400 V Tubular	1
C-38	D66203	.02 mf 400 V Tubular	1
C-39, C-41		Part of C-1 (Gang Condenser)	
C-40	47X471	68 mmf Ceramic	1

RESISTORS

Ref. No.	Part No.	Ohms	Watts		Qty. Used in Set
R-1	B85470	47	0.5	Carbon	1
R-2, R-3, R-6	B85102	1000	0.5	Carbon	3
R-4, R-8	B84680	68	0.5	Carbon	2
R-5, R-12, R-13	B84682	6800	0.5	Carbon	3
R-7, R-25	B85473	47 K	0.5	Carbon	2
R-9	B85222	2200	0.5	Carbon	1
R-10	B85273	27 K	0.5	Carbon	1
R-11	43X233	3.6	0.5	Wirewound	1
R-14, R-16	B85104	100 K	0.5	Carbon	2
R-15	B85223	22 K	0.5	Carbon	1
R-17	B84221	220	0.5	Carbon	1
R-18, R-19, R-24, R-26	B85474	470 K	0.5	Carbon	1
R-20	B85153	15 K	0.5	Carbon	1
R-21	36X372	.5 meg.		Volume Control & Switch	1
R-23	40X285	3 meg.		Tone Control	1
R-27	B85106	10 meg.	0.5	Carbon	1
R-28	D84821	820	2.0	Carbon	1
R-29	B85105	1 meg.	0.5	Carbon	1
R-30	B84271	270	0.5	Carbon	1

TRANSFORMERS AND COILS

L-1	35A5	Insulated Choke	1
L-2	9A2068	Parasitic Choke Assembly	1
L-3	35A9	Insulated Choke	1
L-4	35A8	Insulated Choke	1
T-1	9A2070	"B" Range Loop Antenna	1
T-2	9A2060	1st I-F Trans. (FM)	1
T-3	9A2062	1st I-F Trans. (AM)	1
T-4	9A2061	2nd I-F Trans. (FM)	1
T-5	9A2063	2nd I-F Trans. (AM)	1
T-6	9A2064	Discriminator Transformer	1
T-7	9A2065	Oscillator Coil (AM)	1
T-8	9A2067	Oscillator Coil (FM)	1
T-9	51X134	Output Transformer	1
T-10	9A2004	Dipole Antenna	1
T-11	53X291	Power Transformer	1
T-12	9A2066	Antenna Coil (FM)	1

MODELS 94WG-2748A, 94WG-2748B

REPLACEMENT PARTS LIST (continued)

MODEL 94WG-2748A

Ref. No.	Part No.	Description	Qty. Used in Set
		MISCELLANEOUS	
	12A480	10" P.M. Speaker	1
	3A303	Tube Socket—Octal (8 prong) Molded	2
	3A426	Tube Socket—Miniature	4
	3A427	Tube Socket (12AT7)	1
	3A443	Tube Socket (6BE6)	1
	3A304	Phono Motor Socket	1
	3A305	Phono Socket—Single Pin Tip	1
	2A395	Band Change Switch	1
	13X546	Line Cord and Plug Assembly	1
	10A695	Knob (Tuning)	1
	10A696	Knob (Volume Control & Switch)	1
	10A697	Knob (Tone)	1
	10A698	Knob (Phono—BC—FM)	1
	4X1020	Escutcheon	1

Ref. No.	Part No.	Description	Qty. Used in Set
		DIAL AND DRIVE ASSEMBLY	
	58X727	Dial Glass	1
	24X446	Idler Pulley	2
	15X241	Pointer	1
	25X1569	Dial Bracket	1
	7A103	No. 47 Pilot Light Bulb	2
	7A202	Pilot Light Socket Assembly	1
	26X486	Drive Shaft	1
	41X26	Reflector, Dial Light	2
	28X113	Drive Cord Tension Spring	1
	10X56	Drive Cord Assembly	1
	19X192	"C" Washer (Mtg. drive shaft)	2
	6X66	Rubber Grommet (Mtg. gang cond.)	3
		TYPE V-28A166 RECORD CHANGER PARTS	
	V-2727B	Motor Assembly, 60 cycles 105-125 Volts AC	1
	Shure P-81	Crystal Cartridge	1
		Semi-Permanent Needle	1
		(When ordering needles, specify part number and letter stamped on cartridge.)	

WARD'S AIRLINE RADIO
Model 94WG-2748B

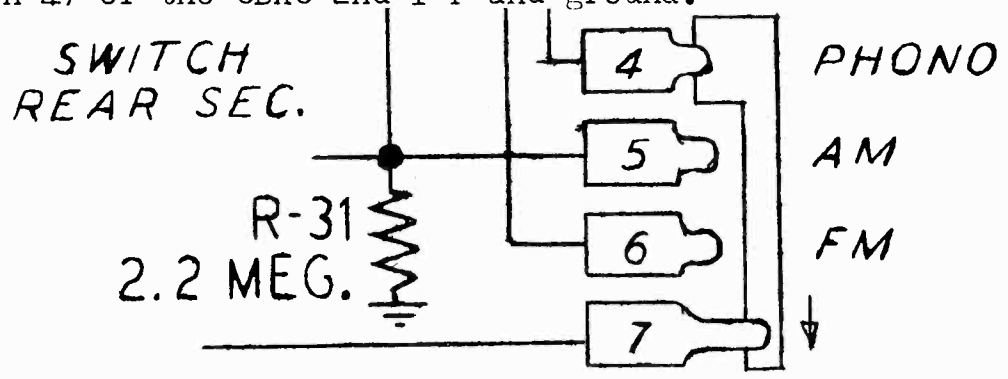
Issue "B" receivers of this model differ from the issue "A" receivers by the addition of a 2.2 megohm resistor and a 5000 MMF ceramic condenser to the circuit.

PARTS LIST ADDITION

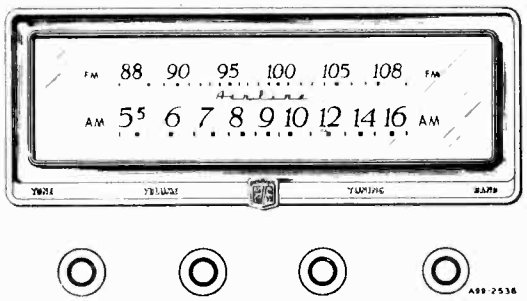
The description of the new parts follows:

REF.NO.	PART NO.	DESCRIPTION	QTY.USED
R-31	B85225	2.2 Meg. .5 W Carbon	1
C-43	47X507	5000 MMF Ceramic	8

The circuit connection of Resistor R-31 is shown in the partial schematic below. Condenser C-43 is connected to the filament (pin 4) of the 6BA6 2nd I-F and ground.



MODEL 94WG-2749A



GENERAL DESCRIPTION

This is a two band, seven tube (plus rectifier tube) AM and FM receiver with automatic record changer. The I-F stages use high gain miniature type tubes. Built-in Air Wave Aerials are provided for the FM and Broadcast bands. Features include, a grounded grid R-F amplifier stage on the FM band, 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.

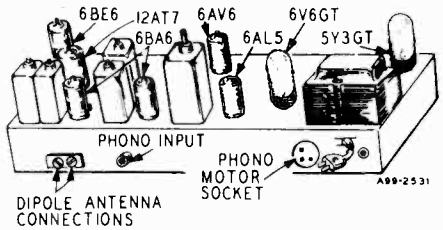
The receiver and record changer are housed in a console combination cabinet with controls provided for tuning, volume, tone and band or phono selection.

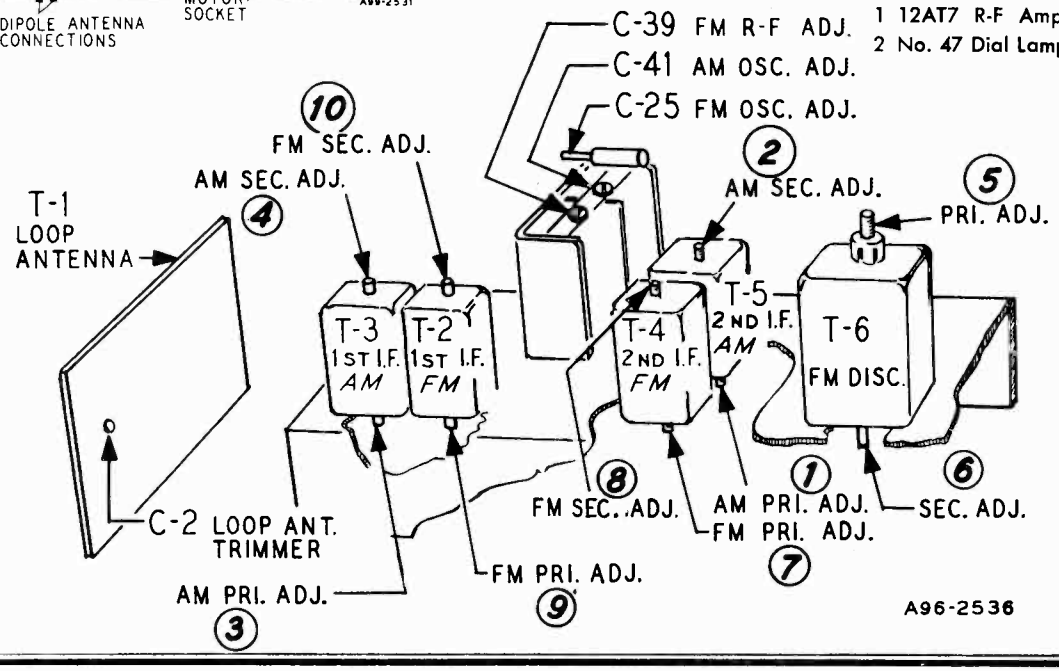
ELECTRICAL SPECIFICATIONS

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—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) 25 microvolts average
Power Output	4.5 watts maximum 2.5 watts 10% distortion
Loud Speaker	12" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles
Record Changer	See Manual No. 5081A

Tube and Dial Lamp Complement

1 6BE6 AM Converter & FM Osc.
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
1 12AT7 R-F Amplifier & Mixer
2 No. 47 Dial Lamps





MODEL 94WG-2749A

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. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I-F Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-41	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-2	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—2500 mmf, 300 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 negotive 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	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
I-F	10.7 MC Note C	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Pri. (7) Sec. (8) Note D	Maximum Deflection
Discriminator	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note D	Maximum Deflection
I-F	10.7 MC	Junction C-32A & B (Dual 100 mmf cond.) And chassis	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (9) & Sec. (10) 2nd I-F Pri. (7) & Sec. (8) Disc. Pri. (5) In Order Shown Note D	Maximum Deflection
	10 7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	Maximum Deflection
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN							
Oscillator	108.5	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-25	Maximum Deflection
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-39	Maximum Deflection
RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN							

FM ALIGNMENT NOTES

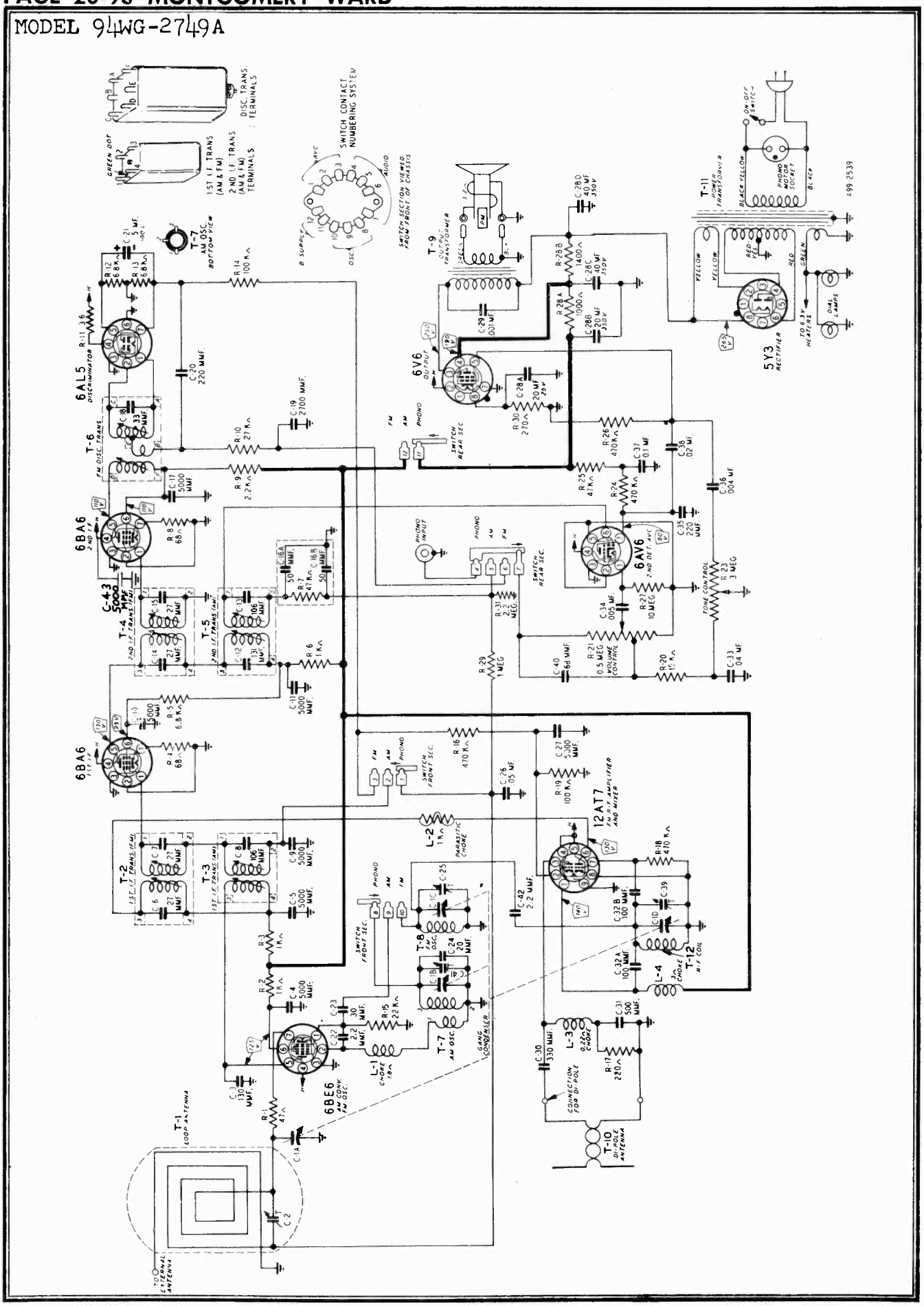
NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter

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-10) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—AM I-F coils must be aligned before attempting to align the FM I-F coils.

NOTE D—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.

MODEL 94WG-2749A

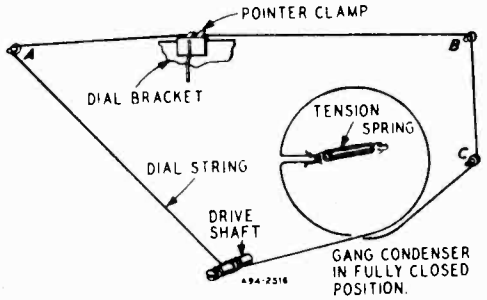


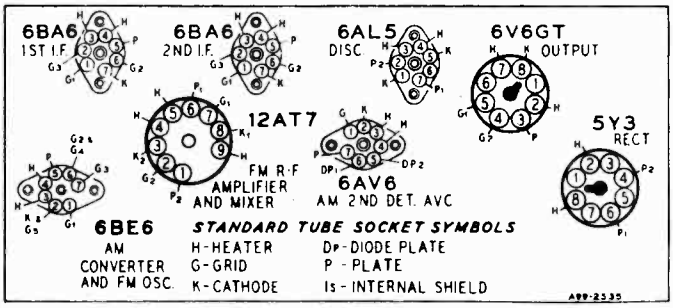
MODEL 94WG-2749A

DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X38 drive cord assembly or a new length of cord 48 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.





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.

REPLACEMENT PARTS LIST

HOW TO ORDER PARTS—Should it be necessary to write us or to order any repair parts, it is important that the complete model number which appears on the label attached to the rear of the chassis be specified. Repair parts should be ordered from your nearest Wards Retail Store, Catalog Order office or Mail Order House.

Ref. No.	Part No.	Description	Qty. Used in Set
		CAPACITORS	
C-1	14A209	Gang Condenser Assembly	1
C-2	17A256	2-24 mmf Trimmer	1
C-3	47X559	130 mmf Ceramic	1
C-4, C-5, C-9, C-10, C-11, C-17, C-27, C-43	47X507	5000 mmf Ceramic	8
C-6, C-7		Part of T-2 (1st I-F Trans. FM)	
C-8		Part of T-3 (1st I-F Trans. AM)	
C-12, C-13		Part of T-5 (2nd I-F Trans. AM)	
C-14, C-15		Part of T-4 (2nd I-F Trans. FM)	
C-16A, C-16B	47X112	50-50 mmf Dual Mica	1
C-18		Part of T-6 (Discriminator Trans.)	
C-19	47X492	2700 mmf Molded Mica	1
C-20, C-35	47X468	220 mmf Ceramic	2
C-21	45X361	5 mf 100 V Dry Electrolytic	1
C-22, C-42	47X557	2.2 mmf Ceramic	2
C-23	47X558	30 mmf Ceramic	1
C-24	47X516	20 mmf Ceramic	1
C-25	17A255	1-8 mmf Trimmer	1
C-26	B66503	.05 mf 200 V Tubular	1
C-28A, C-28B, C-28C, C-28D	45X359	20 mf 25 V, 20 mf 350 V, 40 mf 350 V, 40 mf 350 V Dry Electrolytic	1
C-29	H66102	.001 mf 800 V Tubular	1
C-30	47X470	330 mmf Molded Mica	1
C-31	47X508	500 mmf Ceramic	1
C-32A, C-32B	76X4	100 mmf Dual Ceramic	1
C-33	B66403	.04 mf 200 V Tubular	1
C-34	D66502	.005 mf 400 V Tubular	1
C-36	B66402	.004 mf 200 V Tubular	1
C-37	D66104	.1 mf 400 V Tubular	1
C-38	D66203	.02 mf 400 V Tubular	1
C-39, C-41		Part of C-1 (Gang Condenser)	
C-40	47X471	68 mmf Ceramic	1

MODEL 94WG-2749A

REPLACEMENT PARTS LIST (continued)

RESISTORS

Ref. No.	Part No.	Ohms	Watts	Description	Qty. Used in Set
R-1	B85470	47	0.5	Carbon	1
R-2, R-3, R-6	B85102	1000	0.5	Carbon	3
R-4, R-8	B84680	68	0.5	Carbon	2
R-5, R-12, R-13	B84682	6800	0.5	Carbon	3
R-7, R-25	B85473	47 K	0.5	Carbon	2
R-9	B85222	2200	0.5	Carbon	1
R-10	B85273	27 K	0.5	Carbon	1
R-11	43X233	3.6	0.5	Wirewound	1
R-14, R-16	B85104	100 K	0.5	Carbon	2
R-15	B85223	22 K	0.5	Carbon	1
R-17	B84221	220	0.5	Carbon	1
R-18, R-19, R-24, R-26	B85474	470 K	0.5	Carbon	4
R 20	B85153	15 K	0.5	Carbon	1
R-21	36X372	.5 meg.		Volume Control & Switch	1
R-23	40X285	3 meg.		Tone Control	1
R-27	B85106	10 meg.	0.5	Carbon	1
R-28A, R-28B	43X224	1000 1400	4.0 6.0	Wirewound	1
R-29	B85105	1 meg.	0.5	Carbon	1
R-30	B84271	270	0.5	Carbon	1
R-31	B85225	2.2 meg.	0.5	Carbon	1

TRANSFORMERS AND COILS

Ref. No.	Part No.	Description	Qty. Used in Set
L-1	35A5	Insulated Choke	1
L-2	9A2068	Parasitic Choke Assembly	1
L-3	35A9	Insulated Choke	1
L-4	35A8	Insulated Choke	1
T-1	9A1972	"B" Range Loop Antenna	1
T-2	9A2060	1st I-F Trans. (FM)	1
T-3	9A2062	1st I-F Trans. (AM)	1
T-4	9A2061	2nd I-F Trans. (FM)	1
T-5	9A2063	2nd I-F Trans. (AM)	1
T-6	9A2064	Discriminator Transformer	1
T-7	9A2065	Oscillator Coil (AM)	1
T-8	9A2067	Oscillator Coil (FM)	1
T-9	51X134	Output Transformer	1
T-10	9A2004	Dipole Antenna	1
T-11	53X290	Power Transformer	1
T-12	9A2066	Antenna Coil (FM)	1

MISCELLANEOUS

Part No.	Description	Qty. Used in Set
12A490	12" P.M. Speaker	1
3A303	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket—Miniature	4
3A427	Tube Socket (12AT7)	1
3A443	Tube Socket (6BE6)	1
3A304	Phono Motor Socket	1
3A305	Phono Socket—Single Pin Tip	1
2A393	Band Change Switch	1
13X546	Line Cord and Plug Assembly	1
10A735	Knob	4
4X1049	Escutcheon	1

DIAL AND DRIVE ASSEMBLY

Part No.	Description	Qty. Used in Set
58X729	Dial Glass	1
24X446	Idler Pulley	2
15X251	Pointer	1
25X1616	Dial Bracket	1
7A103	No. 47 Pilot Light Bulb	2
7A199	Pilot Light Socket Assembly	1
26X486	Drive Shaft	1
41X26	Reflector, Dial Light	2
28X113	Drive Cord Tension Spring	1
10X38	Drive Cord Assembly	1
19X192	"C" Washer (Mtg. drive shaft)	2
6X66	Rubber Grommet (Mtg. gang cond.)	3

TYPE V-28A167 RECORD CHANGER PARTS

V-2727B	Motor Assembly, 60 cycles 105-125 Volts AC	1
Shure P-77	Crystal Cartridge	1
	Needle, Microgroove (Red)	1
	Needle, Regular	1

(When ordering needles, specify part number and letter stamped on cartridge.)

MODEL CT9, 1949
Chevrolet

GENERAL INFORMATION

TYPE - Automotive type superheterodyne receiver specifically designed to fit 1949 Chevrolet. Receiver consists of two units; the RF tuner and the Power & Audio Unit.

TUNING RANGE - 535 to 1600 Kc

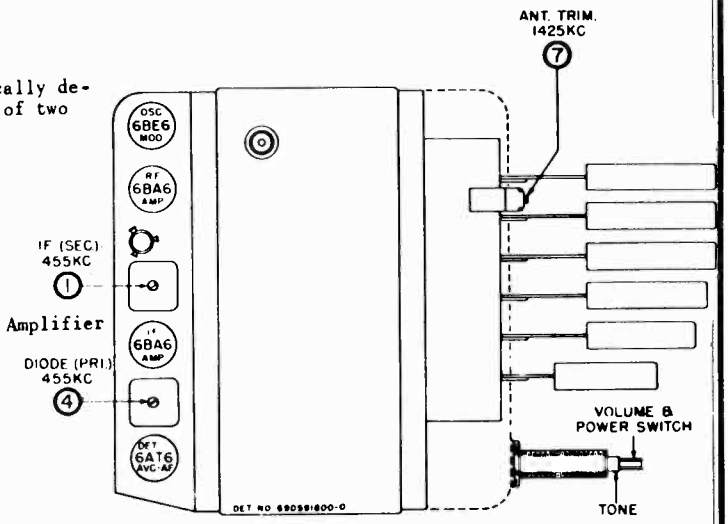
IF - 455 Kc

TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Oscillator-Modulator
6BA6 - IF Amplifier
6AT6 - Diode detector, AVC & 1st AF Amplifier
6V6GT - Power Amplifier
6X4 - Rectifier

POWER INPUT - 6.8 amps at 6.3V DC

POWER OUTPUT - 3 watts (max)

PUSH BUTTON TUNER - Automatic Tuner AT-71.



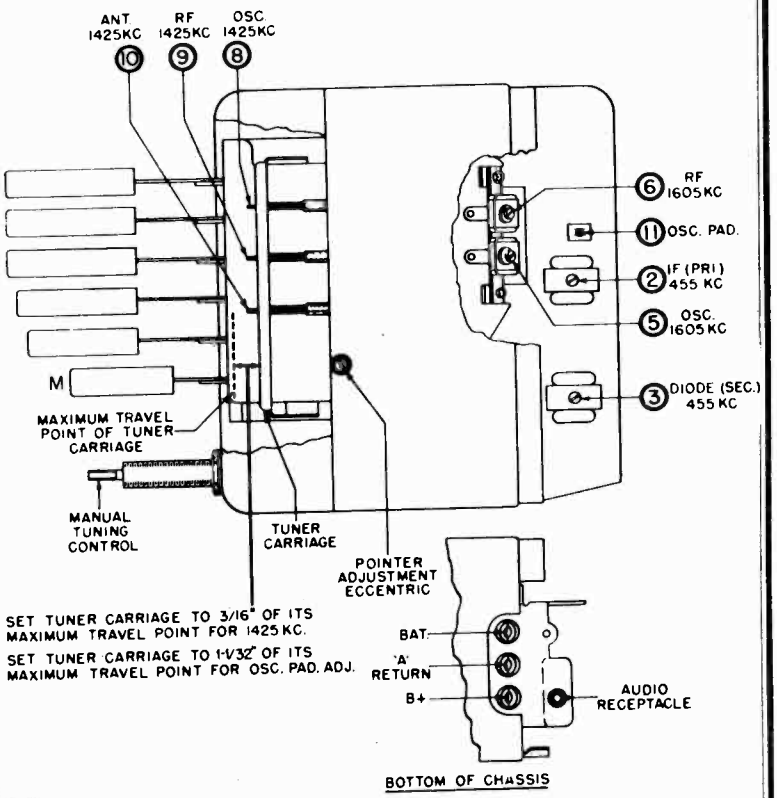
TO SET THE PUSH BUTTONS

1. Turn the radio ON and allow it to warm up for a few minutes.

2. Push the top button in as far as it will go and HOLD IT THAT WAY.

3. With the tuning knob, tune in the station you desire to set up. Tune carefully until you are exactly on the station; tuning to either side of it will result in poor tone quality. Release button and knob after tuning-in the station.

4. Follow above steps 2 and 3 for the remaining four buttons.



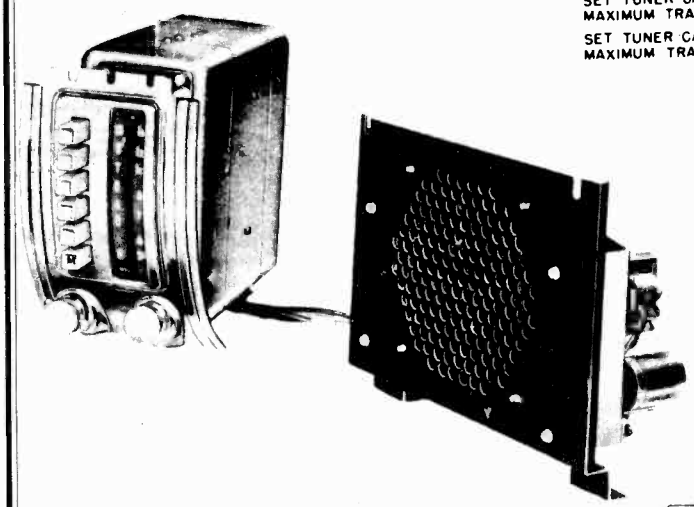
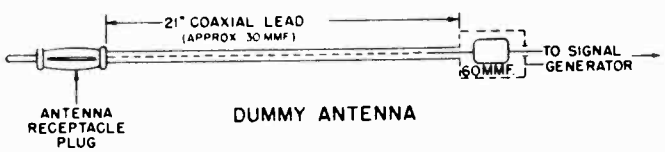


FIGURE 1. TUBE & TRIMMER LOCATION



DUMMY ANTENNA

MODEL CT9, 1949
Chevrolet

ALIGNMENT

EQUIPMENT REQUIRED

1. A special tool for adjusting the tuner cores. Use Alignment Tool, Motorola Part No. 66A76278.

2. A small screwdriver for IF & RF alignment.

3. An accurately calibrated AM modulated signal generator.

4. A low range output meter.

5. A special dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 1. The 21" coaxial lead needed in its construction is the same type as used for lead-in on Motorola car antennas.

PROCEDURE

1. Expose the alignment screws as follows: remove escutcheon, dial background and rear cover.

2. Connect the power & audio unit to the tuner unit and connect the output meter across the voice coil.

3. Connect a 6 volt storage battery to the power & audio unit chassis and 'A' lead. Turn on the receiver and allow it to warm up a few minutes. Set the receiver volume control at maximum and the tone control on 'high'.

4. For greatest accuracy, keep the output of the receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.

5. IF & RF ALIGNMENT - See Alignment Chart & Fig. 1
IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores. The slightest inward pressure on the alignment tool may move the tuner carriage and result in inaccurate alignment.

6. ANTENNA TRIMMER ADJUSTMENT. Once alignment has been satisfactorily performed, no further adjustment of any alignment screws should be made except to align the antenna trimmer (7) to the antenna after receiver is installed in car. This adjustment should be made with the antenna fully extended and receiver set to approximately 1400 Kc. Peak the trimmer for maximum volume of a weak station or background noise between stations. Trimmer can be reached from front by removing the top push button.

7. POINTER ADJUSTMENT. The pointer can be moved slightly for calibration correction by turning the eccentric adjustment rivet. This rivet has a slotted head and is exposed only when tuner is tuned to high frequency end. See Figure 1 for its location.

ALIGNMENT CHART

STEP	TUNER SET TO	DUMMY ANTENNA	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR FREQUENCY	ADJUST	REMARKS
1.	High frequency end (cores out)	.1 mf	Hi side -6BE6 grid (pin #7) Lo side -chassis.	455 Kc	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating procedure.
2.	High frequency end; Core screws should project 5/16" from core adjustment clip	Special -See Fig. 1	Ant. receptacle through special dummy.	1605 Kc	5, 6, & 7	Peak for maximum in order indicated.
3.	Using manual knob, set tuner to extreme HF position, then move carriage inward 3/16" (see 'Measurements', Fig. 1)	Special -See Fig. 1	Ant. receptacle through special dummy.	1425 Kc	8, 9 & 10	Peak for max. in order indicated.
4.	Move carriage 1-1/32" inward from point of maximum travel	Special -See Fig. 1	Ant. receptacle through special dummy.	Turn generator power off.	11	Peak oscillator padder for maximum noise. See*
5.	Approx. 1400 Kc	-	-	-	7	With set installed in car, peak antenna trimmer for maximum noise or volume of a weak station. Car antenna should be fully extended.

* If padder core (11) must be moved more than 1/2 turn from its original position, repeat steps 2, 3 & 4 until it is necessary to move the padder core less than 1/2 turn in this step.

MODEL CT9, 1949
Chevrolet

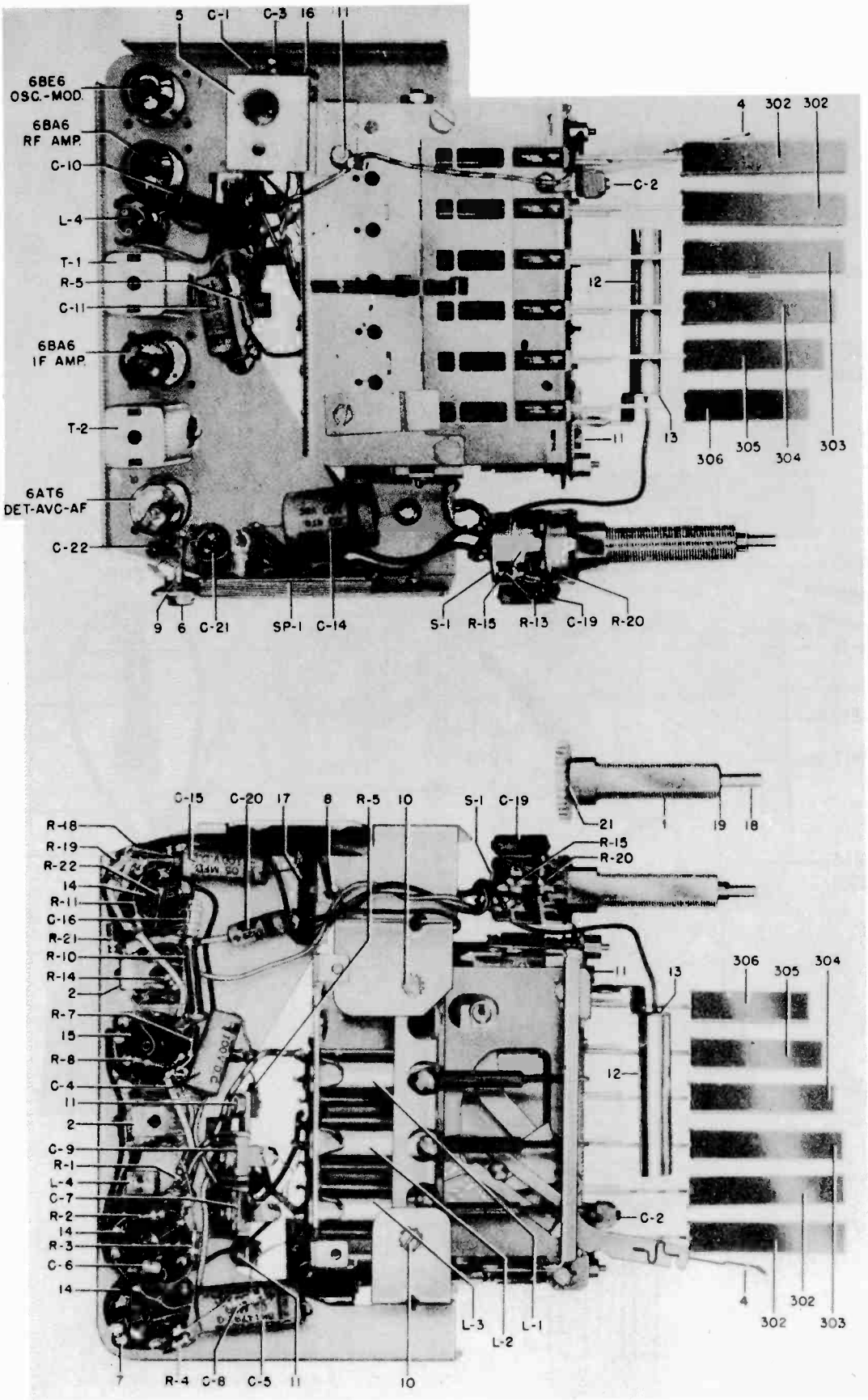


FIGURE 2. PARTS LOCATION - TUNER UNIT

MODEL CT9, 1949
Chevrolet

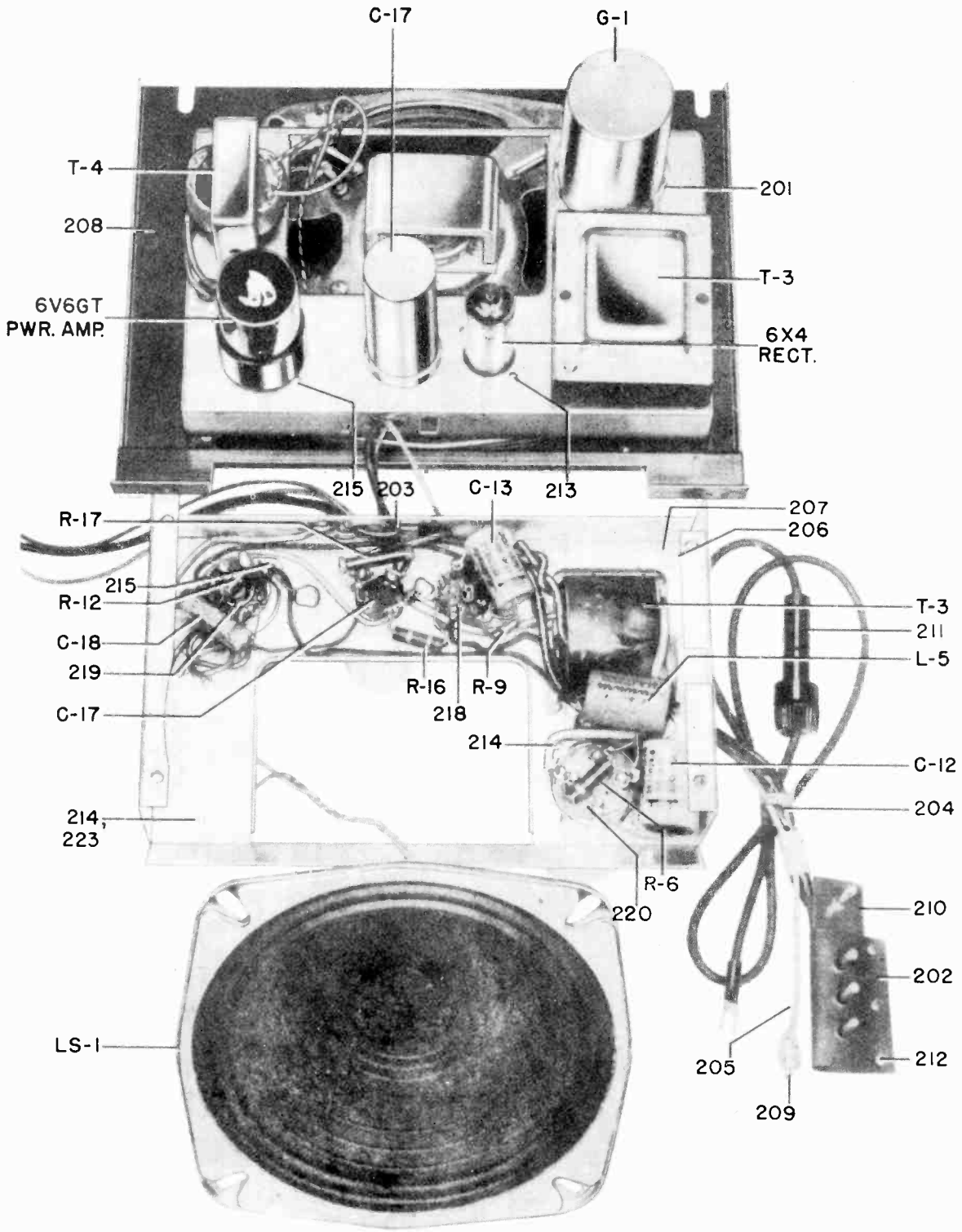
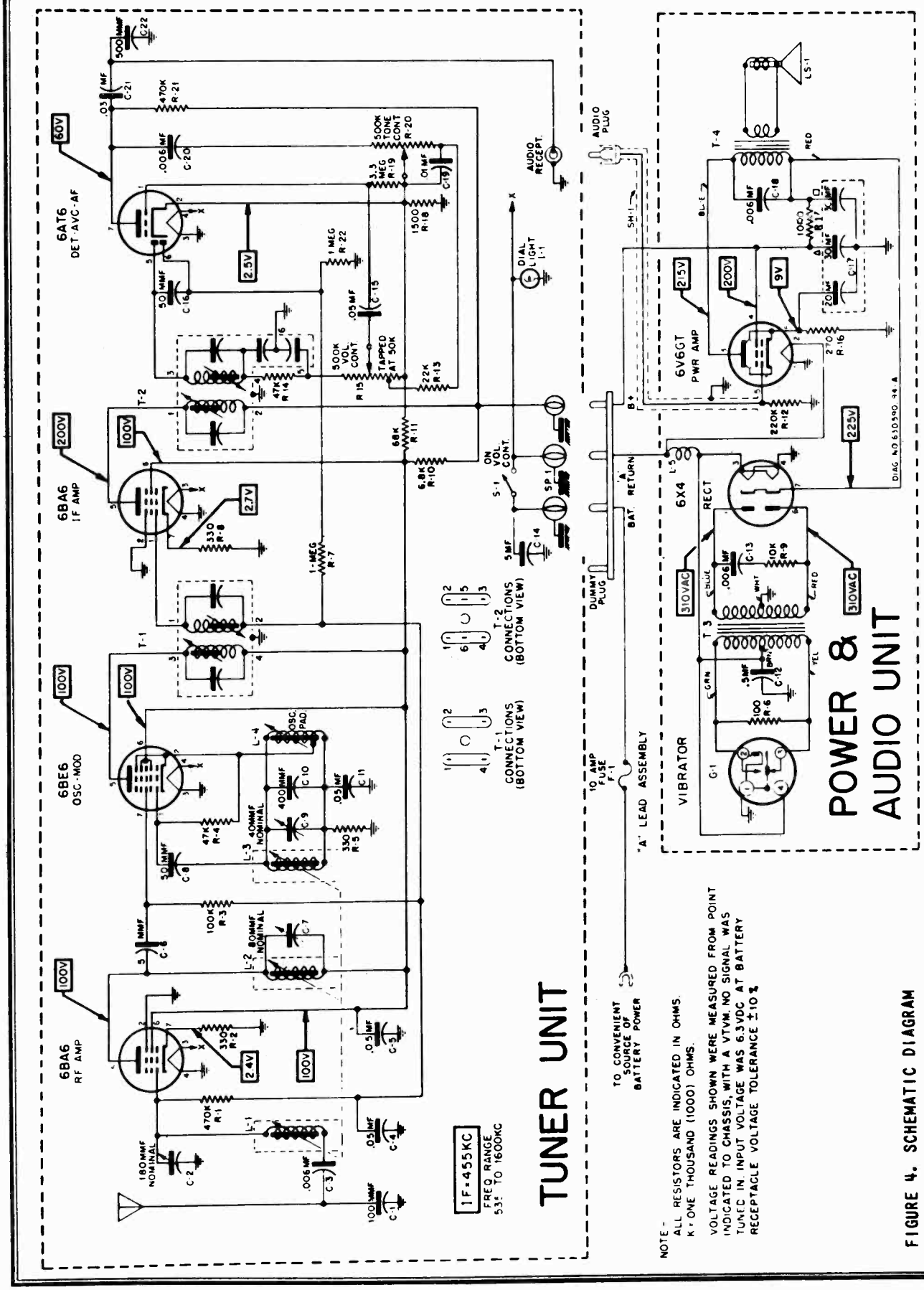


FIGURE 3. PARTS LOCATION - POWER & AUDIO UNIT

MODEL CT9, 1949
Chevrolet



NOTE -
ALL RESISTORS ARE INDICATED IN OHMS.
K = ONE THOUSAND (1000) OHMS.
VOLTAGE READINGS SHOWN WERE MEASURED FROM POINT INDICATED TO CHASSIS, WITH A VTVM. NO SIGNAL WAS TUNED IN. INPUT VOLTAGE WAS 6.3VDC AT BATTERY RECEPTACLE VOLTAGE TOLERANCE ±10%

FIGURE 4. SCHEMATIC DIAGRAM

MODEL CT9, 1949
Chevrolet

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
TUNER UNIT - ELECTRICAL PARTS		
CAPACITORS		
C-1	21B77562	Ceramic: 100 mmf 500V .....
C-2	20A590629	Trimmer, variable mica: 50-220 mmf; with bracket .....
C-3	8C4529	Paper: .006 mf 100V .....
C-4	8K13514	Paper: .05 mf 100V .....
C-5	8K14791	Paper: .05 mf 400V .....
C-6	21K70720	Ceramic: 5 mmf 500V .....
C-7	20A590639	Trimmer, variable mica: 20-180 mmf; includes C-9 and brkt....
C-8	21K74661	Ceramic: 50 mmf 300V .....
or	21R6513	Mica: 50 mmf 300V .....
C-9	20A590639	Trimmer, variable mica: 5-80 mmf; includes C-7 & brkt .....
C-10	21A71872	Ceramic: 400 mmf 5% 500V .....
C-11	8K13514	Paper: .05 mf 100V .....
C-14	8K17028	Paper: .5 mf 100V .....
C-15	8K13514	Paper: .05 mf 100V .....
C-16	21K74661	Ceramic: 50 mmf 300V .....
C-19	8R472754	Paper: .01 mf 100V .....
C-20	8C4529	Paper: .006 mf 100V .....
C-21	8K71911	Paper: .03 mf 400V .....
C-22	21K481377	Ceramic: 500 mmf 500V .....
DIAL LIGHT		
I-1	65X10867	Bulb: 6.3V; .25A; bayonet base; clear #44.....
COILS		
L-1	24B71881*	RF & Antenna coil (specify color of paint dot on old coil when ordering) .....
L-2	24B71881*	RF & Antenna coil (specify color of paint dot on old coil when ordering) .....
L-3	24B71879*	Oscillator coil (specify color of paint dot on old coil when ordering) .....
L-4	24A70227	Oscillator padder coil: complete with iron tuning core .....
RESISTORS		
Note: All resistors are insulated carbon type, unless otherwise specified.		
R-1	6R6032	470,000 20% 1/2W .....
R-2	6R6010	330 20% 1/2W .....
R-3	6R6075	100,000 20% 1/2W .....
R-4	6R6056	47,000 20% 1/2W .....
R-5	6R6010	330 20% 1/2W .....
R-7	6R6004	1 meg 20% 1/2W .....
R-8	6R6010	330 20% 1/2W .....
R-10	6R6287	6800 20% 1W N.I. .....
R-11	6R6001	68,000 20% 1/2W .....
R-13	6R6028	22,000 20% 1/2W .....
R-14	6R6056	47,000 20% 1/2W .....
R-15	18B590604	Volume Control: 500,000 ohms; tapped at 50,000 ohms (includes tone control R-20 and switch S-1) .....
R-18	6R6161	1500 20% 1/2W .....
R-19	6R2118	3.3 meg 20% 1/2W .....
R-20		500,000 ohm tone control (part of vol cont) .....
R-21	6R6032	470,000 20% 1/2W .....
R-22	6R6004	1 meg 20% 1/2W .....
SWITCH		
S-1		Switch (Part of Volume Control)
SPARK PLATE		
SP-1	1A590637	Spark Plate Assembly .....
TRANSFORMERS		
T-1	24B485553	IF, 455 Kc: complete with padding capacitors and tuning cores...
T-2	24K485555	Diode, 455 Kc: complete with padding capacitors and tuning core
TUNER		
	1X590784	AT-71 Automatic Tuner .....
TUNER UNIT - CHASSIS MECHANICAL PARTS		
1	43A590605	Bushing, tuning shaft .....
2	42A485548	Clip, coil can mounting (T-1 & T-2) .....
3	2S8397	Nut, hex: 1/2-28 x 5/8 stl; cad pl (volume control and tuning control bushings mtg).....
4	1X590785	Pointer and Sleeve Assembly ...
5	1X590794	Receptacle, antenna input: includes bracket and terminal strip
6	9A54664	Receptacle, 1-pin (audio input)
7	5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg) .....
8	5S7706	Rivet: .122 x 1/8 stl; pol nkl (terminal strip mtg) .....
9	5S7701	Rivet: .122 x 3/16; stl; pol nkl (audio receptacle mtg).....
10	3S7205	Screw, machine: 8-32 x 1/4; slotted hex head; locking type; stl; cad pl (automatic tuner mtg).....
11	3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; stl; cad pl (variable cap brkt, antenna receptacle brkt, and pilot lamp brkt mtg).....
12	26A473011	Shield, light .....
13	9A472905	Socket, pilot light & brkt ....
14	9A472534	Socket, tube: miniature; 7-prong
15	9K580218	Socket, tube: miniature; 8-prong
16	31K490141	Strip, terminal: 1 ins lug, #2 mtg (part of antenna receptacle brkt) .....
17	31K490143	Strip, terminal: 2 ins lugs, #2 mtg
18	1K590623	Tuning Shaft and Gear Assembly.
19	4A21577	Washer, 'C' (tuning shaft mtg).
20	4S490351	Washer, flat: 11/16 x .515 x .033 thick; stl; cad pl (tuning shaft bushing and volume control mtg) .....
21	4A580282	Washer, spring (tuning shaft mtg) .....
TUNER UNIT HOUSING PARTS		
101	7B590696	Background, dial .....
102	1X590783	Cover, front: includes gear mounting stud .....
103	15D590615	Cover, rear .....
104	13K590702	Escutcheon, dial .....
105	7B590693	Frame, dial retaining .....
106	44B472872	Gear, idler (mounted on front cover)
107	2S8397	Nut, hex: 1/2-28 x 5/8 stl; cad pl (tuner bushing mtg) .....
108	34C590802	Scale, dial .....
109	3S7156	Screw, machine: 6-32 x 3/16 slotted binderhead; stl; cad pl (dial retaining frame mtg)....
110	3S7205	Screw, machine: 8-32 x 1/4 slotted hex head; stl; cad pl (shell housing) .....do?
111	3S7475	Screw, sheet metal: #8 x 1/4 plain acorn head; stl; cad pl (front cover and rear cover mtg).....
112	3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; stl; cad pl (front cover mtg) .....
113	15D590600	Shell, housing .....

* Part of Tuner AT-71

MODEL CT9, 1949
Chevrolet

REF. NO.	PART NO.	DESCRIPTION
114	46A590602	Stud, idler gear mtg .....
115	4K73809	Washer, 'C' (idler gear mtg)...
116	4S490351	Washer: 11/16 x .515 x .033 thick; stl; cad pl (tuner bushing mtg)

POWER & AUDIO UNIT - ELECTRICAL PARTS

C-12	8K17028	Paper: .5 mf 100V .....
C-13	8K12840	Paper: .006 mf 1600V .....
C-17	23A473015	Electrolytic: 30-30-20 mf/350-300-25V .....
C-18	8K71910	Paper: .006 mf 400V .....
FUSE		
F-1	65A10266	Fuse, 10 amp: type 3AG .....
VIBRATOR		
G-1	48B3333	Vibrator, non-sync: 4-pin .....
COILS		
L-5	24A472535	Choke, hash .....
SPEAKER		
LS-1	50K590681	Speaker: 6" PM; 3.2 ohm VC ....
RESISTORS		
Note: All resistors are insulated carbon type unless otherwise specified.		
R-6	6R6415	100 10% 1 watt .....
R-9	6R6054	10,000 20% 1/2W .....
R-12	6R6015	220,000 20% 1/2W .....
R-16	6R6336	270 10% 1 watt .....
R-17	6R6184	1000 20% 1 watt N.I. .....
TRANSFORMERS		
T-3	25K590650	Power transformer .....
T-4	25B590648	Output transformer .....

POWER & AUDIO UNIT - CHASSIS MECHANICAL PARTS

201	42A4215	Clip, vibrator grounding .....
202	14A590633	Insulator, armite (used on 4-pin connector) .....
203	14K590653	Insulator, armite (cable insulator) .....
204	1X590689	Lead Assembly, 'A': includes fuse & fuse receptacle, 4-pin connector and insulator .....
205	1X590691	Lead Assembly, audio: includes plug .....
206	4S7666	Lockwasher, ext: #6; stl; cad pl (power trans mtg).....
207	2S7005	Nut, hex: 6-32 x 1/4; stl; cad pl (power trans mtg) .....
208	64C590641	Plate, speaker mtg .....
209	28K71775	Plug, 1-pin (audio plug) .....
210	28A590611	Plug, 4-pin ('A' lead connector)
211	9B591314	Receptacle, fuse (complete)...
212	5S7769	Rivet: .088 x 3/32 stl; pol nkl (connector plug insulator mtg) .....
213	5S7771	Rivet: .088 x 3/16; stl; pol nkl (miniature socket mtg) .....
214	5S7701	Rivet: .122 x 3/16; stl; pol nkl (vibrator socket and output trans mtg) .....
215	5S7707	Rivet: .122 x 5/32; stl; pol nkl (octal socket and terminal strip mtg) .....
216	3S7475	Screw, sheet metal: #8 x 1/4 PKZ slotted acorn head; stl; cad pl (spkr plate mtg) .....
217	3S8176	Screw, sheet metal: #10 x 3/8 PKZ plain hex head; stl; cad pl (speaker mtg) .....
218	9A472534	Socket, tube: miniature; 7-prong
219	9A6788	Socket, tube: octal .....
220	9A70208	Socket, tube: 4-prong (for vibrator)
221	31K490143	Strip, terminal: 2 ins lugs, #2 mtg
222	4S1706	Washer, flat: 3/8 x .203 x .033 thick; stl; cad pl (spkr mtg).
223	4S7555	Washer, flat: 1/4 x .128 x .033 thick; stl; cad pl (output transformer mtg) .....

MOUNTING PARTS & ACCESSORIES

301	7B590609	Bracket, tuning unit mtg .....
302	1X590563	Button, push: includes clip: 2-3/32" long .....
303	1X590656	Button, push: includes clip: 2-3/64" long .....
304	1X590661	Button, push: includes clip: 1-15/16" long .....
305	1X590662	Button, push: includes clip: 1-25/32" long .....
306	1X590663	Button, push: includes clip:'M'
307	43A590621	Bushing, spacer: chrome pl (large)
308	43A590603	Bushing, spacer (small) .....
309	8A4491	Capacitor, generator .....
310	32C590643	Gasket, speaker: rubber .....
311	36K472939	Knob, reset: chrome pl (tone control)
312	36K590638	Knob, volume and tuning control
313	4S7693	Lockwasher, split: 1/4 stl; cad pl (tuner unit mtg) .....
314	2S7022	Nut, hex: 1/4-20 x 7/16; stl; cad pl (tuner unit mtg).....
315	2S8397	Nut, hex: 1/2-28 x 5/8; stl; cad pl (tuner unit mtg to instrument panel) .....
316	64A13637	Plate, serrated (tuner unit mtg)
317	64D590704	Plate, trim: chrome pl .....
318	2S490342	Speednut: 10-24 blued (power & audio unit mtg) .....
319	46A590644	Stud, threaded shoulder (power & audio unit mtg) .....
320	6A4141	Suppressor, distributor .....
321	4K590606	Washer, cup: chrome pl .....
322	4K489323	Washer, felt (reset knob) .....

MODELS 5A9B, 5A9M, 5A9S,
Ch.HS-62A; 5A9UB, 5A9UM, Ch. HS-165

GENERAL INFORMATION

TYPE - Three-power (AC/DC-Battery) portable radio receiver of the personal type. Four miniature type tubes and a selenium rectifier are used in a superheterodyne circuit.

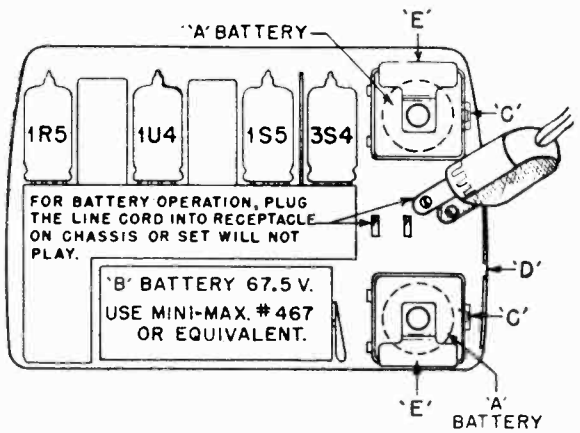
Model 5A9B - black crackle finish; uses chassis HS-62A
Model 5A9M - maroon crackle finish; uses chassis HS-62A
Model 5A9S - black crackle finish; uses chassis HS-62A
Model 5A9UB - black crackle finish; uses chassis HS-165
Model 5A9UM - maroon crackle finish; uses chassis HS-165

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT - 1R5 - Oscillator-Modulator
1U4 - IF Amplifier
1S5 - Detector, AVC & 1st AF Amplifier
3S4 - Power Amplifier
Rectifier - Selenium type - for AC/DC operation

POWER SUPPLY - Operates from 117V AC/DC (15 watts) or from the following batteries:

2 - 1-1/2V flashlight cells (Eveready #950 or equivalent)
1 - 67-1/2 "B" battery (Eveready #467 or equivalent)



'A' Batteries: 1½ V. flashlight cells. Use Eveready No. 950 or equiv. Install with Center Terminal facing back of set. 2 used.

To open 'A' Battery Compartments push Catches 'C' to the right.

When playing from house current, pass Line Cord through Slot 'D' in cabinet.

When line cord is not in use, wind it around Cord Clamps 'E'.

FIGURE 1. BATTERY INSTALLATION DETAIL

ALIGNMENT

It is recommended that receiver be operated from battery during alignment.

If AC power is used, place an isolation transformer between power line and receiver. Connect low side of generator to B-.

A low range output meter should be connected to the speaker voice coil terminal and receiver chassis. Set receiver volume control to maximum. For greatest accuracy, keep output of receiver at approximately .05 watt (.05 watt = .40 volt on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	See Fig. 2.	455 Kc	Gang opened	1, 2 & 3	Adjust for maximum.
RF ALIGNMENT						
2.	.1 mf	See Fig. 2.	1620 Kc	Gang opened	4	This sets oscillator to dial scale.
3.	-	-	-	-	-	Install chassis in cabinet, leaving output meter connected to speaker.
4.	-	Radiation loop*	1400 Kc	Tune for maximum	5	Adjust for maximum. Trimmer is reached through hole under plug button on side of cabinet.

MODELS 5A9B, 5A9M, 5A9S,
Ch. HS-62A; 5A9UB, 5A9UM,
Ch. HS-165

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

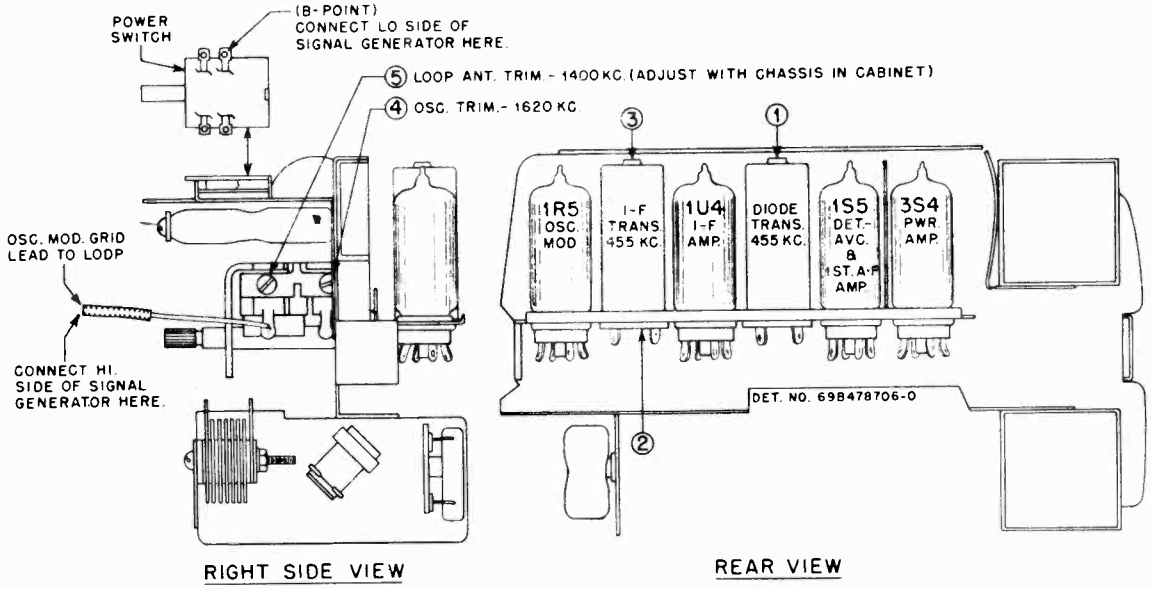


FIGURE 2. TUBE & TRIMMER LOCATIONS

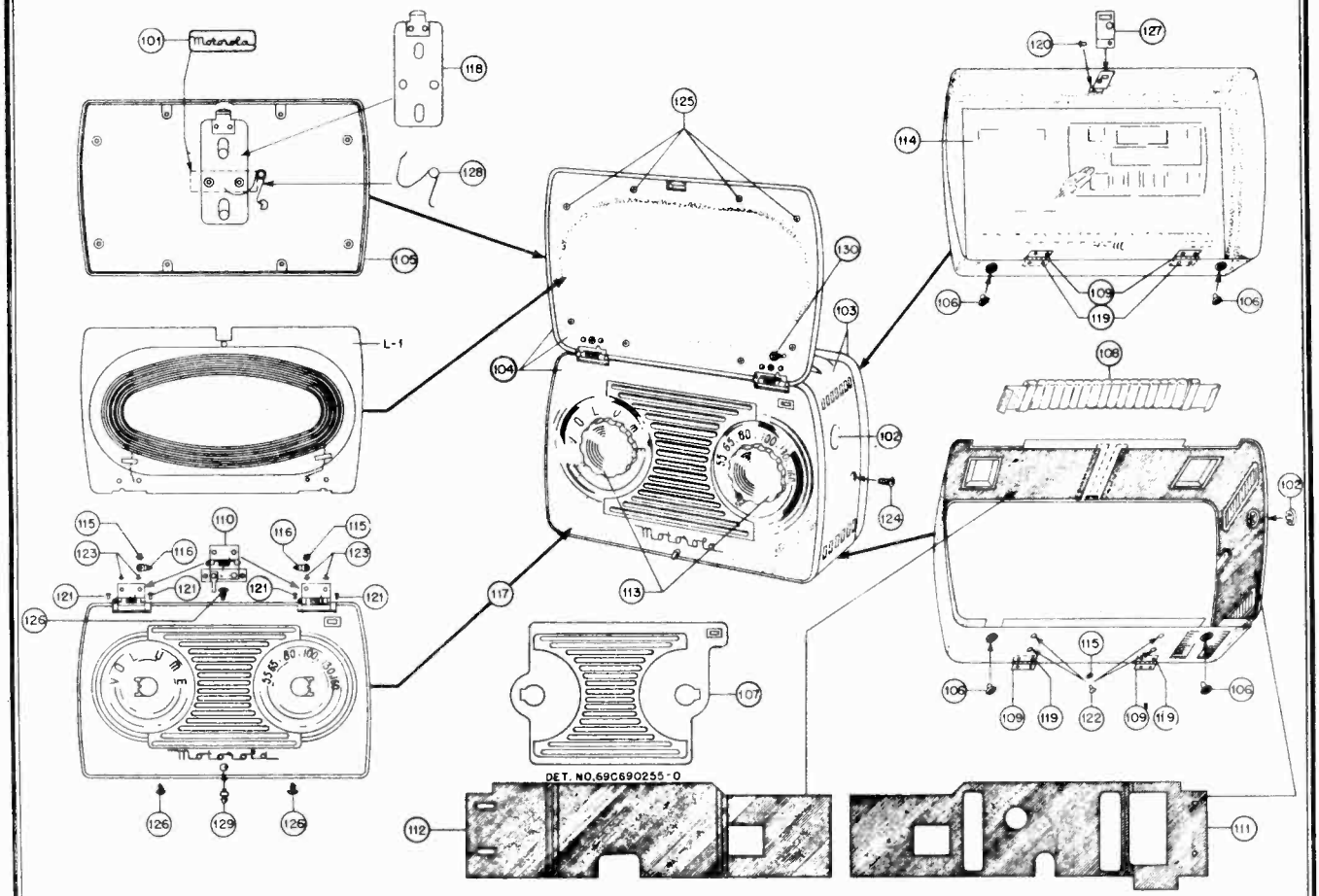
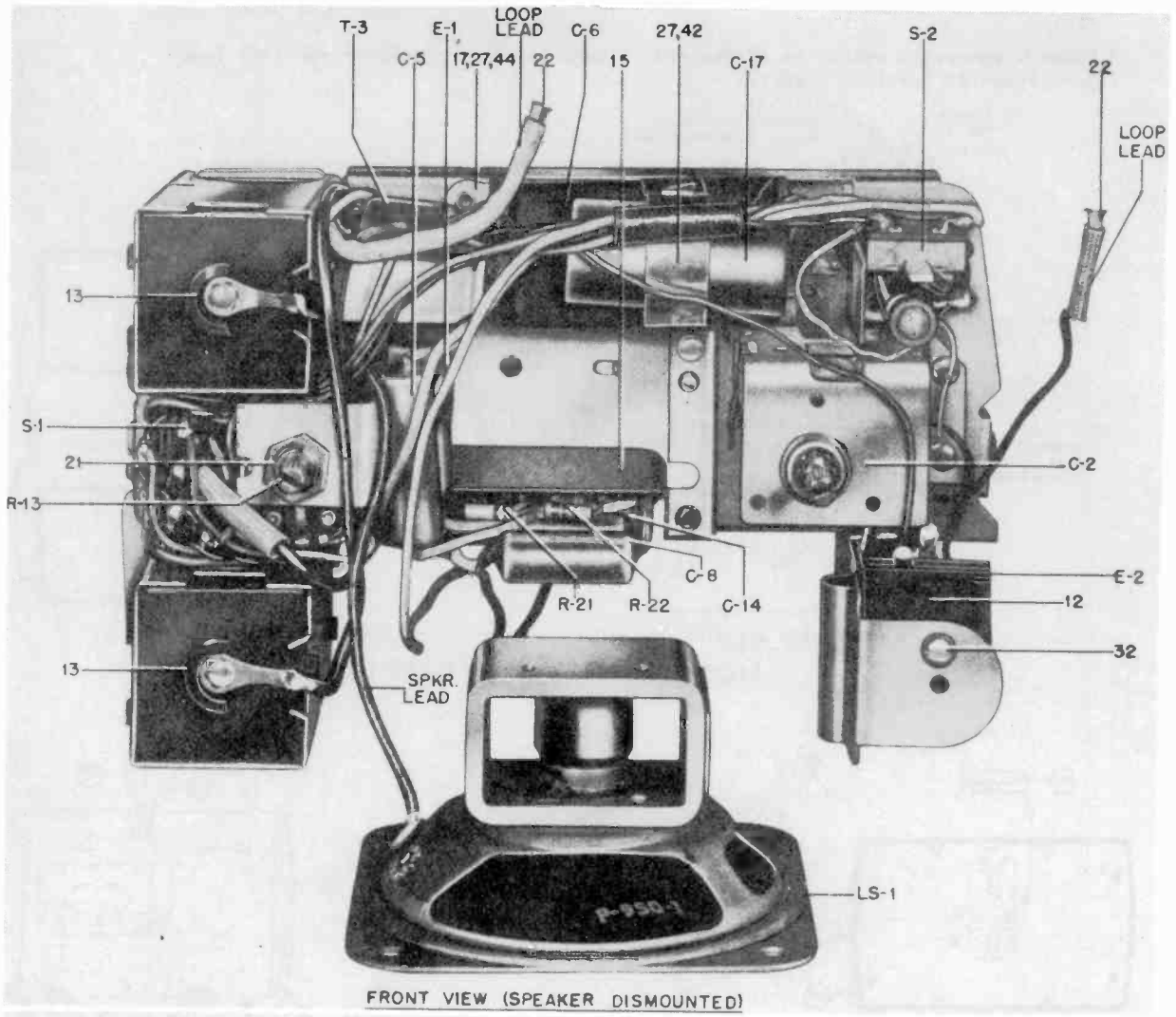


FIGURE 3. CABINET PARTS LOCATION

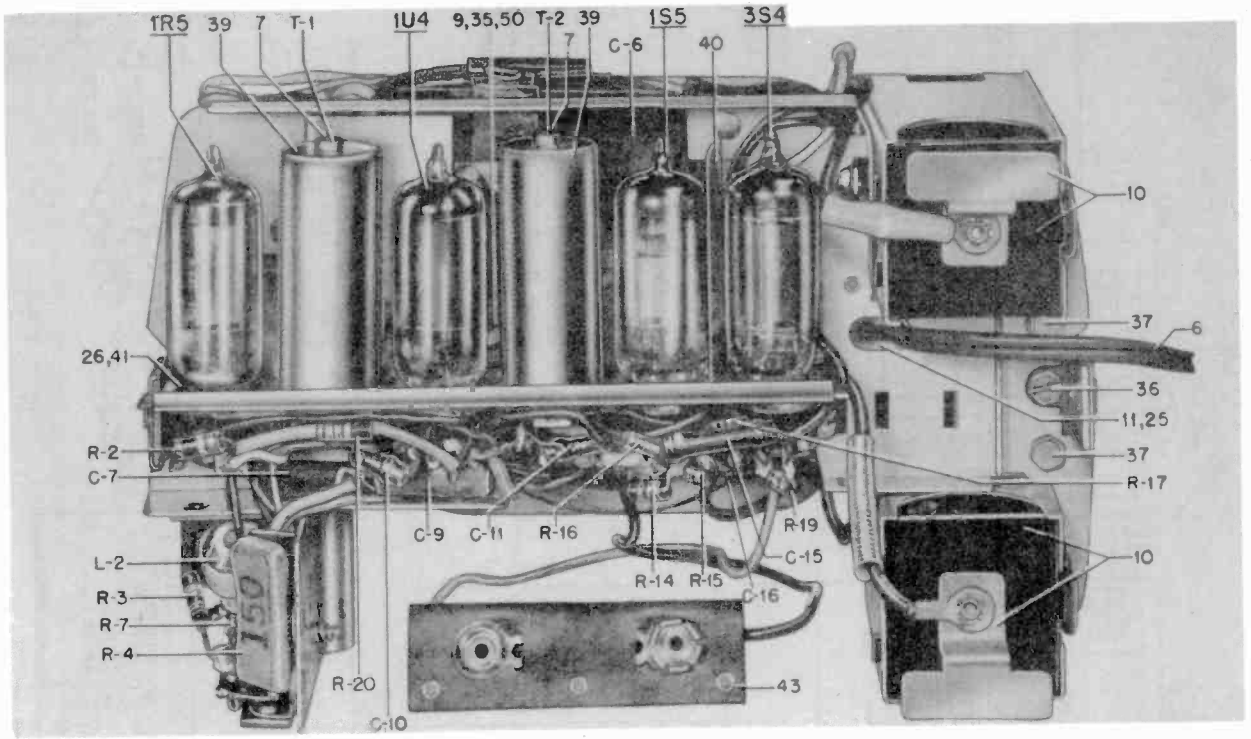
MODELS 5A9B, 5A9M, 5A9S,
Ch. HS-62A; 5A9UB, 5A9UM, Ch. HS-165



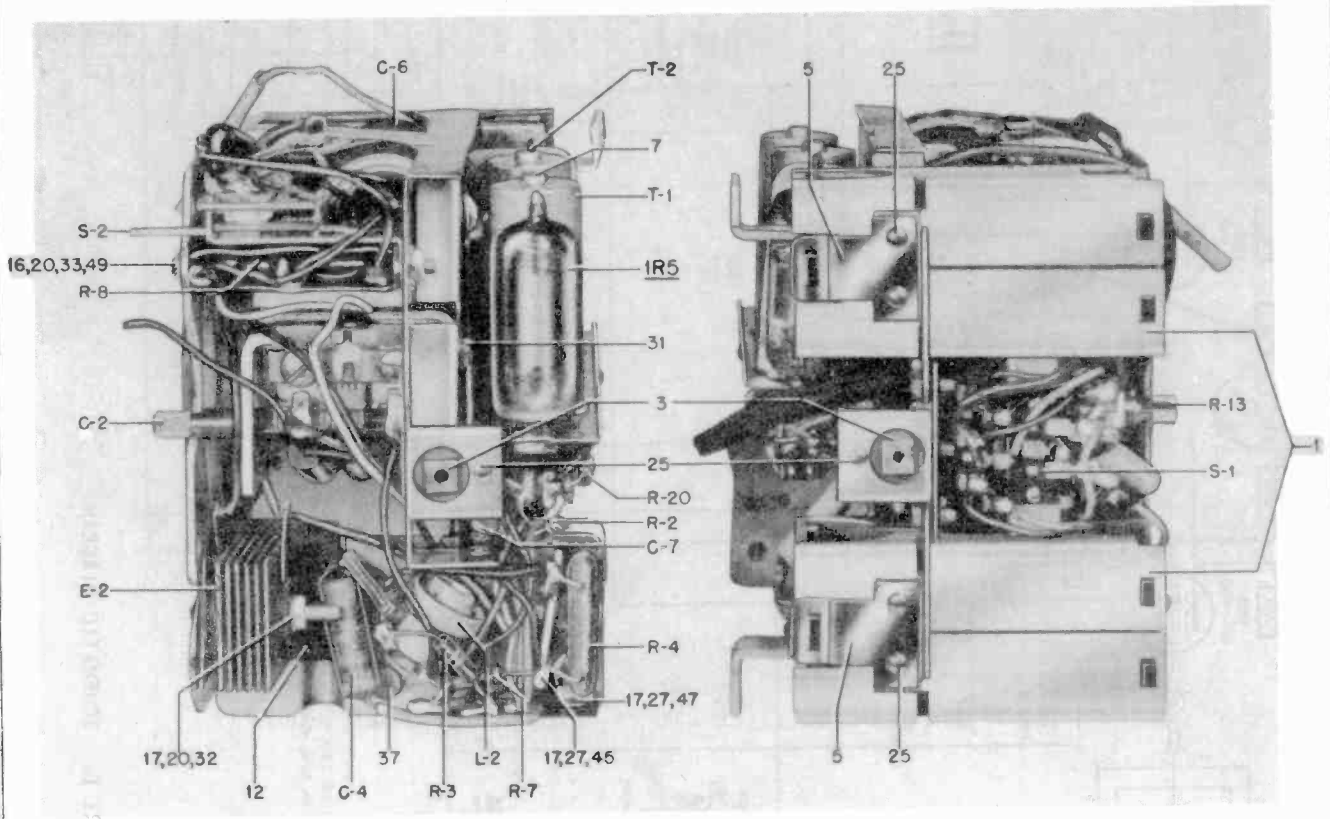
BOTTOM VIEW

FIGURE 4. CHASSIS PARTS LOCATIONS - FRONT & BOTTOM VIEWS

MODELS 5A9B, 5A9M, 5A9S, Ch. HS-62A; 5A9UB, 5A9UM, Ch. HS-165



REAR VIEW



RIGHT SIDE VIEW

LEFT SIDE VIEW

FIGURE 5. CHASSIS PARTS LOCATIONS - REAR & END VIEWS

MODELS 5A9B, 5A9M, 5A9S, Ch. HS-62A; 5A9UB, 5A9UM, Ch. HS-165

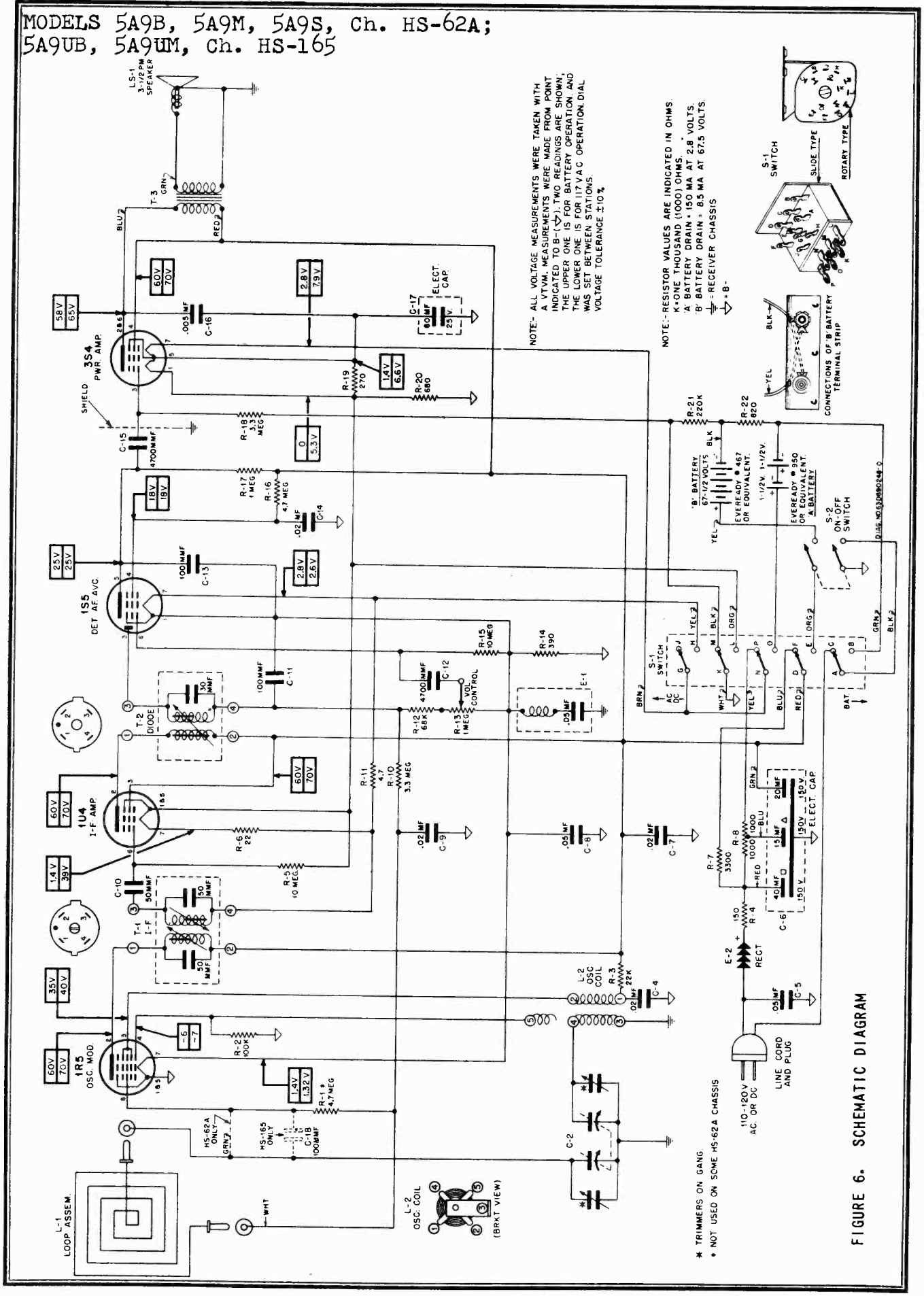


FIGURE 6. SCHEMATIC DIAGRAM

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-2	19B478016	Variable, 2 gang: cut oscillator plates
C-4	8K471628	Paper: .02 mf 100V
C-5	8A470606	Paper: .05 mf 400V
C-6	23B470692	Electrolytic: 40-20-15 mf/150V
C-7	8K471628	Paper: .02 mf 100V
C-8	8A71213	Paper: .05 mf 100V
C-9	8K471628	Paper: .02 mf 100V
C-10	21K77373	Ceramic: 50 mmf 500V
C-11	21B77286	Ceramic: 100 mmf 500V
C-12	21B470567	Ceramic: 4700 mmf 500V
C-13	21B77286	Ceramic: 100 mmf 500V
C-14	8K471628	Paper: .02 mf 100V
C-15	21B470567	Ceramic: 4700 mmf 500V
C-16	8A24966	Paper: .005 mf 100V
C-17	23B470693	Electrolytic: 80 mf 25V
C-18	21B77286	Ceramic: 100 mmf 500V(HS-165 only)
CHOKE & CAPACITOR		
E-1	24A470628	Choke & Tubular Capacitor (.05 mf 200V capacitor)
RECTIFIER		
E-2	48B478111	Selenium Rectifier: half-wave
COILS		
L-1	24K690049	Loop Antenna & Panel Assembly: blk finish (5A9B, 5A9S & 5A9UB)
or	24K478008	Loop Antenna & Panel Assembly: maroon finish (5A9M & 5A9UM)
L-2	24A478022	Oscillator
SPEAKER		
LS-1	50B470620	Speaker: 3-1/2" PM; 3.2 ohm VC
or	50B478023	Speaker: 3-1/2" PM; 3.2 ohm VC
RESISTORS		
Note:		All resistors are insulated carbon type, unless otherwise specified.
R-1	6R2122	4.7 meg (HS-62A only)
R-2	6R6031	100,000
R-3	6R6397	22,000 10%
R-4	17A76986	Wirewound: 150 10% 2-1/2W
R-5	6R2109	10 meg
R-6	6R6406	22 10%
R-7	6R6036	3300
R-8	17A470618	Wirewound: 2,000 10% 5W center tapped
R-10	6R2118	3.3 meg
R-11	17K77629	Wirewound: 4.7 10% 1/2W
R-12	6R6001	68,000
R-13	18A471705	Volume Control: 1 megohm
R-14	6R5554	390 10%
R-15	6R2109	10 meg
R-16	6R2122	4.7 meg
R-17	6R6004	1 meg
R-18	6R2118	3.3 meg
R-19	6R6432	270 10%
R-20	6R6040	680 10%
R-21	6R6015	220,000
R-22	6R6269	820 10%
SWITCHES		
S-1	40A470619	Slide switch: 5PDT (AC-DC/Battery selector-interchangeable with 40B471927)
or	40B471927	Rotary Change-over Switch: 5PDT (AC-DC Battery Selector- interchangeable with 40A470619)
S-2	40A470937	Slide Switch (on-off)
TRANSFORMERS		
T-1	24B480042 or 24B690840	IF, 455 Kc: complete with padding capacitors and tuning cores; less shield
T-2	24B480040	Diode, 455 Kc: complete with padding capacitor and tuning core; less shield
T-3	25B470622	Output
CHASSIS PARTS - MECHANICAL		
1	1X470935	Battery Box and Bracket Assembly: two complete 'A' battery boxes assembled together; includes negative contacts and positive contact insulator catches only
2	7A478012	Bracket, speaker mounting (used only with 50B478023 speaker)
3	1X470835	Bushing and Insulator Assembly (chassis insulated mtg)
4	43K13458	Bushing, plain: brass (used inside sub-chassis shock mtg grommets)
5	55A470913	Catch, battery insulator: phosphor bronze
6	30B470621	Cord, line and plug: 2-conductor, 6 ft lg (HS-62A)
or	30K680022	Cord, line and plug: 2-conductor; 5 ft lg (HS-165)
7	46K680318	Core, iron: threaded (IF & diode trans tuning)
8	15C470942	Cover, chassis (bottom chassis cover)
9	5K470916	Grommet, insulating: rubber (sub-chassis shock mtg)
10	1X470933	Insulator, Lead and Lug Assembly. includes cord clamp ('A' battery box positive contact)
11	14A470614	Insulator, line cord lock: fibre
12	14A478112	Insulator, rectifier: armite
13	1X477026	Insulator, Spring, Lead and Lug Assembly ('A' battery box negative contact)
14	14A470617	Insulator, terminal strip: armite small
15	14A470615	Insulator, terminal strip: armite large
16	4S7666	Lockwasher, ext: #6 (resistor mtg)
17	4S7650	Lockwasher, int: #6 (term strip and rectifier mtg)
18	29R5235	Lug, soldering: #6
19	29R5239	Lug, soldering: #8 (HS-165 only)
20	2S7005	Nut, hex: 6-32 x 1/4; stl; cad pl (resistor and rectifier mtg)
21	2S7018	Nut, hex: 3/8-32 x 1/2; stl; cad pl (vol cont mtg)
22	9A470980	Receptacle, loop lead
23	5S8497	Rivet: .088 x 1/8; stl; nkl pl (line cord lock mtg and bushing & insulator assembly mtg).
24	5S7769	Rivet: .088 x 3/32; stl; nkl pl (term strip mtg)
25	5S7770	Rivet: .088 x 5/32; stl; nkl pl (line cord lock, battery insulator catch and chassis insulator mtg)
26	5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg)
27	5S7706	Rivet: .122 x 1/8; stl; nkl pl (electrolytic strap, ON-OFF switch, terminal strip and battery box & brkt assembly mtg)
28	5S7707	Rivet: .122 x 5/32; stl; nkl pl (spkr screen mtg-HS-165)
29	5S7701	Rivet: .122 x 3/4; stl; nkl pl (term strip mtg)
30	64A680021	Screen, speaker (HS-165)
31	3S7247	Screw, machine: 6-32 x 3/16; slotted hex head locking type; stl; cad pl (gang mtg)
32	3S9663	Screw, machine: 6-32 x 1-1/8; slotted round head; stl; cad pl (rectifier mtg)
33	3S1451	Screw, machine: 6-32 x 2"; slotted round head; stl; cad pl (resistor mtg -HS-62A)
or	3S488195	Screw, machine: 6-32 x 2"; plain round head; stl; cad pl (resistor mtg -HS-165)
34	3S7205	Screw, machine: 8-32 x 1/4 slotted hex head locking type; stl cad pl (spkr mtg)
35	3S2681	Screw, sheet metal: #4 x 3/8; Phillips fillister head thread cutting screw; stl; cad pl (sub-chassis mtg)
36	3S7462	Screw, sheet metal: #6 x 3/16; slotted hex head thread cutting; stl; cad pl (AC/DC Battery sw mtg-center)
37	3S7506	Screw, sheet metal: #6 x 1/4; PKZ plain hex head; stl; cad pl (osc coil and battery box mtg)
38	3S7471	Screw, sheet metal: #6 x 1/4 thread cutting; plain hex head; stl; cad pl (chassis cover mtg-HS-62A)
or	3S7460	Screw, sheet metal: #6 x 1/4; slotted binderhead thread cutting screw; stl; cad pl (chassis cover mtg-HS-165)
39	1K480037	Shield and Sleeve Assembly (for T-1 & T-2)
40	26A470908	Shield, tube
41	9A690129	Socket, tube: miniature; 7-prong
42	42A470607	Strap, electrolytic retainer
43	31K470880	Strip, 'B' battery terminal
44	31A84794	Strip, terminal: 1 insulated lug, end mtg
45	31K86126	Strip, terminal: 2 insulated lugs, #2 mtg (3/8 spacing)
46	31A38311	Strip, terminal: 2 insulated lugs, #2 mtg (1/4" spacing)
47	31A71196	Strip, terminal: 3 insulated lugs, #1 mtg
48	31A470612	Strip, terminal: 5 insulated lugs, hole mtg

49	4A51143	Washer, fibre: 3/8" (resistor mtg) .....
50	3S7554	Washer, flat: 3/8 x 1/8 x .033 thick; stl; cad pl (sub-chassis mtg) .....
51	4S7555	Washer, flat: 1/4 x .128 x 033 thick; stl; cad pl (spkr screen mtg-HS-165).....
CABINET PARTS		
101	36K690047	Button, loop cover: blk plastic (5A9B, 5A9S and 5A9UB) .....
or	36K690473	Button, loop cover: maroon plastic (5A9M & 5A9UM) .....
102	38K690080	Button, plug: wrinkle blk finish (cover for loop ant. trim hole -5A9B, 5A9S and 5A9UB) .....
or	38K690472	Button, plug: wrinkle maroon finish (cover for loop ant. trim hole -5A9M and 5A9UM) .....
103	1X690061	Cabinet: complete;blk crackle finish; includes housing, rear cover with catch, felt feet and armite housing insulators; does not include carrying handle or front cover and loop (5A9B and 5A9S) .....
or	1X690476	Cabinet: same as above except with maroon crackle finish (5A9M) .....
or	1X690126	Cabinet: same as above except with blk crackle finish (5A9UB).....
or	1X690482	Cabinet: same as above except with maroon crackle finish (5A9UM) ....
104	1X690084	Cover, Loop and Front Panel Assembly: includes satin finished chrome front panel, latch retainer stud, two insulated hinges, blk molded speaker grille, blk loop ant and loop cover with latch (5A9B, 5A9S & 5A9UB) .....
or	1X690477	Cover, Loop and Front Panel Assembly: same as above except maroon finish (5A9M and 5A9UM) .....
105	1X690087	Cover and Latch Assembly: blk; loop ant cover with complete latch assembly (5A9B, 5A9S and 5A9UB) ..
or	1X690479	Cover and Latch Assembly: maroon; loop ant cover with complete latch assembly (5A9M & 5A9UM)
106	55A27113	Foot, felt .....
107	13K690051	Grille, speaker: blk plastic (5A9B, 5A9S and 5A9UB) .....
or	13C470873	Grille, speaker: maroon plastic (5A9M and 5A9UM) .....
108	55B690068	Handle, carrying: blk; complete (5A9B, 5A9S and 5A9UB) .....
or	55K690113	Handle, carrying: maroon; complete (5A9M and 5A9UM) .....
109	55K30198	Hinge, back cover .....
110	1X690086	Hinge and Insulator Assembly (front cover hinge) .....
111	14D478014	Insulator, inner housing: right-hand; armite .....
112	14K478079	Insulator, inner housing: left-hand; armite .....
113	36K690050	Knob, control: blk plastic (5A9B, 5A9S and 5A9UB) .....
or	36K690474	Knob, control: maroon plastic (5A9M and 5A9UM) .....
114	54B690229	Label, composite: operating instructions & cover insulator (5A9S)
or	54B690204	Label, composite: operating instructions & cover insulator (5A9B)
or	54B690213	Label, composite: operating instructions & cover insulator (5A9M)
or	54B690214	Label, composite: operating instructions & cover insulator (5A9UB)
or	54B690215	Label, composite: operating instructions & cover insulator (5A9UM)
115	4S8406	Lockwasher, int: #2; stl; cad p' (housing ins and loop lug mtg
116	29R5399	Lug, soldering: #3 .....
117	15K690052	Panel, front: metal; satin chrome finish (5A9B, 5A9S & 5A9UB).....
or	15K690471	Panel, front: metal; satin chrome finish (5A9M and 5A9UM) .....
118	1X690088	Plate and Latch Assembly .....
119	5S7769	Rivet: .088 x 3/32; stl; nkl pl (rear cover hinge mtg).....
120	5S8487	Rivet: .088 x 3/32; stl; blk nkl finish (rear cover catch mtg 5A9B, 5A9S and 5A9UB) .....
or	5S2831	Rivet: .088 x 3/32; stl; statuary bronze finish (rear cover catch mtg -5A9M and 5A9UM).....
121	5S2847	Rivet: .088 x 1/4; stl; blk nkl finish (mounts hinge to front panel-5A9B, 5A9S & 5A9UB)...
or	5S2829	Rivet: .088 x 1/4; stl; statuary bronze finish (mounts hinge to front panel - 5A9M and 5A9UM)
122	5S8490	Rivet: .088 x 5/32; stl; blk nkl finish (housing insulator mtg) .....
123	5S8490	Rivet: .088 x 5/32; stl; blk nkl finish (mounts hinge to loop panel-5A9B, 5A9S and 5A9UB)
or	5S2827	Rivet: .088 x 5/32; stl; statuary bronze finish (mounts hinge to loop panel-5A9M and 5A9UM) .....
124	3S490017	Screw, machine: 4-40 x 1/4; Phillips binderhead; blk nkl finish (chassis to cabinet mtg 5A9B, 5A9S and 5A9UB).....
or	3S476038	Screw, machine: 4-40 x 1/4; Phillips binderhead; statuary bronze finish (chassis to cabinet mtg-5A9M and 5A9UM) .....
125	3S490018	Screw, sheet metal: #2 x 1/4; PKZ Phillips flat head; blk nkl finish (mounts loop to loop cover-5A9B, 5A9S & 5A9UB)...
or	3S3389	Screw, sheet metal: #2 x 1/4; PKZ Phillips flat head; statuary bronze finish (mounts loop to loop cover- 5A9M and 5A9UM) ..
126	3S490019	Screw, sheet metal: #4 x 3/16; PKA Phillips stove head; blk nkl finish (mounts front panel to housing-5A9B, 5A9S and 5A9UB) .....
or	3S3390	Screw, sheet metal: #4 x 3/16; PKA Phillips stove head; statuary bronze finish (mounts front panel to housing-5A9M and 5A9UM) ....
127	1X690083	Spring and Button Assembly (rear cover catch) .....
128	41A470909	Spring, loop door catch .....
129	46K690046	Stud, latch retainer .....
130	46K690079	Stud, trimount: blk nkl finish(on loop panel for actuating on-off switch-5A9B, 5A9S and 5A9UB) ..

SERVICE NOTES

To remove the chassis from the cabinet, remove the two 4-40 screws (one on each side of the cabinet), pull off the tuning knobs, remove the front panel, disconnect the two loop leads from the pin receptacles, and slide the chassis out of the cabinet.

To remove the chassis cover plate, remove the two slotted screws holding the plate to the edge of the large chassis, and with the set lying with speaker cone down, lift the plate up from the chassis.

To remove the gang capacitor, the screws holding the small chassis to the large chassis should be removed. This makes it possible to pull the small chassis strip out of the way so that access can be had to the screws holding the gang.

For access to some of the wiring, the 'A' battery boxes may have to be removed. To do this, remove the two hex-headed screws over the slide switch, leaving the center screw in place. The two boxes and the connecting bracket may now be separated from the chassis. The bottom plates of the battery boxes are wired to the set, but the plates may be removed by bending the ears on the boxes outward.

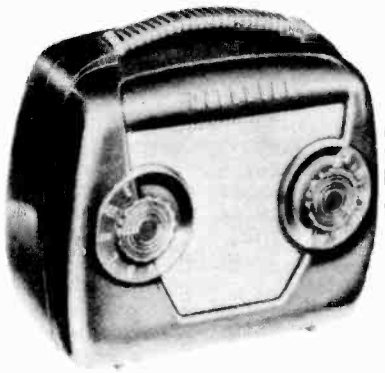
Placement of the four tubes (1R5, 1U4, 1S5 and 3S4) is such that they may be easily removed for servicing by opening the back cover of the set. To reduce microphonic howl, rubber shock mounting is provided for the small chassis holding the tubes and coils. A thin piece of braid serves to bond the two chassis. This braid, as well as all leads connecting the small chassis wiring to the large chassis, should be carefully dressed and free in movement to insure a good floating action of the small chassis.

Insulation between the cabinet (front, back and wrap-around) and chassis is provided for by the bakelite bushing mountings on the sides and by a wrap of armite riveted to the inside of the cabinet. The speaker is held in place by one screw located in the back of the 1S5 tube and a locating ear under the diode coil can. To replace the speaker, remove the 8-32 hex-headed screw, unsolder the voice coil lead receptacle on the speaker and pull the speaker out from the front of the set.

Turning the set "on" or "off" is accomplished by opening or closing the front cover which actuates a push rod connected to a switch. Overthrow has been provided in the switch so that the switch is open circuited before the cover is completely closed. This prevents tolerance between the cover and front panel from causing switch failure. Inserting the line cord plug into the two slots between the battery boxes operates a slide switch which changes the circuit wiring to battery operation. The oscillator coil and tuning capacitor leads should be dressed close to the chassis. This will minimize shifting of oscillator frequency when chassis is installed in its cabinet.

MODELS 49L11Q, 49L13Q;
Ch. HS-183

GENERAL INFORMATION



TYPE - A battery-operated portable receiver. Four miniature type tubes are used in a superheterodyne circuit.

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT - 1R5 - Converter
1U4 - IF Amplifier
1U5 - Detector, AVC & 1st AF Amplifier
3S4 - Power Amplifier

POWER SUPPLY - Operates from the following batteries:

Two 1-1/2V flashlight cells (Eveready #950 or equivalent)
One 67-1/2V 'B' battery (Eveready #467 or equivalent)

INSTALLATION & OPERATING INSTRUCTIONS

CONTROLS. The power switch is combined and operated with the volume (left-hand) knob.

BATTERY OPERATION. Open the rear cover and install the batteries. The rear cover is opened by inserting the fingertips into the slots under the handle and pulling back. See Figure 1 for complete battery installation instructions.

When low volume or fuzzy tone is noticed, replace the flashlight cells. Normally, the 67-1/2 volt 'B' battery will last for 3 or 4 changes of flashlight cells.

If the receiver is to be placed in storage, remove the batteries and store them in a cool place; this will prevent battery leakage and possible damage to the receiver. Replace or remove run-down batteries immediately, or they will leak and damage receiver.

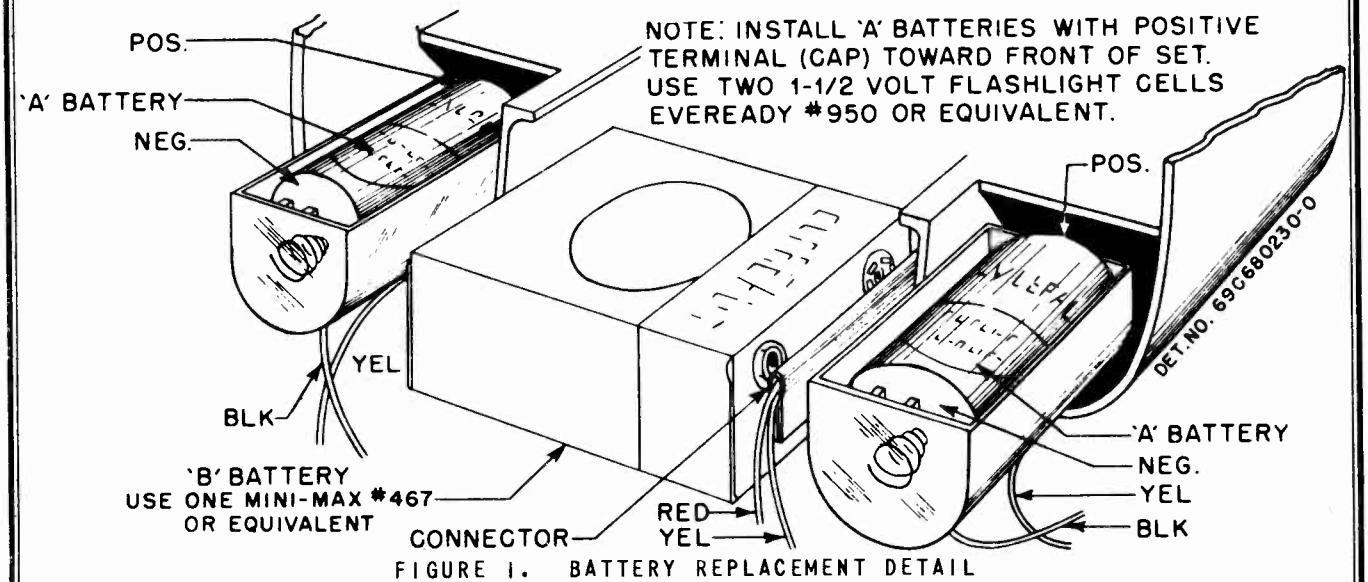


FIGURE 1. BATTERY REPLACEMENT DETAIL

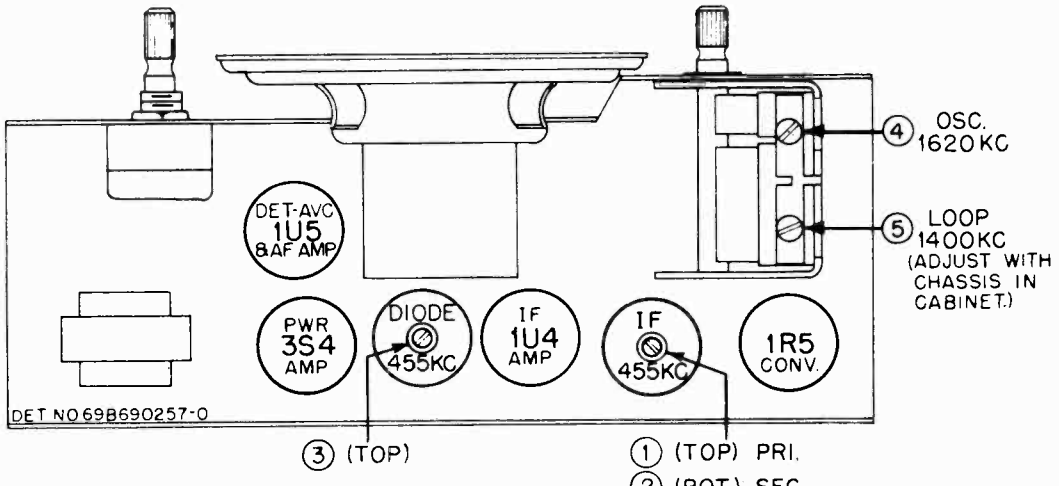


FIGURE 2. TUBE & TRIMMER LOCATIONS

SERVICE NOTES

Tubes can be replaced without removing the chassis from the cabinet; open the back cover and remove the chassis insulator to expose the tubes. Two plug buttons hold the chassis insulator in position.

To remove the chassis from the cabinet:

1. Remove the control knobs.
2. Open the back cover and remove the chassis insulator.
3. Disconnect the two loop leads from the pin receptacles.
4. Remove the two Phillips head screws on each end of the chassis and slide the chassis out of the cabinet.

ALIGNMENT

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

Loop antenna should be connected to chassis during alignment.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	DIAL SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Rear stator of tuning capacitor.	455 Kc	Gang opened	1, 2 & 3	Adjust for maximum.
RF ALIGNMENT						
2.	.1 mf	"	1620 Kc	"	4	Adjust for maximum.
3.	-	-	-	-	-	**Install chassis in cabinet, leaving output meter connected to speaker.
4.	-	Radiation loop*	1400 Kc	Tune for maximum	5	Adjust for maximum. Trimmer is reached through hole under left-hand battery holder.

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

** As an alternate method, the output meter may be disconnected at this point and the set installed in the cabinet. Tune in a weak station near 1400 Kc and adjust trimmer #5 through the hole in the bottom of the cabinet for maximum signal output.

MODELS 49L11Q, 49L13Q;
Ch. HS-183

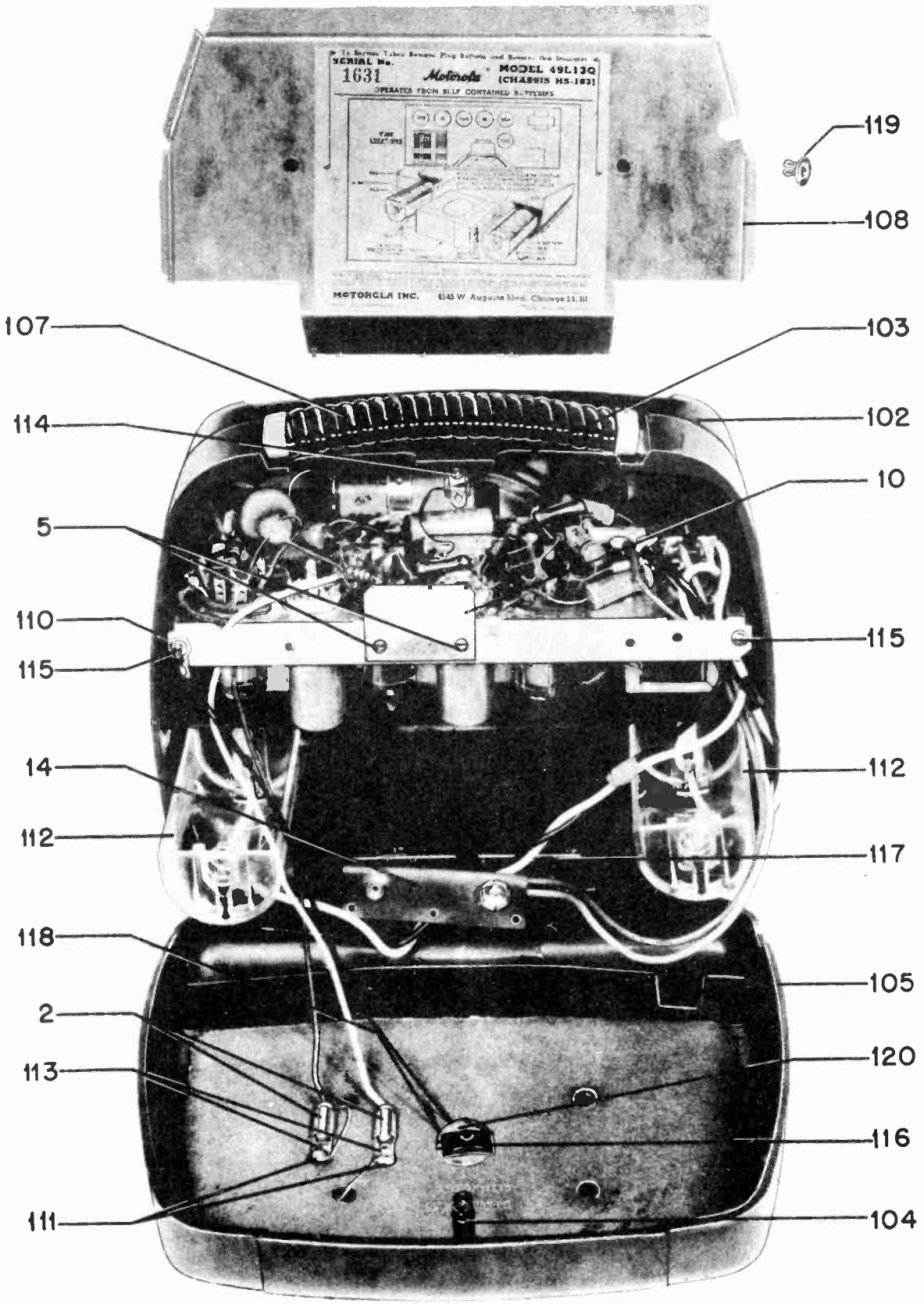


FIGURE 3. PARTS LOCATION - CABINET REAR VIEW

MODELS 49L11Q, 49L13Q;
Ch. HS-183

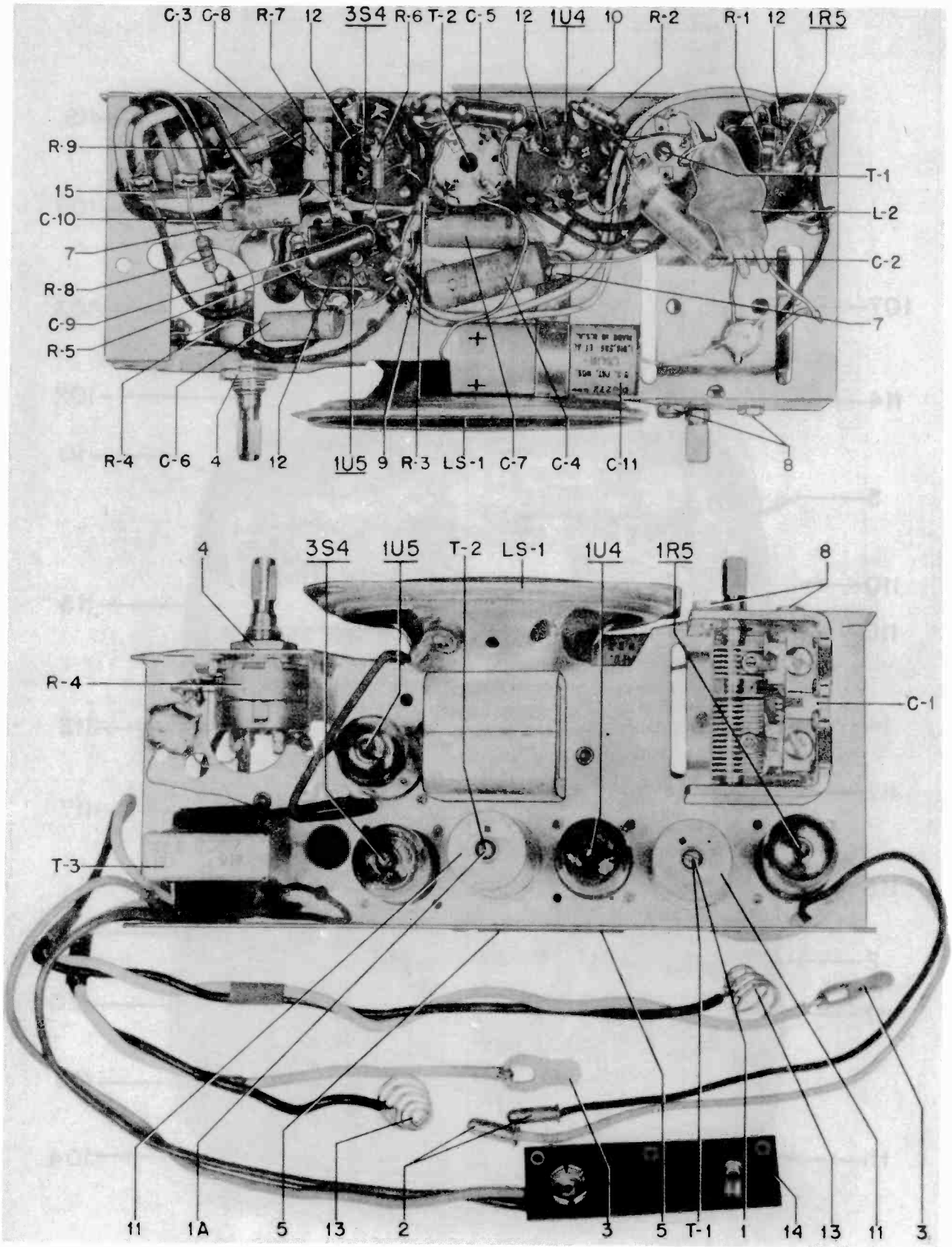


FIGURE 4. PARTS LOCATION - CHASSIS TOP & BOTTOM

MODELS 49L11Q, 49L13Q;
Ch. HS-183

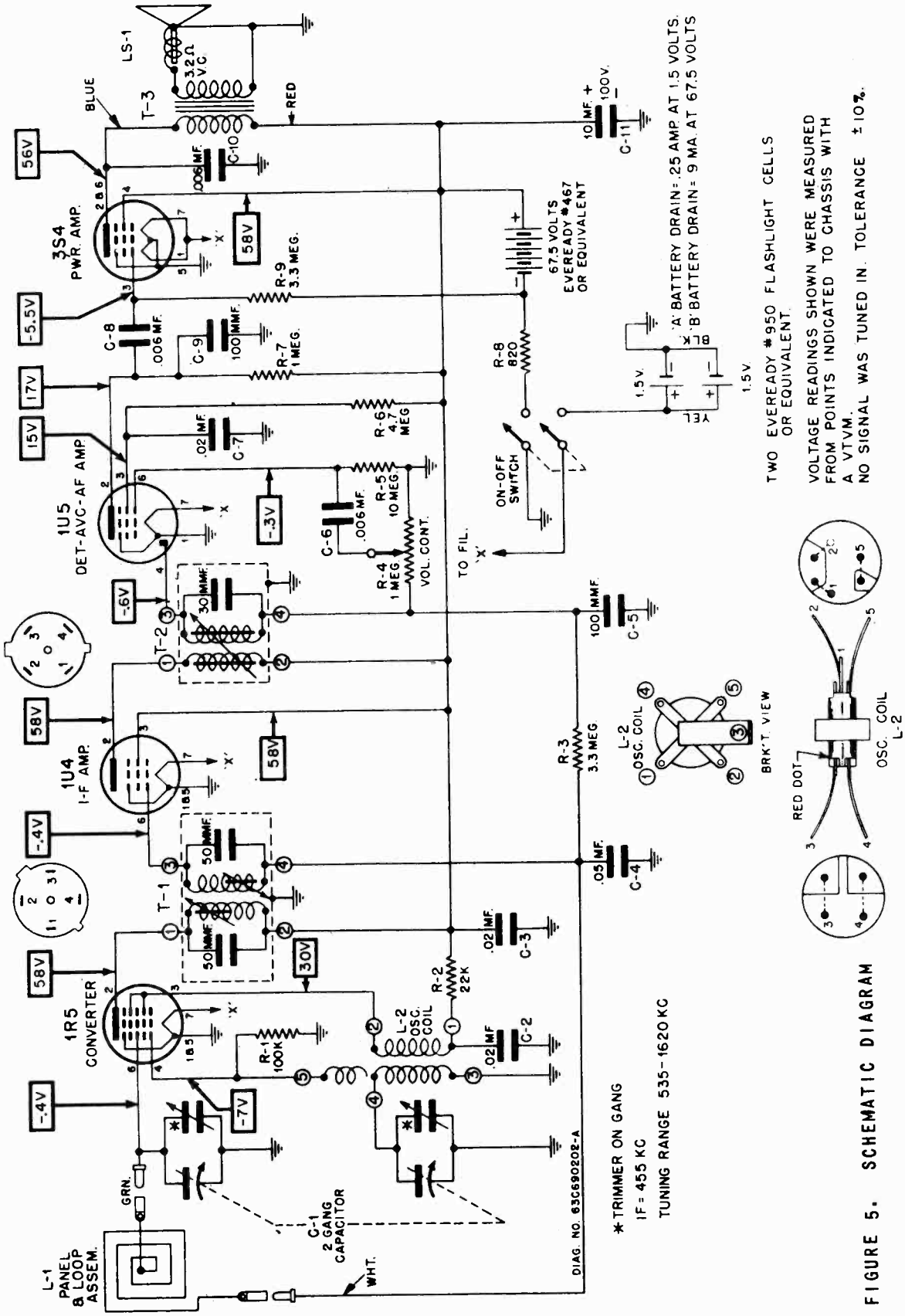


FIGURE 5. SCHEMATIC DIAGRAM

MODELS 49L11Q, 49L13Q;
Ch. HS-183

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	19K680360	Variable: 2 gang .....
C-2	8K471628	Paper: .02 mf 100V .....
C-3	8K471628	Paper: .02 mf 100V .....
C-4	8A71213	Paper: .05 mf 100V .....
C-5	21B77286	Ceramic: 100 mmf 500V .....
C-6	8C4529	Paper: .006 mf 100V .....
C-7	8K471628	Paper: .02 mf 100V .....
C-8	8C4529	Paper: .006 mf 100V .....
C-9	21B77286	Ceramic: 100 mmf 500V .....
C-10	8C4529	Paper: .006 mf 100V .....
C-11	23A75235	Electrolytic: 10 mf 100V .....
COILS		
L-1	24B480092	Panel and Loop Assembly .....
L-2	24A485989	Oscillator coil .....
RESISTORS		
Note:	All resistors are carbon, insulated type unless otherwise specified.	
R-1	6R6031	100,000 10% 1/2W .....
R-2	6R6397	22,000 10% 1/2W .....
R-3	6R2118	3.3 meg 20% 1/2W .....
R-4	18K480039	Volume control: 1 meg; with DPST switch .....
R-5	6R2109	10 meg 20% 1/2W .....
R-6	6R2122	4.7 meg 20% 1/2W .....
R-7	6R6004	1 meg 20% 1/2W .....
R-8	6R6269	820 10% 1/2W .....
R-9	6R2118	3.3 meg 20% 1/2W .....
SPEAKER		
LS-1	50B480048	
or	50B482759	Speaker: 3-1/2" PM; 3.2 ohm VC.
TRANSFORMERS		
T-1	24B480042	
or	24B690840	IF transformer: 455 Kc; complete with tuning cores and padding capacitors, but less shield...
T-2	24B480040	Diode transformer: 455 Kc: complete with tuning cores and padding capacitors, but less shield .....
T-3	25B470622	Output transformer .....
CHASSIS PARTS - MECHANICAL		
1	46K680318	Core, iron: threaded (T-1) ....
1A	46A470885	Core, iron: threaded (T-2)
2	5S7855	Eyelet: .156 x .484 (loop lead tips) .....
3	29R3020	Lug, soldering (battery contact) .....
4	2S7051	Nut, hex: 3/8-32 x 9/16; stl cad pl (vol control mtg)...
5	5S7769	Rivet: .088 x 3/32; stl; nkl pl (shield mtg) .....
6	5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg) .....
7	5S7706	Rivet: .122 x 1/8; stl; nkl pl (electrolytic and terminal strip mtg) .....
8	3S7247	Screw, machine: 6-32 x 3/16; slotted locking hex head; stl: cad pl (tuning capacitor mounting) .....
9	3S7205	Screw, machine: 8-32 x 1/4; slotted locking hex head; stl; cad pl (spkr mtg)....
10	26A480034	Shield, circuit .....
11	1K480037	Shield & Sleeve Assembly (for T-1, part no. 24B480042 & T-2)
or	26K480038	Shield, coil (for T-1, part no. 24B690840) .....
12	9A472534	Socket, tube: 7-prong miniature; wafer type .....
13	41K680029	Spring, battery contact ....
14	31A480032	Strip, terminal ('B' battery connector) .....
15	31K51511	Strip, terminal: 3 insulated lugs, #3 gnd; 3/8 spacing ..
CABINET PARTS		
101	35B690002	Baffle, speaker: cardboard ....
102	1X690081	Cabinet Assembly: tan; complete with handle, grille and back cover catch; less back cover and hinge spring (49L11Q).....
or	1X690491	Cabinet Assembly: green; complete with handle, grille and back cover catch; less back cover and hinge spring (49L13Q)
103	42A480079	Clip, fuse (cover catch) ...
104	42A480078	Clip, speed (on back cover catch stud) .....
105	16K690076	Cover, cabinet back: tan (49L11Q)
or	16K690141	Cover, cabinet back: green (49L13Q) .....
106	13C690005	Grille, speaker .....
107	55K690069	Handle, carrying (49L11Q) ....
or	55K690112	Handle, carrying (49L13Q) .....
108	14C480095	Insulator, chassis: gray fibre.
109	36K690072	Knob, control: tan (49L11Q) ...
or	36K690148	Knob, control: green (49L13Q) ..
110	29A690089	Lug, clinch (connects cover stop cord to chassis) .....
111	9A481743	Receptacle, 1 pin (on loop).
112	15B481896	Retainer, 'A' battery: plastic.
113	5S7720	Rivet: .083 x 1/8 stl; nkl pl (loop receptacle mtg).....
114	3S488008	Screw, machine: #4 x 1/4; Phillips round head; thread cutting type; stl; cad pl (cover catch mtg) .....
115	3S490390	Screw, sheet metal: #4 x 3/8 Phillips round head; thread cutting type; stl; cad pl (chassis mtg) .....
116	2S7089	Speednut: .187 round; 3/8 x 5/8; blk parkerized finish (loop and grille retainer)..
117	41A480094	Spring, hinge (back cover)...
118	30A690007	Stop Assembly, cover: includes cord and lug .....
119	46B480108	Stud, trimount (chassis insulator mtg) .....
120	4K19943	Washer, paper: 11/16 x 17/64 x 1/32 thick (cover stop cord guard) .....

GENERAL INFORMATION

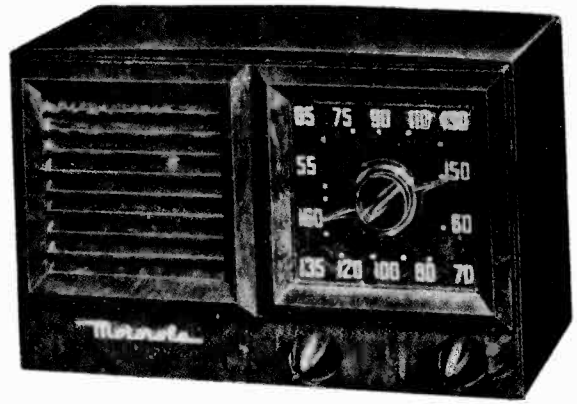
TYPE - AC-DC table model superheterodyne with loop antenna.

TUNING RANGE - 535 to 1620 Kc

IF FREQUENCY - 455 Kc

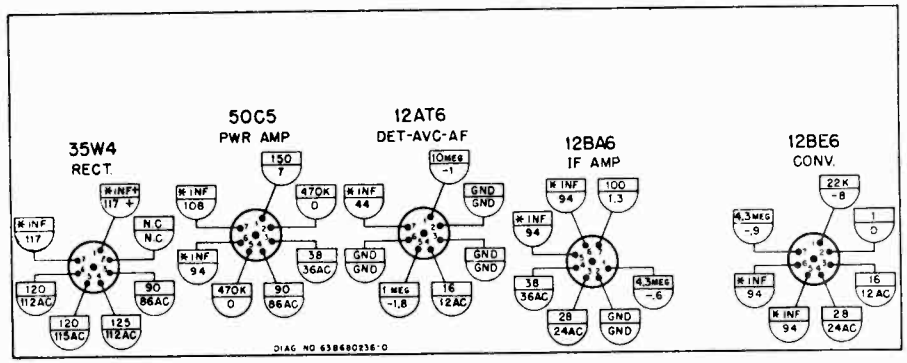
TUBE COMPLEMENT - 12BE6 - Converter
12BA6 - IF Amplifier
12AT6 - Detector, AVC & 1st AF Amp
50C5 - Power Amplifier
35W4 - Rectifier

POWER SUPPLY - 105-125V AC or DC, 30 watts



58G11 Walnut Cabinet 58G12 Ivory Cabinet

CAUTION: Never connect antenna or chassis to water pipe, radiator or other ground. The chassis of this receiver is connected directly to the power line. When operating chassis outside of its cabinet (from an AC power line) use an isolating transformer between power line and receiver to reduce possibility of electrical shock.



NOTE: ▭ = RESISTANCE MEASUREMENTS.
⌓ = VOLTAGE MEASUREMENTS.
\+ = TIE POINT.
GND = GROUND TO CHASSIS.
N.C. = NO CONNECTION.
K = 1000 (ONE THOUSAND) OHMS.
* = MEASUREMENTS MAY VARY DEPENDING ON CONDITION OF ELECTROLYTIC CAPACITOR.

RESISTANCE MEASUREMENTS ±20%
VOLTAGE MEASUREMENTS ± 10%
MEASUREMENTS TAKEN WITH A V.T.V.M.
MEASUREMENTS MADE FROM TUBE BASE PIN TERMINAL TO CHASSIS.
VOLTAGE MEASUREMENTS TAKEN WITH 117 V.A.C. INPUT.
ALL VOLTAGE MEASUREMENTS D.C. UNLESS OTHERWISE SPECIFIED.
VOLUME CONTROL AT MINIMUM NO STATION TUNED IN.

FIGURE 1. VOLTAGE AND RESISTANCE DIAGRAM

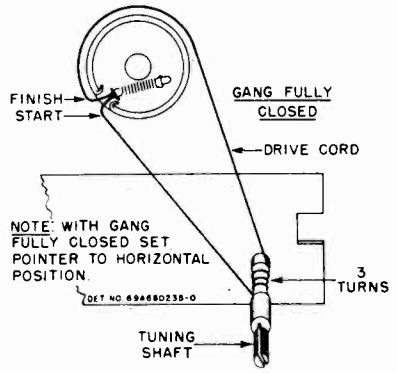


FIGURE 2. DIAL RESTRINGING DETAIL

MODELS 58G11,
58G12; Ch. HS-160

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment. Follow the procedure carefully.

A low range output meter should be connected to the speaker voice coil terminal and receiver chassis. Set receiver volume control to maximum. For greatest accuracy, keep output of receiver at .05 watt (.05 watt = .40 volt on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.

To adjust the IF and diode transformers, use a small fibre screwdriver and do not use undue pressure as damage to the core or coil form may result.

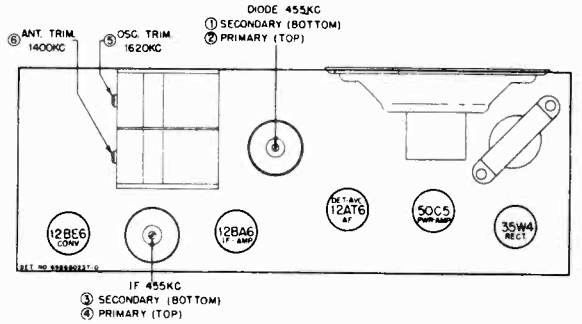


FIGURE 3. TUBE & TRIMMER LOCATIONS

STEP	DIAL SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
IF ALIGNMENT						
1.	Gang fully opened	.1 mf	Converter Grid & chassis*	455 Kc	1,2,3 & 4	Adjust for maximum.
RF ALIGNMENT						
2.	Gang fully opened	.1 mf	Converter Grid & chassis*	1620 Kc	5	This sets oscillator to dial scale.
3.	1400 Kc	None	Radiation loop**	1400 Kc	6	Tune signal in on receiver, then adjust ant. trimmer (6) for maximum.

* A convenient point for this connection is the stator lug of the loop section of the tuning capacitor.

** Connect output of signal generator to a 5" diameter, 3 turn loop and bring loop close enough to receiver loop to obtain output of 50 milliwatts (.40) on output meter. Vary distance between loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".

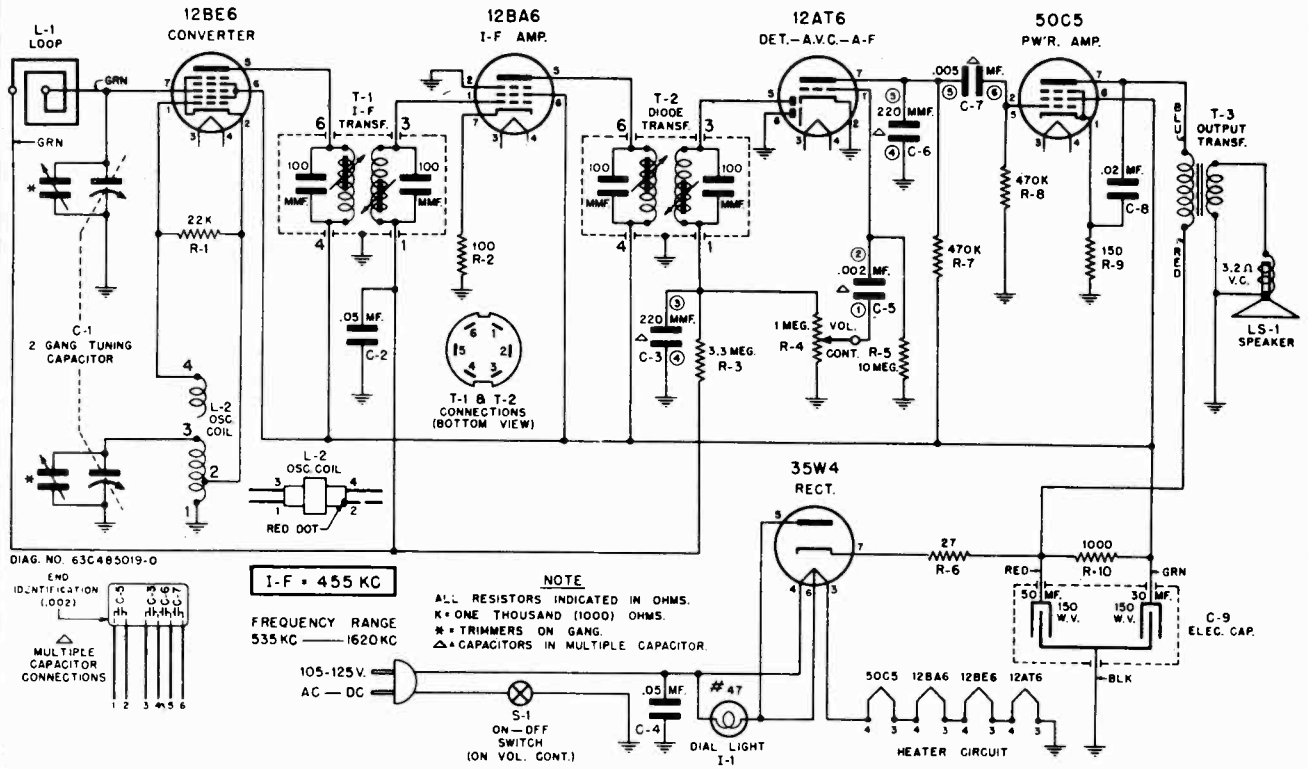


FIGURE 4. SCHEMATIC DIAGRAM

MODELS 58G11, 58G12;
Ch. HS-160

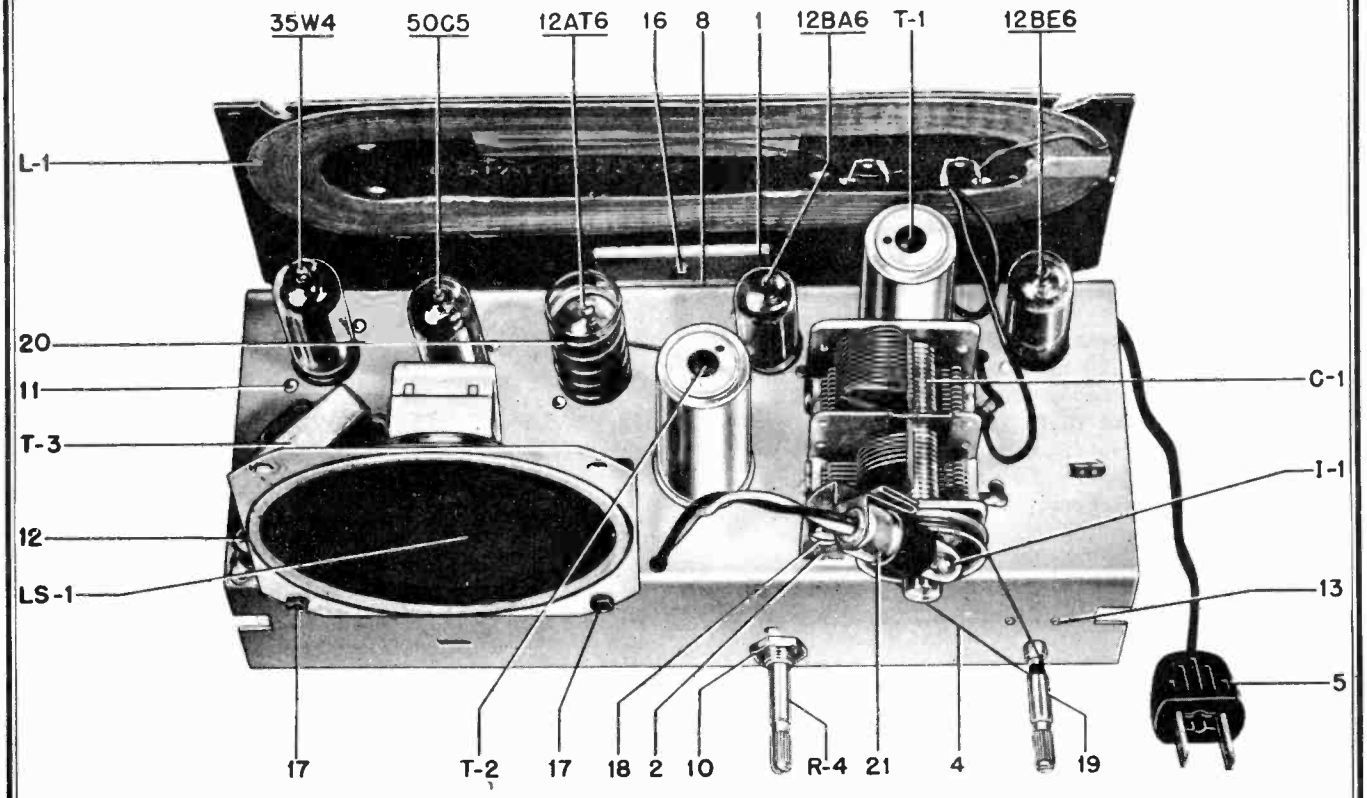


FIGURE 5. CHASSIS PARTS LOCATION - TOP VIEW

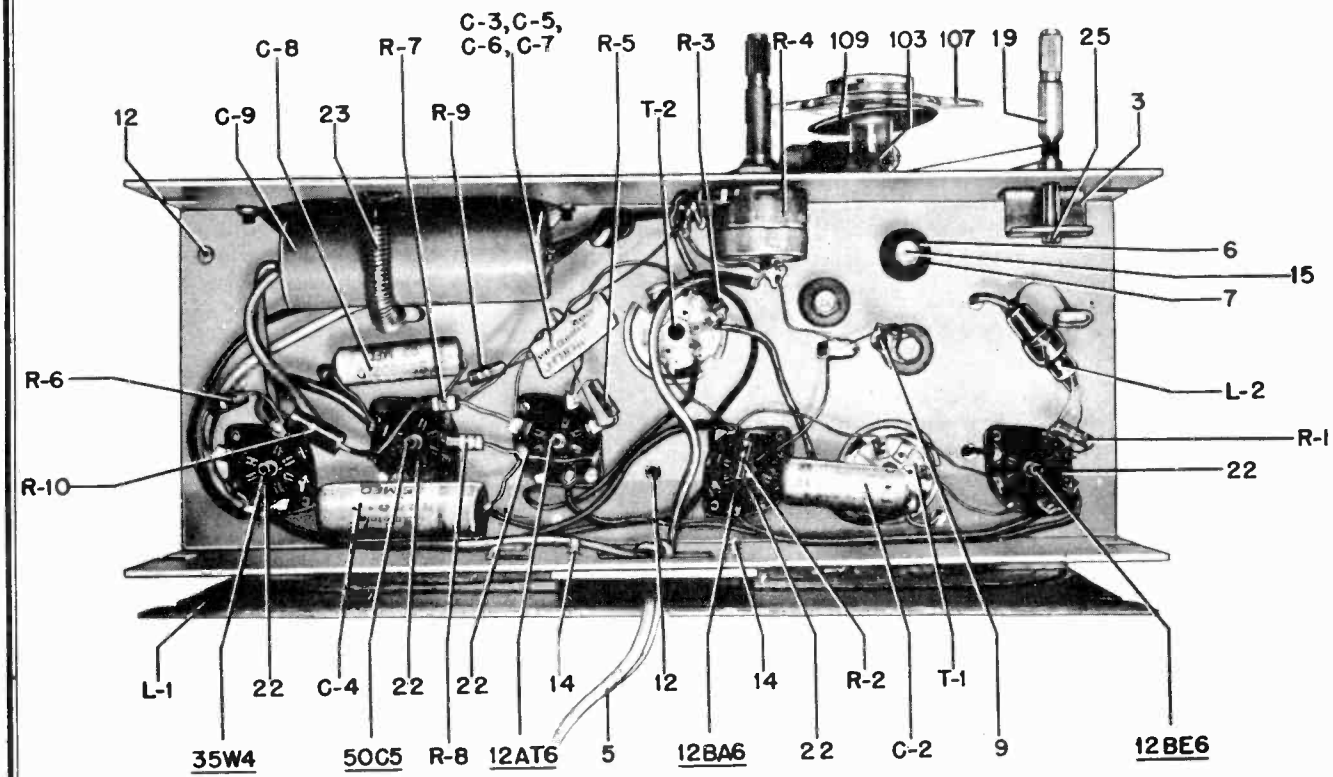


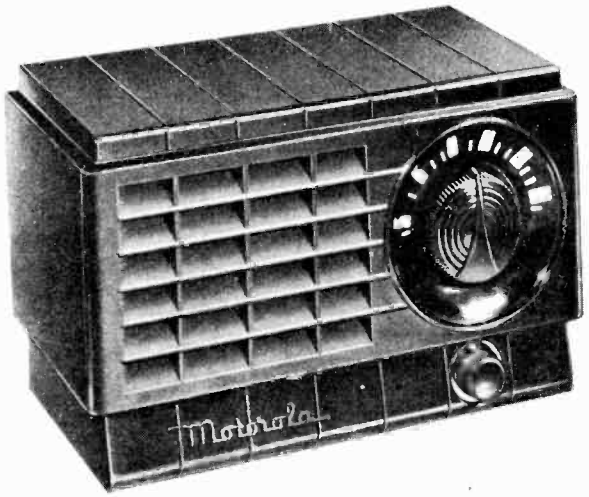
FIGURE 6. CHASSIS PARTS LOCATION - BOTTOM VIEW

MODELS 58G11,
58G12; Ch. HS-160

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	1X485960	Variable: 2 gang; with pulley
C-2	8S9821	Paper: .05 mf 200V .....
C-3,5 6,7	21B482847	Ceramic, multiple: includes 220 mmf (C-3), .002 mf (C-5), 220 mmf (C-6) & .005 mf (C-7) .....
C-4	8S9816	Paper: .05 mf 400V .....
C-8	8S9802	Paper: .02 mf 400V .....
C-9	23K482857	Electrolytic: 50-30 mf/150V.
DIAL LIGHT		
I-1	65X11854	Bulb: 6.3V - .15 Amp; tubular, clear, #47 .....
COILS		
L-1	24C485970	Loop Antenna: includes back panel
L-2	24K482855	BC Oscillator Coil .....
SPEAKER		
LS-1	50C478138	Speaker: 4" PM; 3.2 ohm VC..each exch.
RESISTORS		
Note; All resistors are insulated carbon type, 20%, unless otherwise specified.		
R-1	6R6028	22,000 1/2W .....doz.
R-2	6R6018	100 1/2 watt .....doz.
R-3	6R2118	3.3 meg 1/2 watt .....doz.
R-4	18A70032	Volume Control: 1 meg with SPST switch .....
R-5	6R2109	10 meg 1/2 watt .....doz.
R-6	6R5683	27 10% 1/2 watt .....doz.
R-7	6R6032	470,000 1/2 watt .....doz.
R-8	6R6032	470,000 1/2 watt .....doz.
R-9	6R3992	150 1/2 watt .....doz.
R-10	6R3953	1,000 1 watt .....each doz.
TRANSFORMERS		
T-1	24B482863	IF, 455 Kc: complete .....
T-2	24B482865	Diode, 455 Kc: complete ....
T-3	25K485973	Output Transformer .....
CHASSIS PARTS - MECHANICAL		
1	7K485971	Bracket, loop mtg .....
2	7A485965	Bracket, pilot light mtg ...doz.
3	7A77337	Bracket, tuning shaft .....
4	11M8944	Cord, dial: #18; black .....yd.
5	30A470651	Cord, line and plug: 6 ft long
6	5A19658	Eyelet, spacer (gang mtg) ..doz.
7	5A70404	Grommet, rubber (gang mtg) .doz.
8	14A482844	Insulator, cord outlet .....doz.
9	29R3010	Lug, soldering: #6 hot-tinned .....doz.
10	2S7051	Nut, palnut: 3/8-32 x 9/16 hex; stl; cad pl (volume control mounting) .....doz.
11	5S7771	Rivet: .088 x 3/16 stl; nkl pl (tube socket mtg) .....per/c
12	5S7707	Rivet: .122 x 5/32 stl; nkl pl (tube shield mtg and transformer mtg) .....per/c
13	5S7701	Rivet: .122 x 3/16 stl; nkl pl (tuning shaft bracket mtg) per/c
14	3S3398	Screw, sheet metal: #6 x 3/8 PKZ plain hex head; stl; cad pl (antenna bracket mounting) .....per/c
15	3S2294	Screw, machine: 6-32 x 1/2 plain hex head locking type; stl; cad pl (gang mtg) .....doz.
16	3S7455	Screw, sheet metal: #8 x 3/8 PKA slotted acorn head; antique copper finish (antenna mtg) .....doz.
17	3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; stl; cad pl (speaker mtg) .....per/c
18	3S7205	Screw, machine: 8-32 x 1/4 slotted hex head stl; cad pl (pilot light bracket mtg)doz
19	47A482845	Shaft, tuning .....
20	26A481521	Shield, spring tube .....doz.
21	9A485979	Socket, pilot light: includes leads .....
22	9A472534	Socket, tube: miniature ....
23	41A73996	Spring, tension (electrolytic mtg) .....
24	41A14244	Spring, tension coil(drive cord) .....doz.
25	4A70015	Washer, 'C'(tuning shaft retainer) .....per/c
26	4K482859	Washer, insulated shoulder (antenna bracket mtg) .....doz.
27	4S7633	Washer, flat: 9/16-11/64 x .033 thick; stl; cad pl(antenna mtg) .....doz.
CABINET PARTS		
101	16E485975	Cabinet, table model: molded; walnut (58G11) .....
102	16K485977	Cabinet, table model: molded; ivory (58G12) .....
103	42A485984	Clip, pointer retainer .....doz.
104	36A485968	Knob, control: walnut (58G11)
105	36K485969	Knob, control: ivory (58G12)
106	38A25507	Plug, split (back mtg) .....doz.
107	52B485985	Pointer, dial .....
108	3S7374	Screw, machine: 8-32 x 5/16; slotted hex head; stl; cad pl (chassis mtg) .....per/c
109	4K485986	Washer, felt .....doz.

MODELS 58R11A, 58R12A, 58R13A, 58R14A, 58R15A, 58R16A; Ch. HS-184



58R11A Brown Plastic Cabinet
58R12A White Plastic Cabinet
58R13A Red Plastic Cabinet
58R14A Grey Plastic Cabinet
58R15A Green Plastic Cabinet
58R16A Yellow Plastic Cabinet

GENERAL INFORMATION

TYPE - AC-DC table model superheterodyne with loop antenna.

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT - 12BE6 Converter
12BA6 IF Amp
12AT6 Det. AVC & AF Amp
50C5 Power Amp
35W4 Rectifier

POWER SUPPLY - Operates from 117 volts AC or DC, 50 to 60 cycles, 35 watts

POWER SWITCH & VOLUME CONTROL. Operated with small lower knob. NOTE: Reverse the line plug in the electrical outlet if the radio does not operate from DC. When operating from AC, reversing the line cord plug in wall outlet may sometimes improve reception and reduce hum.

TUNING. Tune in station with large upper knob.

ANTENNA. A loop antenna is built into this receiver, eliminating the need for an external antenna. Reception from some stations may be improved by rotating the whole receiver; this is due to the slight directional characteristic of the loop antenna. In extremely noisy locations, rotate the entire receiver till minimum noise and maximum signal pickup are obtained. For additional pickup, an external antenna may be connected by winding lead-in wire in slots on radio back panel.

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

MODELS 58R11A, 58R12A, 58R13A,
58R14A, 58R15A, 58R16A; Ch. HS-184

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.

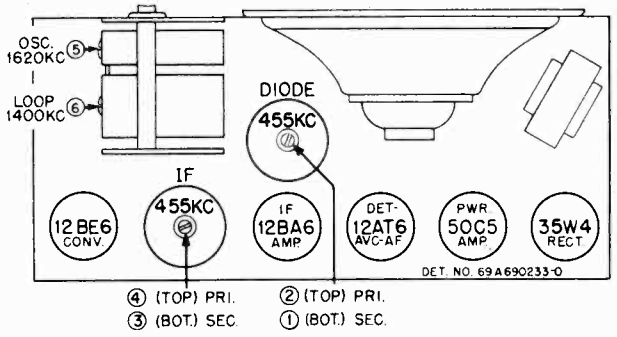


FIGURE 1. TUBE & TRIMMER LOCATION

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	POINTER SET TO	ADJUST	REMARKS
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.

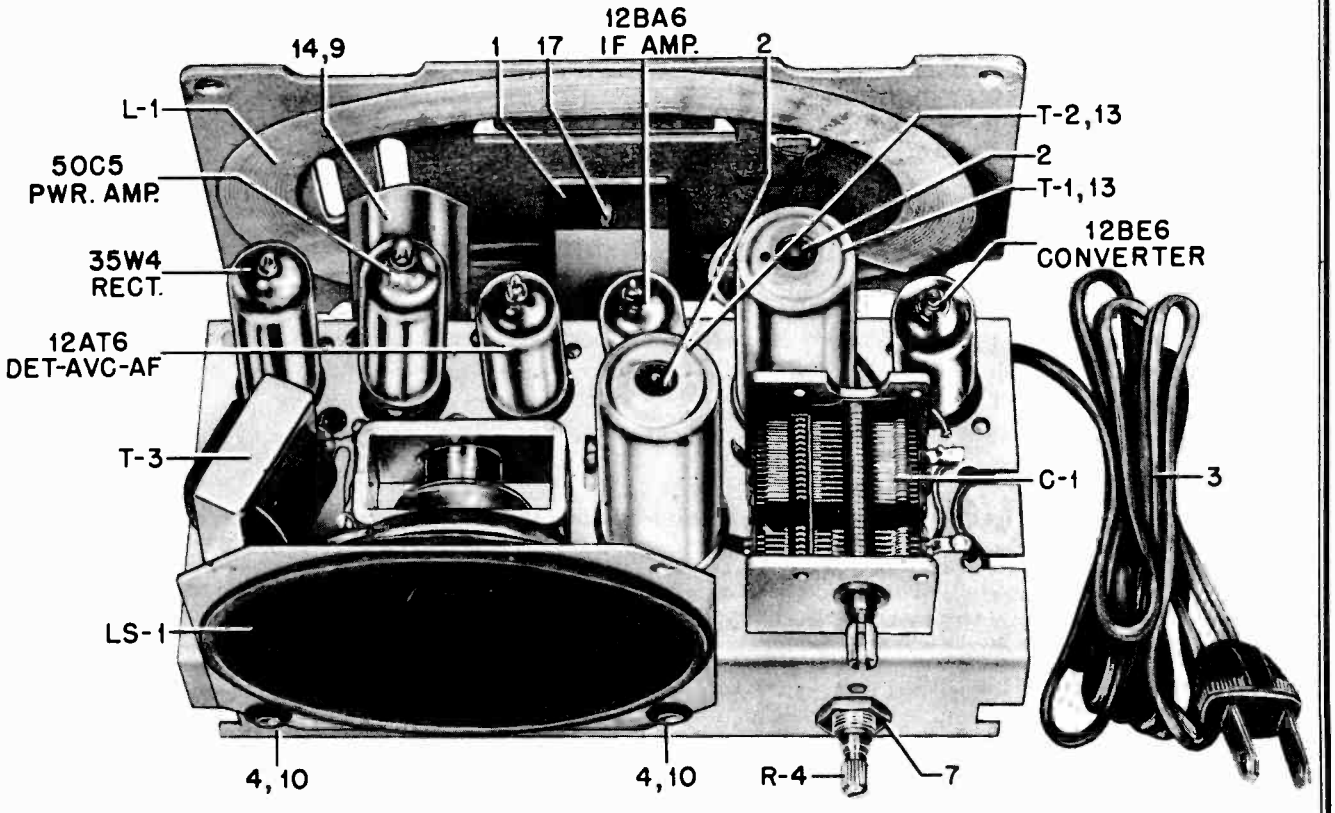


FIGURE 2. PARTS LOCATION - CHASSIS TOP VIEW

MODELS 58R11A, 58R12A, 58R13A,
58R14A, 58R15A, 58R16A; Ch. HS-184

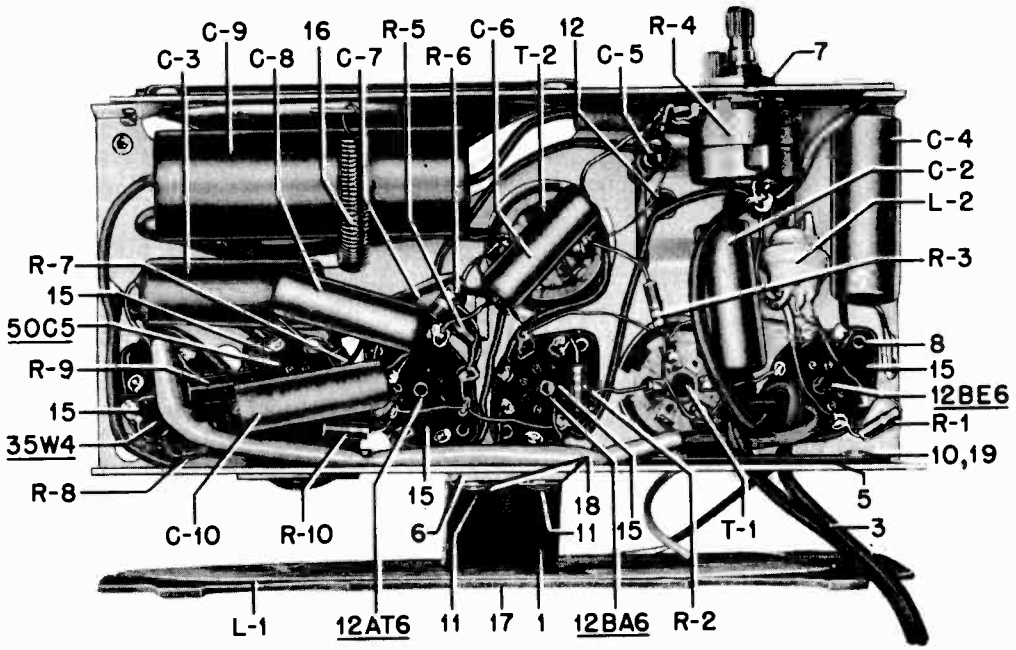


FIGURE 3. PARTS LOCATION - CHASSIS BOTTOM VIEW

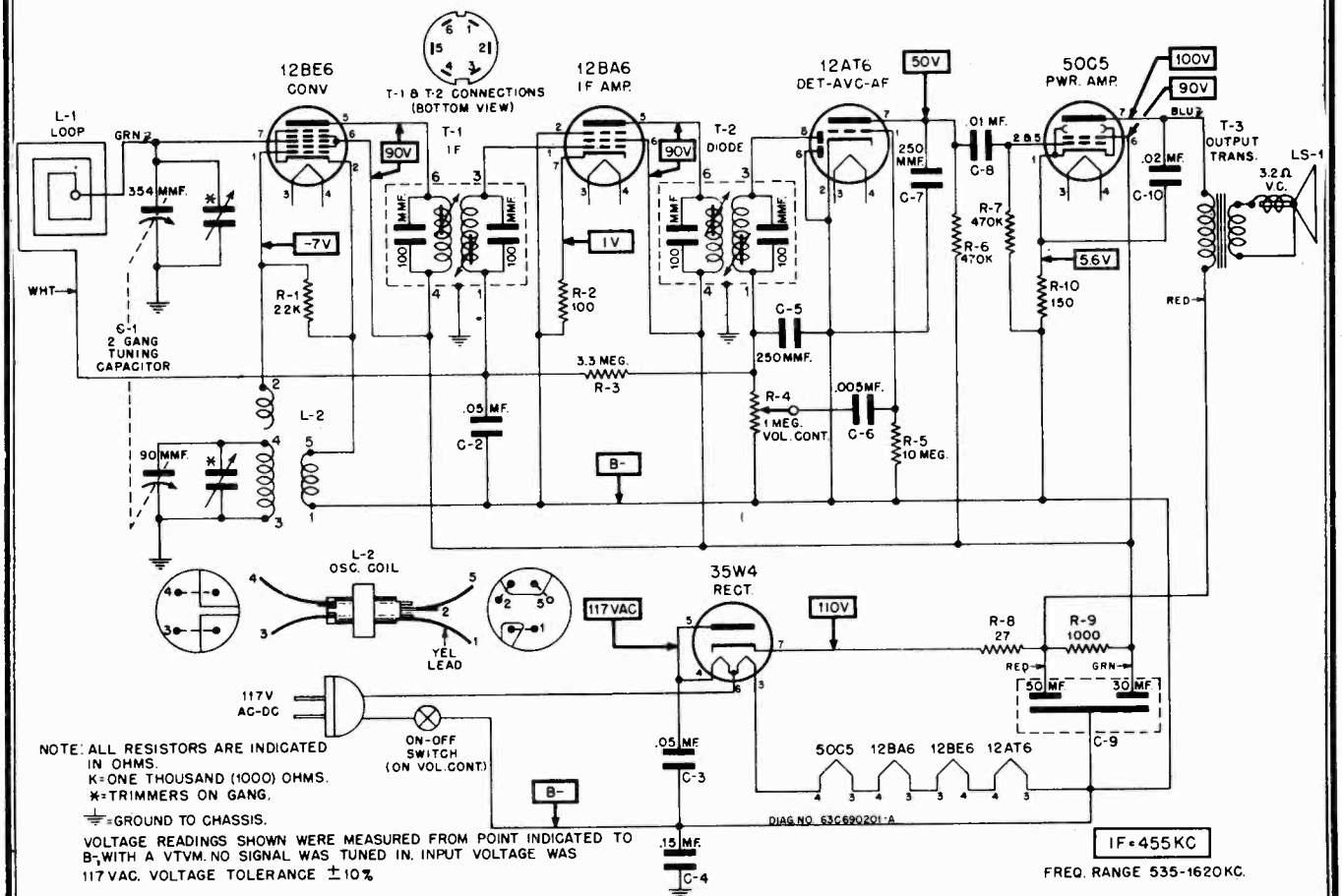


FIGURE 4. SCHEMATIC DIAGRAM

MODELS 58R11A, 58R12A, 58R13A, 58R14A, 58R15A, 58R16A; Ch. HS-184

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	19B478128	Variable: 2 gang .....
C-2	8S9821	Paper: .05 mf 200V .....
C-3	8S9816	Paper: .05 mf 400V .....
C-4	8A72686	Paper: .15 mf 200V .....
C-5	21K77375	Ceramic: 250 mmf .....
C-6	8S9813	Paper: .005 mf 600V .....
C-7	21K77375	Ceramic: 250 mmf .....
C-8	8S9809	Paper: .01 mf 400V .....
C-9	23K482857	Electrolytic: 50-30 mf 150V..
C-10	8S9802	Paper: .02 mf 400V .....
COILS		
L-1	24B680353	Loop Antenna: includes panel.
L-2	24A680364	BC Oscillator .....
SPEAKER		
LS-1	50C478138	Speaker: 4" PM: 3.2 ohm VC...
TRANSFORMERS		
T-1	24B482863	IF, 455 Kc: complete with tuning cores but less shield .....
T-2	24B482865	Diode, 455 Kc: complete with tuning cores but less shield
T-3	25K680345	Output transformer .....
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	18A478122	Volume control: 1 meg; with SPST 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% 1 watt .....
R-10	6R3992	150 20% 1/2W .....
CHASSIS PARTS - MECHANICAL		
1	7A478118	Bracket, loop mtg .....
2	46A470885	Core, iron: threaded (for T-1 & T-2) .....
3	30K680352	Cord, line, and plug: 6 ft long
4	5A484268	Grommet, speaker mtg: rubber.
5	14A482844	Insulator, cord outlet .....
6	14A478119	Insulator, loop mtg .....
7	2S7051	Nut, hex: 3/8-32 x 9/16; stl; cad pl; Palnut (vol cont mtg
8	5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg) .....
9	5S7707	Rivet: .122 x 5/32; stl; nkl pl (electrostatic shield and output transformer mtg).....
10	5S7701	Rivet: .122 x 3/16; stl; nkl pl (cord insulator mtg, spkr mtg) .....
11	5S7703	Rivet: .122 x 7/32; stl; nkl pl (antenna brkt mtg) .....
12	3S7247	Screw, machine: 6-32 x 3/16; slotted hex head; lockscrew; stl; cad pl (gang mtg).....
13	26K485936	Shield, coil: for IF and diode transformers .....
14	26A478117	Shield, electrostatic .....
15	8A472534	Socket, tube: miniature .....
16	41A73996	Spring, tension (electrolytic mtg) .....
17	46A478145	Stud, tri-mount (antenna mtg)
18	14A11493	Washer, fibre: insulating (antenna brkt mtg) .....
19	4S7625	Washer, flat: 1/4 x .128 x .018 thick; stl; cad pl (cord insulator mtg) .....
CABINET PARTS		
101	16D478088	Cabinet, plastic: brown (58R11A)
102	16K484338	Cabinet, plastic: white (58R12A)
103	16K484340	Cabinet, plastic: red (58R13A)
104	16K485161	Cabinet, plastic: gray (58R14A)
105	16K485162	Cabinet, plastic: green (58R15A)
106	16K485163	Cabinet, plastic: yellow (58R16A)
107	36B478147	Knob, tuning(58R11A) .....
108	36A478148	Knob, volume control (58R11A)
109	36K485157	Knob, tuning: gold (58R12A, 58R13A, 58R14A, 58R15A & 58R16A)
110	36K485156	Knob, volume control: gold (58R12A, 58R13A, 58R14A, 58R15A & 58R16A) .....
111	38A25507	Plug, split: copper oxide finish (mounts loop panel to cabinet) .....
112	3S476083	Screw, machine: 6-32 x 5/16 slotted hex head; lockscrew; stl; cad pl (chassis mtg)...
113	11M488253	Tape, aluminum foil: 2-1/2" wide (7" used) (heat shield)

MODELS 58X11Q,
58X12Q; Ch. HS-140

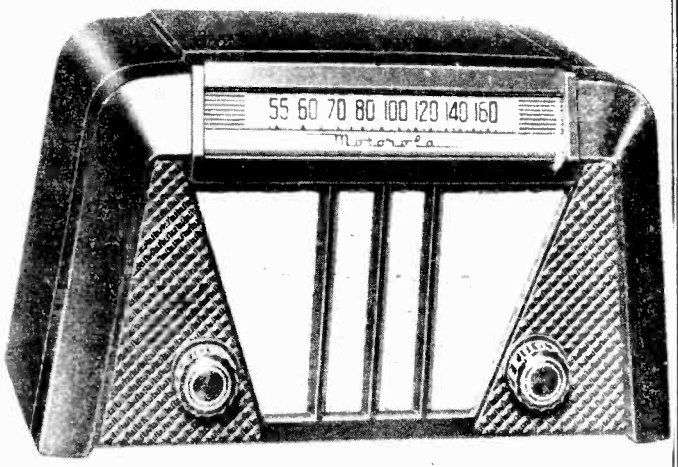
GENERAL INFORMATION

TYPE - AC-DC table model superheterodyne receiver with loop antenna.

TUNING RANGE - 535 to 1620 kc IF- 455 Kc

TUBE COMPLEMENT - 12BE6 Converter
12BA6 IF Amplifier
12AT6 Detector, AVC & 1st AF Amp.
50B5 Power Amplifier
35W4 Rectifier

POWER SUPPLY - 105 to 125 volts AC or DC, 35 watts



MODEL 58X11Q (Walnut Plastic Cabinet) MODEL 58X12Q (Ivory Plastic Cabinet)

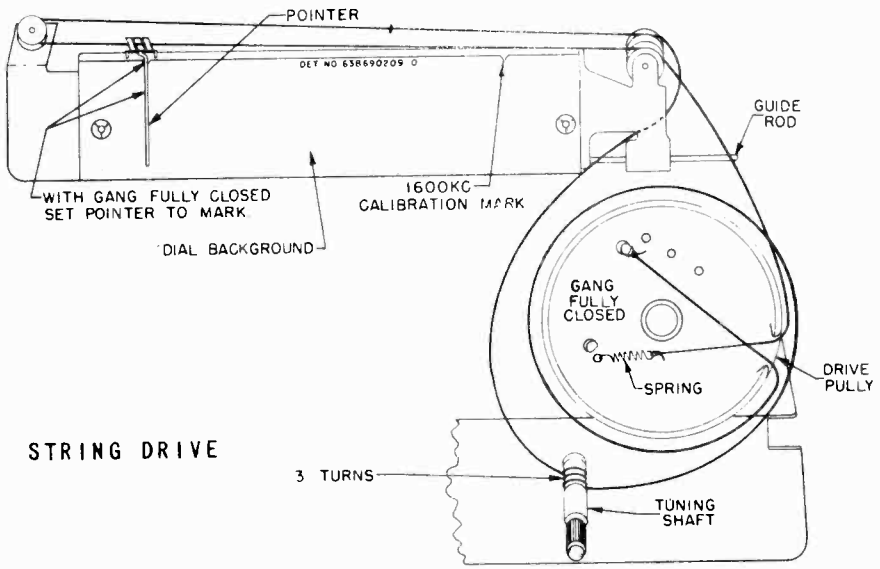


FIGURE 1. STRING DRIVE

INSTALLATION & OPERATING INSTRUCTIONS

POWER SWITCH AND VOLUME CONTROL. Operated with the left-hand knob. NOTE: Reverse the line cord plug in the wall outlet if radio does not operate from DC. When operating from AC, reversing the line cord plug in the wall outlet may sometimes improve reception and reduce hum.

TUNING. Tune stations with right-hand knob.

ANTENNA. A loop antenna is built into this receiver, eliminating the need for an external antenna. Reception from some stations may be improved by rotating the whole receiver; this is due to the slight directional characteristic of the loop antenna. In extremely noisy locations, rotate the entire receiver till minimum noise and maximum signal pickup are obtained. For additional pickup, an external antenna may be connected by winding lead-in wire in slots on radio back panel.

GROUND. Never connect antenna or chassis to water pipe, radiator or other ground, as one side of the power line is connected directly to chassis.

MODELS 58X11Q,
58X12Q; Ch. HS-140

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 chassis 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. Set pointer to calibration mark on left-hand side of dial background when gang is fully closed before starting alignment.

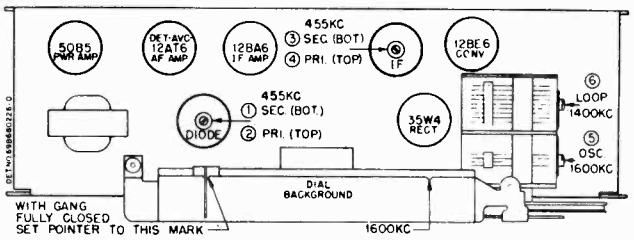


FIGURE 2. TUBE & TRIMMER LOCATIONS

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	POINTER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Rear stator of tuning capacitor	455 Kc	Gang opened	1, 2, 3 & 4	Adjust for maximum.
RF ALIGNMENT						
2.	-	Radiation loop*	1600 Kc	1600 Kc	5	Adjust for maximum.
3.	-	Radiation loop*	1400 Kc	Tune for maximum	6	Adjust for maximum.

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

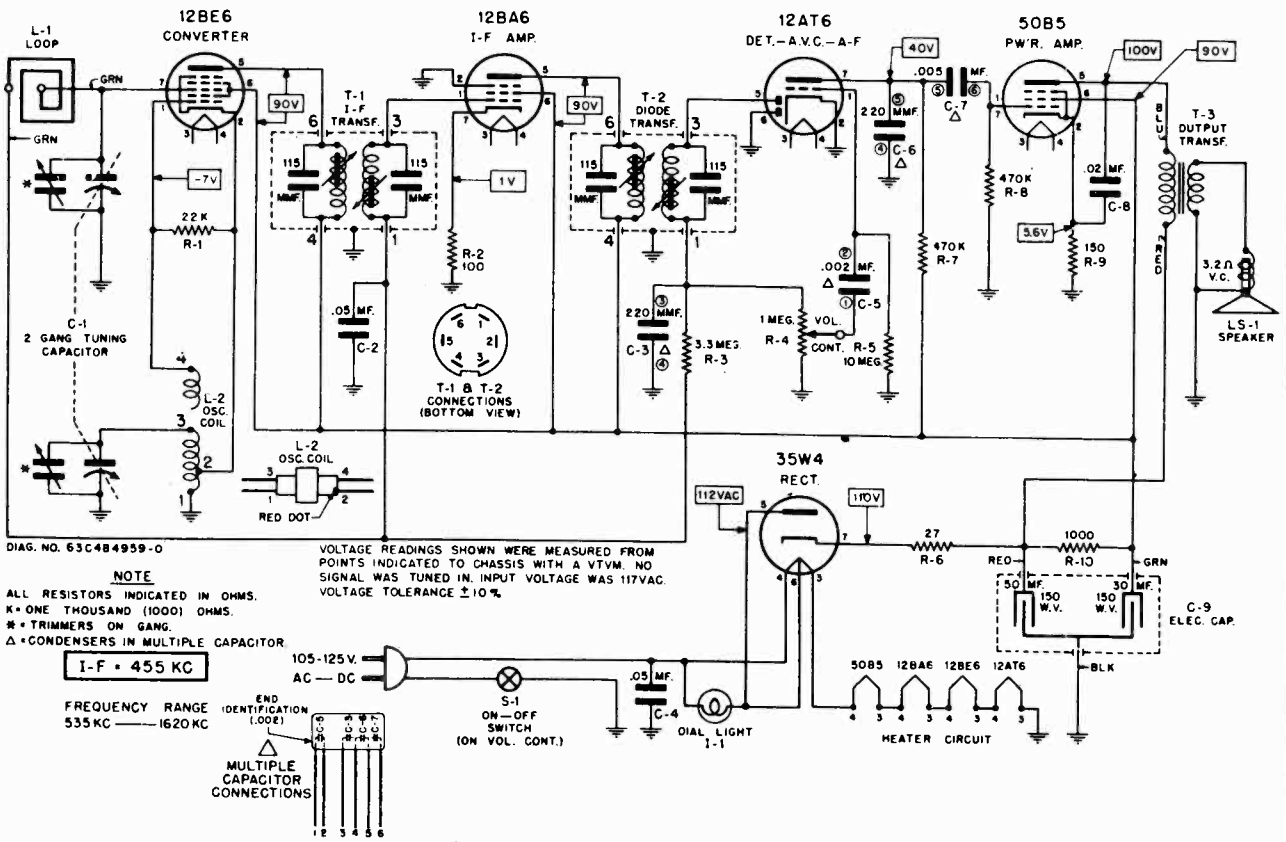


FIGURE 3. SCHEMATIC DIAGRAM

MODELS 58X11Q, 58X12Q; Ch. HS-140

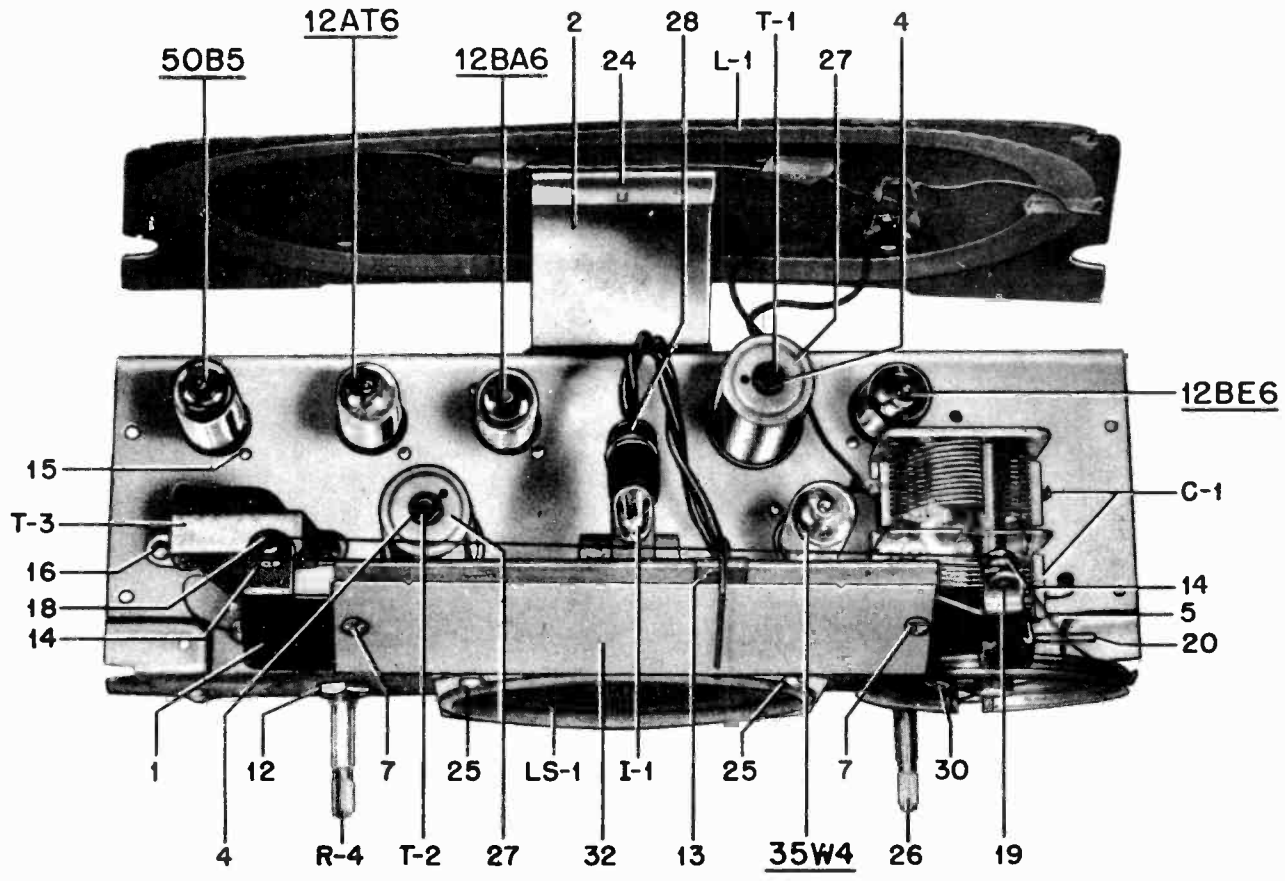
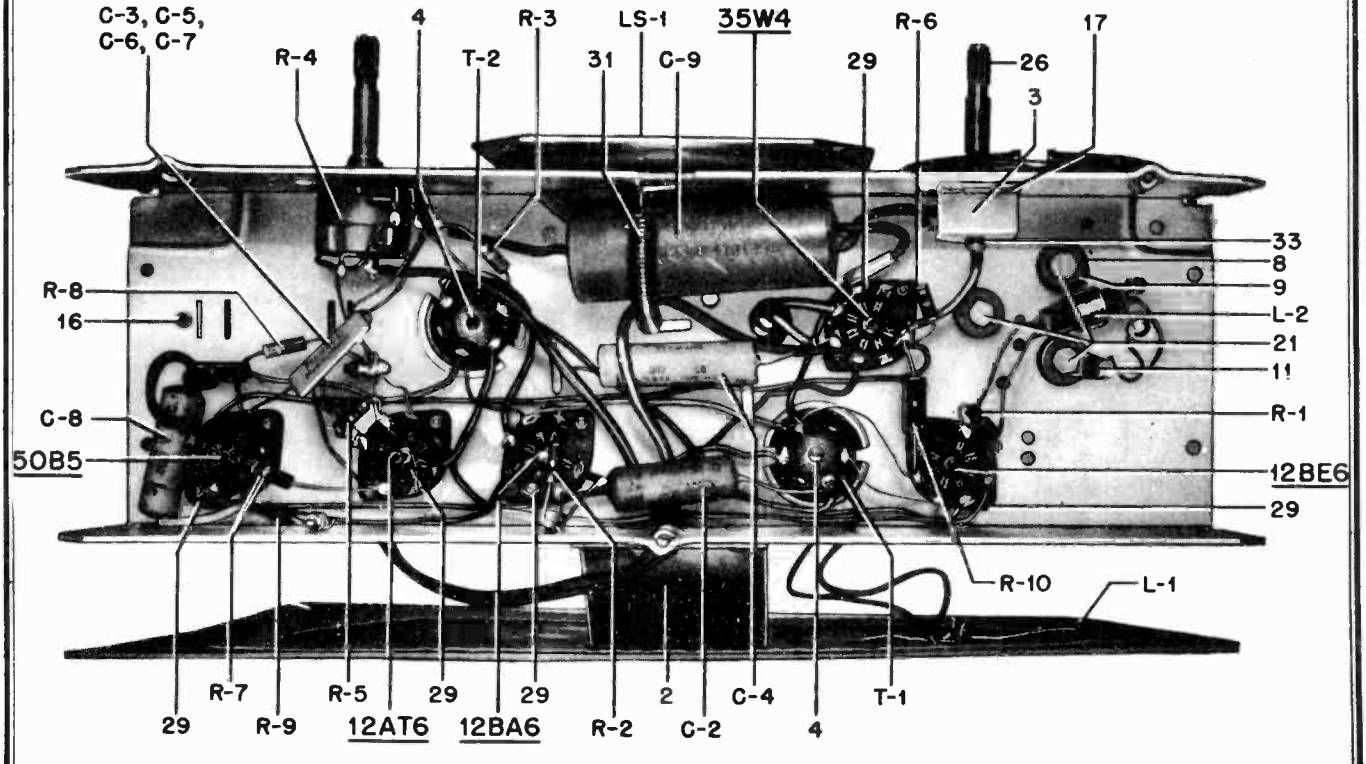


FIGURE 4. PARTS LOCATIONS



MODELS 58X11Q,
58X12Q; Ch. HS-140

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	1X482878	Variable: 2 gang; with pulley
C-2	8S9821	Paper: .05 mf 200V .....
C-3,5, 6,7	21B482847	Ceramic, multiple: includes 220 mmf (C-3), .002 mf (C-5), 220 mmf (C-6) & .005 mf (C-7)
C-4	8S9816	Paper: .05 mf 400V .....
C-8	8S9802	Paper: .02 mf 400V .....
C-9	23K482857	Electrolytic: 50-30 mf 150V.
PILOT LIGHT		
I-1	65X11854	Bulb: 6.3V-.15 amp; tubular, clear, #47 .....
COILS		
L-1	24C482849	Loop Antenna: includes back panel
L-2	24K482855	BC Oscillator Coil .....
SPEAKER		
LS-1	50C482851	Speaker: 4" PM; 3.2 ohm voice coil .....each exchange
RESISTORS		
Note: All resistors are insulated carbon type, 20%, unless otherwise specified.		
R-1	6R6028	22,000 1/2 watt .....doz.
R-2	6R6018	100 1/2 watt .....doz.
R-3	6R2118	3.3 meg 1/2 watt .....doz.
R-4	18A70032	Volume Control: 1 meg with SPST switch .....
R-5	6R2109	10 meg 1/2 watt .....doz.
R-6	6R5683	27 10% 1/2 watt .....doz.
R-7	6R6032	470,000 1/2 watt .....doz.
R-8	6R6032	470,000 1/2 watt .....doz.
R-9	6R3992	150 1/2 watt .....doz.
R-10	6R3953	1,000 1 watt .....each doz.
TRANSFORMERS		
T-1	24B482863	IF, 455 Kc: complete with tuning cores & padding capacitors but less shield ....
T-2	24B482865	Diode, 455 Kc: complete with tuning cores & padding capacitors but less shield ....
T-3	25B482858	Output Transformer .....
CHASSIS PARTS - MECHANICAL		
1	1X481466	Background Bracket and Pulleys Assembly .....
2	7A482843	Bracket, loop mtg .....
3	7A77337	Bracket, tuning shaft .....
4	46A470885	Core, iron: for T-1 & T-2 ..
5	11M8944	Cord, dial: 18# black .....yard
6	30K482856	Cord, line & plug: 6 ft lg .
7	5S7805	Eyelet, snap-in (dial. background mtg) .....doz.
8	5A19658	Eyelet, spacer (gang mtg) ..doz.
9	5A70404	Grommet, rubber (gang mtg) .doz.
10	14A482844	Insulator, cord outlet .....doz.
11	29R3010	Lug, soldering: #6 hot-tinned .....doz.
12	2S7051	Nut, hex: 3/8-32 x 9/16; stl; cad pl; Palnut (volume control mtg) .....doz.
13	52A481378	Pointer and Slider .....
14	49A23960	Pulley, cord: 1/4 groove ...doz.
15	5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg) .....per/c
16	5S7707	Rivet: .122 x 5/32; stl; nkl pl (output trans. mtg) ....per/c
17	5S7701	Rivet: .122 x 3/16 stl; nkl pl (tuning shaft brkt mtg).per/c
18	5K74560	Rivet, shoulder: .132 shoulder .....per/c
19	5A12814	Rivet, shoulder: .156 shoulder .....doz.
20	47A481382	Rod, cord guide .....doz.
21	3S2294	Screw, machine: 6-32 x 1/2 plain hex head locking type; stl; cad pl (gang mtg) ....doz.
22	3S7205	Screw, machine: 8-32 x 1/4 slotted hex head locking type; stl; cad pl (speaker mtg) .doz.
23	3S3360	Screw, sheet metal: #6 x 1/2 PKZ plain hex head; stl; cad pl (cord insulator & loop assembly brkt mtg) ...doz.
24	3S7455	Screw, sheet metal: #8 x 3/8 PKZ slotted acorn head; copper oxide finish (loop panel assembly mtg) .....doz.
25	3S2695	Screw, sheet metal: #6 x 3/16 PKZ plain hex head; stl; cad pl (background brkt & pulley assembly mtg) .....per/c
26	47A482845	Shaft, tuning .....
27	26K485936	Shield, coil .....
28	9A482746	Socket, pilot light .....
29	9A472534	Socket, tube: miniature ....
30	41A14244	Spring, pointer cord tension .....doz.
31	41A73996	Spring, tension (electrolytic mtg) .....
32	35A481384	Strip, dial background .....
33	4A70015	Washer, 'C' (tuning shaft retainer) .....per/c
34	4S7614	Washer, flat: 11/16 x 11/64 x .036 thick; stl; cad pl (loop panel assembly mtg) .doz.
35	4K482859	Washer (cord insulator mtg).doz.
CABINET PARTS		
101	35K481468	Baffle and Grille Cloth Assembly .....
102	37A27142	Band, rubber (dial scale mounting) .....per/c
103	16K482771	Cabinet, table model; molded; ivory (58X12Q) .....
104	16K482770	Cabinet, table model: molded; walnut (58X11Q) .....
105	36K77214	Knob, control: ivory (58X12Q)
106	36B77213	Knob, control: walnut (58X11Q)
107	2A481437	Nut, speednut: black parkerized finish (dial scale mounting) .....doz.
108	2S7089	Nut, speednut: for .187 round, black parkerized (spkr baffle & grille cloth mtg).doz.
109	38A25507	Plug, split: copper oxide finish (back mtg) .....doz.
110	34B481438	Scale, dial: glass .....
111	3S488098	Screw, sheet metal: #8 x 3/8 type 25 plain hex head stl; cad pl (chassis mtg) .....doz.
112	4K19943	Washer, paper: 11/16 x 17/64 x 1/32 thick (used behind control knob-58X12Q) .....per/c

MODEL 59F11,
Ch. HS-188

GENERAL INFORMATION

TYPE - AC operated, portable radio phonograph combination with loop antenna.

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT - 12BE6 Converter
12BA6 IF Amplifier
12AT6 Detector-AVC-AF Amplifier
50C5 Power Amplifier
35W4 Rectifier

POWER SUPPLY - 117V AC only, 60 cycles, 40 watts

RECORD CHANGER - Model C2RC for playing small diameter, fine groove (45 RPM) records. For complete record changer information, see Motorola Service Manual Part No. 54P690245.

RADIO OPERATION

ANTENNA. No outside antenna or ground is required for radio reception. A loop antenna for radio reception is built into this receiver.

VOLUME CONTROL. The volume control and power switch for both radio and phonograph operation are combined and operated with the small left-hand knob.

RADIO PHONO SWITCH. Rotate the small right-hand knob to the left for radio operation; to the right is phonograph playing position.

SERVICE NOTES

TO SERVICE TUBES

The tubes are accessible by removing the rear ventilating grille; 6 wood screws hold the grille in place.

NEEDLE REPLACEMENT

1. To remove the needle from the cartridge, merely pull the needle 'out' from the cartridge using pliers or with your fingers.
2. The replacement needle is partly encased in a small guard to protect the needle point; push the needle into its position in the cartridge and remove the guard. Friction will hold the needle in position. Use Motorola needle, Part No. 47R690971

TO REMOVE CHASSIS & ANTENNA

1. Remove the control knobs.
2. Remove the front grille assembly; 16 Phillips head wood screws hold it in place. Also remove the front grille patch plate; 2 Phillips head wood screws hold it in place.
3. Remove the 2 chassis mounting screws and washers and disconnect the antenna. The chassis may now be removed from the cabinet.
4. The antenna is secured to the cabinet with staples.

TO REMOVE RECORD CHANGER

1. Remove the control knobs from radio.
2. Remove the front grille assembly; 16 Phillips head wood screws hold it in place. Also remove the front grille patch plate; 2 Phillips head wood screws hold it in place.
3. Remove the 3 screws and fibre washers that secure the changer to the cabinet.
4. Disconnect the leads and lift the changer from the cabinet.

MODEL 59F11,
Ch. HS-188

ALIGNMENT

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.

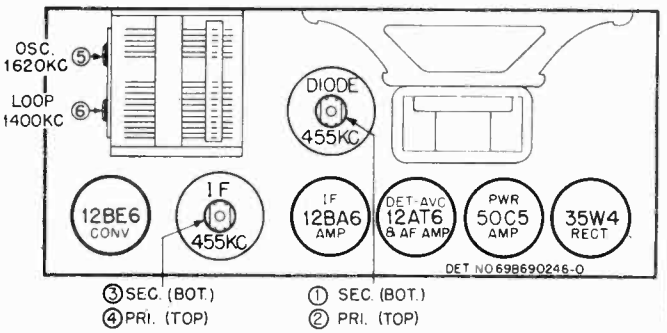


FIGURE 2. TUBE & TRIMMER LOCATION

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Rear stator of tuning capacitor	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 and couple to receiver loop. Keep loops at least 12" apart.

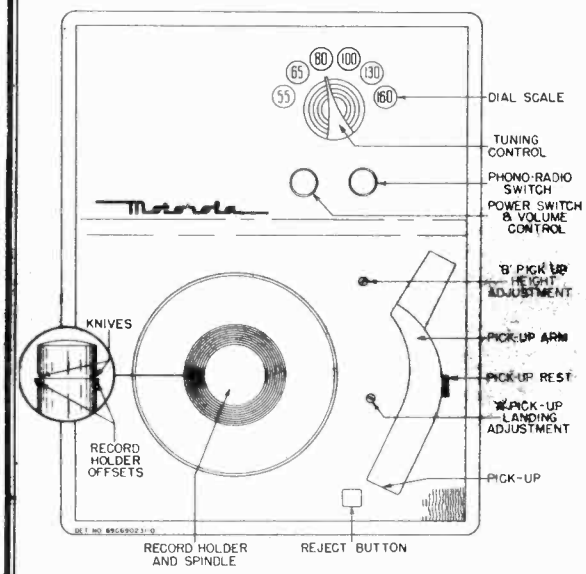


FIGURE 1. OPERATING CONTROLS

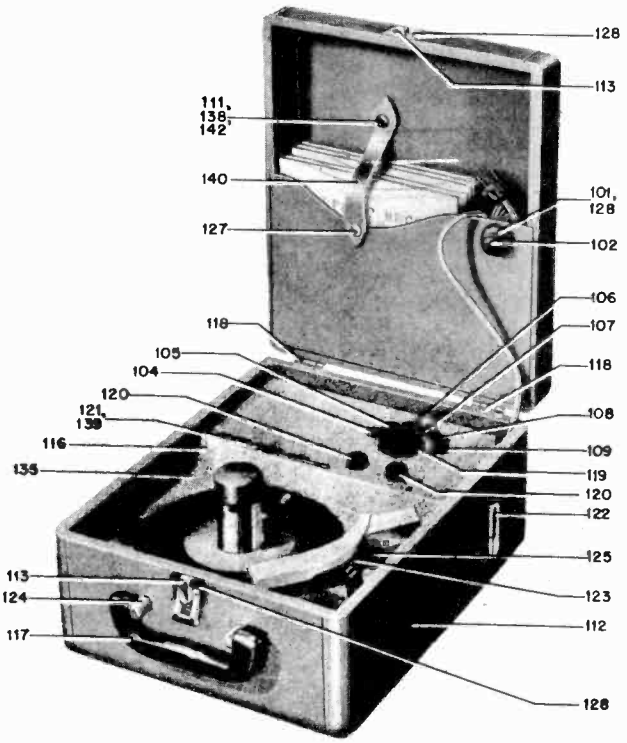


FIGURE 3. PARTS LOCATION - CABINET

MODEL 59F11,
Ch. HS-188

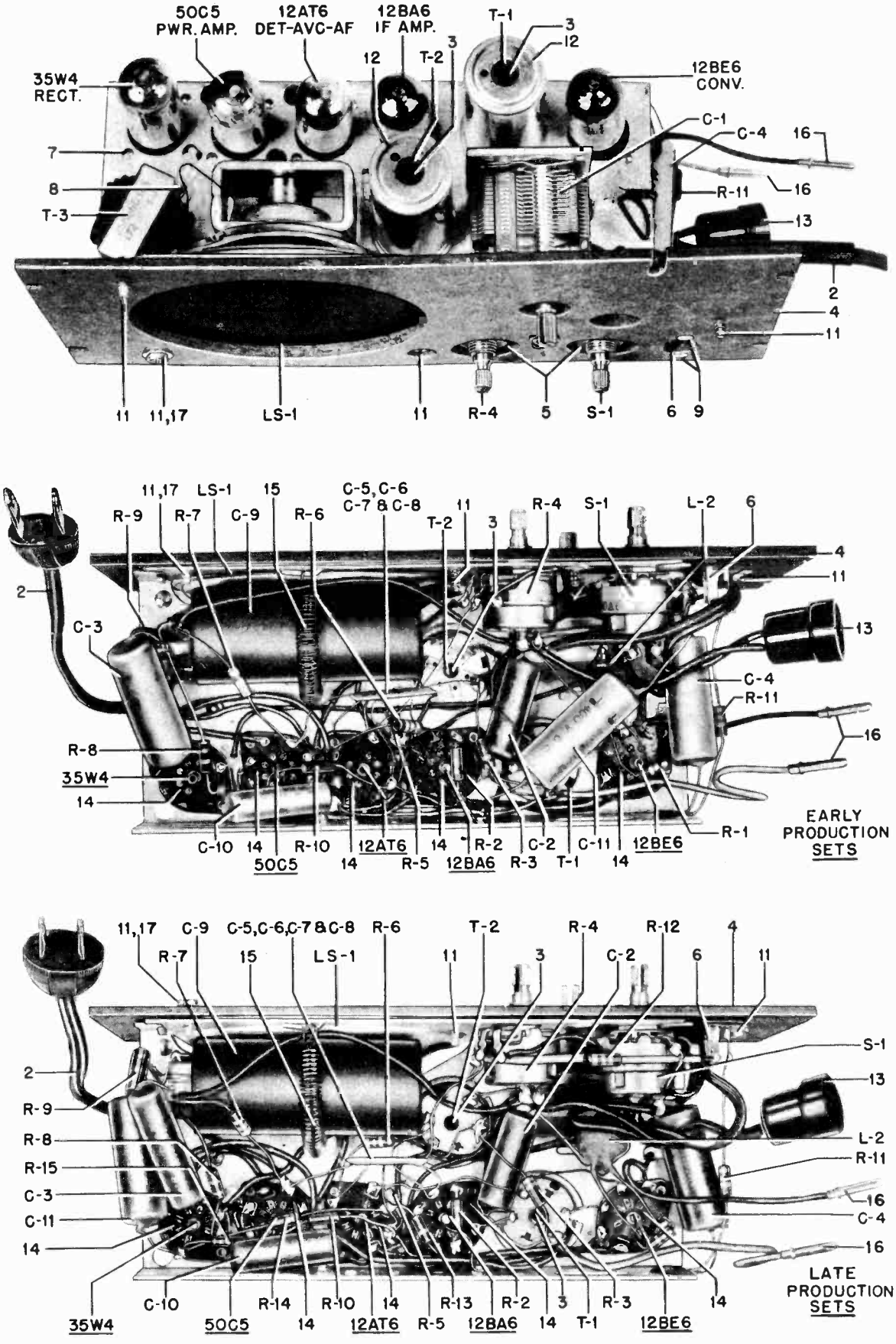


FIGURE 4. PARTS LOCATION - CHASSIS

MODEL 59F11,
Ch. HS-188

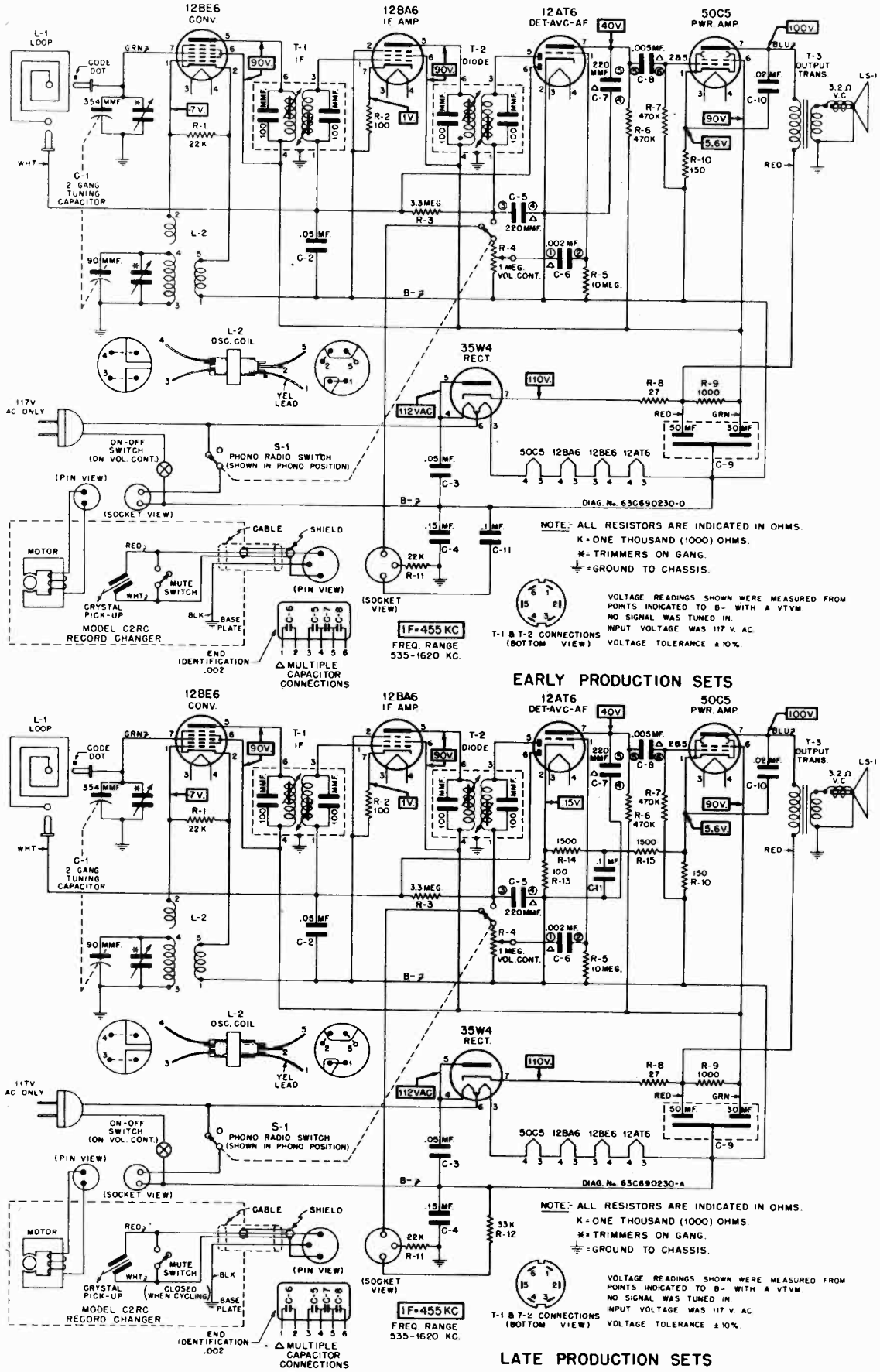


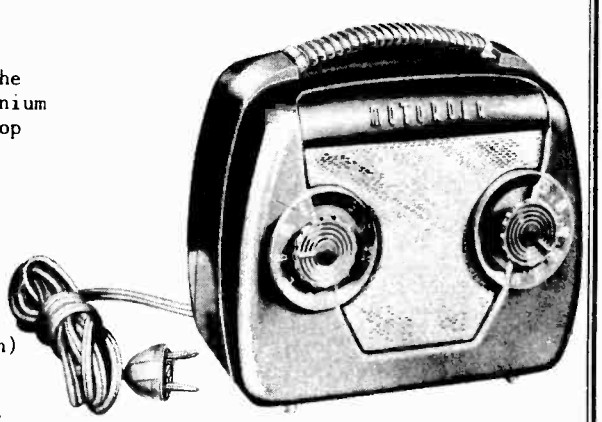
FIGURE 5. SCHEMATIC DIAGRAMS

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	19B478128	Variable, 2-gang .....
C-2	8S9821	Paper: .05 mf 200V .....
C-3	8S9816	Paper: .05 mf 400V .....
C-4	8A72686	Paper: .15 mf 200V .....
C-5,6 7,8	21B482847	Ceramic, multiple: 220 mmf, .002 mf, 220 mmf & .005 mf 400V
C-9	23B690166	Electrolytic: 50-30 mf/150V..
C-10	8S9802	Paper: .02 mf 400V .....
C-11	8S9807	Paper: .1 mf 400V .....
COILS		
L-1	24B690176	Loop Antenna & Panel .....
L-2	24A680364	BC Oscillator .....
SPEAKER		
LS-1	50B690661	Speaker: 4"; PM: 3.2 ohm VC.. Exch
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	18A478122	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 .....
R-10	6R3992	150 20% 1/2W .....
R-11	6R6028	22,000 20% 1/2W .....
R-12	6R6012	33,000 20% 1/2W .....
R-13	6R6326	100 20% 1/2W .....
R-14	6R6038	1500 10% 1/2W .....
R-15	6R6038	1500 10% 1/2W .....
SWITCH		
S-1	40A690168	Switch, phono-radio .....
TRANSFORMERS		
T-1	24B482863	IF, 455 Kc: complete with tuning cores and padding capacitors but less shield .....
T-2	24B482865	Diode, 455 Kc: complete with tuning cores and padding capacitors but less shield .....
T-3	25K680345	Output Transformer .....
CHASSIS PARTS - MECHANICAL		
1	42A16152	Clamp, line cord .....
2	30A470651	Cord, line: with plug; 6 ft long
3	46A470885	Core, iron: threaded (for T-1 & T-2) .....
4	1X690421	Front Panel Assembly: includes 3-prong receptacle .....
5	2S7051	Nut, hex: 3/8-32 x 9/16; Palnut; stl; cad pl (volume control and phono-radio switch mtg) .....
6	9A690170	Receptacle, 3-prong (phono input) .....
7	5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg).....
8	5S7707	Rivet: .122 x 5/32; stl; nkl pl (transformer mtg) .....
9	5S7708	Rivet: .122 x 9/32; stl; nkl pl (phono input receptacle mtg) .....
10	3S7247	Screw, machine: 6/32 x 3/16; slotted hex head; lockscrew stl; cad pl (gang mtg) ....
11	3S3398	Screw, sheet metal: #6 x 3/8 PKZ plain hex head; stl; cad pl (speaker, front panel assembly & cable clamp mtg)
12	26K485936	Shield, coil (for T-1 & T-2)
13	9A690169	Socket Assembly, phono-motor.
14	9A472534	Socket, tube: miniature .....
15	41A73996	Spring, tension (electrolytic mtg) .....
16	29A5400	Terminal, plain pin (antenna input) .....
17	4S7566	Washer, flat: 3/8-5/32 x .033 thick; stl; cad pl (front panel assembly mtg) .....
CABINET PARTS		
101	35K690791	Bumper, rubber recess .....
102	35K690792	Bumper, rubber (cemented to recess bumper) .....
103	35A780453	Bumper, rubber (cabinet feet)
104	38B690160	Button, calibration (55) ....
105	38B690161	Button, calibration (65) ....
106	38B690162	Button, calibration (80) ....
107	38B690163	Button, calibration (100) ...
108	38B690164	Button, calibration (130) ...
109	38B690165	Button, calibration (160) ..
110	1X690302	Button, push (reject) .....
111	38K690782	Button, strap .....
112	16F690128	Cabinet, portable: radio-phono combination .....
113	55K690783	Catch Assembly .....
114	42A16152	Clamp, cable .....
115	13B690180	Grille, ventilating (rear) ..
116	1X690452	Grille Assembly, front: includes calibration buttons, logotype, and pickup resting post ....
117	55K690785	Handle, cabinet: plastic ....
118	55K690784	Hinge, lid: brass pl .....
119	36K690167	Knob, tuning .....
120	36K690171	Knob, volume and phono-radio.
121	62K690406	Logotype, Motorola: black ..
122	5A780439	Louvre, air vent: brass pl ..
123	64A690178	Plate, patch (part of front grille-used under pick-up)..
124	55K690786	Post, handle mtg: brass .....
125	46A690432	Post, pick-up resting .....
126	1X690451	Reject Actuating Assembly: includes bracket and arm .....
127	5K690789	Rivet, bifurcated: 1/4 lg; pol brass (strap mtg) .....
128	5K690788	Rivet, bifurcated: 1/2 lg; pol brass (hinge, recess bumper and lid catch mtg) .....
129	5A13261	Rivet, shoulder; stl; cad pl (actuating arm mtg) ....
130	3S7339	Screw, machine: 6-32 x 5/8 plain hex head; stl; cad pl (chassis mtg) .....
131	3K690787	Screw, machine: 6-32 x 1/2 washer head; (handle post mtg) .....
132	3S7506	Screw, sheet metal: #6 x 1/4 PKZ plain hex head; stl; cad pl (pick-up resting post mtg) .....
133	3S7509	Screw, sheet metal: #6 x 5/8 PKA slotted acorn head; antique copper finish (record changer mtg) .....
134	3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; stl; cad pl (reject actuating assembly mtg) .....
135	3S490108	Screw, wood: #2 x 3/8 Phillips round head; brass pl (front grille mtg) .....
136	3S490107	Screw, wood: #4 x 3/16 slotted oven head; brass pl (ventilating grille mtg) .....
137	26A690595	Shield, protective: armite paper (line cord insulator) .....
138	9K690778	Socket, strap .....
139	2S7095	Speednut: black; PKZ (logotype mtg) .....
140	35K690793	Strap Assembly: includes strap, button & socket .....
141	35A690594	Strip, wood (line cord guard
142	9K690779	Stud, strap .....
143	2K690790	Tee nut: 6-32 (chassis mtg).
144	4S7566	Washer, flat: 3/8 x 5/32 x .033 thick; stl; cad pl (chassis mtg) .....
145	4S1706	Washer, flat: 3/8 x .203 x .033 thick; stl; cad pl (on reject actuating arm) .....
146	4A690158	Washer, shoulder: fibre (record changer mtg) .....

MODELS 59L11Q, 59L12Q, 59L14Q; Ch. HS-187

GENERAL INFORMATION



TYPE - A three-power (AC/DC Battery) portable receiver of the personal type. Four miniature type tubes and a selenium rectifier are used in a superheterodyne circuit. Loop antenna is housed inside rear cover.

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT - 1R5 - Converter
1U4 - IF Amplifier
1U5 - Detector, AVC & 1st AF Amplifier
3S4 - Power Amplifier
Rectifier - Selenium type (for AC/DC operation)

POWER SUPPLY - Operates from 117 volts AC/DC (15 watts) or from the following self-contained batteries:

Two 1-1/2V flashlight cells (Eveready #950 or equivalent)
One 67-1/2V "B" battery (Eveready #467 or equivalent)

INSTALLATION & OPERATING INSTRUCTIONS

CONTROLS. The power switch is operated by a three-position switch lever located under the volume (left-hand) knob. When the switch lever is in "BAT" position, the receiver will operate from its internal batteries; in "AC-DC" position, the receiver will operate from 117 volt house current. Move the lever to "OFF" position when the receiver is not in use.

Stations are tuned in with the right-hand knob. The markings around the tuning knob may be read in kilocycles by adding one zero to the figures.

HOUSE CURRENT OPERATION. Open the rear cover and remove the power cord from inside of the cabinet; pass the cord through the slot in the cover before closing. Connect the power plug to any 117 volt AC or DC outlet. Reverse the power plug in the power outlet if the receiver does not operate from DC power.

If the receiver is to be operated for long periods of time on AC or DC, or is to be placed in storage, remove the batteries and store them in a cool place; this will prevent battery leakage and possible damage to receiver.

BATTERY OPERATION. Open the rear cover and install the batteries. The rear cover is opened by inserting the fingertips into the slots under the handle and pulling back. Complete battery installation instructions will be found on the label inside the receiver or see Figure 1.

When low volume or fuzzy tone is noticed, replace the flashlight cells. Normally, the 67-1/2 volt "B" battery will last for 3 or 4 changes of the flashlight cells. Run-down batteries should not be left inside receiver, as they may leak and cause damage.

The condition of the batteries will not affect the operation of the receiver from AC or DC house current.

SERVICE NOTES

The chassis of this receiver is connected directly to the power line. When operating the set with the chassis outside of its cabinet (from AC power line), use an isolating transformer between power line and receiver to reduce possibility of electrical shock.

Tubes can be replaced without removing the chassis from the cabinet; open the back cover and remove the chassis insulator to expose the tubes. Two plug buttons hold the chassis insulator in position.

To remove the chassis from the cabinet:

1. Remove the control knobs and switch lever.

2. Open the back cover and remove the chassis insulator.

3. Disconnect the two loop leads from the pin receptacles.

4. Remove the two Phillips head screws on each end of the chassis and slide chassis from the cabinet.

MODELS 59L11Q, 59L12Q, 59L14Q; Ch. HS-187

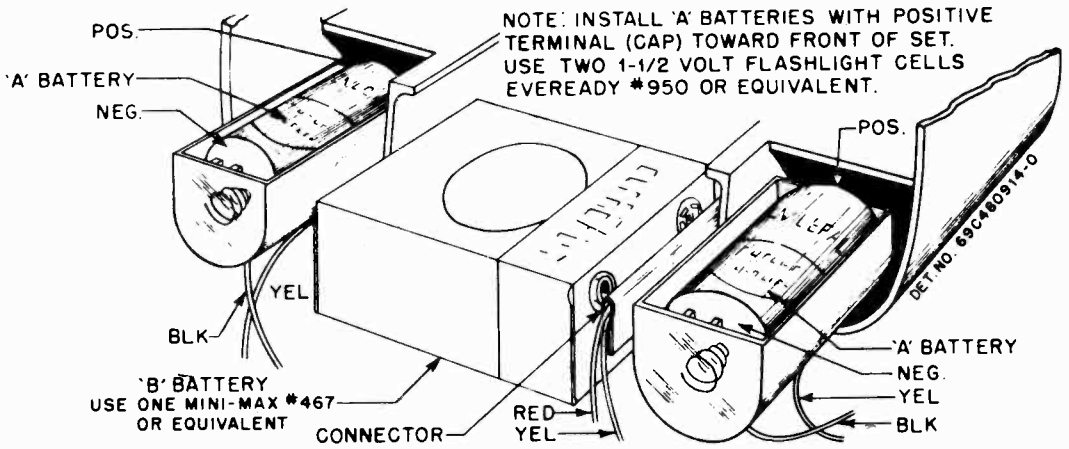


FIGURE 1. BATTERY REPLACEMENT DETAIL

ALIGNMENT

It is recommended that the receiver be operated from battery power during alignment. If the receiver is operated from AC power during alignment, use an isolation transformer between the power line and receiver. If an isolation transformer is not available, connect the low side of the signal generator to chassis through a .1 mf capacitor.

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

The loop antenna should be connected to the chassis during alignment.

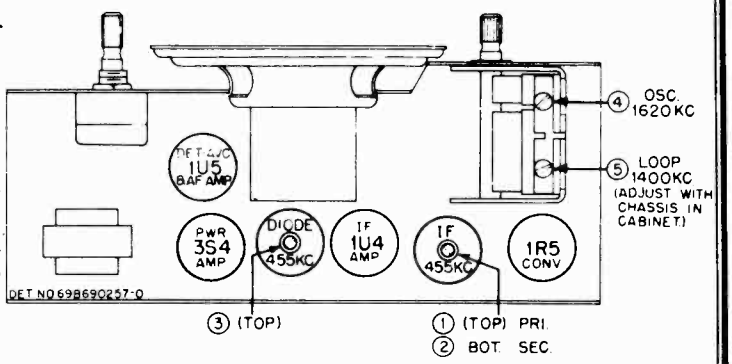


FIGURE 2. TUBE & TRIMMER LOCATIONS

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	DIAL SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Stator lug of tuning capacitor	455 Kc	Gang opened	1, 2 & 3	Adjust for maximum
RF ALIGNMENT						
2.	.1 mf	"	1620 Kc	"	4	Adjust for maximum
3.	-	-	-	-	-	**Install chassis in cabinet, leaving output meter connected to speaker.
4.	-	Radiation loop*	1400 Kc	Tune for maximum	5	Adjust for maximum. Trimmer is reached through hole under left-hand battery holder.

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

** As an alternate method, the output meter may be disconnected at this point and the set installed in the cabinet. Tune in a weak station near 1400 Kc and adjust trimmer #5 through the hole in the bottom of the cabinet for maximum signal output.

MODELS 59L11Q, 59L12Q,
59L14Q; Ch. HS-187

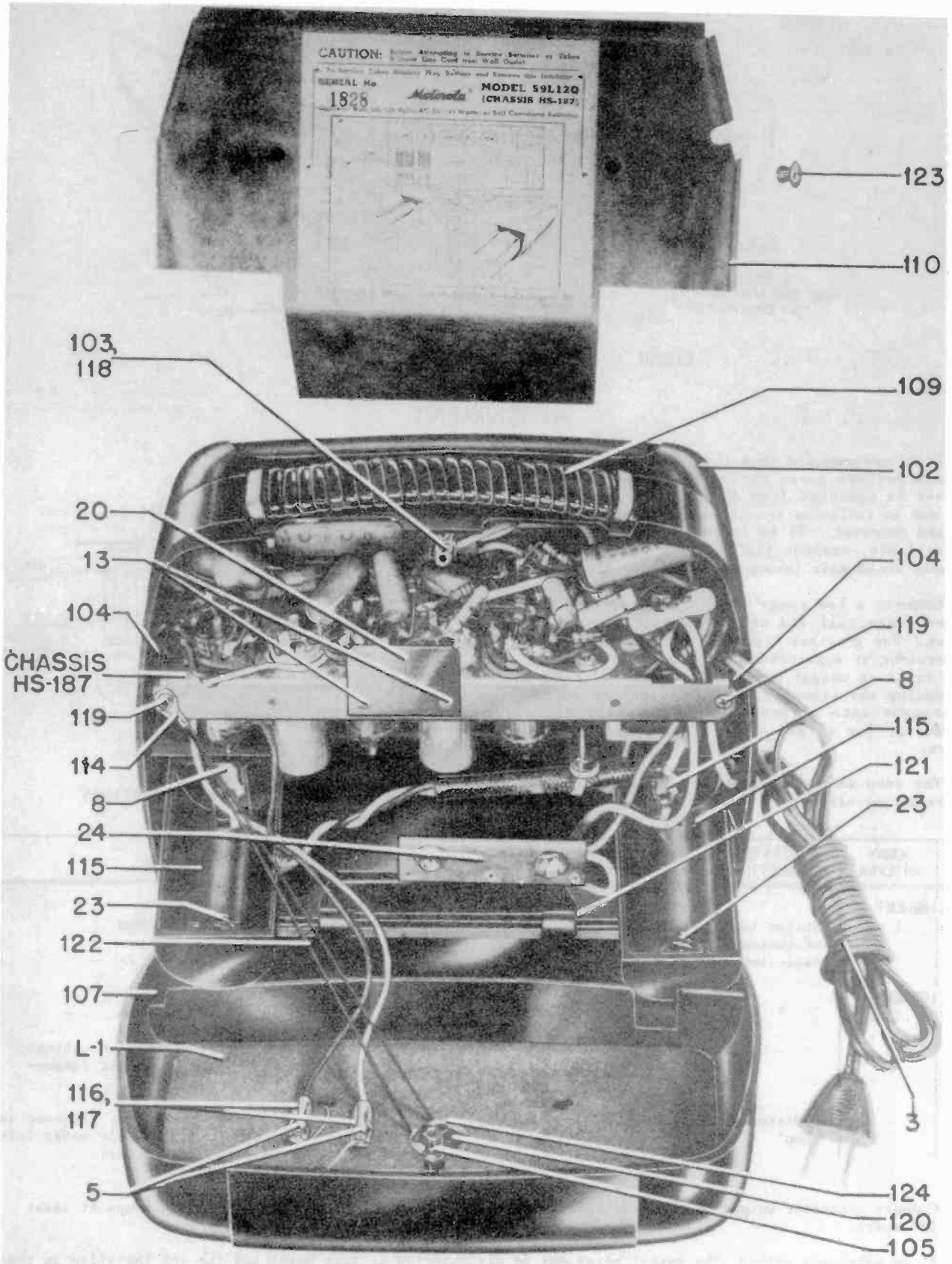
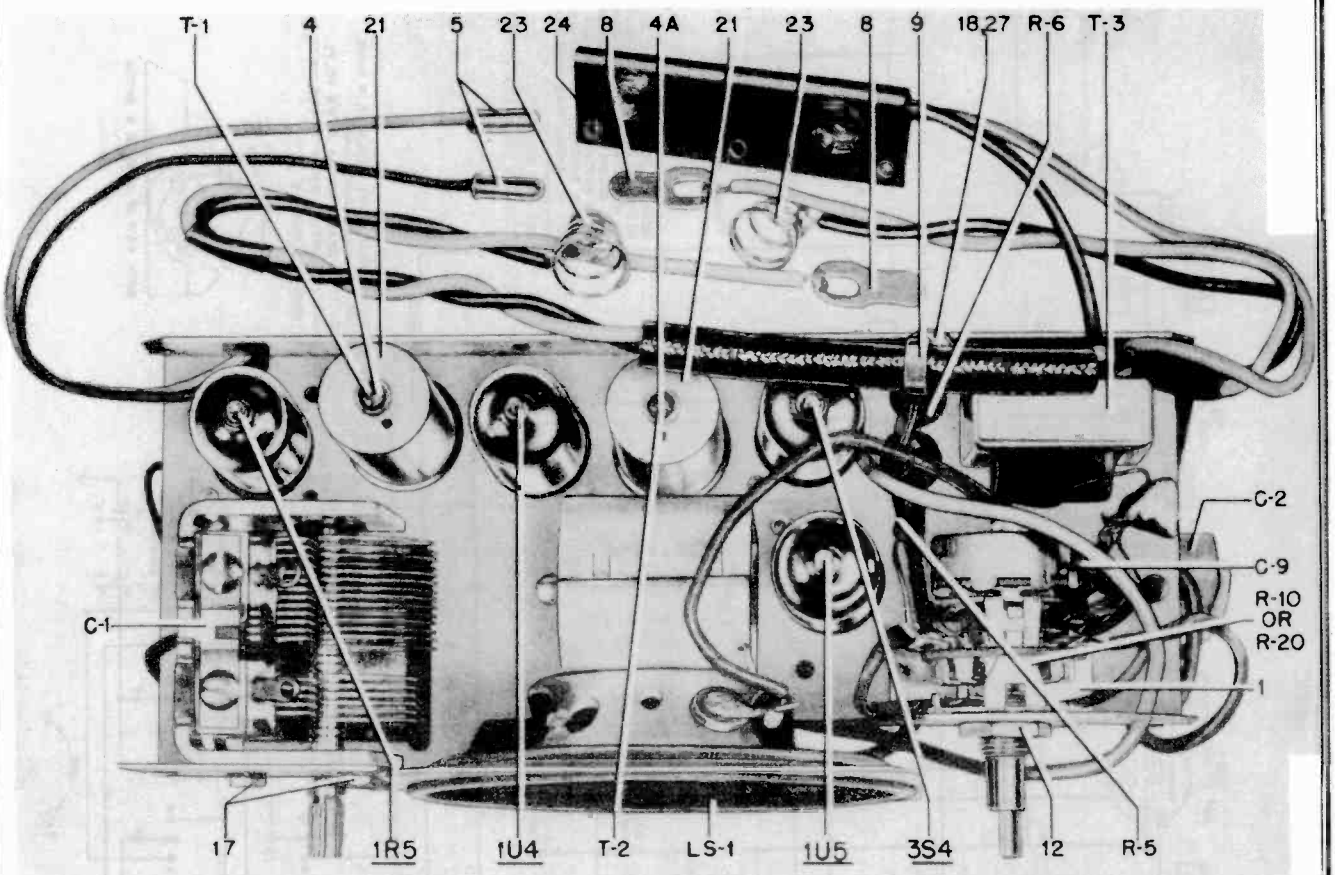


FIGURE 3. PARTS LOCATION - REAR VIEW

MODELS 59L11Q, 59L12Q, 59L14Q; Ch. HS-187



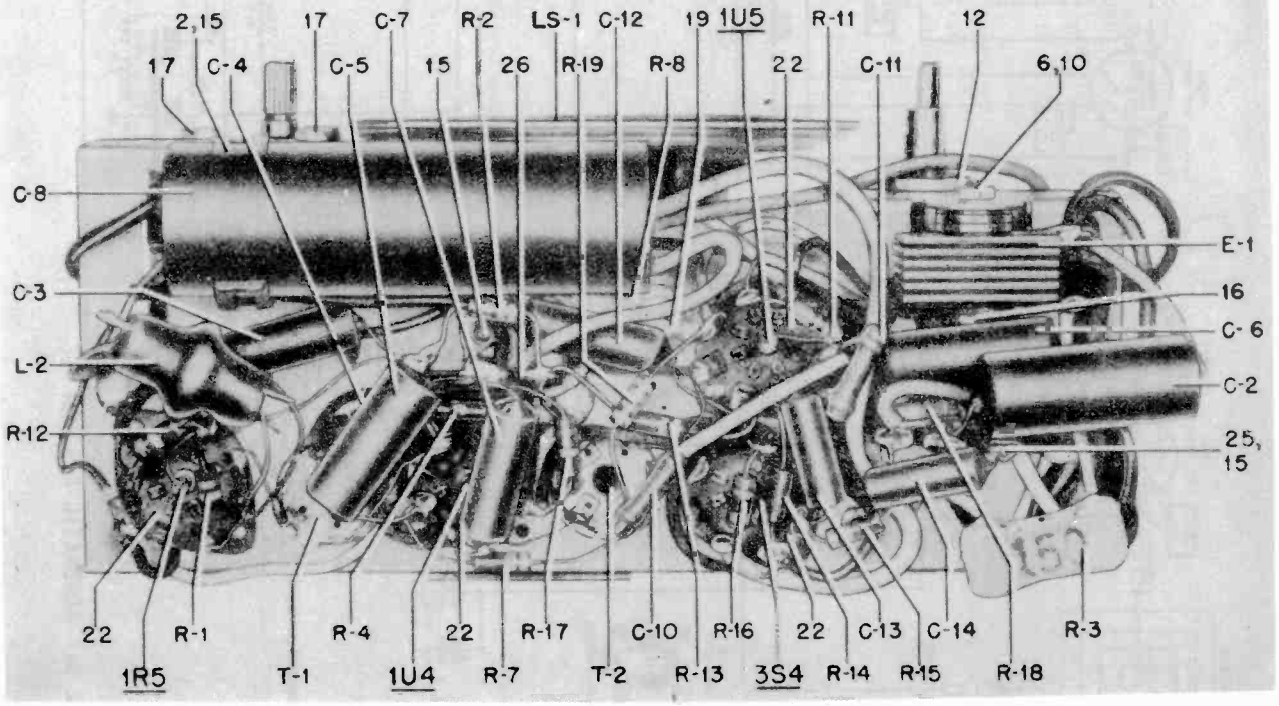
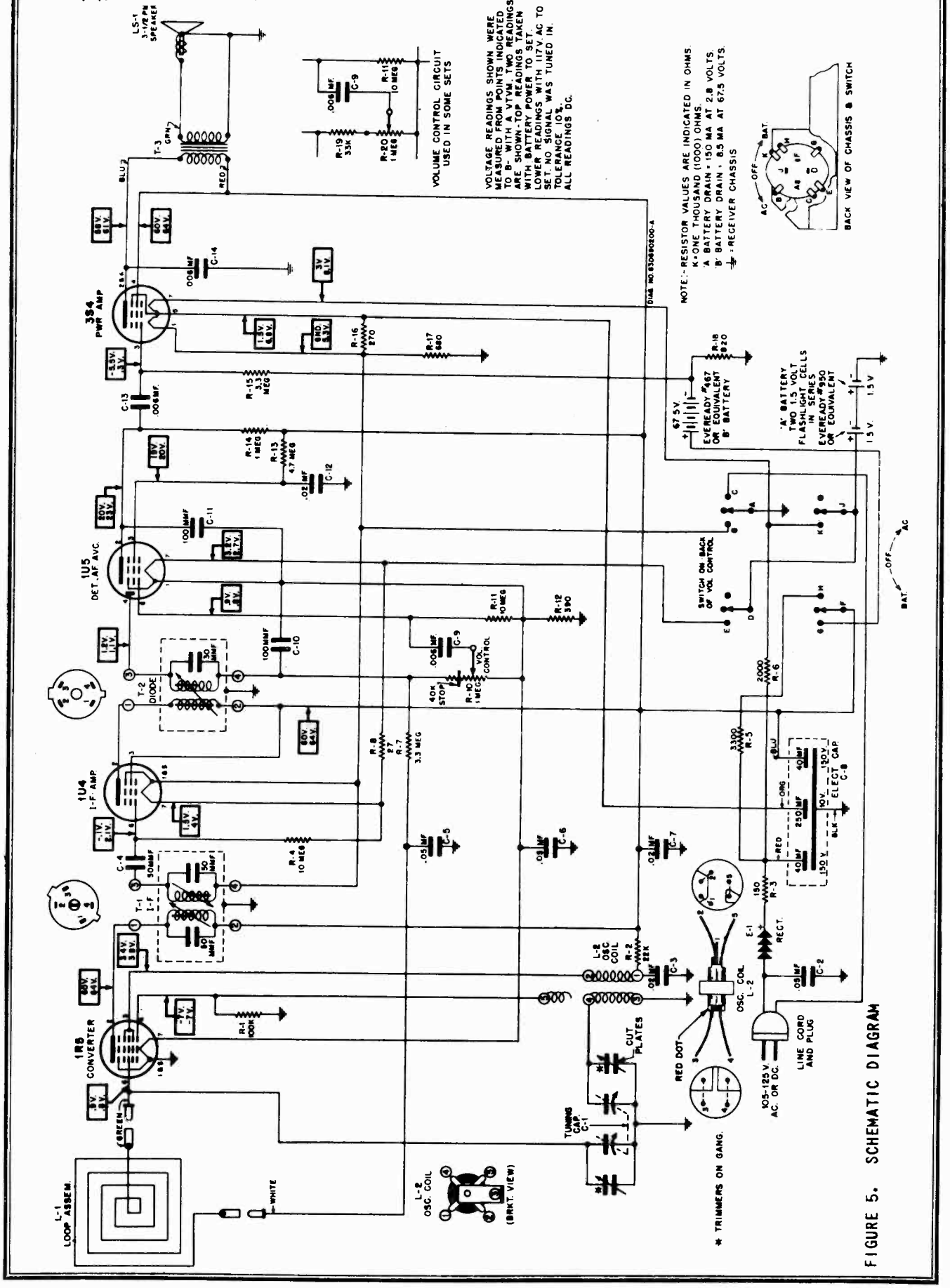


FIGURE 4. PARTS LOCATION - CHASSIS TOP & BOTTOM

MODELS 59L11Q, 59L12Q,
59L14Q; Ch. HS-187



REPLACEMENT PARTS LIST

CHASSIS PARTS - ELECTRICAL

REF. NO.	PART NO.	DESCRIPTION
CAPACITORS		
C-1	19K680360	Variable: 2 gang .....
C-2	8K14791	Paper: .05 mf 400V .....
C-3	8K471628	Paper: .02 mf 100V .....
C-4	21K77373	Ceramic: 50 mmf 500V .....
C-5	8A71213	Paper: .05 mf 100V .....
C-6	8A71213	Paper: .05 mf 100V .....
C-7	8K471628	Paper: .02 mf 100V .....
C-8	23A680014	Electrolytic: 40-40 mf/150V, 250 mf/ 10V .....
C-9	8C4529	Paper: .006 mf 100V .....
C-10	21B77286	Ceramic: 100 mmf 500V .....
C-11	21B77286	Ceramic: 100 mmf 500V .....
C-12	8K471628	Paper: .02 mf 100V .....
C-13	8C4529	Paper: .006 mf 100V .....
C-14	8C4529	Paper: .006 mf 100V .....
RECTIFIER		
E-1	48B478111	Selenium Rectifier: half-wave ...
COILS		
L-1	24B480092	Loop and Panel Assembly .....
L-2	24A485989	Oscillator coil .....
SPEAKER		
LS-1	50B480048	
or	50B482759	Speaker: 3-1/2" PM .....
TRANSFORMERS		
T-1	24B690840	
or	24B480042	IF, 455 Kc: complete with tuning cores and padding capacitors, but less shield .....
T-2	24B480040	Diode, 455 Kc: complete with tuning core and padding capacitors, but less shield .....
T-3	25B470622	Output transformer .....
RESISTORS		
Note:	All resistors are carbon, insulated type unless otherwise specified	
R-1	6R6031	100,000 10% 1/2W .....
R-2	6R6397	22,000 10% 1/2W .....
R-3	17A76986	Wirewound: 150 10% 2-1/2W ...
R-4	6R2109	10 meg 20% 1/2W .....
R-5	6R5581	3300 10% 1/2W .....
R-6	17K680015	Wirewound: 2000 10% 5W; center tapped .....
R-7	6R2118	3.3 meg 20% 1/2W .....
R-8	6R5683	27 10% 1/2W .....
R-10	18K680375	Volume control: 1 meg; with switch.
R-11	6R2109	10 meg 20% 1/2W .....
R-12	6R5554	390 10% 1/2W .....
R-13	6R2122	4.7 meg 20% 1/2W .....
R-14	6R6004	1 meg 20% 1/2W .....
R-15	6R2118	3.3 meg 20% 1/2W .....
R-16	6R6432	270 10% 1/2W .....
R-17	6R6040	680 10% 1/2W .....
R-18	6R6269	820 10% 1/2W .....
R-19	6R6410	33,000 10% 1/2W (used only with R-20) .....
R-20	18A480049	Volume control: 1 meg; with switch (used in some models) .....

CHASSIS PARTS - MECHANICAL

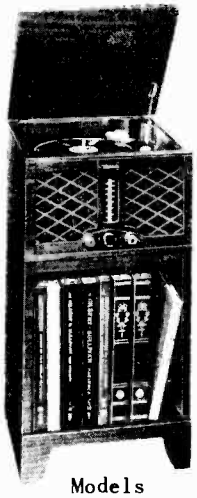
1	15A481339	Baffle, switch: metal plate ..
2	42A75825	Clip, electrolytic mtg .....
3	30K680008	Cord, line & plug: 6 ft long ..
4	46K680318	Core, iron: threaded (T-1) ....
4A	46A470885	Core, iron: threaded (T-2) ....
5	5S7855	Eyelet: .156 x .484 (loop lead tip) .....
6	4S7695	Lockwasher, int: #5; stl; cad pl (rectifier mtg) .....
7	29R3019	Lug, soldering (line cord anchor) .....
8	29R3020	Lug, soldering (battery contact
9	29R5294	Lug, soldering (cable retainer on R-6) .....
10	2S7010	Nut, hex: 5-40 x 1/4; stl; cad pl (rect mtg) .....
11	2S7005	Nut, hex: 6-32 x 1/4; stl; cad pl (resistor mtg) .....
12	2S7051	Nut, hex: 3/8-32 x 9/16; stl; cad pl (vol cont mtg) .....
13	5S7769	Rivet: .088 x 3/32; stl; nkl pl (circuit shield mtg) .....
14	5S7771	Rivet: .088 x 3/16; stl; nkl pl (socket mtg) .....
15	5S7706	Rivet: .122 x 1/8; stl; nkl pl (electrolytic clip, term strip and lug mtg) .....
16	3S7311	Screw, machine: 5-40 x 7/8 slotted hex head; stl; cad pl (rectifier mtg) .....
17	3S7247	Screw, machine: 6-32 x 3/16 slot ted locking hex head; stl; cad pl (gang mtg) .....
18	3S1451	Screw, machine: 6-32 x 2; slotted round head; stl; cad pl (resistor mtg) .....
19	3S7205	Screw, machine: 8-32 x 1/4; slot ted locking type hex head; stl; cad pl (spkr mtg) .....
20	26A480034	Shield, circuit .....
21	1K480037	Shield and Sleeve Assembly (for T-1, part number 24B480042 and T-2) .....
or	26K480038	Shield, coil (for T-1, part number 24B690840) .....
22	9A472534	Socket, tube: 7-prong miniature; wafer type .....
23	41K680029	Spring, battery contact .....
24	31A480032	Strip, terminal ('B' battery connector) .....
25	31K51511	Strip, terminal: 3 ins lugs, #3 gnd; 3/8" spacing .....
26	31K90044	Strip, terminal: 2 ins lugs, #2 gnd; 3/8" spacing .....
27	9K470939	Washer, insulating: 3/8 x .136 x .062 thick; armite (R-6 insulating)

CABINET PARTS

101	35B690002	Baffle, speaker .....
102	1X690082	Cabinet Assembly: tan; complete with handle grille and back cover catch; less back cover and hinge spring (59L11Q) .....
or	1X690484	Cabinet Assembly: same as above, but black finish (59L12Q) .....
or	1X690151	Cabinet Assembly: same as above but maroon finish (59L14Q) ...
103	42A480079	Clip, fuse (cover catch) .....
104	42A680016	Clip, reinforcing .....
105	42A480078	Clip, speed (on back cover catch stud) .....
106	42K482797	Clip, speed (on volume knob) ...
107	16K690076	Cover, cabinet back: tan (59L11Q).
or	16K690140	Cover, cabinet back: black (59L12Q)
or	16K690142	Cover, cabinet back: maroon (59L14Q)
108	13K690005	Grille, speaker .....
109	55K690069	Handle, carrying (59L11Q) .....
or	55B690068	Handle, carrying (59L12Q) .....
or	55K690113	Handle, carrying (59L14Q) .....
110	14C480095	Insulator, chassis: gray fibre ....
111	36K690072	Knob, tuning: tan (59L11Q) .....
or	36K690147	Knob, tuning: black (59L12Q) .....
or	36K690149	Knob, tuning: maroon (59L14Q) .....
112	36K690070	Knob, volume: tan; includes clip (59L11Q) .....
or	36K690134	Knob, volume: black; includes clip (59L12Q) .....
or	36K690138	Knob, volume: maroon; includes clip (59L14Q) .....
113	36K690074	Lever, switch: tan (Batt-Off-AC/DC switch lever, 59L11Q) .....
or	36K690143	Lever, switch: black (Batt-Off-AC/DC switch lever, 59L12Q) .....
or	36B480086	Lever, switch: maroon (Batt-Off-AC/DC switch lever, 59L14Q).....
114	29A690089	Lug, clinch (connects cover stop cord to chassis) .....
115	15B481896	Retainer, 'A' battery: plastic.
116	9A481743	Receptacle, 1-pin (on loop) ...
117	5S7720	Rivet: .083 x 1/8 steel; nkl pl (loop receptacle mtg) .....
118	3S488008	Screw, sheet metal: #4 x 1/4 Phil lips round head; thread cutting type; stl; cad pl (cover catch mtg) .....
119	3S490390	Screw, sheet metal: #4 x 3/8 Phil lips round head; thread cutting type; stl; cad pl (chassis mtg)
120	2S7089	Speednut: for .187 round; 3/8 x 5/8; blk parkerized finish (loop and grille retainer) .....
121	41A480094	Spring, hinge (back cover).....
122	30A690007	Stop Assembly, cover: includes cord and lug .....
123	46B480108	Stud, trimount (chassis insulator mtg) .....
124	4K19943	Washer, paper: 11/16 x 17/64 x 1/32 thick (cover stop cord guard) .....
125	4K481587	Washer, felt (inside switch lever) .....

MODELS 68F11, 68F12, 68F14, 68F14B, 68F14M; Ch. HS-124

Model
68F11



Models
68F14, 68F14M & 68F14B

Model
68F12

GENERAL INFORMATION

TYPE - 68F11 - Table model, plastic-walnut cabinet
68F12 - Table model, wood-mahogany cabinet
68F14 - Petite Console model, wood, brown mahogany cabinet
68F14M- Petite Console model, wood, red mahogany cabinet
68F14B- Petite Console model, wood, blonde mahogany cabinet

The above models are of the radio-phonograph combination type, receiving only the standard broadcast band (AM). A built-in loop antenna is used. Chassis HS-124 is used in all five models.

TUNING RANGE - 535 to 1620 Kc

IF FREQUENCY - 455 Kc.

TUBE COMPLEMENT - (six)
12AU6 Mixer
6C4 Oscillator
12BA6 IF Amplifier
6AQ6 Detector, AVC & 1st AF Amplifier
50B5 Power Amplifier
35W4 Rectifier

POWER SUPPLY - 105-125V, 60 cycles, 55 watts (with record changer).

RECORD CHANGER - Models 68F11, 68F14, 68F14M & 68F14B use Record Changer RC-34; Model 68F12 uses Record Changer RC-30A. For complete record changer information refer to Service Manual, Part No. 54P484953.

INSTALLATION & OPERATING INSTRUCTIONS

Refer to Figure 1 for operating control locations.

POWER SWITCH AND VOLUME CONTROL. The power switch and volume control are combined and operated with the left-hand knob. Turn radio ON by rotating volume knob to the right until a 'click' is heard. Continued rotation of this control to the right will increase volume. Turn receiver OFF by rotating volume knob to the left until a 'click' is heard.

ANTENNA. A loop antenna is built into this receiver, eliminating the need for an external antenna. Reception from some stations may be improved by rotating the receiver; this is due to the slight directional characteristic of the loop antenna. For additional pick-up on Models 68F11 & 12, an external antenna may be connected to the wire on back of set, or to Models 68F14, M & B, by passing external antenna lead-in through hole in cabinet back and connecting to loose lead taped to inside of cabinet.

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

TUNING. The calibrated dial scale is read in kilocycles by adding one '0' to the figures. Tune carefully until you are exactly on the station; tuning to either side of it will result in noisy reception and poor tone quality. Do not regulate volume by detuning the station; always tune exactly 'on' the station, then adjust volume control as desired.

MODELS 68F11, 68F12, 68F14, 68F14B, 68F14M; Ch. HS-124

PHONO SWITCH. The radio will not play unless the PHONO button is out (flush with REJECT button). Alternate pushes will lock the button 'in' for phono operation and 'out' for radio reception.

TONE SWITCH. Alternate pushes on TONE button will change the tone to bass or treble. Bass position is with button 'in'.

MOTOR SWITCH. Push the MOTOR button 'in' to allow the turntable to revolve; the button will lock in position. To stop the turntable, again push the button 'in' and release; the button will snap back to the 'off' position.

REJECT SWITCH. Momentarily push 'in' the REJECT button to begin the playing of the records. The button may be pushed 'in' to reject a record before it has been completely played.

RECORD CHANGER. Refer to Record Changer Service Manual 54P484953 for record changer operation.

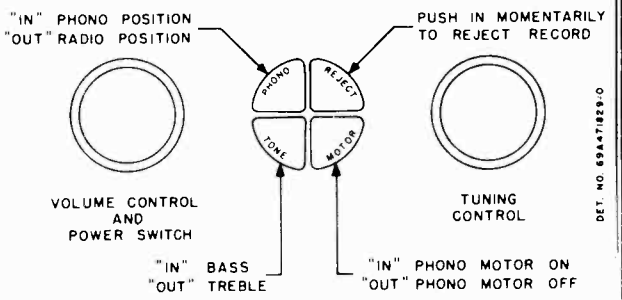


FIGURE 1. CONTROLS

SERVICE NOTES

HOW TO REPLACE PHONOGRAPH NEEDLE

This record player is equipped with a permanent point long-life needle which is good for several thousand plays unless damaged by mishandling. To replace a phonograph needle, loosen the small knurled nut that holds the needle in place. The nut is accessible from the bottom of pick-up arm. Use a pair of long nose pliers or tweezers to avoid damaging the crystal cartridge. Recommended replacement needle is Motorola Part No. 47K471596. CAUTION: Standard type needles will not work.

IF & DIODE REPLACEMENT

NOTE: Two types of IF & Diode transformers are being used. One type has iron cores that are tuned by means of slotted brass screws. These transformers must be used with shields having an internal iron core sleeve.

The other type of transformers have threaded cores moving inside of a threaded coil form. Plain shields must be used with these transformers.

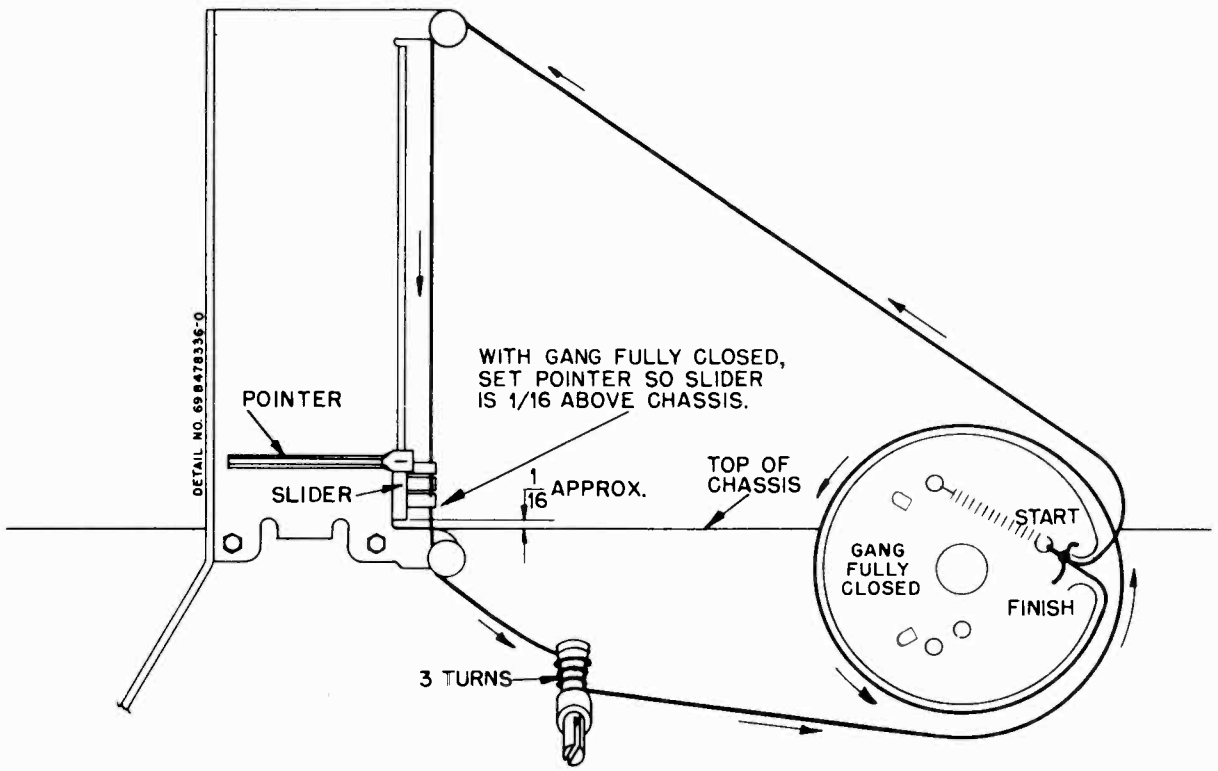


FIGURE 2. CHASSIS HS-124 STRING DRIVE DETAIL

MODELS 68F11, 12, 68F14, 68F14B, 68F14M; Ch. HS-124

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment. Follow the procedure carefully.

It is suggested that an isolating transformer be used between receiver and power line during alignment. If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator through a .1 mf capacitor to B- instead of the receiver chassis.

A low range output meter should be connected across the speaker voice coil. Set receiver volume control to maximum. For greatest accuracy, keep output of receiver at approximately .05 watt (.05 watt = .40 volt on output meter) throughout alignment by reducing signal generator output (not receiver volume control) as stages are brought into alignment.

NOTE: Two types of IF & diode transformers are used in this chassis. One type has cores with slotted brass adjustment screws; the other type has threaded cores that move inside a threaded coil form. To adjust the latter type, use a small fiber screwdriver and do not use undue pressure as damage to the core or coil form may result.

STEP	DIAL SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
IF ALIGNMENT						
1.	Gang fully opened	.1 mf	Mixer Grid (pin #1)	455 Kc	1,2,3 & 4	Adjust for maximum.
RF ALIGNMENT						
2.	Gang fully opened	.1 mf	Mixer Grid (pin #1)	1620 Kc	5	This sets oscillator to dial scale. (Check pointer calibration by referring to Figure 2.)
3.	1400 Kc	None	Radiation loop*	1400 Kc	6	Tune signal in on receiver, then adjust trimmer (6) for maximum. After set is assembled in cabinet, re-peak this trimmer.

* Connect output of signal generator to a 5" diameter, 3 turn loop and bring loop close enough to receiver loop to obtain output of 50 milliwatts (.40V) on output meter. Vary distance between loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".

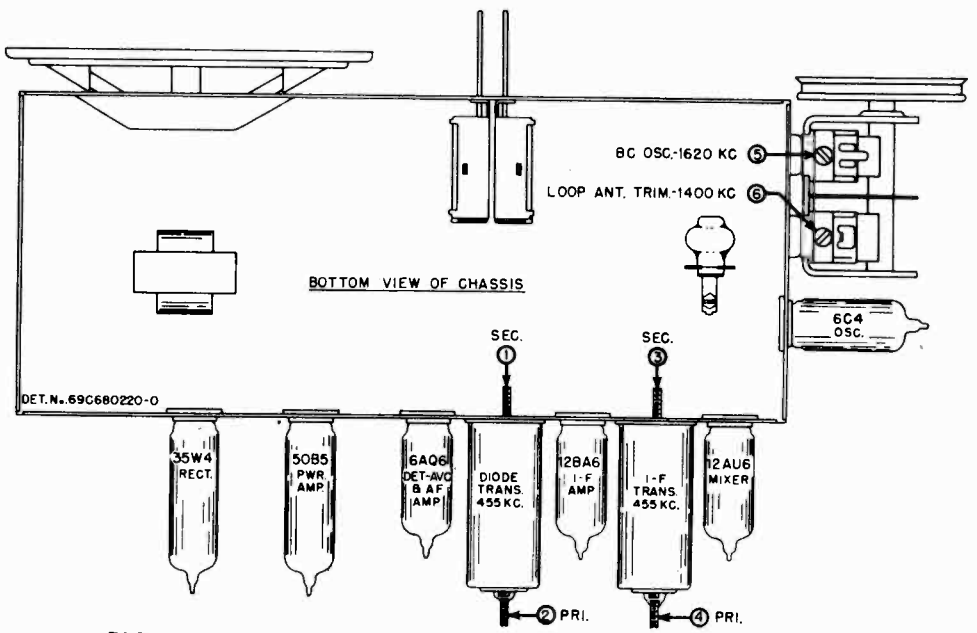


FIGURE 3. CHASSIS HS-124 TUBE & TRIMMER LOCATIONS

MODELS 68F11, 68F12, 68F14, 68F14B, 68F14M; Ch. HS-124

FRONT OF CHASSIS

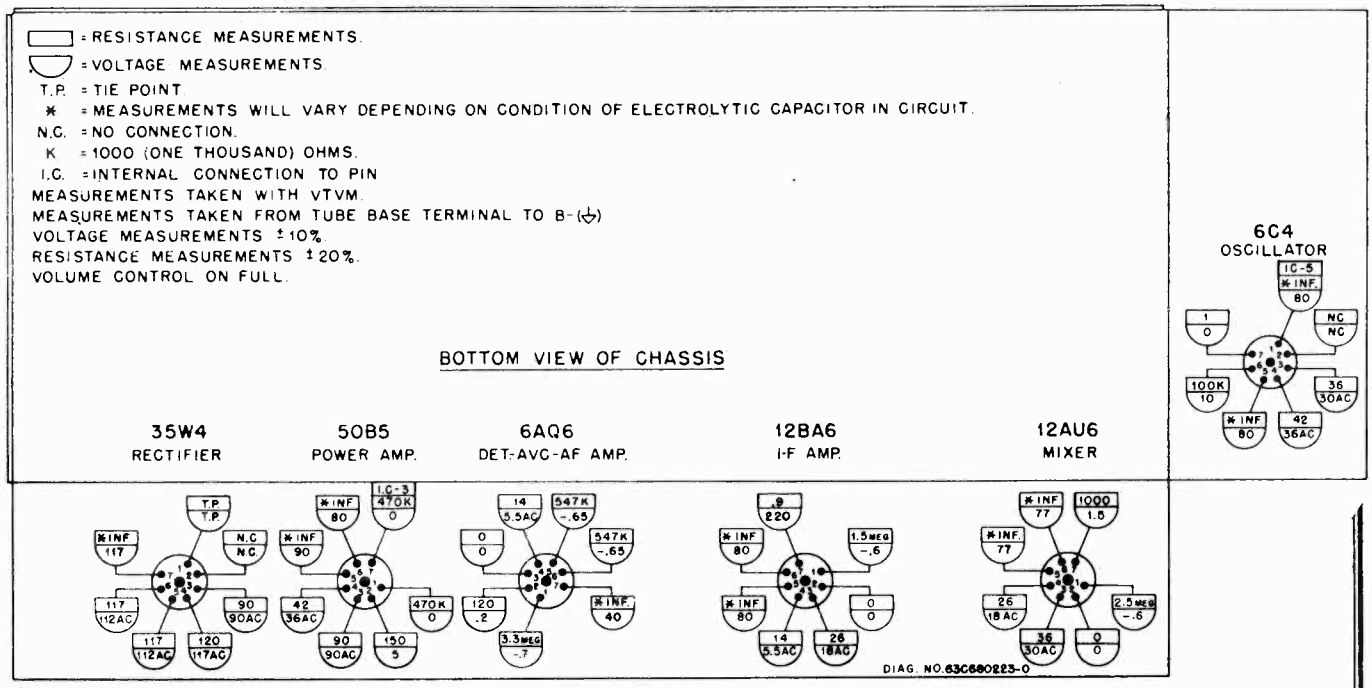


FIGURE 4. CHASSIS HS-124 VOLTAGE & RESISTANCE DIAGRAM

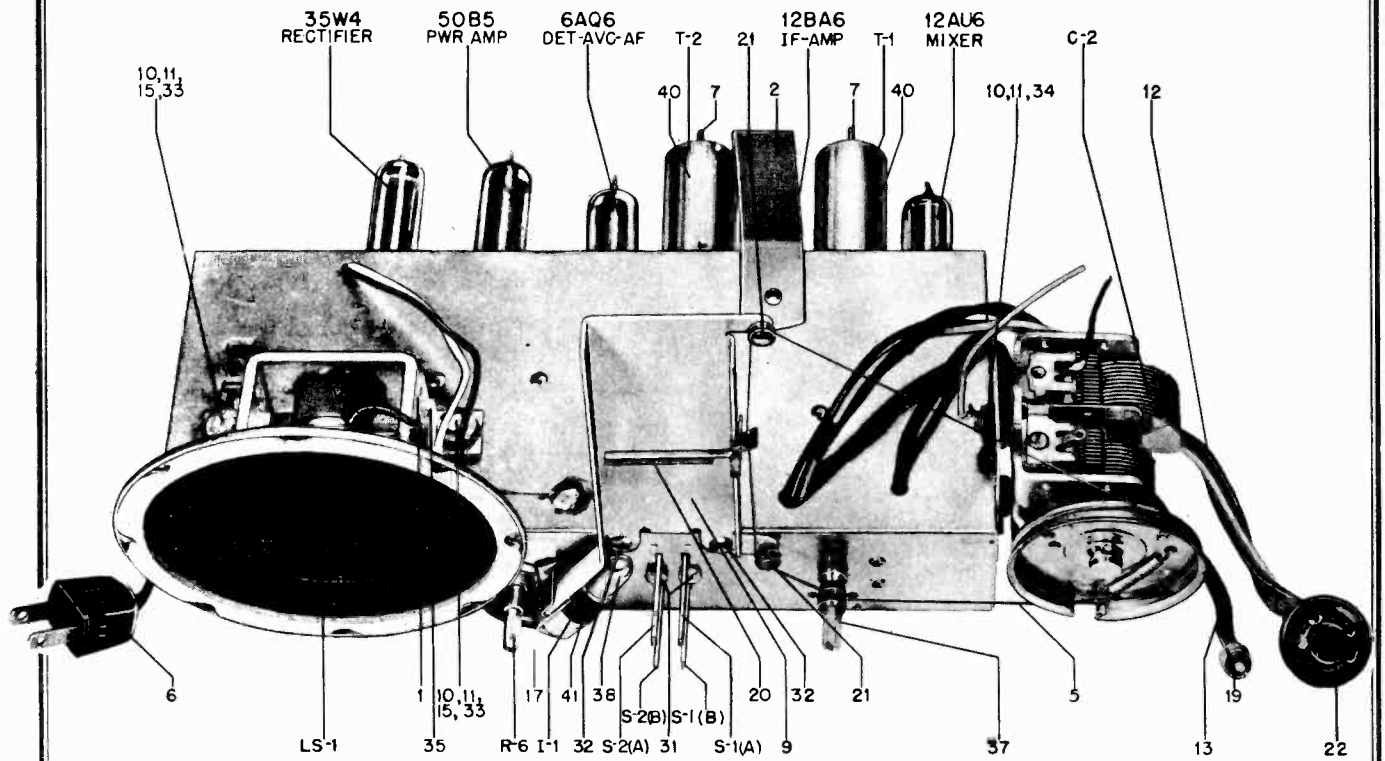


FIGURE 5. CHASSIS HS-124 PARTS LOCATION - TOP VIEW

MODELS 68F11, 68F12, 68F14,
68F14B, 68F14M; Ch. HS-124

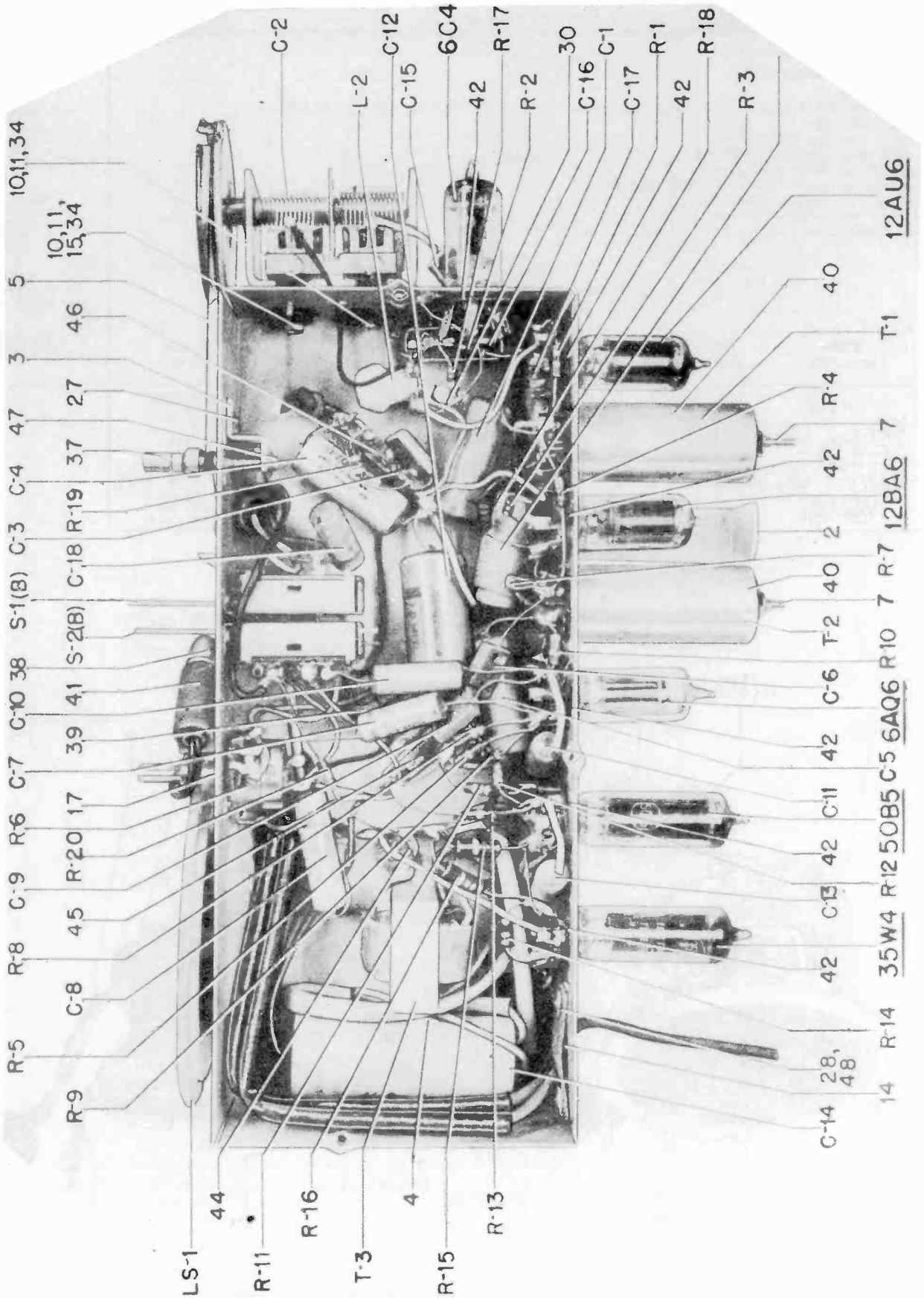
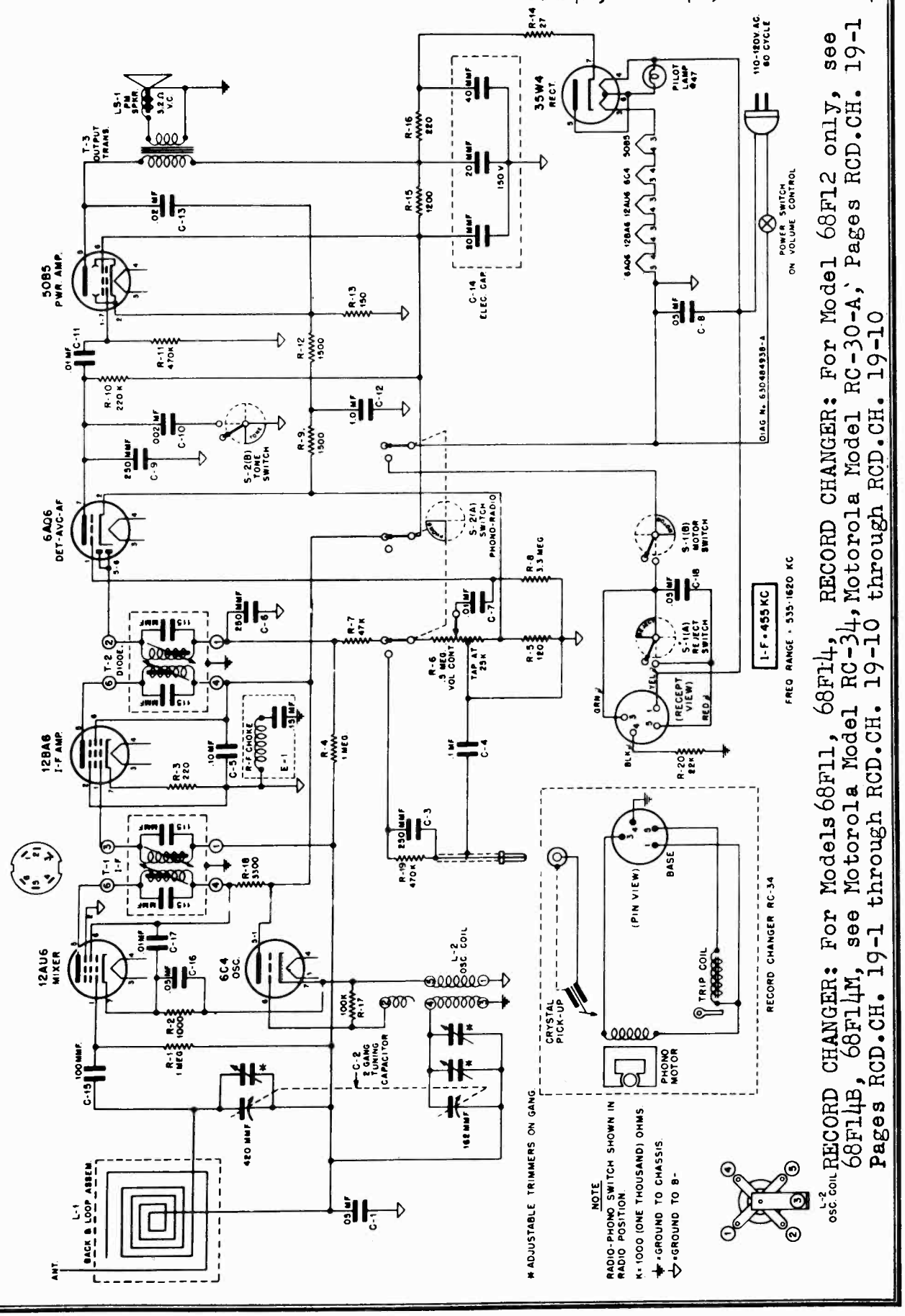


FIGURE 6. CHASSIS HS-124 PARTS LOCATION - BOTTOM VIEW

MODELS 68F11, 68F12, 68F14, 68F14B, 68F14M; Ch. HS-124



MODELS 68F11, 68F12, 68F14, 68F14B, 68F14M; Ch. HS-124

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	8S9816	Paper: .05 mf 400V .....
C-2	1X470181	Variable, 2 gang: includes pulley .....
C-3	21R6648	Mica: 250 mmf 500V .....
C-4	8S9807	Paper: .1 mf 400V .....
C-5	8S9806	Paper: .1 mf 200V .....
C-6	21R6648	Mica: 250 mmf 500V .....
C-7	8S9809	Paper: .01 mf 400V .....
C-8	8S9816	Paper: .05 mf 400V .....
C-9	21R6648	Mica: 250 mmf 500V .....
C-10	8S9824	Paper: .002 mf 400V .....
C-11	8S9809	Paper: .01 mf 400V .....
C-12	8S9839	Paper: 1.0 mf 100V .....
C-13	8S9802	Paper: .02 mf 400V .....
C-14	23B75808	Electrolytic: 40-20-20/150V.
C-15	21R6641	Mica: 100 mmf 500V .....
C-16	8S9821	Paper: .05 mf 200V .....
C-17	8S9809	Paper: .01 mf 400V .....
C-18	8K471635	Paper: .05 mf 400V .....
CHOKE		
E-1	1A77283	Capacitor and Choke Assembly (includes .15 mf 200V paper capacitor and coil) .....
DIAL LIGHT		
I-1	65X11854	Bulb: 6.3V .15A; tubular; bayonet base; clear; #47 ..
COILS		
L-1	24C470214	Loop & Panel Assembly: with lug terminals (68F11 & 68F12)..
or	24K482757	Loop & Panel Assembly: with pin terminals (68F14, 68F14M & 68F14B) .....
L-2	24A74616	Oscillator .....
SPEAKER		
LS-1	50B470034	PM: 5"; 3.2 ohm VC ..... Exchange
RESISTORS		
Note: All resistors are insulated carbon type, 20% watt unless otherwise specified.		
R-1	6R6004	1 meg .....
R-2	6R6301	1000 .....
R-3	6R3933	220 .....
R-4	6R6004	1 meg .....
R-5	6R5551	120 10% .....
R-6	18K470033	Volume Control: .5 meg, tapped at 25,000 ohms; includes power switch .....
R-7	6R6056	47,000 .....
R-8	6R2118	3.3 meg .....
R-9	6R6038	1500 10% .....
R-10	6R6015	220,000 .....
R-11	6R6032	470,000 .....
R-12	6R6038	1500 10% .....
R-13	6R6373	150 10% .....
R-14	6R5683	27 10% .....
R-15	6R5770	1200 10% 1W .....
R-16	6R6389	220 10% 1W .....
R-17	6R6075	100,000 .....
R-18	6R6036	3,300 .....
R-19	6R6032	470,000 .....
R-20	6R6028	22,000 .....

Ref. No.	Part No.	Description
SWITCHES		
S-1A, B,	40A470510	Dual Push Switch: reject & motor
S-2A, B,	40A470511	Dual Push Switch: phono & tone
TRANSFORMERS		
T-1	24B470038	IF, 455 Kc: includes padding capacitors, but less shield (used with shield & sleeve 1A71049)
or	24B482863	IF, 455 Kc: includes padding capacitor but less shield (use with shield 24K485936) .....
T-2	24B75487	Diode, 455 Kc: includes padding capacitors but less shield (use with shield & sleeve 1A71049)
or	24B482865	Diode, 455 Kc: includes padding capacitors but less shield (use with shield 24K485936) ....
T-3	25B76117	Output transformer .....
CHASSIS PARTS - MECHANICAL		
1	7K470005	Bracket, speaker mtg .....
2	7A482736	Bracket, tube guard .....
3	7A77337	Bracket, tuning shaft mtg ..
4	42K75826	Clip, electrolytic mtg .....
5	11M8944	Cord, dial: 18# black .....
6	30K21859	Cord, line: 9 ft long; with plug .....
7	46A70023	Core, iron & screw: for T-1 & T-2 (use with trans. 24B470038 & 24B75487 only) .....
or	46A470885	Core, iron: threaded; for T-1 & T-2 (use with trans. 24B482863 & 24B482865 only) .....
8	1X470184	Cover, chassis bottom: includes grounding wiper .....
9	1X470183	Dial Bracket and Pulley Assembly
10	5A70098	Eyelet, spacer (tuning gang and speaker mounting) .....
11	5A70404	Grommet, rubber (tuning gang and speaker mounting) .....
12	1X470177	Lead Assembly, phono motor & control: four conductors, includes four prong receptacle
13	1X470178	Lead Assembly, phono pick-up: single conductor; includes single pin plug .....
14	32A24815	Lock, line cord: fibre .....
15	4S7666	Lockwasher, external: #6 cadmium plated (tuning gang mtg and tube guard mtg) ....
16	29R5227	Lug, soldering: 6L; hot-tinned .....
17	2S7051	Nut, hex: 3/8-32 x 9/16; Palnut; cad pl (vol. cont.mtg)
18	64A470009	Plate, tuning gang mtg .....
19	28K71775	Plug, single-pin (on phono pick-up lead) .....
20	52A470003	Pointer, dial .....
21	49A12646	Pulley, cord guide .....
22	9K470402	Receptacle, 4 prong .....
23	9A470980	Receptacle, loop lead (68F14, 14M & 14B only) .....
24	5S7770	Rivet: .088 x 5/32; stl; nkl pl (tube socket mtg) .....
25	5S7706	Rivet: .122 x 1/8; stl; nkl pl (grounding wiper mtg)..
26	5S7707	Rivet: .122 x 5/32; stl; nkl

MODELS 68F11, 68F12, 68F14, 68F14B, 68F14M; Ch. HS-124

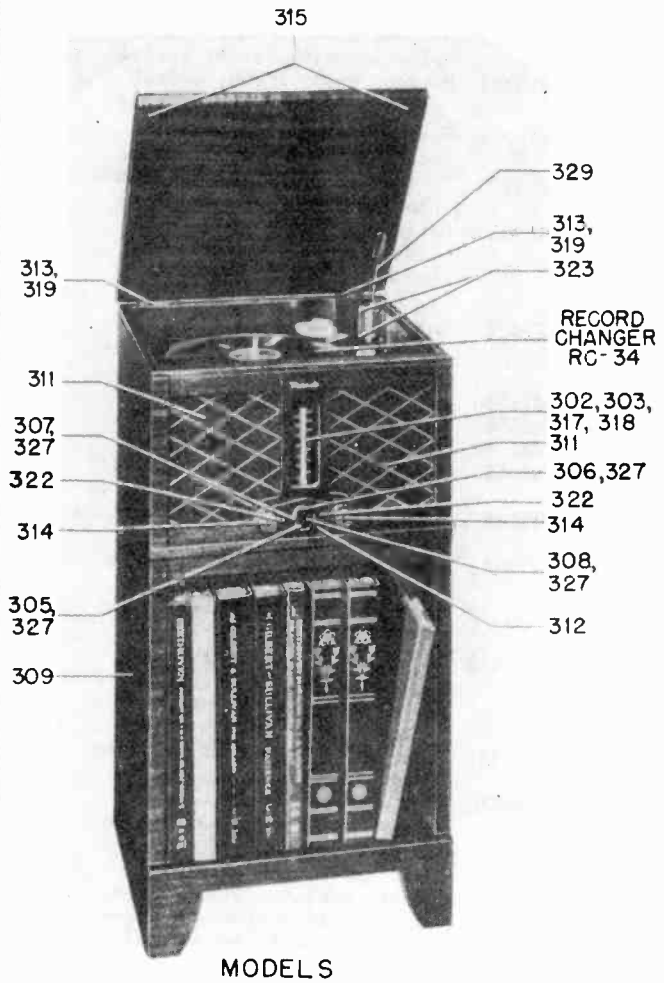
Ref. No.	Part No.	Description
		pl (terminal strip mtg) ...
27	5S7701	Rivet: .122 x 3/16; stl; nkl pl (tuning shaft bracket mtg) .....
28	5S7708	Rivet: .122 x 9/32; stl; nkl pl (line cord lock mtg) ...
29	5A71246	Rivet, shoulder (cord pulley mounting) .....
30	3S2683	Screw, sheet metal: #6 x 3/16 PKZ plain hex head; stl; cad pl (oscillator coil mtg) .....
31	3S7247	Screw, machine: 6-32 x 3/16 slotted hex head locking type; stl; cad pl (switch mtg) ..
32	3S7506	Screw, sheet metal: #6 x 1/4 PKZ plain hex head; stl; cad pl; (tuning gang plate mtg & dial bracket assembly mtg)
33	3S7512	Screw, sheet metal: #8 x 1/2 PKZ plain hex head; stl; cad pl (speaker mtg) .....
34	3S7339	Screw, machine: 6-32 x 5/8 slotted hex head; stl; cad pl; (tuning gang mtg) .....
35	3S7205	Screw, machine: 8-32 x 1/4 slotted hex head locking type; stl; cad pl; (spkr brkt mtg)doz
36	3S8153	Screw, sheet metal: #8 x 3/8 PKA plain hex head; stl; cad pl; (mounts chassis bottom cover to chassis) .....
37	1X470172	Shaft and Pulley Assembly, tuning
38	26A470013	Shield, dial light .....
39	30K14144	Shield, spiral: 3-1/4" lg ..
40	1A71049	Shield and Sleeve Assembly (for IF -Part No. 24B470038 and Diode -Part No. 24B75487 transformers only) .....
or	26K485936	Shield, coil (for IF-Part No. 24B482863 and Diode -Part No. 24B482865 transformers only)
41	9A470015	Socket, pilot light and leads; with mtg clip .....
42	9A472534	Socket, tube: miniature; 7 prong; molded .....
43	41A14244	Spring, tension coil .....
44	31K90044	Strip, terminal: 2 insulated lugs #2 ground .....
45	31A27184	Strip, terminal: 3 insulated lugs #3 mtg .....
46	31A470012	Strip, terminal: 4 insulated lugs #3 ground .....
47	4A70015	Washer 'C' (tuning shaft retainer) .....
48	4S1719	Washer, flat: 3/8 x .140 x .030; stl; cad pl (line cord lock mtg) .....
49	39K470032	Wiper, grounding: two section (used on chassis bottom cover) .....

CABINET PARTS - MODEL 68F11

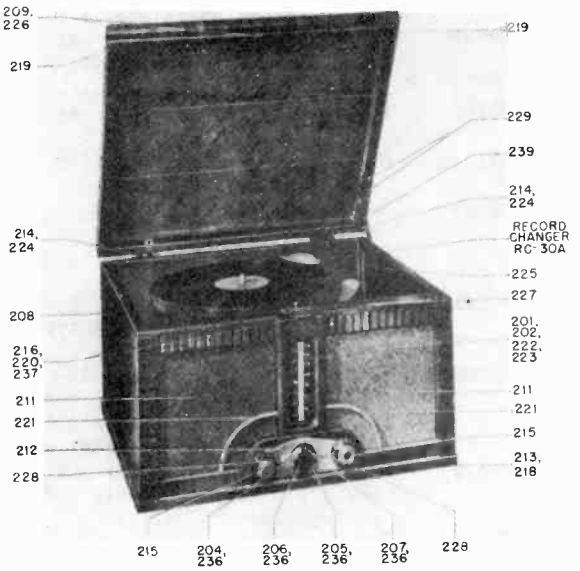
101	1X470286	Baffle Board and Nut Assembly: left side; with spkr hole ..
102	1X470287	Baffle Board and Nut Assembly: right side .....
103	37K470185	Band, rubber: 4" (used on dial scale) .....
104	7A470195	Bracket, dial scale retainer.
105	35A470192	Bumper, rubber (lid cushion).
106	38K482819	Button, plug: 1/4"; mahogany
107	38B470202	Button, push: PHONO; walnut plastic; with insert spring
108	38K470203	Button, push: MOTOR; walnut plastic; with insert spring
109	38K470204	Button, push: TONE; walnut plastic; with insert spring
110	38K470205	Button, push: REJECT; walnut plastic; with insert spring
111	1X470201	Cabinet Assembly: walnut plastic; complete with all hardware, dial scale, escutcheon and grille .....
	16E77697	Cabinet: walnut plastic; less all hardware, dial scale, escutcheon, grille & lid .....
112	42A471546	Clip 'C' (loop lead retainer)
113	13K485953	Cloth, grille (left side) ...
114	13K485952	Cloth, grille (right side) ..
115	13K470513	Escutcheon, knob and push button: brushed brass finish ..
116	37A12748	Foot, cabinet: rubber; includes steel washer .....
117	13C470516	Grille, cabinet: metal (left side) .....
118	13K470517	Grille, cabinet: metal (right side) .....
119	55A470193	Hinge, lid: statuary bronze finish .....
120	36K77661	Knob, control: walnut plastic
121	16E77698	Lid, cabinet: walnut plastic.
122	29A470186	Lug, soldering: bent (on loop panel) .....
123	34K480001	Scale, dial .....
124	3S2992	Screw, machine: 4-40 x 5/16 slotted flat head; stl; cad pl (dial scale mounting) ...
125	3S2994	Screw, machine: 6-32 x 3/16 slotted binderhead; statuary bronze finish (hinge mtg) ..
126	3S476039	Screw, machine: 6-32 x 3/8 Phillips binderhead; brass (escutcheon mtg) .....
127	3S2993	Screw, machine: 6-32 x 3/8 Phillips binderhead; black nkl plated (baffle board mtg and lid support mtg) ...
128	3S3385	Screw, sheet metal: #6 x 3/8 PKZ plain hex head; statuary bronze finish (loop panel mounting) .....
129	3A470198	Screw, special: 6-32 internal thread; statuary bronze finish (hinge mtg) .....
130	2S7374	Screw, machine: 8-32 x 5/16 slotted hex head; stl; cad pl (chassis mtg and tube heat shield mtg) .....
131	3S2958	Screw, machine: 8-32 x 7/16 slotted hex head; stl, cad pl (cabinet foot mtg) .....
132	26C470067	Shield, tube heat (Note: Some receivers had tube retainer springs on this shield; these are no longer used or required)
133	41A12993	Spring, push button insert ..
134	55B470209	Support, lid: statuary bronze finish .....
135	4S7562	Washer, flat: 7/16 x .187 x .033 thick; stl, cad pl (chassis mtg) .....
136	4A470645	Washer, spacer (loop panel mounting)

MODELS 68F11, 68F12, 68F14, 68F14B, 68F14M; Ch. HS-124

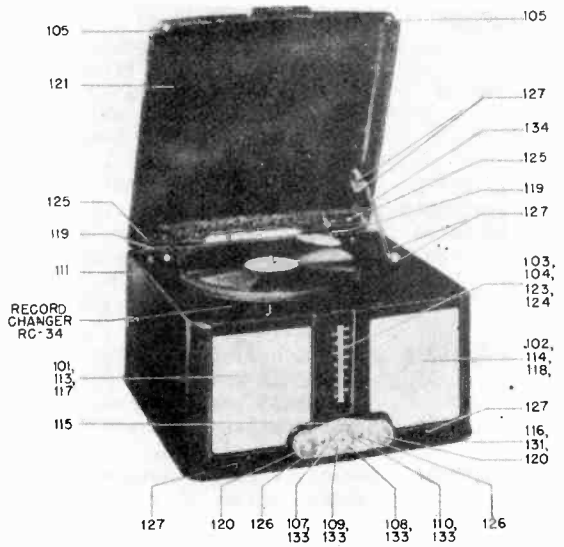
FIGURE 8. CABINET PARTS LOCATION - FRONT VIEW



MODELS
68F14, 68F14M & 68F14B



MODEL 68F12



MODEL 68F11

Ref. No.	Part No.	Description
318	3S7431	Screw, wood: #2 x 1/4 Phillips round head; antique copper finish (dial scale mtg) ...
319	3S1338	Screw, wood: #4 x 1/2 slotted flat head; statuary bronze fin (hinge mtg-68F14 & 14M)....
or	3S1340	Screw, wood: #6 x 1/2 slotted flat head; statuary bronze finish (hinge mtg-68F14B)..
320	3S1348	Screw, wood: #6 x 3/8 Phillips round head; antique copper finish (perforated plate mounting) .....
321	3S7536	Screw, sheet metal: #6 x 3/8 PKA slotted acorn head; antique copper finish (antenna mounting) .....
322	3S488089	Screw, wood: #6 x 3/8 Phillips oval head; statuary bronze finish (escutcheon mtg - 68F14 & 68F14M) .....
or	3S1341	Screw, wood: #6 x 3/8 Phillips oval head; brass (escutcheon mtg -68F14B) .....
323	3S7436	Screw, wood: #6 x 1/2 slotted round head; antique copper finish (lid support mounting-68F14 & 68F14M) .....
or	3S476061	Screw, wood: #6 x 1/2 slotted round head; brass (lid support mtg -68F14B) .....
324	3S7455	Screw, sheet metal: #8 x 3/8 PKA slotted acorn head; antique copper finish (cable clamp mtg) .....
325	3S476007	Screw, machine: 8-32 x 7/8 slotted hex head; stl; cad pl (chassis mtg and tube heat shield mtg) .....
326	26C470067	Shield, tube heat .....
327	41A12993	Spring, push button insert .
328	22S7905	Staple, insulated .....
329	55B482803	Support, lid: brass (68F14B).
or	55B481750	Support, lid: statuary bronze finish (68F14 & 68F14M) ...
330	2A470641	Teenut, pronged: slabbed type .....
331	4S7562	Washer, flat: 7/16-.187-.033 thick; stl; cad pl (chassis mtg)

MODELS 68F11, 68F12, 68F14, 68F14B, 68F14M; Ch. HS-124

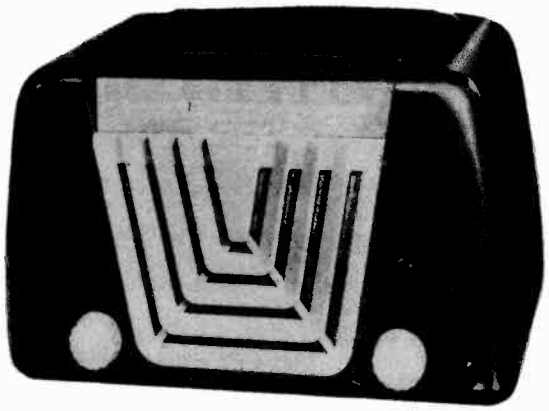
CABINET PARTS - MODEL 67F12

Ref. No.	Part No.	Description
201	37K70069	Band, rubber: 1" (on dial scale)
202	7A470642	Bracket, dial scale retainer
203	38K470830	Button, plug: 1/4", green (for concealing shipping screw holes in record changer base)
204	38K480059	Button, push: PHONO; plastic
205	38K480060	Button, push: MOTOR; plastic
206	38K480061	Button, push: TONE; plastic
207	38K480062	Button, push: REJECT; plastic
208	16K480058	Cabinet, table model: wood, mahogany finish
209	55K482753	Catch, lid: English antique finish
210	42A470832	Clamp, cable
211	13K480182	Cloth, grille: 7 x 6-1/2
212	13K470513	Escutcheon, knob and push button: brushed brass finish
213	37K15841	Foot, cabinet: rubber
214	55K470656	Hinge, lid: statuary bronze finish
215	36K478402	Knob, control: plastic
216	1X482756	Latch Arm, Stud and Bracket Assembly
217	29A470186	Lug, soldering: bent (on loop panel)
218	22S7953	Nail: .080 x 5/8 (cabinet foot mounting)
219	35K484249	Pad, felt: 1/8" thick (lid cushion)
220	35A482755	Pad, latch mtg: fishpaper
221	47A470640	Rod, ornamental: brass
222	34K480001	Scale, dial: glass
223	3S7431	Screw, wood: #2 x 1/4 Phillips round head; antique copper finish (dial scale mtg)
224	3S1338	Screw, wood: #4 x 1/2 slotted flat head; statuary bronze finish (hinge mounting)
225	3S2993	Screw, machine: 6-32 x 3/8 Phillips oval head; copper oxide finish(mounts lid support to cabinet)
226	3S1348	Screw, wood: #6 x 3/8 Phillips round head; antique copper finish (perforated plate mtg & catch mtg)
227	3S488089	Screw, wood: #6 x 3/8 Phillips oval head; statuary bronze finish (latch arm, stud and bracket assembly mtg)
228	3S1341	Screw, wood: #6 x 3/8 Phillips oven head; brass (escutcheon mounting)
229	3S7436	Screw, wood: #6 x 1/2 slotted round head; antique copper finish (mounts lid support to lid)
230	3S3387	Screw, sheet metal: #6 x 1/2 PKA slotted hex head; statuary bronze finish (loop panel mounting)
231	4S476007	Screw, machine: 8-32 x 7/8 slotted hex head; stl, cad pl (chassis and tube heat shield mtg)
232	3S7396	Screw, machine: 10-32 x 2 slotted hex head; copper plated (record changer mtg)
233	26C470067	Shield, tube heat
234	41A28190	Spring, cushion top (record changer mounting)
235	41A21807	Spring, cushion: bottom (record changer mounting)
236	41A12993	Spring, push button insert
237	41A74880	Spring, tension
238	22S7905	Staple, insulated: (loop lead anchor)
239	55K470636	Support, lid: statuary bronze finish
240	2A470641	Teenut, pronged: 8-32; slabbed type
241	4A470645	Washer, paper spacer (loop panel spacer)
242	4S7562	Washer, flat: 7/16 x .187 x .033 thick; stl, cad pl; (chassis mtg)
243	4S7611	Washer, flat: 1/2 x 7/32 x .048 thick; antique copper finish (record changer mtg)

CABINET PARTS - MODELS 68F14, 68F14M & 68F14B

Ref. No.	Part No.	Description
301	64B480157	Back, cabinet rear: brown mahogany (68F14)
or	64K484256	Back, cabinet rear: red mahogany (68F14M)
or	64K485179	Back, cabinet rear: blonde (68F14B)
302	37K70069	Band, rubber: 1" (on dial scale)
303	7A470642	Bracket, dial scale retainer
304	38K482819	Button, plug
305	38K470203	Button, push: motor (67F14).
or	38K480060	Button, push: motor (67F14M)
or	38K471645	Button, push: motor (67F14B)
306	38B470202	Button, push: phono (67F14).
or	38K480059	Button, push: phono (67F14M)
or	38K471644	Button, push: phono (67F14B)
307	38K470205	Button, push: reject (67F14)
or	38K480062	Button, push: reject (67F14M)
or	38K471647	Button, push: reject (67F14B)
308	38K470204	Button, push: tone (67F14)
or	38K480061	Button, push: tone (67F14M).
or	38K471646	Button, push: tone (67F14B).
309	16K482780	Cabinet, petite console: wood; brown mahogany (68F14)
or	16F480155	Cabinet, petite console: wood; red mahogany (68F14M)
or	16K482781	Cabinet, petite console: wood; blonde mahogany (68F14B)
310	42A470832	Clamp, cable
311	13K480156	Cloth, grille (68F14)
or	13K482760	Cloth, grille (68F14M)
or	13K77256	Cloth, grille (68F14B)
312	13K470513	Escutcheon, knob and push button: brushed brass finish (68F14B)
or	13B470512	Escutcheon, knob and push button: statuary bronze finish (68F14 & 68F14M)
313	55A72558	Hinge, butt: statuary bronze finish (68F14B)
or	55K470656	Hinge, lid: statuary bronze finish (68F14 & 68F14M)
314	36K470646	Knob, control: walnut (68F14)
or	36K478402	Knob, control: mahogany (68F14M)
or	36K471643	Knob, control: tan (68F14B)
315	35K470657	Pad, felt (lid cushion)
316	64K484302	Plate, perforated: painted
317	34B470208	Scale, dial: glass; brown (68F14)
or	34K480001	Scale, dial: glass; maroon(68F14M)
or	34K471642	Scale, dial: glass; light tan (68F14B)

MODELS 68X11, 68X11A, 68X12, 68X12A; Ch. HS-127, HS-127A



Models 68X11 & 68X11A
Maroon Plastic Cabinet

Models 68X12 & 68X12A
Brown Plastic Cabinet

GENERAL INFORMATION

TYPE-AC-DC operated, table model, superheterodyne receiver with loop antenna.

TUNING RANGE- 535 to 1620 Kc

IF FREQUENCY - 455 Kc

TUBE COMPLEMENT - 14C7 - RF Amplifier
14Q7 - Oscillator-Modulator
12B7
or 14A7 - IF Amplifier
14B6 - Detector-AVC-1st AF Amplifier
35A5 - Power Amplifier
35Y4 - Rectifier

POWER SUPPLY - 105-125 volts, AC or DC, 30 watts

INSTALLATION & OPERATING INSTRUCTIONS

POWER SWITCH AND VOLUME CONTROL. The power switch and volume controls are combined and operated with with the left-hand knob.

NOTE: If the receiver does not operate from a direct current (DC) line after being turned ON for a few minutes, reverse the line cord plug in the wall outlet. When operating from an AC line, reversing the line cord plug in the wall outlet may sometimes improve reception and reduce hum.

TUNING. Tune stations with the right-hand knob. The calibrated dial scale is read in kilocycles by adding one "O" to the figures.

ANTENNA. A loop antenna is built into this receiver, eliminating the need for an external antenna. Reception from some stations may be improved by rotating the whole receiver; this is due to the slight directional characteristic of the loop antenna. In extremely noisy locations, rotate the entire receiver till minimum noise and maximum signal pickup are obtained. For additional pickup, an external antenna may be connected as shown on back of receiver.

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

SERVICE NOTE

IF & DIODE TRANSFORMER REPLACEMENT

Two types of IF & Diode transformers are being used. One type has iron cores that are tuned by means of slotted brass screws. These transformers must be used with shields having an internal iron core sleeve.

The other type of transformers have threaded cores moving inside of a threaded coil form. Plain shields must be used with these transformers.

MODELS 68X11, 68X11A, 68X12, 68X12A; Ch. HS-127, HS-127A

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment. Follow the procedure carefully.

If receiver is operated from AC line during alignment, it is suggested that an isolating transformer be used between receiver and power line during alignment. If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator through a .1 mf capacitor to B- instead of the receiver chassis.

A low range output meter should be connected across the speaker voice coil. Set receiver volume control to maximum. For greatest accuracy, keep output of receiver at approximately .05 watt (.05 watt = .40 volt on output meter) throughout alignment by reducing signal generator output (not receiver volume control) as stages are brought into alignment.

NOTE: Two types of IF & diode transformers are used. One type has cores with slotted brass adjustment screws; the other type has threaded cores that move inside a threaded coil form. To adjust the latter type, use a small fiber screwdriver and do not use undue pressure, as damage to the core or coil form may result.

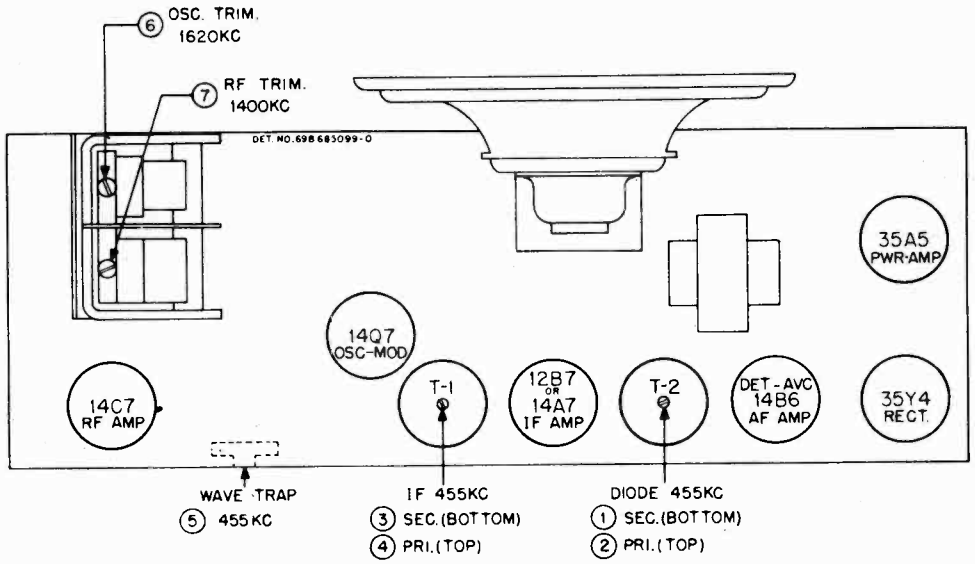
ALIGNMENT PROCEDURE

STEP	DIAL SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET TO	ADJUST TRIMMER OR CORE	REMARKS
IF ALIGNMENT						
1.	Gang fully opened	.1 mf	RF Amp grid*	455 Kc	1, 2, 3 & 4	Adjust for maximum
WAVETRAP						
2.	Gang fully opened	.1 mf	RF Amp grid*	455 Kc	5	Adjust for minimum
RF ALIGNMENT						
3.	1620 Kc**	.1 mf	RF Amp grid*	1620 Kc	6	This sets oscillator to dial scale
4.	1400 Kc	None	Radiation loop***	1400 Kc	7	Tune signal in on receiver, then peak trimmer 7

* A convenient point is the stator of the RF section of the tuning capacitor.

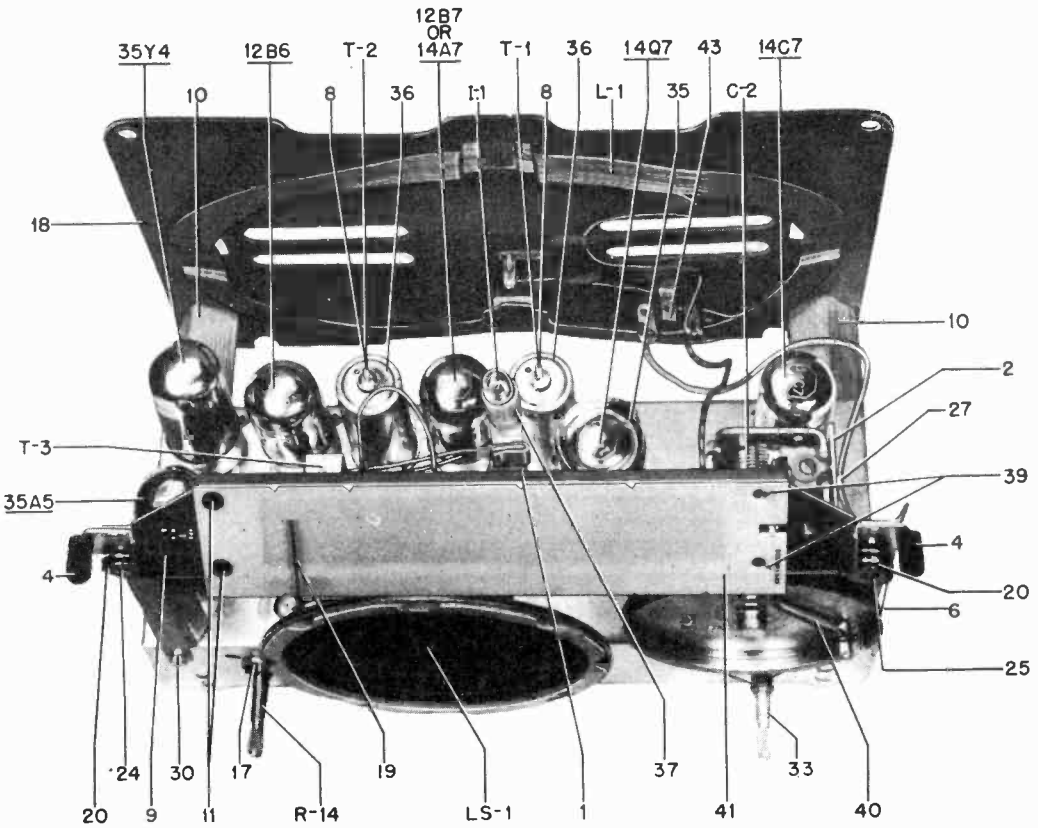
** First close gang fully and set pointer to calibration mark at left-hand side of dial background, then set pointer to 1620 Kc calibration mark (by means of tuning knob) on right-hand side of dial background. See Figure 6.

*** Connect output of signal generator to a 5" diameter, 3 turn loop and bring loop close enough to receiver loop to obtain output of 50 milliwatts (.40V) on output meter. Vary distance between loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".

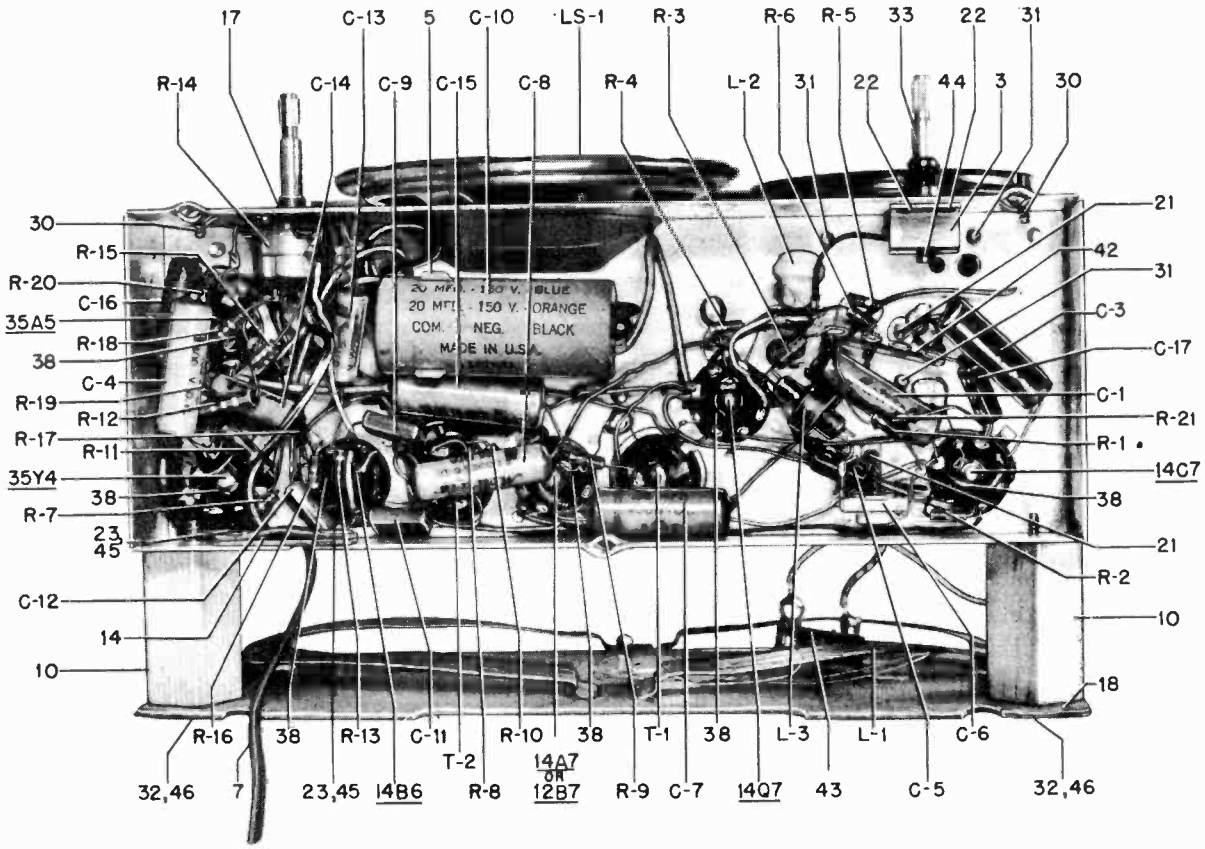


CHASSIS HS-127 & HS-127A TUBE & TRIMMER LOCATIONS

MODELS 68X11, 68X11A, 68X12, 68X12A; Ch. HS-127, HS-127A



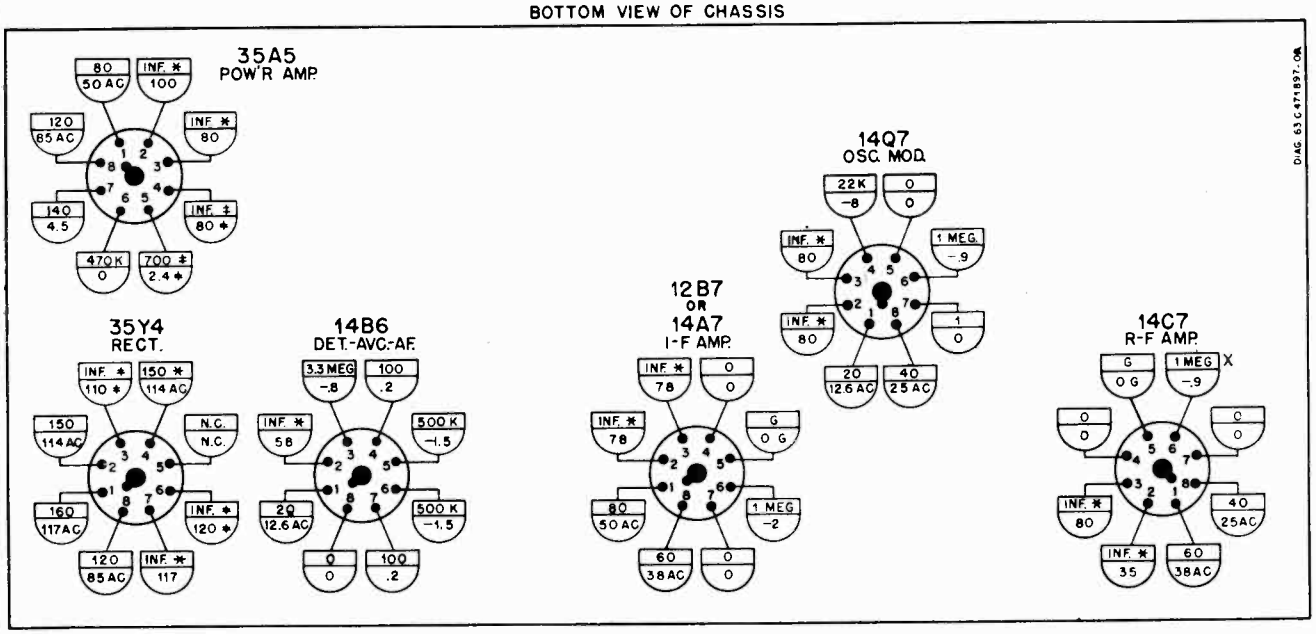
CHASSIS HS-127 & HS-127A PARTS LOCATION - TOP VIEW



CHASSIS HS-127 & HS-127A PARTS LOCATION - BOTTOM VIEW

MODELS 68X11, 68X11A, 68X12, 68X12A; Ch. HS-127, HS-127A

BOTTOM VIEW OF CHASSIS



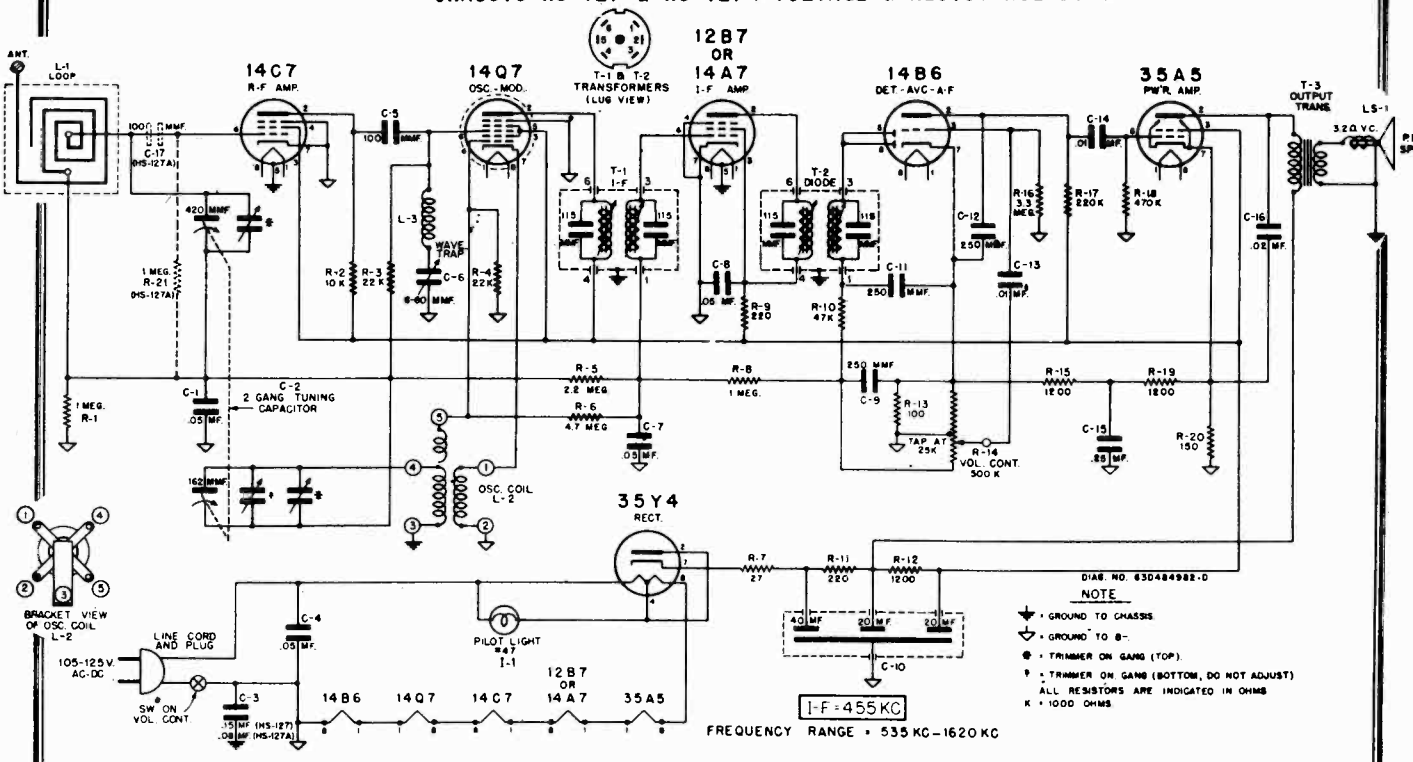
▭ = RESISTANCE READINGS.

◡ = VOLTAGE READINGS.

G = GROUND TO CHASSIS.
N.C. = NO CONNECTION.
* = MAY VARY, DEPENDING ON CONDITION OF ELECTROLYTIC CAPACITORS
+ = TIE POINT.
X = 2 MEG ON HS-127A

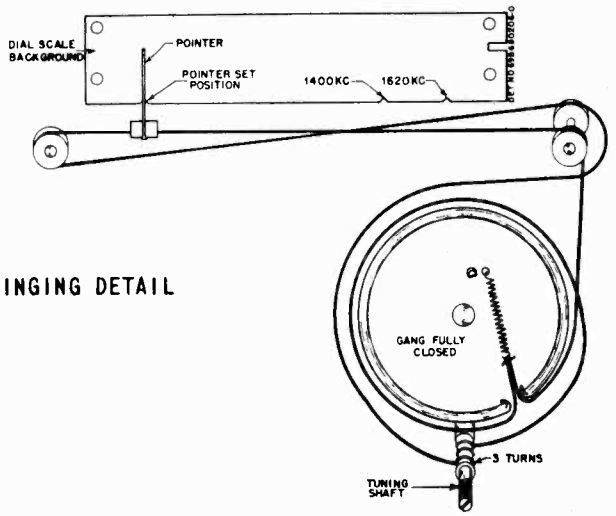
NOTE: A VTVM WAS USED TO MAKE VOLTAGE MEASUREMENTS.
VOLUME CONTROL SET AT MINIMUM AND NO SIGNAL TUNED IN.
MEASUREMENTS TAKEN FROM TUBE SOCKET TERMINALS INDICATED TO B−(▽).
ALL VOLTAGE MEASUREMENTS TAKEN WITH 117 V. AC INPUT TO SET.
ALL VOLTAGE MEASUREMENTS DC UNLESS OTHERWISE SPECIFIED.
ALL MEASUREMENTS ±10%.

CHASSIS HS-127 & HS-127A VOLTAGE & RESISTANCE DIAGRAM



CHASSIS HS-127 & HS-127A SCHEMATIC DIAGRAM

MODELS 68X11, 68X11A, 68X12, 68X12A; Ch. HS-127, HS-127A



CHASSIS HS-127 & HS-127A DIAL CORD RESTRINGING DETAIL

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	8S9816	Paper: .05 mf 400V .....
C-2	1X77339	Variable: 2 gang; includes pulley
C-3	8A72686	Paper: .15 mf 200V (HS-127).
	8A485135	Paper: .08 mf 200V (HS-127-A)
C-4	8S9816	Paper: .05 mf 400V .....
C-5	21R6641	Mica: 100 mmf 500V .....
C-6	20A26941	Variable, mica: 6-60 mmf; includes 'L' mounting bracket
C-7	8S9816	Paper: .05 mf 400V .....
C-8	8S9816	Paper: .05 mf 400V .....
C-9	21R6648	Mica: 250 mmf 500V .....
C-10	23B75808	Electrolytic: 40-20-20 mf 150V
C-11	21R6648	Mica: 250 mmf 500V .....
C-12	21R6648	Mica: 250 mmf 500V .....
C-13	8S9809	Paper: .01 mf 400V .....
C-14	8S9809	Paper: .01 mf 400V .....
C-15	8S9810	Paper: .25 mf 100V .....
C-16	8S9802	Paper: .02 mf 400V .....
C-17	21R6641	Mica: 100 mmf 500V (HS-127A only)
PILOT LIGHT		
I-1	65X11854	Bulb: 6.3 volts .15 Amp, clear
COILS		
L-1	24K77323	Loop Antenna: winding only .
L-2	24A76192	BC Oscillator .....
L-3	24A77336	Wave Trap .....
SPEAKER		
LS-1	50B76196	5" PM ..... Exchange
RESISTORS		
Note: All resistors are insulated carbon type, unless otherwise specified.		
R-1	6R6004	1 meg 20% 1/2W .....
R-2	6R6054	10,000 20% 1/2W .....
R-3	6R6028	22,000 20% 1/2W .....
R-4	6R6028	22,000 20% 1/2W .....
R-5	6R3927	2.2 meg 20% 1/2W .....
R-6	6R2122	4.7 meg 20% 1/2W .....
R-7	6R5683	27 10% 1/2W .....
R-8	6R6004	1 meg 20% 1/2W .....
R-9	6R3933	220 20% 1/2W .....
R-10	6R6056	47,000 20% 1/2W .....
R-11	6R6389	220 10% 1W .....
R-12	6R5770	1200 10% 1W .....
R-13	6R6326	100 10% 1/2W .....
R-14	18A76191	Volume Control: 500K; tapped at 25,000 ohms with SPST switch
R-15	6R6393	1200 10% 1/2W .....
R-16	6R2118	3.3 meg 20% 1/2W .....
R-17	6R6015	220,000 20% 1/2W .....
R-18	6R6032	470,000 20% 1/2W .....
R-19	6R6393	1200 10% 1/2W .....
R-20	6R6373	150 10% 1/2W .....
R-21	6R6004	1 meg 20% 1/2W (HS-127A only)
TRANSFORMERS		
T-1	24B470038	IF, 455 Kc: complete with tuning cores and padding capacitors, but less shield (use with shield & sleeve 1A71049)...
	or 24B482863	IF, 455 Kc: complete with tuning cores and padding capacitors, but less shield (use with shield 24K485936) .....
T-2	24B75487	Diode, 455 Kc: complete with tuning cores and padding capacitors, but less shield (use with shield & sleeve 1A71049)
	or 24B482865	Diode, 455 Kc: complete with tuning cores and padding capacitors but less shield (use with shield 24K485936) ....
T-3	25B76117	Output .....
CHASSIS PARTS - MECHANICAL		
1	7A77303	Bracket, dial light mtg ....
2	7B18748	Bracket, gang mtg .....
3	7A77337	Bracket, tuning shaft mtg ..
4	35A481328	Bumper, rubber .....
5	42K75826	Clip, electrolytic mtg .....
6	11M8944	Cord, dial: 18# black .....
7	30A470651	Cord, line & plug: 6 ft lg .
8	46A70023	Core, iron & screw: for T-1 & T-2 (use with transformers 24B470038 & 24B75487 only)

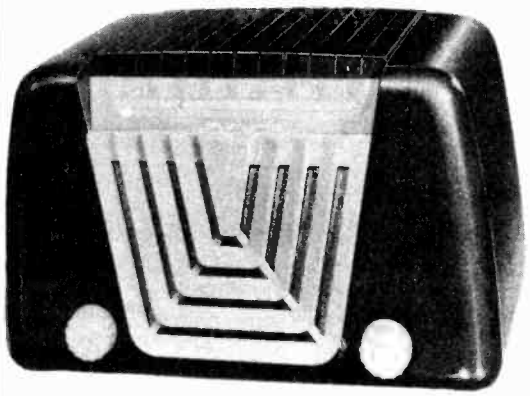
MODELS 68X11, 68X11A, 68X12, 68X12A; Ch. HS-127, HS-127A

REF. NO.	PART NO.	DESCRIPTION
	or46A470885	Core, iron: threaded; for T-1 & T-2 (use with transformers 24B482863 & 24B482865 only)
9	1X481358	Dial Background Support, Brackets & Pulleys Assembly
10	57K77085	Dowel, rear panel mtg .....
11	5S7805	Eyelet, snap-in (dial background mtg) .....
12	5A19658	Eyelet, spacer (gang bracket mounting) .....
13	37A12691	Grommet, rubber(gang bracket mounting) .....
14	32A24815	Lock, line cord: fibre .....
15	4S7666	Lockwasher, external: #6; stl; cad pl (BC oscillator coil mtg and terminal strip mtg)
16	29R5227	Lug, soldering: #6L; hot-tinned .....
17	2S7051	Nut, hex: 3/8-32 x 9/16; Pal-nut; stl; cad pl (volume control mtg) .....
18	1X481363	Panel Assembly, loop: less loop winding .....
19	52A481329	Pointer, dial .....
20	49A21552	Pulley, cord (cord guide) ...
21	5S7707	Rivet: .122 x 5/32; stl; nkl pl (dial light bracket, wave trap capacitor and terminal strip mtg) .....
22	5S7701	Rivet: .122 x 3/16; stl; nkl pl (tuning shaft bracket mounting) .....
23	5S7708	Rivet: .122 x 9/32; stl; nkl pl (line cord lock mtg) ..
24	5A11072	Rivet, shoulder: .235" lg (cord pulley mtg) .....
25	5A481770	Rivet, shoulder: .484" lg (cord pulley mtg) .....
26	3S7152	Screw, machine: 6-32 x 1/4 plain hex head; stl; cad pl (soldering lug mtg) .....
27	3S7350	Screw, machine: 6-32 x 1/4 slotted hex head; locking type; stl; cad pl(gang mtg)
28	3S7506	Screw, sheet metal: #6 x 1/4 PKZ plain hex head; stl; cad pl (BC oscillator coil mtg)
29	3S7205	Screw, machine: 8-32 x 1/4 slotted hex head; stl; cad pl (speaker mtg) .....
30	3S7454	Screw, sheet metal:#8 x 1/4 PKZ plain hex head; stl; cad pl (dial background support & bracket assembly mounting) .....
31	3S7507	Screw, sheet metal: #8 x 5/8 PKZ plain hex head; stl; cad pl (gang bracket mtg) .....
32	3S3384	Screw, sheet metal: #8 x 2-1/4 PKZ plain hex head; stl; cad pl (loop panel mtg) .....
33	1B77363	Shaft, tuning .....
34	26A470013	Shield, dial light .....
35	26A72635	Shield, tube .....
36	1A71049	Shield and Sleeve Assembly (for IF part number 24B470038 and Diode-part number 24B75487 transformers only) .....
	or 24K485936	Shield, coil (for IF-part number 24B482863 and diode-part number 24B482865 transformers only)
37	9A77306	Socket, dial light: includes bracket .....
38	9A76185	Socket, tube:loctal .....
	or 9A72549	Socket, tube: loctal; mounts with rivets (to replace 9A76185 when mounting lugs on chassis break off) .....
39	41A481325	Spring, dial background mtg
40	41A14244	Spring, tension coil (drive cord) .....
41	35B481323	Strip, dial background .....
42	31K471564	Strip, terminal: 3 insulated lugs, #2 ground;3/8 spacing
43	31K86126	Strip, terminal: 2 insulated lugs, #2 mtg; 3/8 spacing (on rear panel) .....
44	4A70015	Washer, 'C' (tuning shaft retainer) .....
45	4S1719	Washer, flat: 3/8 x .140 x .030 thick; stl; nkl pl (line cord lock mtg) .....
46	4S7563	Washer, flat: 5/8 x .203 x .033 thick; stl; cad pl (loop panel mtg) .....

CABINET PARTS

1	35K478186	Baffle & Grille Cloth Assembly (68X11, 68X11A & 68X12A).....
2	35K478185	Baffle & Grille Cloth Assembly (68X12) .....
3	37A27142	Band, rubber (dial scale mounting) .....
4	7A25706	Bracket, dial scale mtg: right-hand (LF end) .....
5	7A25707	Bracket, dial scale mtg: left-hand (HF end) .....
6	16E471984	Cabinet, table model: maroon plastic(68X11 & 68X11A) ....
7	16K478107	Cabinet, table model: brown plastic (68X12 & 68X12A) ..
8	15B481331	Cover, chassis bottom .....
9	16D471985	Grille,speaker: plastic; light beige (68X11, 68X11A & 68X12A) .....
10	16K478099	Grille, speaker: plastic; dark beige (68X12) .....
11	36K481332	Knob, control: light gray (68X11, 68X11A & 68X12A)...
12	36K481333	Knob, control: dark gray (68X12) .....
13	2S476112	Nut, speed (grille mtg) ....
14	38A25507	Plug, split (loop panel mtg)
15	34B481324	Scale, dial: glass (68X11, 68X11A & 68X12A).....
16	34K481857	Scale, dial: glass (68X12)
17	3S2695	Screw, sheet metal: #6 x 3/16 PKZ slotted hex head; stl; cad plt (bottom cover mtg) .....
18	3S488012	Screw, sheet metal: #6 x 1/4 type #25; hex; stl; cad pl (dial scale bracket mtg) ...
19	3S3365	Screw, sheet metal: #8 x 1 PKA plain hex head; black parkerized finish (chassis mtg)
20	4S7633	Washer, flat: 9/16 x 11/64 x .033 thick; stl; cad pl (chassis mtg)

MODELS 68X11Q, 68X12Q, 68X13Q; Ch. HS-148



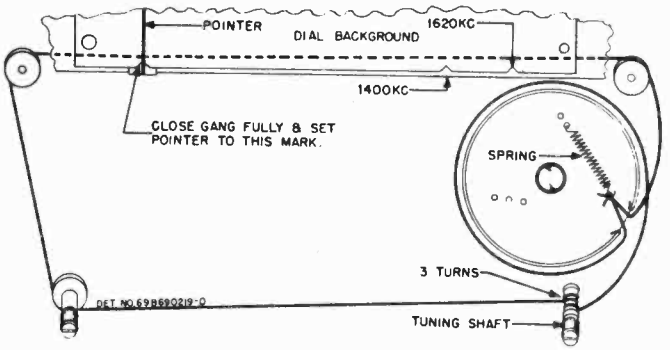


FIGURE 1.
DIAL CORD RESTRINGING DETAIL

Model 68X11Q Maroon Plastic Cabinet
Model 68X12Q Brown Plastic Cabinet
Model 68X13Q Ivory Plastic Cabinet

GENERAL INFORMATION

TYPE - AC-DC operated table model superheterodyne receiver with loop antenna.

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT - 12BA6 RF Amplifier, 12BE6 Converter, 12BA6 IF Amplifier, 12AT6 Detector, AVC & 1st AF Amplifier, 35B5 Power Amplifier, 35W4 Rectifier

POWER SUPPLY - 105 to 125 volts AC or DC, 35 watts

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 chassis 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. Set pointer to calibration mark on left-hand side of dial background when gang is fully closed before starting alignment.

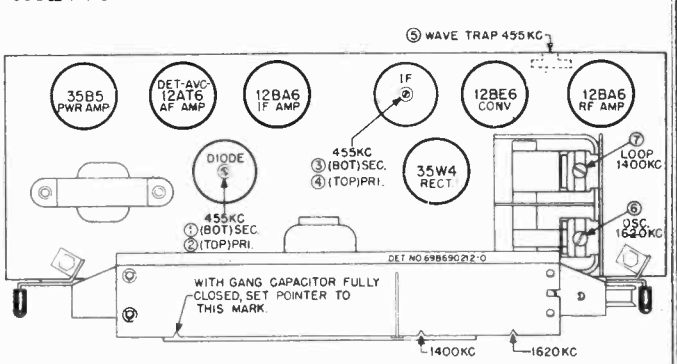


FIGURE 2. TUBE & TRIMMER LOCATIONS

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	POINTER SET TO	ADJUST	REMARKS
IF ALIGNMENT 1.	.1 mf	Rear stator of tuning capacitor	455 Kc	Gang opened	1, 2, 3 & 4	Adjust for maximum.
WAVETRAP 2.	"	"	"	"	5	Adjust for minimum.
RF ALIGNMENT 3.	"	"	1620 Kc	1620 Kc	6	Adjust for maximum.
4.	None	Radiation loop*	1400 Kc	Tune for maximum	7	Adjust for maximum.

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

MODELS 68X11Q, 68X12Q, 68X13Q; Ch. HS-148

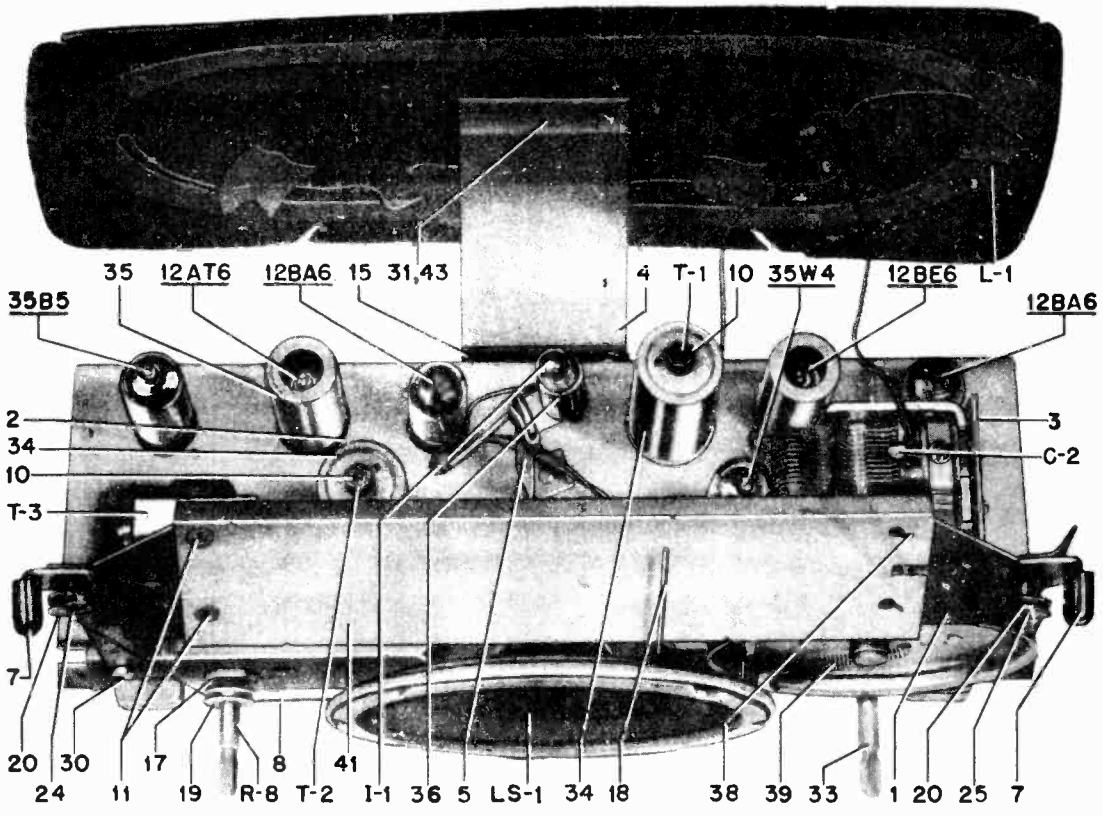


FIGURE 3. PARTS LOCATION - TOP VIEW

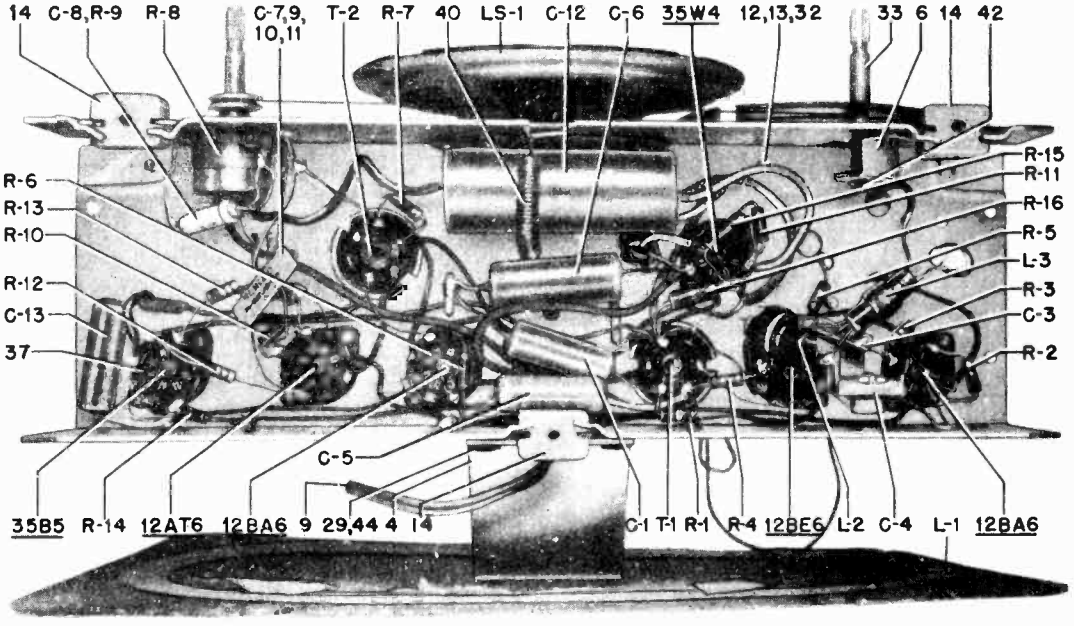


FIGURE 4. PARTS LOCATION - BOTTOM VIEW

MODELS 68X11Q, 68X12Q,
68X13Q; Ch. HS-148

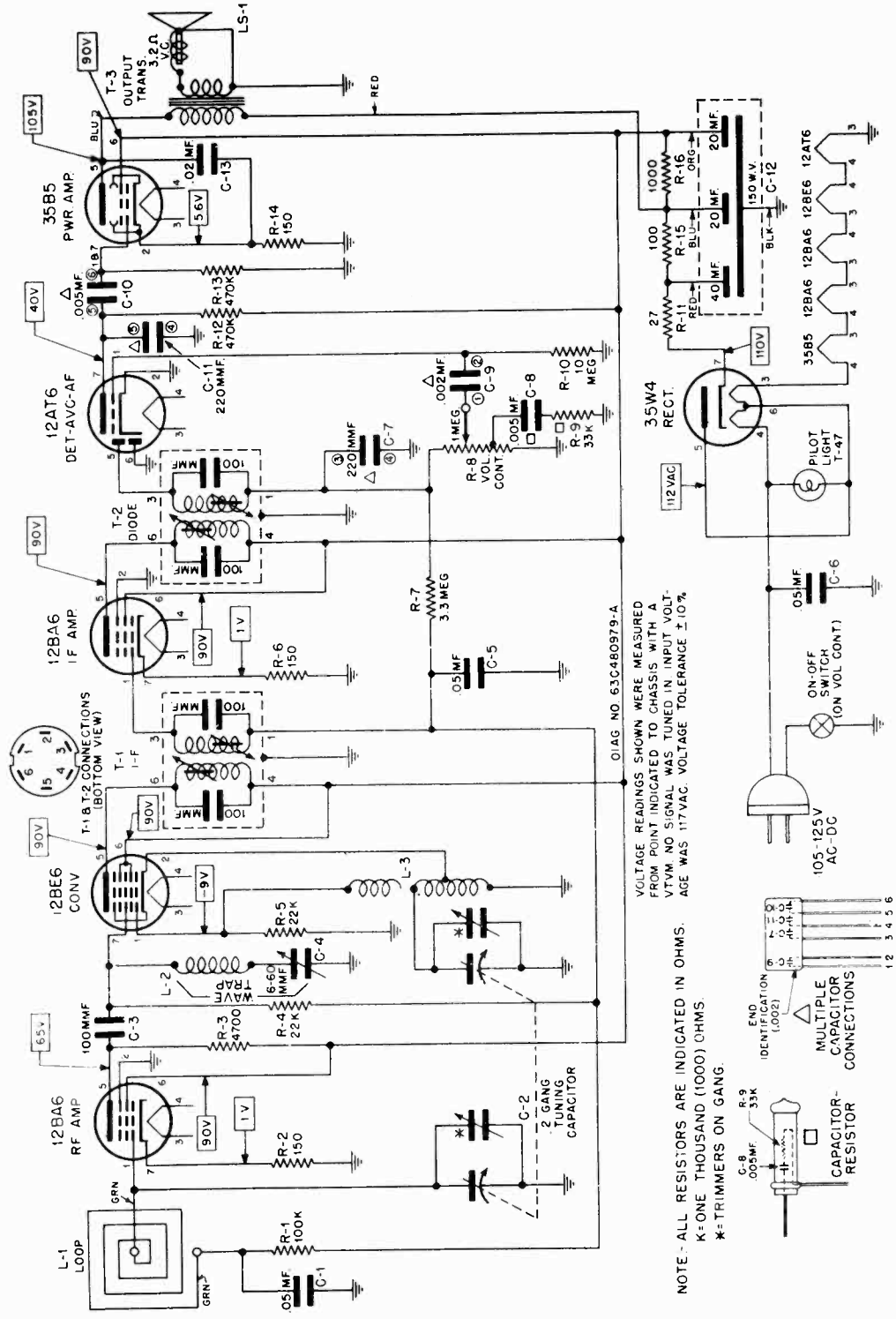


FIGURE 5. CHASSIS HS-148 SCHEMATIC DIAGRAM

MODELS 68X11Q, 68X12Q, 68X13Q; Ch. HS-148

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	8S9821	Paper: .05 mf 200V .....
C-2	1X484398	Variable, 2 gang: includes pulley
C-3	21R6641	Mica: 100 mmf 500V .....
C-4	20A26941	Variable mica: 6-60 mmf, includes 'L' type mtg brkt ..
C-5	8S9821	Paper: .05 mf 200V .....
C-6	8S9816	Paper: .05 mf 400V .....
C-7	21B482847	Ceramic: 220 mmf; (together with C-9, C-10, & C-11) ...
C-8	21B484227	Capacitor-Resistor: .005 mf (includes R-9) .....
C-9	21B482847	Ceramic: .002 mf (together with C-7, 10, 11) .....
C-10	21B482847	Ceramic: .005 mf (together with C-7, 9, 11) .....
C-11	21B482847	Ceramic: 220 mmf (together with C-7, 9, 10) .....
C-12	23K484234	Electrolytic: 40-20-20 mf 150V
C-13	8S9802	Paper: .02 mf 400V .....
PILOT LIGHT		
I-1	65X11854	Bulb: 6.3 volts .15 amp; #47
COILS		
L-1	24C484228	Loop Antenna: includes panel
L-2	24A77336	Wavetrap coil .....
L-3	24K482855	BC Oscillator coil .....
SPEAKER		
LS-1	50B76196	Speaker: 5" PM; 3.2 ohm voice coil .....
RESISTORS		
Note: All resistors are insulated carbon type, unless otherwise specified.		
R-1	6R6075	100,000 20% 1/2W .....doz.
R-2	6R3992	150 20% 1/2W .....doz.
R-3	6R6039	4700 20% 1/2W .....doz.
R-4	6R6028	22,000 20% 1/2W .....doz.
R-5	6R6028	22,000 20% 1/2W .....doz.
R-6	6R3992	150 20% 1/2W .....doz.
R-7	6R2118	3.3 meg 20% 1/2W .....doz.
R-8	18K484226	Volume control: 1 meg; tapped at 300,000 ohms; with SPST sw.
R-9	21B484227	33,000 (together with C-8) .
R-10	6R2109	10 meg 20% 1/2W .....doz.
R-11	6R5683	27 10% 1/2W .....doz.
R-12	6R6032	470,000 20% 1/2W .....doz.
R-13	6R6032	470,000 20% 1/2W .....doz.
R-14	6R3992	150 20% 1/2W .....doz.
R-15	6R488025	100 20% 1W .....each doz.
TRANSFORMERS		
T-1	24B482863	IF, 455 Kc: complete with tuning cores and padding capacitors, but less shield
T-2	24B482865	Diode, 455 Kc: complete with tuning cores and padding capacitors, but less shield
T-3	25B482858	Output Transformer .....
CHASSIS PARTS - MECHANICAL		
1	1X485923	Background Support and Pulley Assembly: less dial background strip .....
2	26A473002	Base, shield mtg .....
3	7B18748	Bracket, gang mtg .....
4	7K484233	Bracket, loop mtg .....
5	7A77302	Bracket, pilot light mtg ...doz.
6	7A77337	Bracket, tuning shaft mtg ..
7	35A481328	Bumper, rubber .....doz.
8	11M8944	Cord, dial: 18 lb; black....yd.
9	30K482856	Cord, line & plug: 6 ft lg..
10	46A470885	Core, iron: threaded; for T-1 & T-2 .....
11	5S7805	Eyelet, snap-in tri-mount (dial background mtg) .....doz.
12	5A19658	Eyelet, spacer (gang mtg) ..doz.
13	37A12691	Grommet, rubber (gang mtg)..doz.
14	14A484225	Insulator, chassis mtg .....
15	14A482844	Insulator, cord outlet & loop bracket .....doz.
16	29R5227	Lug, soldering: #6L; hot-tinned (on gang brkt) .....per/c
17	2S7051	Nut, palnut: 3/8-32 x 9/16; stl; cad pl (volume control mtg)doz.
18	52A481329	Pointer, dial .....
19	49K484341	Pulley, cord: 1/2" groove; .252 diam. hole .....doz.
20	49A21352	Pulley, cord: 1/2" groove; .126 diam. hole .....doz.
21	5S7771	Rivet: .088 x 3/16 stl; nkl pl (shield mtg) .....per/c
22	5S7707	Rivet: .122 x 5/32 stl; nkl pl (output transformer mtg, variable capacitor mtg and pilot light brkt mtg).....per/c
23	5S7701	Rivet: .122 x 3/16 stl; nkl pl (tuning shaft brkt mtg)....per/c
24	5A481770	Rivet, shoulder: .235 lg (pulley cord guide) .....doz.
25	5A11072	Rivet, shoulder: .484 lg (pulley cord guide) .....doz.
26	3S7152	Screw, machine: 6-32 x 1/4 slotted hex head; stl; cad pl (gang mtg) .....per/c
27	3S7350	Screw, machine: 6-32 x 1/4 slotted hex head; locking type; stl; cad pl (gang mtg) .....doz.
28	3S7205	Screw, machine: 8-32 x 1/4 slotted hex head; locking type; stl; cad pl (speaker mtg)..doz.
29	3S3360	Screw, sheet metal: #6 x 1/2 PKZ plain hex head; stl; cad pl (loop bracket mtg).....doz.
30	3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; stl; cad pl (dial background support & pulley assem. mtg).....per/c
31	3S7455	Screw, sheet metal: #8 x 3/8 PKA slotted acorn head; ant copper finish (loop mtg) ..doz.
32	3S7507	Screw, sheet metal: #8 x 5/8 PKZ plain hex head; stl; cad pl (gang bracket mtg) .....per/c
33	47A482845	Shaft, tuning .....
34	26K485936	Shield, coil .....
35	26A90301	Shield, tube .....
36	9A77306	Socket, dial light: includes brkt
37	9A472534	Socket, tube: miniature; 7-prong
38	41A481325	Spring, dial background mtg
39	41A14244	Spring, tension coil (drive cord) .....doz.
40	41A73996	Spring, tension (electrolytic mtg)
41	35B481323	Strip, dial background: tan plastic .....
42	4A70015	Washer, 'C' (tuning shaft retainer) .....per/c
43	4S7614	Washer, flat: 11/16 x 11/64 x .036 thick; stl; cad pl (loop panel mtg) .....doz.
44	4K482859	Washer, insulated: shoulder (loop mtg brkt mtg) .....doz.
CABINET PARTS		
101	35K484231	Baffle and Grille Cloth Assembly (68X11Q & 68X12Q).....
102	35K690078	Baffle and Grille Cloth Assembly (68X13Q) .....
103	37K27142	Band, rubber (on dial scale)per/c
104	7A25707	Bracket, dial scale mtg (high freq. end) .....
105	7A25706	Bracket, dial scale mtg (low freq. end) .....
106	16E471984	Cabinet, table model: maroon plastic (68X11Q) .....
107	16K478107	Cabinet, table model: brown plastic (68X12Q) .....
108	16K690029	Cabinet, table model: ivory plastic (68X13Q) .....
109	16D471985	Grille, speaker: light beige; plastic (68X11Q & 68X12Q)..
110	16K690030	Grille, speaker: ivory; plastic (68X13Q) .....
111	36K481332	Knob, control: light gray; plastic (68X11Q) .....
112	36K481333	Knob, control: dark gray; plastic (68X12Q) .....
113	36K690077	Knob, control: ivory (68X13Q)
114	2S476112	Nut, speed: .156 round; (speaker baffle & grille cloth mtg) .....per/c
115	38A25507	Plug, split (back mtg) .....doz.
116	34B481324	Scale, dial: glass (68X11Q & 68X12Q) .....
117	34K690059	Scale, dial: glass (68X13Q).
118	3S488012	Screw, sheet metal: #6 x 1/4 plain hex head; cad pl (dial scale brkt mtg) .....doz.
119	3S8153	Screw, sheet metal: #8 x 3/4 PKA plain hex head; stl; cad pl (chassis mtg) .....doz.
120	4S7633	Washer, flat: 9/16 x 11/64 x .033 thick; stl; cad pl (chassis mtg) .....doz.

MODEL 69L11,
Ch. HS-175

GENERAL INFORMATION

TYPE - Five-tube, three-power (AC/DC Battery) portable, with a selenium rectifier. A loop antenna is housed in the back cover.

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT - 1U4 - RF Amplifier
1R5 - Oscillator-Modulator
1U4 - IF Amplifier
1S5 - Detector, AVC & 1st AF Amplifier
3V4 - Power Amplifier
Rectifier - Selenium type

POWER SUPPLY - Operates from 117 volts AC or DC (15 watts), or self-contained battery pack. Use Eveready #753 or General #60A-6F6-5.

INSTALLATION & OPERATING INSTRUCTIONS

CONTROLS. The volume control and power switch are combined and are operated with the left-hand knob. Select stations with the right-hand knob. The dial scale is read in kilocycles by adding one zero to the figures.

TO OPEN BACK COVER. Press down on the latch, (directly below handle) simultaneously pulling the cover open. To close, merely snap together. **CAUTION:** When closing the cover, be careful not to pinch the line cord or other leads between the cover and cabinet.

HOUSE CURRENT OPERATION. The power cord is located inside the cabinet and can be reached by opening the back cover; pass the cord through the slot before closing the cover. Plug the power plug into any 117 volt AC or DC outlet. Reverse the line cord plug in power outlet if the receiver does not operate from DC power.

BATTERY OPERATION. Open the back cover and install the battery pack following the instructions on the label located on the inside of the receiver back cover. Plug the line cord plug into the receptacle on the receiver chassis or the receiver will not operate from its battery. If the receiver is to be operated for a long period of time from AC or DC, or is to be placed in storage, remove the battery and store it in a cool place. Replace the battery when low volume or fuzzy tone is noticed. The condition of the battery will not affect the operation of the receiver when operating from AC or DC.

ALIGNMENT

It is recommended that the receiver be operated from battery during alignment. If AC power is used when aligning the receiver, use an isolation transformer between the power line and receiver. If an isolation transformer is not available, connect the low side of the signal generator to B- through .1 mf capacitor.

Connect a low range output meter across the speaker voice coil and set the volume control at maximum. For greatest accuracy, keep the output of the receiver at approximately .05 watts (.05 watts = .40 volts on output meter) throughout alignment by reducing the signal generator output as stages are brought into alignment. Use a small

MODEL 69L11,
Ch. HS-175

fibre screwdriver for aligning the IF & diode transformers.

Normally, RF alignment can be made with trimmers 5, 6 & 7. However, if the range of these trimmers is insufficient to obtain a peak, adjust trimmers 5A & 6A.

The inductance of the RF coil (T-1) is set by the manufacturer by adjusting the iron core. No resetting of this core should be made unless it has been tampered with. Readjustment can be made by proceeding as follows:

Tune in a 600 Kc signal and peak padder (8). Next tune in a 1400 Kc signal and peak trimmer (6). Repeat both adjustments until maximum response is obtained at both ends; the last adjustment should be trimmer (6).

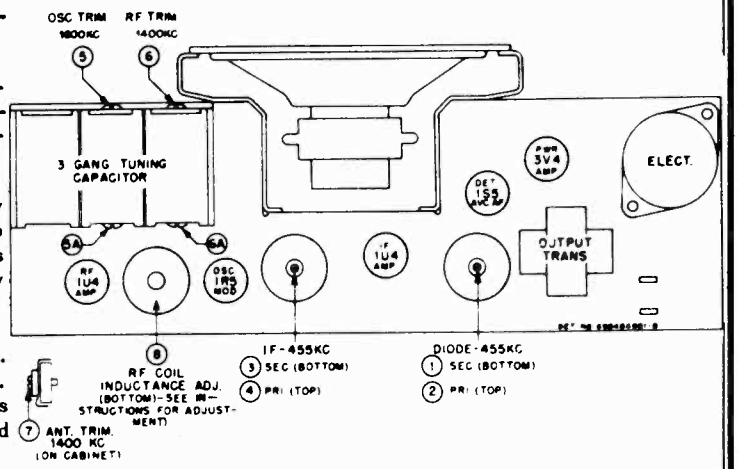


FIGURE 1. TUBE & TRIMMER ADJUSTMENT LOCATIONS

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	POINTER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mfd	Stator of tuning gang	455 Kc	Gang opened	1, 2, 3 & 4	Adjust for maximum
RF ALIGNMENT						
2.	-	Radiation loop**	1600 Kc	1600 Kc*	5	Adjust for maximum
3.	-	"	1400 Kc	Tune for maximum	6 & 7	Adjust for maximum
4.	-	"	"	"	7	With chassis assembled into cabinet, adjust for maximum

* First close gang and set mark on dial scale to calibration line (See Figure 2). Then set to 1600 Kc.

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

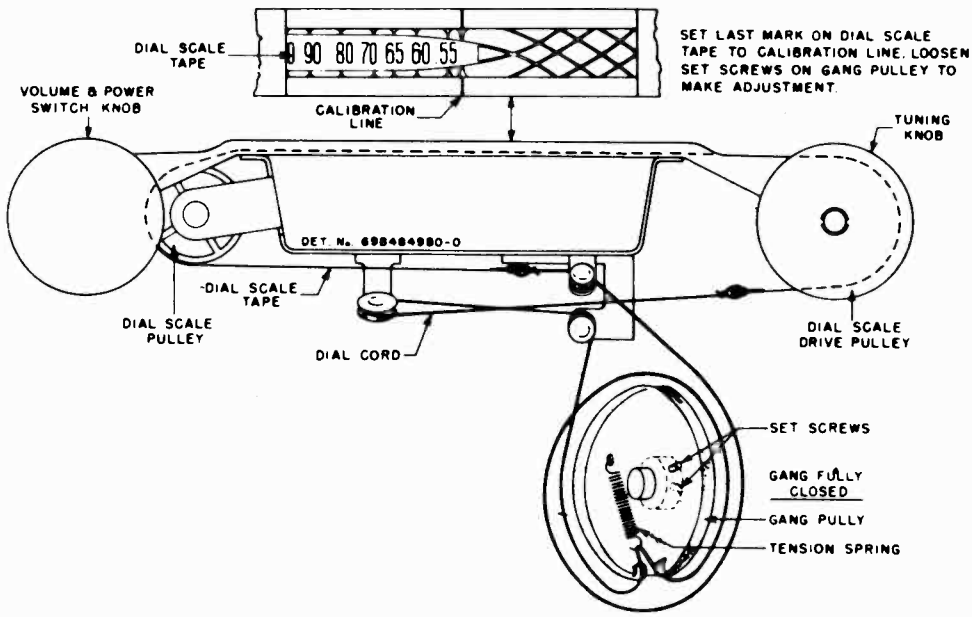


FIGURE 2. DIAL CORD RESTRINGING DETAIL

MODEL 69L11,
Ch. HS-175

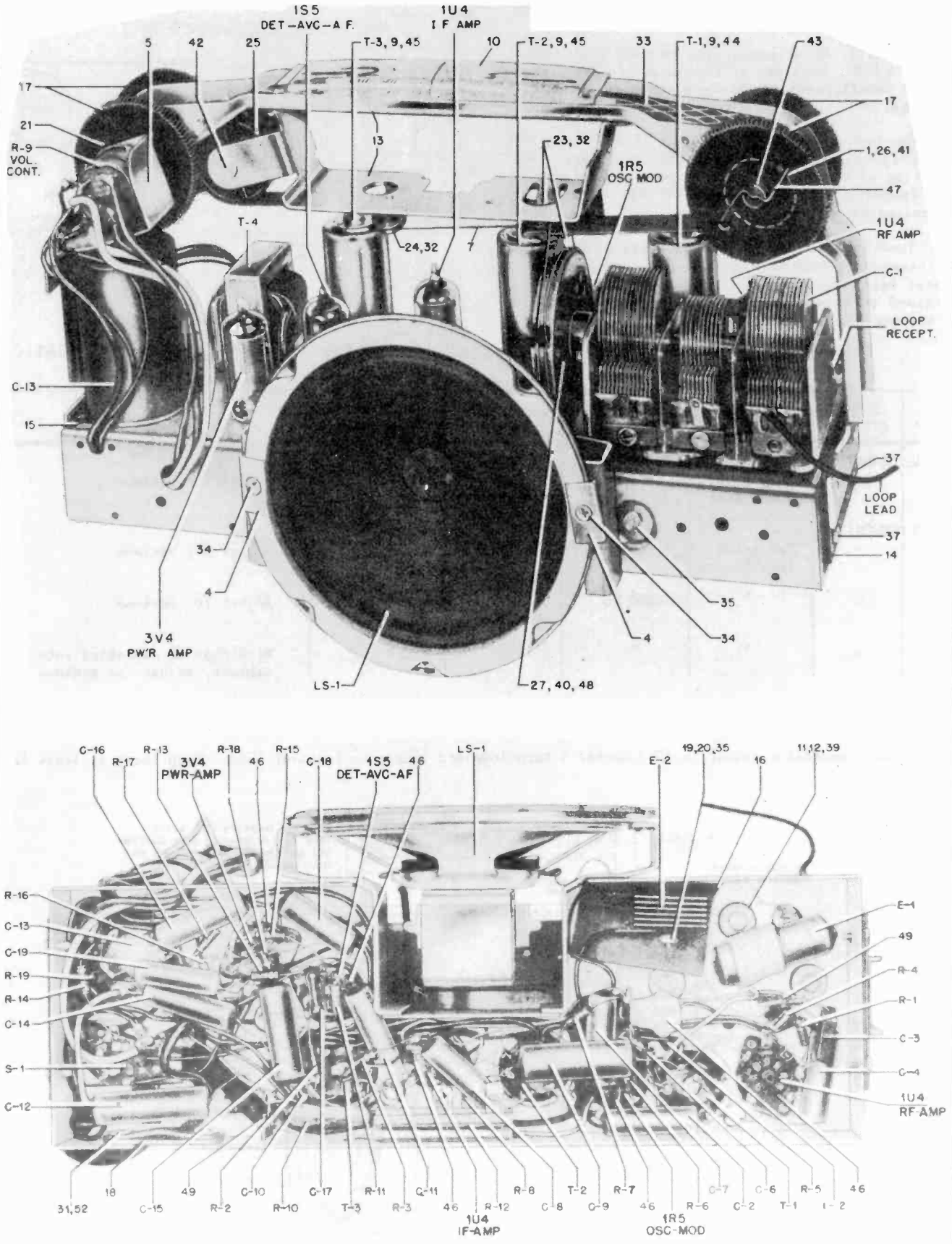


FIGURE 3. PARTS LOCATIONS - CHASSIS TOP & BOTTOM

MODEL 69L11,
Ch. HS-175

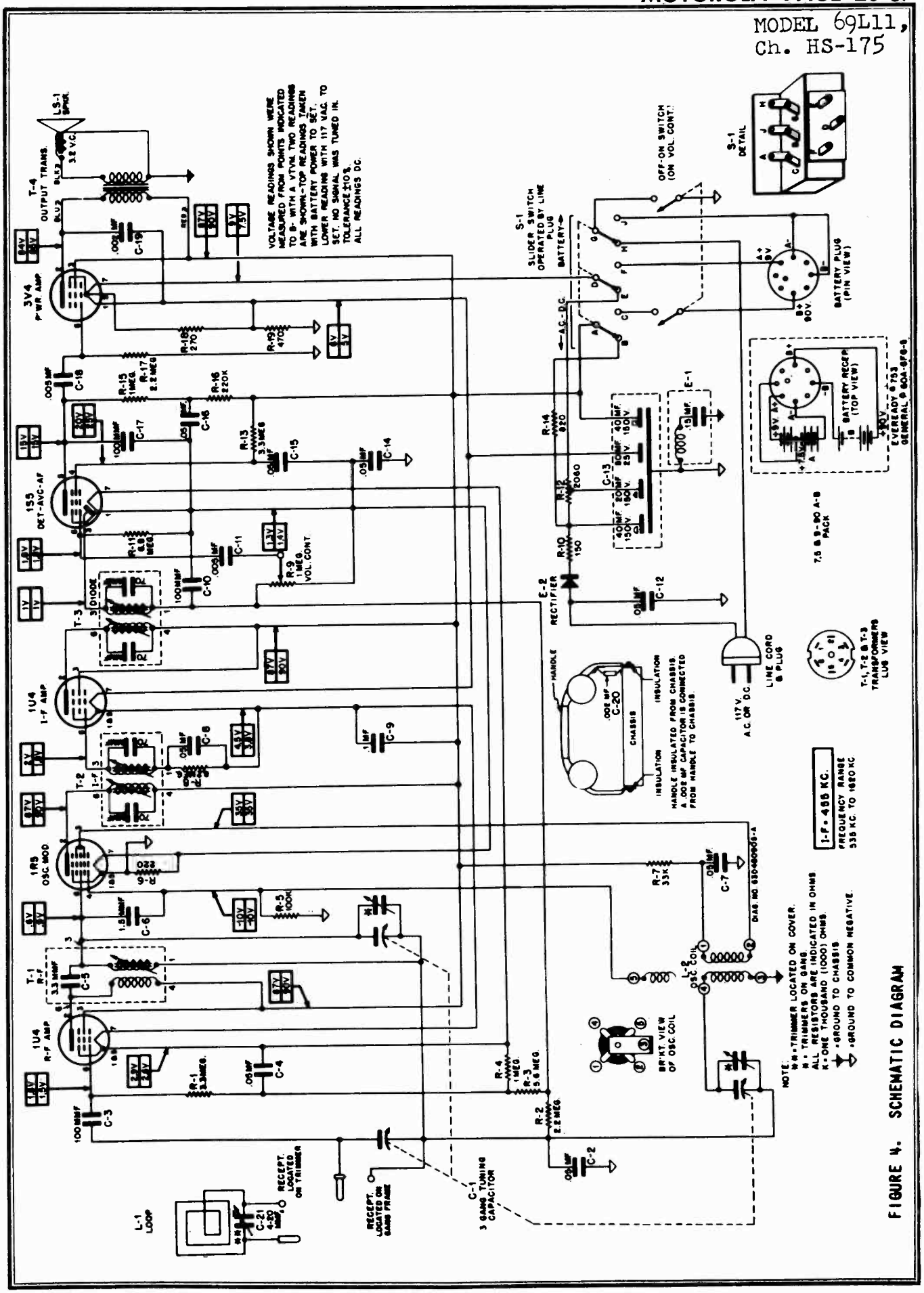


FIGURE 4. SCHEMATIC DIAGRAM

MODEL 69L11;
Ch. HS-175

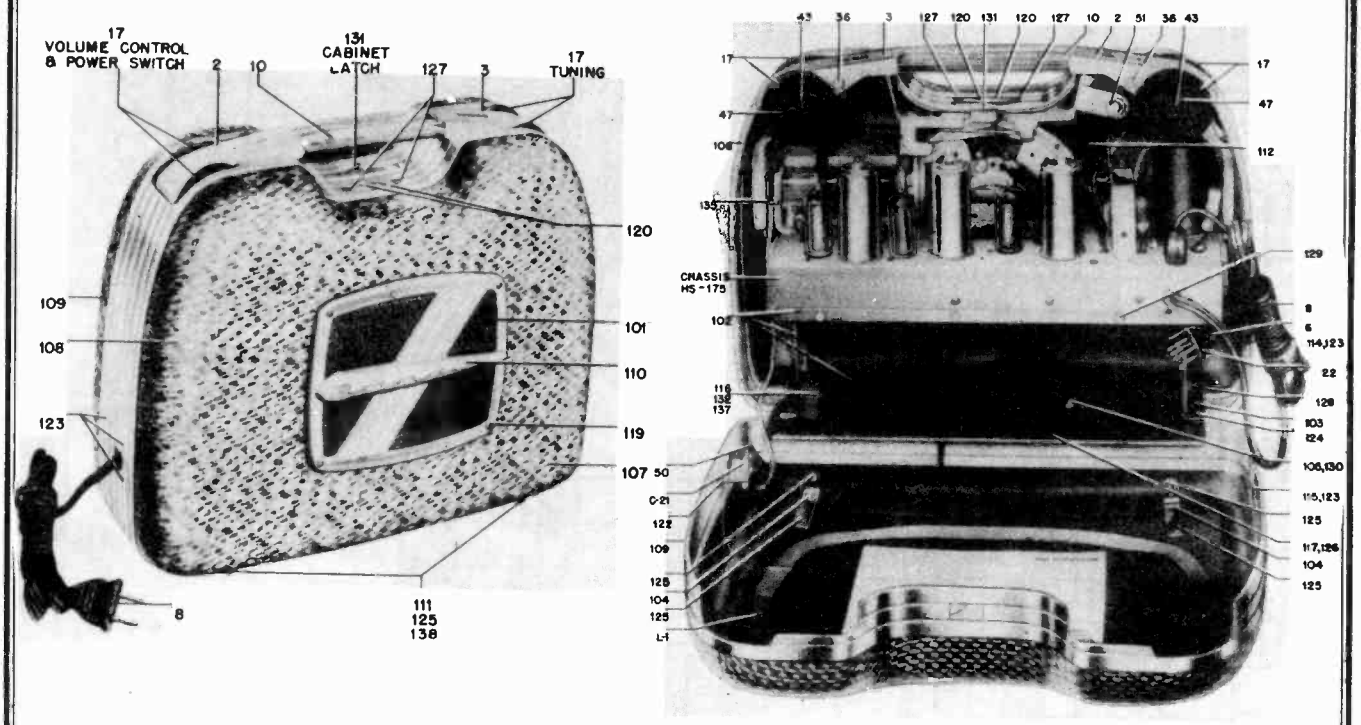


FIGURE 5. PARTS LOCATIONS - CABINET

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	19B480125	Variable: 3 gang .....
C-2	8S9805	Paper: .05 mf 100V .....
C-3	21R6641	Mica: 100 mmf 500V .....
C-4	8S9805	Paper: .05 mf 100V .....
C-5	21K77268	Mica: 3.3 mmf; part of T-1 .....
C-6	21B77267	Molded: 1.5 mmf .....
C-7	8S9805	Paper: .05 mf 100V .....
C-8	8S9805	Paper: .05 mf 100V .....
C-9	8S9806	Paper: .1 mf 200V .....
C-10	21B77286	Ceramic: 100 mmf 500V .....
C-11	8S9813	Paper: .005 mf 600V .....
C-12	8S9816	Paper: .05 mf 400V .....
C-13	23K76985	Electrolytic: 40-40-20-80 mf/150-150-150-25V includes cover .....
C-14	8S9805	Paper: .05 mf 100V .....
C-15	8S9805	Paper: .05 mf 100V .....
C-16	8S9805	Paper: .05 mf 100V .....
C-17	21B77286	Ceramic: 100 mmf 500V .....
C-18	8S9813	Paper: .005 mf 600V .....
C-19	8S9824	Paper: .002 mf 400V .....
C-20	8S9824	Paper: .002 mf 400V .....
C-21	20A480185	Trimmer, mica: 4 mmf to 20 mmf .....
CAPACITOR-CHOKE		
E-1	1A77283	Capacitor and Choke Assembly: includes .15 mf 200V paper capacitor & coil .....

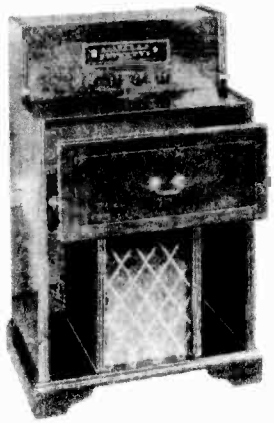
REF. NO.	PART NO.	DESCRIPTION
RECTIFIER		
E-2	48B478111	Selenium Rectifier: half-wave ....
COILS		
L-1	24C690839	Loop Antenna Assembly: includes panel
L-2	24A76943	Oscillator coil .....
SPEAKER		
LS-1	50K480198	Speaker: 5" PM .....
or	50C76953	Speaker: 5" PM (used in early sets)
RESISTORS		
Note:		All resistors are 1/2W, carbon, insulated type unless otherwise specified.
R-1	6R2118	3.3 meg 20% 1/2W .....
R-2	6R3927	2.2 meg 20% 1/2W .....
R-3	6R3988	5.6 meg 10% 1/2W .....
R-4	6R6004	1 meg 20% 1/2W .....
R-5	6R6075	100,000 20% 1/2W .....
R-6	6R3933	220 20% 1/2W .....
R-7	6R6012	33,000 20% 1/2W .....
R-8	6R5585	8.2 meg 10% 1/2W .....
R-9	18A480103	Volume control: 1 meg; with power sw
R-10	17A76986	150 10% 2-1/2W; wirewound; coated
R-11	6R3987	6.8 meg 20% 1/2W .....
R-12	17K75249	2060 5% 5W wirewound .....
R-13	6R2118	3.3 meg 20% 1/2W .....

REF. NO.	PART NO.	DESCRIPTION
R-14	6R6269	820 10% 1/2W
R-15	6R6004	1 meg 20% 1/2W
R-16	6R6015	220,000 20% 1/2W
R-17	6R3927	2.2 meg 20% 1/2W
R-18	6R6432	270 10% 1/2W
R-19	6R6090	470 10% 1/2W
SWITCH		
S-1	40A27114	Slider switch: 3 PDT
TRANSFORMERS		
T-1	24B76988	RF Broadcast: includes coupling capacitor (C-5) but less shield
T-2	24B76990	IF, 455 Kc: includes padding capacitors but less shield
T-3	24B77264	Diode, 455 Kc: includes padding capacitors but less shield
T-4	24B76952	Output Transformer
CHASSIS PARTS - MECHANICAL		
1	37K480147	Band, rubber (on scale tape drive pulley)
2	7B480132	Bracket, knob shaft: left side; marked 'ON'
3	7K690094	Bracket, knob shaft: right side; marked 'TUNING'
4	7A76939	Bracket, speaker mtg
5	7A480117	Bracket, volume control mtg
6	1X480178	Cable Assembly (battery): includes 9-pin plug
7	11M8944	Cord, dial: 18# black
8	30B20329	Cord, line: with plug; 6 ft long.
9	46A70023	Core, iron & screw (T-1, T-2, T-3 tuning)
10	61B480126	Crystal, dial
11	5A70098	Eyelet, spacer (gang mtg)
12	5A70404	Grommet, rubber (gang mtg)
13	1X480179	Handle and Idler Pulley Bracket Assembly: does not include dial, crystal, scale tape pullies, shafts or volume control mtg brkt; includes cord pullies & chassis insulators
14	14A482729	Insulator, bracket mtg
15	9A22056	Insulator, electrolytic mtg
16	14A470428	Insulator, rectifier: armite paper
17	36B480128	Knob, control
18	32A24815	Lock, line cord: fibre
19	4S7695	Lockwasher, int: #5; stl; cad pl (rectifier mtg)
20	2S7010	Nut, hex: 5-40 x 1/4; stl; cad pl (rect. mtg)
21	2S7051	Nut, hex: 3/8-32 x 9/16; Palnut; stl; cad pl (volume control mtg)
22	28K77272	Plug, 9-pin (battery connector).
23	49A12646	Pulley, cord: 7/32 groove
24	49A21741	Pulley, cord: 3/8 groove
25	49K480116	Pulley, scale tape: plain
26	49K480115	Pulley, scale tape: tapped for setscrew
27	1X480174	Pulley and Pushing Assembly: less setscrews (gang drive)
28	5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg)
29	5S7707	Rivet: .122 x 5/32; stl; nkl pl (terminal strip and resistor mtg)
30	5S7701	Rivet: .122 x 3/16; stl; nkl pl (electrolytic insulator mtg and insulator brkt mtg)
31	5S7708	Rivet: .122 x 9/32; stl; nkl pl (line cord lock mtg)
32	5A71246	Rivet, shoulder: .187" long; stl; nkl pl
33	34B480127	Scale, dial: flexible tape
34	3S2974	Screw, machine: 4-40 x 5/16; Phillips head; stl; cad pl (speaker mtg)
35	3S7311	Screw, machine: 5-40 x 7/8; slotted hex head; stl; cad pl (rectifier mtg)
36	3S2695	Screw, sheet metal: #6 x 3/16; PKZ plain hex head; stl; cad pl (slider switch mtg and knob shaft brkt mtg)
37	4S3376	Screw, sheet metal: #6 x 1/4; PKZ slotted hex head; stl; cad pl (handle assembly mtg & volume control brkt mtg)
38	3S7506	Screw, sheet metal: #6 x 1/4; PKZ plain hex head; stl; cad pl (osc coil mtg)
39	3S2294	Screw, machine: 6-32 x 1/2 plain hex head locking type; stl; cad pl (gang mtg)
40	3S7113	Setscrew: 8-32 x 1/4; slab head; stl; cad pl (gang pulley mtg)
41	3S2654	Setscrew: 8-32 x 3/8; Allenhead; stl; cad pl (scale tape pulley retainer)
42	47A480113	Shaft, idler pulley
43	47A480124	Shaft, volume and tuning
44	26K485936	Shield, coil (for T-1)
45	1A71049	Shield and Sleeve Assembly (for T-2 & T-3)
46	9A472534	Socket, tube: miniature; 7-prong.
47	41A480151	Spring, knob retainer
48	41A14244	Spring, tension coil (dial drive)
49	31A84795	Strip, terminal: 2 insulated lugs, #1 mtg
50	29K5419	Terminal, plain pin: small
51	4K24124	Washer 'C': shaft retainer
52	4S1719	Washer, flat: 3/8 x .140 x .030 thick (line cord lock mtg)
CABINET PARTS		
101	16K690105	Baffle and Grille Cloth Assembly
102	1X480192	Bottom Cover, Brackets and Strap Assembly
103	7A680301	Bracket, support (on fibre panel).
104	7A690856	Bracket, loop & panel assembly mounting
105	38A480111	Button, battery strap
106	38K480170	Button, plug
107	16K690103	Cabinet, portable: complete
108	1X690863	Cabinet, front section: includes baffle, hinges, escutcheon, gasket and bottom panel
109	1X690865	Cabinet, rear section: includes antenna panel assembly and loop trimmer
110	13C690093	Escutcheon, cabinet
111	37K480189	Foot, rubber
112	32B484259	Gasket, speaker
113	55A690532	Hinge, cabinet
114	14A482140	Insulator, cord outlet (on cabinet front)
115	14A482141	Insulator, cord retainer (on cabinet rear)
116	29R5235	Lug, soldering (strap mtg)
117	1X690864	Panel and Brackets Assembly, cabinet bottom: includes fibre panel and two brackets
118	5S7771	Rivet: .088 x 3/16; stl; nkl pl (strap and stud mtg)
119	5S490416	Rivet: .088 x 11/32; brass; cad pl (escutcheon mtg)
120	5S490417	Rivet: .098 x 5/32; brass; cad pl (latch spring mtg)
121	5S7707	Rivet: .122 x 5/32; stl; nkl pl (brkt mtg to chassis bottom cover)
122	5S490335	Rivet: .122 x 3/16; brass; cad pl (trimmer mtg)
123	5S2849	Rivet: .140 x 7/32; brass; cad pl (cord insulator, hinge and cord retainer mtg)
124	5S490322	Rivet: .140 x 1/4; brass; cad pl (bracket to bottom panel and bracket to loop panel mtg)
125	5S490320	Rivet: .140 x 9/32; brass; cad pl (foot, antenna loop and loop bracket to cabinet mtg)
126	5S490330	Rivet: .140 x 3/8; brass; cad pl (panel & brkts assembly mtg)
127	3S488125	Screw, machine: 6-32 x 3/8; Phillips flat head; stl; cad pl (chassis mtg)
128	3S7326	Screw, machine: 8-32 x 3/16; plain hex head; lockscrew; stl; cad pl (bottom cover assembly to bottom panel assembly mtg)
129	3S2695	Screw, sheet metal: #6 x 3/16; PKZ plain hex head; stl; cad pl (bottom cover mtg)
130	9A480110	Socket, battery strap
131	41A480158	Spring, cabinet latch
132	35K480112	Strap and Button Assembly
133	35A690861	Strip, loop panel retainer
134	46A480109	Stud, strap (strap catch)
135	29A5400	Terminal, plain pin
136	4A21771	Washer, flat: 3/16 x .095 x .030 thk; stl; cad pl (escutcheon mtg)
137	4S7551	Washer, flat: 9/32 x .120 x .025 thick; brass (strap mtg)
138	4S7566	Washer, flat: 3/8 x 5/32 x .033 thick; stl; cad pl (foot mtg).

MODELS 78FM21, 78FM21M, 78FM22M; Ch. HS-128, HS-132

Model 78FM21
Brown Mahogany Cabinet
Chassis HS-132

Model 78FM21M
Red Mahogany Cabinet
Chassis HS-132



Model 78FM22M
Red Mahogany Cabinet
Chassis HS-128

GENERAL INFORMATION

TYPE- FM-BC radio-phonograph combination. A loop antenna is used for broadcast (AM) reception; for FM reception, a line cord antenna is used. A selenium type rectifier is used in the power supply.

Chassis HS-128 & HS-132 are identical except for dial arrangements and phono connecting cord lead lengths.

TUNING RANGE - BC - 535 to 1620 Kc
FM - 88 to 108 Mc

AM IF Frequency - 455 Kc
FM IF Frequency - 4.3 Mc

TUBE COMPLEMENT -
12AT7 - 1st & 2nd FM Converter
12BE6 - 1st 4.3 Mc IF Amplifier & AM Converter
12BA6 - 2nd 4.3 Mc IF Amplifier & 455 Kc IF Amplifier
12BA6 - 3rd 4.3 Mc IF Amplifier
19T8 - FM Ratio Detector, AM Detector, AVC & 1st AF Amplifier
50B5 - Power Output Amplifier
Rectifier- Selenium type

POWER SUPPLY - 105-125 volts, AC, 60 cycles, 85 watts

RECORD CHANGER -Motorola Model RC-34. Refer to Motorola Service Manual, Part No. 54P484953 for record changer service information and operating instructions.

FM-BC TUNER - Refer to PT-19 Service Manual, Motorola Part No. 54P485033, for tuner information.

INSTALLATION & OPERATING INSTRUCTIONS

ANTENNAS. No outside antenna or ground is normally required for broadcast reception. An 'Aero-Vane' loop antenna for broadcast reception is located at the rear of the cabinet. In locations where additional pick-up is desired, an external antenna may be connected to the screw on the rear of the set marked 'BC'. See Figure 1.

An FM antenna, built into the power cord, eliminates the need for an external FM antenna when the receiver is used in normal FM service areas such as are found in and for a few miles around metropolitan areas being served by FM stations. In 'fringe' or weak FM signal areas, improved FM re-

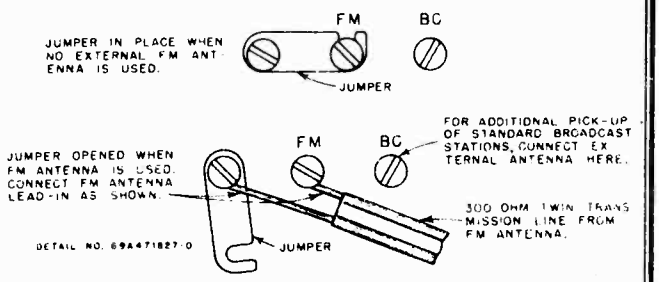


FIGURE 1. EXTERNAL ANTENNA CONNECTIONS

ception can be obtained by using a dipole antenna mounted as high as possible. The dipole antenna should be connected through a 300 ohm twin transmission line to the two screws on the rear of the set as shown in Figure 1. The jumper between the two terminals should be opened as shown. Orient the dipole antenna so maximum volume of FM station or stations is obtained.

CONTROLS. Refer to Figure 2 for instructions pertaining to use of the controls located on the receiver front panel.

The standard broadcast dial scale is read in kilocycles by adding one '0' to figures. The FM band dial scale is read in megacycles (88 to 108).

NOTE: When tuning, tune carefully until you are exactly ON the station. Tuning to either side of it will result in poor tone quality and excessive noise. Tuning of FM stations should be done very carefully, as 3 peaks are present; the center peak is the correct one; distortion and low volume are characteristic of the other two peaks.

RECORD CHANGER OPERATION. Refer to Motorola Model RC-34 Record Changer Service Manual, Part Number 54P484953 of operating instructions.

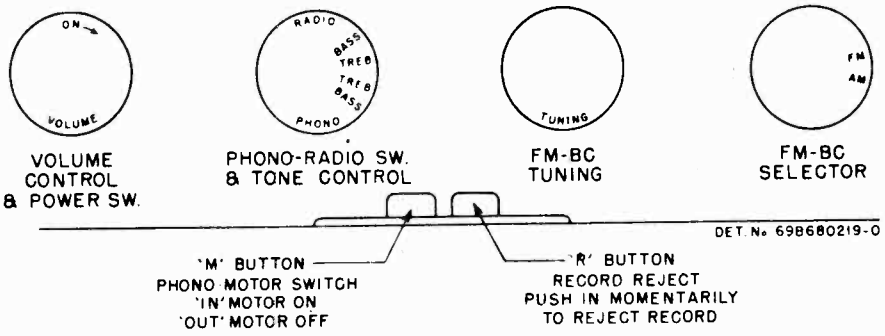


FIGURE 2. OPERATING CONTROLS

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment.

It is suggested that an isolation transformer be used between receiver and power line. If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator output through a .1 mf capacitor to receiver common negative (see schematic diagram) instead of the receiver chassis.

If set oscillates when aligning the broadcast band, connect receiver common negative to receiver chassis.

CAUTION: Don't forget to disconnect common negative from receiver chassis after alignment.

Use an insulated wrench when aligning the FM tuner cores and trimmers. Order Motorola FM Alignment Wrench, Part No. 66A471864.

Some chassis use AM IF & diode transformers having cores that are threaded and screw into threaded coil forms. These cores are slotted for a small diameter fiber screwdriver. Do not press hard on these cores during alignment or the threads on the core or coil form may strip.

The FM oscillator trimmer (adjustment 21 in Figure 2) will not be found on all tuners used in these chassis. Complete instructions for aligning tuners with or without this trimmer will be found in alignment charts.

Check setting of dial pointer before starting alignment. With gang fully closed, pointer should be in line with last mark on extreme left-hand side of dial scale. If necessary, reset pointer on string.

Refer to Figure 3 for location of all alignment trimmers and cores.

COMPLETE ALIGNMENT PROCEDURE USING AM SIGNAL GENERATOR

An AM (30% amplitude modulated) signal generator covering the frequencies shown in Alignment Chart I, is used to align the broadcast and FM bands. A low range output meter, connected across the speaker voice coil, is used as an output indicator.

The broadcast alignment is conventional; instructions are given in the following alignment chart.

The FM band alignment can be satisfactorily performed by following the instructions in the chart When properly aligned, the ratio detector does not respond to amplitude modulation and since an AM type signal generator is used for aligning the FM circuits, it is necessary to detune the ratio detector transformer secondary and leave it that way until all of the FM circuits have been aligned. After completing the alignment of FM circuits, proceed to align the ratio detector transformer secondary by applying a 4.3 Mc AM signal to the control grid (pin #7) of the 2nd FM converter tube and adjusting the ratio detector transformer secondary core for minimum audio output. No adjustment of the FM circuits should be attempted with AM after the ratio detector transformer secondary has been properly aligned.

Keep output of signal generator low so as not to overload stages and obtain false output indications. Keep receiver volume control at maximum; reduce generator output, as stages are brought into alignment, so output meter never reads more than .40 volt (.05 watt).

MODELS 78FM21, 78FM21M,
78FM22M; Ch. HS-128, HS-132

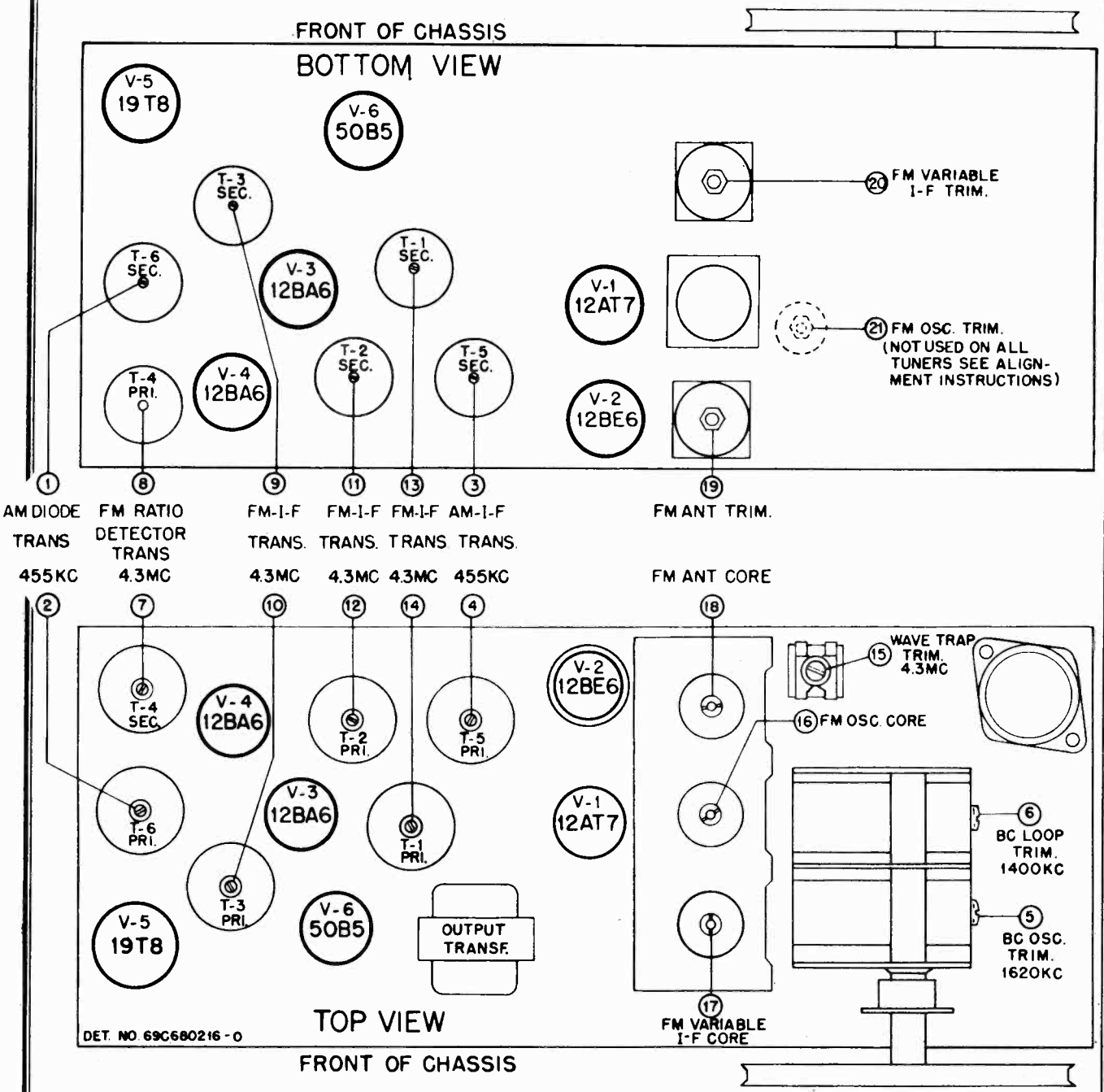


FIGURE 3. CHASSIS HS-128 & HS-132 TUBE & TRIMMER LOCATIONS

MODELS 78FM21, 78FM21M,
78FM22M; Ch. HS-128, HS-132

CHART 1. ALIGNMENT PROCEDURE WHEN USING AM MODULATED SIGNAL GENERATOR AND STANDARD OUTPUT METER FOR COMPLETE RECEIVER ALIGNMENT

STEP	DIAL SET TO	BAND SW SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
455 KC IF CHANNEL ALIGNMENT							
1.	High freq. end.	BC	.1 mf	12BE6 (V-2) BC Conv Grid (Pin #7)	455 Kc	1,2,3 & 4	Adjust for maximum output.
BROADCAST BAND ALIGNMENT							
2.	1620 Kc (gang fully opened)	BC	.1 mf	"	1620 Kc	5	Adjust for maximum output. This sets oscillator to dial scale.
3.	1400 Kc	BC	None	Radiation loop*	1400 Kc	6	Tune in signal with receiver tuning knob, then peak trimmer 6.
4.3 MC IF CHANNEL ALIGNMENT & WAVETRAP ADJUSTMENT							
4.	-	-	-	-	-	7	Detune ratio detector transformer secondary by screwing core (7) out as far as it will go.
5.	(extreme high frequency end)	FM	.001 mf	12AT7 (V-1) 2nd FM Converter Grid (Pin #7)	4.3 Mc	8,9,10, 11, 12, 13 & 14	Adjust for maximum output.
6.	-	FM	300 ohms	FM Ant terminal (center screw on back)	4.3 Mc	15	Adjust for minimum output (wavetrap)
FM BAND ALIGNMENT							
Note: If tuner does not have FM oscillator trimmer (21), perform step 7 & disregard steps 7A, B & C. If tuner has FM oscillator trimmer (21), then disregard step 7 and perform steps 7A, B & C in its place.							
7.	105 Mc	FM	300 ohms	FM Ant terminal (center screw on back)	105 Mc	16	Adjust for maximum output. This sets oscillator to dial scale.
7A.	90 Mc	FM	300 ohms	"	90 Mc	21	Adjust for maximum output.
7B.	105 Mc	FM	300 ohms	"	105 Mc	16	Adjust for maximum output.
7C.	-	-	-	-	-	-	Repeat steps 7A & 7B until oscillator tracks with dial calibration.
8.	90 Mc	FM	300 ohms	FM Ant terminal (center screw on back)	90 Mc	19 & 20	Tune in signal with receiver tuning knob, then adjust 19 & 20 for maximum output.
9.	105 Mc	FM	300 ohms	"	105 Mc	17 & 18	Tune in signal with receiver tuning knob, then adjust 17 & 18 for maximum output.
10.	-	-	-	-	-	-	Repeat steps 8 & 9 several times until further adjustment does not increase the output.
11.	105 Mc	FM	None	Radiate signal (or use weak station after performing step 12)	105 Mc	19	Adjust for maximum output with FM Ant link on back closed.

* Connect output of signal generator to a 5" diameter, 3 turn loop and radiate signal into receiver loop. Minimum distance between loops should never be less than 12".

MODELS 78FM21, 78FM21M, 78FM22M; Ch. HS-128, HS-132

ALIGN RATIO DETECTOR TRANSFORMER SECONDARY							
12.	-	FM	.001 mf	12AT7 (V-1) 2nd FM Converter Grid (Pin #7)	4.3 Mc	7	Adjust ratio detector transformer secondary for minimum response. The correct adjustment is sharply defined minimum response point between the two peaks.

CHART II. ALIGNMENT PROCEDURE WHEN USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

STEP — OPERATION

455 Kc IF Channel Alignment

1. Same as Step 1 in Chart I (Use AM signal generator).

Broadcast Band Alignment

2. Same as Steps 2 & 3 in Chart I (Use AM signal generator).

4.3 Mc IF Channel Alignment (Use FM Signal Generator & Oscilloscope)

3. (A) Ratio Detector

1. Connect the input terminals of the oscilloscope vertical amplifier to the high side of the receiver volume control and common negative.

2. Connect the FM generator synchronizing voltage output terminals to a phase shifting network, consisting of a variable 1/2 megohm resistor in series with a .002 mf capacitor. The input to the oscilloscope horizontal amplifier is connected across the .002 mf capacitor. See Figure 4. (This phase shifting network may not work with every oscilloscope. Different values of R & C may be required).

3. Apply an FM 4.3 Mc signal (125 Kc deviation) through a .001 mf capacitor to the control grid (pin #1) of tube V-4 (12BA6) in the third FM IF Amplifier stage.

4. Back out ratio detector transformer secondary core (7) several turns and then adjust ratio detector transformer primary (8) for maximum amplitude. The phase shifting network resistor is adjusted to give only one trace.

5. Adjust ratio detector transformer secondary (7) until a symmetrical pattern is obtained, with peaks occurring at about 100 Kc above and below 4.3 Mc and is substantially linear between peaks. The trace should pass through the intersection of the vertical and horizontal axis. The phase shifting network should be adjusted to give only a single pattern at all times. See Figure 5. It will be necessary to go over ratio detector transformer primary (8) and secondary (7) adjustments several times before a pattern of maximum amplitude and correct symmetry is obtained.

(B) 4.3 Mc IF Amplifiers & Wavetrap

1. Apply an FM 4.3 Mc signal (100 Kc deviation) to the control grid (pin #1) of tube V-3 (12BA6) in the 2nd FM IF amplifier stage, through a .001 mf capacitor and adjust both primary and secondary cores (9 & 10) to get a symmetrical pattern as before, with peaks occurring at a slightly lower deviation.

2. Move signal generator lead from tube V-3 to control grid (pin #1) of tube V-2 (12BE6) in the first FM IF amplifier stage, and adjust both primary and secondary cores (11 & 12) until a symmetrical pattern substantially linear between peaks is obtained.

3. Move signal generator lead from tube V-2 to FM antenna terminal (center clip on back). Turn 4.3 Mc wavetrap trimmer (15) off resonance and adjust both primary and secondary cores (13 & 14) until a symmetrical pattern substantially linear between peaks is obtained.

4. Leave signal generator connected to FM antenna terminal. Adjust 4.3 Mc wavetrap trimmer (15) for minimum output.

4. FM Band Alignment (Use FM Signal Generator & Output Meter)

(A) Connect generator output through a 300 ohm resistor to the receiver FM antenna terminal (center clip on back.)

(B) If tuner does not have oscillator trimmer (21) then set oscillator to dial scale as follows: Set receiver pointer to 105 Mc. Also set FM signal generator to 105 Mc (22-1/2 Kc deviation). Adjust FM oscillator core (16) for maximum output; this sets oscillator to dial scale.

If tuner does have oscillator trimmer (21) then set oscillator to dial scale as follows: Set receiver pointer to 90 Mc. Also set FM signal generator to 90 Mc (22-1/2 Kc deviation). Adjust FM oscillator trimmer (21) for maximum output. Next set receiver pointer and FM generator to 105 Mc and adjust FM oscillator core (16) for maximum output. Repeat oscillator adjustments at 90 Mc and 105 Mc until oscillator tracks with dial.

(C) Set FM signal generator to 90 Mc (22-1/2 Kc deviation). Tune in signal with receiver tuning knob and then adjust FM variable IF and FM antenna trimmers (19 & 20) for maximum output.

(D) Set FM signal generator to 105 Mc (22-1/2 Kc deviation). Tune in signal with receiver tuning knob and then adjust FM variable IF and FM antenna tuning cores (17 & 18) for maximum output.

(E) Repeat steps 4(C) and 4(D) until cores (17 & 18) and trimmers (19 & 20) reach their peak.

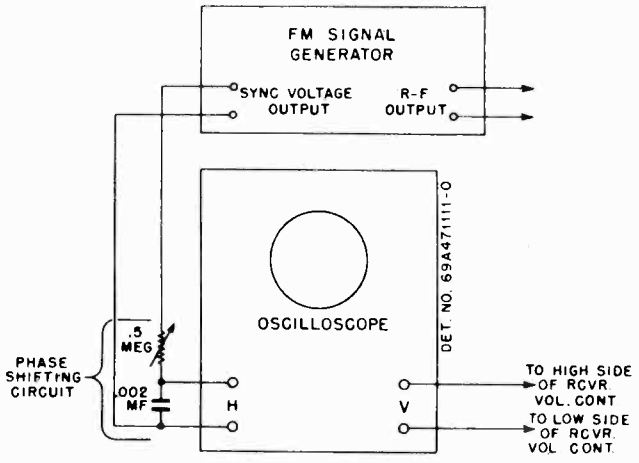


FIGURE 4. SIGNAL GENERATOR & OSCILLOSCOPE HOOK-UP

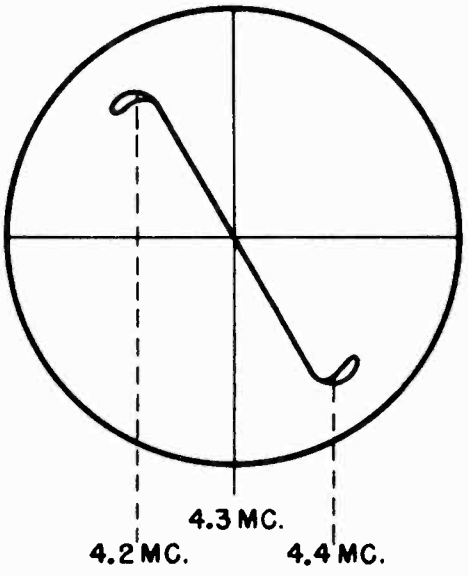
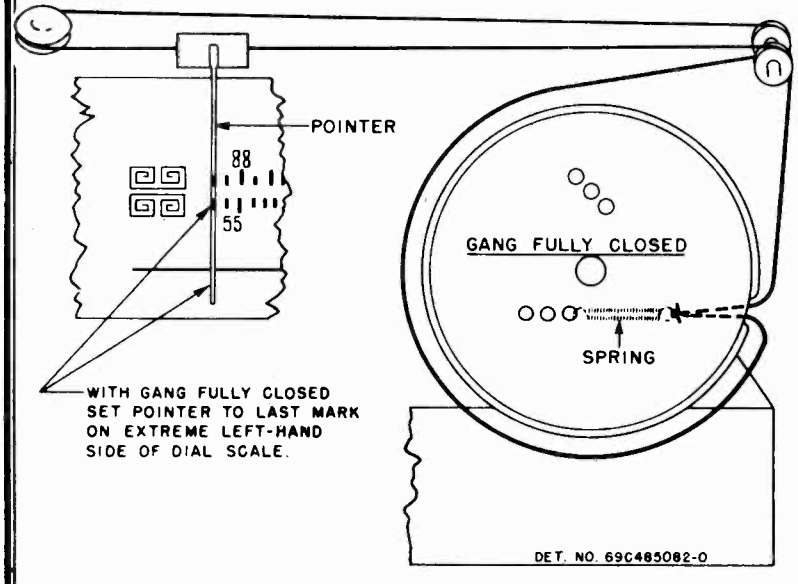
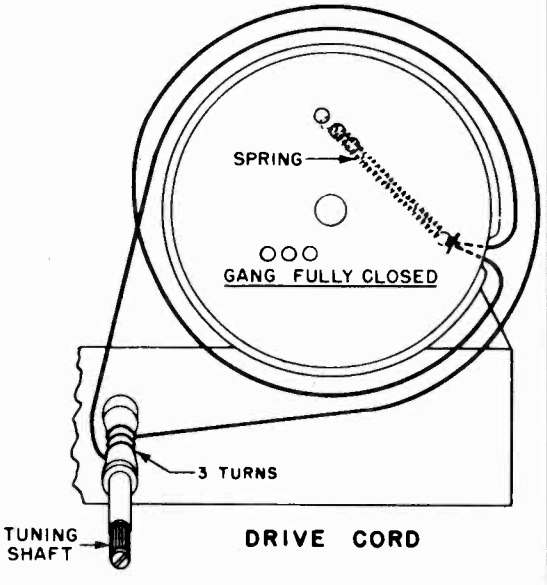


FIGURE 5. OSCILLOSCOPE PATTERN



POINTER CORD



DRIVE CORD

FIGURE 6. CHASSIS HS-128 & HS-132 STRING DRIVE DETAIL

MODELS 78FM21, 78FM21M,
78FM22M; Ch. HS-128, HS-132

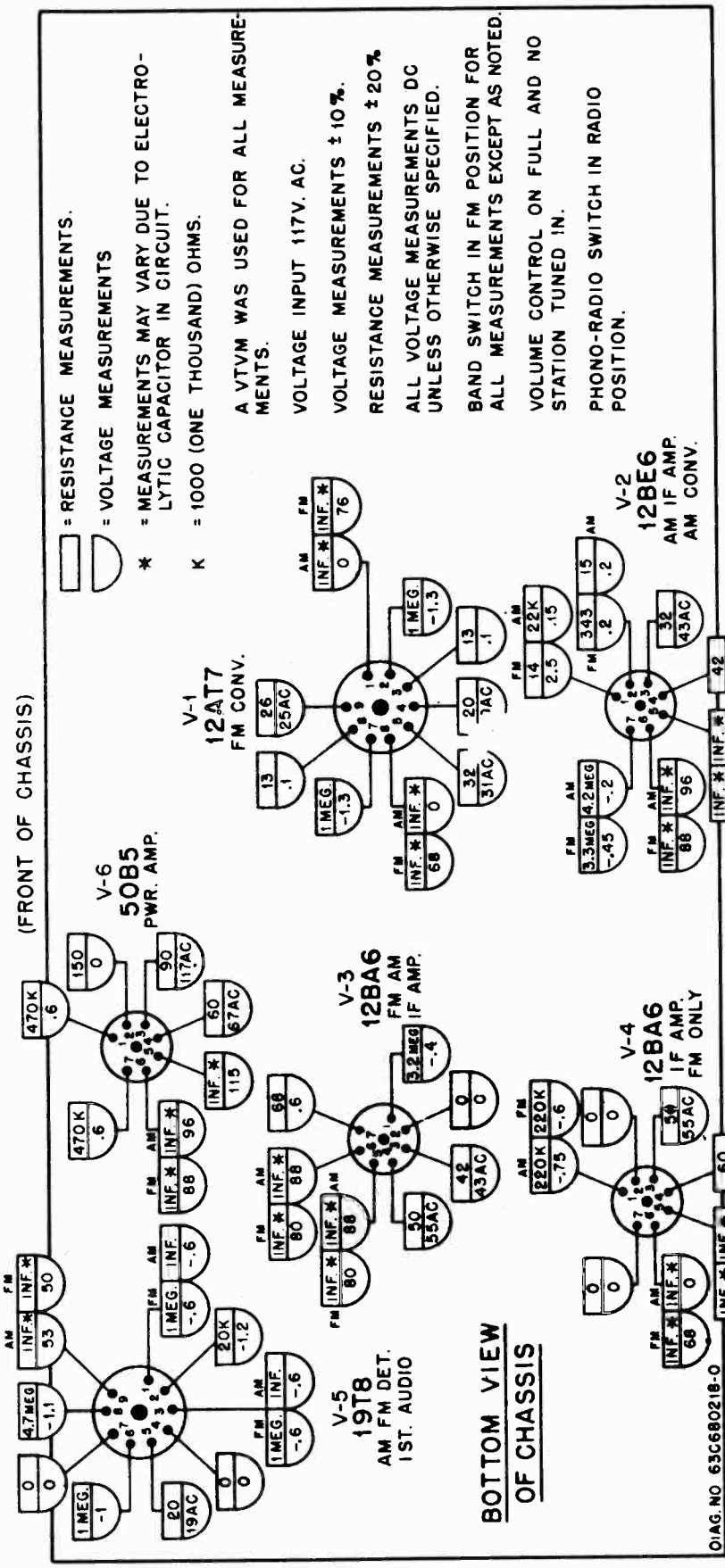


FIGURE 7. CHASSIS HS-128 & HS-132 VOLTAGE & RESISTANCE DIAGRAM

MODELS 78FM21, 78FM21M,
78FM22M; Ch. HS-128, HS-132

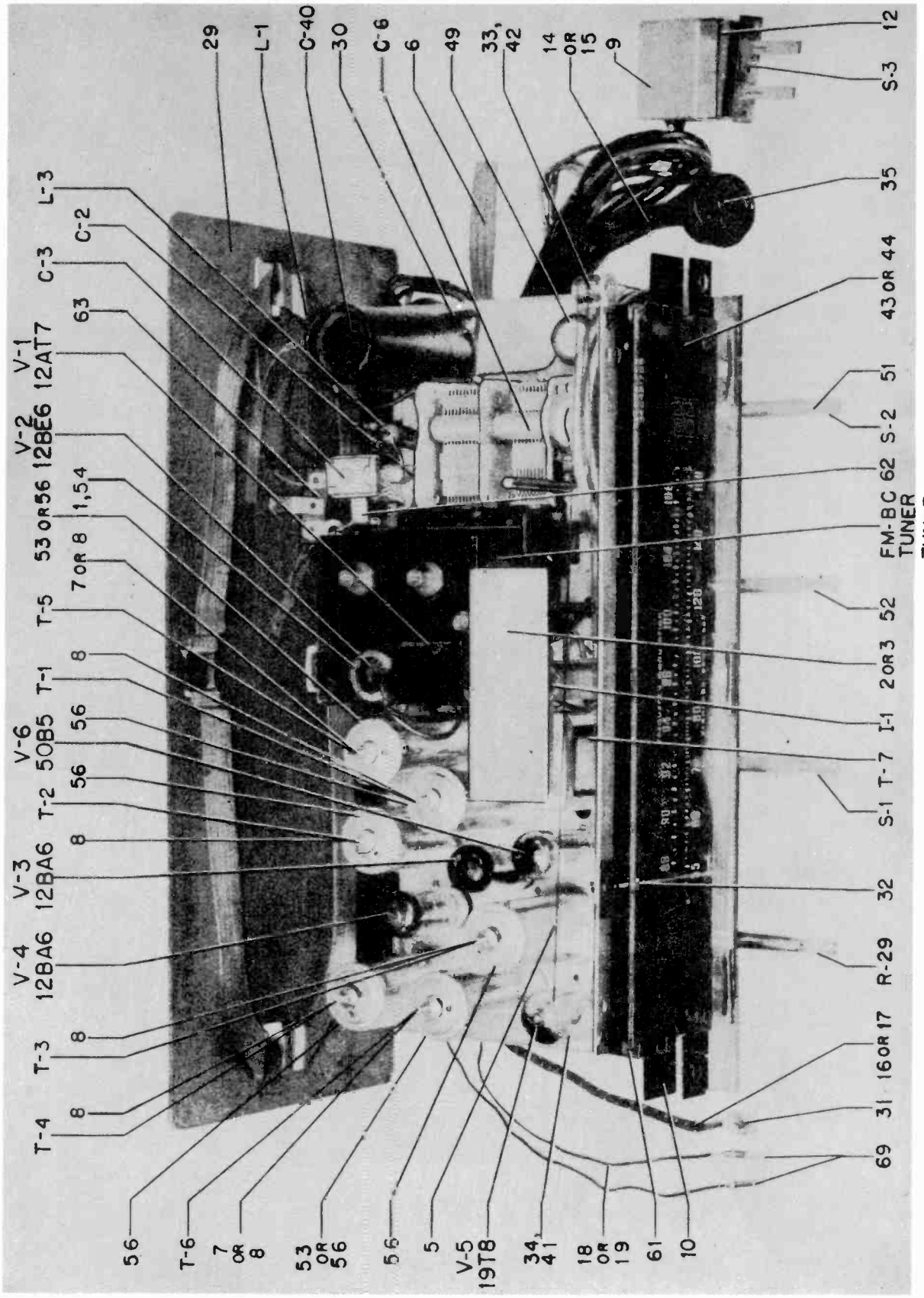


FIGURE 9. CHASSIS HS-128 & HS-132 CHASSIS PARTS LOCATION -TOP VIEW

MODELS 78FM21, 78FM21M,
78FM22M; Ch. HS-128, HS-132

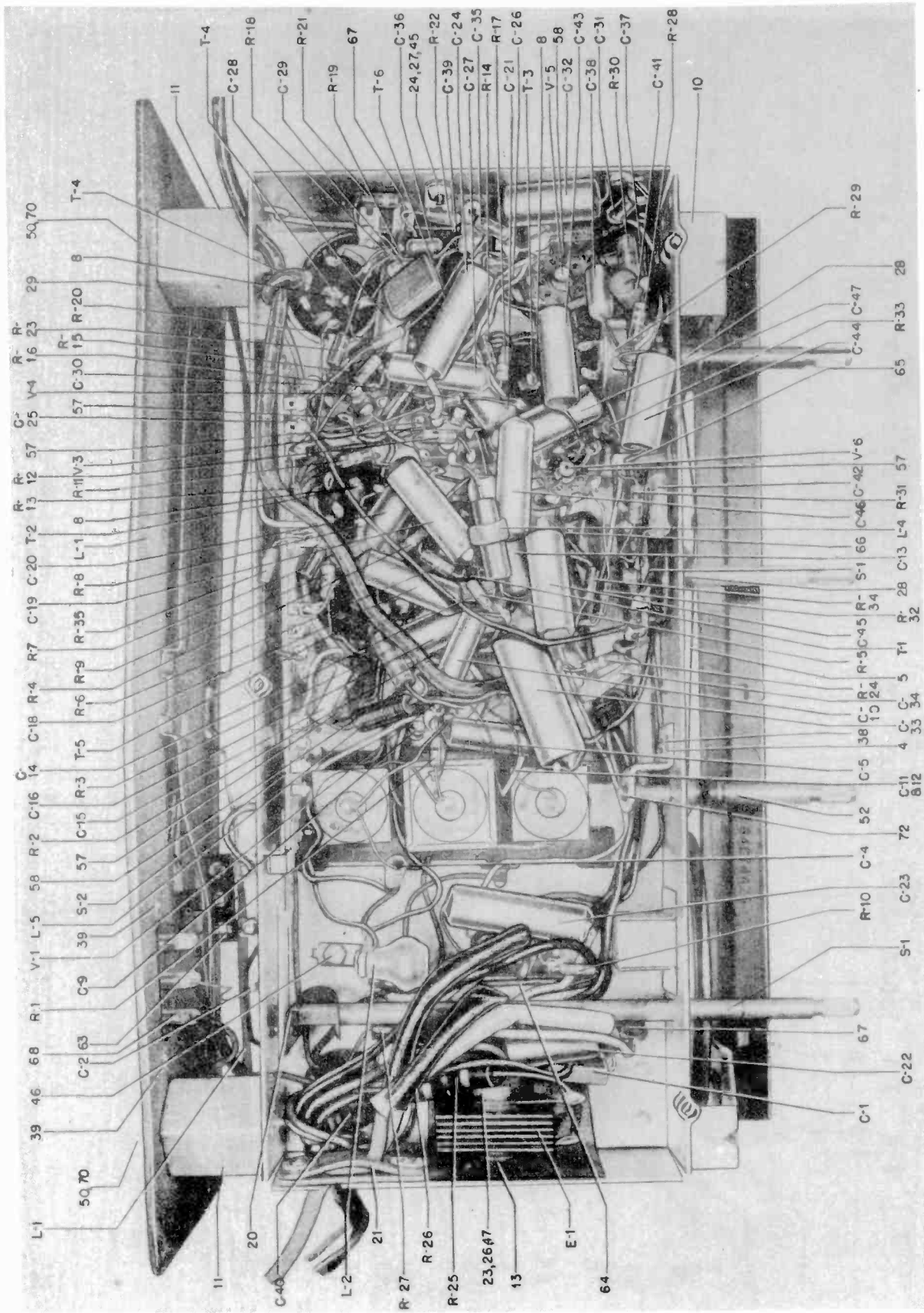
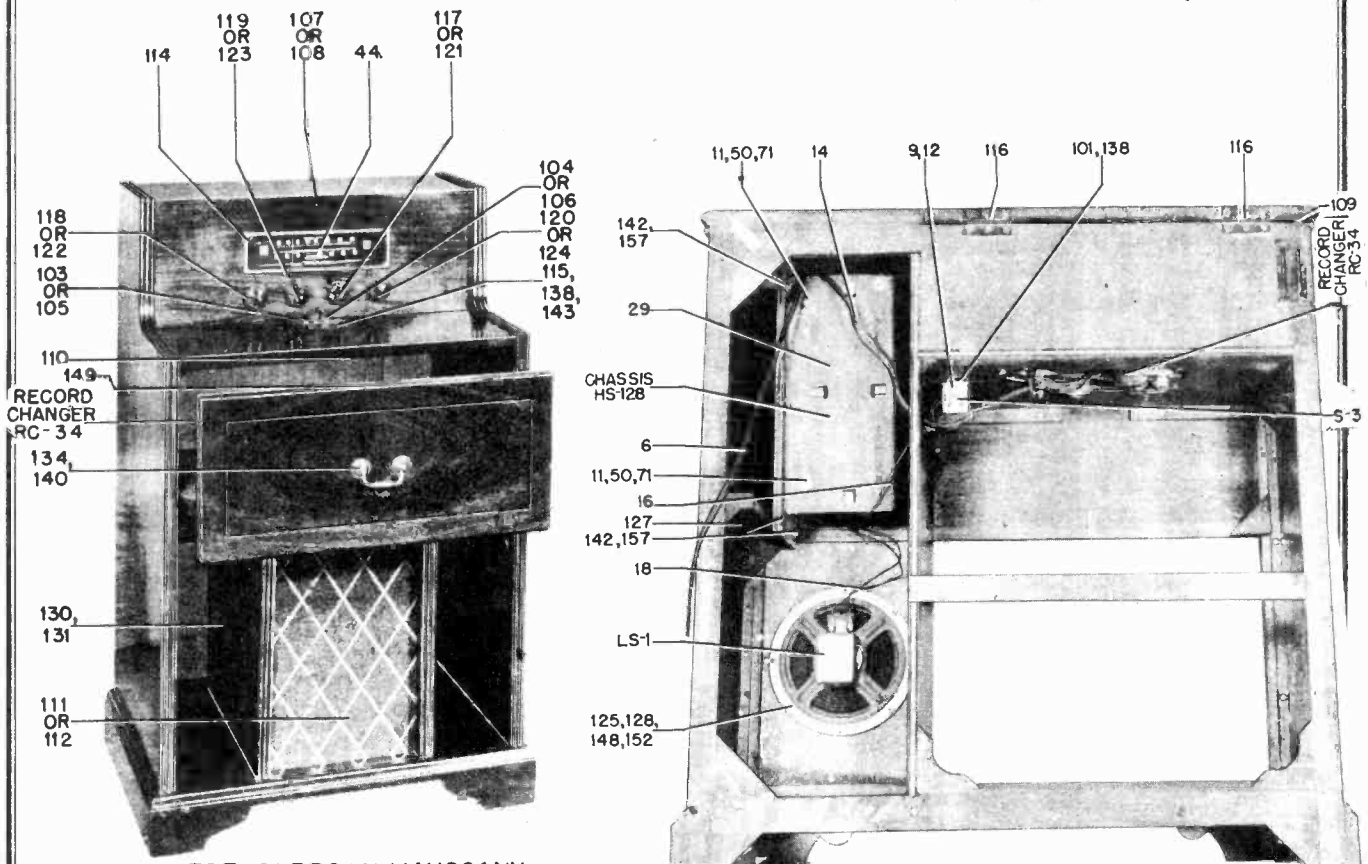
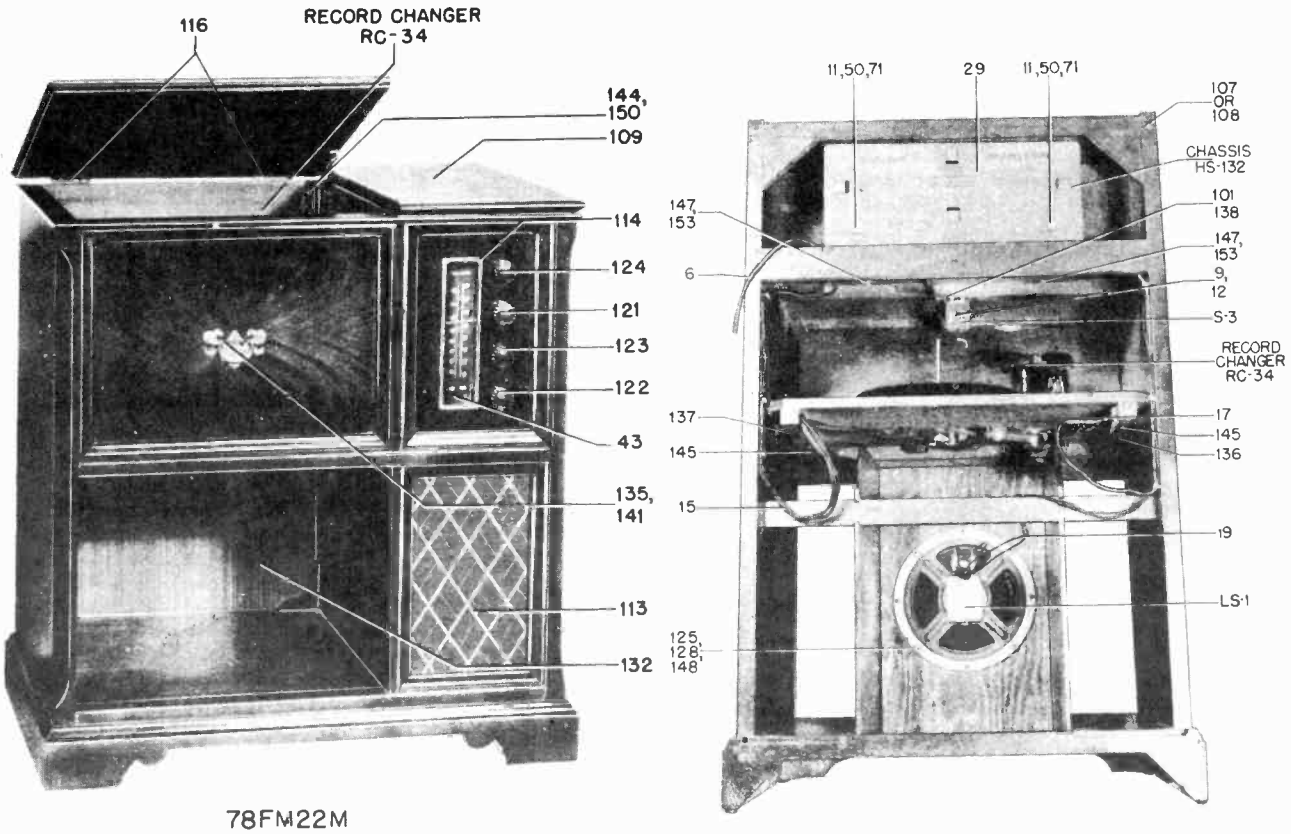


FIGURE 10. CHASSIS HS-128 & HS-132 CHASSIS PARTS LOCATION - BOTTOM VIEW

MODELS 78FM21, 78FM21M,
78FM22M; Ch. HS-128, HS-132



78FM21 BROWN MAHOGANY
78FM21M RED MAHOGANY



78FM22M

FIGURE 11. CABINET PARTS LOCATION - FRONT & REAR VIEWS

MODELS 78FM21, 78FM21M,
78FM22M; Ch. HS-128, HS-132

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	21K77373	Ceramic: 50 mmf 500V .....
C-2	21K484347	Molded: 7 mmf .....
C-3	20A71125	Trimmer: 10-80 mmf; with mtg bracket .....
C-4	21K484347	Molded: 7 mmf .....
C-5	8A471019	Paper: .02 mf 400V .....
C-6A, 6B	19K75415	Variable, 2 gang: cut oscillator plates; with trimmers C-7 and C-17 .....
C-7	-	Trimmer: Part of gang capacitor C-6 .....
C-9	21K478410	Ceramic: 1000 mmf 500V .....
C-10	8A24966	Paper: .005 mf 100V .....
C-11, 12	21B484337	Ceramic: dual 250 mmf .....
C-13	8S9825	Paper: .01 mf 200V .....
C-14	21K77373	Ceramic: 50 mmf 500V .....
C-15	21R6639	Mica: 500 mmf 500V .....
C-16	8K471636	Paper: .1 mf 200V .....
C-17	-	Trimmer: Part of gang capacitor C-6 .....
C-18	8S9801	Paper: .01 mf 100V .....
C-19	8S9825	Paper: .01 mf 200V .....
C-20	8S9801	Paper: .01 mf 100V .....
C-21	8K471635	Paper: .05 mf 400V .....
C-22	8K471635	Paper: .05 mf 400V .....
C-23	8S9816	Paper: .05 mf 400V .....
C-24	8S9825	Paper: .01 mf 200V .....
C-25	21B77286	Ceramic: 100 mmf 500V .....
C-26	21B77286	Ceramic: 100 mmf 500V .....
C-27	8S9801	Paper: .01 mf 100V .....
C-28	8S9825	Paper: .01 mf 200V .....
C-29	21B77286	Ceramic: 100 mmf 500V .....
C-30	21K478410	Ceramic: 1000 mmf 500V .....
C-31	21B470567	Ceramic: 4700 mmf 500V .....
C-32	8K471635	Paper: .05 mf 400V .....
C-33	8S9807	Paper: .1 mf 400V .....
C-34	21K77375	Ceramic: 250 mmf 500V .....
C-35	21K478410	Ceramic: 1000 mmf 500V .....
C-36	21K478410	Ceramic: 1000 mmf 500V .....
C-37	21K77375	Ceramic: 250 mmf 500V .....
C-38	8A24966	Paper: .005 mf 100V .....
C-39	23A481316	Electrolytic: 8 mf 50V .....
C-40	23B470429	Electrolytic: 40-20-20 mf 200-150-150V .....
C-41	8A24966	Paper: .005 mf 100V .....
C-42	21B470567	Ceramic: 4700 mmf 500V .....
C-43	8S9809	Paper: .01 mf 400V .....
C-44	8K471636	Paper: .1 mf 200V .....
C-45	23A481316	Electrolytic: 8 mf 50V .....
C-46	8S9802	Paper: .02 mf 400V .....
C-47	8K471635	Paper: .05 mf 400V .....
DIAL LIGHT		
I-1	65A470930	Lamp, incandescent: 117V, 10 watt; clear .....
RECTIFIER		
E-1	48B90140	Selenium type: half-wave ...
COILS		
L-1	24K481708	BC Loop Antenna: winding only
L-2	24A470556	BC Oscillator .....
L-3	24A77240	Wavetrap .....
L-4	24A470505	RF Choke .....
L-5	24A74989	Filament choke .....

REF. NO.	PART NO.	DESCRIPTION
SPEAKER		
LS-1	50C481495	Speaker: 8" PM; 3.2 ohm VC..
RESISTORS		
NOTE: All resistors are 20%, carbon type, unless otherwise specified.		
R-1	6R6004	1 meg 1/2W .....
R-2	6R6004	1 meg 1/2W .....
R-3	6R5610	8200 10% 1W .....
R-4	6R6028	22,000 1/2W .....
R-5	6R6028	22,000 1/2W .....
R-6	6R6378	56,000 10% 1/2W .....
R-7	6R6004	1 meg 1/2W .....
R-8	6R6301	1000 1/2W .....
R-9	6R6022	330 10% 1/2W .....
R-10	6R6028	22,000 1/2W .....
R-11	6R6012	33,000 1/2W .....
R-12	6R2039	68 10% 1/2W .....
R-13	6R3927	2.2 meg 1/2W .....
R-14	6R6301	1,000 1/2W .....
R-15	6R6056	47,000 1/2W .....
R-16	6R6015	220,000 1/2W .....
R-17	6R6012	33,000 1/2W .....
R-18	6R6301	1,000 1/2W .....
R-19	6R3949	470 1/2W .....
R-20	6R6028	22,000 1/2W ... .
R-21	6R2119	15,000 1/2W .....
R-22	6R6039	4700 1/2W .....
R-23	6R6004	1 meg 1/2W .....
R-24	6R6032	470,000 1/2W .....
R-25	6R3994	27 10% 2W .....
R-26	6R3968	180 10% 2W .....
R-27	6R476004	1,000 2W .....
R-28	6R6012	33,000 1/2W .....
R-29	18K471518	Volume control: 1 meg; includes on-off switch .....
R-30	6R2122	4.7 meg 1/2W .....
R-31	6R6075	100,000 1/2W .....
R-32	6R6032	470,000 1/2W .....
R-33	6R6075	100,000 1/2W .....
R-34	6R3992	150 1/2W .....
R-35	6R6182	150,000 1/2W .....
SWITCHES		
S-1	40K471508	Phono-Radio & Tone Switch ..
S-2	40B470432	Change-over Switch (BC-FM)..
S-3A & B	40K471447	Pushswitch: dual (phono ON-OFF & phono reject) .....
TRANSFORMERS		
T-1	24B481391	1st IF, 4.3 Mc: complete with iron cores and padding capacitors, but less shield ...
T-2	24B471670	2nd IF, 4.3 Mc: complete with iron cores and padding capacitors, but less shield ...
T-3	24B471672	3rd IF, 4.3 Mc: complete with iron cores and padding capacitors, but less shield ...
T-4	24B481393	Ratio Detector Transformer, 4.3 Mc: complete with iron cores and padding capacitor, but less shield .....
T-5	24B75487	IF, 455 Kc: complete with iron cores and padding capacitors, but less shield (use with

MODELS 78FM21, 78FM21M, 78FM22M; Ch. HS-128, HS-132

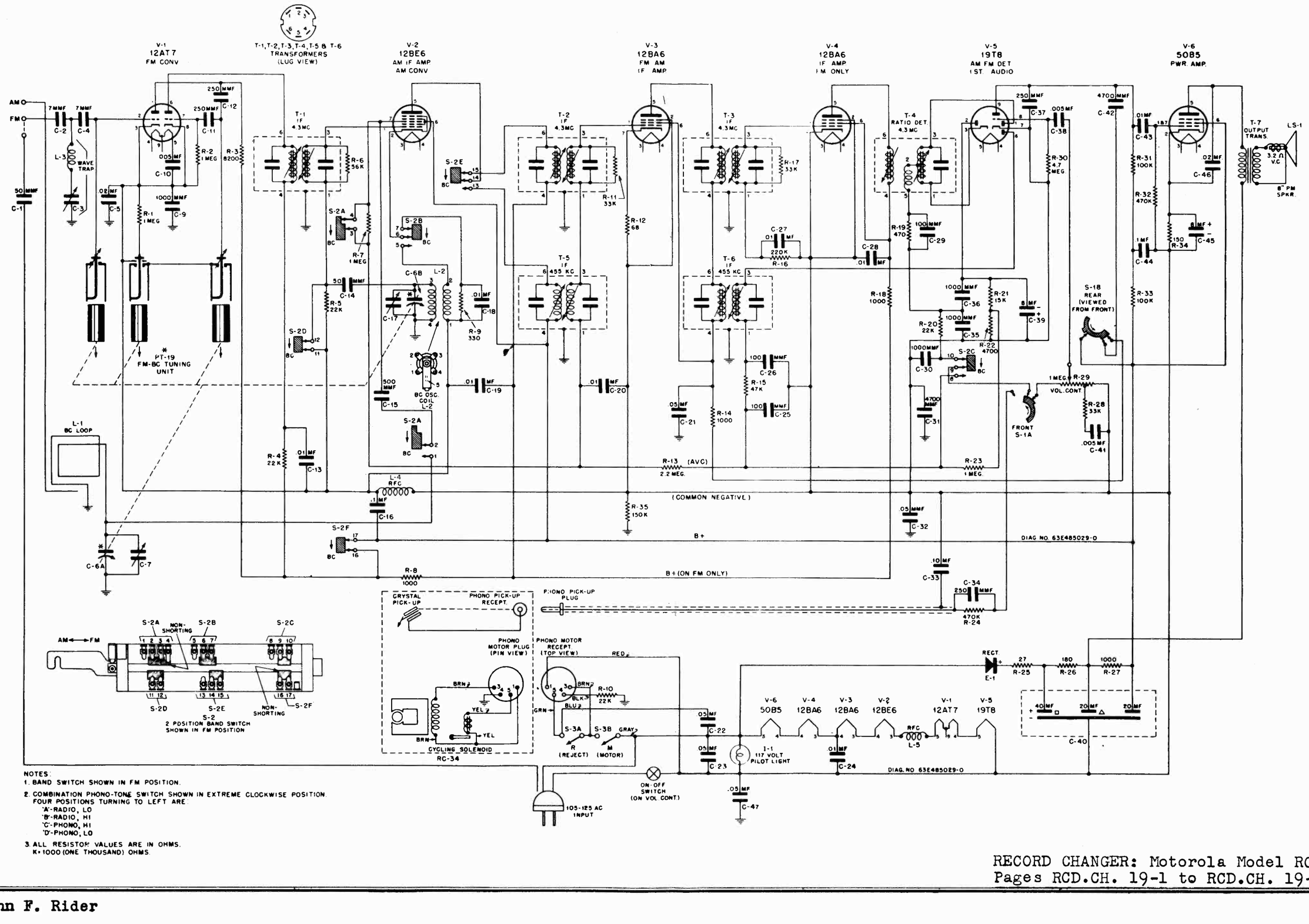
REF. NO.	PART NO.	DESCRIPTION
		shield having iron core sleeve)
	or 24B482863	IF, 455 Kc: complete with iron cores and padding capacitors, but less shield (use with plain shield) .....
T-6	24B471666	Diode, 455 Kc: complete with iron cores and padding capacitors, but less shield (use with shield having iron core sleeve) .....
	or 24B482865	Diode, 455 Kc: complete with iron cores and padding capacitors, but less shield (use with plain shield) .....
T-7	25K481726	Output Transformer .....
		CHASSIS PARTS - MECHANICAL
1	26A24869	Base, tube shield .....
2	1X481733	Bracket, dial light: includes shield (HS-132) .....
3	1X485931	Bracket & Shield Assembly, dial light (HS-128) .....
4	7A77337	Bracket, tuning shaft .....
5	11M8944	Cord, dial: 18 lb; black ...
6	30K31258	Cord, line & plug: 3-conductor
7	46A470885	Core, iron: threaded (use with transformers 24B482863 and 24B482865 only) .....
8	46A70023	Core, iron and screw (for 4.3 Mc IF trans., and 455 Kc IF & diode trans., part no. 24B75487 and 24B471666) ...
9	15A471444	Cover, push switch .....
10	1X471776	Dial Plate, Brackets and Pullies Assembly: less dial scale .....
11	57K470568	Dowel, back mtg: wood .....
12	14A471446	Insulator, pushswitch cover: armite .....
13	14A470428	Insulator, rectifier: fibre.
14	1X481765	Lead Assembly, phono: with 4-pin receptacle & dual pushswitch (for HS-128 chassis) .....
15	1X481730	Lead Assembly, phono: with 4-pin receptacle & dual pushswitch (for HS-132 chassis) .....
16	1X481766	Lead Assembly, phono pick-up: includes plug (HS-128 only) .....
17	1X481731	Lead Assembly, phono pick-up: includes plug (HS-132 only) .....
18	1X481767	Lead Assembly, speaker (HS-128 only) .....
19	1X481732	Lead Assembly, speaker (HS-132 only) .....
20	1X470545	Lever and Rivet Assembly (on bandswitch shaft) .....
21	32K31259	Lock, line cord: fibre .....
22	4S7695	Lockwasher, internal: #5 (terminal strip mtg) .....
23	4S7650	Lockwasher, internal: #6; cad pl (rectifier mtg and trimmer bracket mtg) .....
24	4S7666	Lockwasher, external: #6 (terminal strip mtg) .....
25	2S7005	Nut, hex: 6-32 x 1/4; cad pl; (trimmer bracket mtg) .....
26	2S7002	Nut, hex: 6-32 x 5/16; cad pl; (rectifier mtg) .....
27	2S7010	Nut, hex: 5-40 x 1/4; cad pl; (terminal strip mtg) .....
28	2S7051	Nut, hex: 3/8-32 x 9/16 Palnut; steel; cad pl (volume control and phono-radio switch mtg) .....
29	24C481707	Panel Assembly, rear: includes antenna winding ....
30	9A12705	Plate, electrolytic mtg: bakelite .....
31	28K71775	Plug, single-pin (phono pick-up lead) .....
32	52B481704	Pointer, dial .....
33	49A23960	Pulley, cord: 1/4 groove ...
34	49A21552	Pulley, cord: 1/2" groove..
35	9K470402	Receptacle, phono-motor ....
36	5S7774	Rivet: .088 x 1/4; steel; nkl pl (tube socket mtg) ..
37	5S7707	Rivet: .122 x 5/32; steel; nkl pl (terminal strip & dial light shield mtg) ....
38	5S7701	Rivet: .122 x 3/16; steel; nkl pl (tuning shaft brkt & electrolytic plate mtg) ...
39	5S7700	Rivet: .122 x 1/4; stl; nkl pl (3 screw terminal mtg).
40	5S7708	Rivet: .122 x 9/32; steel; nkl pl (line cord lock mtg) ...
41	5A71246	Rivet, shoulder: .187 long (cord pulley mtg) .....
42	5A71735	Rivet, shoulder: 1/2" long (cord pulley mtg) .....
43	34C481737	Scale, dial: glass (HS-128).
44	34K485921	Scale, dial: glass (HS-132).
45	3S6912	Screw, machine: 5-40 x 1/4 slotted round head; cad pl (terminal strip mtg) .....
46	3S7506	Screw, sheet metal: #6 x 1/4 PKZ plain hex head; cad pl; steel; (oscillator coil mtg)
47	3S2927	Screw, machine: 6-32 x 7/8 slotted hex head; cad pl (rectifier mtg) .....
48	3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; cad pl (dial light shield & brkt assembly mtg and dial plate & brkts assembly mtg) .....
49	3S7507	Screw, sheet metal: #8 x 5/8 PKZ plain hex head; cad pl (tuner mtg) .....
50	3S7530	Screw, sheet metal: #8 x 1-1/2 PKZ slotted hex head; cad pl (back mtg) .....
51	47A470405	Shaft, bandswitch .....
52	1K471779	Shaft and Pulley Assembly (tuning shaft) .....
53	1A71049	Shield and Iron Core Sleeve Assembly (for T-5, 24B75487 IF & T-6, 24B471666 diode transformers only) .....
54	26A24970	Shield, tube .....
55	26A485918	Shield, dial and escutcheon (HS-128 only-prevents light from shining through the dial & escutcheon) .....
56	26K485936	Shield, coil (for T-1, T-2, T-3, T-4 & T-5 IF 24B482863

REF. NO.	PART NO.	DESCRIPTION
		& T-6 diode 24B482865 transformers only) .....
57	9A6778	Socket, tube: min. 7 prong .
58	9A481376	Socket, tube: 9 prong(noval)
59	9k481727	Socket, dial light: includes bracket .....
60	41A14244	Spring, tension coil (on drive and pointer cords)...
61	37K21114	Strip, channel: rubber; 1" long (dial scale mtg) .....
62	31K37504	Strip, terminal: 1 insulated lug; #1 mtg; 3/8" spacing
63	31k15026	Strip, terminal: 2 insulated lugs; #2 mtg; 3/8" spacing
64	31K471564	Strip, terminal: 3 insulated lugs; #2 gnd; 3/8" spacing
65	31K14655	Strip, terminal: 3 insulated lugs; #3 mtg; 3/8" spacing .....
66	31K470747	Strip, terminal: 5 insulated lugs; #3 mtg; 3/8" spacing
67	31K471562	Strip, terminal: 5 insulated lugs; #4 mtg; 3/8" spacing
68	31A470403	Strip, terminal: 3 screws (on loop back) .....
69	29A5400	Terminal, plain pin (speaker lead) .....
70	4S1719	Washer, flat: 3/8 x .140 x .030 thick; stl; cad pl (line cord lock mtg) .....
71	4S7613	Washer, flat: 3/4 x 13/64 x .027 thick; stl; antique copper finish (back mtg) ..
72	4A70015	Washer, 'C' (tuning shaft and bandswitch shaft retainer) .....

CABINET PARTS

101	7A481713	Bracket, push switch mtg ...
102	36K482819	Button, plug: 1/4"; red mahogany finish (for concealing shipping screw holes in record changer)...
103	1X485913	Button, push: 'M'; walnut (78FM21) .....
104	1X485914	Button, push: 'R'; walnut (78FM21) .....
105	1X485915	Button, push: 'M'; mahogany (78FM21M & 78FM22M) .....
106	1X485916	Button, push: R ; mahogany (78FM21M & 78FM22M) .....
107	16K482779	Cabinet, spinet combination; brown mahogany (78FM21) ...
108	16F481718	Cabinet, spinet combination; red mahogany (78FM21M) ....
109	16F481758	Cabinet, console combination; red mahogany (78FM22M) ....
110	55B72307	Catch, bullet .....
111	13K482798	Cloth, grille: brown mahogany (78FM21) .....
112	13K481719	Cloth, grille: red mahogany (78FM21M) .....
113	13K481763	Cloth, grille: red mahogany (78FM22M) .....
114	13K482138	Escutcheon, dial: antique brass finish .....
115	13A471458	Escutcheon, push button; statuary bronze finish ....
116	55A471394	Hinge, lid mtg (78FM22M) ...
117	36K484526	Knob, control: walnut plastic; 'TUNING' (78FM21) .....
118	36K484528	Knob, control: walnut plastic; 'ON-VOLUME' (78FM21) .....
119	36K484536	Knob, control: walnut plastic; 'RADIO-PHONO' (78FM21) ....
120	36K484537	Knob, control: walnut plastic; 'AM-FM' (78FM21) .....
121	36K484522	Knob, control: mahogany plastic; 'TUNING' (78FM21M and 78FM22M) .....
122	36K484524	Knob, control: mahogany plastic; 'ON-VOLUME' (78FM21M and 78FM22M) .....
123	36K484534	Knob, control: mahogany plastic; 'RADIO-PHONO' (78FM21M and 78FM22M) .....
124	36K484535	Knob, control: mahogany plastic; 'AM-FM' (78FM21M and 78FM22M) .....
125	4S7657	Lockwasher, external: #8; cad pl (speaker mtg) .....
126	22S1647	Nail, furniture: #42; antique brass; (rear panel mtg) ...
127	2A72610	Nut, tee: 8-32 thread (on cabinet-chassis mounting) .
128	2S7003	Nut, hex: 8-32 x 5/16; steel cad pl (speaker mtg) .....
129	35K470657	Pad, felt .....
130	64K484557	Panel, cabinet rear; walnut (78FM21) .....
131	64K481724	Panel, cabinet rear: mahogany (78FM21M) .....
132	64K481725	Panel, cabinet rear: mahogany (78FM22M) .....
133	64C482829	Panel, record changer cover (78FM21 and 78FM21M) .....
134	55A481715	Pull, drawer: English antique finish (78FM21 and 78FM21M)
135	55A481759	Pull, drawer: dummy (78FM22M)
136	55C74786	Rail, support: right-hand ..
137	55K74787	Rail, support: left-hand ...
138	3S7156	Screw, machine: 6-32 x 3/16 slotted binder head; steel; cad pl (push switch mtg) ..
139	3S7455	Screw, sheet metal: #8 x 3/8 PKA slotted acorn head; steel; cad pl (record changer cover mtg) .....
140	3K481722	Screw, machine: 8-30 x 7/8 washerhead; antique copper finish (drawer pull mtg - 78FM21 and 78FM21M) .....
141	3K481761	Screw, machine: 8-32 x 1/4 washerhead; statuary bronze (drawer pull mtg -78FM22M)..
142	3S2963	Screw, machine: 8-32 x 1-3/4; slotted hex head; steel; cad pl (chassis mounting - 78FM22M) .....
143	3S488129	Screw, machine: #4 x 5/8 Phillips oval head; statuary bronze finish (push button escutcheon mtg) ....
144	3S7436	Screw, wood: #6 x 1/2 slotted round head screw; antique copper finish (lid support mtg - 78FM22M) .....
145	3S1314	Screw, wood: #6 x 3/4 slotted round head; statuary bronze finish (support rail mtg)
146	3S476106	Screw, sheet metal: #8 x 1 PKA slotted hex head; steel; cad pl (chassis mtg - 78FM22M) .....
147	3S3396	Screw, sheet metal: #8 x 1-1/4 PKA plain hex head; steel; cad pl (chassis mounting - 78FM21 & 78FM21M) .....
148	3K653	Screw, speaker mounting ....
149	55K72308	Strike, bullet: includes nail
150	55B482802	Support, lid: statuary bronze finish (78FM22M) .....
151	4K485917	Washer, felt: used behind control knobs .....
152	4S7630	Washer, flat: 1/2 x 7/32 x .033 thick; steel; cad pl (chassis mtg 78FM22M and speaker mounting).....
153	4S8214	Washer, flat: 7/8 x .203 x .067 thick; steel; cad pl (chassis mtg) .....

MODELS 78FM21, 78FM21M,
78FM22M; Ch. HS-128, HS-132



NOTES:
1. BAND SWITCH SHOWN IN FM POSITION.
2. COMBINATION PHONO-TONE SWITCH SHOWN IN EXTREME CLOCKWISE POSITION. FOUR POSITIONS TURNING TO LEFT ARE:
   'A'-RADIO, LO
   'B'-RADIO, HI
   'C'-PHONO, HI
   'D'-PHONO, LO
3. ALL RESISTOR VALUES ARE IN OHMS. K=1000 (ONE THOUSAND) OHMS.

RECORD CHANGER: Motorola Model RC-34, Pages RCD.CH. 19-1 to RCD.CH. 19-10.

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Ch. HS-133

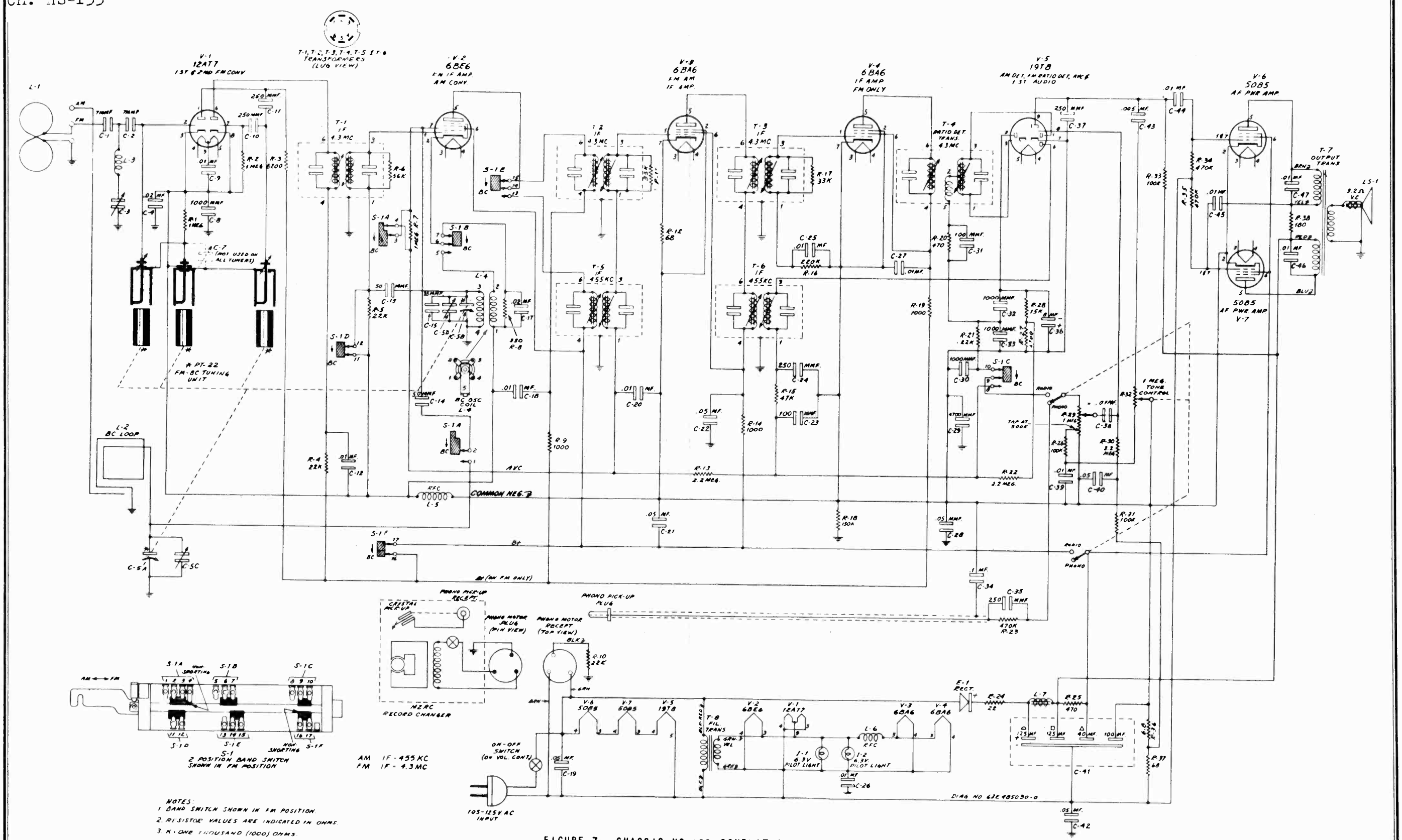

FIGURE 7. CHASSIS HS-133 SCHEMATIC DIAGRAM

POWER SUPPLY - 105-125 volts AC, 60 cycles, 75 watts

TUNING RANGE - BC - 535 to 1620 Kc
FM - 88 to 108 Mc

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment.

It is suggested that an isolation transformer be used between receiver and power line. If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator output through a .1 mf capacitor to receiver common negative (see schematic diagram) instead of the receiver chassis.

If set oscillates when aligning the broadcast band, connect receiver common negative to receiver chassis.

CAUTION: Don't forget to disconnect common negative from receiver chassis after alignment.

Use an insulated wrench when aligning the FM tuner cores and trimmers. Order Motorola FM Alignment Wrench, Part No. 66A471864.

The AM IF & diode transformer cores are threaded and screw into the threaded coil forms. These cores are slotted for a small diameter fiber screwdriver. Do not press hard on these cores during alignment or the threads on the core or coil form may strip.

The FM oscillator trimmer (adjustment 21 in Figure 2) will not be found on all tuners used in Chassis HS-133. Complete instructions for aligning tuners with or without this trimmer will be found in alignment charts.

Check setting of dial pointer before starting alignment. With gang fully closed, pointer should be in line with last mark on extreme left-hand side of dial scale. If necessary, reset pointer on string.

Refer to Figure 2 for location of all alignment trimmers and cores.

COMPLETE ALIGNMENT PROCEDURE USING AM SIGNAL GENERATOR

An AM (30% amplitude modulated) signal generator covering the frequencies shown in Alignment Chart I, is used to align the broadcast and FM bands A low range output meter, connected across the speaker voice coil, is used as an output indicator.

The broadcast alignment is conventional; instructions are given in the following alignment chart.

The FM band alignment can be satisfactorily performed by following the instructions in the chart When properly aligned, the ratio detector does not respond to amplitude modulation and since an AM type signal generator is used for aligning the FM circuits, it is necessary to detune the ratio detector transformer secondary and leave it that way until all of the FM circuits have been aligned. After completing the alignment of FM circuits, proceed to align the ratio detector transformer secondary by applying a 4.3 Mc AM signal to the control grid (pin #7) of the 2nd FM converter tube and adjusting the ratio detector transformer secondary core for minimum audio output. No adjustment of the FM circuits should be attempted with AM after the ratio detector transformer secondary has been properly aligned.

Keep output of signal generator low so as not to overload stages and obtain false output indications. Keep receiver volume control at maximum; reduce generator output, as stages are brought into alignment, so output meter never reads more than .40 volt (.05 watt).

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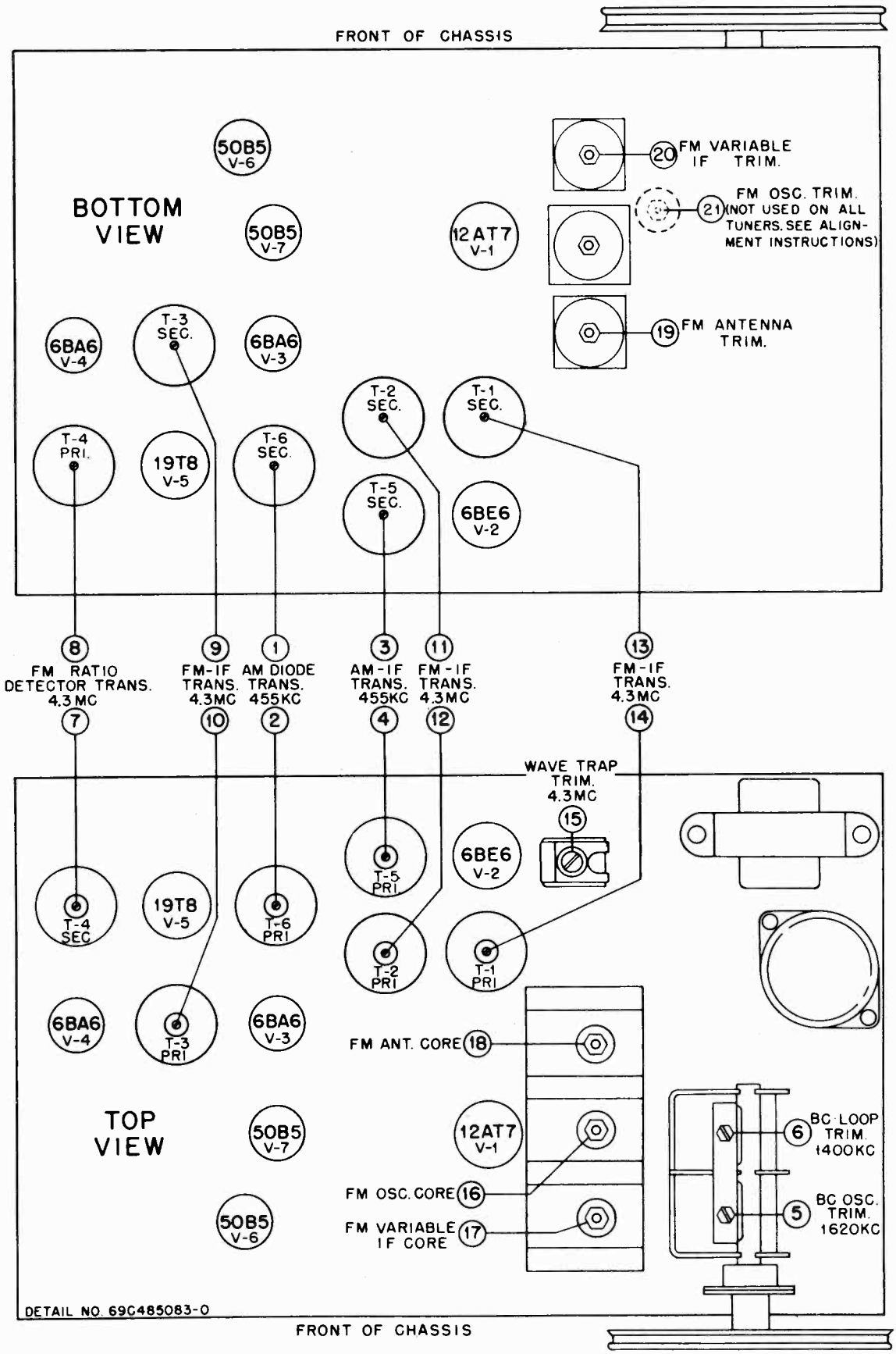

FIGURE 2. CHASSIS HS-133 TUBE & TRIMMER LOCATIONS

MODEL 88FM21,
Ch. HS-133

CHART I. ALIGNMENT PROCEDURE WHEN USING AM MODULATED SIGNAL GENERATOR AND STANDARD OUTPUT METER FOR COMPLETE RECEIVER ALIGNMENT

STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
455 KC IF CHANNEL ALIGNMENT							
1.	High freq. end.	BC	.1 mf	6BE6 (V-2) BC Conv Grid (Pin #7)	455 Kc	1,2,3 & 4	Adjust for maximum output.
BROADCAST BAND ALIGNMENT							
2.	1620 Kc (gang fully opened)	BC	.1 mf	6BE6 (V-2) BC Conv Grid (Pin #7)	1620 Kc	5	Adjust for maximum output. This sets oscillator to dial scale.
3.	1400 Kc	BC	None	Radiation loop*	1400 Kc	6	Tune in signal with receiver tuning knob, then peak trimmer 6.
4.3 MC IF CHANNEL ALIGNMENT & WAVETRAP ADJUSTMENT							
4.	-	-	-	-	-	7	Detune ratio detector transformer secondary by screwing core (7) out as far as it will go.
5.	(extreme high frequency end)	FM	.001 mf	12AT7 (V-1) 2nd FM Converter Grid (Pin #7)	4.3 Mc	8,9,10, 11, 12, 13 & 14	Adjust for maximum output.
6.	-	FM	300 ohms	FM Ant terminal (center clip on back)	4.3 Mc	15	Adjust for minimum output (wavetrap)
FM BAND ALIGNMENT							
Note:	If tuner does not have FM oscillator trimmer (21), perform step 7 & disregard steps 7A, B & C. If tuner has FM oscillator trimmer (21), then disregard step 7 and perform steps 7A, B & C in its place.						
7.	105 Mc	FM	300 ohms	FM Ant terminal (center clip on back)	105 Mc	16	Adjust for maximum output. This sets oscillator to dial scale.
7A.	90 Mc	FM	300 ohms	FM Ant terminal (center clip on back)	90 Mc	21	Adjust for maximum output.
7B.	105 Mc	FM	300 ohms	FM Ant terminal (center clip on back)	105 Mc	16	Adjust for maximum output.
7C.	-	-	-	-	-	-	Repeat steps 7A & 7B until oscillator tracks with dial calibration.
8.	90 Mc	FM	300 ohms	FM Ant terminal (center clip on back)	90 Mc	19 & 20	Tune in signal with receiver tuning knob, then adjust 19 & 20 for maximum output.
9.	105 Mc	FM	300 ohms	FM Ant terminal (center clip on back)	105 Mc	17 & 18	Tune in signal with receiver tuning knob, then adjust 17 & 18 for maximum output.

*Connect output of signal generator to a 5" diameter, 3 turn loop and radiate signal into receiver loop. Minimum distance between loops should never be less than 12".

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(CHART I. ALIGNMENT CONT'D)

STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
10.	-	-	-	-	-	-	Repeat steps 8 & 9 several times until further adjustment does not increase the output.
11.	105 Mc	FM	None	Radiate signal (or use weak station after performing Step 12)	105 Mc	19	Adjust for maximum output with FM figure 8 antenna connected.
ALIGN RATIO DETECTOR TRANSFORMER SECONDARY							
12.	-	FM	.001 mf	12AT7 (V-1) 2nd FM Converter Grid (Pin #7)	4.3 Mc	7	Adjust ratio detector transformer secondary for minimum response. The correct adjustment is sharply defined minimum response point between the two peaks.

CHART II. ALIGNMENT PROCEDURE WHEN USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

STEP OPERATION

455 Kc IF Channel Alignment

1. Same as Step 1 in Chart I (Use AM signal generator).

Broadcast Band Alignment

2. Same as Steps 2 & 3 in Chart I (Use AM signal generator).

4.3 Mc IF Channel Alignment (Use FM Signal Generator & Oscilloscope)

3. (A) Ratio Detector

1. Connect the input terminals of the oscilloscope vertical amplifier to the high side of the receiver volume control and common negative.

2. Connect the FM generator synchronizing voltage output terminals to a phase shifting network, consisting of a variable 1/2 megohm resistor in series with a .002 mf capacitor. The input to the oscilloscope horizontal amplifier is connected across the .002 mf capacitor. See Figure 3 . (This phase shifting network may not work with every oscilloscope. Different values of R & C may be required).

3. Apply an FM 4.3 Mc signal (125 Kc deviation) through a .001 mf capacitor to the control grid (pin #1) of tube V-4 (6BA6) in the third FM IF Amplifier stage.

4. Back out ratio detector transformer secondary core (7) several turns and then adjust ratio detector transformer primary (8) for maximum amplitude. The phase shifting network resistor is adjusted to give only one trace.

5. Adjust ratio detector transformer secondary (7) until a symmetrical pattern is obtained, with peaks occurring at about 100 Kc above and below 4.3 Mc and is substantially linear between peaks. The trace should pass through the intersection of the vertical and horizontal axis. The phase shifting network should be adjusted to give only a single pattern at all times. See Figure 4 . It will be necessary to go over ratio detector transformer primary (8) and secondary (7) adjustments several times before a pattern of maximum amplitude and correct symmetry is obtained.

(B) 4.3 Mc IF Amplifiers & Wavetrap

1. Apply an FM 4.3 Mc signal (100 Kc deviation) to the control grid (pin #1) of tube V-3 (6BA6) in the

MODEL 88FM21,
Ch. HS-133

(CHART II. ALIGNMENT CONT'D)

OPERATION

2nd FM IF amplifier stage, through a .001 mf capacitor and adjust both primary and secondary cores (9 & 10) to get a symmetrical pattern as before, with peaks occurring at a slightly lower deviation.

2. Move signal generator lead from tube V-3 to control grid (pin #1) of tube V-2 (6BE6) in the first FM IF amplifier stage, and adjust both primary and secondary cores (11 & 12) until a symmetrical pattern substantially linear between peaks is obtained.

3. Move signal generator lead from tube V-2 to FM antenna terminal (center clip on back). Turn 4.3 Mc wavetrap trimmer (15) off resonance and adjust both primary and secondary cores (13 & 14) until a symmetrical pattern substantially linear between peaks is obtained.

4. Leave signal generator connected to FM antenna terminal. Adjust 4.3 Mc wavetrap trimmer (15) for minimum output.

4. FM Band Alignment (Use FM Signal Generator & Output Meter)

(A) Connect generator output through a 300 ohm resistor to the receiver FM antenna terminal (center clip on back.)

(B) If tuner does not have oscillator trimmer (21) then set oscillator to dial scale as follows: Set receiver pointer to 105 Mc. Also set FM signal generator to 105 Mc (22-1/2 Kc deviation). Adjust FM oscillator core (16) for maximum output; this sets oscillator to dial scale.

If tuner does have oscillator trimmer (21) then set oscillator to dial scale as follows: Set receiver pointer to 90 Mc. Also set FM signal generator to 90 Mc (22-1/2 Kc deviation). Adjust FM oscillator trimmer (21) for maximum output. Next set receiver pointer and FM generator to 105 Mc and adjust FM oscillator core (16) for maximum output. Repeat oscillator adjustments at 90 Mc and 105 Mc until oscillator tracks with dial scale.

(C) Set FM signal generator to 90 Mc (22-1/2 Kc deviation). Tune in signal with receiver tuning knob and then adjust FM variable IF and FM antenna trimmers (19 & 20) for maximum output.

(D) Set FM signal generator to 105 Mc (22-1/2 Kc deviation). Tune in signal with receiver tuning knot and then adjust FM variable IF and FM antenna tuning cores (17 & 18) for maximum output.

(E) Repeat steps 4(C) and 4(D) until cores (17 & 18) and trimmers (19 & 20) reach their peak.

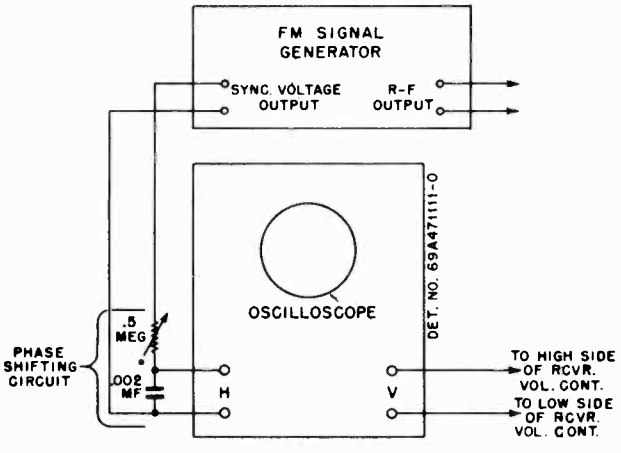

FIGURE 3. SIGNAL GENERATOR & OSCILLOSCOPE HOOKUP

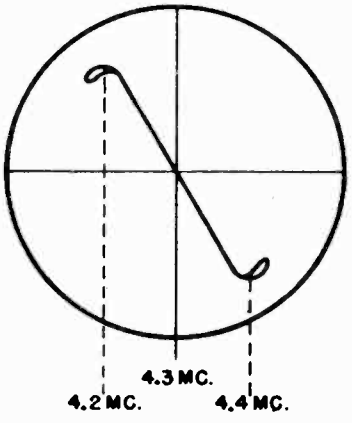

FIGURE 4. OSCILLOSCOPE PATTERN

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Ch. HS-133

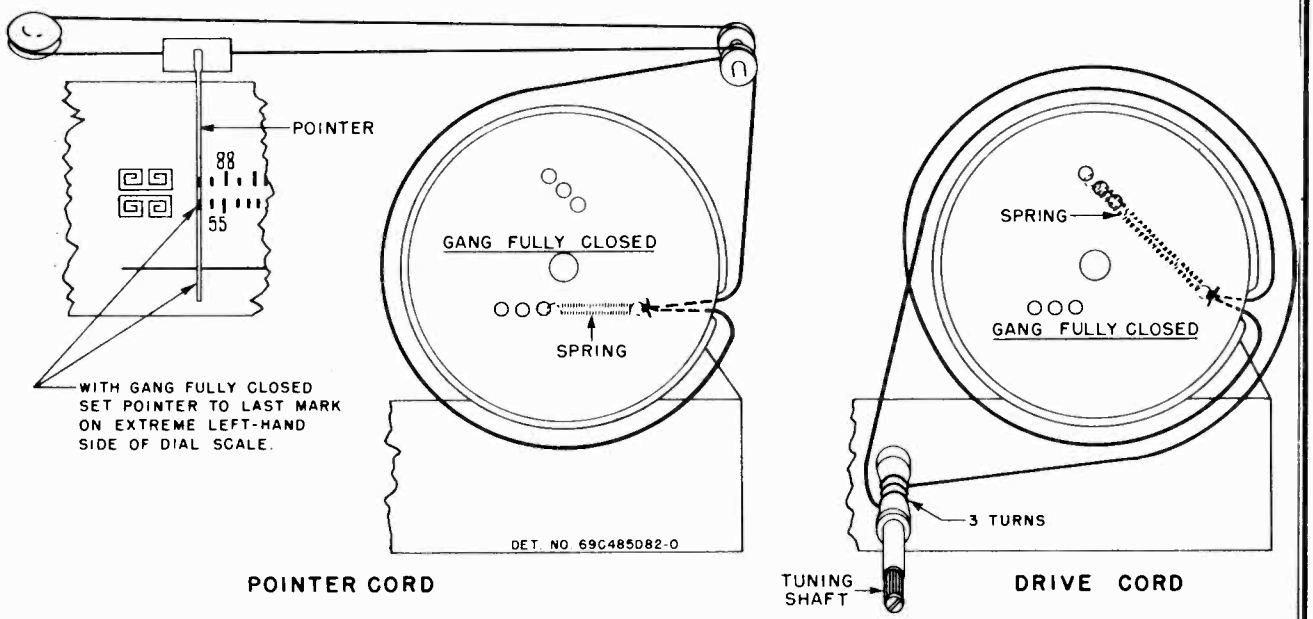


FIGURE 5. CHASSIS HS-133 STRING DRIVE DETAIL

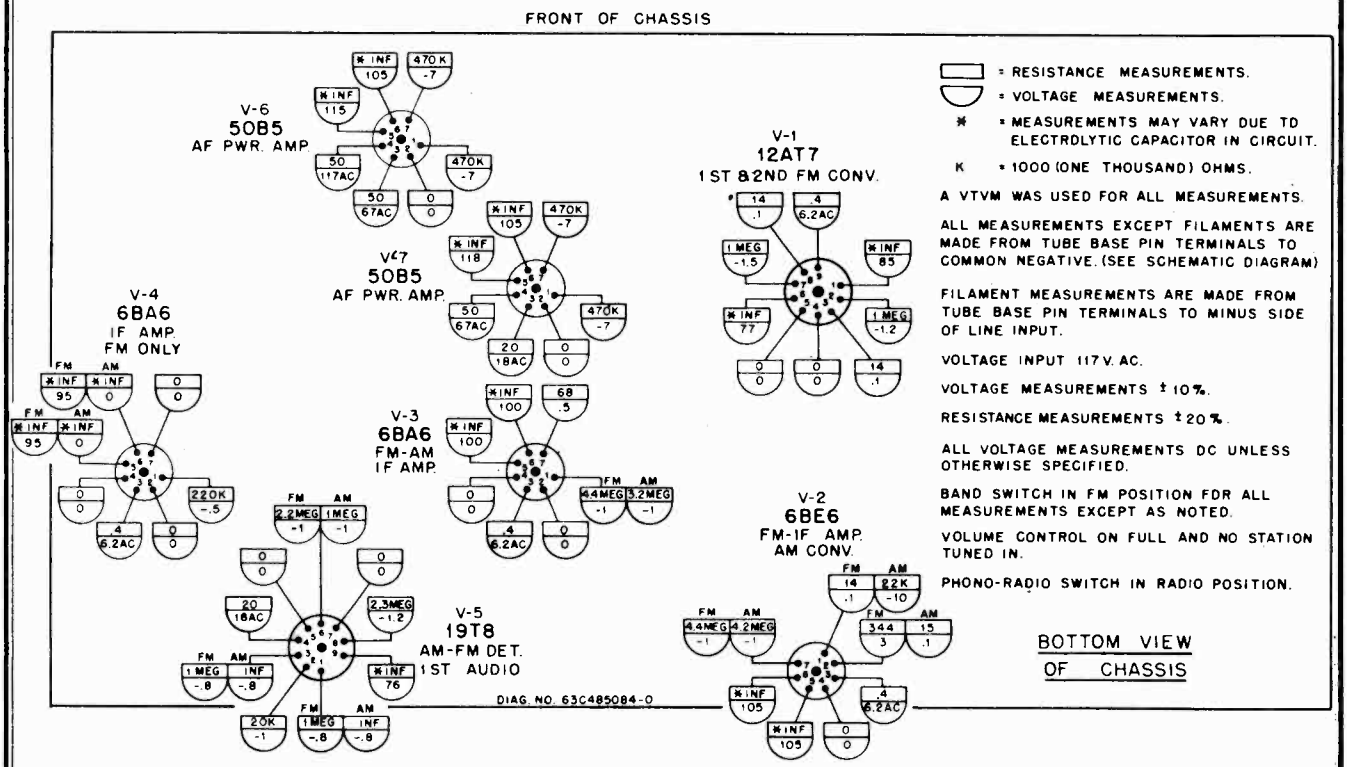


FIGURE 6. CHASSIS HS-133 VOLTAGE & RESISTANCE DIAGRAM

MODEL 88FM21,
Ch. HS-133

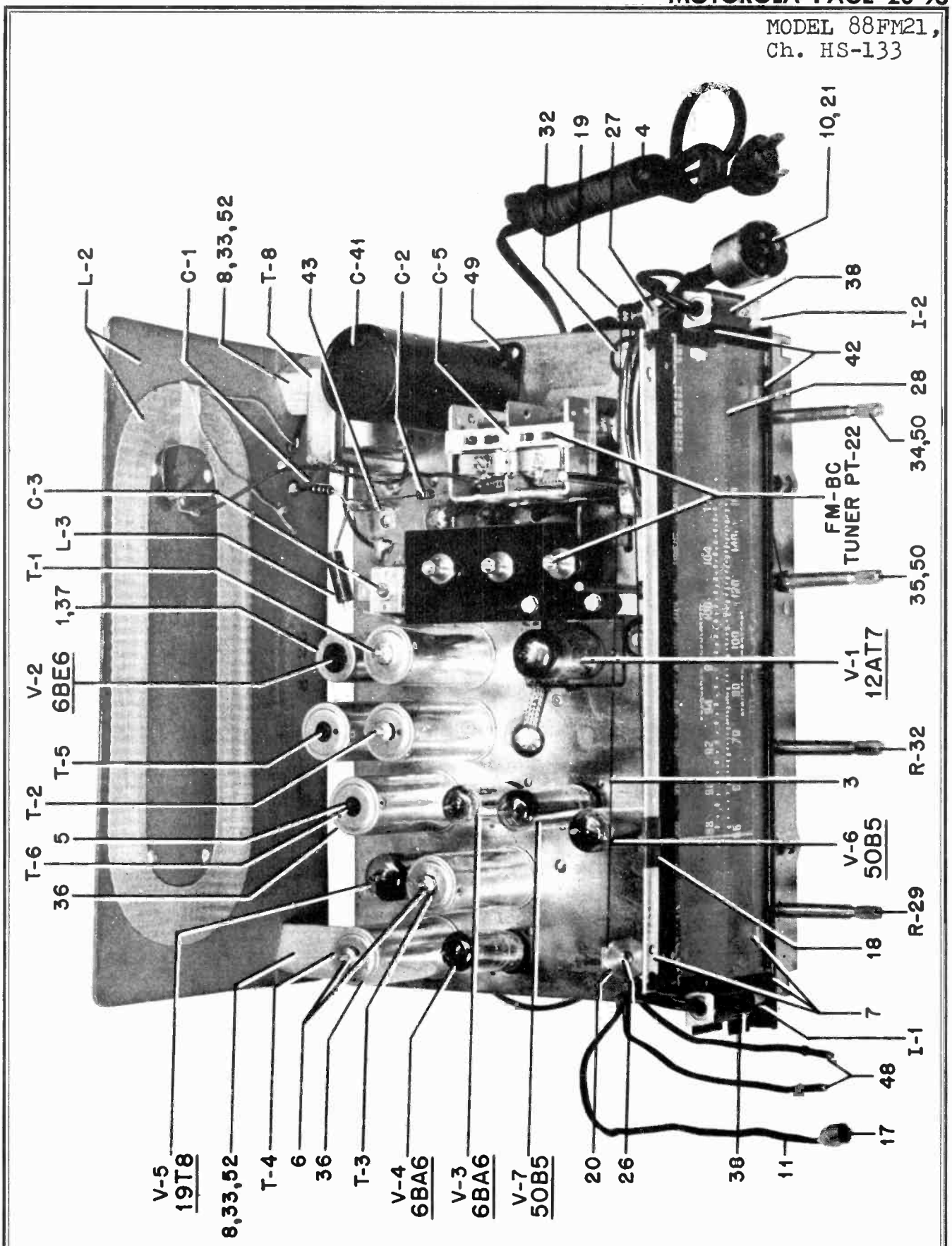


FIGURE 8. CHASSIS HS-133 PARTS LOCATIONS - TOP VIEW

MODEL 88FM21,
Ch. HS-133

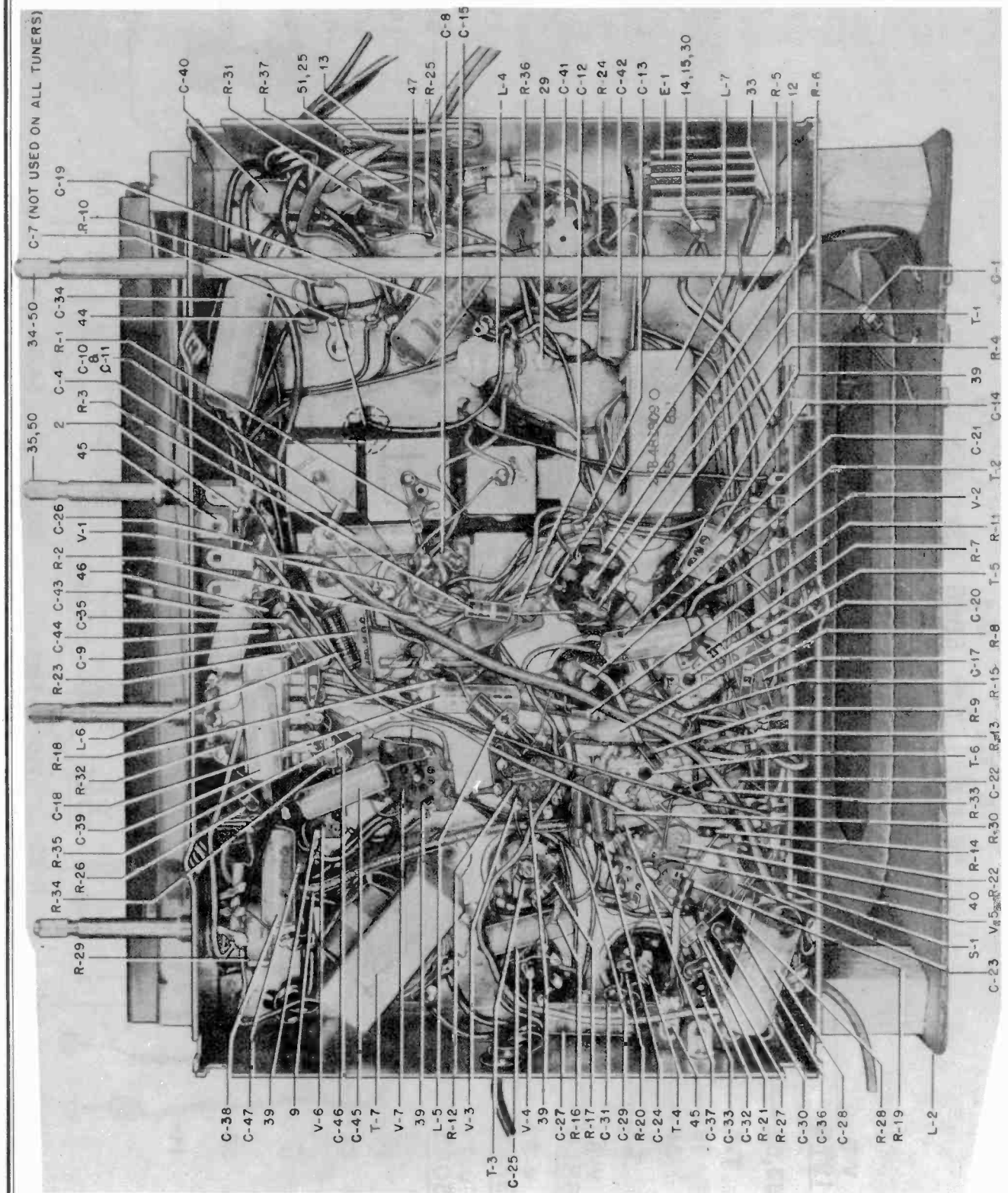
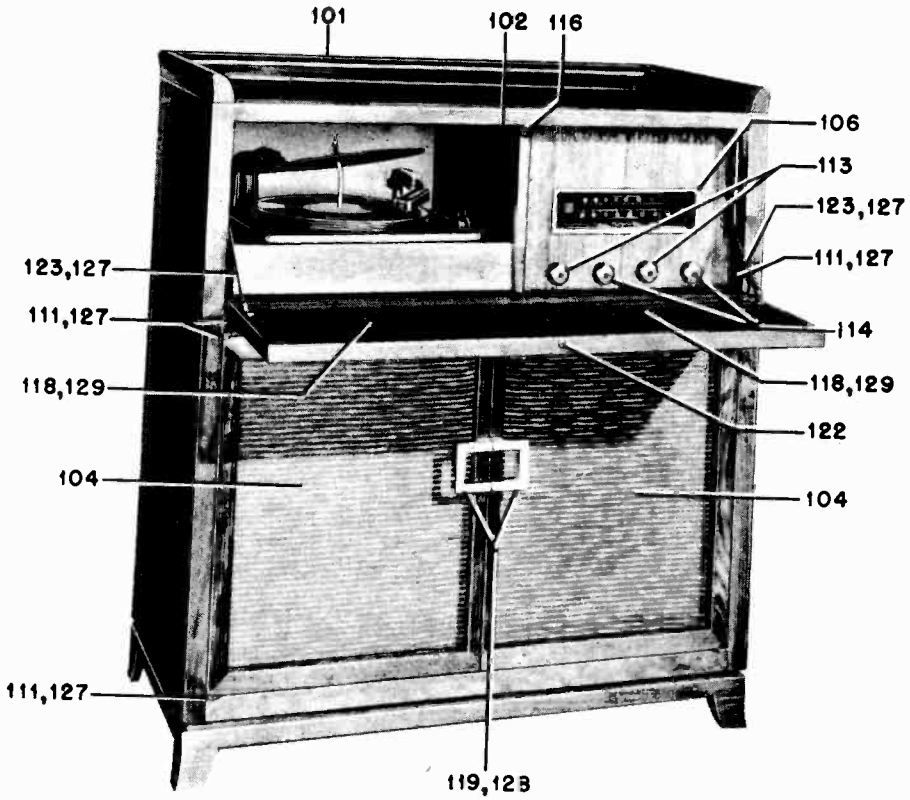


FIGURE 9. CHASSIS HS-133 PARTS LOCATIONS - BOTTOM VIEW

MODEL 88FM21,
Ch. HS-133



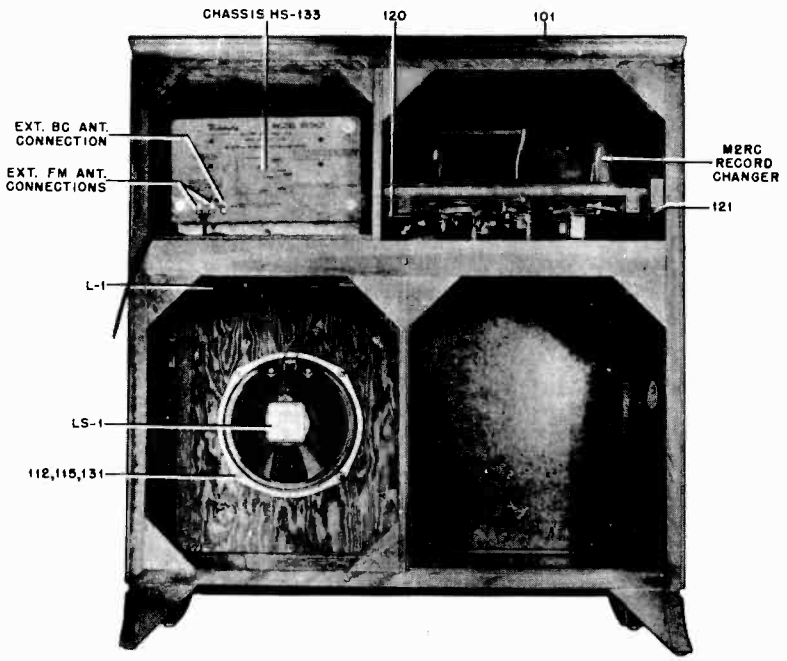


FIGURE 10. MODEL 88FM21 CABINET PARTS LOCATIONS - FRONT & REAR VIEWS

REF. NO.	PART NO.	DESCRIPTION
		CAPACITORS
C-1	21K484347	Molded: 7 mmf 500V
C-2	21K484347	Molded: 7 mmf 500V
C-3	20A75234	Trimmer, mica: 10-80 mmf with mtg brkt (part of wavetrap)
C-4	8S9802	Paper: .02 mf 400V
C-5A,B, C&D	19K482832	Variable, two-gang: includes trimmers 5C & 5D
C-7	19A470426	Variable air: 2.5 to 30 mmf (not used in all tuners)
C-8	21K478410	Ceramic: 1000 mmf 500V
C-9	8S9809	Paper: .01 mf 400V
C-10,& 11	21B484337	Ceramic: 250 mmf 450V; dual
C-12	8S9809	Paper: .01 mf 400V
C-13	21K77373	Ceramic: 50 mmf 500V
C-14	21R6642	Mica: 50 mmf 500V
C-15	21K31493	Ceramic: 25 mmf
C-17	8K471628	Paper: .02 mf 100V
C-18	8S9809	Paper: .01 mf 400V
C-19	8S9816	Paper: .05 mf 400V
C-20	8S9825	Paper: .01 mf 200V
C-21	8K471635	Paper: .05 mf 400V
C-22	8S9816	Paper: .05 mf 400V
C-23	21B77286	Ceramic: 100 mmf 500V
C-24	21K77375	Ceramic: 250 mmf 500V
C-25	8S9809	Paper: .01 mf 400V
C-26	8S9809	Paper: .01 mf 400V
C-27	8S9809	Paper: .01 mf 400V
C-28	8S9816	Paper: .05 mf 400V
C-29	21B470567	Ceramic: 4700 mmf 500V
C-30	21K478410	Ceramic: 1000 mmf 500V
C-31	21B77286	Ceramic: 100 mmf 500V
C-32	21K478410	Ceramic: 1000 mmf 500V
C-33	21K478410	Ceramic: 1000 mmf 500V
C-34	8S9807	Paper: .1 mf 400V
C-35	21K77375	Ceramic: 250 mmf 500V
C-36	23A481316	Electrolytic: 8 mf 50V
C-37	21K77375	Ceramic: 250 mmf 500V
C-38	8S9809	Paper: .01 mf 400V
C-39	8S9809	Paper: .01 mf 400V
C-40	8S9805	Paper: .05 mf 100V
C-41	23B482811	Electrolytic: 125-125-40-100 mf/150-150-150-25V
C-42	8S9816	Paper: .05 mf 100V
C-43	8S9813	Paper: .005 mf 600V
C-44	8S9809	Paper: .01 mf 400V (Note: .02 mf used in some sets)
or	8S9802	Paper: .02 mf 400V
C-45	8S9809	Paper: .01 mf 400V
C-46	8S9809	Paper: .01 mf 400V
C-47	8S9809	Paper: .01 mf 400V
		RECTIFIER
E-1	48B482807	Selenium type: half-wave; 150 ma
		DIAL LIGHT
I-1,2	65X11854	Bulb: 6-8V .15A tubular bayonet base; clear, #47
		COILS
L-1	24C482890	FM loop, panel & leads assembly
L-2	24C482833	BC loop & panel assembly
L-3	24A77240	Wavetrap coil
L-4	24A484336	BC oscillator coil
L-5	24A470505	RF choke
L-6	24A74989	Filament choke
L-7	25B482809	Power filter choke
		SPEAKER
LS-1	50C484255	Speaker: 10" PM; 3.2 ohm voice coil
		RESISTORS
		Note: All resistors are insulated, carbon type, 20% unless otherwise specified.
R-1	6R6004	1 meg 1/2W
R-2	6R6004	1 meg 1/2W
R-3	6R5610	8200 10% 1W
R-4	6R6028	22,000 1/2
R-5	6R6028	22,000 1/2W
R-6	6R6378	56,000 10% 1/2W
R-7	6R6004	1 meg 1/2W
R-8	6R6022	330 10% 1/2W
R-9	6R6301	1000 1/2W
R-10	6R6028	22,000 1/2W
R-11	6R6012	33,000 1/2W

R-12	6R6007	68 1/2W
R-13	6R3927	2.2 meg 1/2W
R-14	6R6301	1000 1/2W
R-15	6R6056	47,000 1/2W
R-16	6R6015	220,000 1/2W
R-17	6R6012	33,000 1/2W
R-18	6R6182	150,000 1/2W
R-19	6R6301	1000 1/2W
R-20	6R6090	470 10% 1/2W
R-21	6R6028	22,000 1/2W
R-22	6R3927	2.2 meg 1/2W
R-23	6R6032	470,000 1/2W
R-24	6R488111	22 10% 2W
R-25	6R488110	470 1W
R-26	6R6075	100,000 1/2W
R-27	6R6039	4700 1/2W
R-28	6R2119	15,000 1/2W
R-29	18K471518	Volume Control: 1 meg; tapped at 300,000 ohms, includes power swtich
R-30	6R3927	2.2 meg 1/2W
R-31	6R6075	100,000 1/2W
R-32	18K482815	Tone Control: 1 meg; includes phono-radio switch
R-33	6R6075	100,000 1/2W
R-34	6R6032	470,000 1/2W
R-35	6R6032	470,000 1/2W
R-36	17K484269	6.8 10% 1/2W molded; wirewound
R-37	17A470492	68 5% 2W molded; wirewound
R-38	6R6390	180 10% 1W

SWITCH

S-1	40B470432	Bandswitch

TRANSFORMERS

T-1	24B481391	1st IF, 4.3 Mc: complete with iron cores and padding capacitors but less shield.
T-2	24B471670	2nd IF, 4.3 Mc: complete with iron cores and padding capacitors but less shield.
T-3	24B471672	3rd IF, 4.3 Mc: complete with iron cores and padding capacitors but less shield.
T-4	24B481393	Ratio Detector Transformer, 4.3 Mc: complete with iron cores and padding capacitors but less shield
T-5	24B482863	IF, 455 Kc: complete with iron cores and padding capacitors but less shield
T-6	24B482865	Diode, 455 Kc: complete with iron cores and padding capacitors but less shield.
T-7	25B482808	Output Transformer
T-8	25B482810	Filament Transformer

CHASSIS PARTS - MECHANICAL

1	26A473002	Base, shield mtg (for V-2)
2	7A77337	Bracket, tuning shaft
3	11M8944	Cord, dial: 18 lb; black
4	30K21859	Cord, line and plug: 9 ft long
5	46A470885	Core, iron: threaded (for T-5 & 6 pri & sec)
6	46A70023	Core, iron & screw (for T-1, 2, 3 & 4 pri & sec)
7	1X471776	Dial Plate, Brackets, Pullies & Dial Scale Assembly
8	57A77084	Dowel, back mtg: wood
9	1X484277	Lead Assembly: single conductor; shielded; 9-1/2" long
10	1X484276	Lead Assembly, phono motor: includes receptacle
11	1X484278	Lead & Plug Assembly (phono pickup connector)
12	1X470545	Lever and Rivet Assembly
13	32A24815	Lock, line cord: fiber
14	4S7650	Lockwasher: #6 internal; steel; cad pl (rectifier mtg)
15	2S7002	Nut: 6-32 x 5/16 hex; steel; cad pl (rectifier mtg)
16	2S7051	Nut: 3/8-32 x 9/16; cad pl; Palnut (volume and tone control mtg)
17	28K71775	Plug, insulated (phono pick-up)
18	52B481704	Pointer, dial
19	49A23960	Pulley, cord: 1/4" groove
20	49A21552	Pulley, cord: 1/2" groove
21	9A30680	Receptacle: 3 prong; includes shell (phono-motor)
22	5S7771	Rivet: .088 x 3/16; steel; nkl pl (tube socket mtg)
23	5S7707	Rivet: .122 x 5/32; steel; nkl pl (trimmer & bracket mtg, terminal strip mtg and filament trans mtg)
24	5S7701	Rivet: .122 x 3/16; steel; nkl pl (wafer mtg & tuning shaft brkt mtg)
25	5S7708	Rivet: .122 x 9/32; steel; nkl pl (line cord lock mtg)
26	5A71246	Rivet, shoulder: .187" long
27	5A71735	Rivet, shoulder: 1/2" long
28	34C482834	Scale, dial: glass

29	3S7506	Screw: #6 x 1/4 PKZ plain hex head sheet metal screw; steel; cad pl (BC oscillator mounting) .....
30	3S2977	Screw: 6-32 x 1-1/8 plain hex head machine screw; steel; cad pl (rectifier mtg) ..
31	3S7454	Screw: #8 x 1/4 PKZ plain hex head sheet metal screw (dial mtg) .....
32	3S7507	Screw: #8 x 5/8 PKZ plain hex head sheet metal screw; steel; cad pl (tuner mtg).
33	3S3383	Screw: #8 x 2" PKZ plain hex head sheet metal screw; cad pl (back mtg) .....
34	47B482812	Shaft, band switch .....
35	1K471779	Shaft and Pulley Assembly (tuning shaft)
36	26K485936	Shield, coil (for T-1, 2, 3, 4, 5 & 6) .
37	26A90301	Shield, tube .....
38	9A482889	Socket, dial light & bracket .....
39	9A472534	Socket, tube: miniature; 7 prong .....
40	9A481376	Socket, tube: noval; 9 prong; wafer (for V-5)
41	41A14244	Spring, tension coil (on drive & pointer cords) .....
42	37K21114	Strip, channel: rubber; 1" long (dial scale mtg) .....
43	31K85348	Strip, terminal: 1 insulated lug, #2 mtg
44	31K471564	Strip, terminal: 3 insulated lugs, #2 gnd
45	31K470746	Strip, terminal: 3 insulated lugs, #2 mtg
46	31K75232	Strip, terminal: 4 insulated lugs, #3 mtg
47	31K471562	Strip, terminal: 5 insulated lugs, #4 mtg
48	29A5400	Terminal, plain pin (on spkr leads) ....
49	9A22056	Wafer, electrolytic mtg: 4 holes .....
50	4A70015	Washer "C" (tuning and band switch shaft retainer) .....
51	4S1719	Washer: 3/8 x .140 x .030 thick; steel; cad pl (line cord lock mtg) .....
52	4S7563	Washer: 5/8 x .203 x .033 thick; steel; cad pl (back mtg) .....

CABINET PARTS

101	16F482827	Cabinet, console: brown mahogany .....
102	55K482159	Catch, bullet: statuary bronze finish ..
103	42A75825	Clip, mtg (supports phono power connector) .....
104	13K484218	Cloth, grille .....
105	15C482814	Cover, chassis bottom .....
106	13K482138	Escutcheon, dial .....
107	5A70098	Eyelet (on chassis retainer screws)....
108	5A71081	Eyelet, chassis (on each corner of chassis) .....
109	5K485954	Grommet, chassis mtg (chassis cushions- on each corner of chassis) .....
110	5K485955	Grommet, chassis retainer (on chassis retainer screws) .....
111	55A480240	Hinge, door: statuary bronze finish ....
112	4S7657	Lockwasher: #8 external; steel; cad pl (spkr mtg) .....
113	36K471545	Knob, control: plain (volume and tuning)
114	36K471324	Knob, control: with dot (phono-radio and bandswitch) .....
115	2S7003	Nut: 8-32 x 5/16 hex; steel; cad pl (spkr mtg) .....
116	35K470657	Pad, felt (drop leaf cushion) .....
117	64K471459	Panel, cabinet rear .....
118	55A482892	Pull, drawer: brushed brass finish (for drop leaf panel) .....
119	55A482893	Pull, drawer: brushed brass finish (for record compartment and dummy panel) ...
120	55K74787	Rail, support: left-hand .....
121	55C74786	Rail, support: right-hand .....
122	55K482160	Strike, bullet: statuary bronze finish .
123	55B471529	Support, fall: statuary bronze finish ..
124	3S3367	Screw: #5 x 3/8 PKA plain hex head sheet metal screw; black parkerized finish (mounts phono power connector support clip) .....
125	3S2695	Screw: #6 x 3/16 PKZ plain hex head sheet metal screw; steel; cad pl (chassis cover mtg) .....
126	3S3369	Screw: #6 x 3/8 PKA plain hex head sheet metal screw; copper oxide finish (FM loop mtg) .....
127	3S1344	Screw: #6 x 5/8 slotted flat head wood screw; statuary bronze finish (fall support mtg, hinge mtg, etc.) .....
128	3S488103	Screw: 8-32 x 1 slotted flat head machine screw; statuary bronze finish (record comp pull mtg) .....
131	3K27913	Screw, speaker mtg .....
132	4S7562	Washer: 7/16 x 3/16 x .033 thick, steel; cad pl (FM loop mtg) .....
133	4S7629	Washer: 1/2 x 3/16 x .048 thick; steel; cad pl (speaker mtg) .....
134	4S7589	Washer: 7/8 x 9/32 x .027 thick; steel; cad pl (on chassis retaining screws) .
129	3S488105	Screw: 8-32 x 1-1/8 slotted flat head machine screw; statuary bronze finish (drop leaf pull mtg) .....
130	3S7534	Screw: #8 x 1-3/8 PKA plain hex head sheet metal screw; steel; cad pl (chassis retaining screws) .....

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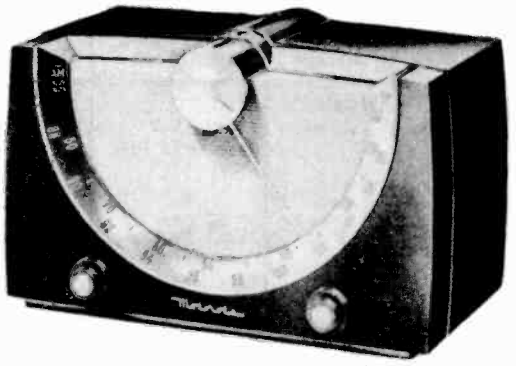
GENERAL INFORMATION



TYPE - FM-AM table model receiver

TUNING RANGE - AM 535 to 1620 Kc IF - 455 Kc
FM 88 to 108 Mc IF - 10.7 Mc

TUBE COMPLEMENT - 12BA6 - FM-AM RF Amplifier
12BA7 - FM-AM Converter
12BA6 - FM-AM IF Amplifier
12BA6 - FM IF Amplifier
19T8 - FM Ratio Detector, AM Detector & 1st Audio Amplifier
50C5 - Power Amplifier
Rectifier - Selenium type

POWER SUPPLY - 117V AC or DC, 40 watts

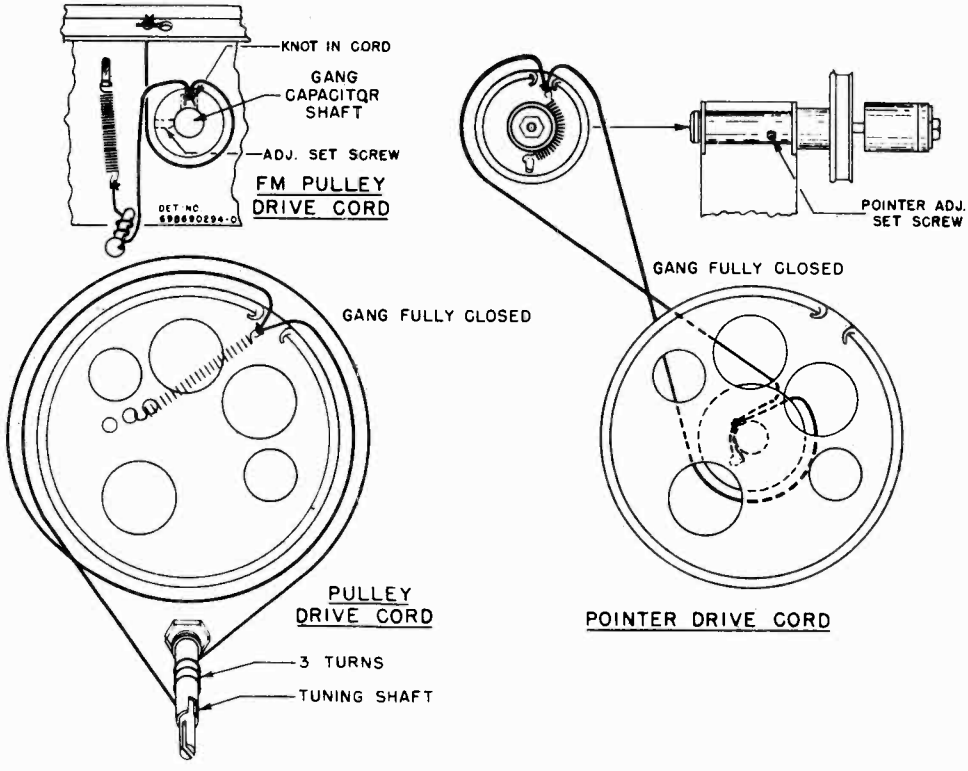


FIGURE 1. STRING DRIVE DETAIL

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment.

It is suggested that an isolation transformer be used between receiver and power line. If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator output through a .1 mf capacitor to receiver chassis.

Refer to Figure 2 for location of all alignment trimmers and cores.

COMPLETE ALIGNMENT PROCEDURE USING AM SIGNAL GENERATOR

An AM (30% amplitude modulated) signal generator covering the frequencies shown in Alignment Chart I, is used to align the broadcast and FM bands. A low range output meter, connected across the speaker voice coil, is used as an output indicator.

The FM band alignment can be satisfactorily performed by following the instructions in the chart. When properly aligned, the ratio detector does not respond to amplitude modulation and since an AM type signal generator is used for aligning the FM circuits, it is necessary to detune the ratio detector transformer secondary before aligning the FM circuits. After completing the alignment of FM circuits, proceed to align the radio detector transformer secondary by applying a 10.7 Mc AM signal to the control grid (pin 7) of the FM converter tube (V-2) and adjust the ratio detector transformer secondary core for minimum audio output. No adjustment of the FM circuits should be attempted with AM after the ratio detector transformer secondary has been properly aligned.

Keep output of signal generator low so as not to overload stages and obtain false output indications. Keep receiver volume control at maximum; reduce generator output, as stages are brought into alignment, so output meter never reads more than .40 volts (.05 watts).

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CHART 1. ALIGNMENT PROCEDURE WHEN USING AN AM MODULATED SIGNAL GENERATOR AND STANDARD OUTPUT METER

STEP	BAND	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
455 Kc AM IF Alignment							
1.	AM	.1 mf	12BA7 (V-2) Conv Grid Pin #7	455 Kc	Gang opened	1, 2, 3 & 4	Adjust for maximum
AM RF Alignment							
2.	AM	.1 mf	12BA7 (V-2) Conv Grid Pin #7	1620 Kc	Gang fully opened	5	Adjust for maximum
3.	AM	.1 mf	12BA7 (V-2) Conv Grid Pin #7	538 Kc	Gang fully closed	7	Adjust for maximum
4.	-	-	-	-	-	-	Repeat steps 2 & 3 several times since one adj affects the other slightly; the osc trimmer (7) should be the last adj made. Steps 2 & 3 set osc range and calibrate osc to dial scale.
5.	AM	-	Radiation loop*	1400 Kc	Tune in signal	6	Adjust for maximum
10.7 Mc FM IF Alignment							
6.	-	-	-	-	-	8	Detune ratio detector transformer secondary core by screwing core (8) out several turns.
7.	FM	.001 mf	12BA7 (V-2) Conv Grid Pin #7	10.7 Mc	Extreme high freq end	9, 10 11, 12 & 13	Adjust for maximum
FM RF Alignment							
8.	AM	-	Radiation loop*	1320 Kc	Tune in signal	-	This is for FM calibration purposes. Leave gang in this position for step 9.
9.	FM	300 ohms	12BA7 (V-2) Conv Grid Pin #7	105 Mc	Leave gang at same setting as in step 8.	14	Adjust osc core adjustment nut (14) until maximum signal output is obtained.
10.	-	-	-	-	-	15	Close gang fully and turn RF core adjustment nut (15) counterclockwise until core is at bottom of pipe, then turn nut (15) four turns clockwise.
11.	FM	300 ohms	FM Ant terminal #2 on loop back (open jumper between terminals)	90 Mc	Tune in signal	16	Adjust for maximum.
12.	FM	300 ohms	FM Ant terminal #2 on loop back (open jumper between terminals)	105 Mc	Tune in signal	15	Adjust for maximum.
13.	-	-	-	-	-	-	Repeat steps 11 & 12 until no further gain can be obtained. Make tuning plug (16) the last adjustment.
Ratio Detector Secondary Alignment							
14.	FM	.001 mf	12BA7 (V-2) Conv Grid Pin #7	10.7 Mc	High freq end	8	Adjust for minimum response between two peaks

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

SERVICE NOTES

The chassis of this receiver is connected directly to the power line. When operating the chassis (from AC line) outside of its cabinet, use an isolation transformer between power line and receiver to reduce the possibility of electrical shock. If an isolation transformer is not available, check the AC voltage between chassis and bench ground, if there is any indication of voltage, reverse line plug before handling the set.

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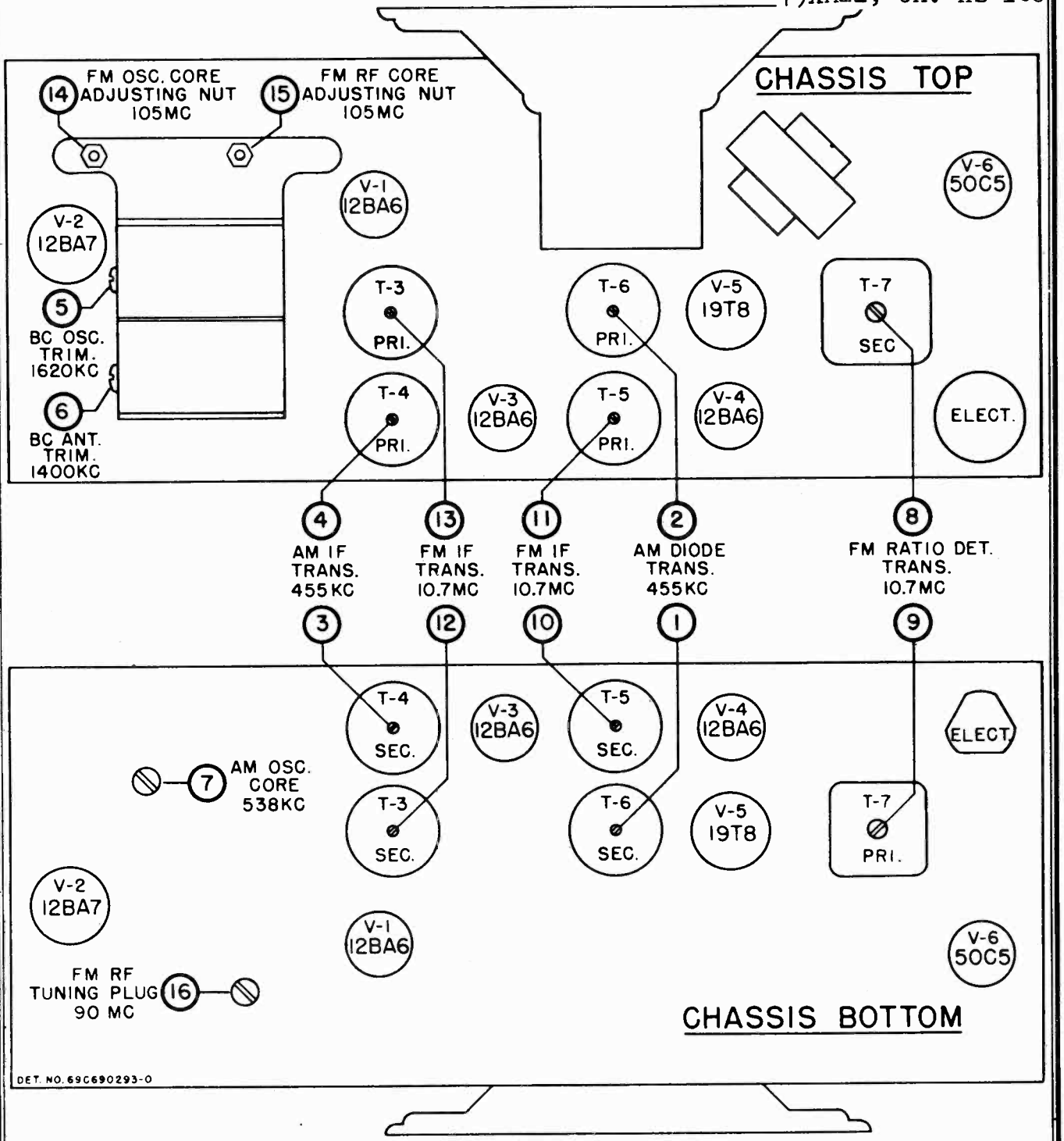

FIGURE 2. TUBE AND TRIMMER LOCATIONS

TO REMOVE CHASSIS FROM CABINET

1. Remove the pointer by setting it to either end of the dial scale and then lift the tip slightly above top of the cabinet. Now grasp the pointer tip with the fingers and screw it out of the pointer shaft (similar to removing a screw).

2. Remove the control knobs; they pull off.

3. Remove the four screws and washers that hold the back cover to the cabinet and remove the back cover.

4. Remove the two screws that hold the chassis to cabinet and slide the chassis from the cabinet.

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CHART II. FM ALIGNMENT PROCEDURE WHEN USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

1. 10.7 Mc FM IF Channel Alignment (Use FM Signal Generator & Oscilloscope)

(A) Ratio Detector Alignment

1. Connect the input terminals of the oscilloscope vertical amplifier to the high side of the receiver volume control and chassis.

2. Connect the FM generator synchronizing voltage output terminals to a phase shifting network consisting of a variable 1/2 megohm resistor in series with a .002 mf capacitor. The input to the oscilloscope horizontal amplifier is connected across the .002 mf capacitor. See Figure 3. (This phase shifting network may not work with every oscilloscope. Different values of R & C may be required).

3. Apply an FM 10.7 Mc signal (200 Kc deviation) through a .001 mf capacitor to the control grid (pin 1) of the tube V-4 (12BA6) in the second FM IF amplifier stage

4. Back out ratio detector transformer secondary core (8) several turns and then adjust ratio detector transformer primary (9) for maximum amplitude. The phase shifting network resistor is adjusted to give only one trace.

5. Adjust ratio detector transformer secondary (8) until a symmetrical pattern is obtained, with peaks occurring at about 190 Kc above and below 10.7 Mc and is substantially linear between peaks. The trace should pass through the intersection of the vertical and horizontal axis. The phase shifting network should be adjusted to give only a single pattern at all times. See Figure 4. It will be necessary to go over ratio detector transformer primary (9) and secondary (8) adjustments several times before a pattern of maximum amplitude and correct symmetry is obtained.

(B) 10.7 Mc IF Alignment

1. Apply an FM 10.7 Mc signal (160 Kc deviation) to the control grid (pin 7) of tube V-3 (12BA6) in the first FM IF amplifier stage, through a .001 mf capacitor and adjust both primary and secondary cores (10 & 11) to get a symmetrical pattern as before, with peaks occurring at a slightly lower deviation.

2. Move signal generator lead from tube V-3 to control grid (pin 7) of tube V-2 (12BA7) in the converter stage, and adjust both primary and secondary cores (12 & 13) until a symmetrical pattern substantially linear between peaks is obtained.

2. RF Alignment (Use FM Signal Generator & Output Meter)

The FM signal generator may now be used to align the FM RF and oscillator channels. Merely follow steps 8 through 13, inclusive, in Chart I.

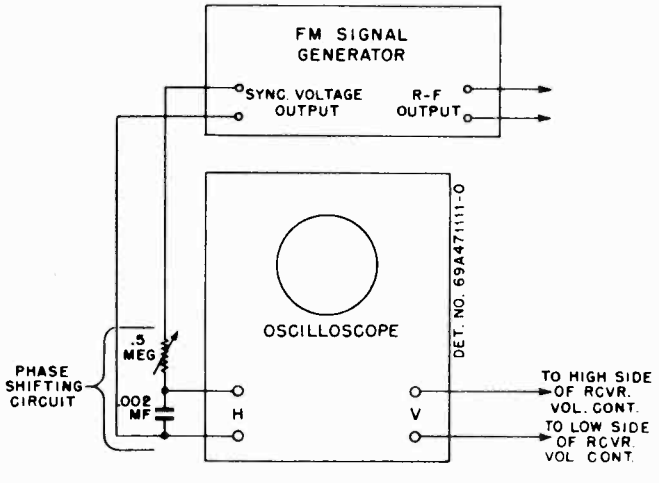

FIGURE 3. SIGNAL GENERATOR & OSCILLOSCOPE HOOKUP

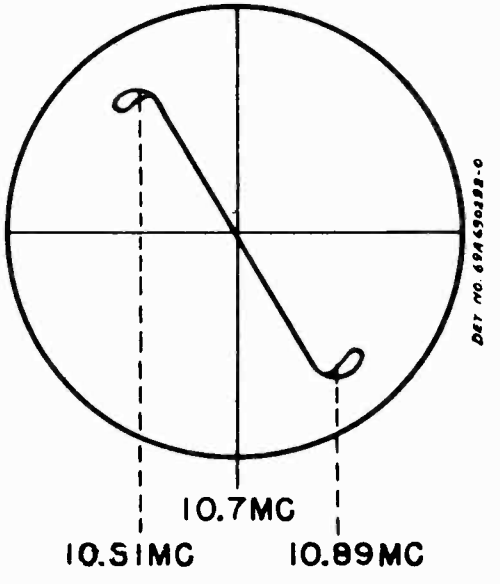

FIGURE 4. OSCILLOSCOPE PATTERN

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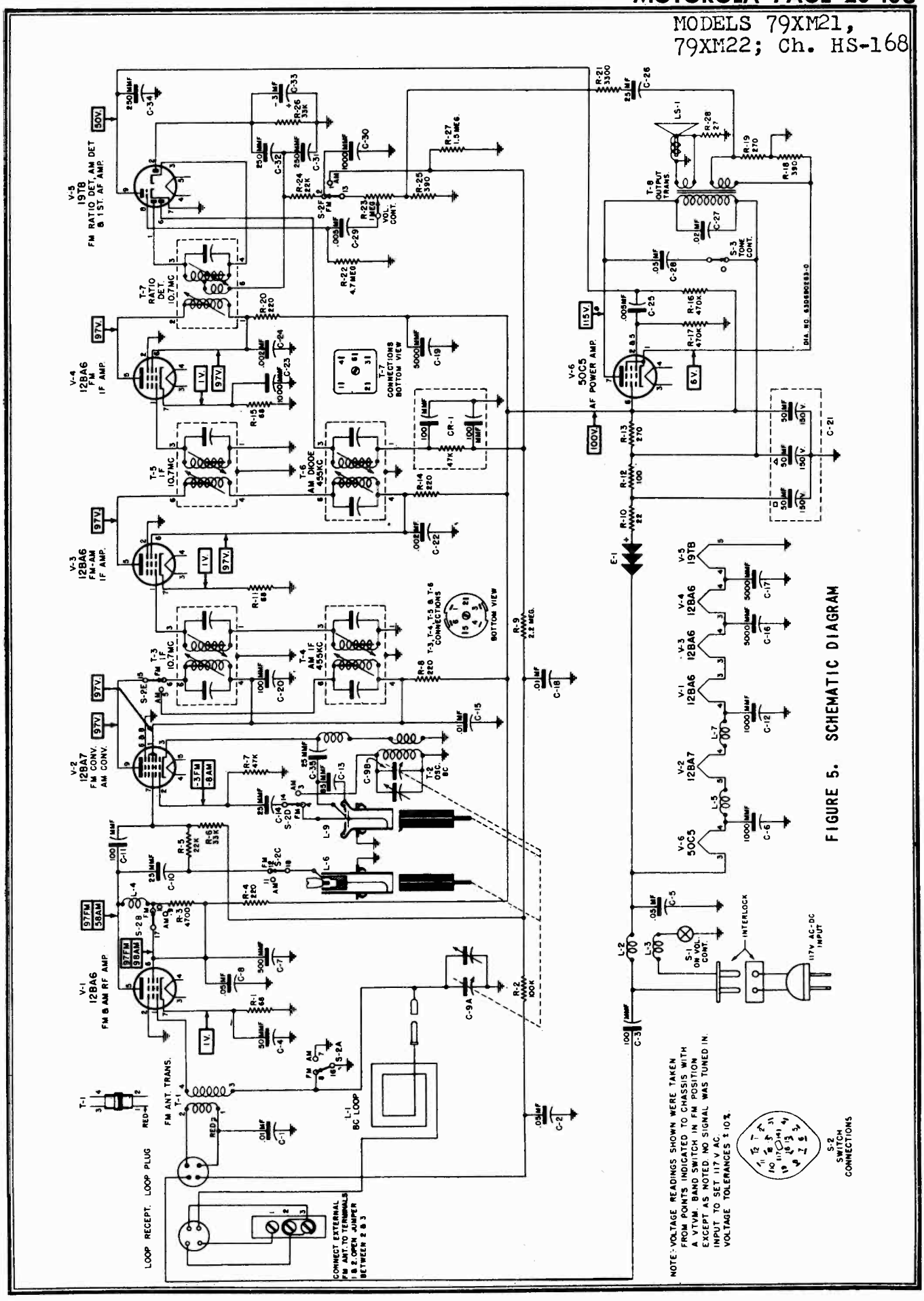

FIGURE 5. SCHEMATIC DIAGRAM

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REPLACEMENT PARTS LIST

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	8S9809	Paper: .01 mf 400V
C-2	8A470606	Paper: .05 mf 400V
C-3	21B77286	Ceramic: 100 mmf 500V
C-4	21K77373	Ceramic: 50 mmf 500V
C-5	8K471635	Paper: .05 mf 400V
C-6	21K478410	Ceramic: 1000 mmf 500V
C-7	21K481377	Ceramic: 500 mmf 500V
C-8	8S9821	Paper: .05 mf 200V
C-9	19B690747	Variable: 2 gang
C-10	21K28816	Ceramic: 25 mmf 100V
C-11	21B77286	Ceramic: 100 mmf 500V
C-12	21K478410	Ceramic: 1000 mmf 500V
C-13	21B690688	Ceramic: 85 mmf 5% 350V
C-14	21K28816	Ceramic: 25 mmf 100V
C-15	8S9809	Paper: .01 mf 400V
C-16	21A470789	Ceramic, disc: 5000 mmf
C-17	21A470789	Ceramic, disc: 5000 mmf
C-18	8S9801	Paper: .01 mf 100V
C-19	21A470789	Ceramic, disc: 5000 mmf 450V
C-20	21B77286	Ceramic: 100 mmf 500V
C-21	23B690539	Electrolytic: 50-50-50 mf/150V
C-22	8S9824	Paper: .002 mf 400V
C-23	21K471761	Ceramic: 1000 mmf 350V
C-24	8S9824	Paper: .002 mf 400V
C-25	8A24966	Paper: .005 mf 100V
C-26	8S9810	Paper: .25 mf 100V
C-27	8S9802	Paper: .02 mf 400V
C-28	8S9821	Paper: .05 mf 200V
C-29	8A24966	Paper: .005 mf 100V
C-30	21K478410	Ceramic: 1000 mmf 500V
C-31	21K77375	Ceramic: 250 mmf 500V
C-32	21K77375	Ceramic: 250 mmf 500V
C-33	21K690543	Electrolytic: 3 mf/50V
C-34	21K77375	Ceramic: 250 mmf 500V
C-35	21K28816	Ceramic: 25 mmf 100V
Capacitor-Resistor		
CR-1	21A473040	Capacitor-Resistor: two 100 mmf capacitors & one 47,000 resistor in one unit
Rectifier		
E-1	48B482807	Rectifier, selenium
Coils		
L-1	1X690709	Loop Antenna Assembly, BC: complete including line cord, power and antenna input plugs
L-2	24B580540	Choke, RF
L-3	24B580540	Choke, RF
L-4	24A90064	Choke, RF
L-5	24K780128	Choke, RF
L-6	24C690584	Inductor and Capacitor Assembly, FM RF
L-7	24K780128	Choke, RF
L-8	24K780128	Choke, RF
L-9	24C690580	Inductor and Capacitor Assembly, FM oscillator
Speaker		
LS-1	50B690537	Speaker, PM: 5"
Resistors		Note: All resistors are insulated carbon type unless otherwise specified.
R-1	6R2039	68 10% 1/2W
R-2	6R6075	100,000 20% 1/2W
R-3	6R6039	4700 20% 1/2W
R-4	6R3933	220 20% 1/2W
R-5	6R6028	22,000 20% 1/2W
R-6	6R6075	100.000 20% 1/2W
R-7	6R6056	47,000 20% 1/2W
R-8	6R3933	220 20% 1/2W
R-9	6R3927	2.2 meg 20% 1/2W
R-10	17A690578	Wirewound: 22 10% 1.5W
R-11	6R2039	68 10% 1/2W
R-12	6R3963	100 10% 2W
or	6R490401	100 10% 1W N.I.
R-13	6R476116	270 10% 2W
or	6R6035	270 10% 1W N.I.
R-14	6R3933	220 20% 1/2W
R-15	6R2039	68 10% 1/2W
R-16	6R6032	470,000 20% 1/2W
R-17	6R6032	470,000 20% 1/2W
R-18	6R5554	390 10% 1/2W
R-19	6R6432	270 10% 1/2W
R-20	6R3933	220 20% 1/2W
R-21	6R6036	3300 20% 1/2W
R-22	6R2122	4.7 meg 20% 1/2W
R-23	18A690549	Volume Control: 1 meg; includes ON-OFF switch
R-24	6R6028	22,000 20% 1/2W
R-25	6R5554	390 10% 1/2W
R-26	6R6012	33,000 20% 1/2W
R-27	6R3966	1.5 meg 20% 1/2W
R-28	6R5683	27 10% 1/2W
Switch		
S-1	-	ON-OFF: part of volume control
S-2	40B690538	Bandswitch
S-3	40A690546	Tone Control
Transformers		
T-1	24A690544	FM Antenna input
T-2	24B690563	BC Oscillator coil
T-3	24B690540	1st IF, 10.7 Mc: complete; including padding capacitors and tuning cores but less shield
T-4	24B482863	IF, 455 Kc: complete; including padding capacitors and tuning cores but less shield
T-5	24B690541	2nd IF, 10.7 Mc: complete; including padding capacitors and tuning cores but less shield
T-6	24B482865	Diode, 455 Kc: complete; including padding capacitors and tuning cores but less shield
T-7	24B690542	Discriminator, 10.7 Mc: complete; including padding capacitors, tuning cores and shield
T-8	25B690536	Output Transformer
CHASSIS PARTS - MECHANICAL		
	43A4326	Ball, steel: 1/8" diameter
	1X691198	Brackets Assembly, pointer mtg: includes small and large bracket
	1X690717	Bracket Assembly, tuning core mtg: includes shoulder rivet and anti-rattle clip
	7C690567	Bracket, tuner mtg
	42A690560	Clip, anti-backlash: double
	42K690561	Clip, anti-backlash: single
	43A690730	Collar, pointer detent
	11M488137	Cord, dial: core drive
	11M8944	Cord dial: pointer drive
	46A690127	Core, iron and screw (for L-6 and L-9)
	46K680318	Core, iron: threaded (for T-4 and T-6)
	5A70098	Eyelet (speaker mtg)
	5S7866	Eyelet: .125 x .091; brass; nkl pl (core drive cord retainer)
	5A70404	Grommet, rubber (speaker mtg)
	14A690545	Insulator, armite (pointer bracket mtg)

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Part Number	Description
14A690534	Insulator, armite (tone switch mtg)
14A690535	Insulator, armite (volume control and bandswitch mtgL
14A690548	Insulator, bakelite (volume control and bandswitch mtg)
4S9751	Lockwasher, int-ext: #8; stl; cad pl (pulley assembly mtg)
2S7005	Nut, hex: 6-32 x 1/4; stl; nkl pl (L-6 and L-9 core mtg and pointer detent)
2S7051	Nut, hex: 3/8-32 x 9/16; Palnut; stl; cad pl (volume control and bandswitch mtg)
28A690552	Plug, 2-prong (power input)
28A690615	Plug, 4-pin (antenna input)
1X691184	Pulley Assembly, pointer drive; includes large and small pulley spot-welded together
49A690562	Pulley, cord drive: brass
9A470980	Receptacle, loop lead
5S8497	Rivet: .088 x 1/8; stl; nkl pl (single anti-rattle clip mtg).
5S7771	Rivet: .088 x 3/16; stl; nkl pl (7-prong tube socket mtg)
5S7774	Rivet: .088 x 1/4 stl; nkl pl (9-prong tube socket mtg)
5S7701	Rivet: .122 x 3/16 stl; nkl pl (tone switch insulator, antenna input receptacle and power input receptacle mounting)
5S7707	Rivet: .122 x 5/32; stl; nkl pl (terminal strip and tube shield mtg)
5K13896	Rivet, shoulder
3S7205	Screw, machine: 8-32 x 1/4 slotted hex head; locking type; stl; cad pl (gang mtg)
3S7163	Screw, machine: 8-32 x 1/4 plain hex head; stl; cad pl (pulley assembly mtg)
3S488011	Screw, machine: 8-32 x 5/8 slotted hex head; locking type; stl; cad pl (speaker mtg)
3S2695	Screw, sheet metal: #6 x 3/16 PKZ plain hex head; stl; cad pl (tuner bracket mtg)
3S3398	Screw, sheet metal: #6 x 3/8 PKZ plain hex head; stl; cad pl (pointer brackets assembly mtg)
3S490325	Screw, sheet metal: #6 x 1-1/8 PKZ plain hex head; stl; cad pl (rectifier mtg)
3S9700	Setscrew: 6-32 x 3/16 Allenhead; stl; cad pl (core drive pulley mtg)
3S7103	Setscrew: 8-32 x 1/8 Allenhead; stl; cad pl (pointer shaft adj)
1X690722	Shaft and Arm Assembly, tone control.
1X690739	Shaft and Pulley Assembly, pointer drive
1A690738	Shaft and Sleeve Assembly, pointer detent
47K690573	Shaft, tuning
26K485936	Shield, coil (for T-3, T-4, T-5 & T-6)
26A481521	Shield, tube: spring
9K484167	Socket, tube: 7-prong
9A485495	Socket, tube: 9-prong

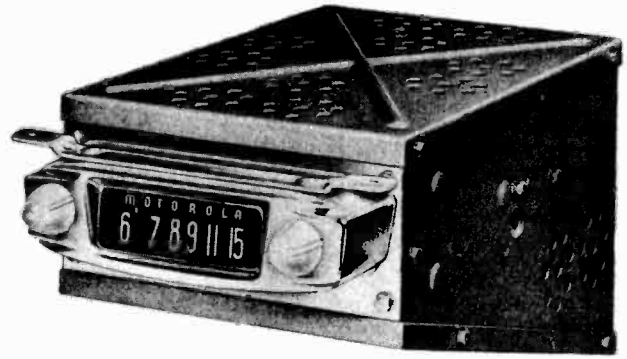
Ref. No.	Part Number	Description
	41A690598	Spring, coil (L-6 and L-9 core mtg)
	41A690732	Spring, compression (pointer detent)
	41A14244	Spring, tension (core drive, cord tension and cord compression)
	31K85348	Strip, terminal: 1 insulated lug, #2 mtg
	31K86126	Strip, terminal: 2 insulated lugs, #2 mtg
	31K470746	Strip, terminal: 3 insulated lugs, #2 mtg
	31K470747	Strip, terminal: 5 insulated lugs, #3 mtg
	4A21941	Washer, "C" (shaft and pulley assembly retainer)
	4A73639	Washer, "C" (tuning shaft and tone control shaft & arm retainer).
	4A691006	Washer, double "D": copper pl (pulley assembly mtg)
	4S7578	Washer, flat: 5/16 x .130 x .025 thick; brass (pointer brkt mtg)
	4S1765	Washer, flat: 1/2 x .147 x .015 thick; stl; cad pl (pointer detent)
	4K690572	Washer, shoulder: fibre (pointer bracket mtg)
	2K690571	Washer, shoulder: fibre (volume control & bandswitch mtg)
	4A690729	Washer, spring: phosphor bronze (pointer detent)
CABINET PARTS		
	16E690503	Cabinet, table model: molded; green (79XM21)
or	16K691189	Cabinet, table model: molded; walnut-mahogany (79XM22)
	13C690581	Cloth, grille
	30K21859	Cord, line & plug: 9 ft long
	15A690556	Cover, power receptacle
	34D690590	Escutcheon and dial scale
	36K690586	Knob, tone and tuning control: green (79XM21)
or	36K691190	Knob, tone and tuning control: walnut-mahogany (79XM22)
	36K690585	Knob, on-off and band selector: green and brass (79XM21)
or	36K690668	Knob, on-off and band selector: walnut-mahogany (79XM22)
	52A690553	Pointer, dial
	9A15907	Receptacle, 2-prong (power input)
	9K690618	Receptacle, 4-pin (antenna input)
	5S7703	Rivet: .122 x 7/32; stl; nkl pl (cover mtg)
	3S3375	Screw, sheet metal: #6 x 5/16 PKZ plain hex head; stl; cad pl (power receptacle mtg)
	3S488098	Screw, sheet metal: #8 x 3/8; type 25; plain hex head; stl; cad pl (chassis and back mtg)
	15A690616	Shell, antenna receptacle and insulator
	2A580844	Speednut: 1/8" diameter (escutcheon mtg)
	31A470403	Strip, terminal: 3 screw; with shorting bar
	4S1771	Washer, flat: 5/16 x .203 x .016 thick: stl; cad pl (back mtg)

GENERAL INFORMATION

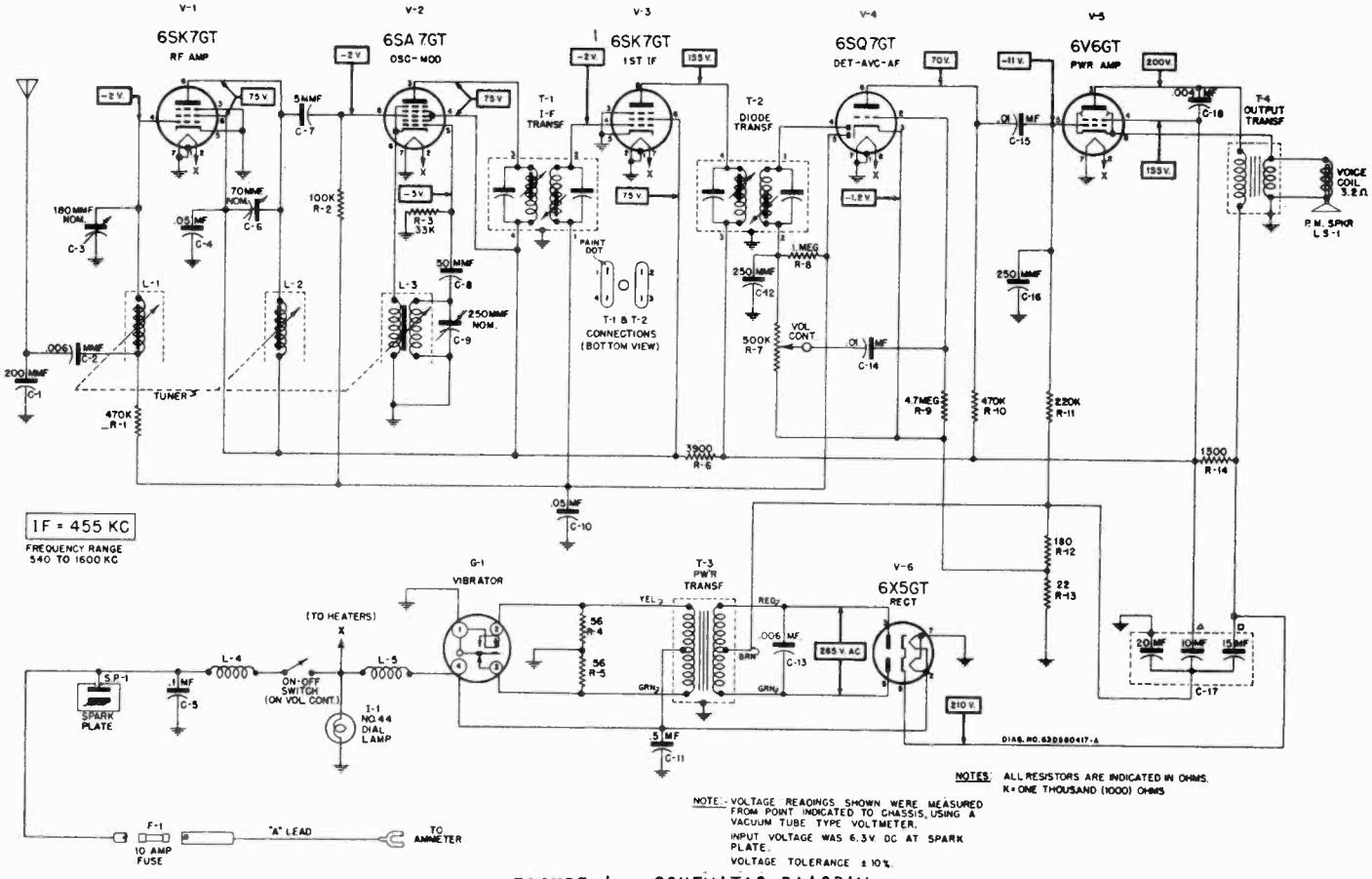
TYPE - Universal automotive type superheterodyne receiver with self-contained speaker. Designed for under-dash mounting.

TUNING RANGE - 540 to 1600 Kc IF - 455 Kc

TUBE COMPLEMENT - 6SK7GT - RF Amplifier
6SA7GT - Oscillator-Modulator
6SK7GT - IF Amplifier
6SQ7GT - Detector-AVC-AF Amplifier
6V6GT - Power Amplifier
6X5GT - Rectifier



POWER INPUT - 6.3 volts DC at 6 amperes



NOTES: ALL RESISTORS ARE INDICATED IN OHMS. K = ONE THOUSAND (1000) OHMS

NOTE: VOLTAGE READINGS SHOWN WERE MEASURED FROM POINT INDICATED TO CHASSIS, USING A VACUUM TUBE TYPE VOLTMETER. INPUT VOLTAGE WAS 6.3V DC AT SPARK PLATE. VOLTAGE TOLERANCE ± 10%.

FIGURE 1. SCHEMATIC DIAGRAM

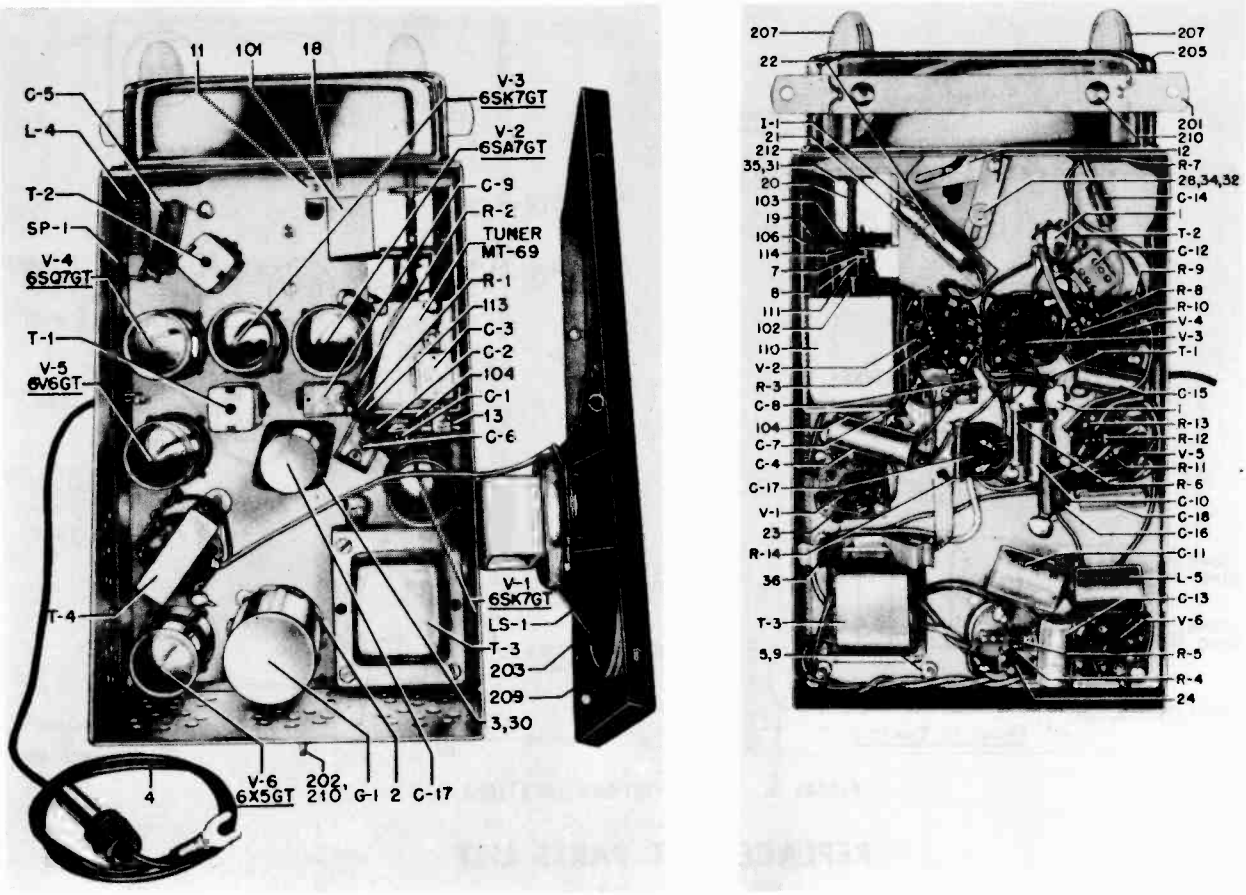


FIGURE 2. PARTS LOCATIONS

ALIGNMENT

Connect a low range output meter across speaker voice coil and set volume control at maximum. For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing signal generator output as stages are brought into alignment. Use a small fibre screwdriver when aligning IF and diode transformers. A special tool, Motorola Part No. 66A76278, is required for adjusting the tuner cores. IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores; the slightest inward pressure may move tuner carriage and result in inaccurate alignment. Remove receiver top and bottom covers and the escutcheon and dial scale assembly to expose all adjustments.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6SA7 Grid (pin #8)	455 Kc	High frequency end (cores out)	1, 2 3 & 4	Peak for maximum in order indicated. Check by repeating procedure.
RF ALIGNMENT						
2.	See Fig. 3	Antenna receptacle through dummy.	1605 Kc	High frequency end; cores should project 1-1/4" from cans. (Screw out)	5, 6 & 7	Peak for maximum in order indicated.
3.	"	"	1300 Kc	1300 Kc per Fig. 4	8, 9 & 10	"
POINTER ADJUSTMENT						
4.	"	"	600 Kc	Tune for maximum.	-	Replace dial scale & set pointer to 600 Kc by means of pointer adjustment screw.

5. With receiver installed in car, the antenna fully extended and dial set to approximately 1400 Kc, adjust antenna trimmer (7) for maximum volume of a weak station or noise between stations.

MODEL 309

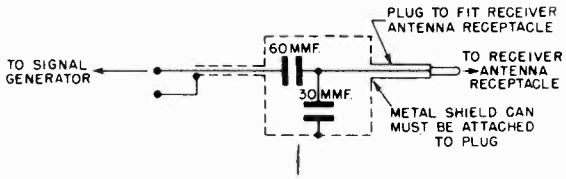


FIGURE 3. DUMMY ANTENNA

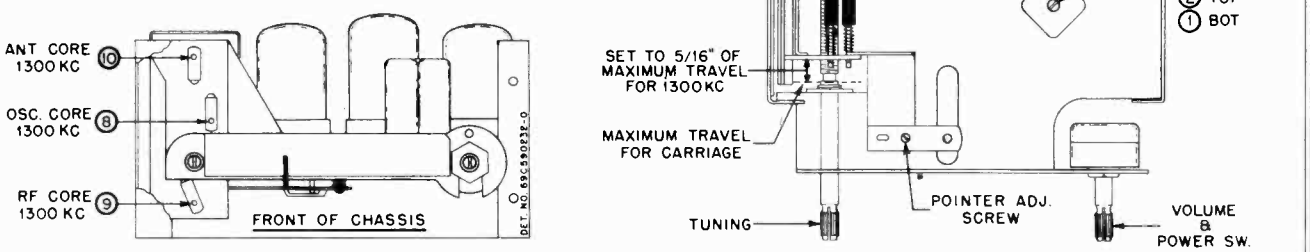


FIGURE 4. TUBE & TRIMMER LOCATIONS

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	21K87136	Ceramic: 200 mmf 500V .....
C-2	8C4529	Paper: .006 mf 100V .....
C-3	20A485652	Trimmer, mica: 50 to 280 mmf 500V .....
C-4	8K14791	Paper: .05 mf 400V .....
C-5	8k472035	Paper: .1 mf 100V .....
C-6	20A481526	Trimmer, mica: 20 to 180 mmf 500V .....
C-7	21K70720	Molded: 5 mmf 500V .....
C-8	21k74661	Ceramic: 50 mmf 300V .....
C-9	20A580113	Trimmer, mica: 240 to 300 mmf 500V .....
C-10	8K13514	Paper: .05 mf 100V .....
C-11	8k17028	Paper: .5 mf 100V .....
C-12	21R6543	Mica: 250 mmf 500V .....
C-13	8K12840	Paper: .006 mf 1600V .....
C-14	8k472754	Paper: .01 mf 100V .....
C-15	8k23690	Paper: .01 mf 400V .....
C-16	21R6543	Mica: 250 mmf 500V .....
C-17	23A485677	Electrolytic: 15-10-20 mfd/ 350-350-25V .....
C-18	8K71909	Paper: .004 mf 400V .....
FUSE		
F-1	65A10266	Fuse: 10 amp .....
VIBRATOR		
G-1	48B3333	Vibrator: 4-pin; non-sync..
DIAL LIGHT		
I-1	65X10867	Bulb: 6.3V; .25A; tubular; bayonet base; #44 .....
COILS		
L-1	24B580570	Coil, antenna .....
L-2	24k580571	Coil, RF .....
L-3	24B580569	Coil, oscillator .....
L-4	24k580706	Choke, RF .....
L-5	24A472535	Choke, hash .....

REF. NO.	PART NO.	DESCRIPTION
SPEAKER		
LS-1	50B580759 or 50B590079	Speaker: PM; 5-1/4"; 3.2 ohm voice coil ..... Exch.
RESISTORS		Note: All resistors are carbon insulated type unless otherwise specified.
R-1	6R6032	470,000 20% 1/2W .....doz.
R-2	6R6075	100,000 20% 1/2W .....doz.
R-3	6R6012	33,000 20% 1/2W .....doz.
R-4	6R5614	56 10% 1/2W .....doz.
R-5	6R5614	56 10% 1/2W .....doz.
R-6	6R476012	3,900 10% 2W .....
R-7	18A485612	Volume Control: .5 meg; includes on-off switch .....
R-8	6R6004	1 meg 20% 1/2W .....doz.
R-9	6R6122	4.7 meg 20% 1/2W .....doz.
R-10	6R6032	470,000 20% 1/2W .....doz.
R-11	6R6015	220,000 20% 1/2W .....doz.
R-12	6R6390	180 10% 1W .....each doz.
R-13	6R6406	22 10% 1/2W .....doz.
R-14	6R2005	1500 10% 2W .....
SPARK PLATE		
SP-1	1A485606	Spark Plate Assembly .....
TRANSFORMERS		
T-1,2	24B485553	IF and Diode: 455 Kc; complete
T-3	25C485630	Power Transformer .....
T-4	25B70171	Output Transformer .....
CHASSIS PARTS - MECHANICAL		
1	42A485548	Clip, coil can mtg (T-1 & T-2 mtg) .....doz.
2	42A4215	Clip, vibrator grounding ..doz.
3	9K14906	Insulator, electrolytic mtg: armite .....doz.

REF. NO.	PART NO.	DESCRIPTION
4	9K580705	Lead, fuse: complete with 10 amp fuse .....
5	4S7666	Lockwasher, ext: #6; stl; cad pl (power trans mtg) .per/c
6	4S7650	Lockwasher, int: #6; stl; cad pl (dial light mtg)...per/c
7	2A78005	Nut, floating: with ear (on tuning shaft) .....
8	2A77596	Nut, floating: without ear (on tuning shaft) .....
9	2S7005	Nut, hex: 6-32 x 1/4; stl; cad pl (power trans mtg)..per/c
10	2S7051	Nut, hex: 3/8-32 x 9/16; stl; cad pl (vol.cont mtg) ...doz.
11	1X580165	Plate and Stud Assembly (pointer adj plate) .....
12	1X580163	Pointer and Drive Plate Assembly .....
13	9A472148	Receptacle, antenna contact
14	5S7706	Rivet: .122 x 1/8; stl; nkl pl (dial light mtg) .....per/c
15	5S7707	Rivet: .122 x 5/32; stl; nkl pl (tube socket mtg) .....per/c
16	5S7701	Rivet: .122 x 3/16; stl; nkl pl (vibrator socket, output trans and spark plate assem mtg) .....per/c
17	5S7703	Rivet: .122 x 7/32; stl; nkl pl (electrolytic wafer mtg) .....per/c
18	3S1921	Screw, machine: 2-56 x 1/8; slotted binder head; stl; cad pl (pointer plate mtg and pointer adjustment screw) .....per/c
19	3S7454	Screw, sheet metal: #8 x 1/4; plain hex head; stl; cad pl (tuner mtg) .....per/c
20	47A485650	Shaft, drive (tuning shaft)
21	60K25753	Shield, light .....
22	9K580609	Socket, dial light: includes mtg bracket .....
23	9A6788	Socket, tube: octal .....
24	9A70208	Socket, tube: 4 prong (for vibrator) .....
25	41A77592	Spring, compression (tuning shaft) .....doz.
26	41A472659	Spring, torsion (pointer assembly) .....
27	46A485622	Stud, drive plate mtg .....doz.
28	46A580076	Stud, pointer mtg .....doz.
30	9A12705	Wafer, electrolytic mtg: bakelite .....doz.
31	4K24124	Washer, 'C'(drive shaft retainer) .....doz.
32	4K70015	Washer, 'C' (pointer mtg and carriage plate stop) .....per/c
33	4S488235	Washer, flat: 3/8 x 3/32 x .010 thick; stl; cad pl (pointer plate mtg) .....doz.
34	4S1719	Washer, flat: 3/8 x 9/64 x .030 thick; stl; cad pl (pointer mtg) .....per/c
35	4K580572	Washer, spring (drive shaft play takeup) .....doz.
36	39A26068	Wiper, grounding: spring brass (grounds chassis to top cover) .....doz.

TUNER PARTS - MECHANICAL

Note: Coils and trimmers are includes in the Electrical Chassis Parts list. Drive shaft parts are included in the Mechanical Chassis Parts List.

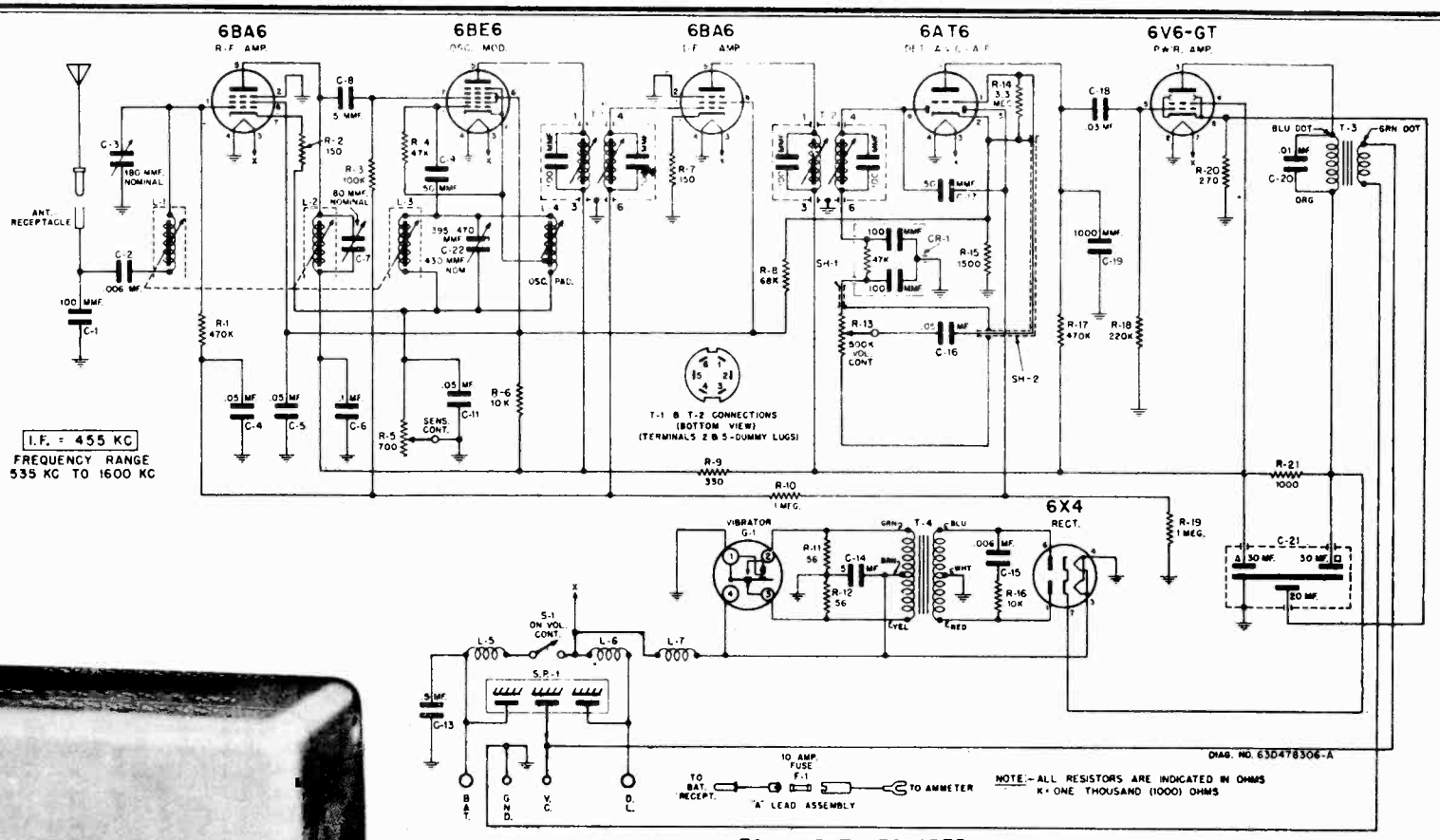
REF. NO.	PART NO.	DESCRIPTION
101	1X580162	Carriage Plate Assembly: includes bakelite core insulator & slider spring ....
102	46K489214	Core, iron and screw (specify color coding on old core when ordering) .....
103	42A70184	Clip, core adjustment .....doz.
104	5K580503	Grommet, rubber (ant & RF coil mtg) .....doz.
105	5K580504	Grommet, rubber(oscillator coil mtg) .....doz.
106	14A485602	Insulator, core: bakelite; 2-11/16 x 1-1/8 .....
107	5S8497	Rivet: .088 x 1/8; stl; nkl pl (terminal strip and slider mtg) .....per/c
108	5S7770	Rivet: .088 x 5/32; stl; nkl pl (core insulator mtg)per/c
109	5S6819	Rivet: .122 x 1/8; stl; nkl pl (shield mtg) .....per/c
110	26A580546	Shield, coil .....
111	41A485649	Spring, core .....per/c
112	41A580079	Spring, slider .....doz.
113	31A485605	Strip, terminal: 2 insulated lugs, #2 mtg .....
114	4A70956	Washer, core insulator: 1/4 dia; bakelite .....per/c

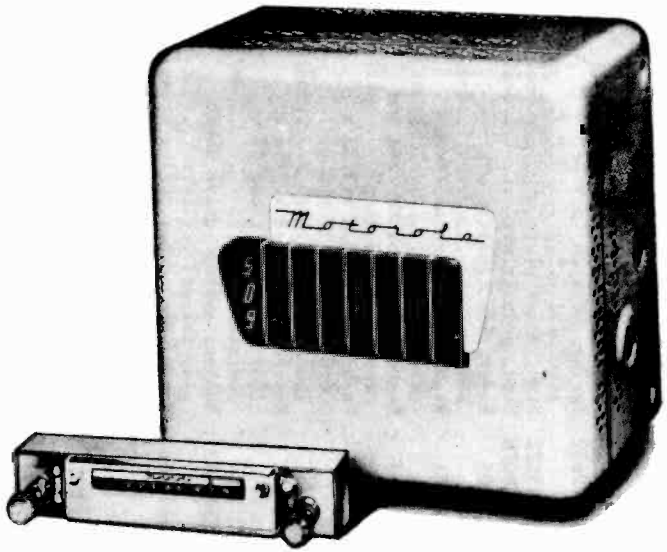
HOUSING PARTS

201	7A485608	Bracket, receiver mtg (on escutcheon) .....
202	7A72256	Bracket, receiver mtg (on rear of housing shell)....
203	15K485664	Cover, bottom: less speaker
204	15K485663	Cover, top .....
205	1X580019	Escutcheon & Bracket Assembly
206	7A485674	Frame, dial scale retainer.
207	36K580548	Knob, control .....
208	2S7988	Speednut (dial scale mtg) .doz.
209	2S490009	Speednut (speaker mtg) ....per/c
210	5S7765	Rivet: .187 x 7/32; stl; nkl pl (receiver rear bracket mtg) .....doz.
211	34B485628	Scale, dial: glass .....
212	3S8114	Screw, sheet metal: #8 x 1/4; slotted acorn head; antique copper finish (housing screws and escutcheon mtg) .....doz.

MOUNTING PARTS AND ACCESSORIES

301	7A484424	Bracket and Stud Assembly (receiver mtg) .....
302	8A4491	Capacitor, noise suppression (generator cap) .....
303	4S7688	Lockwasher, int-ext: 1/4; stl; cad pl (receiver mtg)doz.
304	2S7022	Nut, hex: 1/4-20 x 7/16; stl; cad pl (receiver mtg) ....doz.
305	3S8109	Screw, sheet metal: #8 x 3/8; PKZ; slotted acorn head; stl; cad pl (receiver mtg to instrument panel) .....doz.
306	3S7295	Screw, machine: 1/4-20 x 3/4; plain hex head; stl; cad pl (receiver mtg to receiver mtg strap) .....doz.
307	3S9694	Screw, machine: 1/4-20 x 1-1/2; plain hex head; stl; cad pl (receiver mtg to car firewall) doz.
308	42A485718	Strap, receiver mtg .....
309	6A4141	Suppressor, noise (distributor)





EQUIPMENT REQUIRED

ALIGNMENT

1. A special tool for adjusting the tuner cores. Use Alignment Tool, Motorola Part No. 66A76278.
2. A small screwdriver for IF & RF alignment.
3. An accurately calibrated AM modulated signal generator.
4. A low range output meter.
5. A special dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 1. The 21" coaxial lead needed in its construction is the same type as used for lead-in on Motorola car antennas.

PROCEDURE

1. Remove the front and rear housings. All adjustments are now exposed.
2. Connect a PM speaker (3.2 ohm VC) to VC and GND. terminals and connect the output meter across the voice coil.

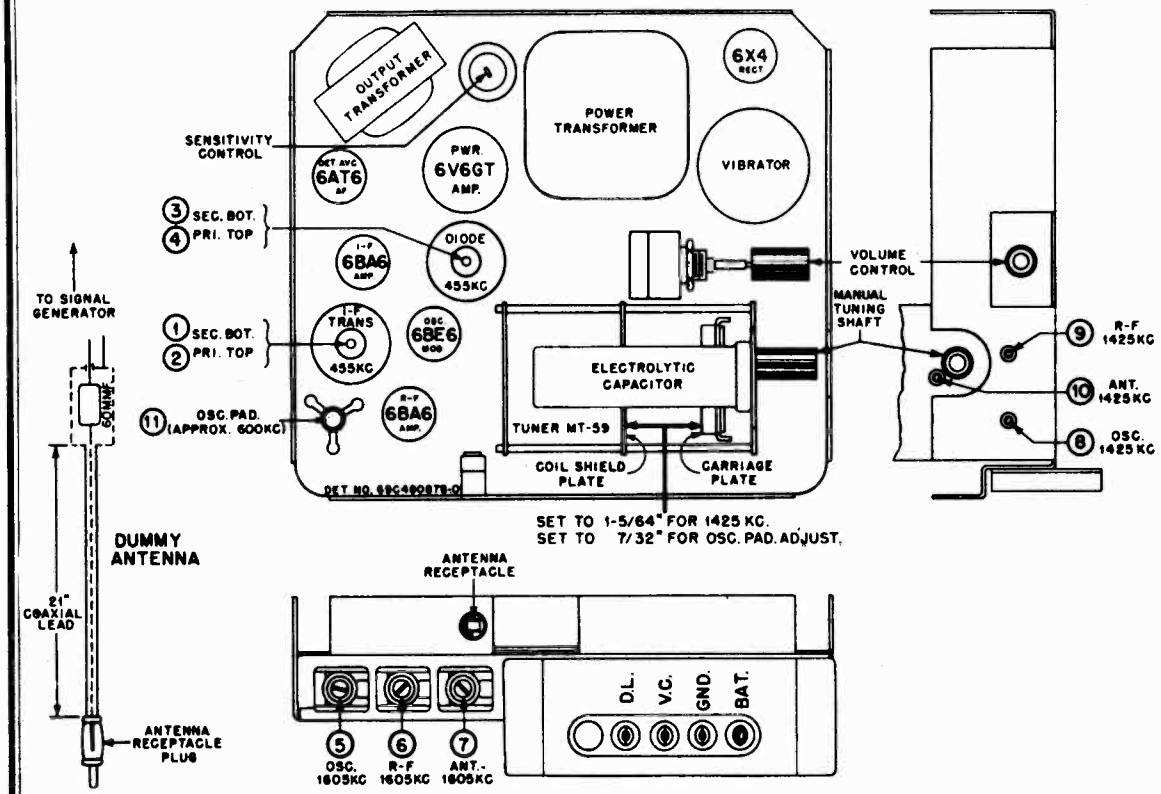


FIGURE 1. TUBE & TRIMMER LOCATIONS

PART NO.	DESCRIPTION
3S3397	Screw, sheet metal: #8 x 5/16 PKZ plain hex head; cad pl (power transformer mtg) .....
1A71049	Shield and Sleeve Assembly (for T-1 & T-2) .....
9A70208	Socket, tube: 4-pin; with grounding lug (vibrator socket) .....
9A472534	Socket, tube: miniature; 7-prong .....
9A6788	Socket, tube: octal .....
31C4079	Strip, terminal: 1 insulated lug, end mtg .....
31A472573	Strip, terminal: 2 insulated lugs, #2 mtg .....
31K16330	Strip, terminal: 3 insulated lugs, #3 mtg .....

HOUSING PARTS

42A472033	Clip, chassis retainer ....
13D580531	Escutcheon, complete .....
1X580832	Housing and Bushing Assembly, rear .....
15K580526	Housing, front: less escutcheon
3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; cad pl, (escutcheon mounting) ....

9. ANTENNA TRIMMER ADJUSTMENT. Once steps 7A, B, C, D & 8 have been satisfactorily performed, no further adjustment of any alignment screws should be made except to align the antenna trimmer (7) to car antenna after receiver is installed in car. This adjustment should be made with antenna fully extended and receiver set to approximately 1400 Kc. Peak the trimmer for maximum volume of a weak station or background noise between stations.

3. Connect a 6 volt storage battery to GND. and BAT. terminals of receiver; turn receiver on and allow it to warm up for a few minutes. Set receiver volume control at maximum.

4. Sensitivity Control. This control must be set to provide 2 ± 1/2 volts bias on the RF tubes before alignment is started. Measure this voltage between sensitivity control terminal and chassis.

5. For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.

6. IF ALIGNMENT

A. Connect high side of signal generator through .1 mf capacitor to 6BE6 grid (pin #7) and the low side to chassis. Set generator to 455 Kc and peak adjustments (1, 2, 3 & 4), in this order, for maximum output.

B. Check alignment by repeating procedure.

7. RF ALIGNMENT

A. Connect signal generator to antenna receptacle through special dummy antenna (60 mmf capacitor in series with 21" coax lead).

B. Move carriage plate (by turning manual tuning shaft) to extreme high frequency position and screw coil cores out so that at least 1-1/8" of all three cores shall be outside of the coil shield can. Set signal generator to 1605 Kc and peak trimmers (5, 6 and 7), in this order.

C. Move the carriage plate (by turning manual tuning shaft) so carriage plate is spaced exactly 1-5/64" from coil shield plate. Set signal generator to 1425 Kc and adjust coil cores (8, 9 & 10), in this order, for maximum output.

D. Move carriage plate (by turning manual tuning shaft) so carriage plate is spaced approximately 7/32" from coil shield plate. Leave signal generator connected but turn signal generator power off. Peak oscillator padder core (11) for maximum noise. If the padder core must be moved more than 1/2 turn from its original position, the carriage plate should be moved to extreme high frequency position, the coil cores (8, 9 & 10) should be screwed out so that 1-1/8" of each core is exposed and steps 7A, B, C & D repeated until it is necessary to move the padder core less than 1/2 turn in this step.

IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores. The slightest inward pressure on the alignment tool may move the tuner carriage and result in inaccurate alignment.

8. SETTING THE SENSITIVITY CONTROL. After alignment is completed, set signal generator to 600 Kc and adjust its output to 1.3 microvolts. Adjust the sensitivity control to provide 1 watt output (1 watt = 1.79 volts on output meter).

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	21B77562	Ceramic: 100 mmf 500V .....
C-2	8A4529	Paper: .006 mf 100V .....
C-3	20K485812	Trimmer, variable: 50 to 180 mmf; on same bracket as C-7 and C-22 (sold only as assembly)
C-4	8A13514	Paper: .05 mf 100V .....
C-5	8A14791	Paper: .05 mf 400V .....
C-6	8K13166	Paper: .1 mf 400V .....
C-7	20K485812	Trimmer, variable: 50 to 180 mmf; on same bracket as C-2 and C-22 (sold only as assembly)
C-8	21K70720	Molded: 5 mmf 500V .....
C-9	21R6513	Mica: 50 mmf 300V .....
or	21K74661	Ceramic: 50 mmf 300V .....
C-11	8A13514	Paper: .05 mf 100V .....
C-13	8A17028	Paper: .5 mf 100V .....
C-14	8A17028	Paper: .5 mf 100V .....
C-15	8A12840	Paper: .006 mf 1600V .....
C-16	8A13514	Paper: .05 mf 100V .....
C-17	21R6513	Mica: 50 mmf 300V .....
or	21K74661	Ceramic: 50 mmf 300V .....
C-18	8A71911	Paper: .03 mf 400V .....
C-19	21K478410	Ceramic: 1000 mmf 500V .....
C-20	8K23690	Paper: .01 mf 400V .....
C-21	23A473015	Electrolytic: 30-30-20 mf/ 350-300-25V .....
C-22	20K485812	Trimmer, variable: 395 to 470 mmf; on same bracket as C-2 and C-7 (sold only as assembly) .....
CAPACITOR-RESISTOR		
CR-1	21A472571	Capacitor-Resistor: 100 mmf-47,000 ohms 100 mmf .....
FUSE		
F-1	65A10266	10 Amp (3AG) .....
VIBRATOR		
G-1	48B3333	Non-sync: 4-pin .....
COILS		
*L-1,2	24B71881	RF & Antenna Coil (specify color of paint dots on old coil when ordering) .....
*L-3	24B71879	Oscillator Coil (specify color of paint dots on old coil when ordering) .....
L-4	24B70227	Oscillator Padder Coil: complete with iron tuning core
L-5,6	24K78026	Choke .....
L-7	24A472535	Choke, hash .....

REF. NO.	PART NO.	DESCRIPTION
RESISTORS		
NOTE: All resistors are 1/2W 20% carbon insulated type unless otherwise specified.		
R-1	6R6032	470,000 .....
R-2	6R3992	150 .....
R-3	6R6075	100,000 .....
R-4	6R6056	47,000 .....
R-5	18K77552	Sensitivity control: 700 ohms
R-6	6R476060	10,000 2W .....
R-7	6R3992	150 .....
*Part of Tuner MT-59		
R-8	6R6001	68,000 .....
R-9	6R6010	330 .....
R-10	6R6004	1 meg .....
R-11	6R5614	56 10% .....
R-12	6R5614	56 10% .....
R-13	1A472531	Volume Control: 500,000 ohms; includes SPST switch .....
R-14	6R2118	3.3 meg .....
R-15	6R6161	1,500 .....
R-16	6R6054	10,000 .....
R-17	6R6032	470,000 .....
R-18	6R6015	220,000 .....
R-19	6R6004	1 meg .....
R-20	6R6336	270 10% 1W .....
R-21	6R476004	1,000 2W .....
SWITCHES		
S-1		Power (part of volume control)
SHIELD		
SH-1	30A77553	Cable, shield: 5" long .....
SH-2	30K472991	Cable, shield: 10" long ....
SPARK PLATE		
SP-1	1X78041	Spark Plate Assembly: mtg. brkt included .....
TRANSFORMERS		
T-1 & T-2	24B76553	Diode or IF, 455 Kc: complete with padding capacitors and tuning iron cores, but less shield .....
T-3	25B70171	Output Transformer .....
T-4	25B472533	Power Transformer .....
TUNER		
	1X472702	Manual Tuner MT-59 .....

REF. NO.	PART NO.	DESCRIPTION
	3S7456	Screw, sheet metal: #8 x 1/4 PKA slotted acorn head; antique copper finish (housing screws) .....
ACCESSORIES		
	65X4151	Bulb, pilot light: 6-8V; clear; bayonet base .....
	8A4491	Capacitor, generator .....
	9B473111	Lead Assembly, fuse: complete with 10 amp fuse .....
	1X74340	Lead Assembly, dial light: complete with bulb .....
	1X76859	Lead Assembly, speaker: 2-conductor, 36" long, with pin terminals on one end
	4S7653	Lockwasher: 5/16 int-ext; cad pl (receiver mtg) .....
	2S2863	Nut, hex: 5/16-18 x 9/16; cad pl (receiver mtg) .....
	1K75148	Shaft, flexible: with housing; 24" long .....
	50B473118	or
	50B473119	or
	50B473696	or
	50B473697	or
	50B473783	Speaker: 6" PM; 3.2 ohm VC; less speaker lead .....
	3A77542	Stud, receiver mtg .....
	6X4141	Suppressor, distributor ...
CHASSIS PARTS - MECHANICAL		
	42A13177	Clip, center post grounding.
	42A4215	Clip, vibrator grounding ..
	1X70646	Receptacle, antenna .....
	5S7771	Rivet: .088 x 3/16 steel; nkl pl (tube socket mtg)..
	5S7706	Rivet: .122 x 1/8 steel; nkl pl (terminal strip mtg, sensitivity control and center post ground clip mtg).....
	5S7707	Rivet: .122 x 5/32 steel; nkl pl (tube socket mtg)..
	5S7701	Rivet: .122 x 3/16 steel; nkl pl (vibrator grounding clip and output transformer mtg) .....
	3S8140	Screw, sheet metal: #8 x 3/16 PKZ plain hex head; cad pl (tuner, capacitor bracket assembly and spark plate mtg) .....

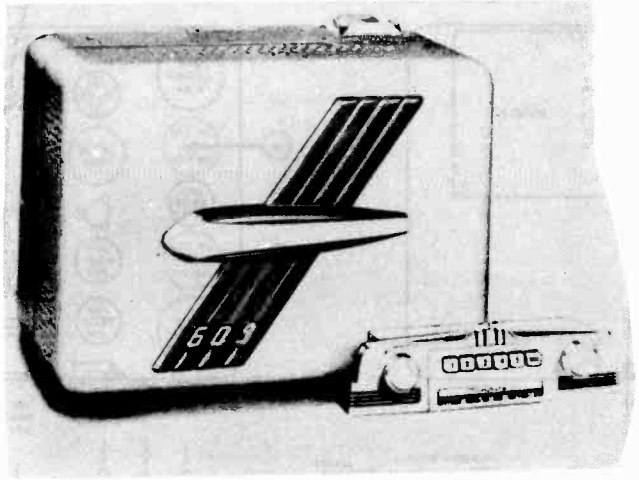
ALIGNMENT

EQUIPMENT REQUIRED

1. A special tool for adjusting the tuner cores. Use Alignment Tool, Motorola Part No. 66A76278.
2. A small screwdriver for IF & RF alignment.
3. An accurately calibrated AM modulated signal generator.
4. A low range output meter.
5. A special dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 1. The 21" coaxial lead needed in its construction is the same type as used for lead-in on Motorola car antennas.

PROCEDURE

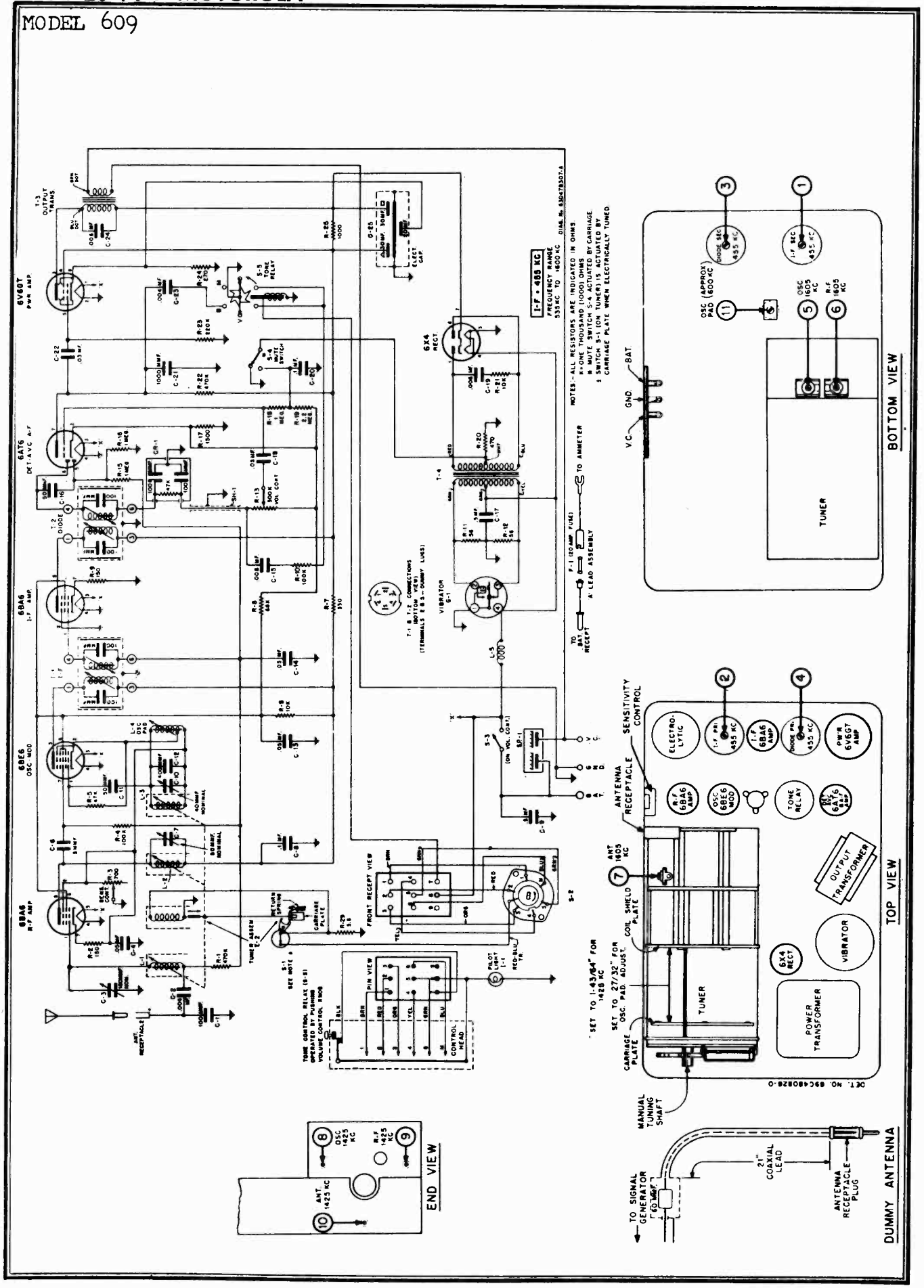
1. Remove the front and rear housings. Also remove the shield from the tuner. All adjustments are now exposed.
2. Connect a PM speaker (3.2 ohm VC) to VC and GND. terminals and connect the output meter across the voice coil



3. Connect a 6 volt storage battery to chassis and BATT. terminal of receiver; turn receiver on and allow it to warm up for a few minutes. Press control head 'M' button to place tuner in manual position. (If a control head is not available, move tuner carriage plate by hand till tuner is in manual position). Set receiver volume control at maximum and tone control to treble (high) position.
4. Sensitivity Control. This control must be set to provide 2 ± 1/2 volts bias on the RF tubes before alignment is started. Measure this voltage between sensitivity control terminal and chassis.
5. For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.
6. IF ALIGNMENT
   A. Connect high side of signal generator through .1 mf capacitor to 6BE6 grid (pin #7) and the low side to chassis. Set generator to 455 Kc and peak adjustments (1, 2, 3 & 4), in this order, for maximum output.
   B. Check alignment by repeating procedure.
7. RF ALIGNMENT
   A. Connect signal generator to antenna receptacle through special dummy antenna (60 mmf capacitor in series with 21" coax lead).
   B. Move carriage plate (by turning manual tuning shaft) to extreme high frequency position and screw coil cores out so that at least 1-1/8" of all three cores shall be outside of the coil shield can. Set signal generator to 1605 Kc and peak trimmers (5, 6 and 7), in this order.
   C. Move the carriage plate (by turning manual tuning shaft) so carriage plate is spaced exactly 1-43/64" from coil shield plate. Set signal generator to 1425 Kc and adjust coil cores (8, 9 & 10) in this order, for maximum output.
   D. Move carriage plate (by turning manual tuning shaft) so carriage plate is spaced approximately 27/32" from coil shield plate. Leave signal generator connected but turn signal generator power off. Peak oscillator padder core (11) for maximum noise. If the padder core must be moved more than 1/2 turn from its original position, the carriage plate should be moved to extreme high frequency position, the coil cores (8, 9 & 10) should be screwed out so that 1-1/8" of each core is exposed and steps 7A, B, C & D repeated until it is necessary to move the padder core less than 1/2 turn in this step.
   IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores. The slightest inward pressure on the alignment tool may move the tuner carriage and result in inaccurate alignment.
8. SETTING THE SENSITIVITY CONTROL. After alignment is completed, set signal generator to 600 Kc and adjust its output to 1.3 microvolts. Adjust the sensitivity control to provide 1 watt output (1 watt = 1.79 volts on output meter).
9. ANTENNA TRIMMER ADJUSTMENT. Once steps 7A, B, C, D & 8 have been satisfactorily performed, no further adjustment of any alignment screws should be made except to align the antenna trimmer (7) to car antenna after receiver is installed in car. This adjustment should be made with antenna fully extended and receiver set to approximately 1400 Kc. Peak the trimmer for maximum volume of a weak station or background noise between stations.

REF. NO.	PART NO.	DESCRIPTION
	9A70208	Socket, tube: 4 prong (for vibrator) .....
	9A472534	Socket, tube: miniature 7 prong
	9A6788	Socket, tube: octal .....
	31A472573	Strip, terminal: 2 insulated lugs, #2 mtg .....
	31K14655	Strip, terminal: 3 insulated lugs, #3 mtg .....
	7A472576	Support. volume cont. shaft alignment .....
	5S7555	Washer, flat: 1/4 x .128 x .033 thick; cad pl (output trans. mtg) .....
HOUSING PARTS		
	13D580541	Escutcheon (complete) .....
	15K580612	Housing, front: includes 2 grounding wipers; less escutcheon .....
	15K580692	Housing, rear .....
	38A71874	Knob (automatic tuner station set-up); plastic; with clamp spring .....
	5S7730	Rivet: .122 x 1/8 steel; antique copper finish (grounding wiper mtg) .....
	3S7454	Screw, sheet metal #8 x 1/4 PKZ plain hex head; cad pl (escutcheon mtg) .....
	3S7456	Screw, sheet metal: #8 x 1/4 PKA slotted acorn head; ant. cop finish (housing screws) .....
	39K470032	Wiper, grounding .....
ACCESSORIES		
	3A51494	Bolt, 'J' (receiver mtg) ...
	8A4491	Capacitor, generator .....
	9K473161	Lead Assembly, fuse: comp. with 20 Amp fuse .....
	1X76859	Lead Assembly, speaker; 2 conductor; 36" lg; with pin terminals on one end .....
	4S7653	Lockwasher: 5/16 int-ext; cad pl (receiver mtg) .....
	2S2863	Nut, hex: 5/16-18 x 9/16; cad pl (receiver mtg) .....
	1K75148	Shaft, flexible: with hsng; 24" long .....
	50B473783 or 50B473696 or 50B473697 or 50B473118 or 50B473119	Speaker: 6" PM; 3.2 ohm VC; less spkr lead ..... Exchange
	6X4141	Suppressor, distributor ....

MODEL 609



MODEL 609

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	21B77562	Ceramic: 100 mmf 500V .....
C-2	8A4529	Paper: .006 mf 100V .....
C-3*	20K472613	Trimmer, variable mica: range 50 to 180 mmf; with bracket
C-4	8A13514	Paper: .05 mf 100V .....
C-6	21K70720	Molded: 5 mmf 500V .....
C-7*	20K472613	Trimmer, variable mica: range 50-180 mmf; with bracket ..
C-8	8K13166	Paper: .1 mf 400V .....
C-9	8A17028	Paper: .5 mf 100V .....
C-10*	20K472612	Trimmer, variable mica: range 30 to 60 mmf; with bracket.
C-11	21R6513	Mica: 50 mmf 300V .....
C-12	21A71872	Ceramic: 400 mmf 5% 500V ...
C-13	8A14791	Paper: .05 mf 400V .....
C-14	8A13514	Paper: .05 mf 100V .....
C-15	8A71910	Paper: .006 mf 400V .....
C-16	21R6513	Mica: 50 mmf 300V .....
C-17	8A19133	Paper: .5 mf 100V .....
C-18	8A13514	Paper: .05 mf 100V .....
C-19	8A12840	Paper: .006 mf 1600V .....
C-20	8A472035	Paper: .1 mf 100V .....
C-21	21K478410	Ceramic: 1000 mmf 500V .....
C-22	8A71911	Paper: .03 mf 400V .....
C-23	8A71909	Paper: .004 mf 400V .....
C-24	8A71910	Paper: .006 mf 400V .....
C-25	23A473015	Electrolytic: 30-30-20 mf/ 350-300-25V .....
CAPACITOR-RESISTOR		
CR-1	21A472571	Capacitor-Resistor: 100 mmf-47,000 ohms-100 mmf .....
FUSE		
F-1	65K4637	Fuse: 20 Amp (3AG) .....
VIBRATOR		
G-1	48B3333	Vibrator, non-sync: 4-pin ..
COILS		
L-1 & L-2*	24B71881	RF & Antenna coil (specify color of paint dots on old coil when ordering) .....
L-3*	24B71879	Oscillator Coil (specify color of paint dots on old coil when ordering) .....
L-4	24B70227	Osc. padder coil: complete with iron tuning core .....
L-5	24A472535	Choke, hash .....
RESISTORS		
Note: All resistors are 1/2 watt, 20% insulated, carbon type unless otherwise specified.		
R-1	6R6032	470,000 .....doz.
R-2	6R3992	150 .....doz.
R-3	18K77552	Control, sensitivity: 700 ohm
R-4	6R6075	100,000 .....doz.
R-5	6R6056	47,000 .....doz.
R-6	6R476060	10,000 2W .....
R-7	6R6010	330 .....doz.
R-8	6R6001	68,000 .....doz.
R-9	6R3992	150 .....doz.
R-10	6R6075	100,000 .....doz.
	3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; cad pl (tuner mtg) .....
	3S3397	Screw, sheet metal: #8 x 5/16 PKZ plain hex head; cad pl (pwr. trans. mtg).....
	47B480768	Shaft & Coupling Assembly (for vol. cont) .....
	1A71049	Shield & Sleeve Assembly (for T-1 & T-2) .....
R-11	6R5614	56 10% .....
R-12	6R5614	56 10% .....
R-13	18A480773	Volume Control: 500,000; with SPST switch .....
R-15	6R6004	1 meg .....
R-16	6R6004	1 meg .....
R-17	6R6161	1500 .....
R-18	6R6004	1 meg .....
R-19	6R3927	2.2 meg .....
R-20	6R3949	470 .....
R-21	6R6054	10,000 .....
R-22	6R6032	470,000 .....
R-23	6R6015	220,000 .....
R-24	6R6336	270 10% 1W .....
R-25	6R476004	1,000 2W ....
R-29	17K484497	5.6 10% 1W: wirewound ....
SWITCHES		
S-1*	1B70944	Solenoid Switch: with mtg plate
S-2*	40B70952	Selector Switch .....
S-3	-	Power Switch (part of volume control) .....
S-4*	40A472644	Mute Switch .....
S-5	1X78040	Type MR6 Tone Relay .....
SHIELD		
SH-1	30K472998	Cable, volume control: 5" lg; single conductor .....
SPARK PLATE		
SP-1	1X472624	Spark Plate Assembly .....
TRANSFORMERS		
T-1 & T-2	24B76553	Diode or IF, 455 Kc: complete with padding capacitors and tuning iron cores, but less shield .....
T-3	25B70171	Output .....
T-4	25B472553	Power .....
TUNER		
	1X472634	Tuner: ST-60 ..... Exchange
CHASSIS PARTS - MECHANICAL		
	42A4215	Clip, vibrator grounding ...
	58A480774	Coupling, tinnerman shaft (on volume control) .....
	14A76883	Insulator, contact: fibre...
	4S7650	Lockwasher: #6 internal; cad pl .....
	4S7657	Lockwasher: #8 external; cad pl (tone relay mtg) ...
	2S7007	Nut, hex: 8-32 x 1/4; cad pl
	2S7051	Nut, hex: 3/8-32 x 9/16; cad pl (volume cont. mtg) .....
	1X70646	Receptacle, antenna lead-in.
	5S7771	Rivet: .088 x 3/16 steel; nkl pl (miniature tube socket mounting) .....
	5S7706	Rivet: .122 x 1/8 steel; nkl pl .....
	5S7707	Rivet: .122 x 5/32 steel; nkl pl .....
	5S7701	Rivet: .122 x 3/16 steel; nkl pl (vib. socket mtg)
	3S8140	Screw, sheet metal: #8 x 3/16 PKZ plain hex head; cad pl (tuner mtg & on vol. control shaft coupling set-screw) .....

*Part of Tuner ST-60

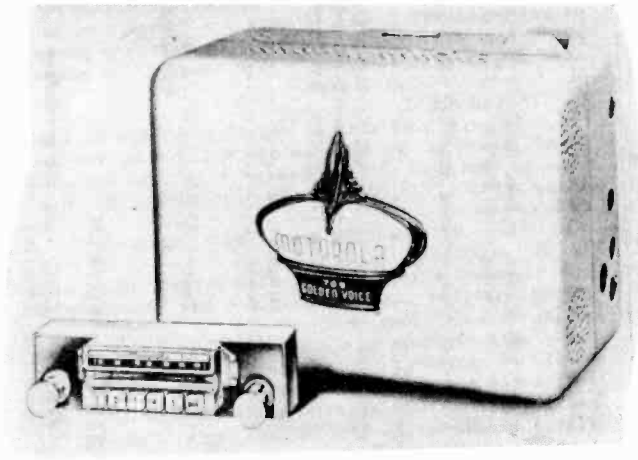
ALIGNMENT

EQUIPMENT REQUIRED

1. A special tool for adjusting the tuner cores. Use Alignment Tool, Motorola Part No. 66A76278.
2. A small screwdriver for IF & RF alignment.
3. An accurately calibrated AM modulated signal generator.
4. A low range output meter.
5. A special dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 1. The 21" coaxial lead needed in its construction is the same type as used for lead-in on Motorola car antennas.

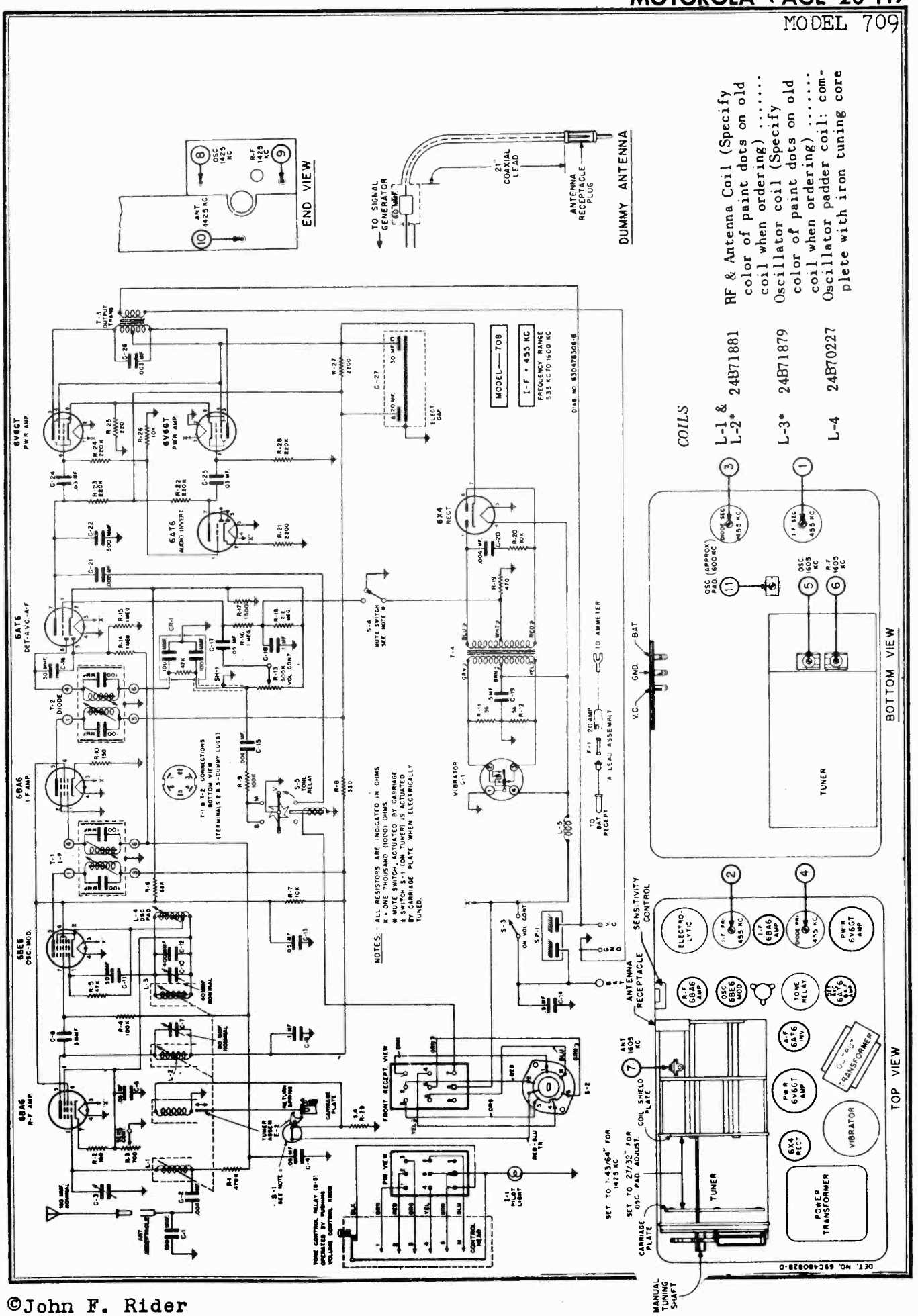
PROCEDURE

1. Remove the front and rear housings. Also remove the shield from the tuner. All adjustments are now exposed.
2. Connect a PM speaker (3.2 ohm VC) to VC and GND. terminals and connect the output meter across the voice coil.
3. Connect a 6 volt storage battery to chassis and BATT. terminal of receiver; turn receiver on and allow it to warm up for a few minutes. Press control head 'M' button to place tuner in manual position. (If a control head is not available, move tuner carriage plate by hand till tuner is in manual position). Set receiver volume control at maximum and tone control to treble (high) position.
4. Sensitivity Control. This control must be set to provide 2 ± 1/2 volts bias on the RF tubes before alignment is started. Measure this voltage between sensitivity control terminal and chassis.
5. For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.
6. IF ALIGNMENT
   A. Connect high side of signal generator through .1 mf capacitor to 6BE6 grid (pin #7) and the low side to chassis. Set generator to 455 Kc and peak adjustments (1, 2, 3 & 4), in this order, for maximum output.
   B. Check alignment by repeating procedure.
7. RF ALIGNMENT
   A. Connect signal generator to antenna receptacle through special dummy antenna (60 mmf capacitor in series with 21" coax lead.)
   B. Move carriage plate (by turning manual tuning shaft) to extreme high frequency position and screw coil cores out so that at least 1-1/8" of all three cores shall be outside of the coil shield can. Set signal generator to 1605 Kc and peak trimmers (5, 6 and 7), in this order.
   C. Move the carriage plate (by turning manual tuning shaft) so carriage plate is spaced exactly 1-43/64" from coil shield plate. Set signal generator to 1425 Kc and adjust coil cores (8, 9 & 10), in this order, for maximum output.
   D. Move carriage plate (by turning manual tuning shaft) so carriage plate is spaced approximately 27/32" from coil shield plate. Leave signal generator connected but turn signal generator power off. Peak oscillator padder core (11) for maximum noise. If the padder core must be moved more than 1/2 turn from its original position, the carriage plate should be moved to extreme high frequency position, the coil cores (8, 9 & 10) should be screwed out so that 1-1/8" of each core is exposed and steps 7A, B, C & D repeated until it is necessary to move the padder core less than 1/2 turn in this step.
   IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores. The slightest inward pressure on the alignment tool may move the tuner carriage and result in inaccurate alignment.
8. SETTING THE SENSITIVITY CONTROL. After alignment is completed, set signal generator to 600 Kc and adjust its output to 1.3 microvolts. Adjust the sensitivity control to provide 1 watt output (1 watt = 1.79 volts on output meter).
9. ANTENNA TRIMMER ADJUSTMENT. Once steps 7A, B, C, D & 8 have been satisfactorily performed, no further adjustment of any alignment screws should be made except to align the antenna trimmer (7) to car antenna after receiver is installed in car. This adjustment should be made with antenna fully extended and receiver set to approximately 1400 Kc. Peak the trimmer for maximum volume of a weak station or background noise between stations.



REF. NO.	PART NO.	DESCRIPTION
HOUSING PARTS		
	13D580534	Escutcheon .....
	15D580580	Housing, front: includes 2 grounding wipers; less escutcheon .....
	15K580697	Housing, rear .....
	38A71874	Knob (automatic tuner station set-up): plastic; with clamp spring .....
	5S7730	Rivet: .122 x 1/8 steel; antique cop. finish .....
	3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; cad pl (escutcheon mtg) .....
	3S7456	Screw, sheet metal: #8 x 1/4 PKA slotted acorn head; antique copper finish (housing screws)
	39K470032	Wiper, grounding .....
ACCESSORIES		
	3A51494	Bolt, 'J' (receiver mtg) ...
	8A4491	Capacitor, generator .....
	9K473161	Lead Assembly, fuse: complete with 20 Amp fuse .....
	1X76859	Lead Assembly, speaker: 2 conductor; 36" long; with pin terminals on one end .....
	4S7653	Lockwasher: 5/16 int-ext; cad pl (receiver mtg) .....
	2S2863	Nut, hex: 5/16-18 x 9/16; cad pl (receiver mtg) .....
	1K75148	Shaft, flexible: with housing; 24" long .....
	50B473118 or	
	50B473696 or	
	50B473697 or	
	50B473783	Speaker: 6" PM; 3.2 ohm VC; less spkr lead ..... Exchange
	6X4141	Suppressor, distributor ....
TRANSFORMERS		
T-1 & T-2	24B76553	Diode or IF, 455 Kc: complete with padding capacitors and tuning iron cores, but less shield .....
T-3	25B472558	Output .....
T-4	25C472586	Power .....
TUNER		
	1X472634	Solenoid Tuner ST-60 .....

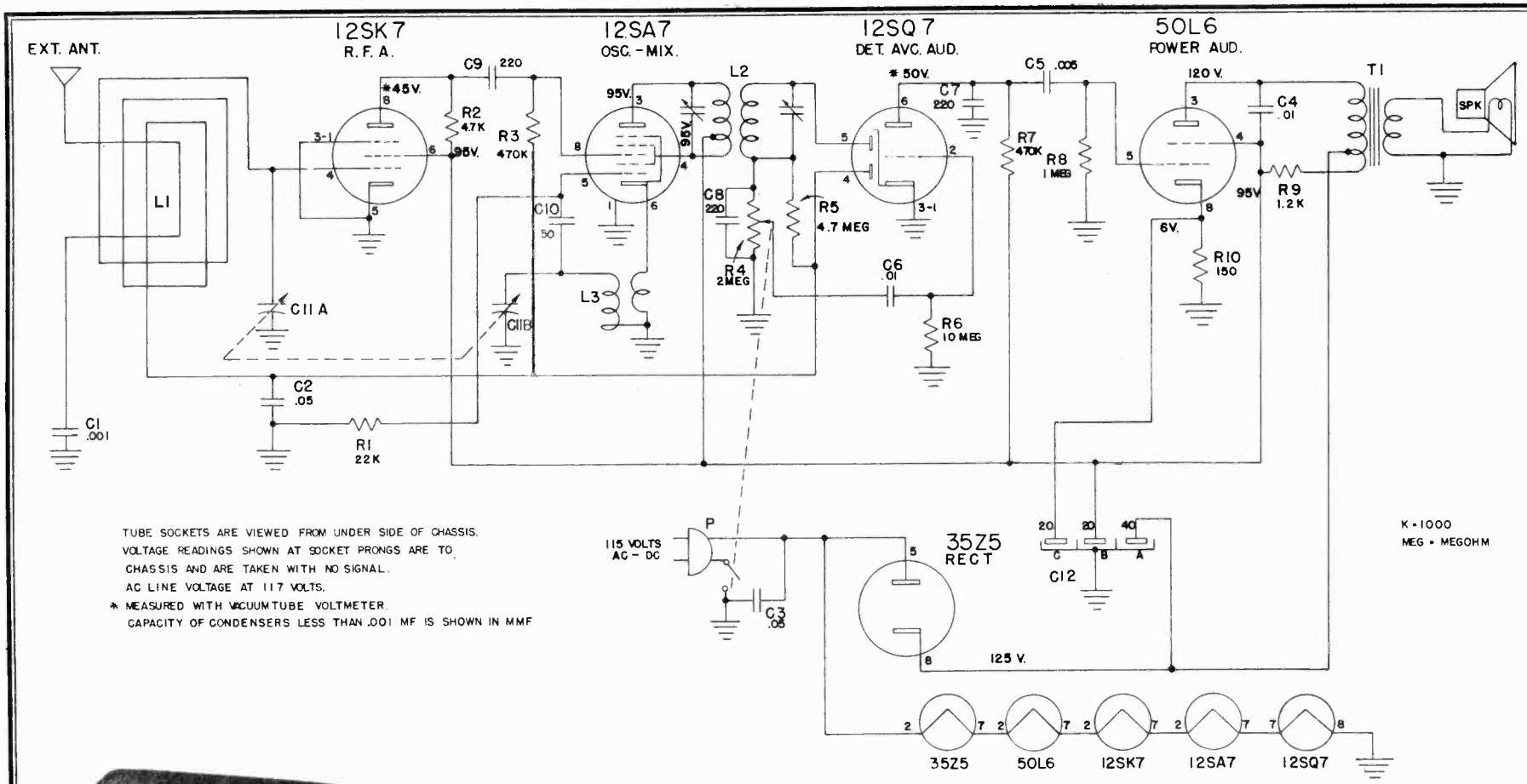
MODEL 709



REPLACEMENT PARTS LIST

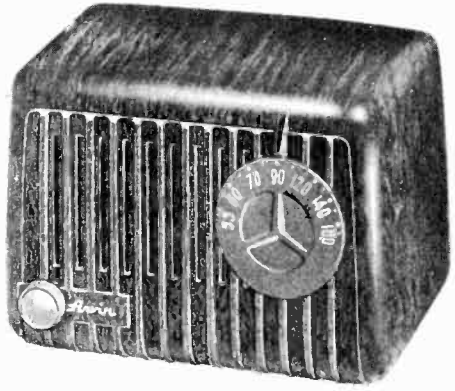
REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	21B77562	Ceramic: 100 mmf 500V .....
C-2*	8A4529	Paper: .006 mf 100V .....
C-3*	20K472613	Trimmer, variable mica: 50 to 180 mmf; includes mounting bracket .....
C-4	8A13514	Paper: .05 mf 100V .....
C-6	8A13514	Paper: .05 mf 100V .....
C-7*	20K472613	Trimmer, variable: mica; 50 to 180 mmf; includes mounting bracket .....
C-8	21K70720	Molded: 5 mmf 500V .....
C-9	8K13166	Paper: .1 mf 400V .....
C-10*	20K472612	Trimmer, variable mica: 30 to 60 mmf; includes mounting bracket .....
C-11	21R6513 or 21K74661	Mica: 50 mmf 300V ..... Ceramic: 50 mmf 300V .....
C-12	21A71872	Ceramic: 400 mmf 5% 500V ...
C-13	8A14791	Paper: .05 mf 400V .....
C-14	8A17028	Paper: .5 mf 100V .....
C-15	8A4529	Paper: .006 mf 100V .....
C-16	21R6513 or 21K74661	Mica: 50 mmf 300V ..... Ceramic: 50 mmf 300V .....
C-17	8A13514	Paper: .05 mf 100V .....
C-18	8A472035	Paper: .1 mf 100V .....
C-19	8A19133	Paper: .5 mf 100V .....
C-20	8A12840	Paper: .006 mf 1600V .....
C-21	8A4736	Paper: .002 mf 400V .....
C-22	21R6639	Mica: 500 mmf 500V .....
C-24	8K71911	Paper: .03 mf 400V .....
C-25	8K71911	Paper: .03 mf 400V .....
C-26	8K13165	Paper: .003 mf 1000V .....
C-27	23A472570	Electrolytic: 30-20 mf/ 400-350V .....
CAPACITOR-RESISTOR		
CR-1	21A472571	Capacitor-Resistor: 100 mmf -47,000 ohms 100 mmf .....
FUSE		
F-1	65K4637	Fuse: 20 Amp (3AG) .....
VIBRATOR		
G-1	48B3333	Vibrator, non-sync: 4-pin ..
PILOT LIGHT		
I-1	65X4151	Bulb: 6-8V; bayonet base; type #51 .....
L-5	24C473954	Choke, hash .....
RESISTORS		
Note: All resistors are 1/2 watt, 20%, insulated carbon type, unless otherwise specified.		
R-1	6R6032	470,000 .....doz.
R-2	6R3992	150 .....doz.
R-3	18K77552	Sensitivity Control: 700 ohms
R-4	6R6075	100,000 .....doz.
R-5	6R6056	47,000 .....doz.
R-6	6R6001	68,000 .....doz.
R-7	6R476060	10,000 2W .....
R-8	6R6010	330 .....doz.
R-9	6R6075	100,000 .....doz.
R-10	6R3992	150 .....doz.
R-11	6R5614	56 10% .....doz.
R-12	6R5614	56 10% .....doz.
R-13	18A480773	Volume Control: 500,000 ohms; with SPST Sw .....
R-14	6R6004	1 Meg .....doz.
R-15	6R6004	1 Meg .....doz.
R-16	6R6004	1 Meg .....doz.
R-17	6R6161	1500 .....doz.
R-18	6R3927	2.2 Meg .....doz.
R-19	6R3949	470 .....doz.
R-20	6R6054	10,000 .....doz.
R-21	6R6069	2,200 10% .....doz.
R-22	6R6015	220,000 .....doz.
R-23	6R6015	220,000 .....doz.
R-24	6R6015	220,000 .....doz.
R-25	6R6389	220 10% 1W .....each doz.
R-26	6R6320	10,000 10% .....doz.
R-27	6R476130	2,200 2W .....
R-28	6R6015	220,000 .....doz.
R-29	17K484497	5.6 10% 1W: wirewound ....each doz.
SWITCHES		
S-1*	1B70944	Solenoid Switch .....
S-2*	40B70952	Selector Switch .....
S-3	-	Power Switch (part of volume cont)
S-4*	40A472644	Mute Switch .....
S-5	1X78040	Type MR6 Tone Relay .....
SHIELD		
SH-1	30K472998	Cable, volume control: 5"long; single cond.....
SPARK PLATE		
SP-1	1X472624	Spark Plate Assembly .....
*Part of Tuner ST-60		
CHASSIS PARTS - MECHANICAL		
	42A4215	Clip, vibrator grounding ...
	58A480774	Coupling, tinnerman shaft (on volume cont) .....
	14A76883	Insulator, contact: fibre ..
	4S7650	Lockwasher: #6 internal; cad pl (terminal strip mtg) .....
	4S7657	Lockwasher: #8 external; cad pl (tone relay mtg) .....
	2S7007	Nut, hex: 8-32 x 1/4; cad pl (tone relay mtg) .....
	2S7051	Nut, hex: 3/8-32 x 9/16; cad pl (volume control mtg) ...
	1X70646	Receptacle, antenna lead-in.
	5S7771	Rivet: .088 x 3/16; steel; nkl pl (tube socket mtg)...
	5S7706	Rivet: .122 x 1/8; nkl pl (sensitivity control mtg)
	5S7707	Rivet: .122 x 5/32; steel; nkl pl (tube socket mtg, terminal strip mtg) .....
	5S7701	Rivet: .122 x 3/16; steel; nkl pl (tube socket mtg, output trans. mtg) .....
	3S8140	Screw, sheet metal: #8 x 3/16 PKZ plain hex head; cad pl (tuner mtg & vol. control shaft coupling setscrew) .....
	3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; cad pl (tuner mtg) .....
	3S3397	Screw, sheet metal: #8 x 5/16 PKZ plain hex head; cad pl (power trans mtg) ..
	47B480768	Shaft & Coupling Assembly (for volume control) .....
	1A71049	Shield and Sleeve Assembly (for T-1 & T-2) .....
	9A70208	Socket, tube: 4-prong (for vibrator) .....
	9A472534	Socket, tube: miniature: 7 prong
	9A6788	Socket, tube: octal .....
	31K86126	Strip, terminal: 2 insulated lugs, #2 mtg .....
	31A472573	Strip, terminal: 2 insulated lugs, #2 mtg .....
	7A472576	Support, volume control shaft alignment .....
	4S7555	Washer, flat: 1/4 x .128 x .033; cad pl (output trans.mtg) .

MODELS 253T, 254T, 255T, 256T; Ch. RE-252



TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS.
VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO CHASSIS AND ARE TAKEN WITH NO SIGNAL.
AC LINE VOLTAGE AT 117 VOLTS.
* MEASURED WITH VACUUM TUBE VOLTMETER.
CAPACITY OF CONDENSERS LESS THAN .001 MF IS SHOWN IN MMF

K = 1000
MEG = MEGOHM



SPECIFICATIONS

FREQUENCY RANGE
- Broadcast ---------- 540-1600 kc
- IF ---------- 455 kc

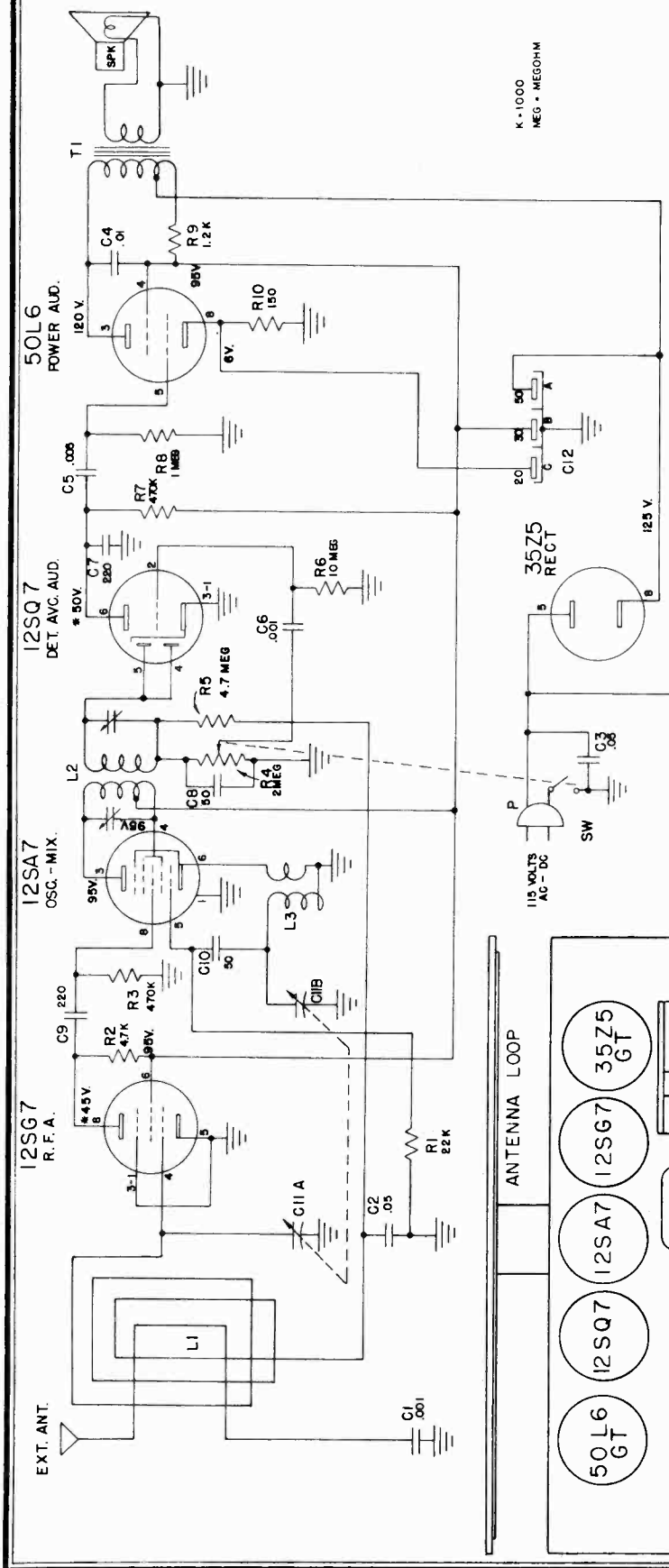
POWER OUTPUT
- Undistorted ---------- 1.2 Watts
- Maximum ---------- 3 Watts
- Plate load ---------- 2000 Ohms

LOUD SPEAKER
- Type: Permanent magnet
- Size: 4 Inch
- Voice coil impedance ---------- 3.2 Ohms

POWER SUPPLY
- 105-125 Volts, AC-DC, 35 Watts

All Models are identical except for Colors, See Chart under Parts list.

MODELS 253T, 254T,
255T, 256T; Ch. RE-252



Circuit Changes

The following changes have been made in the circuit of Chassis RE-252 since the original service bulletin was printed:

1. Resistor R3 is connected from the grid of the 12SA7 tube to chassis. On the schematic diagram of the original bulletin, this was shown connected from the grid to A. V. C.
2. The Electrolytic Condenser C12, Part No. A22015, has been changed from 40-20 mfd., 150 V., 20 mfd., 25 V., to 50-30 mfd., 150 V., 20 mfd., 25 V. Some sets were built with a 20 mfd., 150 V. condenser connected across the B section of the original condenser. When excessive hum or hum modulation is encountered on sets which have the original 40-20 mfd., 150 V., 20 mfd., 25 V. condenser, adding the extra 20 mfd., 150. condenser across the B section will usually correct it.
3. The RF Plate Resistor R2 is changed from ¼ Watt, C20060-472 to 1 Watt, C20103-472.
4. The two diodes in the 12SQ7 tube, socket lugs 4 and 5, are tied together; lug No. 4 was originally connected to A. V. C.
5. The RF tube was changed from 12SK7 to 12SG7 to increase the gain.

MODELS 253T, 254T,
255T, 256T; Ch. RE-252

ALIGNMENT PROCEDURE

A. Connect to 117 V., AC line and turn set on with volume control at full volume.

B. Connect signal generator high side through .05 uf or larger condenser to 12SA7 grid. Connect low side of signal generator to Chassis. Connect output meter across speaker voice coil.

C. Open variable condenser.

D. With signal generator set at 455 Kc, increase output of generator until output is heard in speaker. Adjust IF trimmers until maximum output meter reading is obtained, reducing signal generator output as adjustment progresses so that final adjustment is made with lowest input consistent with good signal to noise ratio.

E. With signal generator connected to a radiating loop and set to 1620 Kc, adjust oscillator trimmer (C11B) on variable condenser until output is maximum. Variable Condenser is to be fully opened during this adjustment.

F. Set signal generator to 1400 Kc and rotate variable condenser until output is maximum. Adjust R. F. trimmer (C11A) on variable, condenser until output increases to a new maximum. Rotate variable condenser slightly to obtain another maximum output. Re-adjust trimmers until output is again a maximum. Repeat this cycle until no further increase in output can be obtained. Final adjustment to be made with a signal generator output at lowest level consistent with good signal to noise ratio.

G. Set signal generator to 1000 Kc and tune radio to maximum output. Adiust variable condenser plates for maximum output.

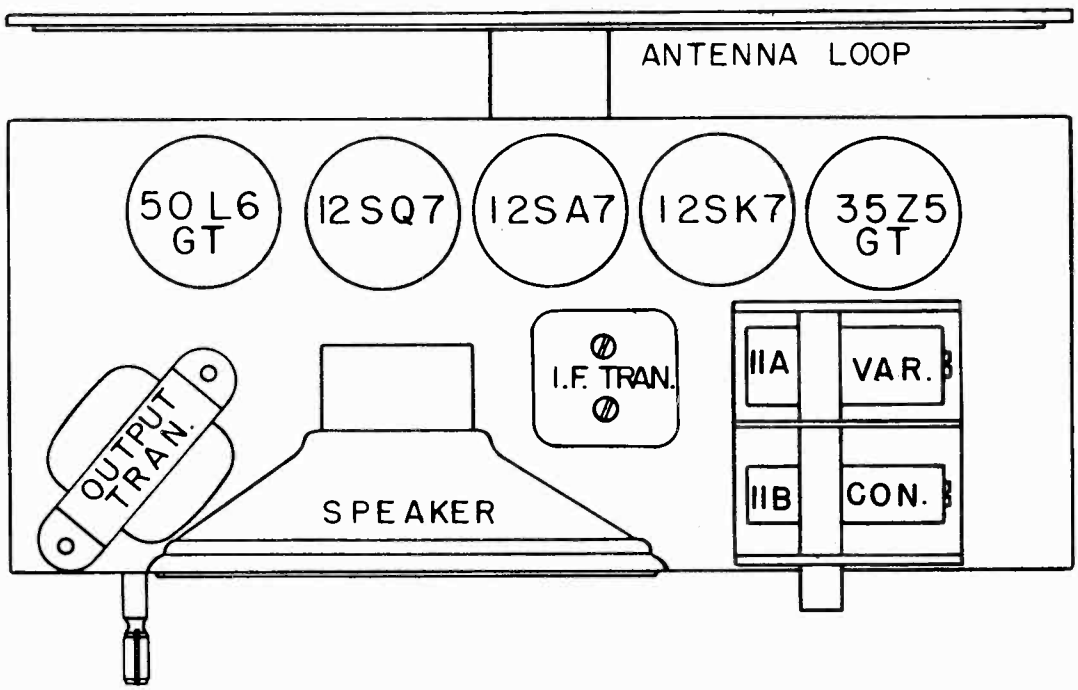
H. Set signal generator to 600 Kc and proceed as in G above.

I. Set signal generator to 540 Kc and make sure that radio will tune to maximum output slightly before variable condenser is fully closed.

J. Recheck alignment and calibration at 1400, 1000, and 600 Kc, making any necessary readjustments.

K. Tune the variable condenser through its entire range to make sure it is not shorted at any point.

TUBE LAYOUT



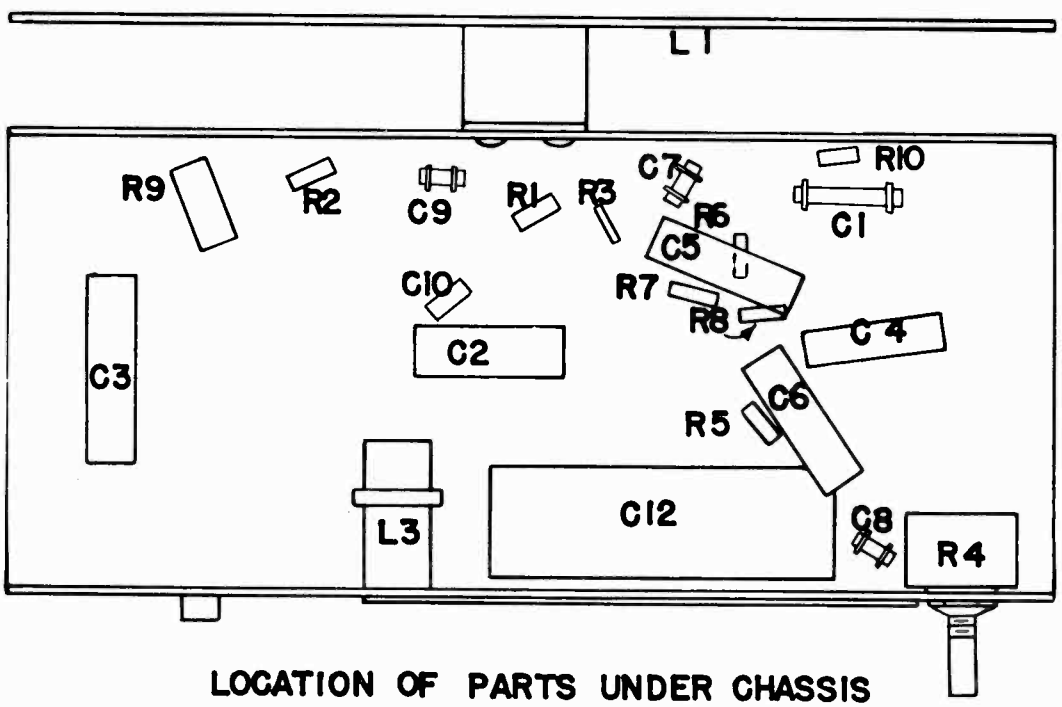
MODELS 253T, 254T, 255T, 256T; Ch. RE-252

PARTS LIST

Sch. Loc.	Part No.	Description
R1	C20060-223	Resistor, 22,000 ohms, ¼ W
R2	C20060-472	Resistor, 4700 ohms, ¼ W
R3, R7	C20060-474	Resistor, 470,000 ohms, ¼ W
R4	C21947	Volume control & switch, 2 megohms
R5	C20060-475	Resistor, 4.7 megohms, ¼ W
R6	C20060-106	Resistor, 10 megohms, ¼ W
R8	C20060-105	Resistor, 1 megohm, ¼ W
R9	C20070-122	Resistor, 1200 ohms, 1 W
R10	C20060-151	Resistor, 150 ohms, ¼ W
C1	C20226-102	Condenser, .001 uf., 350 V., Ceramic
C2	C20067-503	Condenser, .05 uf., 200 V., P. T.
C3	C20068-503	Condenser, .05 uf., 400 V., P. T.
C4	C20068-103	Condenser, .01 uf., 400 V., P. T
C5	C20069-502	Condenser, .005 uf., 600 V., P. T.
C6	C20067-103	Condenser, .01 uf., 200 V., P. T.
C7, C8, C9	C20226-221	Condenser, .00022 uf., 350 V., Ceramic
C10	A21643	Condenser, .00005 uf., 350 V., molded
C11A, B	C21948	Condenser, variable
C12A, B, C	A22015	Condenser, electrolytic, 20-40 uf., 150 V., 20 uf, 25 V.
L1	AC21998-1	Antenna loop and rear cover assembly
L2	AC21999-1	I. F. coil assembly
L3	AC22024	Oscillator coil assembly
T1	AC22014-1	Output transformer assembly
Spk.	C21946	Speaker, 4"
	A20077-3	Grommet, rubber, variable condenser mtg.
	A20258-1	Socket, tube, molded, plain
	*A21993-1( )	Knob, volume
	A22016	Carton, complete with fillers
	*AA22114-1 & 4	Cabinet assembly, walnut and black
	*AA22114-2 & 3	Cabinet assembly, ivory and green
	*AA22115-1 ( )	Knob, tuning
	A19138-1	Spacer eyelet, variable condenser mounting
	B20254-1	Line Cord & Plug assembly

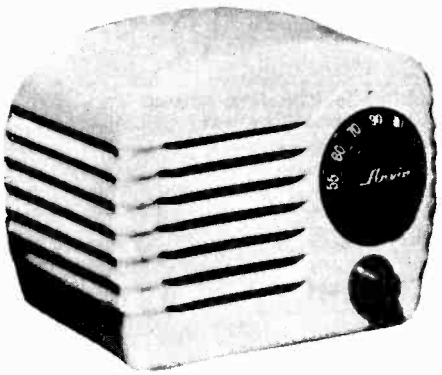
*Be sure to use the proper dash number as outlined in the chart below when ordering colored parts:

MODEL	CABINET	VOLUME KNOB	TUNING KNOB
254-T Walnut	AA22114-1 Walnut	A21993-1 Rust	A22115-1 Rust
255-T Ivory	AA22114-2 Ivory	A21993-2 Old Rose	A22115-2 Old Rose
256-T Green	AA22114-3 Green	A21993-3 Cream	A22115-3 Cream
253-T Black	AA22114-4 Black	A21993-4 Fern Green	A22115-4 Fern Green



LOCATION OF PARTS UNDER CHASSIS

MODEL 341T,
Ch. RE-274



ELECTRICAL AND MECHANICAL SPECIFICATIONS

FREQUENCY RANGE
- Broadcast ---------- 540-1600 kc
- IF ---------- 455 kc

TUBES AND FUNCTIONS
- 12SA7 ---------- Mixer-oscillator
- 12SQ7 ---------- Detector-AVC-AF
- 50L6GT ---------- Output
- 35Z5GT ---------- Rectifier

POWER SUPPLY
- 105-125 Volts AC-DC, 35 Watts

POWER OUTPUT
- Type: Beam tube
- Undistorted ---------- .8 Watts
- Maximum ---------- 2.5 Watts
- Plate load ---------- 2000 ohms

LOUD SPEAKER
- Type: Permanent magnet
- Size: 4 inch
- Voice coil impedance ---------- 3.2 ohms

CHASSIS FEATURES
- Automatic Volume Control
- Underwriters Listed

OPERATING CONTROLS
- 1. Upper knob ---------- Tuning
  - Tuning ratio ---------- 1:1
- 2. Lower knob ---------- ON-OFF & Volume

PHYSICAL DIMENSIONS
- Length ---------- 6½ inches
- Width ---------- 5 inches
- Depth ---------- 4⅝ inches

HOW TO ORDER PARTS

Replacement parts should be ordered by Arvin part number, description and model number of receiver from your Arvin Distributor. The Distributor will order direct from the factory, except in the case of tubes, which should be obtained through regular tube distribution channels.

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
R1	C20060-475	Resistor, 4.7 Megohms ¼ watt
R2	Part of (A21642 Capristor)	Resistor, 1 Megohm
R3	C20060-151	Resistor, 150 ohms, ¼ watt
R4	C20060-223	Resistor, 22,000 ohms ¼ watt
R5	C20060-334	Resistor, 330,000 ohms, ¼ watt
R6	C20060-156	Resistor, 15 megohms ¼ watt
R7	B18587	Volume Control & Sw. 2 megohms
R8	C20060-474	Resistor, 470,000 ohms ¼ watt
R9	A19177	Resistor, 47 ohms 1 watt
R10	C20070-222	Resistor, 2,200 ohms 1 watt
R11	C20060-150	Resistor, 15 ohms ¼ watt
CR-1	A21642	Capristor, .002 uf. condenser & 1 megohm resistor
C1, C2	C22047	Condenser, variable
C3,	C20067-503	Condenser, .05 uf, 200 Volt
C4	C20068-503	Condenser, .05 uf 400 Volt
C6	A21643	Condenser, .00005 uf
C7	A21645	Condenser, .0001 uf
C8	C20068-202	Condenser, .002 uf 400 Volt
C9	C20203-103	Condenser, .01 uf 350 Volt Ceramic
C10	A19176	Condenser, 40 uf 150 Volt
C11		Condenser, 20 uf 150 Volt
C12		Condenser, 20 uf 25 Volt
T1	AC18255-1	Coil Antenna
T2	AC18256-1	Coil Oscillator
T3	AC18257-1	Coil IF
T4	AC18258-1	Output Transformer
	D16511-4	Cabinet, Sandel wood
	C22028-6	Knob Tuning
	A18262-8	Knob Volume
Spk.	C21626	Speaker
	A22058	Carton with fillers
	B20257-1	Line Cord & Plug Ass'y.
	A21992	Compression Spring on Tuning Knob

MODEL 341T,
Ch. RE-274

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection	Across loudspeaker voice coil
Output meter reading to indicate 200 milliwatts (standard output)	0.8 volts
Dummy antenna to be in series with signal generator output	See chart below
Connection of generator ground lead	Floating ground
Generator modulation	30% 400 cycles
Position of Volume Control	Fully clockwise
Position of pointer with variable fully closed	54 on dial

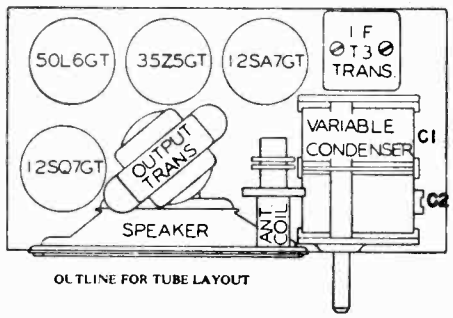
Position of Variable	Generator Frequency	Dummy Antenna	Generator Output Connection	Trimmers Adjuster	Trimmer Function	Approximate Sensitivity
Open	455 Kc	.05 uf	12SA7 Grid (Stator of C-1)	2 trimmers on top of T-3	IF	3000 uv
1400 Kc	1400 Kc	.00005 uf	Antenna lug with Ant. Removed	**C-2	Oscillator	360 uv

**Since the antenna section of the variable has no trimmer, the rotor of the variable should be rocked back and forth on both sides of 1400 Kc while adjusting the oscillator trimmer for maximum output. This is to obtain the combination of rotor and trimmer setting to give perfect tracking of the two sections of the variable condenser and consequently give maximum output.

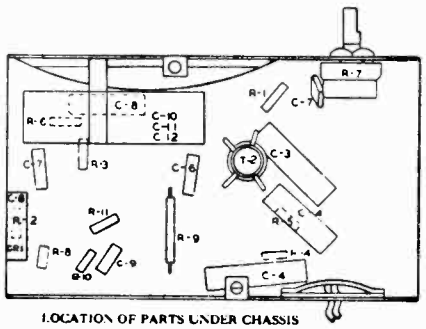
Check sensitivity at 600 Kc. If weak, adjust antenna section plates for maximum output at 600 Kc. Tracking of the condenser at points other than 1400 Kc is accomplished by bending the outside plates on the variable condenser rotor, which are cut for this purpose. When bending plates to track the condenser at any given frequency, keep in mind the fact that this will affect the tracking at all frequencies below the point where the plates are bent. A tuning wand is very helpful in checking the tracking of this condenser, to indicate whether more or less capacity is needed.

The alignment procedure should be repeated stage by stage in the original order for greatest accuracy.

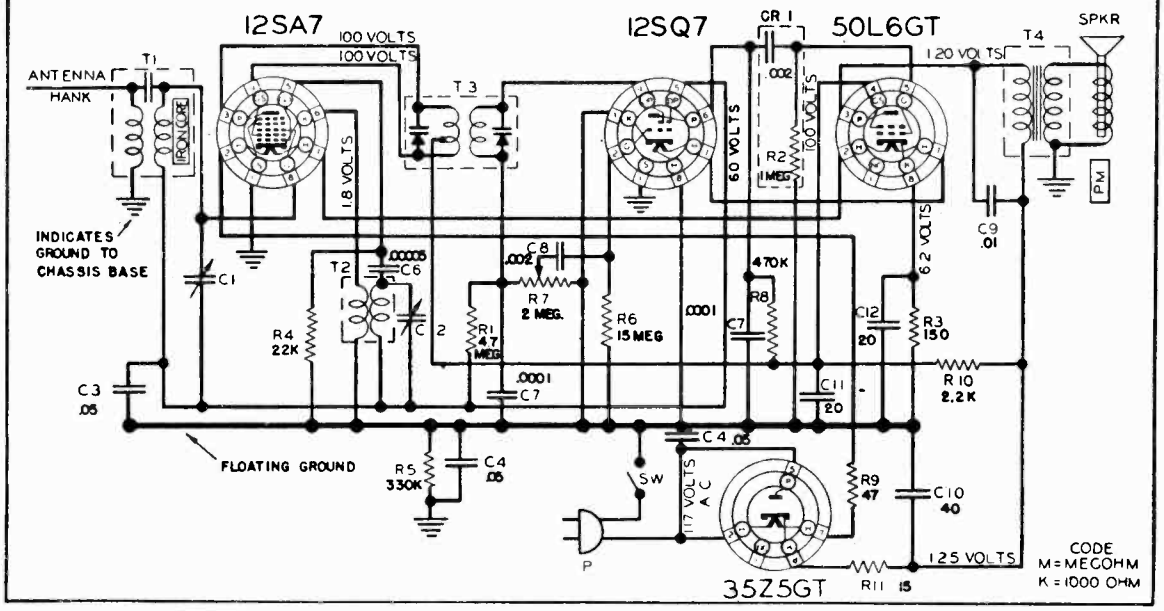
Always keep the output from the test oscillator at its lowest possible value to make the AVC action of the receiver ineffective.



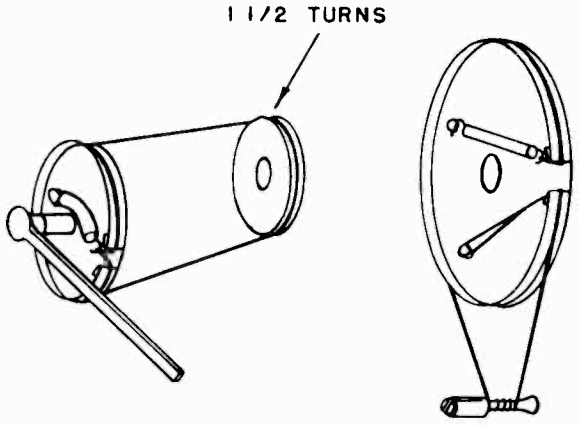
OUTLINE FOR TUBE LAYOUT

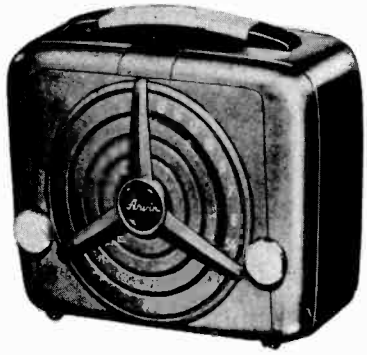

LOCATION OF PARTS UNDER CHASSIS

SCHEMATIC CIRCUIT DIAGRAM



MODELS 350P, 351P; Ch. RE-267





DIAL STRINGING ARRANGEMENT SPECIFICATIONS

FREQUENCY RANGE
- Broadcast ---------- 540-1600 kc
- IF ---------- 455 kc

TUBES AND FUNCTIONS
- 1U4 ---------- RF Amp.
- 1R5 ---------- Mixer-oscillator
- 1U4 ---------- IF Amp.
- 1U5 ---------- DET-AVC AF Amp.
- 3V4 ---------- Output

POWER SUPPLY
1. 90 V. B Battery, Eveready Minimax, No. 490 or Equal.
6. 1½ V. C Size Flashlight Cells, 9 Volts total

Or 115 Volts AC or DC, 16 Watts

POWER OUTPUT
- Undistorted ---------- .2 Watt
- Maximum ---------- .3 Watt
- Plate Load ---------- 10,000 ohms

LOUD SPEAKER
- Type: Permanent magnet
- Size: 4 Inch
- Voice coil impedance ---------- 3.2 Ohms

CHASSIS FEATURES
- Automatic Volume Control
- Built-in Loop
- Underwriters listed.

OPERATING CONTROLS
1. Left knob ---------- On-Off Sw & Volume
2. Right knob ---------- Tuning

PHYSICAL DIMENSIONS
- Length ---------- 9½ inches
- Height ---------- 7½ inches
- Depth ---------- 4¾ inches

Models 350P & 351P are identical except for the Color of the Cabinet and Dial Backing plate. Model 350P is Blue Green, Model 351P is Jade Green.

ALIGNMENT PROCEDURE

A. Connect to 117 V. AC line and turn set on with volume control at full volume.

B. Connect output meter across speaker voice coil. (Output meter reading to indicate 50 MW, standard output is .4 volt).

C. With variable condenser closed set pointer to end mark, (bottom hole) on dial back.

D. Connect signal generator high side through .05 uf or larger condenser to high side of loop or variable condenser. Connect signal generator low side to floating ground of the receiver.

E. Open variable condenser.

F. With signal generator set at 455 Kc., increase output of generator until output is heard in speaker. Adjust I. F. trimmers A1, A2, A3 and A4 until maximum output meter reading is obtained, reducing signal generator output as adjustment progresses so that final adjustment is made with lowest input consistent with good signal to noise ratio. NOTE: If no signal can be heard with signal generator connected at at D above, connect high side to terminal 6 of 1R5 tube, through condenser as at D, and proceed as before.

G. With signal generator at 455 Kc and connected as in D above, adjust R. F. transformer coupling condenser A5 until output meter reading is a minimum. Final adjustment is to be made with high signal input so that an accurate adjustment can be made.

H. With signal generator connected to radiating loop and set to 1620 Kc adjust oscillator trimmer A6 on variable condenser until output is maximum. Variable condenser is to be fully opened during this adjustment.

I. Set signal generator to 1400 Kc and rotate variable condenser until output is maximum. Adjust R. F. trimmer A7 on variable condenser until output increases to a new maximum. Rotate variable condenser slightly to obtain another maximum output. Re-adjust trimmer until output is again a maximum. Repeat this cycle until no further increase in output can be obtained.

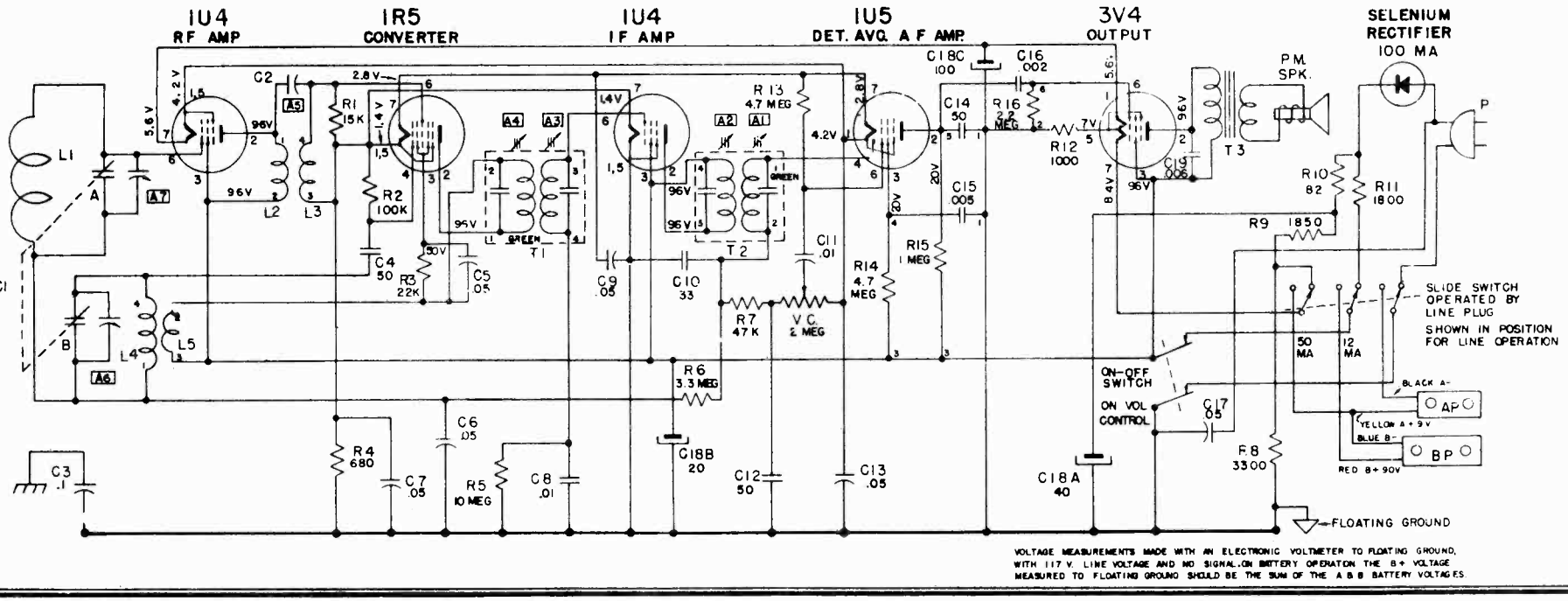
NOTE: When adjusting A7 R. F. Trimmer, make sure the set loop is the same distance from and in the same position with respect to the chassis and batteries as it would be when the set is mounted in the cabinet with the back closed.

J. The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the AVC action of the receiver ineffecctive.
The sensitivity of this set should be approximately 180 uv/meter with 400 cycle 30% modulation and 50 milliwatt (.4 volt) output.

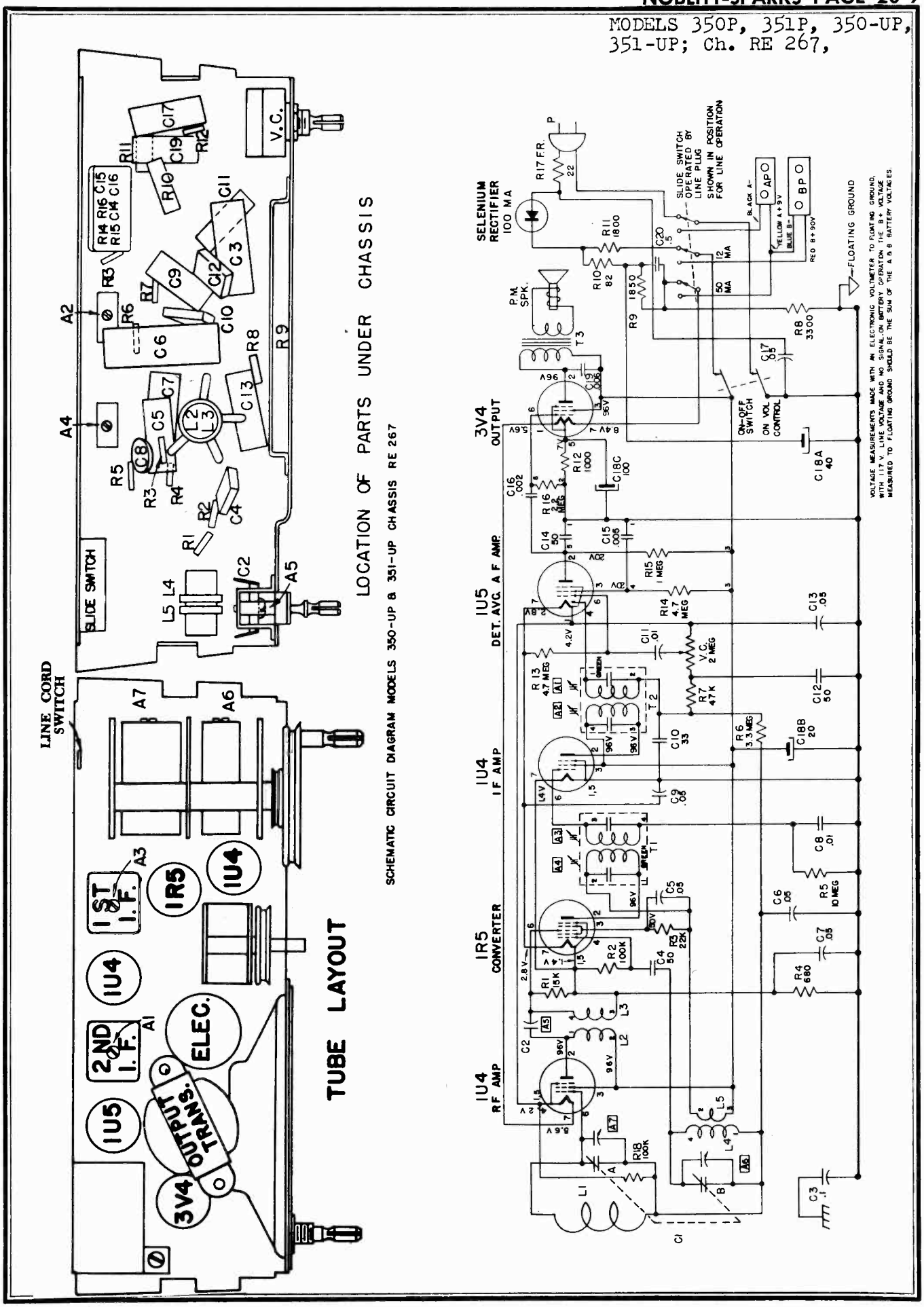
PARTS PRICE LIST FOR 350-P, 351-P

SCHEMATIC LOCATION	PART NO.	DESCRIPTION
R1	C20271-153	Resistor, 15,000 ohm, 1/3 w, 20%
R2	C20271-104	Resistor, 100K, 1/3 w, 20%
R3	C20271-223	Resistor, 22K ohm, 1/3 w, 20%
R4	C20271-681	Resistor, 680 ohm, 1/3 w, 20%
R5	C20271-106	Resistor, 10 meg., 1/3 w, 20%
R6	C20271-335	Resistor, 3.3 meg., 1/3 w, 20%
R7	C20271-473	Resistor, 47K, 1/3 w, 20%
R8	C20060-332	Resistor, 3300 ohm, 1/4 w, 20%
R9	A21816	Resistor, 1850 ohms, 10 w, 10%
R10	C22336-820	Resistor, 82 ohm, 2 w, 20%
R11	C20070-182	Resistor, 1800 ohm, 1 w, 20%
R12	C20271-102	Resistor, 1,000 ohm, 1/3 w, 20%
R13	C20271-475	Resistor, 4.7 meg., 1/3 w, 20%
R14, R15, R16		
C14, C15, C16	A22257	Audio Coupling Unit
VC	C22253	Volume Control & Switch, 2 meg.
C1	AC22277-1	Variable Condenser Assembly
C2	A20275	Trimmer, 8-75 uuf,
C3	C20273-104	Condenser, P. T., .1 uf, 400 v
C4, C12	C20065-500	Condenser, Mica, 50 uuf., 500 v
C5, C7, C9		
C13, C17	C20272-503	Condenser, P. T., .05 uf., 200 v
C6	C20068-503	Condenser, P. T., .05 uf., 400 v
C8	A22295	Disc Ceramic Capacitor, .01 uf.
C10	C20065-330	Condenser, Mica 33 uuf, 500 v.
C11	C20272-103	Condenser, P. T., .01 uf., 200 v
C18A, B, C	A21815	Condenser, Electrolytic, 40-20 mfd., 150 v. 100 mfd., 10 v.
C19	C20273-602	Condenser, P. T., .006 uf., 400 v.
L1	AD22258-1	Antenna Loop & Cabinet Back Assembly, Blue-Green
L1	AD22258-2	Antenna Loop & Cabinet Back Assembly, Jade-Green
L2, L3	AC22256-1	R. F. Transformer Assembly
L4, L5	AC22255-1	Oscillator Coil Assembly
T1	C21797-2	I. F. Transformer, First
T2	C21797-5	I. F. Transformer, Second
T3	AC22254-1	Output Transformer Assembly
	C20207-2	Selenium Rectifier, 75 m. a.
P	B20246-2	Line Cord & Plug
	A21051	Slide Switch
AP	A21861	"A" Battery Cable & Terminal Strip
Spk	C22241	Speaker with Transformer Bracket
BP	A22269	"B" Battery Cable & Terminal Strip
	A19361	Hair Pin Clip
	A20243-1	Socket, Unshielded
	A20243-3	Socket, Shielded
	A21277	Dial Pointer Pulley
	C21767-1	Spring Latch
	D21786	Chassis Bottom Cover
	A21792	Spring Clip Mtg. I. F.'s)
	A21801	Line Cord Hook (2 req.)
	A21802	Spring Hinge (Set of 2)

SCHEMATIC LOCATION	PART NO.	DESCRIPTION
	A21838	Carton Complete with Fillers
	A21852	Electrolytic, Mtg. Wafer
	A22245	Dial Pointer Shaft Bracket
	A22246	Dial Pointer Shaft
	A22247	Tuning Shaft & Trimmer Bracket
	C22248	Rectifier Mt. Bracket
	C22249	Rectifier Bracket Cover
	A22250	Tuning Shaft
	C22252	Antenna Loop Shield
	C22264	Dial Scale Backing Plate
	C22267	Pointer
	AC22268-1	Battery Clip Assembly
	AC22270-1	Handle Assembly
	A22286-1	Knob, (2 req.)
	A22297	Battery Tube (3 req.)
	AA22380-1	Cabinet Assembly, Blue-Green
	AA22380-2	Cabinet Assembly, Jade-Green



MODELS 350P, 351P, 350-UP, 351-UP; Ch. RE 267,



MODELS 350-UP, 351-UP;
Ch. RE 267,

SUBJECT: Circuit and Model Number Changes.

Change covered in this supplement.

1. Circuit change to reduce hum, prevent oscillation and improve reception.
2. Model number changes (350-UP and 351-UP) to comply with Underwriters' Lab requirements.

The following changes were made in production and can be used as repair measures on sets of earlier production now in the field.

Hum Reduction.

The 100 mfd. 10 V. section of the Electrolytic Condenser was changed from the end of the 3V4 filament (Pin #1) to the center tap of the 3V4 filament (Pin #5) and a .5 mfd, 200 V. Condenser (Part #A22388) was added across the 1850 ohm metal clad 10 watt Resistor, R9. This Resistor is mounted on the front chassis flange.

To make this change in the field, remove the two yellow wires from the 100 mfd. 10V. lug on the Electrolytic Condenser (C18C). Connect these two wires together, placing the joint so that it can not touch anything. Then connect a piece of wire from this condenser lug to #5 pin of the 3V4 socket. Connect .5 mfd. 200 V. Condenser (Part #A22338, chosen for its small size due to space limitations) to the two lugs on the metal clad resistor.

Oscillation Prevention.

The AVC characteristics were modified to prevent oscillation and improve reception, by adding a 100,000 ohm, 1/3 watt Resistor, R18 (Part #C20271-104) connected from Pin #1 of 1U4 R.F. amplifier to the lug on the variable condenser mounting screw (AVC).

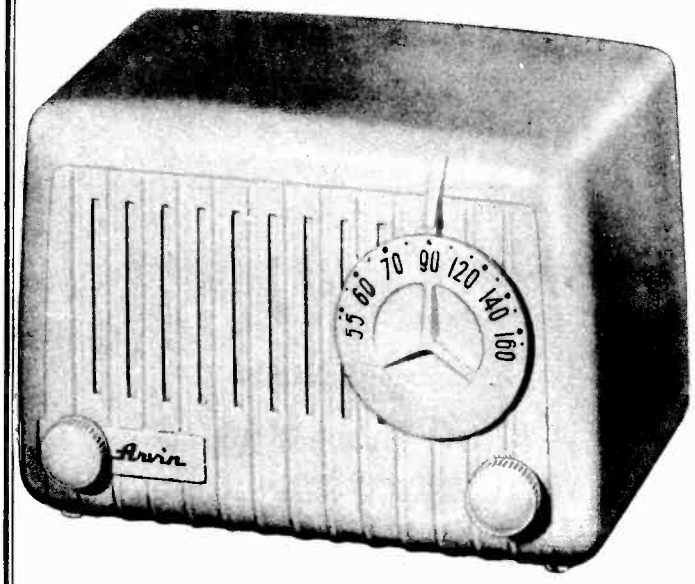
Model Number Changes.

A 22 ohm fusing resistor was added in series in the high side of the AC line to the Selenium Rectifier, to comply with Underwriters' Lab. requirements. All sets having this change will be designated as Model 350-UP or 351-UP.

Precautions which should be taken to prevent excessive hum and audio feed back.

1. See that the AC lead along back chassis flange is dressed along the edge of the chasis flange, as far away from the bottom end of the I. F. transformer and associated leads as possible.
2. See that the audio coupling condenser connected to center lug on the volume control is separated as much as possible from the output transformer leads, and the black molded 2 watt, 82 ohm resistor, R10.
3. See that the output transformer leads are not behind the speaker near the 1U5 tube.

MODELS 356T, 357T;
Ch. RE-273



SPECIFICATIONS

FREQUENCY RANGE

Broadcast	540-1600 kc
IF	455 kc

TUBES AND FUNCTIONS

12SA7	Mixer-oscillator
12SK7	IF amp.
12SQ7	DET-AVC AF Amp.
50L6GT/G	Output
35Z5GT/G	Rectifier

LOUD SPEAKER

Type: Permanent magnet
Size: 4 Inch
Voice coil impedance ---------- 3.2 Ohms

CHASSIS FEATURES

Automatic Volume Control
Built-in Loop

POWER SUPPLY

105-125 Volts, AC-DC, 35 Watts

POWER OUTPUT

Undistorted	1.2 Watts
Maximum	3 Watts
Plate load	2000 Ohms

OPERATING CONTROLS

1. Left knob ---------- ON-OFF Sw and Volume
2. Right knob ---------- Tuning

PHYSICAL DIMENSIONS

Length	8¾ inches
Height	6 inches
Depth	5¾ inches

Models 356T & 357T are identical except for Color, 356T is Sandalwood, 357T is Willow Green.

POSITION OF POWER CORD PLUG

On AC, the power cord plug should be tried in both its possible positions in the receptacle, and left in the position that gives least hum. On DC, the receiver will work in only one position of the plug in its receptacle.

THE ANTENNA

This receiver has a built-in loop which gives satisfactory reception in most locations. If the receiver is located some distance from a broadcasting station, or where the electrical interference is high, an outside antenna connected to the pickup lead on the loop, will improve reception.

This receiver is designed to operate without a ground connection and no attempt should be made to use one.

ALIGNMENT PROCEDURE

A. Connect to 117 V., AC line and turn set on with volume control at full volume.

B. Connect signal generator high side through .05 uf or larger condenser to 12SA7 grid. Connect low side of signal generator to Chassis. Connect output meter across speaker voice coil.

C. Open variable condenser.

D. With signal generator set at 455 Kc, increase output of generator until output is heard in speaker. Adjust IF trimmers A1, A2 & A3 until maximum output meter reading is obtained, reducing signal generator output as adjustment progresses so that final adjustment is made with lowest input consistent with good signal to noise ratio.

E. With signal generator connected to a radiating loop and set to 1620 Kc, adjust oscillator trimmer A4 on variable condenser until output is maximum. Variable Condenser is to be fully opened during this adjustment.

F. Set signal generator to 1400 Kc and rotate variable condenser until output is maximum. Adjust R. F. trimmer A5 on variable, condenser until output increases to a new maximum. Rotate variable condenser slightly to obtain another maximum output. Re-adjust trimmers until output is again a maximum. Repeat this cycle until no further increase in output can be obtained. Final adjustment to be made with the signal generator output at lowest level consistent with good signal to noise ratio.

G. Set signal generator to 1000 Kc and tune radio to maximum output. Adjust variable condenser plates for maximum output.

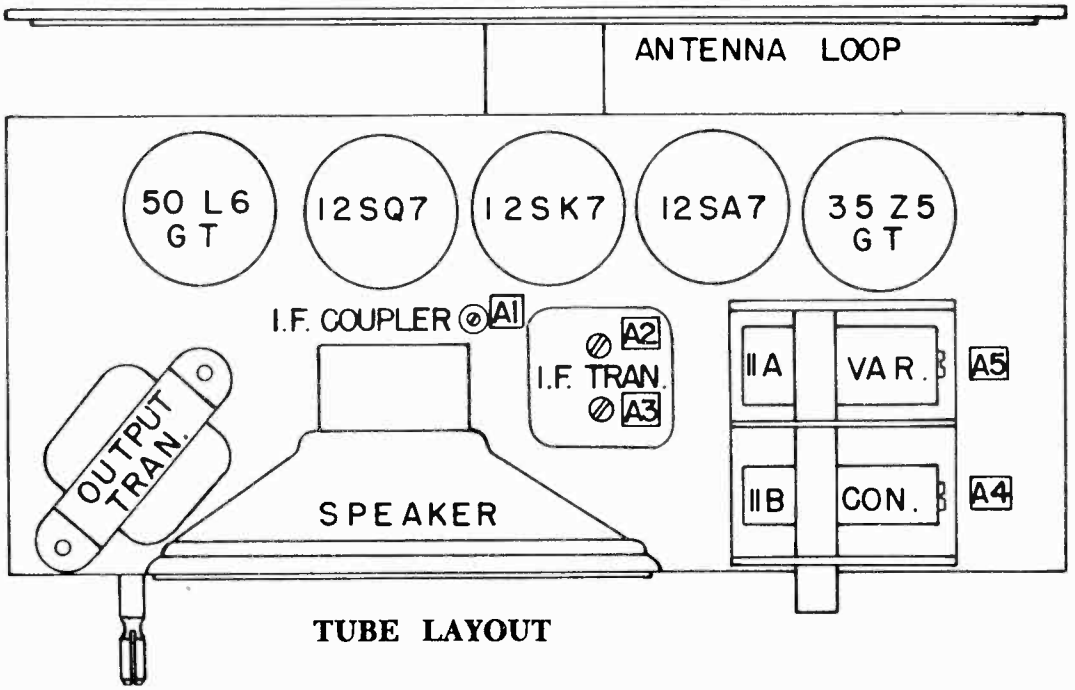
H. Set signal generator to 600 Kc and proceed as in G above.

I. Set signal generator to 540 Kc and make sure that radio will tune to maximum output slightly before variable condenser is fully closed.

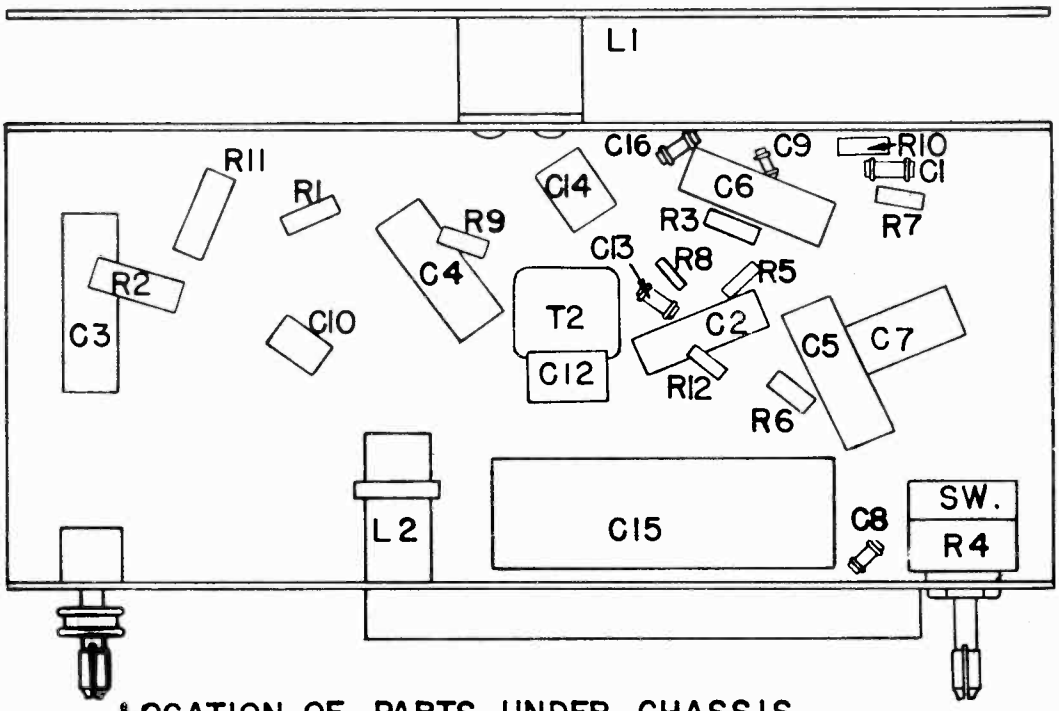
J. Recheck alignment and calibration at 1400, 1000, and 600 Kc, making any necessary readjustments.

K. Tune the variable condenser through its entire range to make sure it is not shorted at any point.

MODELS 356T, 357T;
Ch. RE-273



TUBE LAYOUT

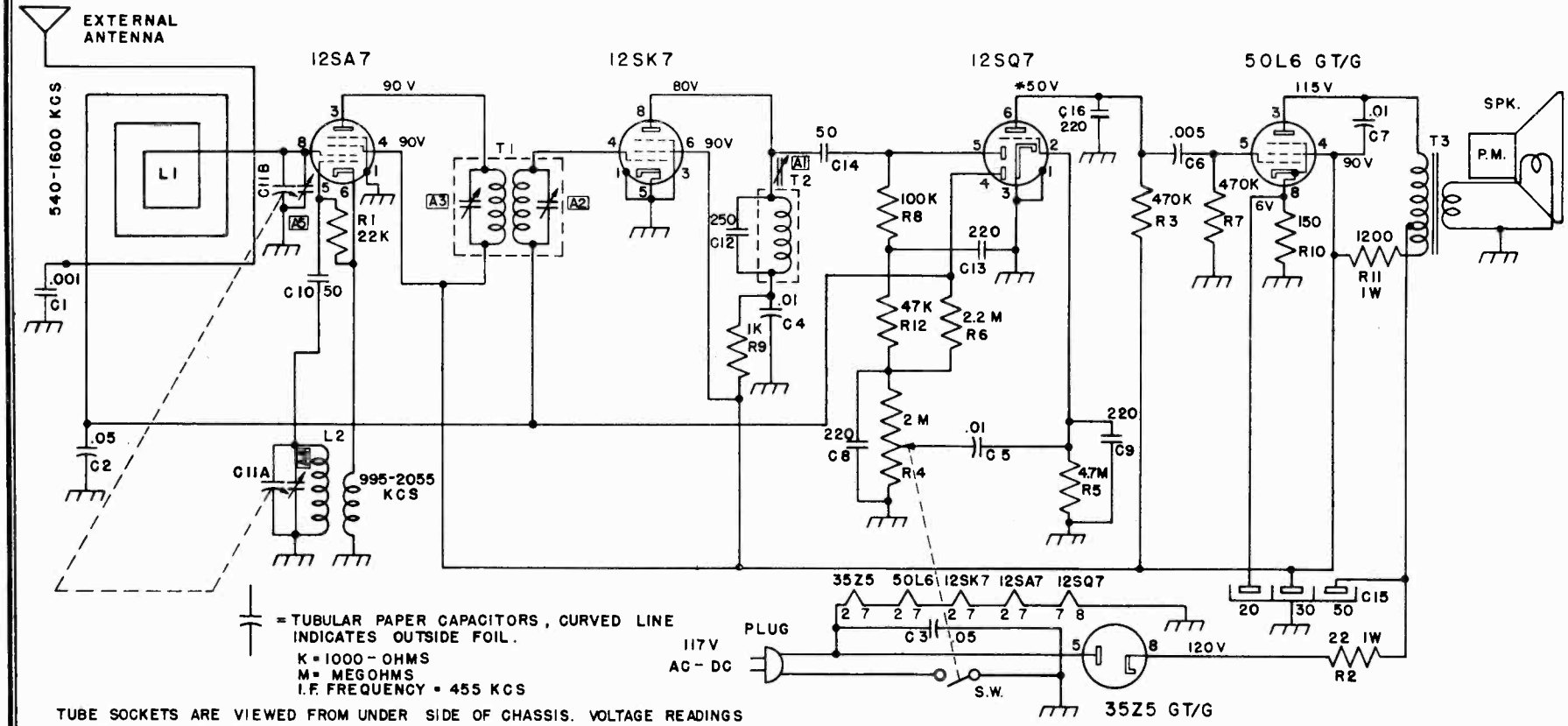


LOCATION OF PARTS UNDER CHASSIS

PARTS LIST FOR 356-T AND 357-T

Sch. Loc.	Part No.	Description
R1	C20060-223	Resistor, 22,000 ohms, ¼ watt
R2	C20070-220	Resistor, 22 ohms, 1 watt
R3, R7	C20060-474	Resistor, 470,000 ohms, ¼ watt
R4	C21947	Volume Control and Switch, 2 meg.
R5	C20060-475	Resistor, 4.7 megohms, ¼ watt
R6	C20060-225	Resistor, 2.2 megohms, ¼ watt
R8	C20060-104	Resistor, 100,000 ohms, ¼ watt
R9	C20060-102	Resistor, 1,000 ohms, ¼ watt
R10	C20060-151	Resistor, 150 ohms, ¼ watt
R11	C20070-122	Resistor, 1,200 ohms, 1 watt
R12	C20060-473	Resistor, 47,000 ohms, ¼ watt
C1	C20226-102	Condenser, .001 uf, 350 V., Ceramic
C2	C20067-503	Condenser, .05 uf, 200 V., P.T.
C3	C20068-503	Condenser, .05 uf, 400 V., P.T.
C4, C5, C7	C20068-103	Condenser, .01 uf, 400 V., P.T.
C6	C20069-502	Condenser, .005 uf, 600 V., P.T.
C8, C9, C13, C16	C20226-221	Condenser, .00022 uf, 350 V., Ceramic
C10	A21643	Condenser, .00005 uf, 350 V., Molded
C11A, C11B	AC22694-1	Variable Condenser Assembly
C12	C20325-251	Condenser, .00025 uf, 500 V.
C14	C20065-500	Condenser, .00005 uf, 500 V.
C15A, C15B, C15C	C22015	Condenser, Electrolytic, 50-30 uf, 150 V. 20 uf, 25 V
L1	AC21998-1	Antenna Loop and Rear Cover Assy..
L2	AC22024	Oscillator Coil Assembly
T1	AC22695-1	1st I-f Transformer Assembly
T2	A22616	I-f Coupler
T3	AC22134-1	Output Transformer Assembly

Sch. Loc.	Part No.	Description
Spk.	C21946	Speaker, 4" P.M.
	A22164	Speaker Baffle-Ring (Rubber)
	AA22668-1	Tuning Shaft Assembly
	A20077-3	Grommet, Rubber, Variable Condenser Mtg.
	A20258-1	Socket, Tube, Molded, Plain
	A19138-1	Spacer Eyelet, Variable Condenser Mtg.
	B20254-1	Line Cord and Plug Assembly
	A21993-5	Knob, Volume and Tuning
	AA22115-5	Knob, Dial for 356-T
	AA22115-6	Knob, Dial for 357-T
	AA22114-5	Cabinet Assembly, Sandalwood for 356-T
	AA22114-6	Cabinet Assembly, Willow Green for 357-T
	A22016	Carton Complete with fillers



TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS. VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO CHASSIS AND ARE TAKEN WITH NO SIGNAL. AC LINE VOLTAGE AT 117 VOLTS.

* MEASURED WITH VACUUM TUBE VOLTMETER. CAPACITY OF CONDENSERS LESS THAN .001 MF IS SHOWN IN MMF.

MODELS 360TFM, 361TFM;
Ch. RE-260

SPECIFICATIONS

FREQUENCY RANGE
- Broadcast (AM) ..... 540-1600 kc
- IF ..... 455 kc
- FM ..... 88-108 mc
- IF ..... 10.7 mc

TUBES AND FUNCTIONS
- 12AT7 ..... FM Converter
- 12BE6 ..... AM Converter
- 12BA6 ..... FM-IF Amp.
- 12BA6 ..... AM-FM, IF Amp.
- 19T8 ..... FM-AM DET, IST Audio AVC
- 50L6 ..... Output

POWER OUTPUT
- Undistorted ..... 2.5 Watts
- Maximum ..... 3 Watts
- Plate load ..... 2000 Ohms

LOUD SPEAKER
- Type: Permanent magnet, 1.47 oz. Alnico 5
- Size: 5 Inch
- Voice coil impedance ..... 3.2 Ohms

CHASSIS FEATURES
- Automatic Colume Cotrol
- Built-in Loop
- Underwriters' Listed
- Bass Boost Circuit

OPERATING CONTROLS
1. Left knob ..... ON-OFF Sw and Volume
2. Right knob ..... Tuning
3. Center knob ..... Band Sw

PHYSICAL DIMENSIONS
- Length ..... 12 11/16 inches
- Height ..... 7 1/8 inches
- Depth ..... 7 11/16 inches

Models 360TFM is in a walnut cabinet. Model 361TFM is in a Willow Green cabinet. The Chassis is the same in both models.

ALIGNMENT PROCEDURE

AM

1. Plug set into 117 V. power source, turn volume control full on and band switch to AM, (left).
2. Connect output meter across speaker voice coil.
3. Connect signal generator high side through .05 mfd. condenser to converter grid and generator ground lead to receiver floating ground. Open tuning condenser. ator to test loop. Set signal generator to 1650 Kc. Tune trimmer A5 on oscillator section of tuning condenser for maximum output.
4. Close tuning condenser and set pointer at end mark of dial. Open tuning condenser. Connect signal generator to 1650 Kc. Tune trimmer A5 on oscillator section of tuning condenser for maximum output.
5. Set signal generator to 1400 Kc. Adjust tuning shaft until maximum output is obtained. Tune antenna trimmer A6 on tuning condenser for greatest output. Reset tuning shaft until output is again a maximum. Retune antenna trimmer. Repeat this cycle of operations at 1400 Kc until no further increase of output can be obtained. Keep generator output at a low value to prevent detuning by A. V. C. action.
6. Set signal generator to 600 Kc. Adjust tuning shaft for maximum output. Adjust tuning condenser plates for maximum output.
7. Check sensitivity at 1000 Kc. If sensitivity is too low, tuning condenser plates can be adjusted for tracking at this frequency. If this adjustment is made, tracking at 600 Kc must be readjusted.
8. Check coverage and calibration after alignment. Coverage should include 535 and 1650 Kc. Calibration should be such that pointer covers some part of calibration mark. If coverage and/or calibration are not correct, plates of tuning condenser can be adjusted. Calibration check points are 1400, 1000 600 and 540 Kc. If oscillator plates are adjusted, tracking of antenna section must be rechecked and corrected if necessary.
9. Check setting of trimmers on tuning condenser. Trimmer adjustments must not be extremely tight nor so loose as to be noisy or vibrate.
10. After alignment, check for noise due to condenser plates touching or pointer touching dial as tuning shaft is turned through the full tuning range.
11. The sensitivity of this set should be approximately 500 uv/m with 400 cycles, 30% modulation and 200 milliwatts, (.8 volt output.

FM

1. Turn band switch to FM, (right).
2. Connect (FM) I.F. generator to the second 12BA6 I.F. amp. grid, (lug #1) through the .01 uf mica dummy. Connect oscilloscope across volume control. With 150 Kc deviation 10.7 on the I. F. generator and the same audio voltage used as horizontal sweep on the scope, adjust the ratio detector transformer slugs A7-A8 for the characteristic "S" curve (See Fig. 1), with maximum vertical height on the scope. After this adjustment the top slug of the ratio detector should not be moved during the rest of the alignment.
3. Connect I.F. generator to mixer grid through .01 mica dummy. Using 23 Kc deviation 10.7 Mc adjust 10.7 Mc I. F. transformer slugs A9, A10, A11 and A12 for maximum output. Maximum output may be indicated by maximum vertical height on the scope or maximum voltage on a standard output meter across the voice coil of the receiver. After the two I.F. transformers have been aligned the bottom slug A8 of the ratio detector should also be peaked.
   The characteristic "S" curve of the complete I.F. channel should be checked by applying a 10.7 Mc signal with 150 Kc deviation to the mixer grid and observing the "S" curve on the scoke. It should not be very much different from that observed in step 2.
4. Connect R.F. (FM) generator (88 to 108 Mc) to the antenna terminals through the standard 300 ohm dummy (150 ohm in each side of generator leads). Use R.F.generator with 23 Kc deviation. With the variable condenser completely open and S.G. tuned to 108.5 Mc adjust oscillator trimmer A13 small ceramic trimmer) for maximum reading on output meter.
   Then tune receiver to low end of band (variable completely closed) and S.G. to 87.5 Mc. If the receiver does not tune to this frequency the FM oscillator coil L4 will either have to be squeezed together or lengthened to cover the band, (squeezing lowers and lengthening raises the frequency). Any change in the coil will have to be compensated by the trimmer at the high end of the band.
5. With the same S.G. connections as per paragraph 4 tune S.G. and set to 105 Mc. Tune R.F. trimmer A14 for maximum output at the same time rock variable back and forth through the frequency. (Rocking is necessary because slight oscillator pulling causes erroneous maximum readings).
   Tune S.G. and set the 90 Mc. Adjust R.F. coil L3 length for maximum output by squeezing or lengthening. Any change in the coil will have to be compensated at 105 Mc by the R.F. trimmer A14.
6. After steps 4 and 5 are finished check calibration and band coverage. Steps 4 and 5 may have to be repeated if set is off calibration. Band coverage should be 87.5 Mc to 108.5 Mc. Sensitivity should be approximately 200 uv at 105 Mc, 98 Mc and 90 Mc.

PARTS LIST FOR 360-361 TFM

SCHEMATIC LOCATION	PART NO.	DESCRIPTION
R1	C20060-470	Resistor, 47 ohms, ¼ w, 20%
R2, 4, 13	C20060-223	Resistor, 22 K ohms, ¼ w, 20%
R3	C20060-150	Resistor, 15 ohms, ¼ w, 20%
R5, 16, 17	C20060-474	Resistor, 470 K, ¼ w, 20%
R6, 7	C20060-102	Resistor, 1,000 ohms, ¼ w, 20%
R8, 11, 12	C20060-105	Resistor, 1 meg., ¼ w, 20%
R9, 15	C20060-104	Resistor, 100 K ohms, ¼ w, 20%
R10	C20060-221	Resistor, 220 ohms, ¼ w, 20%
R14	C20060-475	Resistor, 4.7 meg., ¼ w, 20%
R18	C20060-151	Resistor, 150 ohms, ¼ w, 20%
R19	C22336-561	Resistor, Wire-Wound, 560 ohms, 2 w, 10%
R20	C20060-222	Resistor, 2200 ohms, ¼ w, 20%
R21	C20060-471	Resistor, 470 ohms, ¼ w, 20%
R22	C20103-220	Resistor, 22 ohms, 1 w, 20%
R23, 25	C20060-334	Resistor, 330 K ohms, ¼ w, 20%
R24	C21554	Volume Control & Switch, 500 K
R26	C22336-101	Resistor, Wire-Wound, 100 ohms, 2 watts, 10%
C1, 2	C20203-500	Condenser, Ceramic, 50 uuf, 350 v.
C3	A20238-4	Condenser, 2.2 uuf.
C4, C27	C20067-503	Condenser, P. T., .05 uf., 200 v.
C5	C20065-500	Condenser, Mica, 50 uuf, 500 v.
C6	C20205-5	Condenser, N750, 50 uuf, 500 v.
C7, 8, 11, C13, 14, 15, C16, 17	A21674	Disc Ceramic Capacitor, .005 uf.
C9	A22307	Condenser, N500, 5-20 uuf.
C10, 21, 22, 37	C20203-221	Condenser, Ceramic, 220 uf., 350 v.
C12, 35, 36	A22295	Disc Ceramic Capacitor, .01 uf.
C18, 29, 30	C20068-503	Condenser, P. T., .05 uf., 400 v.
C19, C43	C20203-101	Condenser, Ceramic, 100 uuf., 350 v.
C20	C20067-302	Condenser, P. T., .003 uf., 200 v.
C23	A22388	Condenser, P. T., .5 uf., 200 v, + 30%, — 10%
C24, 26	C20068-103	Condenser, P. T., .01 uf., 400 v.
C25	C20068-502	Condenser, P. T., .005 uf., 400 v.
C28	C20203-501	Condenser, Ceramic, 500 uuf., 350 v.
C31	A22308	Condenser, Electrolytic, 50-80 uf., 150 v.
C32, 33, 34	A20281-1	Condenser, Herlic Dual, .004 uf
C38	AD22324-1	Condenser, Variable, Assy.
C39	C20203-102	Condenser, .001 uf, 350 V.
C40, 41	A20238-3	Condenser, 1.5 uuf.
C42	A21675	Condenser, Electrolytic, 30 uf., 150 v.
L1	AD22316-1	Antenna Loop Assy.
L2	AC22329-1	Oscillator Coil Assy. AM
L5, 6, 7 L8, 9, 10, 11, 12	A21673	R. F. Choke, 14 u. h., Iron Core
	AA21444-1	High Frequency Choke
T1, 2	C22353	I. F. Transformer, F. M., 10.7 Mc
T3	AD22319-1	F. M. Ratio Detector Transformer
T4, 5	C22352	I. F. Transformer, A. M., 455 Kc
T6	AC22320-1	Output Transformer Assy.
SR	C20207-3	Selenium Rectifier, 150 M. A.
BS	C22311	Band Switch
Spk	C22323	Speaker, 5" P. M., 3.2 ohm Voice Coil
PS1	AA22345-1	F. M. Parasitic Suppressor
PS2	AA22334-1	A. M. Parasitic Suppressor
	A18254-1	Socket, Wafer Plain
	A19361	Hair Pin Clip
	B20138-14	Line Cord & Plug
	A20243-3	Socket, Min. Wafer, 7 prong
	A20274-1	Socket, Min. Wafer, 9 prong
	A21330	Name Plate with Speed Nuts
	D21546	Dial Mtg. Bracket, Left
	D21547	Dial Mtg. Bracket, Right
	E21536-1	Cabinet, Walnut
	E21536-3	Cabinet, Willow Greeen
	C21559	Dial Crystal
	A21677	Socket, Min. Low Loss, 9 prong
	A21852	Electrolytic Mtg. Wafer
	A22117	Carton with Fillers
	A22300	Rectifier Can
	A22301	Tuning Shaft Bracket
	A22302	Selenium Rectifier Bracket
	A22303	Condenser Mtg. Bracket
	D22304	Dial Scale
	AC22312-1	Dial Pointer
	A22330-2	Grille Cloth & Speaker Baffle Assy., Willow Green
	A22330-1	Grille Cloth & Speaker Baffle Assy., Walnut
	A22332-1	Knob, Mahogany
	A22332-2	Knob, Ivory
	D22335-2	Cabinet, Rear Cover
	A22346	Tuning Shaft

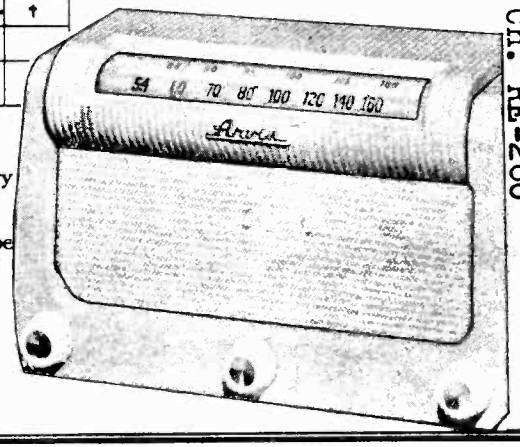
APPROXIMATE VOLTAGE AND RESISTANCE MEASUREMENTS
TUBE SOCKET LUGS TO FLOATING GROUND

			VOLTAGE									RESISTANCE								
TUBE	FUNCTION	BAND SW. POSITION	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
12AT7	FM Converter	FM	96	-1*	0	0	AC 12	96	-2	0	AC 6	-	880K	0	0	30	-	22K	.2	20
		AM	**	**	0	0	AC 12	**	**	0	AC 6	Inf.	1 meg.	0	0	30	Inf.	22K	.2	20
12BE6	AM Converter	FM	**	0	AC 43	AC 31	**	**	**			22K	.5	50	36	Inf.	Inf.	100K		
		AM	-9	0	AC 43	AC 31	109	109	-1			22K	.5	50	36	†	†	785K		
12BA6	1st I-f Amp. (FM)	FM	-.8	0	AC 55	AC 43	96	96	0			410K	0	60	50	†	†	0		
		AM	**	0	AC 55	AC 43	**	**	0			522K	0	60	50	Inf.	Inf.	0		
12BA6	2nd I-f Amp. (AM-FM)	FM	-.5	0	AC 67	AC 55	94	94	0			100K	0	70	60	†	†	0		
		AM	-.8	0	AC 67	AC 55	104	104	0			785K	0	70	60	†	†	0		
19T8	AM-FM Det. 1st Audio, AVC	FM	-.8	-1.6	-.8	AC 31	AC 12	**	0	-.9*	38*	522K	100K	522K	36	30	Inf.	0	4.7 meg.	†
		AM	**	**	**	AC 31	AC 12	-1.1	0	-.9*	40*	Inf.	100K	Inf.	36	30	420K	0	4.7 meg.	†
50L6	Output	FM	0	AC 67	118	98	0	0	AC 117	7		Inf.	70	†	†	470K	Inf.	120	150	
		AM	0	AC 67	120	110	0	0	AC 117	7.8		Inf.	70	†	†	470K	Inf.	120	150	

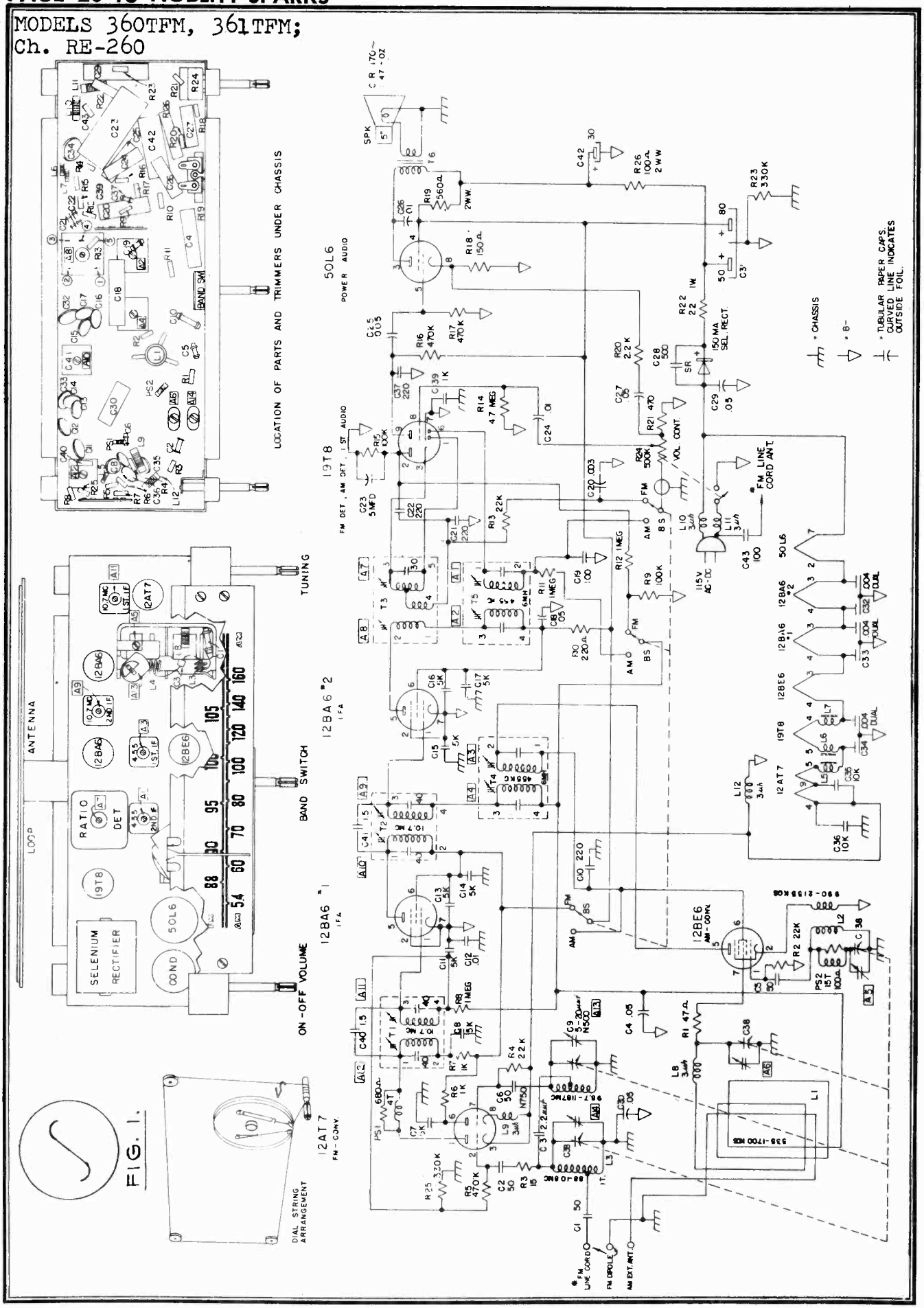
All voltage readings not indicated otherwise are +DC.
*Measure with vacuum tube voltmeter.
**These lugs are not used in this position of the band switch. The voltage should be zero or silghtly negative, and will vary on different sets and with different types of meters.
Inf - Infinite resistance or open circuit.
† Resistance readings at these points will vary greatly depending on the condition of the electrolytic condenser, the type meter used and the range of the meter. They are all B+ lugs and should have a relatively high resistance.

APPROXIMATE DC RESISTANCE OF COILS AND TRANSFORMERS

L1 Loop Antenna .8 ohm. L2 AM oscillator coil, tank 7 ohms, tickler .6 ohm.
L3 through L11, FM antenna coil, FM osc. coil and all R-f chokes are much less than 1 ohm.
T1 and T2 FM, 10.7 mc., I-F trans., pri. .8 ohm, sec. .8 ohm.
T4 and T5 AM, 455 Kc, I-f trans., pri. 10 ohms, sec. 10 ohms.
T3 - FM ratio det. trans., pri. 2 ohms, sec. lugs 3 to 4, .4 ohm. Lugs 4 to 5, .4 ohms. Lugs 3 to 5, .1 ohm.
T6 output transformer pir. 100 ohms. Sec. .3 ohm.



MODELS 360TFM, 361TFM;
Ch. RE-260



MODELS 664, 664A;
Ch. RE 206-1

Addition of Suffix -1 to Chassis No.; addition of 12SQ7 tube, and deletion of 14R7 tube; addition of hum bucking circuit in output.

CHANGES COVERED IN THIS SUPPLEMENT

1. Tube Complement.
2. Parts List.
3. Tube Layout Drawing.
4. Location of Parts under Chassis.
5. Schematic Diagram.

TUBES & FUNCTIONS

12SK7	RF Amp.
12SA7	Mixer-oscillator
12SK7	IF Amp.
12SQ7	DET-AVC-AF Amp.
35L6	Output
35Z5GT	Rectifier

NOTE: Some of the RE-206-1 Chassis use the same Tone Control Circuit as the RE-206 (A 20,000 ohm Control and .1 mfd. Condenser in the plate circuit of the output tube, with a 470,000 ohm fixed resistor in the grid circuit). For information on these sets refer to the Schematic & Parts Layout drawings in the original RE-206 Bulletin. The Reference Numbers on the Parts List and all drawings have been rearranged in this supplement, so that each number is used only once on the Schematic drawing. Therefore C-13 and R-13 in this supplement are C-14 & R-14 in the original bulletin. The 470,000 ohm grid resistor is designed as R-11 in both the original bulletin and this supplement.

NOTE: The AC hum on many of the sets now in the field can be decreased by making the above resistor and condenser change.

REF. NO.	PART NO.	DESCRIPTION
R1	C20060-103	Resistor, 10,000 ohm ½ W
R2	C20060-334	Resistor, 330,000 ohm ½ W
R3	C20060-332	Resistor, 3300 ohm ½ W
R4	C20060-223	Resistor, 22,000 ohm ½ W
R5,R8	C20060-685	Resistor, 6.8 megohm ½ W
R6	C20060-225	Resistor, 2.2 megohm ½ W
R7	C20060-473	Resistor, 47,000 ohm ½ W
R9	C19244	Vol. Cont. & Sw., 500,000 ohms
R10,*R11	C20060-474	Resistor, 470,000 ohm ½ W
R12	C20070-123	Resistor, 12,000 ohms 1 W
*R13	C19965	Tone Control, 500,000 ohm
	or	
	C19279	Tone Control, 70,000 ohm
R14	C20060-151	Resistor, 150 ohm ½ W
R15	C20060-150	Resistor, 15 ohm ½ W
C1	B18564	
C2	or	**Variable Condenser, 3 gang
C3	C19853	
C4,C10	C20068-103	Cond., .01 uf. 400 V P.T.
C5,C12	C20068-104	Cond., .1 uf. 400 V P.T.
C6	C20065-101	Cond., .0001 uf. 500 V Mica
C7,C9	C20068-503	Cond., .05 uf. 400 V P.T.
C8,C11	C20065-251	Cond., .00025 uf. 500 V Mica
*C13	C20069-202	Cond., .002 uf. 600 V
	or	
	C20067-104	Cond., .1 uf. 200 V P.T.
C14	C20068-203	Cond., .02 uf. 400 V P.T.
C15	A19182	Cond., 14 mmf. 600 V Mica
C16	C20069-502	Cond., .005 uf. 600 V P.T.
C18A C18B	A19239	Cond., Electrolytic 40-20 uf 150 V
	A19674	Terminal Strip

REF. NO.	PART NO.	DESCRIPTION
	A19138-1	Spacer Eyelet for Mtg. Var. Cond.
	D18422-1	Cabinet, Walnut (Assy.)
	D18422-2	Cabinet Assy., Ivory
	A18272	Dial Crystal
	A16922	Handle
	A19783-1	Knobs, Walnut
	A19783-2	Knobs, Ivory
	A19240	Grill Cloth
L1	AC18579-1	Antenna Loop Assy.
L2	AC19860-1	R. F. Coil
L3	AC18580-1	Oscillator Coil
L4	AC18583-1	Iron Core Choke
T1	AC21009-1	1st I. F. Coil
T2	AC18578-1	2nd I. F. Coil
T3	AC18582-1	Output Transformer
Spk.	AC19872-1	Speaker Assy. (Spk. with Trans. Mtg. Bracket)
Spk.	C18550	Speaker only
	A19293	Tuning Shaft
	C18432	Dial Scale
	A18572	Dial Pointer
	A19132	Dial Drive Cord
	A18254-1	Socket, tube, wafer type
	A16668	Elect. Mtg. Wafer
	A19234	Antenna Socket
	A19134-2	Dial Light Socket
L	A19135	Dial Light Bulb, Mazda C7 Nite Lite, 7W
P	B20064-8	Line Cord and Plug Assy.
	A20077-3	Rubber Grommet for mtg. Var. Cond. B18564 & C19853
	A19328-2	Rubber Grommet for mtg. Var. Cond. C19853 only

Subject:
Revision of the hum bucking circuit to reduce AC hum.

Changes covered in this supplement:

Capacity of C12 condenser connected from B+ to cathode of the 35L6 tube is changed from .1 mfd. to .03 mfd. Resistance of R12 resistor connected from B+ to cathode of the 35L6 tube is changed from 12,000 ohms to 15,000 ohms.

Changes in Parts List:

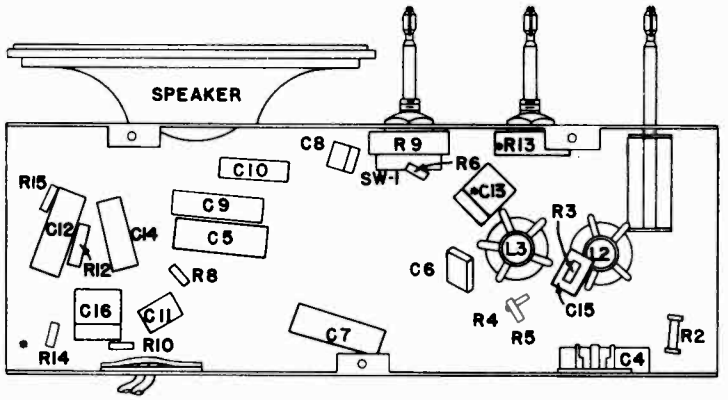
Delete:

Ref. No.	Part No.	Description
R12	C20070-123	Resistor 12,000 ohms, 1 Watt
C12	C20068-104	Condenser, 1 mfd., 400 V.P.T.

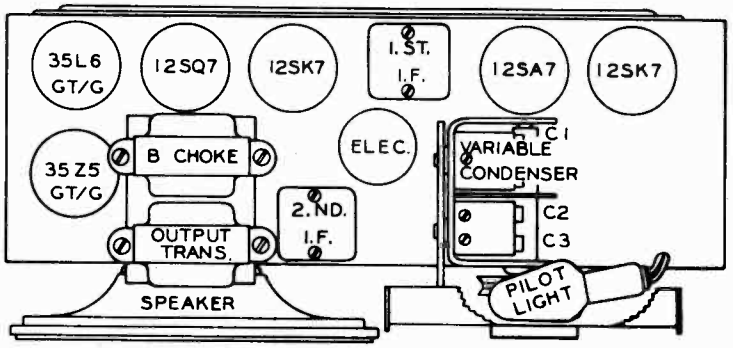
Add:

Ref. No.	Part No.	Description
R12	C20070-153	Resistor, 15,000 ohms, 1 Watt
C12	C20068-303	Condenser, .03 mfd., 400 V.P.T.

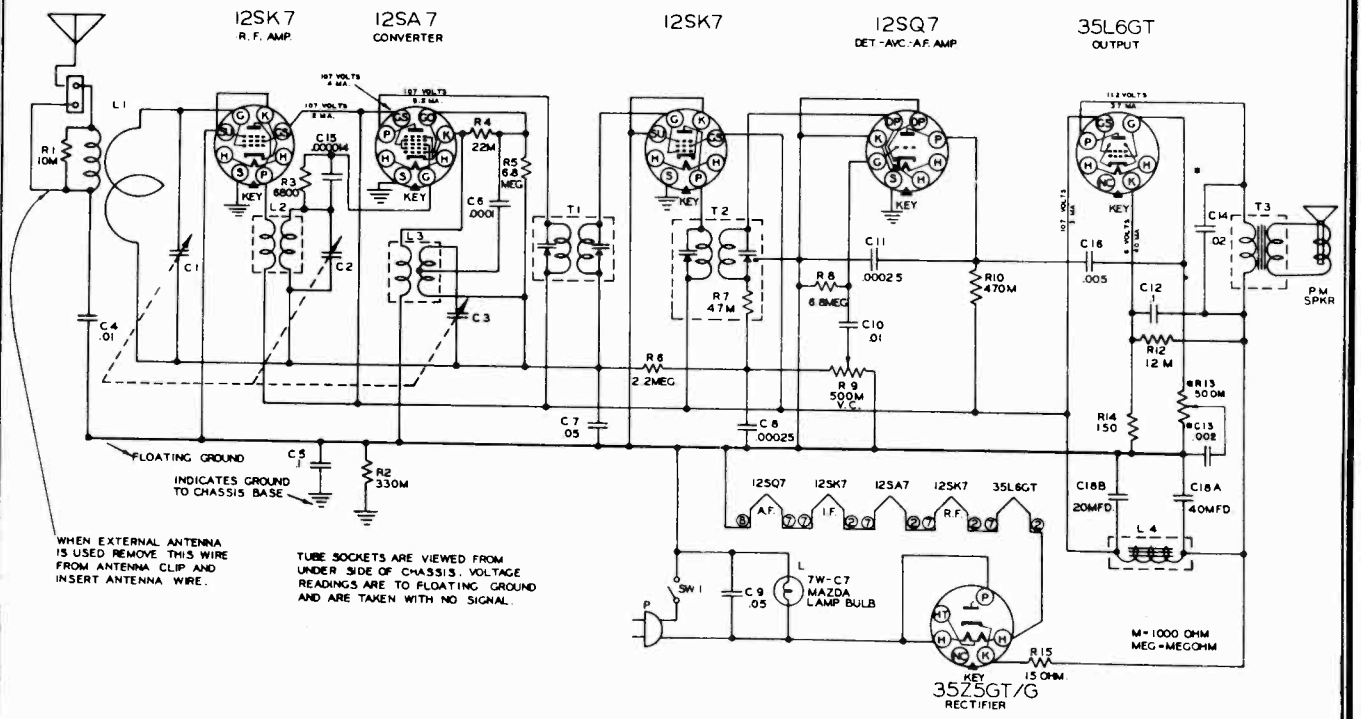
MODELS 664, 664A;
Ch. RE 206-1



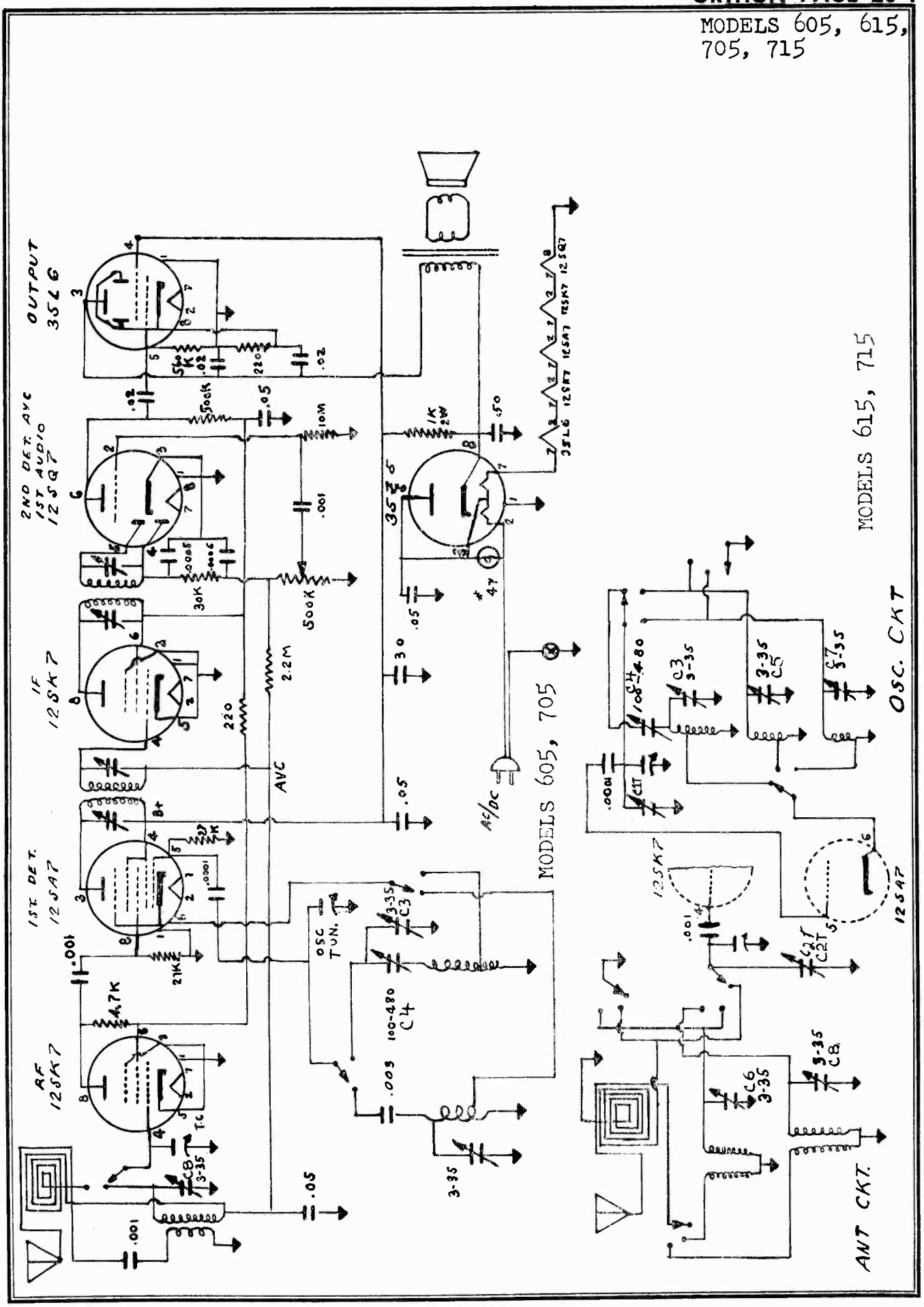
LOCATION OF PARTS UNDER CHASSIS



TUBE LAYOUT



MODELS 605, 615, 705, 715



MODELS 605, 615,
705, 715

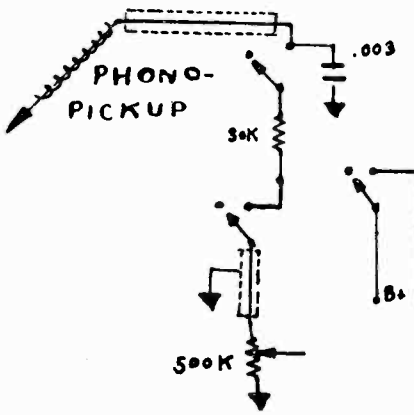
★ALIGNMENT PROCEDURE

Steps	Dummy Ant.	Coupling	Gen. Freq.	Band Switch	Dial Setting	Output Meter	Adjust	Remarks
I.	.05	RF Stator on Variable Condenser.	455 KC	BC	550	Across Voice Coil	Trimmers on input and output IF cans	Adjust for maximum reading.
II.	.05	Radiated signal. A loop of a few turns of wire 15" from chassis.	1600 KC	BC	1660	"	C1t C2t C3 trimmer	C2t should be near min. capacity. Adjust C3 for max. — then C1t for maximum.
III.	.05	"	1000 KC	BC	1000	"	C4	Adjust only if center of dial does not track. Adjust for max. As this adjustment affects setting of C3, it may be necessary to repeat this.
VI.	400 ohms in series with generator.	To antenna on radio.	5 MC	SW1	5MC	"	C5 C6	C5 is SW1 osc. Adjust till 5 MC is heard. Then adjust C6 for max. reading.
V.	"	"	15 MC	SW2	15MC		C7 C8	C7 is Sw2 osc. Adjust till 15MC is heard. Then adjust C8 for max. reading.

* To align Models 605 and 705 use steps I, II, III and V.
* To align Models 615 and 715 use steps I, II, III, IV and V.

C1t Located on variable condenser
C2t Located on variable condenser.
C3 B'cast osc. trimmer.
C4 B'cast padder.
C5 2-6 MC Oscillator trimmer.
C6 2-6 MC Antenna trimmer.
C7 6-18 MC Oscillator trimmer.
C8 6-17 MC Antenna trimmer.

Tube Types: 1-12SK7 R. F. Amplifier.
1-12SA7 Converter.
1-12SK7 I.F. Amplifier.
1-12SQ7 Diode Detector, Audio Amplifier.
1-35L6 Power output.
1-35Z5 Rectafier.



PHONO-RADIO SWITCH FOR CONVERTING 605, 615 TO 705, 715 RESPECTIVELY

Model 605 and 615 Power Supply: 105-125, 220-230, 50/60 cycles AC/DC.
Model 705 and 715 Power Supply: 105-125, 220-230, 50/60 cycles AC only.