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	12" Dynamic	5" PM
Field coil resistance	165 ohms	None
Voice coil impedance (400 cycles)	6 ohms	3.8 ohms
Output transformer	5000/6	

METHOD FOR REMOVING CHASSIS FROM CABINET

Model CR-234 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.

MODEL CR-234

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.

DIAL CORD REPLACEMENT

Two separate drive cables are used in the CR-234 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.

MODEL CR-234

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.

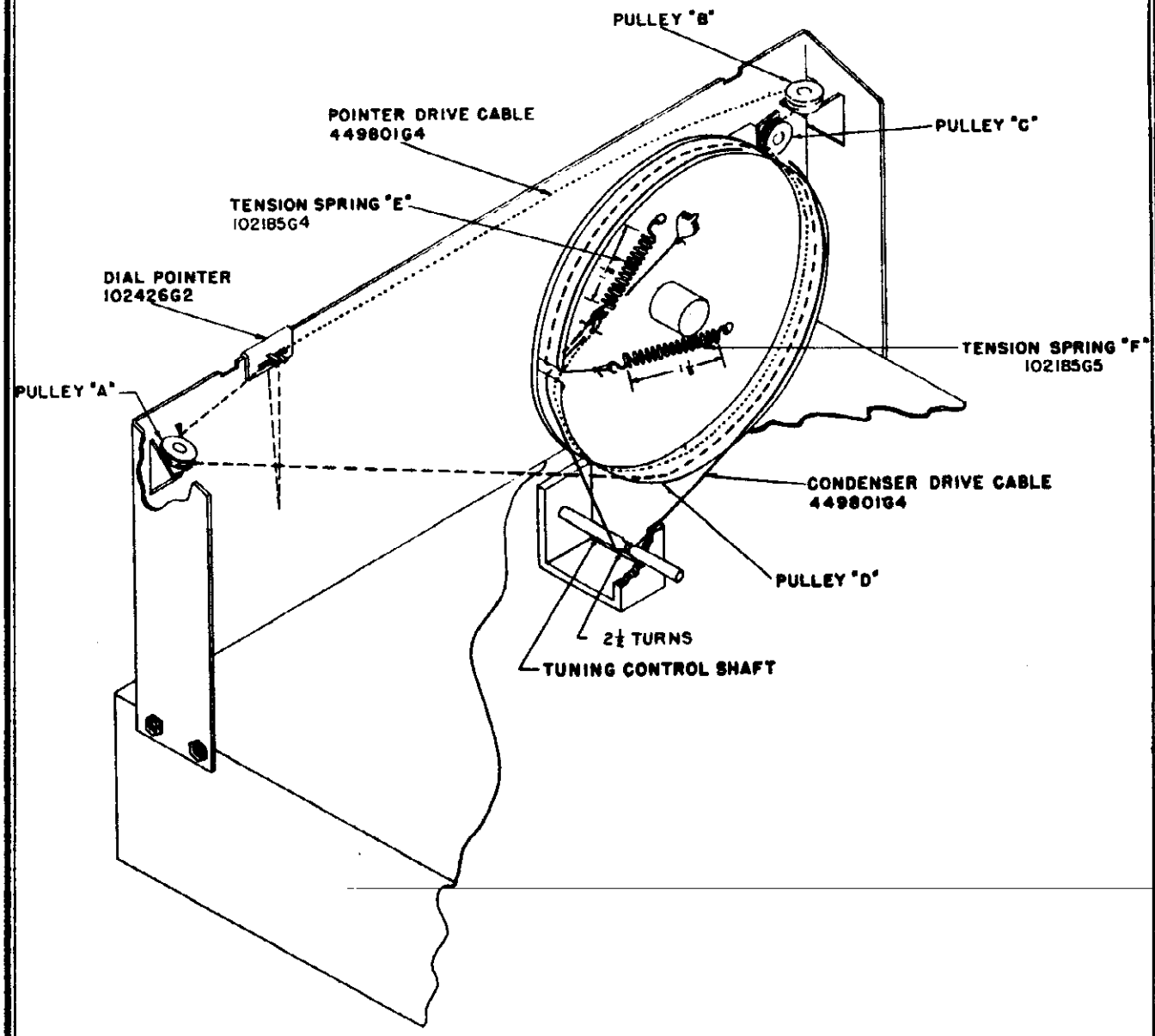
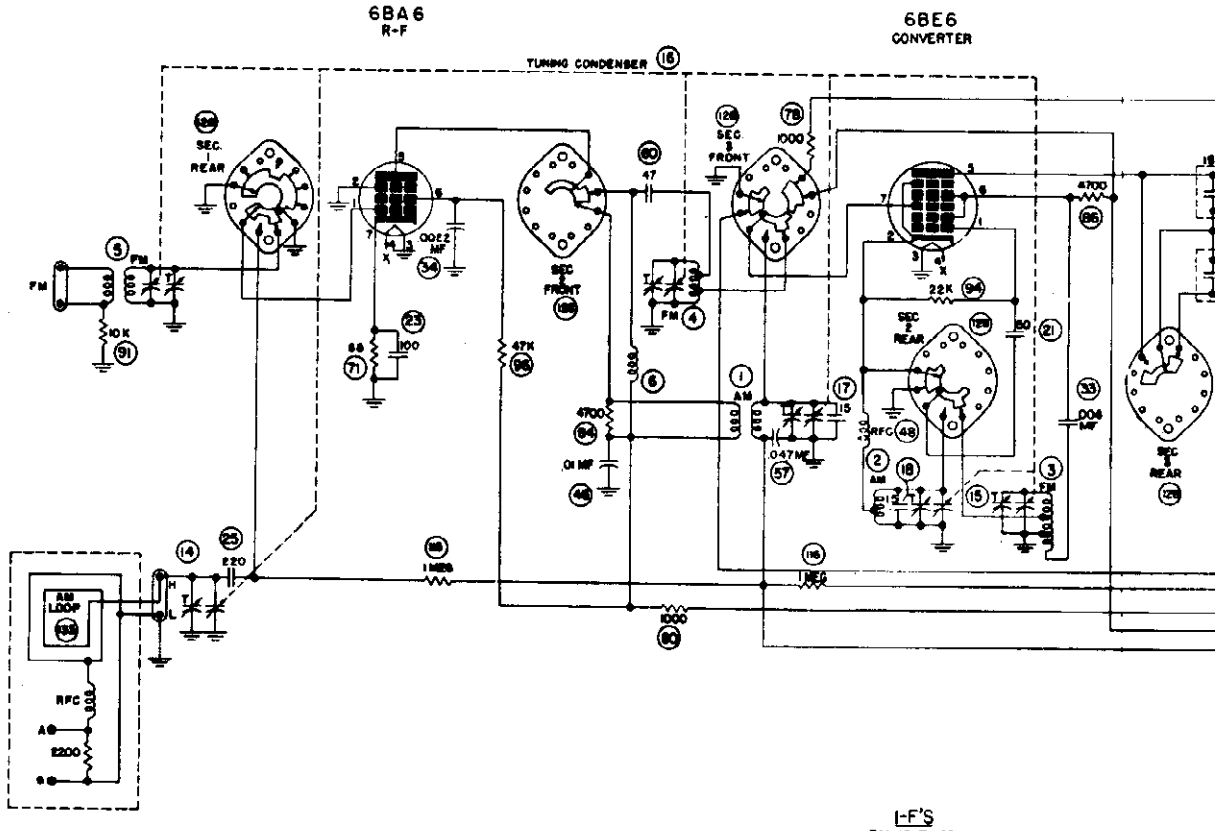


FIGURE 1



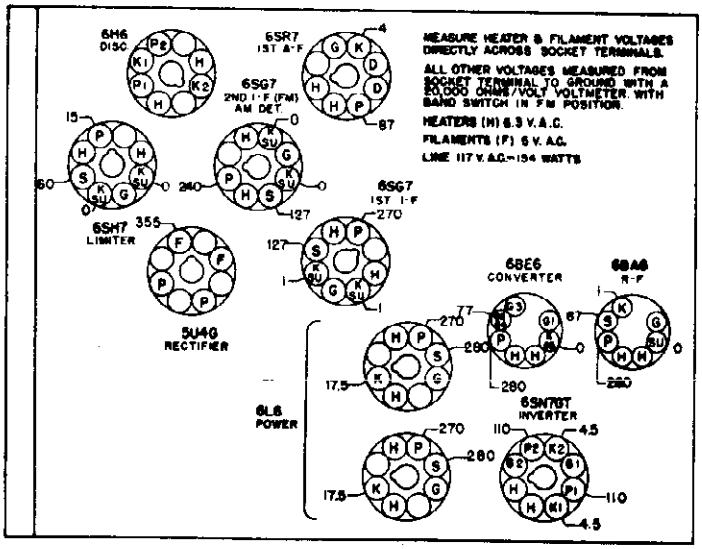
I-F'S
FM 10.7 MC.
AM 455 KC.

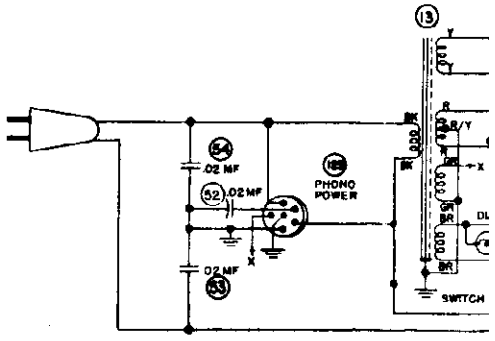
NOTES

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.





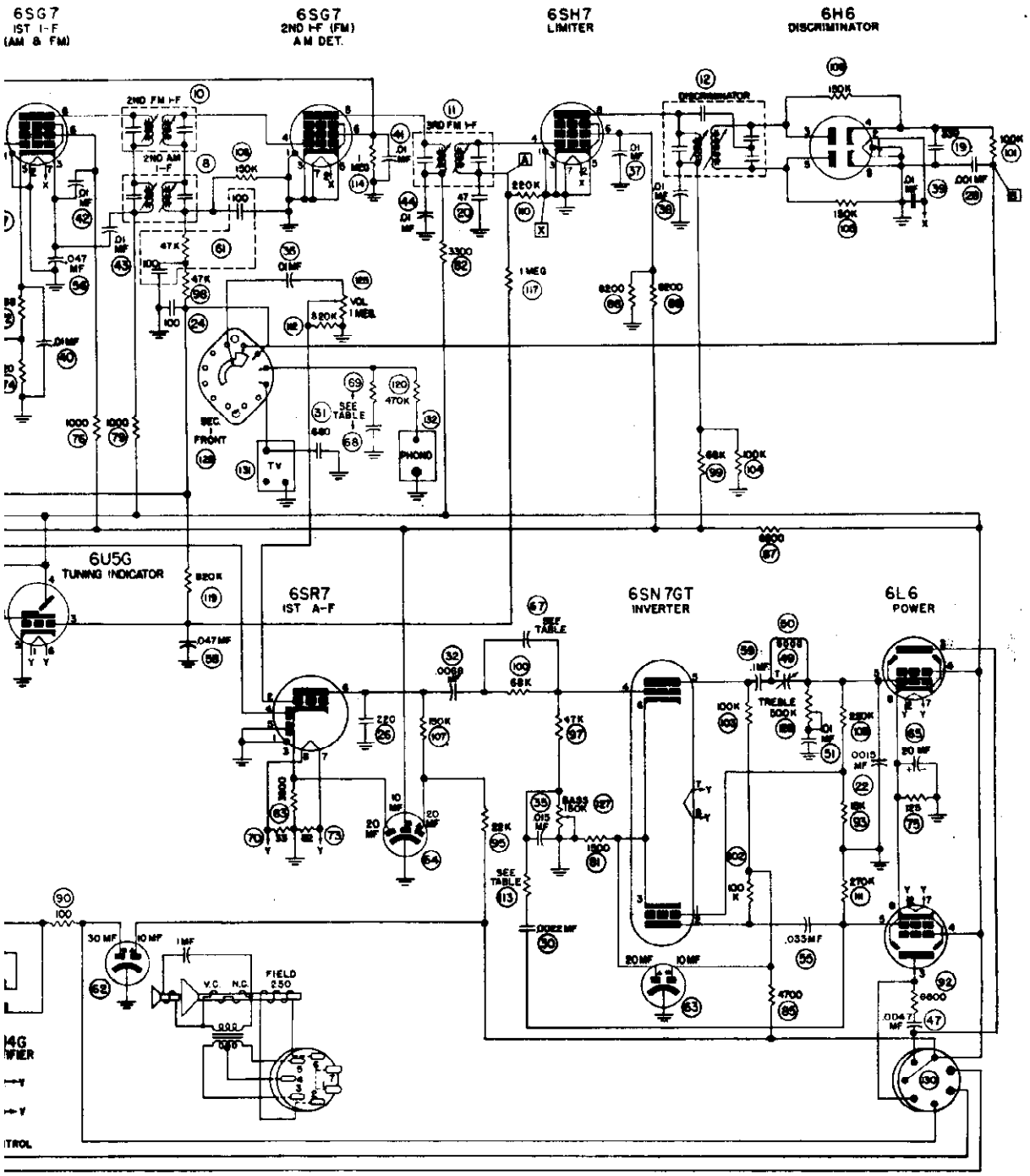

6SG7
IST I-F
(AM & FM)
6SG7
2ND I-F (FM)
AM DET.
6SH7
LIMITER
6H6
DISCRIMINATOR
6U5G
TUNING INDICATOR
6SR7
IST A-F
6SN7GT
INVERTER
6L6
POWER
2ND FM I-F
2ND AM I-F
3RD FM I-F
DISCRIMINATOR
VOL 1 MEG
SEC. FRONT
TV
PHONO
SEE TABLE
TREBLE 500K
FIELD 250
V.C.
N.C.

FIGURE 2

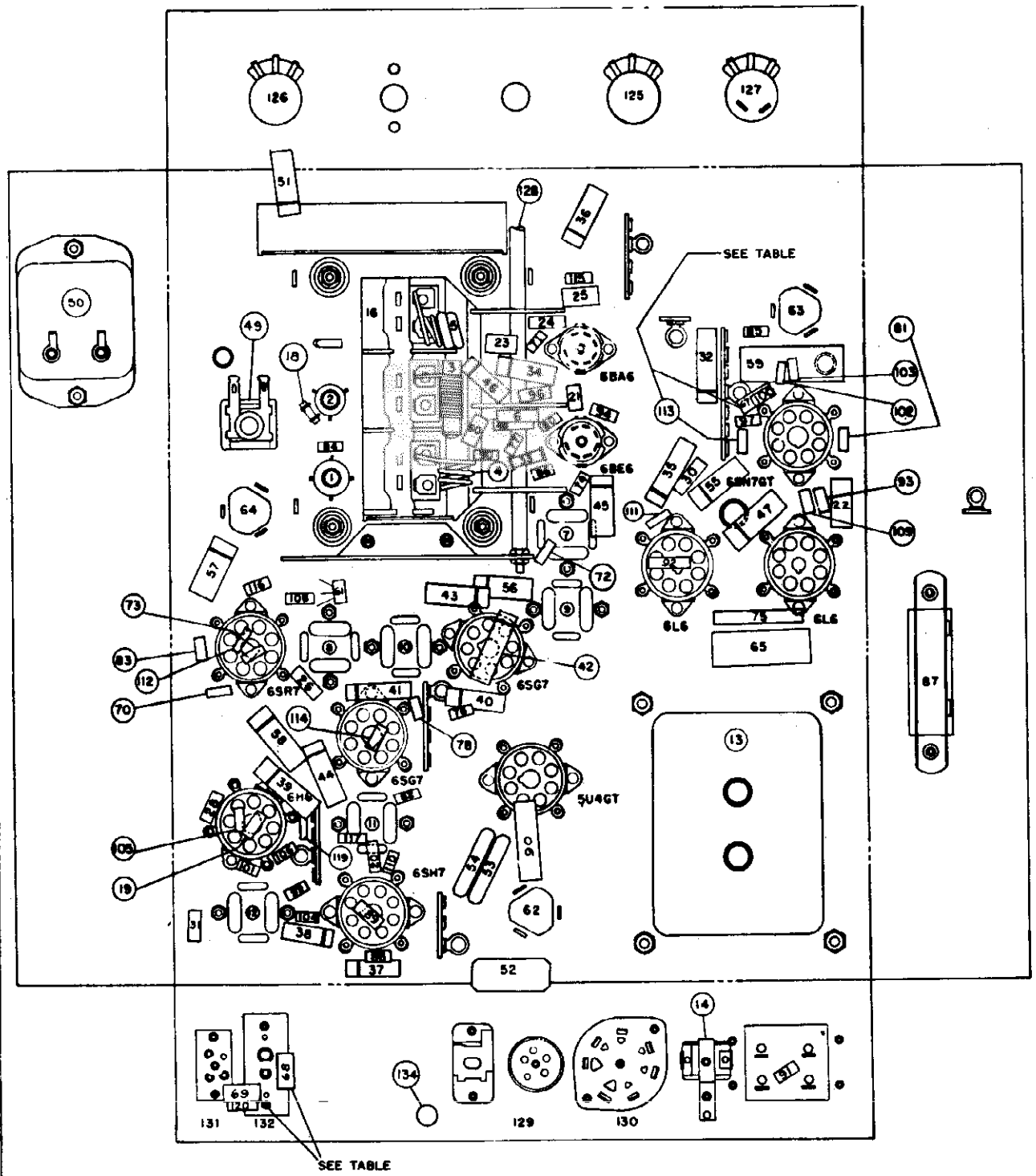
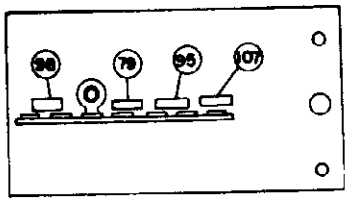
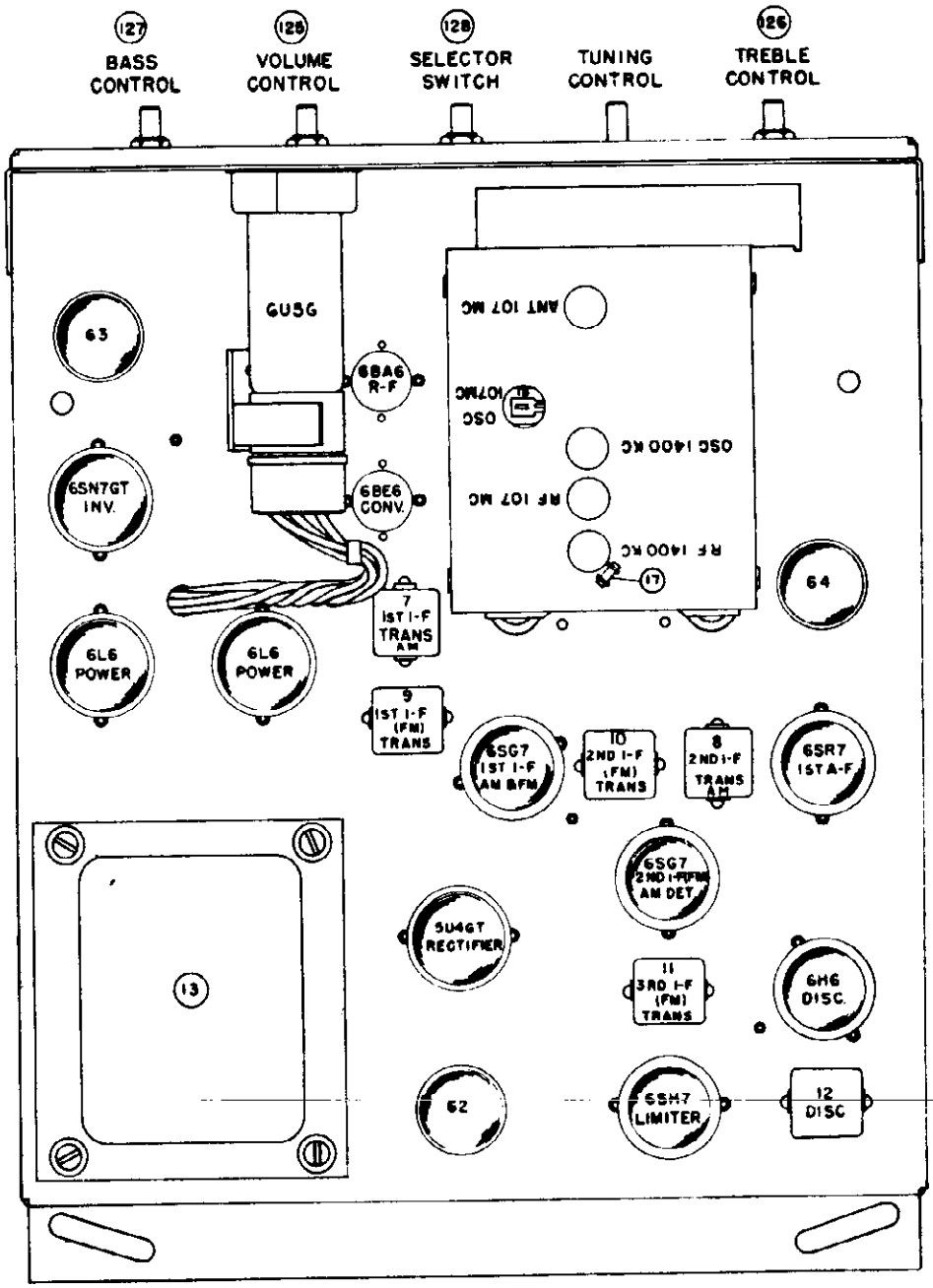

SEE TABLE
6BA6
6BE6
5SH7GT
6L6
6L6
6SR7
6SG7
6SG7
6H6
5U4GT
6SH7
SEE TABLE

FIGURE 3

MODEL CR-234


98
79
95
107


127
BASS CONTROL
128
VOLUME CONTROL
128
SELECTOR SWITCH
TUNING CONTROL
126
TREBLE CONTROL
6U5G
63
6BA6 R-F
6SN7GT INV.
6BE6 CONV.
7 1ST I-F TRANS AM
6L6 POWER
6L6 POWER
9 1ST I-F (FM) TRANS
6SG7 1ST I-F AM & FM
10 2ND I-F (FM) TRANS
8 2ND I-F TRANS AM
6SR7 1ST A-F
64
6SG7 2ND I-F FM & AM DET.
5U4GT RECTIFIER
11 3RD I-F (FM) TRANS
6H6 DISC.
13
62
6SH7 LIMITER
12 DISC
ANT 107 MC
OSC 107MC
OSC 1400 KC
RF 107 MC
RF 1400 KC
17

PARTS LIST

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil Assembly, R-F (AM)	360348G1
2	Coil Assembly, Oscillator (AM)	360407G1
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. (AM)	360373G1
8	Transformer, Second I.F. (AM)	360373G2
9	Transformer, First I.F. (FM)	360374G1
10	Transformer, Second I.F. (FM)	360374G1
11	Transformer, Third I.F. (FM)	360374G1
12	Transformer, Discriminator	360375G1
13	Transformer, Power	300052G2
14	Capacitor, Variable Trimmer	250046G2
15	Capacitor, Variable Trimmer	260067G6
16	Capacitor, Three Gang Tuning	260103G1
17	Capacitor, Ceramic, 15mmf, ± 10%, 500 V.	250187G43
18	Capacitor, Ceramic, 15mmf, ± 10%, 500 V.	250187G43
19	Capacitor, Mica, 330 mmf, 500 V.	250159G101
20	Capacitor, Mica, 47 mmf, 500 V.	250159G96
21	Capacitor, Ceramic, 50 mmf, ± 10%, 500 V.	250088G39
22	Capacitor, Molded Paper, .0015 mfd, 600 V.	250201G2
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
28	Capacitor, Molded Paper, .001 mfd, 600 V.	250201G1
30	Capacitor, Mica, .0022 mfd, ± 5%, 500 V.	250160G46
31	Capacitor, Mica, 680 mmf, 500 V.	250159G136
32	Capacitor, Molded Paper, .0068 mfd, 600 V.	250201G6
33	Capacitor, Ceramic, .004 mfd, 350 V.	250088G34
34	Capacitor, Molded Paper, .0022 mfd, 600 V.	250201G3
35	Capacitor, Paper, .015 mfd, ± 10%, 200 V.	250185G1
36	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
37	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
38	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
39	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
40	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
41	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
42	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
43	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
44	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
45	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
46	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
47	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
48	R. F. Choke	360284G1
49	Trimmer, 10 K.C.	259610G2
50	Coil, 10 K.C.	360244G2
51	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
52	Capacitor, Molded Paper, .02 mfd, 600 V.	250129G3

MODEL CR-234

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
53	Capacitor, Molded Paper, .02 mfd, 600 V.	25012963
54	Capacitor, Molded Paper, .02 mfd, 600 V.	25012963
55	Capacitor, Molded Paper, .033 mfd, 600 V.	250201G10
56	Capacitor, Molded Paper, .047 mfd, 600 V.	250201G11
57	Capacitor, Molded Paper, .047 mfd, 600 V.	250201G11
58	Capacitor, Molded Paper, .047 mfd, 600 V.	250201G11
59	Capacitor, Molded Paper, .1 mfd, 600 V.	250201G13
60	Capacitor, Mica, 47 mmf	250159G96
61	Capacitor-Resistor Filter	250170G1
62	Capacitor, Electrolytic, 30-10 mfd, 475 V.	270023G2
63	Capacitor, Electrolytic, 10 mfd, 475 V. — 20 mfd, 25 V.	270023G13
64	Capacitor, Electrolytic, 20-10 mfd, 475 V. — 20 mfd, 25 V.	270023G12
65	Capacitor, Electrolytic, 20 mfd, 25 V.	270027G2
66	Capacitor, Mica, 680 mmf, 300 V. ± 10%	250159G131
67	Capacitor, Mica, 470 mmfd.	250159G90
68	Capacitor, Mica, 270 mmf.	250159G87
69	Resistor, Composition, 270 Ohms, ± 10%, ½ W.	230104G91
70	Resistor, Composition, 33 Ohms, ± 10%, ½ W.	230104G44
71	Resistor, Composition, 68 Ohms, ± 10%, ½ W.	230104G48
72	Resistor, Composition, 68 Ohms, ± 10%, ½ W.	230104G48
73	Resistor, Composition, 82 Ohms, ± 10%, ½ W.	230104G49
74	Resistor, Composition, 220 Ohms, ± 10%, ½ W.	230104G54
75	Resistor, Wire Wound, 125 Ohms, 5 W.	240021G11
76	Resistor, Composition, 1000 Ohms, ± 10%, ½ W.	230104G62
77	Resistor, Composition, 1000 Ohms, ± 10%, ½ W.	230104G62
78	Resistor, Composition, 1000 Ohms, ± 10%, ½ W.	230104G62
79	Resistor, Composition, 1000 Ohms, ± 10%, ½ W.	230104G62
80	Resistor, Composition, 1000 Ohms, ± 10%, ½ W.	230104G62
81	Resistor, Composition, 1500 Ohms, ± 10%, ½ W.	230104G64
82	Resistor, Composition, 3300 Ohms, ± 10%, ½ W.	230104G68
83	Resistor, Composition, 3900 Ohms, ± 10%, ½ W.	230104G69
84	Resistor, Composition, 4700 Ohms, ± 10%, ½ W.	230104G70
85	Resistor, Composition, 4700 Ohms, ± 10%, ½ W.	230104G70
86	Resistor, Composition, 4700 Ohms, ± 10%, ½ W.	230104G70
87	Resistor, Wire Wound, 6500 Ohms, ± 10%.	240035G9
88	Resistor, Composition, 8200 Ohms, ± 10%, 1 W.	230105G73
89	Resistor, Composition, 8200 Ohms, ± 10%, 1 W.	230105G73
90	Resistor, Wire Wound, 100 Ohms, 10 W.	240021G17
91	Resistor, Composition, 10K Ohms, ± 10%, ½ W.	230104G74
92	Resistor, Composition, 6800 Ohms, 1W.	230105G72
93	Resistor, Composition, 15K Ohms, ± 10%, ½ W.	230104G76
94	Resistor, Composition, 22K Ohms, ± 10%, ½ W.	230104G78
95	Resistor, Composition, 22K Ohms, ± 10%, ½ W.	230104G78
96	Resistor, Composition, 47K Ohms, ± 10%, ½ W.	230105G82
97	Resistor, Composition, 47K Ohms, ± 10%, ½ W.	230104G82
98	Resistor, Composition, 47K Ohms, ± 10%, ½ W.	230104G82
99	Resistor, Composition, 68K Ohms, ± 10%, ½ W.	230104G84
100	Resistor, Composition, 68K Ohms, ± 10%, ½ W.	230104G84
101	Resistor, Composition, 100K Ohms, ± 10%, ½ W.	230104G86
102	Resistor, Composition, 100K Ohms, ± 10%, 1 W.	230105G86
103	Resistor, Composition, 100K Ohms, ± 10%, 1 W.	230105G86

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
104	Resistor, Composition, 100K Ohms, ± 10%, ½ W.	230104G86
105	Resistor, Composition, 150K Ohms, ± 10%, ½ W.	230104G88
106	Resistor, Composition, 150K Ohms, ± 10%, ½ W.	230104G88
107	Resistor, Composition, 150K Ohms, ± 10%, ½ W.	230104G88
108	Resistor, Composition, 150K Ohms, ± 10%, ½ W.	230104G88
109	Resistor, Composition, 220K Ohms, ± 10%, ½ W.	230104G90
110	Resistor, Composition, 220K Ohms, ± 10%, ½ W.	230104G90
111	Resistor, Composition, 270K Ohms, ± 10%, ½ W.	230104G91
112	Resistor, Composition, 820K Ohms, ± 10%, ½ W.	230104G97
113	Resistor, Composition, 1.2 Megohm, ± 10%, ½ W. ... 234AA Only	230104G99
	Resistor, Composition, 1 Megohm, ± 10%, ½ W. ... 234BB Only	230104G98
114	Resistor, Composition, 1 Megohm, ± 10%, ½ W.	230104G98
115	Resistor, Composition, 1 Megohm, ± 10%, ½ W.	230104G98
116	Resistor, Composition, 1 Megohm, ± 10%, ½ W.	230104G98
117	Resistor, Composition, 1 Megohm, ± 10%, ½ W.	230104G98
118	Resistor, Composition, 560K Ohms, ± 10%, ½ W. .. (In Tuning Eye Socket)	230104G95
119	Resistor, Composition, 820K Ohms, ± 10%, ½ W.	230104G97
120	Resistor, Composition, 470K Ohms, ± 10%, ½ W.	230104G94
125	Control Volume	220072G18
126	Control, Treble	220072G8
127	Control, Bass, With Switch	220073G5
128	Switch, Selector	160194G1
129	Socket, Motor	180520G4
	Plug, Motor (4 Prong)	180502G5
	Plug, Motor (6 Prong)	180521G4
130	Socket, Speaker	180504G16
	Plug, Speaker	180503G4
131	Socket, External	180060G1
	Plug, External	180311G2
132	Socket, Phono	189741G1
	Plug, Phono	180311G1
133	Loop Antenna	* * * *
134	Socket, A.C. Output	180505G5
135	Socket & Cable Assembly	180458G2
	Dial Glass	150353G1
	Panel Escutcheon	633934G3
	Knob, Tuning	
	Maroon	140025G4
	Beige	140025G2
	Knob, Selector	
	Maroon	143727G3
	Beige	143727G2
	Knob, Treble, Volume	
	Maroon	140025G5
	Beige	140025G3
	Output Transformer, Primary 5000 ohms, Secondary 6 ohms	623504G1

* * * * 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.

MODELS CR-242,
CR-243

SPECIFICATIONS

JAN. 1951 1286

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

CT242 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	
CT243 Speaker: coaxial	12" Dynamic	5" PM
Field coil resistance	165 ohms	None
Voice coil impedance (400 cycles)	6 ohms	3.8 ohms
Output transformer	5000/6	

GENERAL

CR-242 and CR-243 differ only in the speaker systems and audio response for different cabinets. It may become necessary to make minor changes in the electrical circuit of a chassis to provide the correct response for different cabinets. If this becomes necessary such a variation from the original chassis is indicated by a suffix letter. 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-242 and CR-243 radio chassis are 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 these receivers 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 diagrams.

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 these models 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.

MODELS CR-242
CR-243

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.

MODELS CR-242, CR-243

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.

CR-242—*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.

CR-243—*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 1.22V. 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 .57 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 both the CR-242 and CR-243 dial assemblies. One cable is used to transmit the motion from the tuning knob to the large pulley that is coupled to the gang condenser; the other cable actuates the dial pointer whenever the large pulley on the gang condenser 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 gang condenser 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 gang condenser 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.

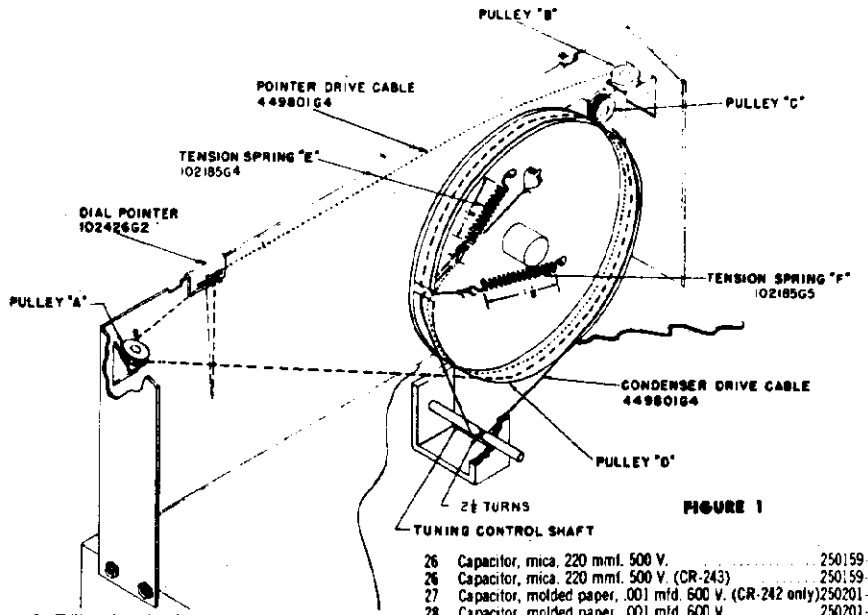


FIGURE 1

PARTS LIST

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil assembly, r-f (AM)	360348-1
2	Coil assembly, oscillator (AM)	360407-1
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	260067-6
16	Capacitor, three gang tuning	260103-1
17	Capacitor, ceramic, 15 mmf. ± 10%, 500 V.	250187-43
18	Capacitor, ceramic, 15 mmf. ± 10%, 500 V.	250187-43
19	Capacitor, mica, 330 mmf. 500 V.	250159-88
19	Capacitor, mica, 330 mmf. 500 V. (CR-243)	250159-101
20	Capacitor, mica, 47 mmf. 500 V.	250187-49
20	Capacitor, mica, 47 mmf. 500 V (CR-243)	250159-96
21	Capacitor, ceramic, 50 mmf. ± 10%, 500 V	250088-39
22	Capacitor, molded paper, .0015 mfd. 600 V.	250201-2
23	Capacitor, mica, 100 mmf. 500 V.	250187-53
23	Capacitor, mica, 100 mmf. 500 V. (CR-243)	250159-98
24	Capacitor, mica, 100 mmf. 500 V.	250187-53
24	Capacitor, mica, 100 mmf. 500 V. (CR-243)	250159-98
25	Capacitor, mica, 220 mmf. 500 V.	250159-86
25	Capacitor, mica, 220 mmf. 500 V. (CR-243)	250159-100
26	Capacitor, mica, 220 mmf. 500 V.	250159-86
26	Capacitor, mica, 220 mmf. 500 V. (CR-243)	250159-100
27	Capacitor, molded paper, .001 mfd. 600 V. (CR-242 only)	250201-1
28	Capacitor, molded paper, .001 mfd. 600 V.	250201-1
30	Capacitor, mica, .0022 mfd. ± 5%, 500 V.	250160-46
31	Capacitor, mica, 680 mmf. ± 10%, 500 V.	250160-62
31	Capacitor, mica, 680 mmf. ± 10%, 500 V. (CR-243)	250160-136
32	Capacitor, molded paper, .0033 mfd. 600 V.	250201-4
32	Capacitor, molded paper, .0033 mfd. 600 V. (CR-243)	250201-6
33	Capacitor, ceramic, .004 mfd. 350 V.	250088-34
34	Capacitor, molded paper, .0022 mfd. 600 V.	250201-3
35	Capacitor, paper, .015 mfd. ± 10%, 200 V.	250185-1
36	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
37	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
38	Capacitor, molded peper, .01 mfd. 600 V.	250201-7
39	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
40	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
41	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
42	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
43	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
44	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
45	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
46	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
47	Capacitor, molded paper, .0047 mfd. 600 V. (CR-243)	250201-5
48	Coil, choke	360284-1
49	Trimmer, 10 kc.	259610-2
50	Coil, 10 kc.	360244-2
51	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
52	Capacitor, molded paper, .02 mfd. 600 V.	250129-3
53	Capacitor, molded paper, .02 mfd. 600 V.	250129-3
54	Capacitor, molded paper, .02 mfd. 600 V.	250129-3
55	Capacitor, molded paper, .033 mfd. 600 V.	250201-10
56	Capacitor, molded paper, .047 mfd. 600 V.	250201-11
57	Capacitor, molded paper, .047 mfd. 600 V.	250201-11
58	Capacitor, molded paper, .047 mfd. 600 V.	250201-11
59	Capacitor, molded paper, .1 mfd. 600 V.	250201-13
60	Capacitor, mica, 47 mmf.	250159-96
61	Capacitor-resistor filter	250170-1
62	Capacitor, electrolytic, 30-10 mfd. 475 V.	270023-2
63	Capacitor, electrolytic, 10 mfd. 475 V. 20 mfd. 25 V.	270023-13
64	Capacitor, electrolytic, 20-10 mfd. 475 V. 20 mfd. 25 V.	270023-12
65	Capacitor, electrolytic, 20 mfd. 25 V.	270027-2
67	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
67	Capacitor, mica, 470 mmf. (CR-243)	250159-90
68	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
68	Capacitor, mica, 270 mmf. (CR-243)	250159-87
69	Resistor, composition, 270,000 ohms, ± 10%, ½ W. (CR-243 only)	230104-91
70	Resistor, composition, 33 ohms, ± 10%, ½ W.	230104-44
71	Resistor, composition, 68 ohms, ± 10%, ½ W.	230104-48
72	Resistor, composition, 68 ohms, ± 10%, ½ W.	230104-48
73	Resistor, composition, 82 ohms, ± 10%, ½ W.	230104-49
74	Resistor, composition, 220 ohms, ± 10%, ½ W.	230104-54
75	Resistor, composition, 125 ohms, 5 W.	240021-11
76	Resistor, composition, 1000 ohms, ± 10%, ½ W.	230104-62
77	Resistor, composition, 1000 ohms, ± 10%, ½ W.	230104-62
78	Resistor, composition, 1000 ohms, ± 10%, ½ W.	230104-62
79	Resistor, composition, 1000 ohms, ± 10%, ½ W.	230104-62
80	Resistor, composition, 1000 ohms, ± 10%, ½ W.	230104-62
81	Resistor, composition, 1500 ohms, ± 10%, ½ W.	230104-64
82	Resistor, composition, 3300 ohms, ± 10%, ½ W.	230104-68
83	Resistor, composition, 3900 ohms, ± 10%, ½ W.	230104-60
83	Resistor, composition, 3900 ohms, ± 10%, ½ W.	230104-69
84	Resistor, composition, 4700 ohms, ± 10%, ½ W.	230104-70
85	Resistor, composition, 4700 ohms, ± 10%, ½ W.	230104-70
86	Resistor, composition, 4700 ohms, ± 10%, ½ W.	230104-70
87	Resistor, wire wound, 6500 ohms, ± 10%	240035-9
88	Resistor, composition, 8200 ohms, ± 10%, 1 W.	230105-73
89	Resistor, composition, 8200 ohms, ± 10%, 1 W.	230105-73
90	Resistor, wire wound, 100 ohms, 10 W. (CR-243 only)	240021-17
91	Resistor, composition, 10,000 ohms, ± 10%, ½ W.	230104-74
92	Resistor, composition, 33,000 ohms, ± 10%, ½ W.	230104-80
93	Resistor, composition, 15,000 ohms, ± 5%, ½ W.	230104-187
94	Resistor, composition, 22,000 ohms, ± 10%, ½ W.	230104-78
95	Resistor, composition, 22,000 ohms, ± 10%, ½ W.	230104-78
96	Resistor, composition, 47,000 ohms, ± 10%, 1 W.	230105-82
97	Resistor, composition, 47,000 ohms, ± 10%, ½ W.	230104-82
98	Resistor, composition, 47,000 ohms, ± 10%, ½ W.	230104-82
99	Resistor, composition, 68,000 ohms, ± 10%, ½ W.	230104-84
100	Resistor, composition, 220,000 ohms, ± 10%, ½ W.	230104-90
100	Resistor, composition, 68,000 ohms, ± 10%, ½ W.	230104-84
101	Resistor, composition, 100,000 ohms, ± 10%, ½ W.	230104-86
102	Resistor, composition, 100,000 ohms, ± 10%, 1 W.	230105-86
103	Resistor, composition, 100,000 ohms, ± 10%, 1 W.	230105-86
104	Resistor, composition, 100,000 ohms, ± 10%, ½ W.	230104-86
105	Resistor, composition, 150,000 ohms, ± 10%, ½ W.	230104-88
106	Resistor, composition, 150,000 ohms, ± 10%, ½ W.	230104-88
107	Resistor, composition, 150,000 ohms, ± 10%, ½ W.	230104-88
108	Resistor, composition, 150,000 ohms, ± 10%, ½ W.	230104-88
109	Resistor, composition, 220,000 ohms, ± 5%, ½ W.	230104-215
110	Resistor, composition, 220,000 ohms, ± 10%, ½ W.	230104-90
111	Resistor, composition, 270,000 ohms, ± 10%, ½ W.	230104-91
112	Resistor, composition, 330,000 ohms, ± 10%, ½ W.	230104-92
112	Resistor, composition, 820,000 ohms, ± 10%, ½ W. (CR-243)	230104-97
113	Resistor, composition, 1.2 megohm, ± 10%, ½ W.	230104-99
113	Resistor, composition, 1 megohm, ± 10%, ½ W. (CR-243)	230104-98
114	Resistor, composition, 1 megohm, ± 10%, ½ W.	230104-98
115	Resistor, composition, 1 megohm, ± 10%, ½ W.	230104-98
116	Resistor, composition, 1 megohm, ± 10%, ½ W.	230104-98
117	Resistor, composition, 1 megohm, ± 10%, ½ W.	230104-98
118	Resistor, composition, 560,000 ohms, ± 10%, ½ W. (in tuning eye)	230104-95
119	Resistor, composition, 820,000 ohms, ± 10%, ½ W.	230104-97
120	Resistor, composition, 470,000 ohms, ± 10%, ½ W.	230104-94
125	Control, volume	220072-18

MODELS CR-
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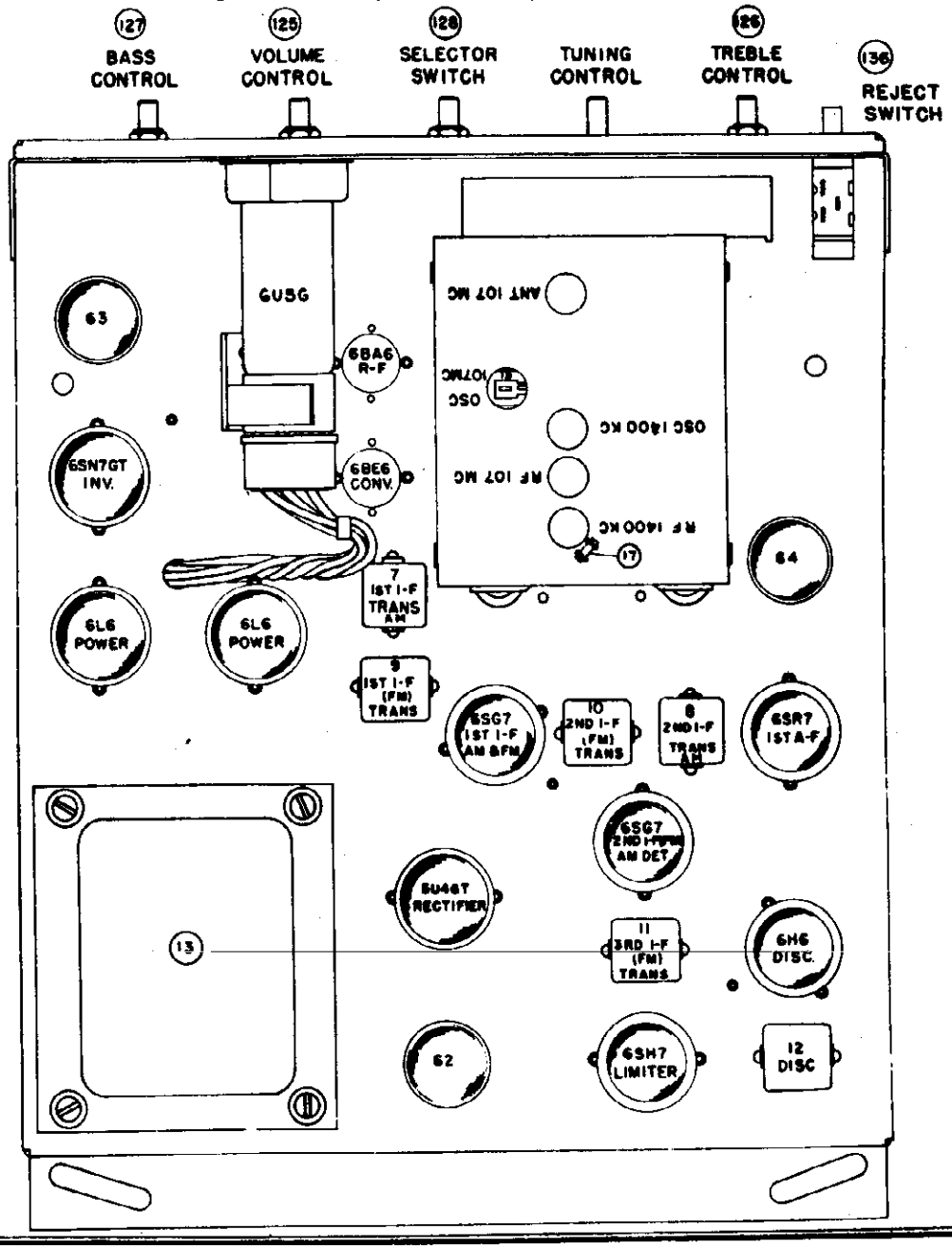
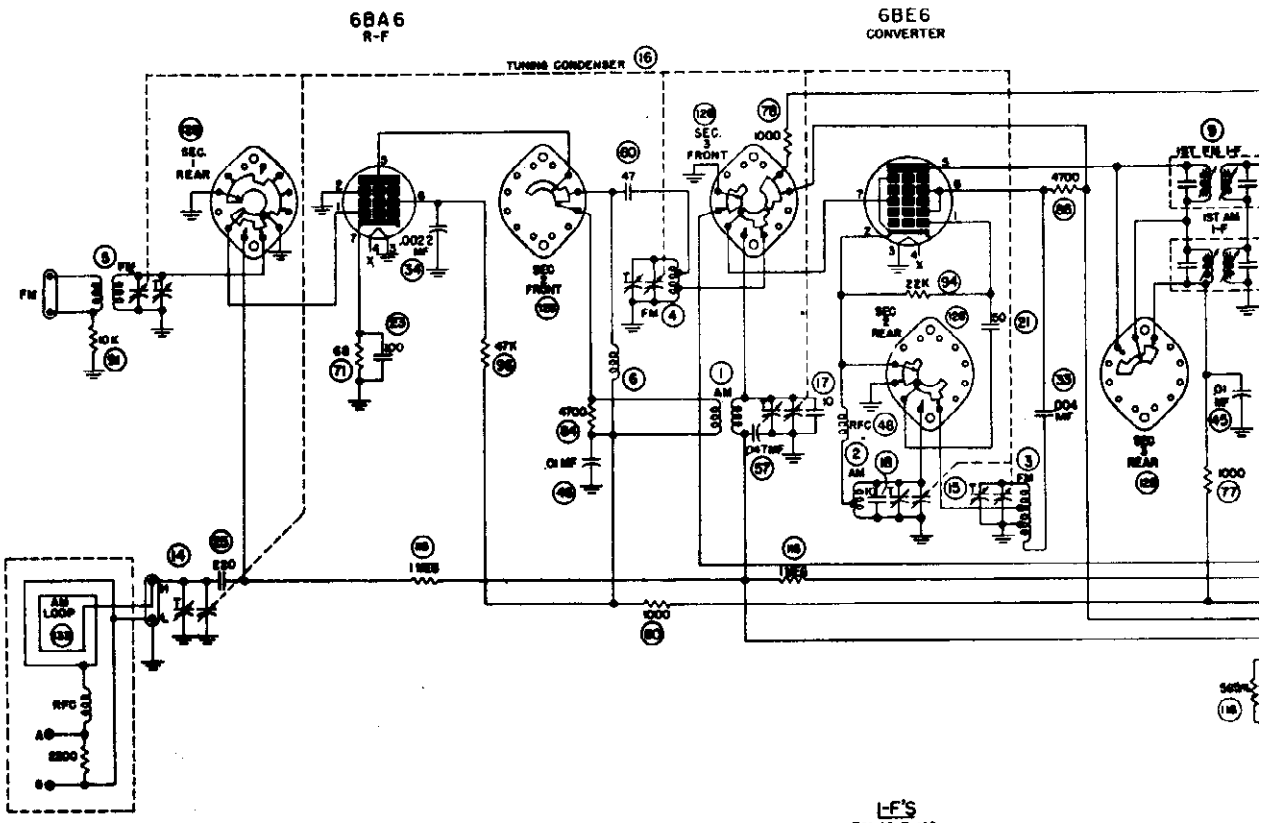
126	Control, treble	220072-8
127	Control, bass, with switch assembly (CR-243 only)	220073-5
128	Switch, selector	160194-1
129	Socket, motor	180520-4
	Plug, motor	180521-4
130	Socket, speaker	180504-16
	Plug, speaker	180503-4
131	Socket, external	180060-1
	Plug, external	189741-1
132	Socket, phono	180311-1
	Plug, phono	*
133	Loop antenna	180458-2
135	Socket and cable	

	Dial Glass	150353-1
	Panel Escutcheon	633934-3
	Knob, tuning	
	Maroon	140025-4
	Beige	140025-2
	Knob, selector	
	Maroon	143727-3
	Beige	143727-2
	Knob, treble, volume	
	Maroon	140025-5
	Beige	140025-3
136	Reject switch	160224-1
137	Socket, solenoid	182776-1

*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.





I-F'S

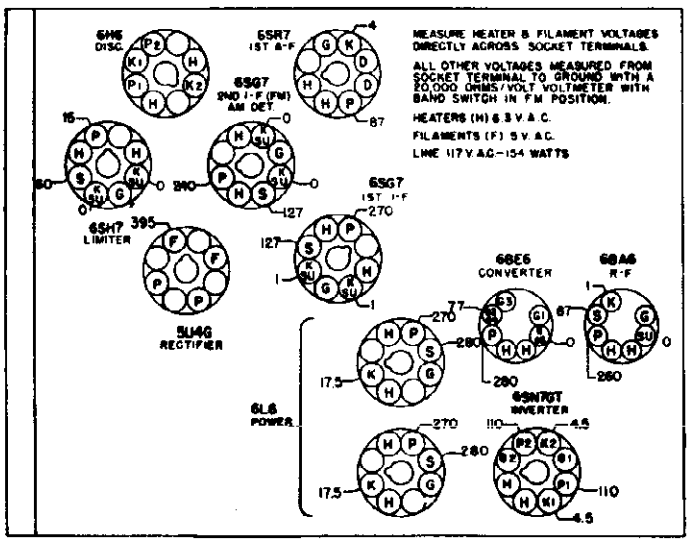
FM 10.7 MC.
AM 455 KC.

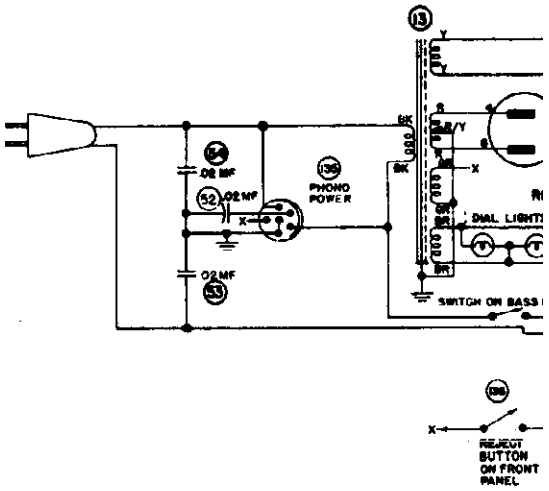
NOTES

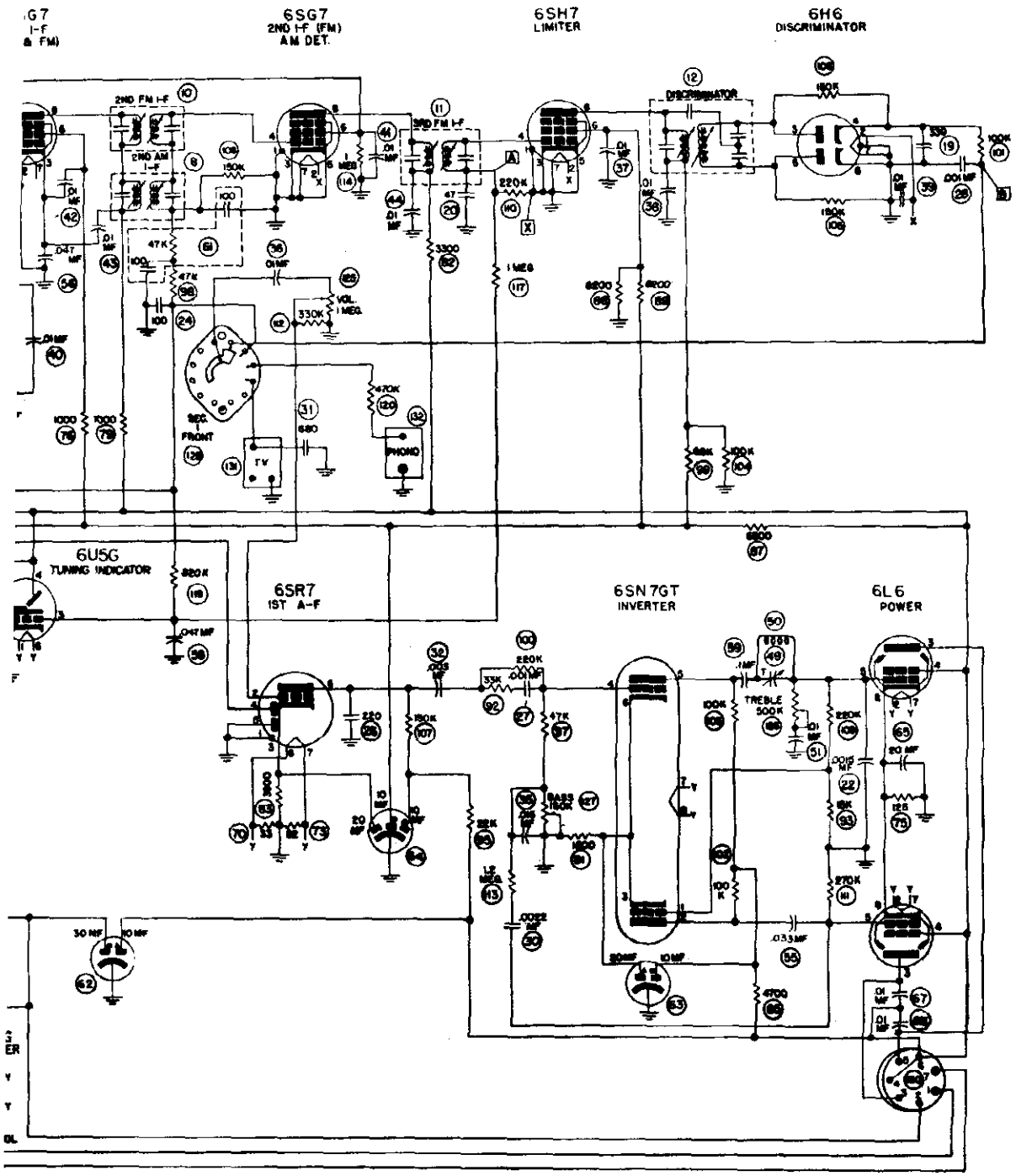
BAND SWITCH SHOWN IN COUNTERCLOCKWISE (FM) POSITION WHEN VIEWED FROM THE FRONT PANEL.

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.



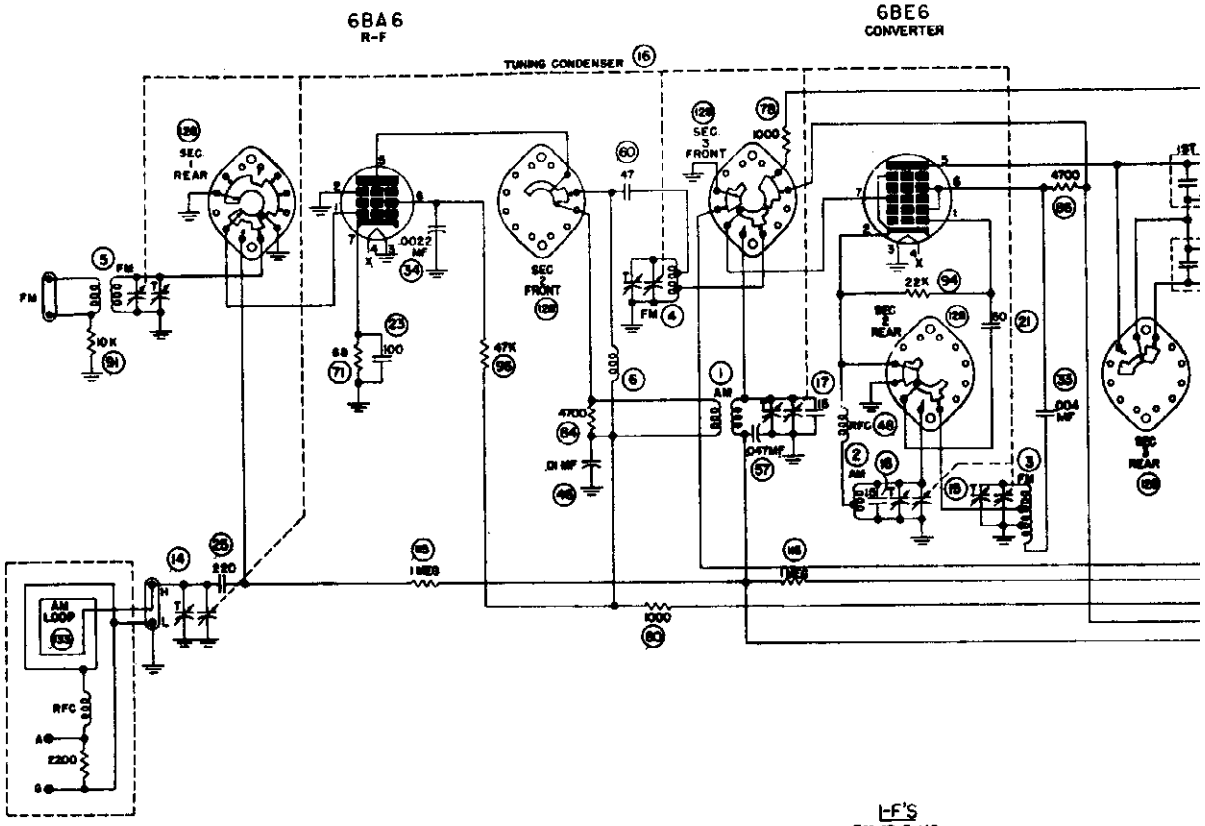




CR242
595411

FIG. 2a

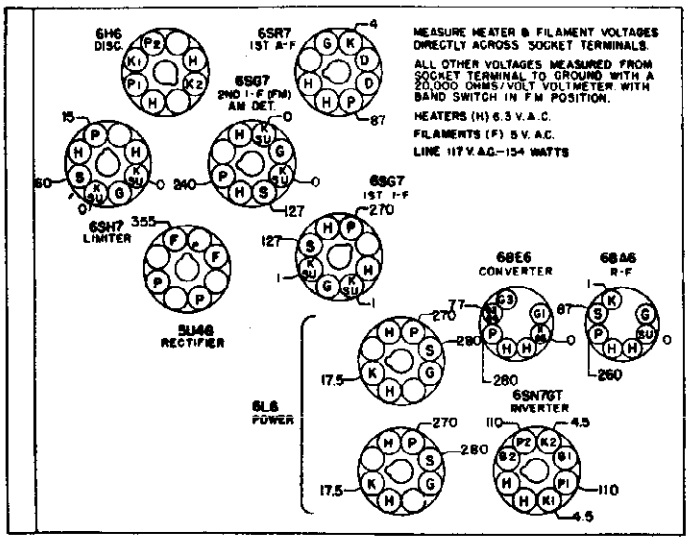
MODEL CR-243



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.



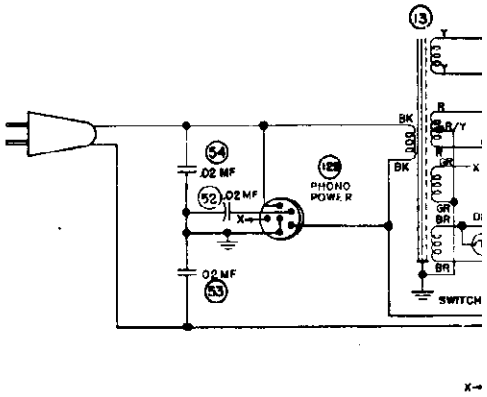
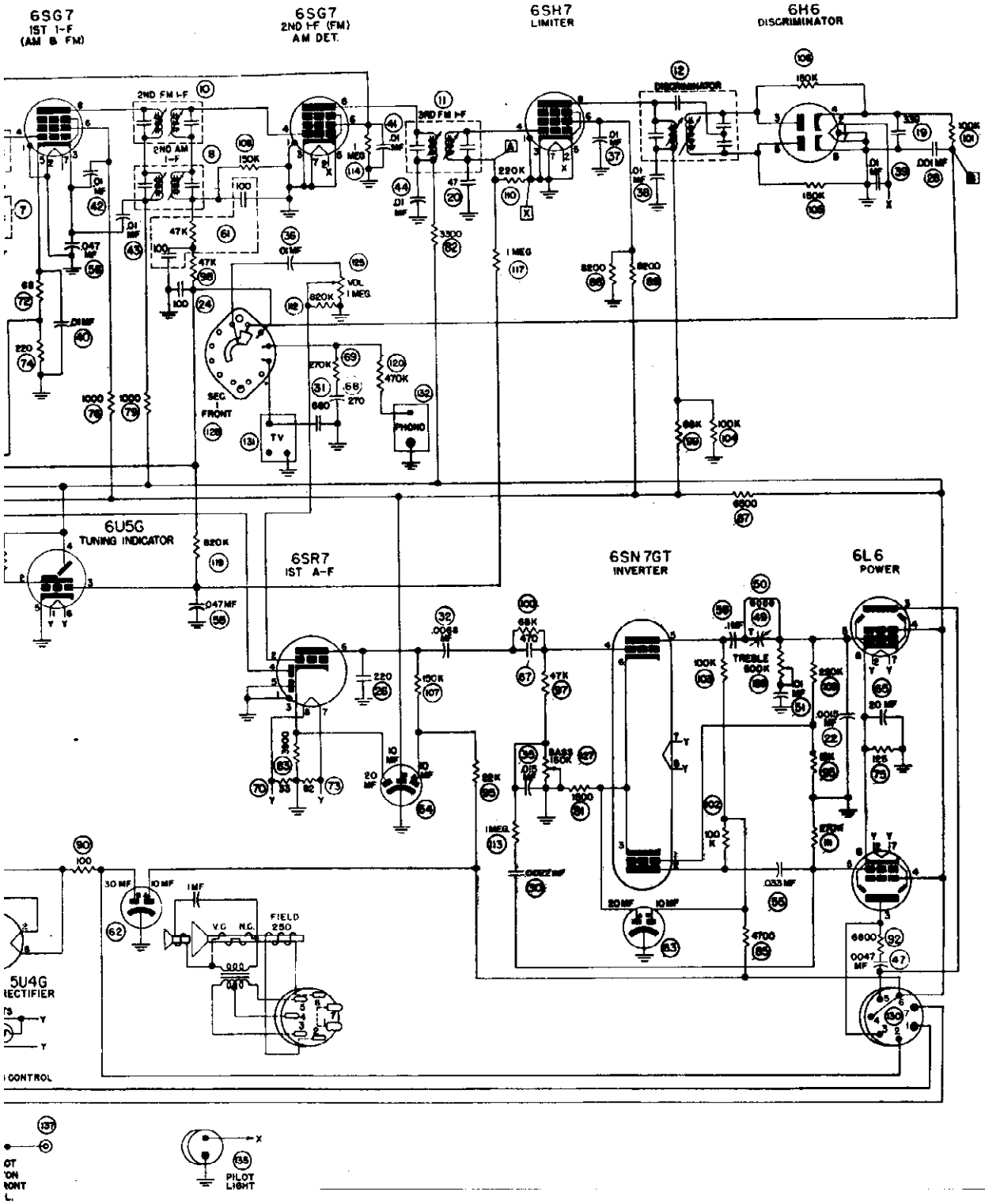
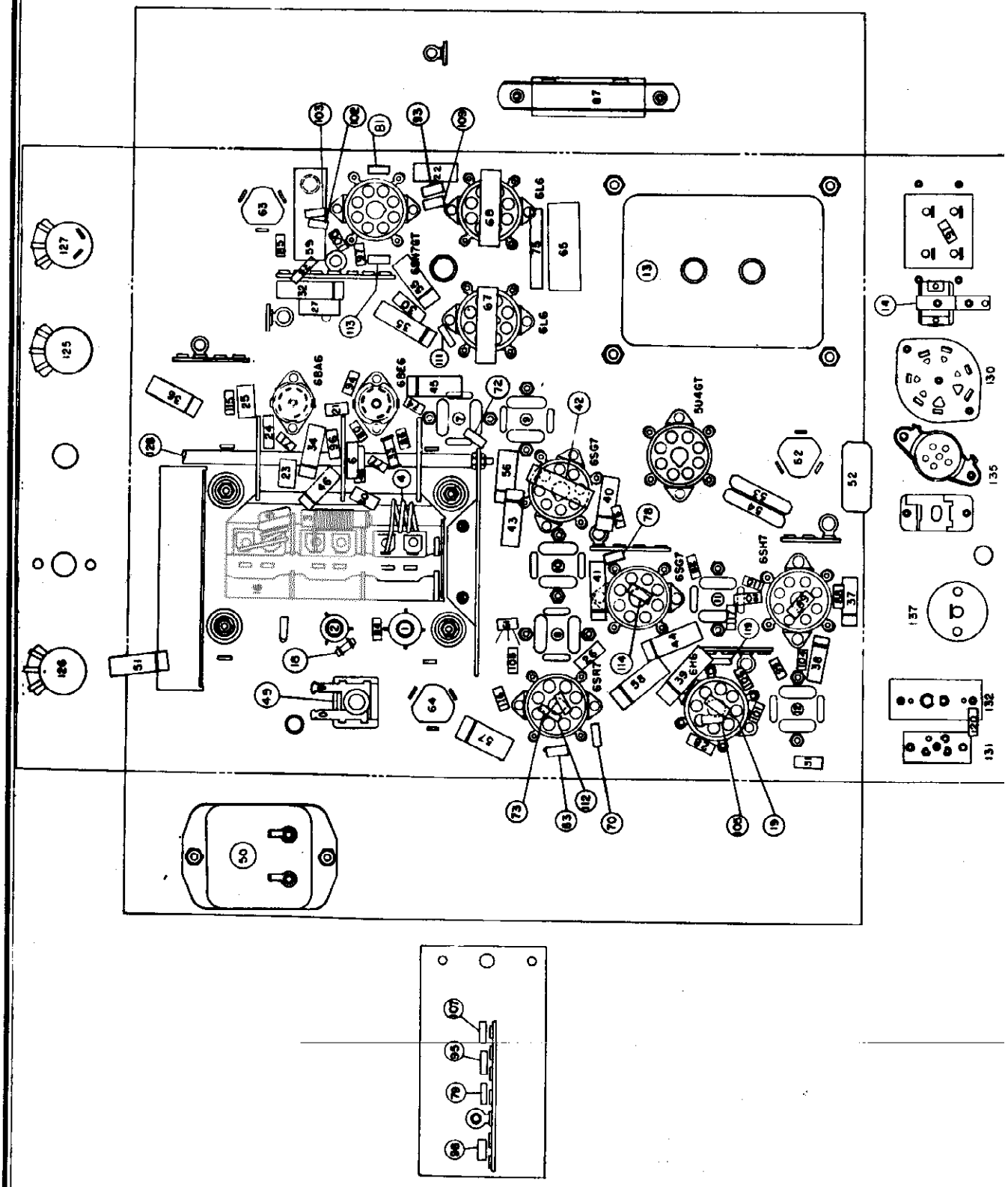


FIG. 2b



CR243
595412


6BA6
6BE6
6L6
6L6
6SN7GT
5U4GT
6SG7
6SG7
6SH7
6SH7
6EH5

LINE VOLTAGE: This clock-radio receiver is designed for operation on 117 Volts, 60 Cycles, Alternating Current only.

POWER CONSUMPTION: Clock and Radio only — 35 watts
A.C. Receptacle — 700 watts max.

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

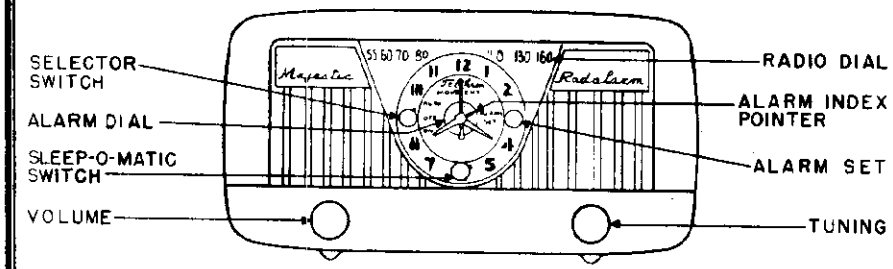
DIAL: The Dial Scale is calibrated in Kilocycles times 10 to correspond with newspaper or periodical listings.

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

12BE6 Converter	12AT6 or 12AV6 Detector, Avc and Audio Amp.
12BA6 I.F. Amplifier	50C5 Beam Power Amplifier
	35W4 Rectifier

INSTALLATION: Models 5C-2 and 5C-3 are complete in every detail for efficient and immediate operation. A self-contained Loop Antenna is included which will give excellent results in most locations. Due to the directional properties of the Loop, it may be advantageous to turn the receiver to the left or right in noisy locations for maximum signal and minimum noise. A best position for reception can always be found.

CONTROLS: Refer to the diagram below for location of the clock and radio control knobs.



HOW TO OPERATE YOUR "RADALARM" RADIO: The electric clock starts as soon as you plug the radio power cord into the A-C power line which corresponds with the rating shown on the Model Label. To set the clock to the correct time, turn the Time Set knob, located at the rear of the receiver, in the clockwise direction.

TO OPERATE THE RADIO: Turn the Selector knob located at the left side of the clock face so that its index points to ON. This turns on the power to the radio. Next, turn the Volume control knob at the bottom left of the cabinet about half way in the clockwise direction, or to the right. After the receiver has warmed up (allow about 30 seconds), set the Volume Control about half way and turn the Tuning Control knob so that the dial pointer indicates the frequency of the desired station. Then tune carefully for best reception. Adjust the volume by turning the Volume Control to the left or right to suit the listener. Never reduce the volume by detuning — always use the Volume Control knob.

To turn the radio off, turn the Selector knob so that the index points to the center or OFF position.

TO OPERATE YOUR "RADALARM" RADIO AS A MUSICAL ALARM: You may set your clock-radio to automatically turn on a program you wish to hear during the next eleven hours. Proceed by tuning in the station which will carry the program desired. Then set the Volume control knob at the level you want, as for regular radio operation. Pull alarm set knob, located at the right side of the clock face, and turn counterclockwise. This causes the alarm dial disc to rotate. Stop rotation when the time you desire the radio to go on, is indicated on the dial directly under the short index pointer, on the opposite end of the hour hand. Now turn Selector knob so that the index points to Auto position.

The "RADALARM" is now ready to turn on the radio automatically, at the time selected. As an added feature, an A.C. outlet is provided at the rear of the receiver. This enables the connection of any electrical appliance, of less than max. rated wattage, and its subsequent automatic simultaneous operation with that of the radio in the Auto position.

After setting the alarm, if you wish to return to normal radio operation, turn the Selector knob so that the index points to ON. Then operate the radio as described in preceding paragraphs. Be sure to turn the Selector knob back to the Auto position if you want a program to be turned on automatically, at the time previously set.

As with any alarm, when the radio goes on at the time selected, push alarm set knob in. To turn off radio, follow previous instructions.

SLEEP-O-MATIC: Uninterrupted radio operation and automatic shut-off may be obtained by turning the "Sleep-o-matic" control, located at the bottom of the clock face, clockwise for up to 60 minutes of operation. No further controls are necessary, other than Tuning and Volume.

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

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

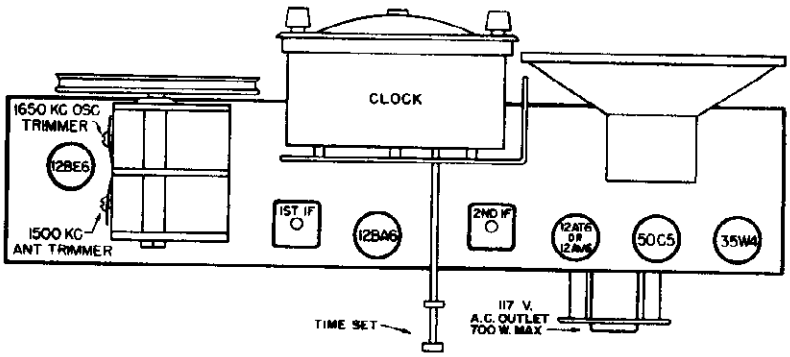
(2) Adjust the trimmers located at the top of the first and second I. F. Transformers or the iron cores located at the top and bottom of each I. F. for maximum output as indicated on the Output Meter.

MODELS 5C-2,
5C-3

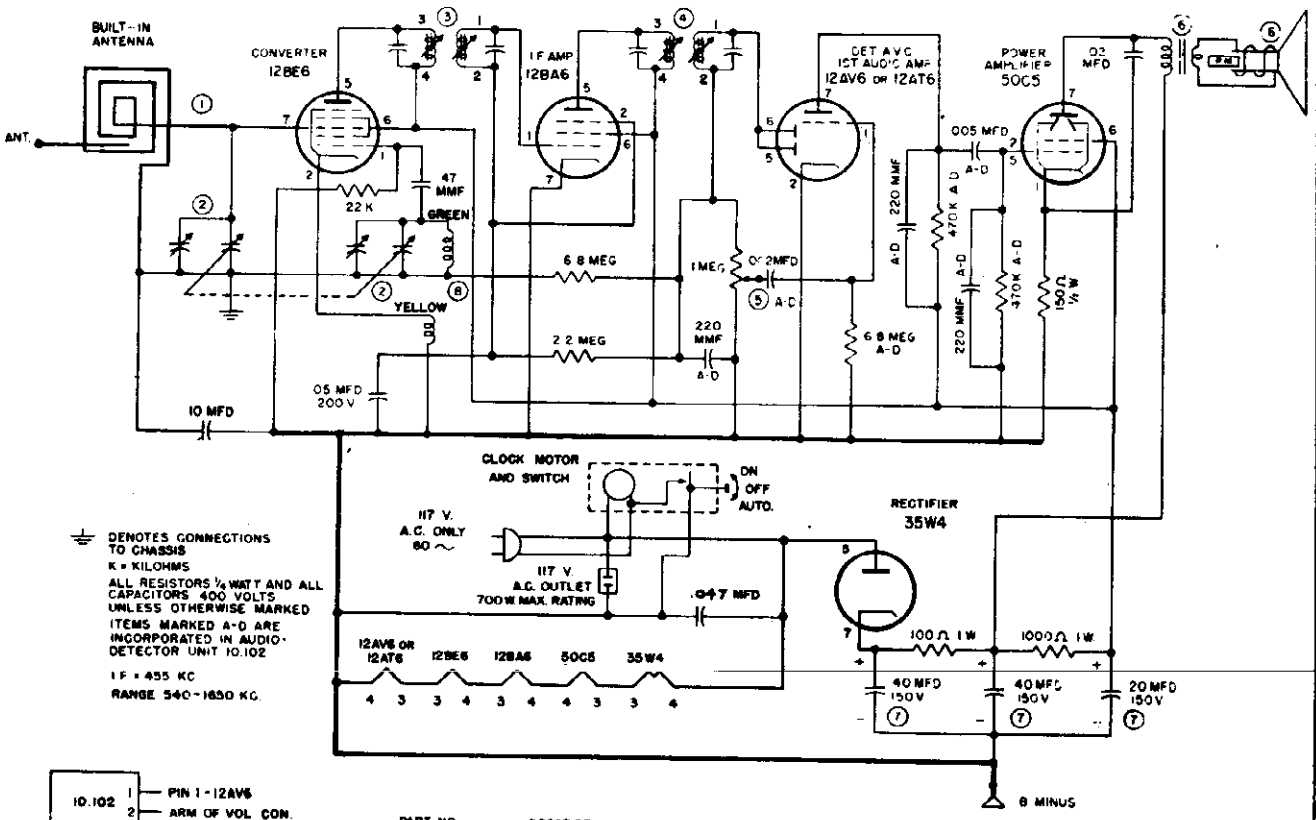
(3) Loosely couple the Signal Generator lead to the Loop and set to 1650 KC.

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

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



TRIMMER AND TUBE LOCATION DIAGRAM



10.102 AUDIO DETECTOR UNIT ITEMS MARKED A-D		
	1	PIN 1 - 12AV6
	2	ARM OF VOL. CON.
	3	TOP OF VOL. CON.
	4	PIN 2 - 12AV6
	5	PIN 5 - 50C5
	6	PIN 7 - 12AV6
	7	B +

PART NO.	DESCRIPTION
(1) 1.550	LOOP ASSEMBLY
(2) 2.163	2 GANG VARIABLE CONDENSER
(3) 1445-2	1st I.F. TRANSFORMER
(4) 1445-6	2nd I.F. TRANSFORMER

PART NO.	DESCRIPTION
(5) 8.200-11	VOLUME CONTROL AND SWITCH
(6) 30.332-3	PM 4" SPEAKER & OUTPUT TRANS.
(7) 5415-5	ELECTROLYTIC CAP. 40-40-20 MFD 150V.
(8) 1526	OSCILLATOR COIL

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

POWER CONSUMPTION: 30 Watts.

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

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

12SA7 Converter	12SQ7 Detector, Avc and Audio Amp.
12SK7 I.F. Amplifier	50L6 Beam Power Amplifier
	35Z5 Rectifier

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

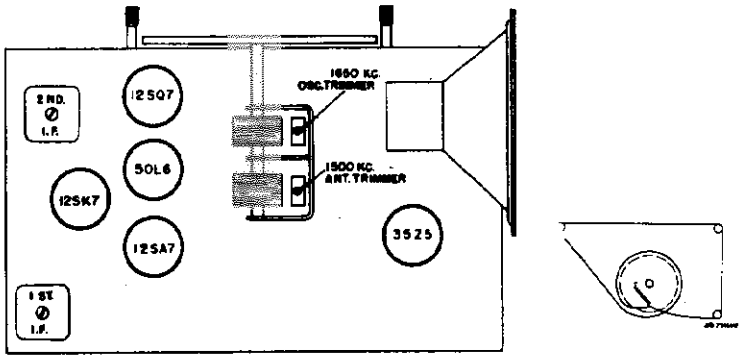
(1) Set the Signal Generator to 455 KC and connect to the stator lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn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

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

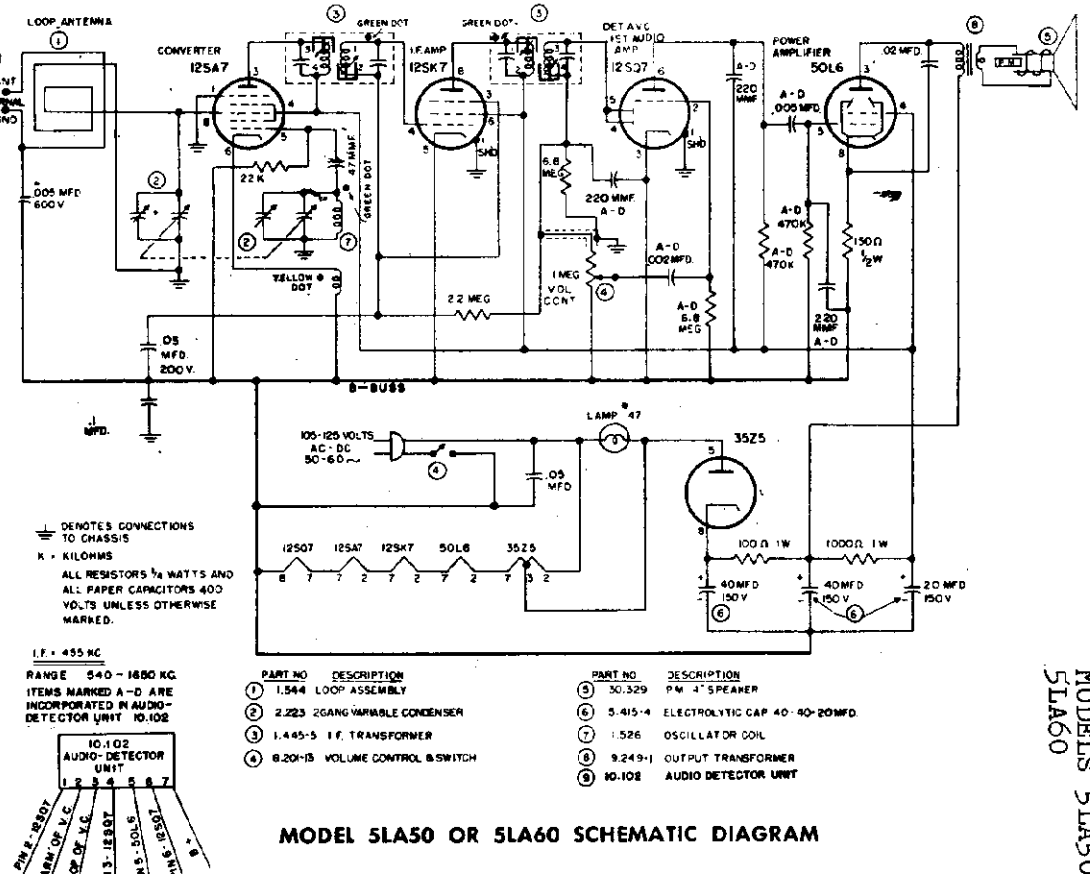
(3) Loosely couple the Signal Generator lead to the Loop and set to 1650 KC.

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

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



TRIMMER AND TUBE LOCATION DIAGRAM



PART NO	DESCRIPTION
(1) 1.544	LOOP ASSEMBLY
(2) 2.223	2GANG VARIABLE CONDENSER
(3) 1.445-5	I.F. TRANSFORMER
(4) 8.201-15	VOLUME CONTROL & SWITCH
(5) 50.329	P.M. 4" SPEAKER
(6) 5.415-4	ELECTROLYTIC CAP 40-40-20MFD.
(7) 1.526	OSCILLATOR COIL
(8) 9.249-1	OUTPUT TRANSFORMER
(9) 10.102	AUDIO DETECTOR UNIT

MODEL 5LA50 OR 5LA60 SCHEMATIC DIAGRAM

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

POWER CONSUMPTION: 30 Watts.

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

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

12SA7 Converter — 12SQ7 Detector, Avc and Audio Amp

12SK7 I.F. Amplifier — 50L6 Beam Power Amplifier

35Z5 Rectifier

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

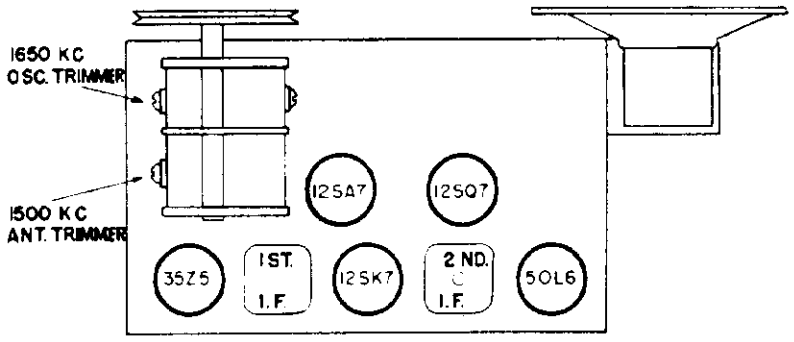
(1) Set the Signal Generator to 455 KC and connect to the stator lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn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

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

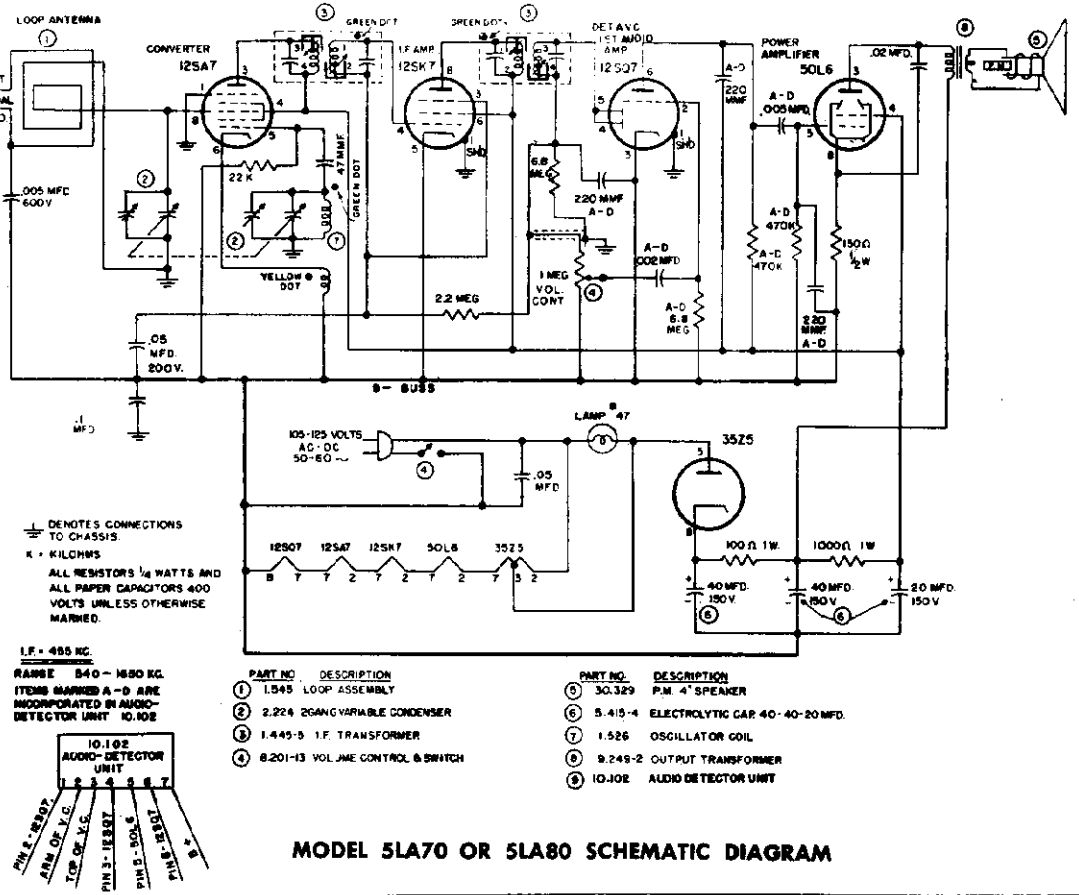
(3) Loosely couple the Signal Generator lead to the Loop and set to 1650 KC.

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

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



TRIMMER AND TUBE LOCATION DIAGRAM



MODEL 5LA70 OR 5LA80 SCHEMATIC DIAGRAM

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

POWER CONSUMPTION: 30 Watts.

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

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

12BE6 Converter	12AT6 or 12AV6 Detector, Ava and Audio Amp.
12BA6 I.F. Amplifier	50C5 Beam Power Amplifier
	35W4 Rectifier

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

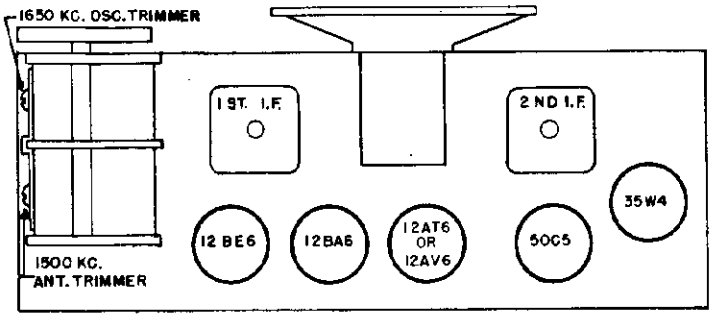
(1) Set the Signal Generator to 455 KC and connect to the stator lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn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

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

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

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

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

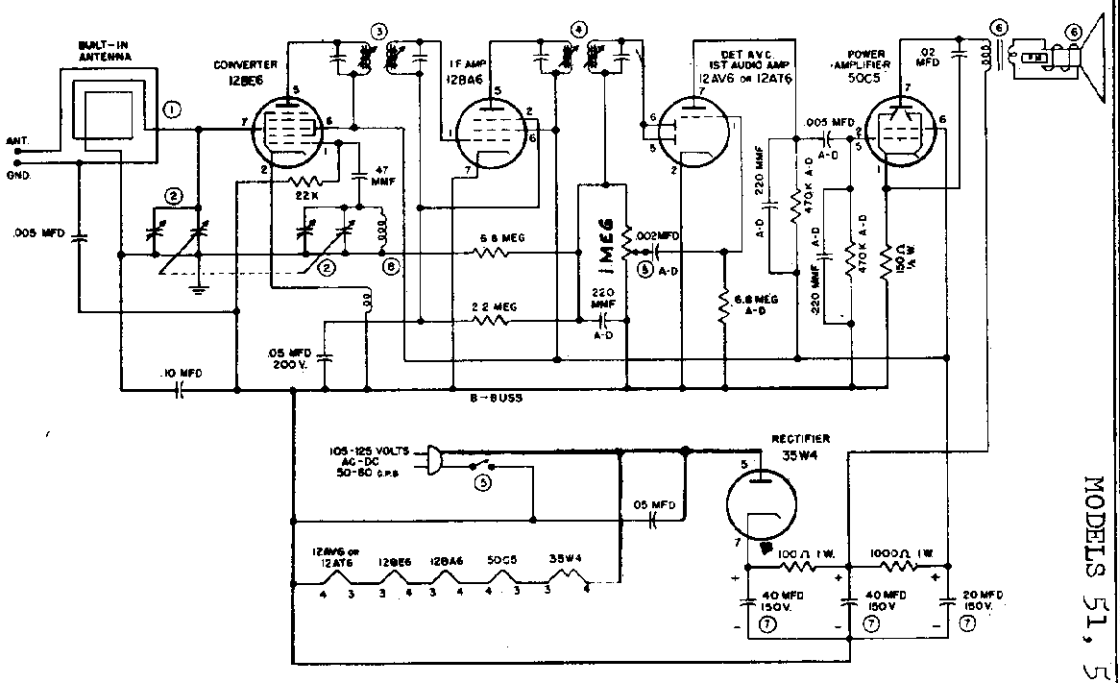


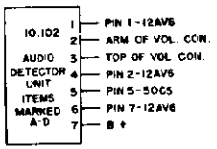
TRIMMER AND TUBE LOCATION DIAGRAM

PART NO.	DESCRIPTION
① 1.548	LOOP ASSEMBLY
② 2.200	2 GANG VARIABLE CONDENSER
③ 1.445-2	1st I.F. TRANSFORMER
④ 1.445-6	2nd I.F. TRANSFORMER

PART NO.	DESCRIPTION
⑤ 8.200-9 or 8.201-4	VOLUME CONTROL & SWITCH
⑥ 30.332-2 PM	4" SPEAKER & OUTPUT TRANS
⑦ 5.415-5	ELECTROLYTIC CAP. 40-40-20 MFD 150V.
⑧ 1.445-2	OSCILLATOR COIL
⑨ 10.102	AUDIO-DETECTOR UNIT

MODEL 51, 52 SCHEMATIC DIAGRAM





⏚ DENOTES CONNECTIONS TO CHASSIS
K = KILOHMS
ALL RESISTORS ½ WATT AND ALL CAPACITORS 400 VOLTS UNLESS OTHERWISE MARKED
ITEMS MARKED A-D ARE INCORPORATED IN AUDIO-DETECTOR UNIT 10.102
I.F. = 455 KC.
RANGE 540-1650 KC.

MODEL 80FMP2

TUBES: The Tubes used, and their functions, are as follows:

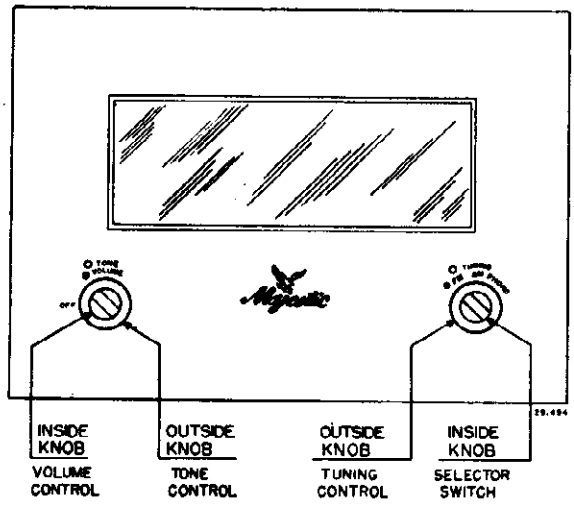
12AT7	R-F Amplifier and Mixer (F-M)
6BE6	A-M Converter and F-M Oscillator
6BA6	1st I-F Amplifier (A-M & F-M)
6BA6	2nd I-F Amplifier (F-M)
6AL5	F-M Detector
6AV6	A-M Detector, A.V.C. and Audio Amp.
6V6GT	Beam Power Amplifier
5Y3GT	Rectifier

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

POWER CONSUMPTION INCLUDING RECORD CHANGER: 115 Watts.

TUNING RANGE:

Broadcast Band:	540 to 1650 Kilocycles (182 to 555 Meters)
F-M Band:	87.5 to 108.5 Megacycles (2.7 to 3.4 Meters)



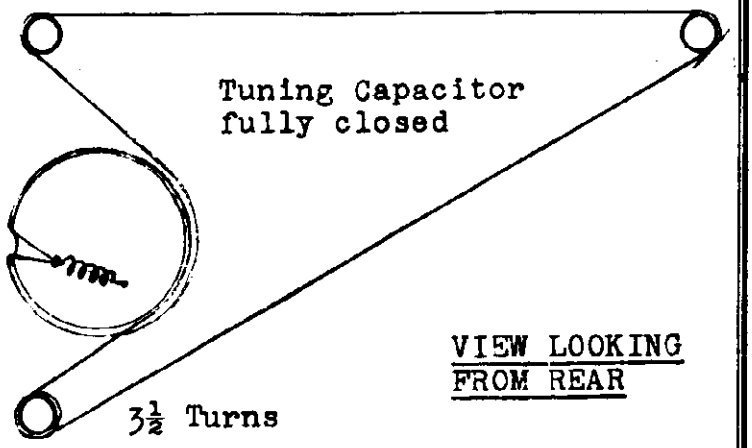
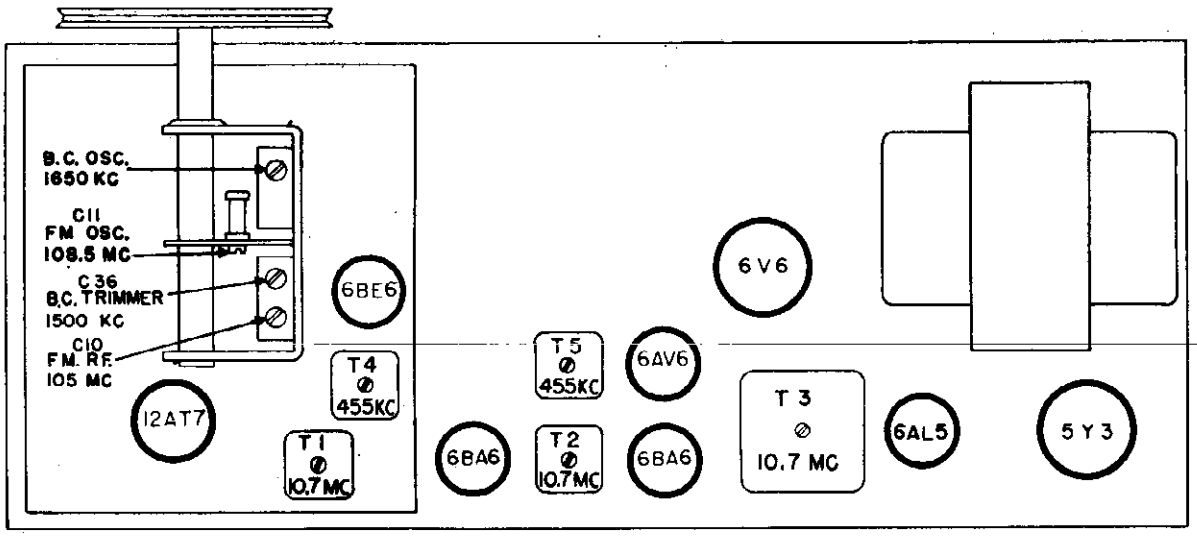


FIG. 1—FRONT PANEL CONTROLS



29.463

FIG. 2—TUBE AND ADJUSTMENT LOCATION DIAGRAM

ALIGNMENT CHART

STEP	CIRCUIT ALIGNED	RECEIVER DIAL AT	SIGNAL GENERATOR			METER		ADJUST	METER INDICATION
			TYPE	FREQ.	CONNECTIONS	TYPE	CONNECTIONS		
1	B.C. I.F.	B.C. BAND MAX. FREQ.	A.M.	455 KC 30% MOD.	REAR B.C. SECTION OF VARIABLE CONDENSER	OUTPUT	ACROSS VOICE COIL	TOP & BOT. OF T4 & T5	MAX. OUTPUT
PREFERRED METHOD 2	F.M. I.F.	F.M. BAND MAX. FREQ.	F.M.	10.7 MC. 30% MOD.	HIGH SIDE THROUGH .005 MF (APPROX.) CAP TO PIN 7 OF 12AT7	OUTPUT	ACROSS VOICE COIL	TOP & BOT. OF T1 & T2; BOT. OF T3	MAX. OUTPUT
ALTERNATE METHOD 2			R.F. OR A.M.	10.7 MC. UNMOD.		D.C. V.T.V.M.	NEGATIVE TO PIN 7 OF 6AL5; POSITIVE TO GROUND		MAX. DEFLECTION
PREFERRED METHOD 3	F.M. DET.	F.M. BAND MAX. FREQ.	F.M.	10.7 MC. 30% MOD.		OUTPUT	ACROSS VOICE COIL	TOP OF T3	MAX. OUTPUT
ALTERNATE METHOD 3			R.F. OR A.M.	10.7 MC. UNMOD.		D.C. V.T.V.M.	NEG. TO JUNCTION OF 8.2K'S AT 6AL5; POS. TO JUNCTION OF R15 & C17.		ZERO BETWEEN TWO OPPOSITE POLARITY PEAKS
PREFERRED METHOD 4	F.M. OSC.	F.M. BAND MAX. FREQ.	F.M.	108.5 MC. 30% MOD.	EACH SIDE OF GEN. OUTPUT THROUGH 150 OHM RESISTOR TO F.M. ANT. TERMINALS	OUTPUT	ACROSS VOICE COIL	TRIMMER ON TOP CENTER OF VAR. COND. (C11)	MAX. OUTPUT
ALTERNATE METHOD 4			R.F. OR A.M.	108.5 MC. UNMOD.		D.C. V.T.V.M.	NEGATIVE TO PIN 7 OF 6AL5; POSITIVE TO GROUND		MAX. DEFLECTION
PREFERRED METHOD 5	F.M. R.F.	F.M. BAND 105 MC	F.M.	105 MC. 30% MOD.		OUTPUT	ACROSS VOICE COIL	TRIMMER AT REAR OF VAR. COND. (C10)	MAX. OUTPUT
ALTERNATE METHOD 5			R.F. OR A.M.	105 MC. UNMOD.		D.C. V.T.V.M.	NEGATIVE TO PIN 7 OF 6AL5; POSITIVE TO GROUND		MAX. DEFLECTION
6	B.C OSC.	B.C. BAND MAX. FREQ.	A.M.	1650 KC 30% MOD.	REAR B.C. SECTION OF VARIABLE CONDENSER	OUTPUT	ACROSS VOICE COIL	TRIMMER AT FRONT OF VAR. COND. (C34).	MAX. OUTPUT
7	B.C. R.F.	B.C. BAND 1500 KC	A.M.	1500 KC 30% MOD.	EACH SIDE OF GEN. OUTPUT TO 2 OR 3-TURN LOOP (1 FOOT DIA.) SEVERAL FEET FROM ANT.	OUTPUT	ACROSS VOICE COIL	B.C. TRIM. AT REAR OF VAR. COND. (C 36).	

29.498

NOTES:

1- TURN VOLUME CONTROL FULLY CLOCKWISE.

2- MAINTAIN SIGNAL INPUT LOW ENOUGH TO HAVE LESS THAN 2 VOLTS ACROSS METERS.

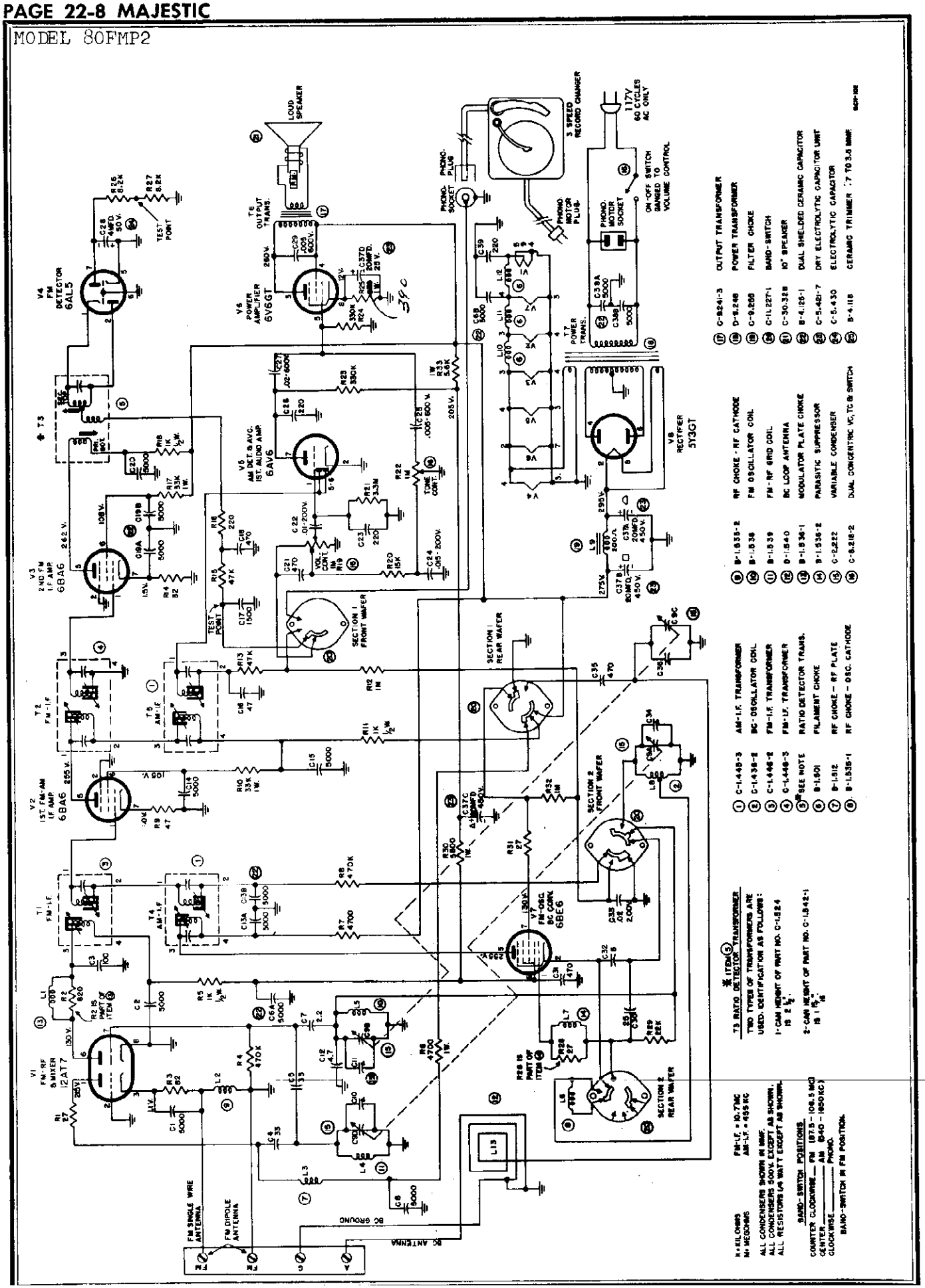
3- UNLESS OTHERWISE NOTED, CONNECT LOW SIDE OF SIGNAL GENERATOR TO CHASSIS.

4- UNLESS OTHERWISE NOTED, SET VARIABLE CONDENSER TO MINIMUM CAPACITY (MAX. FREQ.)

5- USE PROPER TOOL FOR SMALL I.F. TRANS. ADJUSTMENTS— I.E., .150 DIA. BAKELITE WITH BLADE .075 THICK.

6- MAINTAIN 60 CYCLE LINE VOLTAGE AT APPROX. 117 VOLTS.

MODEL 80FMP2



MODEL 104, Lon
Ranger, Rudolp

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

POWER CONSUMPTION: 30 Watts.

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

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

12BE6 Converter	12AT6 Detector, Avc and Audio Amp.
35W4 Rectifier	50C5 Power Amplifier

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

(1) Connect the high side of a 455 KC Signal Generator through a .1 mf capacitor to the stator lug on the rear section of the variable capacitor; the ground lead to one of the lugs on the line on-off switch. Connect a suitable output meter across the speaker voice coil. Turn the Volume and Tuning controls to their extreme clockwise positions.

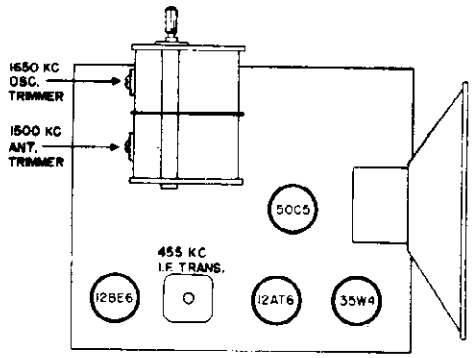
(2) Adjust the trimmers located at the top and bottom of the I-F transformer for maximum indication on the output meter.

(3) Connect the Signal Generator high side to the antenna lug through a 47 mmfd capacitor; the low side remains as in step (1). Set the Signal Generator to 1650 KC.

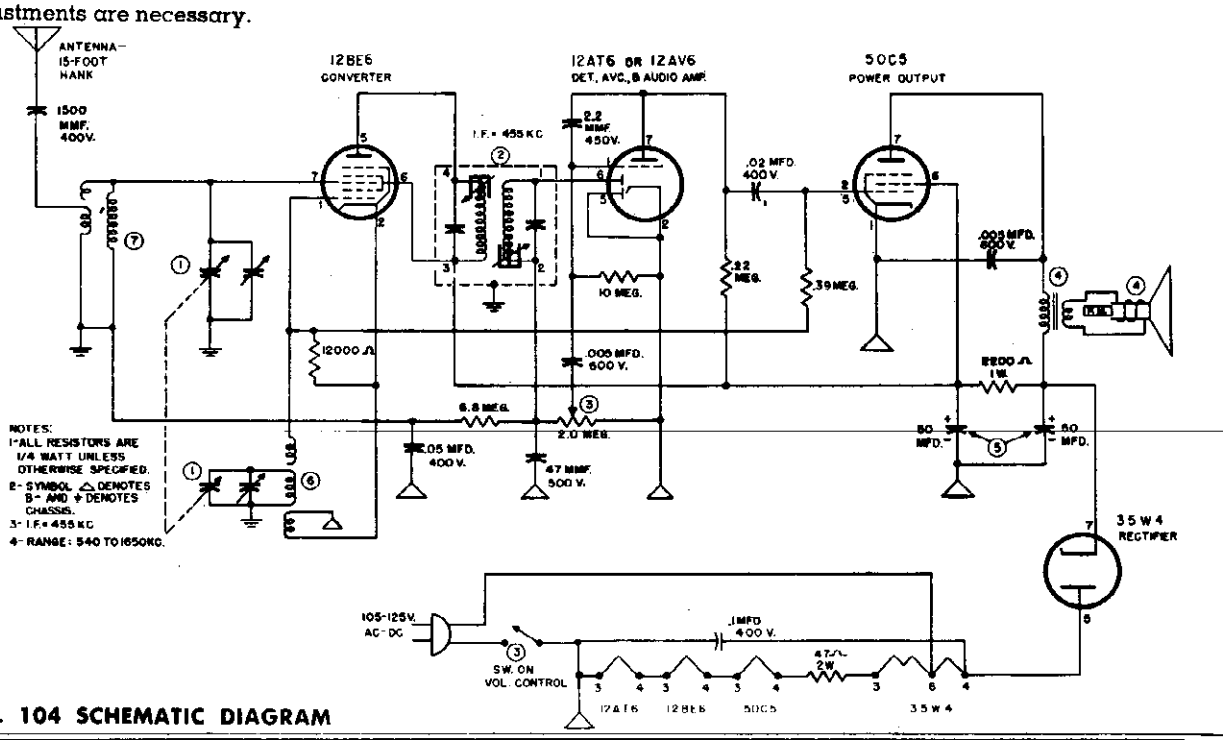
(4) With Variable Capacitor set at the extreme clockwise position, tune in the 1650 KC signal by means of the Oscillator Trimmer on the Variable Capacitor (front section).

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

ITEM	PART NO	DESCRIPTION
①	2.225	2-GANG VAR. CONDENSER
②	1.445-2	I.F. TRANSFORMER
③	6.201-9	VOLUME CONTROL W/SWITCH
④	30.332-1	4" P.M. SPEAKER WITH OUTPUT TRANSFORMER
⑤	5.436-1	50-50 MFD. ELECT. 150V. D.C.
⑥	1.402-4	OSCILLATOR COIL
⑦	1.534	ANTENNA COIL



TRIMMER AND TUBE LOCATION DIAGRAM



MODEL 104 SCHEMATIC DIAGRAM

MEISSNER T.R.F. BANDPASS TUNER
MODEL 4E

The Meissner Model 4E T.R.F. Bandpass Tuner is designed for superior high fidelity broadcast reception. It is specifically designed for custom installation and may be used in connection with a power amplifier and speaker system to fit a wide variety of installations ranging from the simplest home installation consisting of a low power amplifier and a speaker, to the largest high power installations designed to serve large auditoriums and consisting of one or more high power amplifiers and multiple speakers. Although the designer of such an installation must be guided to a large extent by the requirements of the installation, the following general hints may prove helpful.

The Power Amplifier

The output impedance of the 4E Tuner is 100,000 ohms and should be worked into an amplifier having high impedance input. High impedance amplifiers usually have an input impedance of 500,000 ohms, but some have a lower impedance than this and the 4E may be worked into an impedance as low as 100,000 ohms with no appreciable loss of low frequencies or increase in distortion. An amplifier having provision for phonograph input from a crystal pickup is satisfactory for use with the 4E, but under no conditions should the 4E be worked into a microphone input channel. The relatively high output of the 4E would cause overloading and severe distortion in the microphone input stage and the hum level would be too high to be a considered acceptable.

The Cabinet

No special precautions are necessary in the installation of the 4E Tuner, although it should be borne in mind that sufficient ventilation is required to prevent the unit from overheating. The heat generated by the 4E is low so that only a small amount of ventilation is required and usually the ordinary open back type of cabinet is satisfactory.

One more thing which should be observed in planning an installation is to use the normal precautions against microphonics. Since the 4E is a T.R.F. circuit and has no local oscillator, its tendency toward microphonism will be much less than in a similar superhet unit; but the 6AT6 audio amplifier tube may produce microphonics if subjected to severe vibration. This vibration may be transmitted through the cabinet or through the air from the speaker and the installation layout should be planned to avoid it.

The Record Player (or Changer)

The phonograph system of the 4E chassis is designed for use with crystal type pickups, and any record player or changer having this type pickup may be used. The following notes should be observed:

1. The record player frame must be connected to the tuner chassis in order to prevent hum pickup. In some record players the connecting lead from the phonograph pickup cartridge to the tuner chassis is a shielded lead with the shield connected to the pickup cartridge and to the record player frame. In this case the record player frame is automatically connected to the tuner chassis; but in record players which do not have this connection, a separate connecting lead between the record player frame and tuner may be used.

MODEL T4EK

2. The record player motor may be plugged into the convenience outlet on the rear of the tuner chassis. A power switch must be provided on the record player to turn the motor on and off.

3. The connecting lead from the pickup cartridge must be provided with a miniature phonograph plug. The 4E chassis is shipped with a proper plug in the input jack for use on phono units not so equipped. The outer band or shield is connected to the shell of the plug, and the center wire is soldered in the pin of the plug.

Antenna and Ground

For the best results it is strongly recommended that a good outdoor antenna be used with the 4E. Although this practice has been virtually abandoned with present day receivers having built-in antennas, it is still good practice when the best reception is desired.

Equally important in insuring the best possible reception is the use of a good ground system. Cold water pipes or a rod driven several feet into the earth may be used for external ground, but hot water or steam pipes or electrical conduit should not be used. A good ground connection will do much to minimize electrical interference, and is well worth the effort required for its installation.

Service Data - General

Power Supply 110-120 V 50-60 cycles.
Power Consumption 25 watts
Undistorted Output 2 to 15 volts.
Replacement Part Numbers - as shown on circuit diagram.
Circuit T.R.F. Bandpass.
Audio Frequency Response - flat ±2 db. 40 to 15,000 cycles.
Hum Output .002 volts.

Tubes:	6BA6 R.F. Amplifier	6AT6 Detector - Audio Amplifier
	6BA6 R.F. Amplifier	6X4 Rectifier

Alignment Procedure (use 200 uuf. dummy)

1. Using an F.M. Signal Generator and Oscilloscope:

Connect the vertical plates of the oscilloscope to the chassis and top of volume control. Connect the horizontal plates to the sync terminals of the F.M. signal generator.

Set the dial of the tuner to 1,400 kc and the generator to 1,400 kc, using a sweep frequency of 400 cycles and deviation of about ±50 kc. Set the output of the generator to the least that will give a useful picture, connecting generator to antenna terminal.

Adjust the 4 trimmers at the top of the gang condenser to obtain a pattern of the greatest amplitude, reducing generator input as alignment proceeds, and at the same time adjusting the trimmers to give a double-humped pattern with humps of equal magnitude and with the center of the pattern centered on the scope.

2. Using an A.M. Signal Generator:

Connect the signal generator as usual, with an output meter as indicator connected to top of volume control or audio cable.

Set generator at 1,385 kc and tuner to 1,400 kc. Loosen the 4 trimmers on top of the gang and slowly tighten one at a time to obtain a maximum output reading. Keep each trimmer on the loose side of resonance until all trimmers are nearly peaked; then carefully peak each trimmer. Check

alignment by slowly tuning generator to about 1,415 kc, during which the output meter should show a slight drop and then a rise again. This alignment centers the response at 1,400 kc so that the dial calibration will be accurate. If the generator had been set at 1,400 kc initially, the center of the tuner's response would be below 1,400 kc on the tuner dial.

Resistance and Voltage Chart

Resistance between pin and chassis

Tube	Pin Number						
	1	2	3	4	5	6	7
6BA6 1st RF	2.1 meg.	0	*0-25	*0-25	**5 meg.	**5 meg.	470
6BA6 2nd RF	470K	0	*0-25	*0-25	**5 meg.	**5 meg.	470
6AT6 Detector	10 meg.	0	*0-25	*0-25	940K	147K	**5 meg.
6X4 Rectifier	240	Tie Point	*0-25	*0-25	Tie Point	240	**5 meg.

* Reading subject to position of hum balance control.

** Reading subject to variation depending upon the filter condensers.
CAUTION: Discharge filter condensers before making measurements.

Voltage between pin and chassis

No signal condition.
Measurements to ground with 20,000 ohm/volt meter, 1,000 ohm/volt on AC

Tube	Pin Number						
	1	2	3	4	5	6	7
6BA6 1st RF	Sl.Neg.	0	*	*	200	132	3.5
6BA6 2nd RF	Sl.Neg.	0	*	*	200	132	3.9
6AT6 Detector	Sl.Neg.	0	*	*	Sl.Neg.	Sl.Neg.	85
6X4 Rectifier	185 VAC	Tie Point	*	*	Tie Point	185 VAC	237

* Reading will range from 0 to 6.3 volts AC depending on setting of hum control.

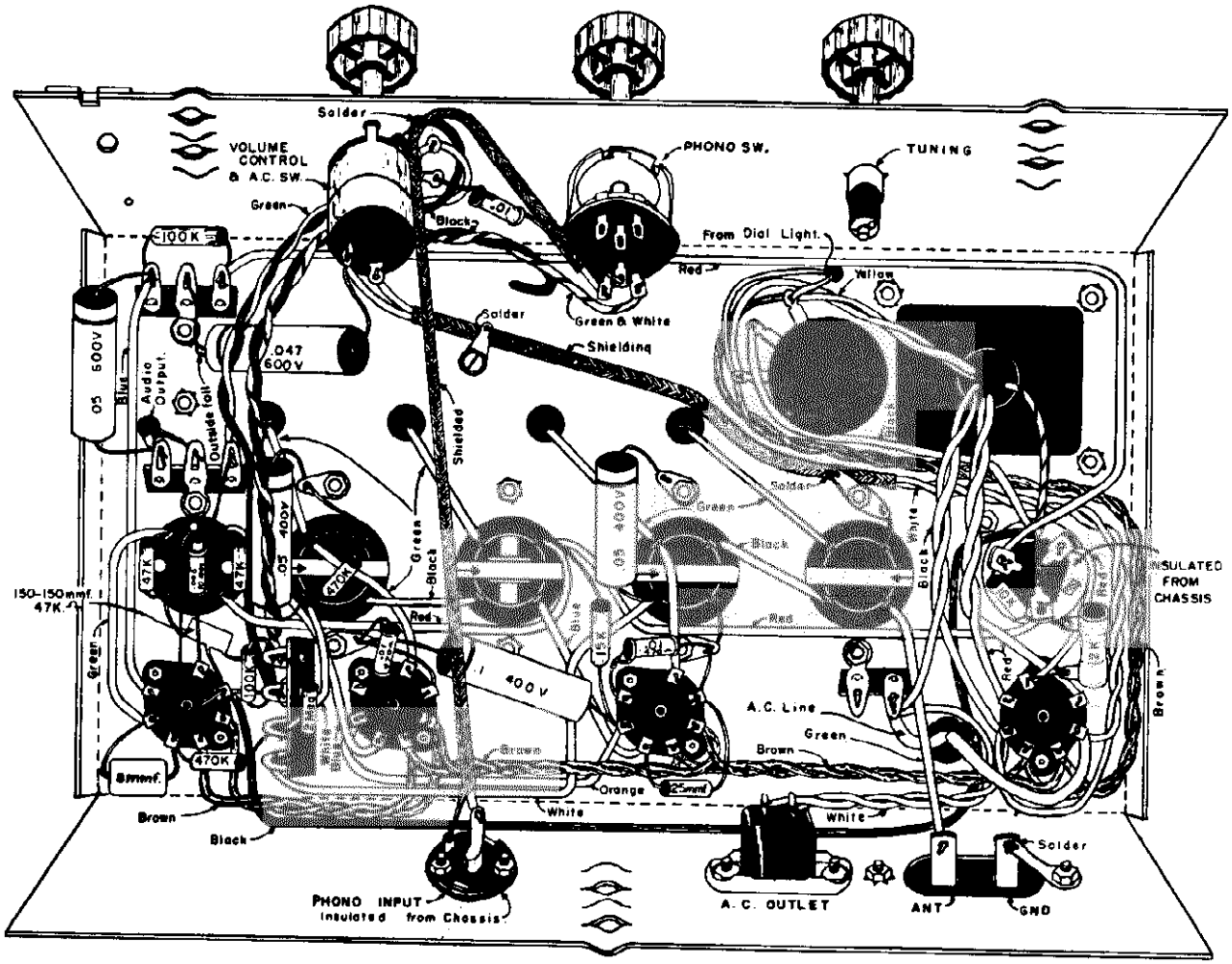
Parts List for T4EK

1. One chassis with bearing, #06279.
2. One bracket and pulley assembly #06282.
3. One 4 gang variable condenser #21-5223.
4. One gang condenser shield assembly #25-8208.
5. One dial plate assembly #05939.
6. One input ant. coil #9820.
7. One output ant. coil #9822.
8. One input R.F. coil #9824.
9. One output R.F. coil #9826.
10. One untuned R.F. coil #9828.
11. One 500K volume control with switch #29424.
12. One two-position switch #29582.
13. One 100 ohm jum balance control #29260.
14. One power transformer #29501.
15. One output cable assembly #05554.

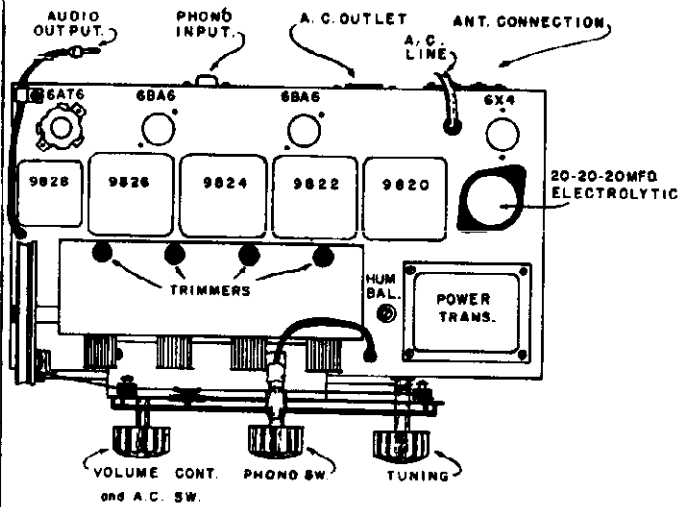
MODEL T4EK

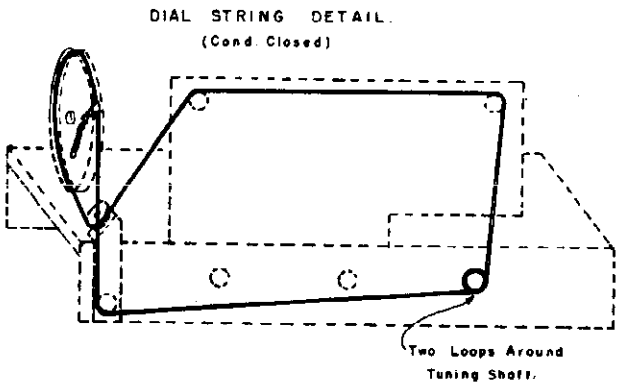
16.One length of shielded wire.
17.One length of braided shielding.
18.One line cord #12434.
19.One 20-20-20 mfd. 250 V. electrolytic condenser #34102.
20.One .1 mfd. 400 V. paper condenser #28113GT.
21.One .05 mfd. 600 V. paper condenser #28115GT.
22.Two .05 mfd. 400 V. paper condensers #28103GT.
23.One .047 mfd. 600 V. molded condenser #34160.
24.One 8 mmf. molded mica condenser #15149.
25.One 25 mmf. ceramic condenser #27165.
26.One .01 mfd. ceramic condenser #34111.
27.Two .01 mfd.-470 ohm type JCR-P capristors #34150-5.
28.One .005 mfd.-10 megohm type JCR-C capristor #34151-7.
29.One 150 mmf.-150 mmf.-47,000 ohm filpec #34171-1.
30.One 2,000 ohm 5 watt wire wound resistor #34149.
31.Two 47,000 ohm 1/2 watt carbon resistors.
32.One 100,000 ohm 1/2 watt carbon resistor.
33.One 100,000 ohm 1 watt carbon resistor.
34.Two 470,000 ohm 1/2 watt carbon resistors.
35.One 2 megohm 1/2 watt carbon resistor.
36.One 10,000 ohm 1/2 watt carbon resistor.
37.One 15,000 ohm 1 watt carbon resistor.
38.One tuning shaft #06285.
39.One AC receptacle #19794.
40.Four miniature tube sockets #29477.
41.One tube shield clip #29530.
42.One tube shield #29531.
43.One phono jack #29253.
44.One insulating washer for phono jack #26624.
45.One 2 lug terminal strip #16731.
46.One bakelite mounting plate for electrolytic condenser #19450.
47.One 1-insulated tie lug #25-5732.
48.One 3-insulated tie lug #25-6715.
49.Two 2-insulated tie lugs #25-5731.
50.Six single ended lugs.
51.One double ended lug #16480.
52.One cable clamp #16491.
53.One line cord strainrelief (2 pieces) #29414.
54.One dial pointer #29425.
55.Two dial scale retaining springs #05938.
56.One dial drum assembly #05817.
57.One dial cord assembly #06286.
58.One dial scale #23-8238.
59.Three felt washers #19595.
60.Two knobs (plain) #29270.
61.One knob with dot #05878.
62.One dial light socket #29583.
63.One dial lamp #29262.
64.One 6X4 tube.
65.One 6AT6 tube.
66.Two 6BA6 tubes.
67.One hairpin cotter #29493.
68.One piece of plastic tubing #23440.
69.Supply of screws, nuts, lockwashers, and washers for assembly.
70.Instructions, including circuit and pictorial diagrams.
71.One mounting dimensions sheet printed full scale.

4 TUBE T.R.F. TUNER KIT. MODEL 4EK.

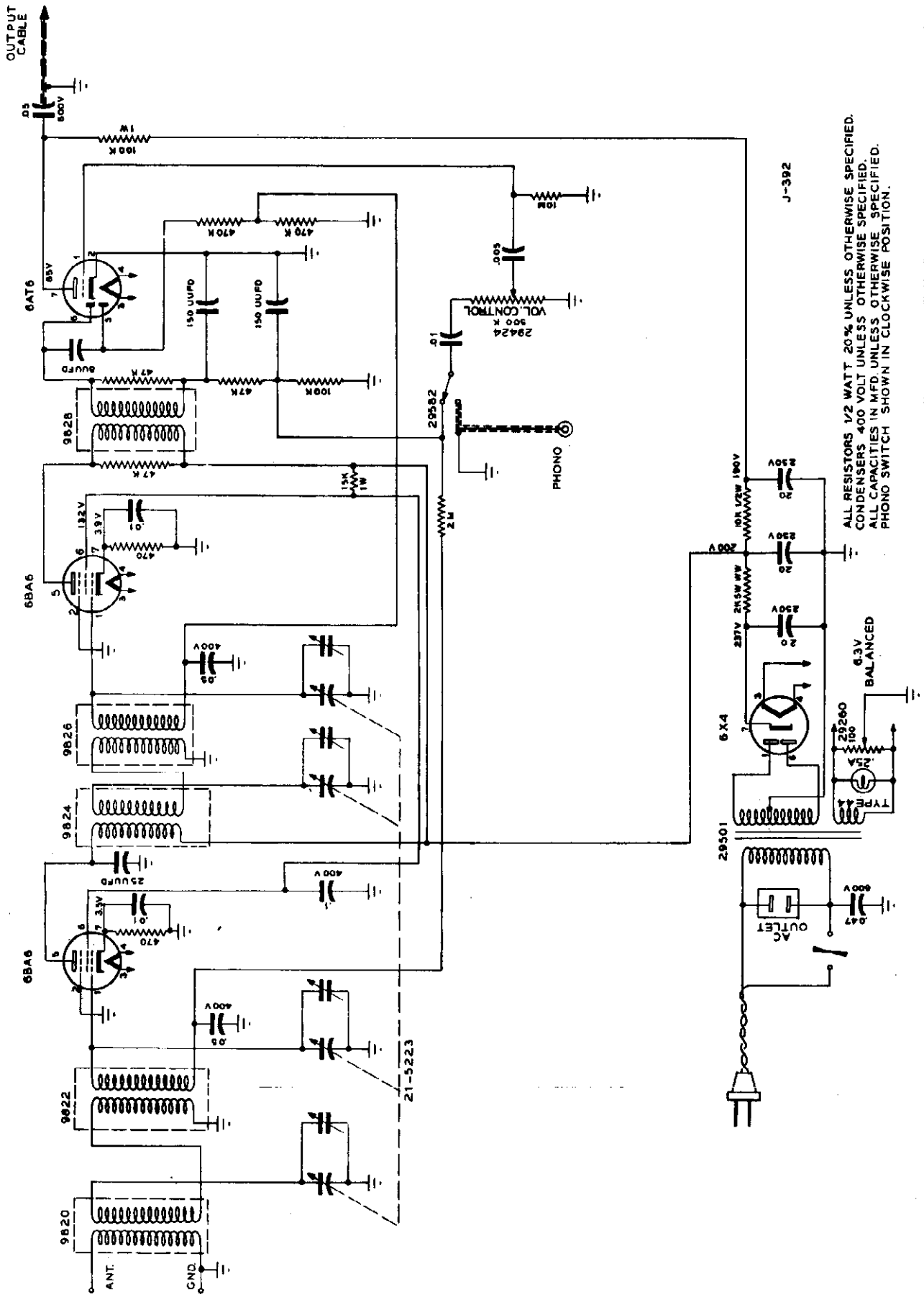


J-393





MODEL TLEK


OUTPUT CABLE
6AT6
6BA6
6BA6
6X4
9828
9826
9824
9822
9820
29582
29424
VOL. CONTROL
PHONO
J-392
29501
AC OUTLET
6.3V BALANCED
TYPE 44
ANT.
GND.
21-5223
ALL RESISTORS 1/2 WATT 20% UNLESS OTHERWISE SPECIFIED.
CONDENSERS 400 VOLT UNLESS OTHERWISE SPECIFIED.
ALL CAPACITIES IN MFD. UNLESS OTHERWISE SPECIFIED.
PHONO SWITCH SHOWN IN CLOCKWISE POSITION.

MODEL TK-16,
Ch. KD-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: 7 watts.

AM Sensitivity: 2 to 4 microvolts.

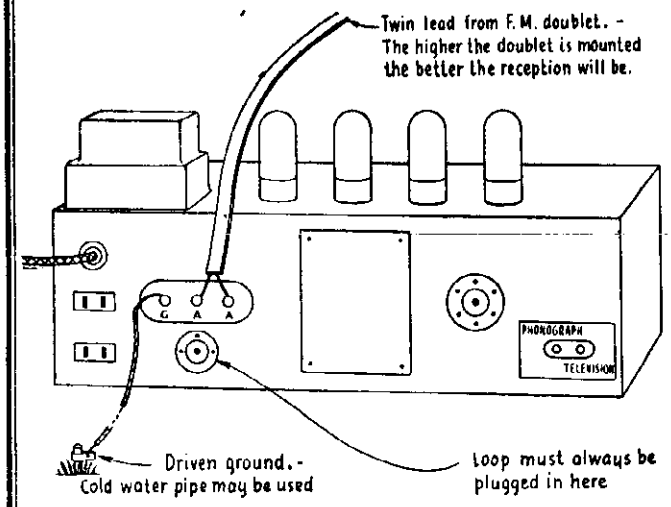
FM Sensitivity: 20 microvolts, quieting signal.
5 microvolts, minimum signal.

Tube Complement:

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

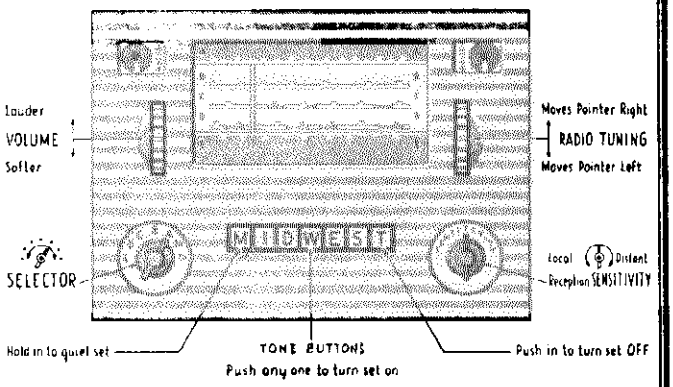
INSTALLATION

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. See that all tubes are seated and light up. Remove the packing inside the phonograph compartment and observe other warnings and cautions as advised by the tags attached to the receiver.

Plug the receiver into a 120 volt 60 cycle outlet. If you are not certain that your supply is 120 volts, 60 cycles alternating current (ac) call the local Electric Company.

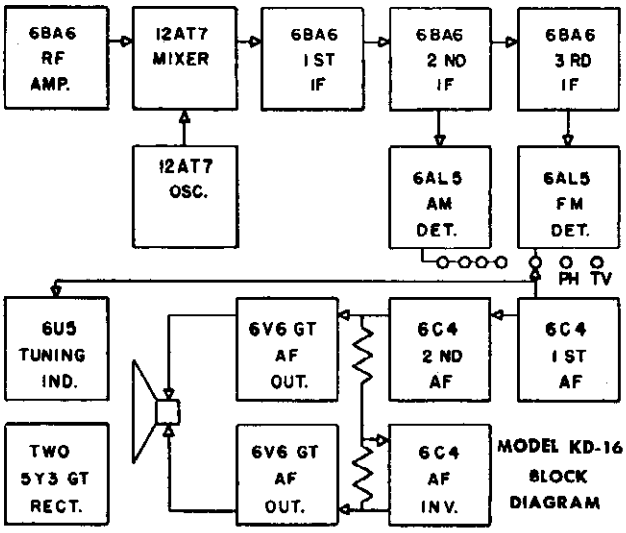


ALIGNMENT

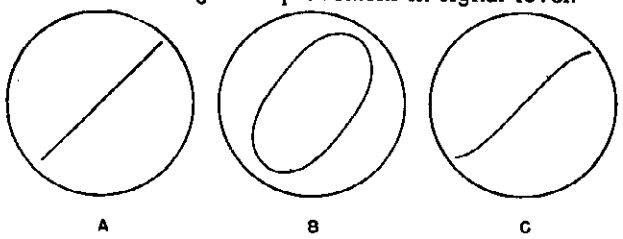
AM IF should be aligned at 456 KC. There are three transformers and six adjustments, the transformers are coupled with less than critical coupling and there is only one peak. Couple the generator into the mixer grid and use either AVC or audio for the output meter.

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.

MODEL TK-16,
Ch. KD-16



1. Connect generator to 3rd IF grid and vertical input 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 detector 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 grid 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.

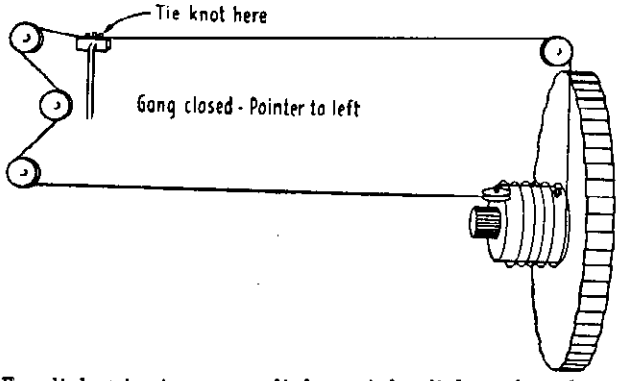
Alternate Method: The IF response of the 1st, 2nd and 3rd transformer may be observed more directly if you use a crystal detector at the plate of the tube following the transformer and feed the vertical plates of the scope from that point. Feed signal into grid of tube preceding transformer. Use a CW marker at 10.7 to be sure the double peaked response curve straddles the ratio detector response. Observe each stage separately. Discount the transformer in the plate of the tube following the transformer to be aligned and use 470 ohm resistor as plate load.

Notice: Do not use AM or CW signal to peak the FM transformers. Regeneration may result and bandwidth and noise rejection 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.

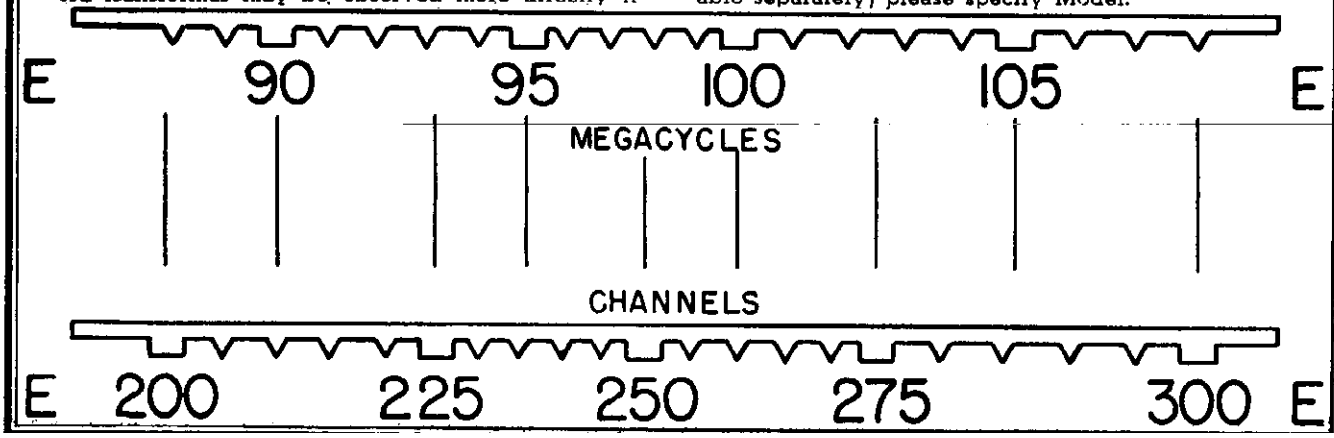


For dial stringing use a light weight dial cord such as Bevin-Wilcox 6-18 Imperial silk cord.

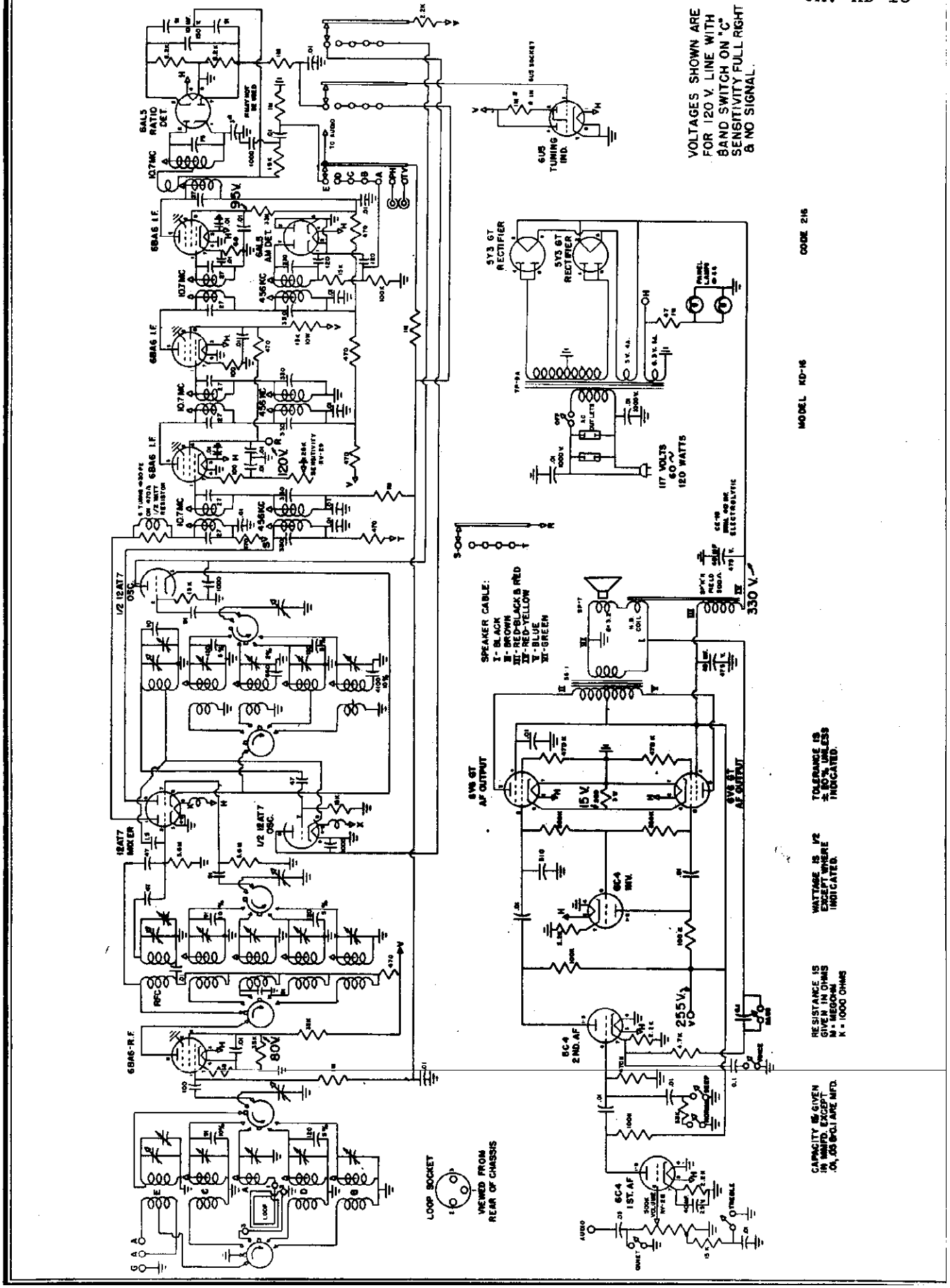
Radio Band	Coil Adj.	Trimmer Adj.
A	560 KC	1500 KC
B	1.6 MC	4.7 MC
C	5 MC	10 MC
D	11.5 MC	22 MC
E	.....	105 MC

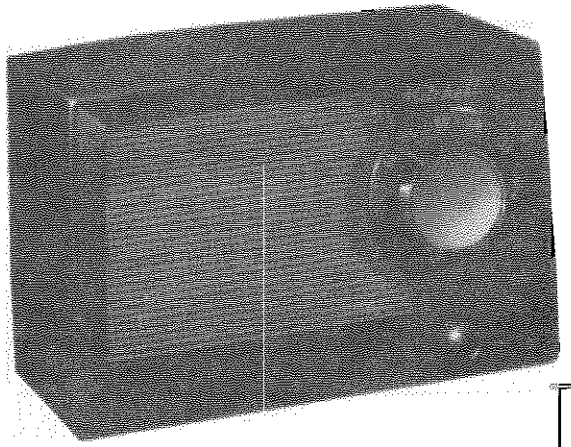
If replacement parts of identical manufacture and rating are not available for service repairs these should be ordered from Midwest Radio & Television Corporation, giving model number and serial number of the chassis and name of the part.

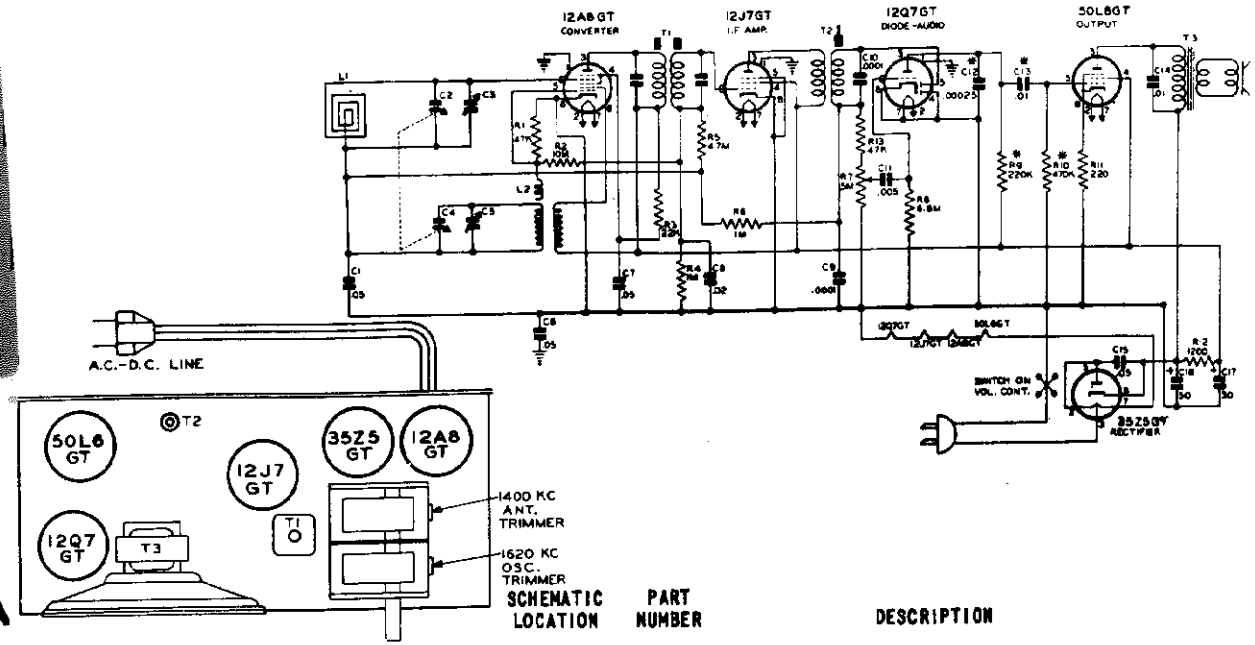
Repair data for the record changer mechanism is available separately, please specify Model.



MODEL TK-16,
Ch. KD-16







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.

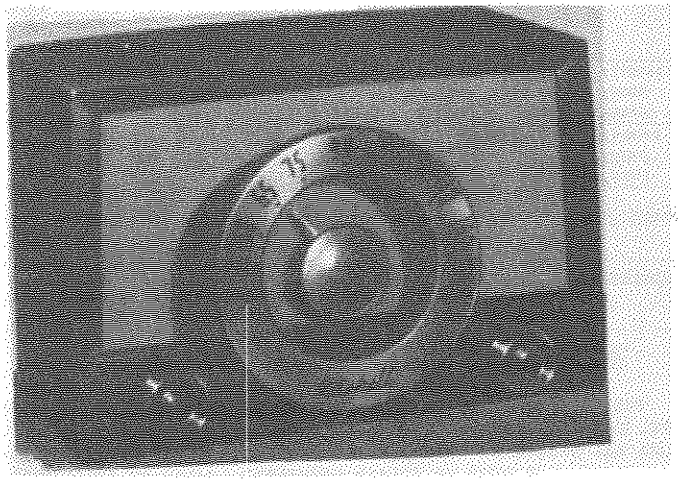
NOTE: IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER AND THAT THE PROCEDURE BE CAREFULLY FOLLOWED, OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT. THE TRIMMERS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

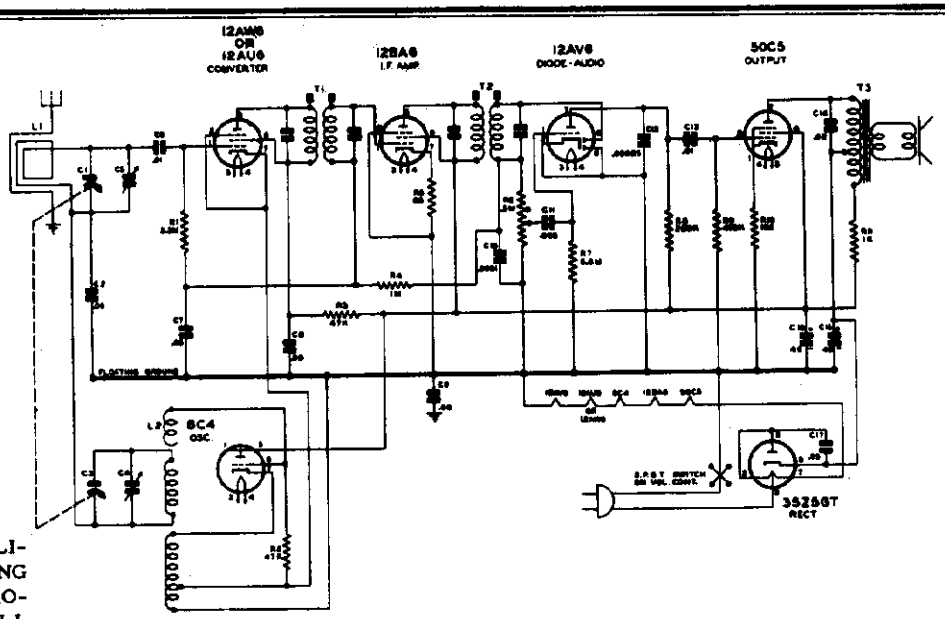
ALIGNMENT PROCEDURE

STEP NO.	POSITION OF GANG	SIGNAL GENERAL FREQUENCY	GENERATOR CONNECTION	DUMMY ANTENNA	ADJUSTMENT	TYPE OF ADJUSTMENT
1.	Open	455 KC.	Rear Gang Terminal	.1 Mfd.	I.F.Slugs	Adjust for Maximum Output
2.	Open	1620 KC.	Dummy Antenna	2 Turns of Hookup Wire 6" in Dia.(Place Approx.a Foot from & parallel to loop.)	Front Gang Trimmer	Adjust for Maximum Output
3.	1400 KC.	1400 KC.			Rear Gang Trimmer	Adjust for Maximum Output
4.	600 KC	600 KC.				Check Gang Alignment

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
C1,C6,C7	N-1345	Capacitor, Paper .05 MFD. 230 V.
C8	N-1376	Capacitor, Paper .02 MFD. 200 V.
C9	N-6015	Capacitor, Ceramic .0001 MFD. 500 V. 20%
C10	N-7549	Capacitor, Ceramic .0001 MFD. 500 V. 10%
C11	N-4894	Capacitor, Paper .005 MFD. 600 V.
*C12	N-6488	Capacitor, Ceramic .00025 MFD. 500 V. 20%
*C13,C14	N-1344	Capacitor, Paper .01 MFD. 400 V.
C15	N-1346	Capacitor, Paper .05 MFD. 400 V.
C16) C17)	N-7889	Capacitor, Electro-lytic (50 MFD. 150 V. (30 MFD. 150 V.
R1,R13	N-4063	Resistor 47,000 Ohm - 1/2 W. - 20%
R2	N-1623	Resistor 10 Megohm - 1/2 W. - 20%
R3	N-4025	Resistor 22,000 Ohm - 1/2 W. - 20%
R4,R6	N-1262	Resistor 1.0 Megohm - 1/2 W. - 20%
R5	N-4061	Resistor 4.7 Megohm - 1/2 W. - 20%
R7	N-7890	Volume Control with On-Off Switch
R8	N-4028	Resistor 6.8 Megohm - 1/2 W. - 20%
*R9	N-4026	Resistor 220,000 Ohm - 1/2 W. - 20%
*R10	N-4027	Resistor 470,000 Ohm - 1/2 W. - 20%
R11	N-4024	Resistor 220 Ohm - 1/2 W. - 10%
R12	N-4900	Resistor 1,200 Ohm - 1.0 W. - 10%
	N-7824	Speaker, 4" P.M with Output Transformer
	N-8138	Coil, Loop Antenna
	N-7981	Coil, 1st. I.F.
	N-8150 or	Coil, 2nd. I.F. (Includes C10)
	N-7542	Coil,2nd I.F.(C10 must be added externally)
	N-8263	Coil, Oscillator

* In some receivers parts indicated with asterisk are replaced by an N-8215 Couplate.





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.

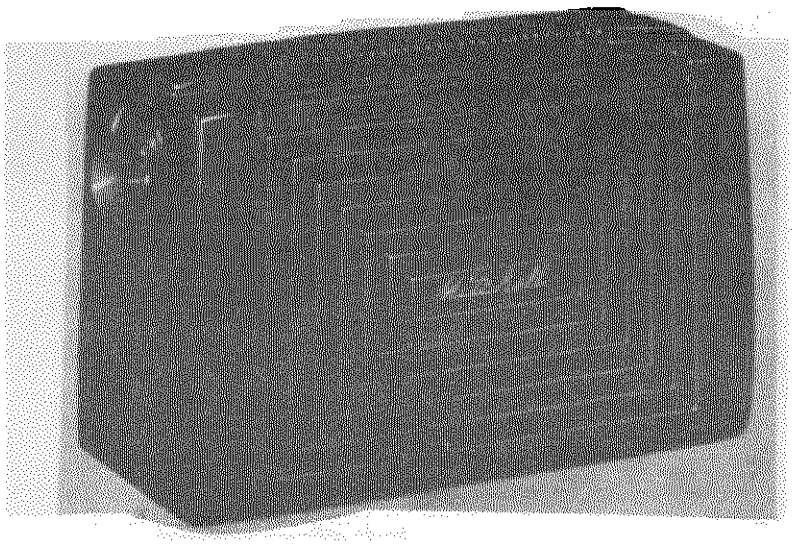
ALIGNMENT PROCEDURE

STEPS	SET RECEIVER DIAL TO	TEST OSCILLATOR: ADJUST TEST OSCILLATOR FREQUENCY TO	TEST OSCILLATOR: ATTACH OUTPUT OF TEST OSCILLATOR TO	DUMMY ANTENNA	ADJUSTMENTS
1	Any point where no interfering signal is received	EXACTLY 455 KC	High side to grid of Converter Tube, Low side to common negtive.	.05 MFD CONDENSER	Adjust slugs at top and bottom of 2nd I.F.(T2) and then each of the slugs of the 1st. I.F.for maximum output.
2	Exactly 1620 KC	Exactly 1620 KC	External Antenna blue lead on loop.	100 MMFD Condenser.	Adjust 1620 KC cillator trimmer (C4) for maximum output.
3	Approx. 1400 KC	Approx. 1400 KC	External Antenna blue lead on loop.	100 MMFD Condenser.	Adjust 1400 KC antenna trimmer for maximum output.

PARTS LIST

ILLUS. NO.	PART NUMBER	DESCRIPTION
C2,C7,C8	N-1345	Condenser, Paper .05 MFD. 200 V.
C6,C13	N-1344	Condenser, Paper .01 MFD. 400 V.
C9	N-8092	Condenser, Paper .08 MFD. 200 V.
C10	N-6015	Condenser, Ceramic 100 MMFD. 500 V. 20%
C11	N-4894	Condenser, Paper .005 MFD. 600 V.
C12	N-6488	Condenser, Ceramic 250 MMFD. 500 V. 20%
C14	N-1376	Condenser, Paper .02 MFD. 400 V.
C15) C16)	N-5051	Condenser, Electrolytic (40 MFD. 150 V. 40 MFD. 150 V.
C17	N-1346	Condenser, Paper .05 MFD. 400 V.
R1	N-4062	Resistor, Carbon 3.3 Megohm 1/2 W. 20%
R2,R3	N-4063	Resistor, Carbon 47,000 Ohm 1/2W. 20%
R4	N-1262	Resistor, Carbon 1.0 Megohm 1/2 W. 20%
R5	N-6485	Resistor, Carbon 68 Ohm 1/2 W. 10%
R6	N-7984	Volume Control- 500,000 Ohm with Switch
R7	N-4028	Resistor, Carbon 6.8 Megohm 1/2 W. 20%
R8	N-4026	Resistor, Carbon 220,000 Ohm 1/2W. 20%
R9	N-4027	Resistor, Carbon 470,000 Ohm 1/2W. 20%
R10	N-4067	Resistor, Carbon 180 Ohm 1/2W. 10%
R11	N-3341	Resistor, Carbon 1,000 Ohm 1/2W. 10%

ILLUS. NO.	PART NUMBER	DESCRIPTION	
L1	N-8002	Coil,	Loop Antenna and Cabinet Back
L2	N-7982	Coil,	Oscillator
T1,T2	N-7981	Coil,	1st.and 2nd. I.F.Transformer
T3	N-8001	Transformer,	Output
	N-7980	Speaker,	5 Inch P.M.
	N-8045	Assembly,	Gang Condenser & Pulley
	N-8386	Screen,	Flocked - Front Panel
	N-8387	Escutcheon,	Dial
	N-8392	Pointer,	Dial Indicator
	N-1090	Cord,	Line - 6 Ft. Rubber
#314		Cabinet,	Ivory Plastic) Model 1255
N-8003		Knob,	Ivory Plastic) Only
#315		Cabinet,	Walnut Plastic) Model 1254
N-8004		Knob,	Walnut Plastic) Only



BATTERY INSTALLATION

BATTERY INSTALLATION: Before installing new batteries or replacing old ones, turn the volume control to the extreme left or "OFF" position.

Attach the connector with the snap-on fasteners to the "B" battery (90 Volt) and insert battery into the left hand side of the battery retaining area of the cabinet back so that the connector faces in the direction of the top of the receiver. Insert the prongs of the other battery connector into the socket of the "A" battery (4-1/2 Volt) and place battery in cabinet back so that the connector faces the outside wall of cabinet.

This receiver will accommodate any of the batteries listed below: (No preference is intended by the order of listing.)

MANUFACTURER	MANUFACTURER'S TYPE NUMBER "A" Battery	"B" Battery
National Carbon (Eveready)	746	490
General Dry Battery	3H3	132
Ray-O-Vac	P83A	4390
Burgess Battery	G3	N-60

BATTERY OPERATION

BATTERY OPERATION: To operate this receiver on battery, insert the power cord prongs into the power switch through the two slots provided in the bottom of chassis. These slots are at the right hand edge of chassis as viewed from rear.

TUBE REPLACEMENT

Do not replace tubes or batteries unless switch on the volume control is turned completely off. In case of tube failure be sure to turn the receiver off immediately.

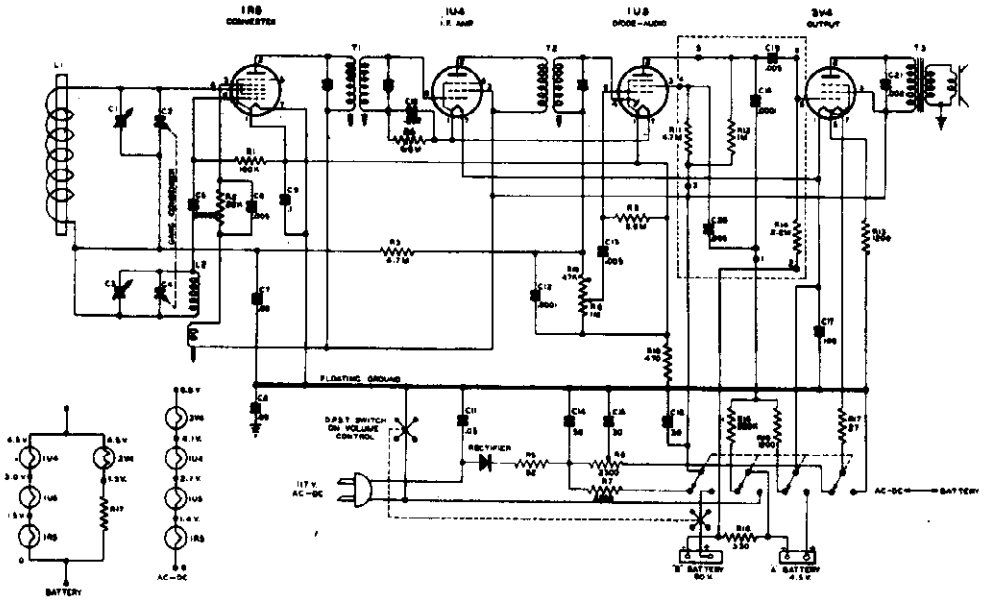
Four tubes (Plus selenium rectifier) are used. Type numbers and locations are shown in the tube diagram label located inside the cabinet. If tubes are removed from their sockets for test or replacement purposes, make certain that the receiver is turned off when replacing the tubes in their proper sockets. Failure to replace tubes in their proper sockets may result in damage to the tube, or to the receiver, or both.

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.

MODEL 1256



ALIGNMENT PROCEDURE

GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455,600,1400 and 1620 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

ALIGNMENT PROCEDURE CHART

STEP NO.	POSITION OF GANG	SIGNAL GENERATOR FREQUENCY	GENERATOR CONNECTION	DUMMY ANTENNA	ADJUSTMENT	TYPE OF ADJUSTMENT
1	Any point where no interfering signal is received	Exactly 455 KC	High side to grid of 1R5 tube. Low side to common negative	.05 MFD Condenser	Slug at top of 2nd. I.F. (T2) and then each of the slugs of the 1st. I.F.	For Maximum Output.
2	Exactly 1620 KC	Exactly 1620 KC.	DUMMY ANTENNA	2 Turns of hookup wire 6" in Diameter. (Place approximately a foot from end of, and in same axis as loop.)	Front Gang Trimmer	For Maximum Output.
3	Approx. 1400 KC.	Approx. 1400 KC			Rear Gang Trimmer	For Maximum Output.
4	Exactly 600 KC	Exactly 600 KC			Slug in Oscillator Coil. (L2)	For Maximum Output.
5					Repeat Steps 2 and 3.	

PARTS LIST

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
C18)		(.0001 MFD.)
C19,C20)		(.005 MFD.)
R11)	N-8330	Couplate (4.7 Megohm)
R12)		(1.0 Megohm)
R14)		(2.2 Megohm)
C5	N-8375	Condenser, Ceramic 50 MMFD. 500 V.
C6,C13	N-4004	Condenser, Paper .005 MFD. 600 V.
C7,C8	N-1345	Condenser, Paper .05 MFD. 200 V.
C9	N-1351	Condenser, Paper .1 MFD. 200 V.
C10,C21	N-8377	Condenser, Paper .002 MFD. 600 V.
C11	N-1346	Condenser, Paper .05 MFD. 400 V.
C12	N-8015	Condenser, Paper 100 MMFD. 500 V.
C14)		(50 MFD. 150 V.)
C15)	N-6841	Condenser, Electro- (30 MFD. 150 V.)
C16)		lytic (30 MFD. 150 V.)
C17)		(100 MFD. 25 V.)
	N-5681	Speaker, 4" P.M.
L1	N-8328	Coil, Loop - Iron Rod Type
T1	N-7981	Coil, 1st, I.F.
T2	N-8326	Coil, 2nd, I.F.
L2	N-8327	Coil, Oscillator
T3	N-8329	Transformer, Output
	N-8331	Rectifier, Selenium
	N-5951	Switch, Power Changeover

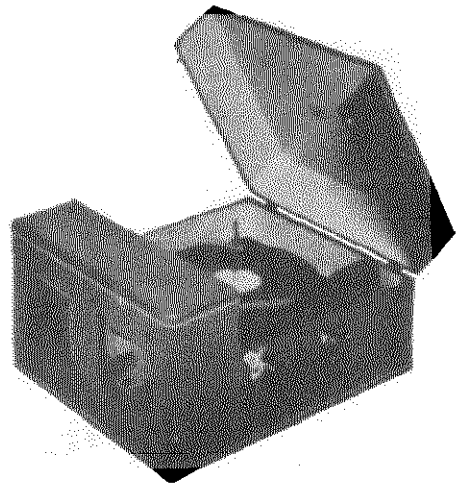
N-8381

PARTS LIST

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
R1	N-1973	Resistor 100,000 Ohm 1/2W. 10%
R2	N-6012	Resistor 22,000 Ohm 1/2W. 10%
R3	N-4061	Resistor 4.7 Megohm 1/2W. 20%
R4,R9	N-4028	Resistor 6.8 Megohm 1/2W. 20%
R5	N-4023	Resistor 82 Ohm 2.0W. 10%
R6	N-8333	Resistor 2,300 Ohm 5.6W. 5% (Center Tapped)

PARTS LIST

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
R7	N-4095	Resistor 2,200 Ohm 1/2W. 10%
R8	N-8332	Volume Control with Switch 1.0 Megohm
R10	N-4066	Resistor 470 Ohm 1/2W. 10%
R13,R16	N-6793	Resistor 1,200 Ohm 1/2W. 10%
R15	N-4026	Resistor 220,000 Ohm 1/2W. 20%
R17	N-6792	Resistor 27 Ohm 1/2W. 10%
R18	N-4420	Resistor 330 Ohm 1/2W. 10%



ELECTRICAL SPECIFICATIONS

Power Supply	105 to 125 volts A.C. 60 cycle. 50 watts with record player operating.
Frequency Range	535 to 1620 KC
Intermediate Frequency	455 KC
Selectivity	40 KC broad at 1000 times signal. 1000 KC
Sensitivity	(.05 watt output with Hazeltine test loop) 350 Microvolt per meter average.
Power Output	1.1 watts max. .7 watts 10% distortion.
Loud Speaker	5" PM dynamic 1.47 oz. Alnico 5 magnet, voice coil impedance 3.2 ohms at 400 cycles
Tube Complement	1 - 12SA7 Mixer 1 - 12SK7 I.F. Amplifier 1 - 12SQ7 Det. & A.F. 1 - 50L6 Power Amp. 1 - 35Z5 Rectifier 1 - No. 47 Dial Lamp
Record Changer	Three speed intermix. (10" and 12")

SPECIAL INSTRUCTIONS

REMOVAL OF RADIO CHASSIS

Remove two screws holding record changer. Lift record changer and move back, tilting at the same time. Remove changer power cord and pick up lead.

Remove two wood screws holding back board. This will expose the antenna. Remove antenna plug.

Remove two wood screws holding back of chassis. Remove two nuts holding front panel. Chassis may now be removed.

ALIGNMENT PROCEDURE

The following equipment is required for aligning: A signal generator which will provide an accurately calibrated signal at the indicated test frequencies; an output indicating meter; a non-metallic screwdriver.

Radiation Loop: 2-turn loop, 6 inches in diameter.

Conditions for Alignment:

Tone - Treble

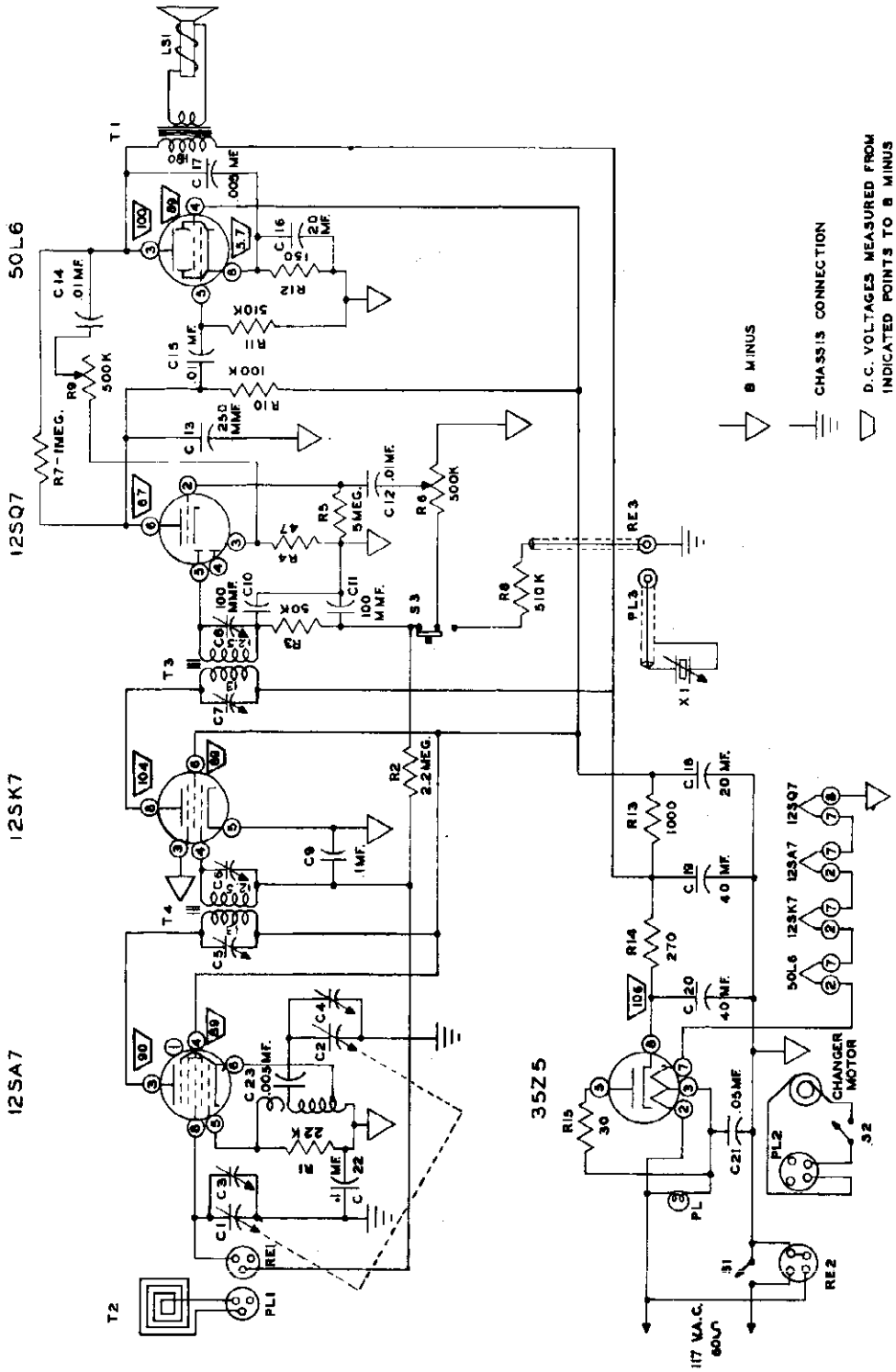
Volume - Maximum

Selector Switch - "Radio" position

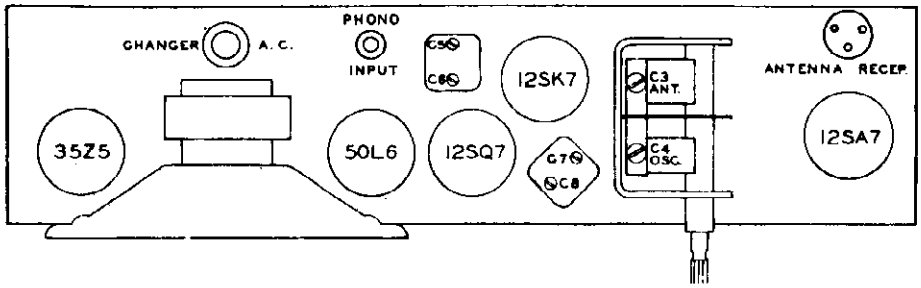
Test loop coupled loosely to receiver by spacing - receiver loop in same position as it will be with chassis in cabinet.

SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	REMARKS	ADJUST FOR MAXIMUM OUTPUT
LOOP	455 KC	Low End of Band	Across Voice Coil	Short out osc. tuning gang section C-2; compress C-3	C-8, C-7, C-6, C-5
LOOP	1620 KC	High End of Band	"	Remove short across C-2	C-4
LOOP	1400 KC	Point of Maximum Output	"	Set pointer to 140 on dial	C-3
LOOP	600 KC	Point of Maximum Output	"	Knife C-1 plates for maximum output	
LOOP	1400 KC	1400	"	Recheck Alignment	C-3 if necessary

MODEL 05GAA-992A



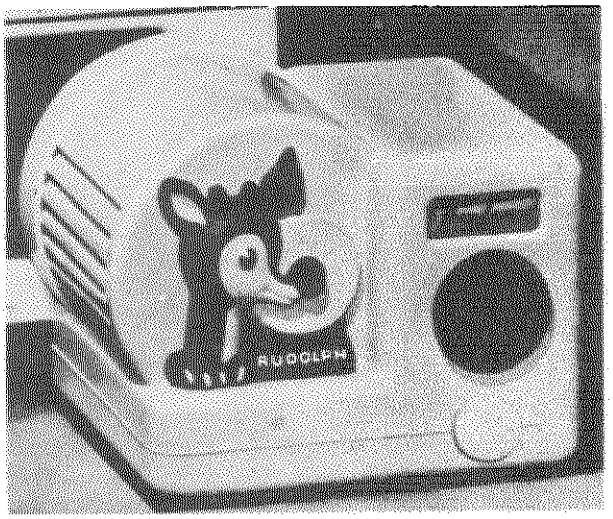
LOCATION OF TUBES



REPLACEMENT PARTS LIST

SCHEMATIC LOCATION	PART NO.	DESCRIPTION
		RESISTORS
R1	517	22,000 OHM ½ Watt
R2	615	2.2 Meg OHM ½ Watt
R3		See Capristors
R4	520	47 OHM ½ Watt
R5		See Capristors
R6	401	500,000 OHM Vol. Control with Switch
R7	516	1 Meg OHM ½ Watt
R8, R11	502	510,000 OHM ½ Watt
R9	408	500,000 OHM Tone Control
R10		See Capristors
R12	505	150 OHM ½ Watt
R13	607	1000 OHM 1 Watt
R14	602	270 OHM 1 Watt
R15	534	30 Ohm 1/2 W.
		CAPACITORS
C1, C2		Tuning Gang and Trimmer
C3, C4	1004A	Assembly
C5, C6		Trimmer Condensors in
C7, C8		I.F. Cans.
C9, C22	804	.1 MFD. 200 V.
C10, C11		See Capristors
C12		See Capristors
C13	817	250 MMF. Ceramic
C14	825	.01 MF. Ceramic
C15		See Capristors
C17	824	.005 MF. Ceramic
C18, C19	1003	40-40-20 MFD/150 Volts
C20, C16		20 MFD/25 Volts
C21	803A	.05 400 V. Tubular
		CAPRISTORS
R3, C10	811	100 MMF. 50,000 OHM 100 MMF Dual Shunt Connection
R5, C12	813	.01 MF 5 Meg OHM Common Terminal Connection
R10, C15	814	.01 MF 100,000 OHM Common Terminal Connection
		TRANSFORMERS
T1	1201	Output Transformer
T3, T4	1402	I.F. Transformers
		MISCELLANEOUS
S1	401	On-Off Switch on Volume Control
S2	407	Motor Switch on Changer Assembly
S3	1892	Radio-Phono Slide Switch
PL1	307A	Loop Antenna Plug
PL2	307	Changer A.C. Plug
PL3	305	Pickup Plug
RE1	106A	Loop Antenna Receptacle
RE2	106	Changer A.C. Receptacle
RE3	104	Pickup Receptacle
X1	2534	Pickup Cartridge EV-334
	62-349	.0023 Needle
LS1 - T1	2607	5" Speaker and Output Transformer
	2108	Portable Carrying Case
	2411	Knob
T2	1512	Loop Antenna
	1736A	Dial Pointer
	2307	Dial Bezel
	2127C	Front Panel
	1722B	Dial

MODELS 05GCB-1540A, Rudolph;
05GCB-1541A, Lone Ranger



MODEL 05GCB-1540A "RUDOLPH"

MODEL 05GCB-1541A "LONE RANGER"

ALIGNMENT PROCEDURE AND RECEIVER STAGE SENSITIVITIES

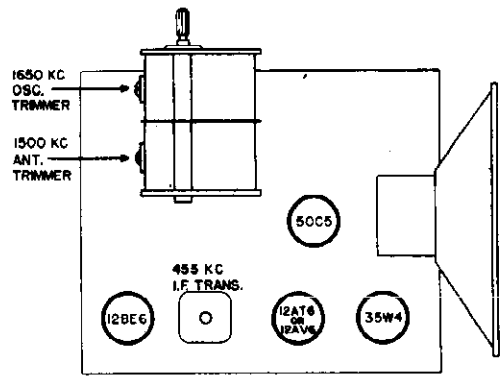
ALIGNMENT: Should it become necessary at any time to check the alignment of this receiver, proceed as follows: (1) Connect the high side of 455 KC Signal Generator through a .1 mf capacitor to the stator lug on the rear section of the variable capacitor; the ground lead to one of the lugs on the line on-off switch. Use Isolation Transformer if available. If not, connect a capacitor in series with low side of signal generator and power lug on switch. Connect a suitable output meter across the speaker voice coil. Turn the Volume and Tuning controls to their extreme clockwise positions.

(2) Adjust the trimmers located at the top and bottom of the I-F transformer for maximum indication on the output meter.

(3) Connect the Signal Generator high side to the antenna lug through a 47 mmfd capacitor; the low side remains as in step (1). Set the Signal Generator to 1650 KC.

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

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



TRIMMER AND TUBE LOCATION DIAGRAM

ELECTRICAL SPECIFICATIONS

Frequency Range	540 to 1650 KC
Intermediate Freq.	455 KC
Selectivity	At 1000 Kilocycles, 22 KC at 10 X signal
Sensitivity	400 Microvolts per meter average for .05 watt output.
Power Output	620 Milliwatts undistorted
Loud Speaker	4" P.M., V.C. impedance 3.2 ohms
Tube Complement	12BE6 Converter
	12AT6 or 12AV6 Detector, AVC, audio amplifier
	50C5 Power Amplifier
	35W4 Rectifier
	#47 Pilot Light

MODELS 05GCB-1510A,
Rudolph; 05GCB-1511A
Lone Ranger

The signal source must be an accurately calibrated signal generator capable of supplying R.F. signals modulated 30% with a 400-cycle audio signal. A 400-cycle source is necessary for the audio measurements.

The table below lists the sensitivity at various points. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice co and substituting a 3.2 ohm, 5 watt resistor across the sec ondary winding of the output transformer. A reading o .4 volts AC across this resistor will be equivalent to a 50 milliwatt output with the speaker connected. Variation of plus or minus 25% are usually permissible. Volume con trol at maximum for all adjustments.

SIGNAL GENERATOR				DIAL SETTING	ADJUST FOR MAXIMUM OUTPUT	INPUT FOR 50-MILLIWATT OUTPUT
Frequency	Coupling	Connection to Radio	Ground Connection			
455 KC	.1 mfd condenser	Stator lug Var. Capacitor (rear section)	Lug on Power Switch	Variable Condenser fully open	Trimmers on I.F. transformer	3000 microvolts
1650 KC	47 mmf condenser	To lug of Ant. Hank	Lug on Power Switch	Variable Condenser fully open	Oscillator Trimmer (front section)	———
1500 KC	47 mmf condenser	To lug of Ant. Hank	Lug on Power Switch	1500 KC	Ant. trimmer (front section)	———
400 cycles	.1 mfd condenser	High side of volume control	Lug on Power Switch	———	———	.03 volts

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description
		CAPACITORS
C1	D-4.108-12	1500 mmf ±20% Ceramic
C2A, C2B, C3, C4	2.225	Variable Condenser
C5, C9	D-3.103-11	.05 × 400 volts, Paper
C6	C-4.109-12	47 mmf±20% Ceramic
C7	D-3.103-4	.005 × 600 volts, Paper Tubular
C8	D-3.103-23	.1 × 400 volts, Paper Tubular
C10	5.425	Electrolytic, 25 mfd, 25 volts
C11	D-3.103-7	.01 × 400 volts, Paper Tubular
C12A, C12B	C-5.436-1	Electrolytic, 50-50 mfd., 150 V.D.C.
		RESISTORS
R4	C-8.201-10	2 Meg. Volume Control and Switch
R10	D-7.103-31	47 ohm, 2 watt, 20%
R1	D-7.100-62	12 K ohms, ¼ watt, 10%
R2	D-7.100-178	6.8 meg ohm, ¼ watt, 20%
R3	D-7.100-185	10 meg ohm, ½ watt, 20%
R5	D-7.100-115	220 K ohms, ¼ watt, 20%
R6	D-7.100-125	390 K ohms, ¼ watt, 20%
R7	D-7.101-204	150 ohms, ½ watt, 20%
R8	D-7.102-27	1200 ohms, 1 watt, 10%
R9	D-7.102-215	22 ohms, 1 watt, 20%
		SPEAKER
T4	B-30.332-1	Speaker, 4" P.M., with Transformer
		COILS
T1	B-1.534	Antenna Coil
T2	C-1.402-4	Oscillator Coil
T3	C-1.445-2	I.F. Transformer, 455 K.C.

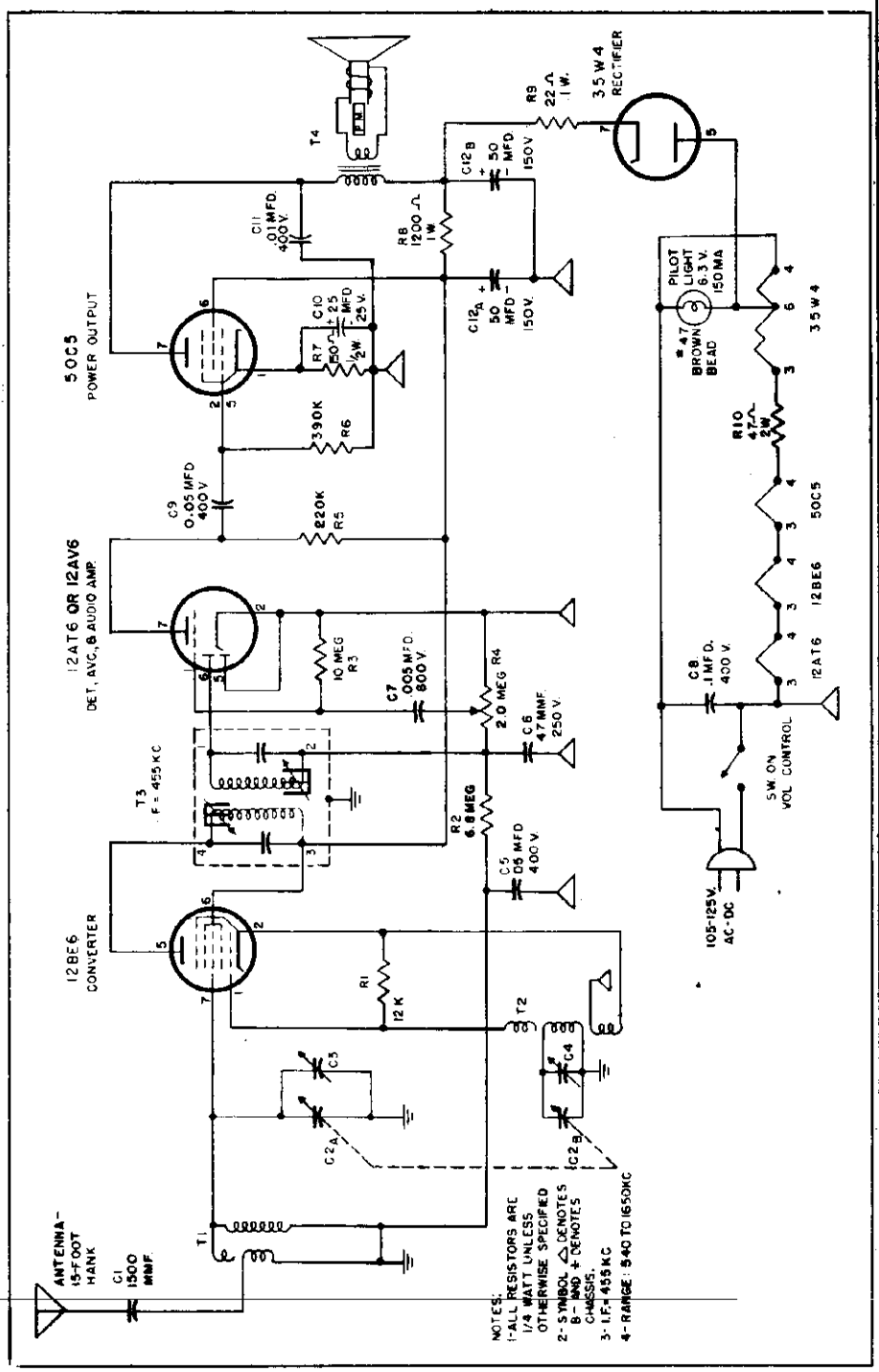
MODELS 05GCB-1540A,
Rudolph; 05GCB-1541A,
Lone Ranger

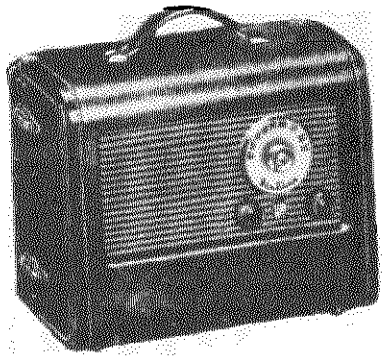
DIAL PARTS

C-13.133	Tuning Knob
B-13.102	Volume Knob

MISCELLANEOUS

D-12.418	Cabinet
C-29.442	Back Cover
20.226	Antenna Hank, 15 Ft.
B-24.235	Socket, Min. 7 Pin
C-20.206	Line Cord, 6 Ft., U.L.
	#47 Pilot Light Bulb, 6.3 volts
C-13.214	Front Plaque, Rudolph
C-13.215	Front Plaque, Lone Ranger





NEVER LEAVE A DISCHARGED BATTERY IN THE SET. After a dry cell is completely exhausted the zinc outer case may be eaten through and the electrolyte inside may leak out. This fluid is very corrosive and can ruin the metal parts of the set if neglected.

BATTERY REQUIREMENTS. The Model 1061A operates from a battery pack which delivers 7½ volts and 90 volts. Wards #33 pack should be used. This battery can be obtained from any Wards Retail Store or Mail Order House. Other batteries which can be used are: RCA VS019, General 60A6F6/5, Sears 6404, Burgess F6A60, Philco P841A, Ray-o-vac B6460 and Western AB994. To install the battery in the set merely place it in position in the bottom of the cabinet and plug the battery cable into the socket in the top of the battery.

ELECTRICAL SPECIFICATIONS

POWER SUPPLY: 105-125 Volts AC or DC and #33 Battery

FREQUENCY RANGE: 540 to 1640 KC

INTERMEDIATE FREQUENCY: 455 KC

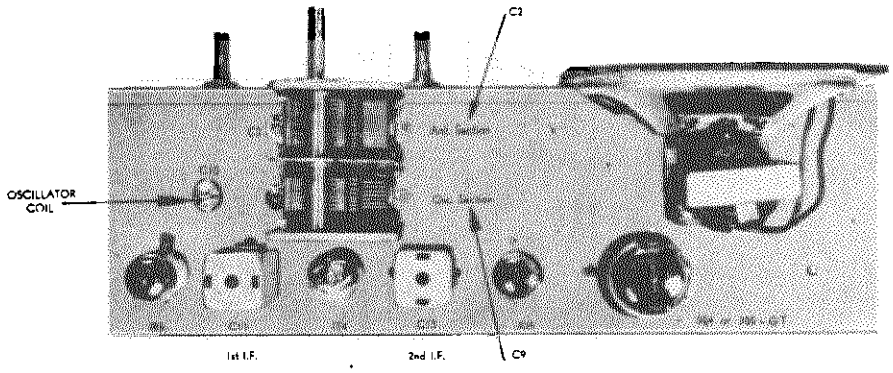
SENSITIVITY (For .05 Watt Output)
150 Microvolts per Meter

POWER OUTPUT: .190 Watt 10% Distortion

TUBE COMPLEMENT:
1—1R5 Converter
1—1T4 I.F. Amplifier
1—1U5 Det. Avc. 1st AF.
1—3Q5 or 3Q4 Power Amplifier

LOUD SPEAKER: 4" PM Dynamic 3.2 VoiceCoil Impedance

TUBE AND TRIMMER CONDENSER LAYOUT



NOTE:
C12 is located on bottom of 1st I.F. Transformer.
C14 is located on bottom of 2nd I.F. Transformer.

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Allow Chassis and Signal Generator to "Heat Up" for several Minutes.
The equipment in column at right is required for aligning:
Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter; Non-Metallic Screwdriver.
Dummy Antennas—.1 mf.

Frequency Setting	SIGNAL GENERATOR Coupling Capacitor	SIGNAL GENERATOR Connection to Radio	Ground Connection	Variable Condenser Setting	ADJUST TRIMMERS TO MAXIMUM See Trimmer Illustration
455 KC	.1	CONTROL GRID OF 1R5	TO B-BUS BAR	CLOSED	1st AND 2nd I.F. C11-C12-C13-C14
540 KC	.1	CONTROL GRID OF 1R5	TO B-BUS BAR	CLOSED	OSCILLATOR COIL SCREW
1640 KC	.1	CONTROL GRID OF 1R5	TO B-BUS BAR	WIDE OPEN	OSCILLATOR TRIMMER-C10
1400 KC	.1	CONTROL GRID OF 1R5	TO B-BUS BAR	TO 1400 KC SIGNAL	ANTENNA TRIMMER-C3

REPEAT PROCEDURE

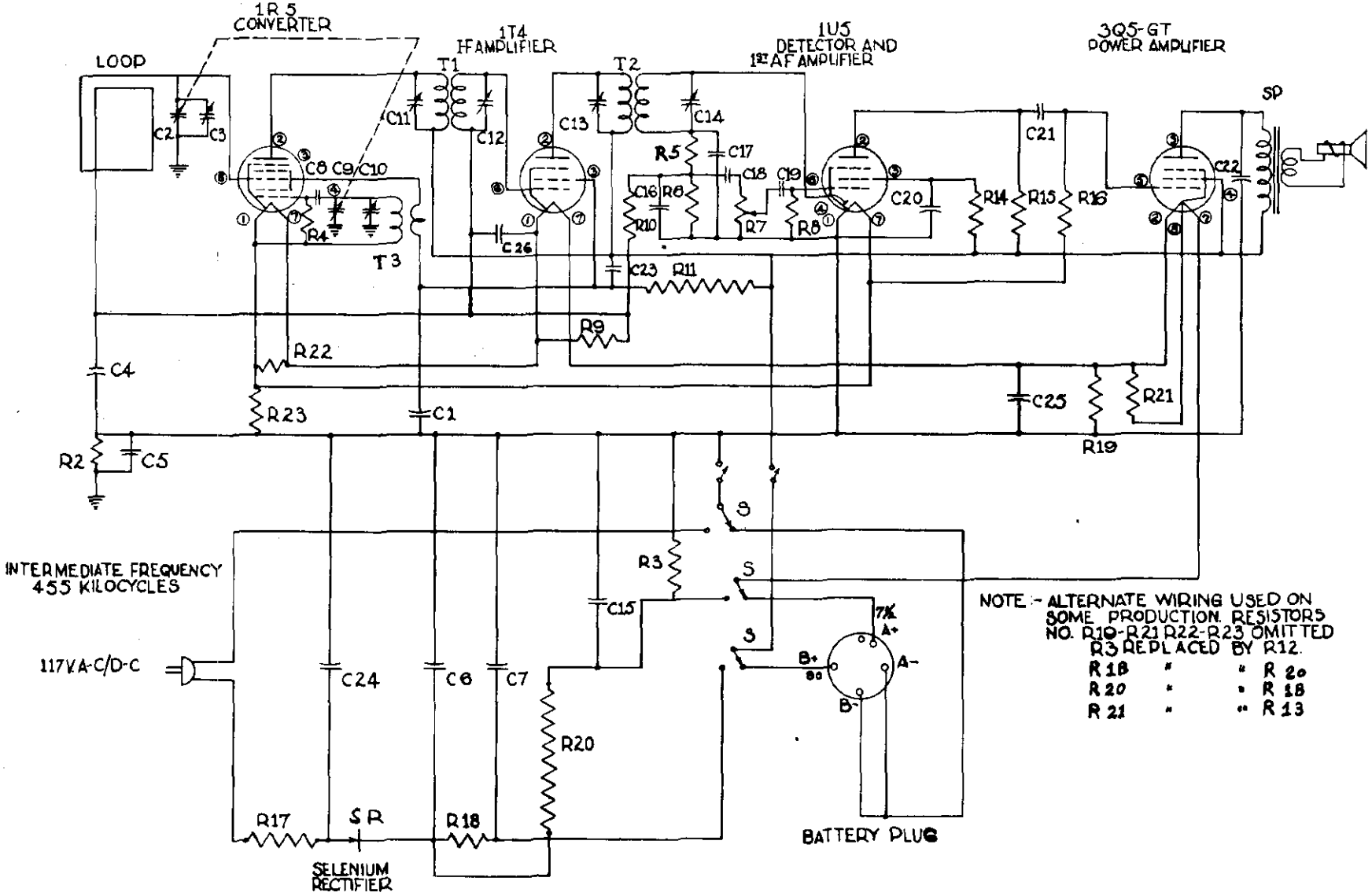
PARTS LIST

WHEN ORDERING PART, STATE MODEL NO. OF RADIO AND PART NO.

Ref. No.	Part No.	Description
		CONDENSER
C1-20-23 26	PC1	.05-150 V.
C2-C3 C9-C10	PM1	2 Gang Var. Condenser
C4	PC2	.1-150 V.
C5	PC3	.2-200 V.
C6-C7	PC4	50 MFD-150 V. (C6-C7)
C15	"	200 MFD-25 V. (C15) 3 Section Filter Condenser
C8	PC5	50 MMF-150 V.
C11-C12	.....	1st I.F. Trimmers Part of T-1
C13-C14	.....	2nd I.F. Trimmers Part of T-2
C16-C17	PC6	100 MMF-150 V.
C18-C19	PC7	.005-150 V.
C21	PC8	.01-150 V.
C22	PC9	.006-150 V.
C24	PC10	.05-400 V.
C25	PC11	100 MFD-25 V.
		RESISTORS
R2-R15	PR1	470 K — ½ Watt
R3	PR2	1800 OHM — ½ "
R4	PR3	100 K — ½ "
R5	PR4	47 K — ½ "
R6	PR5	560 K — ½ "
R7	PR6	2 Meg. Vol. Control With Switch
R8-9	PR7	5.6 " — ½ Watt
R10	PR8	2.2 " — ½ "
R11	PR9	15 K — ½ "
R12-R13*	PR10	1 K — ½ "
R14	PR11	2.5 Meg. — ½ "
R16	PR12	1 Meg. — ½ "
R17	PR13	25 OHM — 1 "
R18	PR14	3000 " — 1 "
R19	PR15	470 " — ½ "
R20	PR16	2500 " — 10 "
R21-R23	PR17	360 " — ½ "
R22	PR18	510 " — ½ "

NOTE: Resistors Marked By * Are Used in Earlier Production Only

		MISCELLANEOUS
SP	PM2	4" Speaker with Output Trans.
SR	PM3	Selenium Rectifier, 100 Mil.
T1-T2	PM4	I.F. Transformer
.....	PM5	I.F. Trans. Mounting Clip
T3	PM6	Oscillator Coil
S	PM7	Switch, "Electric-Battery"
	PM8	Socket, Tube, Miniature
	PM9	Socket, Tube, Octal
	PM10	Dial, Tuning
	PM11	Knob, "AC-DC-Battery" or "Volume" Specify Push on Knob or Set Screw Knob
	PM12	Loop Antenna
	PM13	Grill Cloth, Plastic
	PM14	Cabinet-Leatherette Covered
	PM15	Line Cord with Plug
	PM16	Battery Plug with Leads

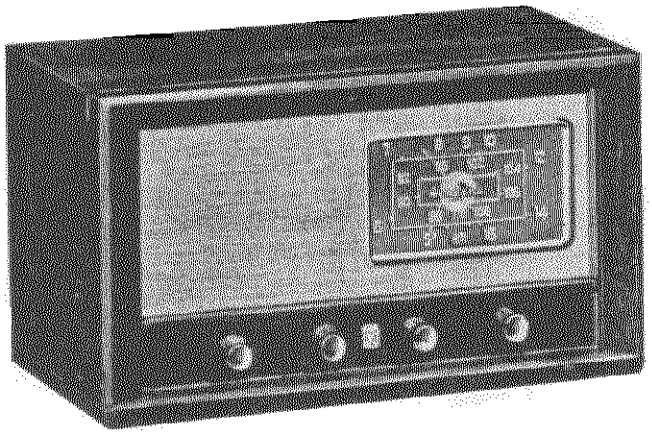


NOTE :- ALTERNATE WIRING USED ON SOME PRODUCTION. RESISTORS NO. R19-R21 R22-R23 OMITTED R3 REPLACED BY R12.

R 18	"	" R 20
R 20	"	" R 18
R 21	"	" R 13

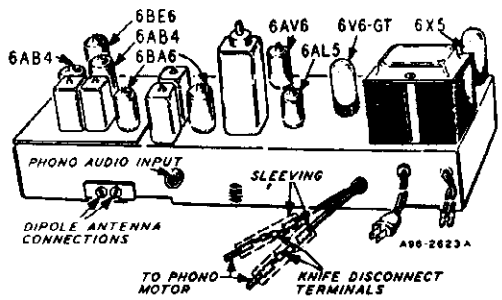
SCHEMATIC DIAGRAM FOR MODEL NO. 05 - GHM - 1061 A

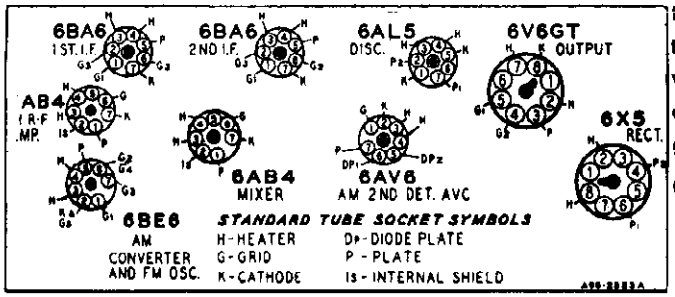
MODEL 05WG-1813A



GENERAL DESCRIPTION

This is a two band, eight tube (plus rectifier tube) AM and FM receiver. Controls are provided at the front of the cabinet for tuning, volume, tone and band or phono selection. A phono input socket is provided at the rear of the receiver to which a record player may be connected. The I-F stages use high gain miniature type tubes. 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.





ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 50-60 cycles, 40 watts.
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 25 microvolts average
FM Sensitivity	(For .5 watt output) 25 microvolts average
Power Output	1.9 watts maximum 0.8 watts 10% distortion
Loud Speaker	6" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles

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 6AB4 R-F Amplifier
1 6AB4 Mixer
1 No. 47 Dial Lamp

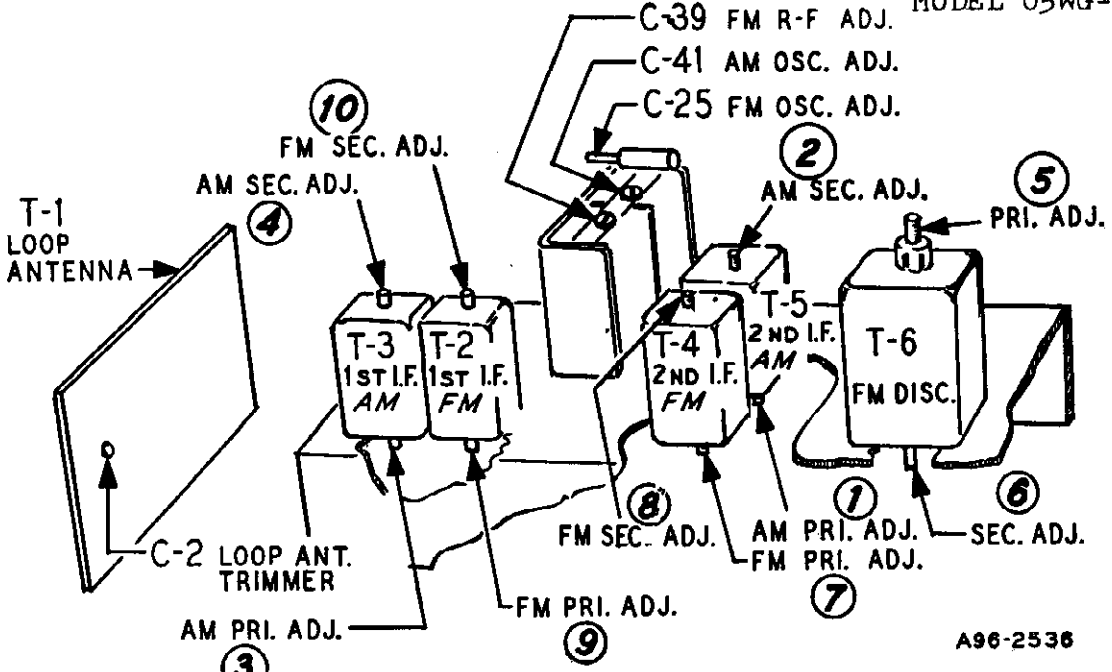
TUBE SOCKET VOLTAGES

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.

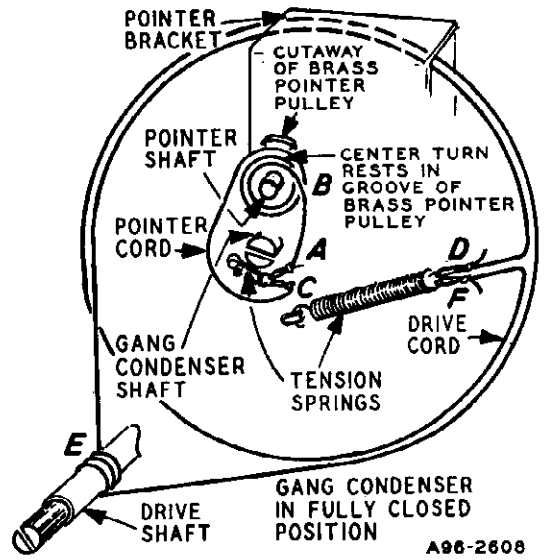


A96-2536

DRIVE CORD REPLACEMENTS

POINTER CORD

Install the cord as shown in the illustration making sure that the center turn of the three turns rests in the groove of the brass pointer pulley.



A96-2608

DIAL CORD

Install the cord as shown in the illustration, winding three turns counterclockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.

ALIGNMENT PROCEDURES
AM STAGES

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

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

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. 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 Terminal	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.

MODEL 05WG-1813A

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			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	
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN							
Oscillator	108.5	Disconnect hank 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.

REPLACEMENT PARTS LIST

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, R-9	B85102	1000	0.5	Carbon	4
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-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	36X385	.5 meg.		Volume Control & Switch	1
R-23	40X312	.5 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
R-31	B84274	270 K	0.5	Carbon	1

TRANSFORMERS AND COILS

L-1	35A5	Insulated Choke	1
L-2	9A2103	Parasitic Choke Assembly	1
L-3	35A9	Insulated Choke	1
L-4	35A8	Insulated Choke	1
T-1	9A2182	"B" Range Loop Antenna	1
T-2	9A2060	1st I-F Trans. (FM)	1

Ref. No.	Part No.	Description	Qty. Used in Set
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	9A2161	Discriminator Transformer	1
T-7	9A2065	Oscillator Coil (AM)	1
T-8	9A2067	Oscillator Coil (FM)	1
T-9	51X152	Output Transformer	1
T-11	53X291	Power Transformer	1
T-12	9A2066	Antenna Coil (FM)	1

CAPACITORS

Ref. No.	Part No.	Description	Qty. Used in Set
C-1	14A214	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, C-44	B66503	.05 mf 200 V Tubular	2
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	B66203	.02 mf 200 V Tubular	1
C-34	D66502	.005 mf 400 V Tubular	1
C-36	B66103	.01 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

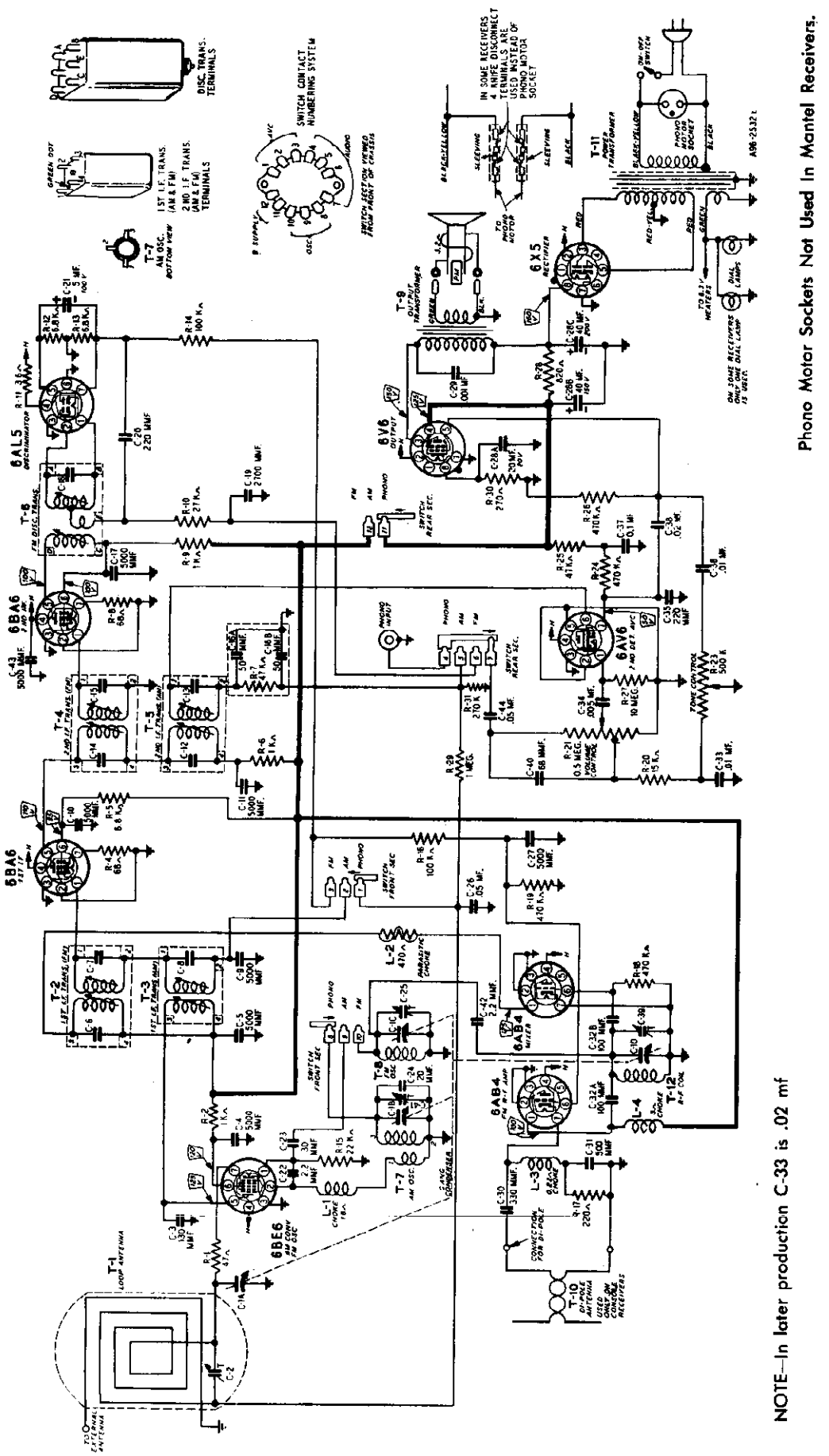
DIAL AND DRIVE ASSEMBLY

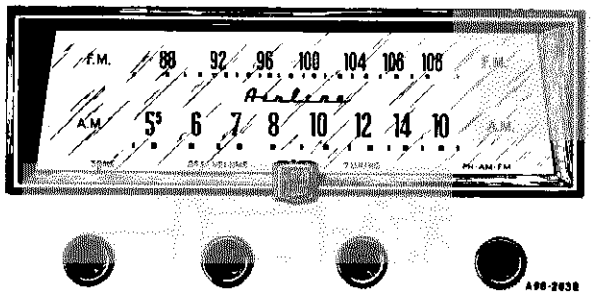
Part No.	Description	Qty. Used in Set
58X745	Dial Glass	1
15X253	Pointer	1
7A103	No. 47 Pilot Light Bulb	1
7A226	Pilot Light Socket Assembly	1
26X514	Drive Shaft	1
28X113	Drive Cord Tension Spring	1
10X74	Drive Cord Assembly	1
19X192	"C" Washer (Mtg. Drive Shaft)	2
28X292	Snap Button	4
6X66	Rubber Grommet (Mtg. Gang Condenser)	3
25A1079	Pointer Shaft & Pulley Assembly	1
28X524	Pointer Cord Tension Spring	1
25X1672	Pointer Bracket	1
10X76	Pointer Cord Assembly	1

MISCELLANEOUS

Part No.	Description	Qty. Used in Set
12A498	6" P.M. Speaker	1
3A435	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket (1st 6BA6)	1
3A427	Tube Socket	3
3A439	Tube Socket (Miniature)	3
3A305	Phono Socket—Single Pin Tip	1
2A394	Band Change Switch	1
13X546	Line Cord and Plug Assembly	1
4X1120	Escutcheon	1
10A757	Knob	4

MODEL 05WG-1813A





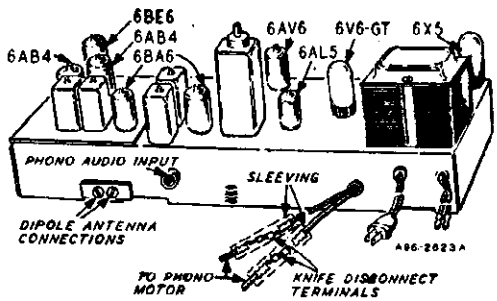
GENERAL DESCRIPTION

This is a two band, eight 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 cycle 40 watts. 60 watts with recor changer.
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 M
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—45 KC broad at 1000 time signal, measured at 1000 KC I.F. FM—200 KC broad at 2 time down I.F. FM—950 KC broad at 20 times down
AM Sensitivity	(For .5 watt output with externc antenna) 25 microvolts average
FM Sensitivity	(For .5 watt output) 25 microvolts average
Power Output	1.9 watts maximum 0.8 watts 10% distortion
Loud Speaker	10" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles



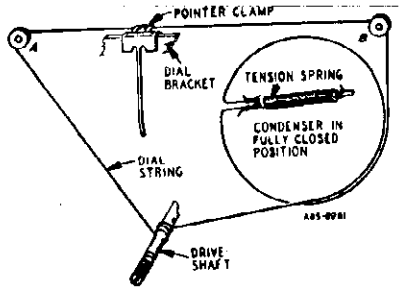
Tube and Dial Lamp Complement

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 6AB4 R-F Amplifier
1 6AB4 Mixer
2 No. 47 Dial Lamps

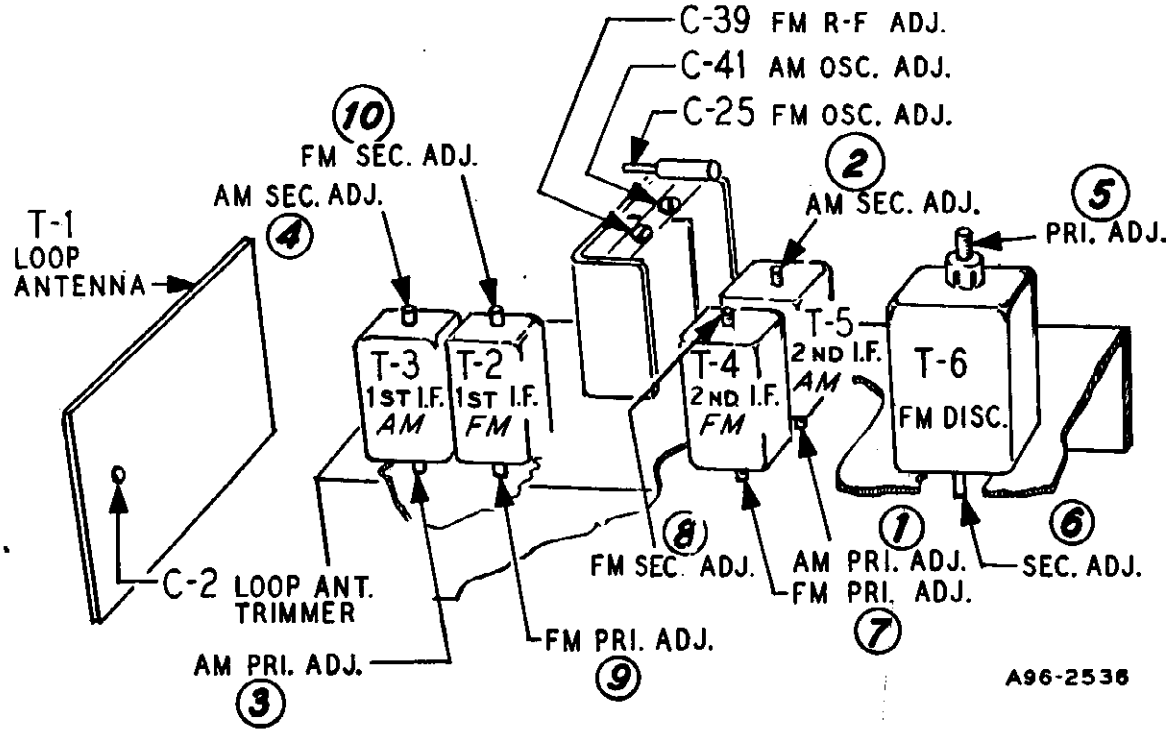
DRIVE CORD REPLACEMENT

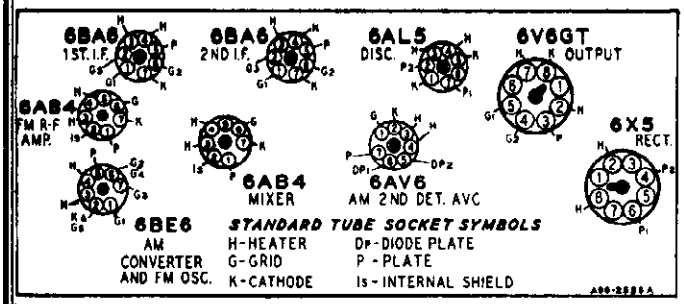
DIAL POINTER CORD

Use a new 10X72 drive cord assembly or a new length of cord 44 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 05WG-2748F





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.

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 50 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	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 Terminal	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			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	

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	Deflection Maximum
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.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
		CAPACITORS	
C-1	14A209	Gang Condenser Assembly	1
C-2	17A235	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	47X523	10 mmf Ceramic	1
C-25	17A255	1-8 mmf Trimmer	1
C-26, C-44	B66503	.05 mf 200 V Tubular	2
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

MODEL 05WG-2748F

Ref. No.	Part No.	Description			Qty. Used in Set
C-32A, C-32B	76X4	100 mmf		Dual Ceramic	1
C-33	B66203	.02 mf	200 V	Tubular	1
C-34	D66502	.005 mf	400 V	Tubular	1
C-36	B66103	.01 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

		Ohms	Watts		
R-1	B85470	47	0.5	Carbon	1
R-2, R-6, R-9	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-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-24, R-26	B85474	470 K	0.5	Carbon	3
R-20	B85153	15 K	0.5	Carbon	1
R-21	36X372	.5 meg.		Volume Control & Switch	1
R-23	40X310	.5 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
R-31	B84274	270 K	0.5	Carbon	1

TRANSFORMERS AND COILS

L-1	35A5	Insulated Choke	1
L-2	9A2103	Parasitic Choke Assembly	1
L-3	35A9	Insulated Choke	1
L-4	35A8	Insulated Choke	1
T-1	9A2146	"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	9A2161	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

MISCELLANEOUS

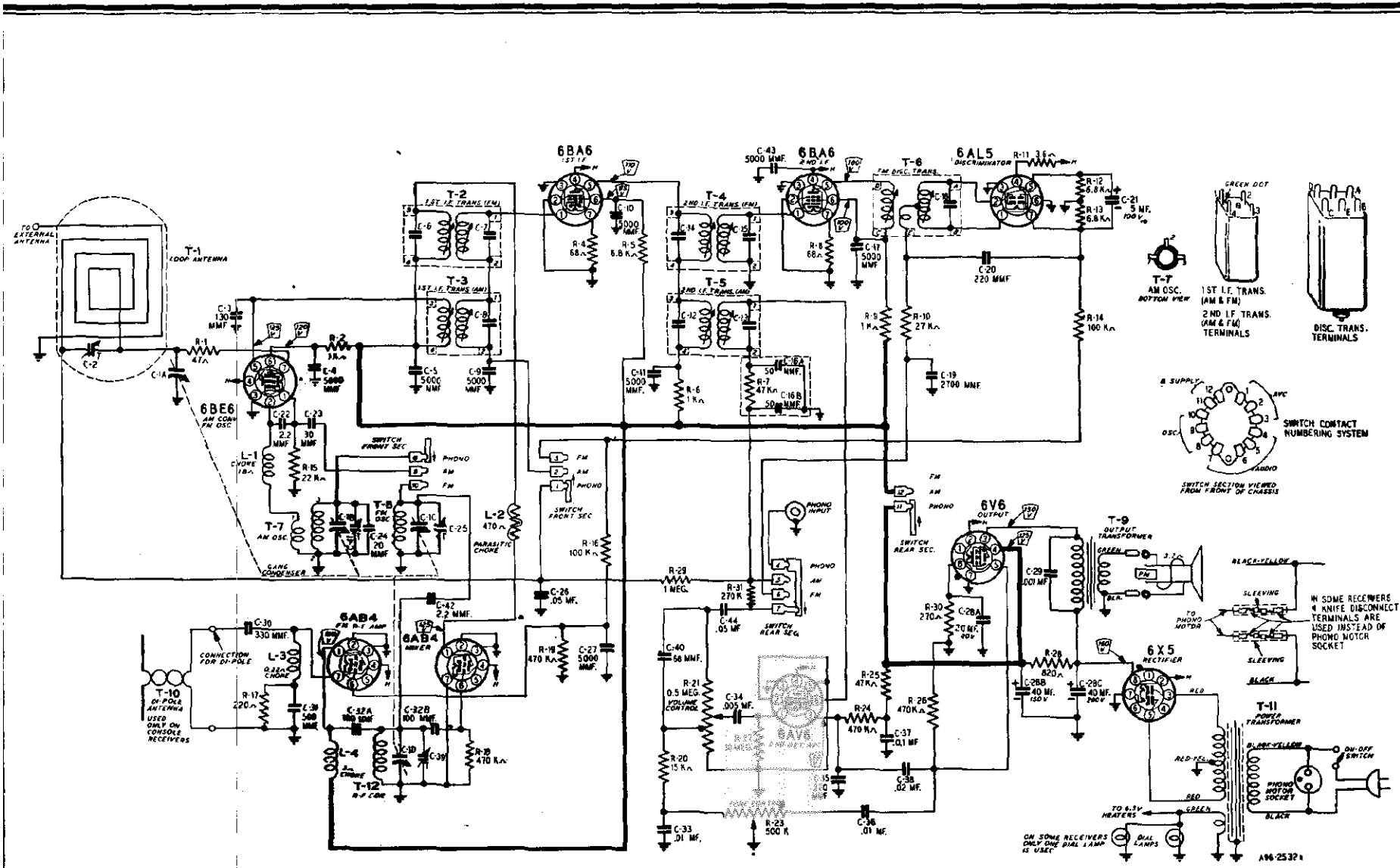
12A480	10" P.M. Speaker	1
3A435	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket (1st 6BA6)	1
3A427	Tube Socket	3
3A439	Tube Socket (Miniature)	3
3A308	Phono Socket—Single Pin Tip	1
2A393	Band Change Switch	1
13X546	Line Cord and Plug Assembly	1
4X1114	Escutcheon	1
10A759	Knob	4

DIAL AND DRIVE ASSEMBLY

58X741	Dial Glass	1
24X446	Idler Pulley	2
15X251	Pointer	1
25X1650	Dial Bracket	1
7A103	No. 47 Pilot Light Bulb	2
7A199	Pilot Light Socket Assembly	1
26X486	Drive Shaft	1
41X88	Reflector, Dial Light	2
28X113	Drive Cord Tension Spring	1
10X72	Drive Cord Assembly	1
19X192	"C" Washer (Mtg. drive Shaft)	2
6X66	Rubber Grommet (Mtg. gang cond.)	3

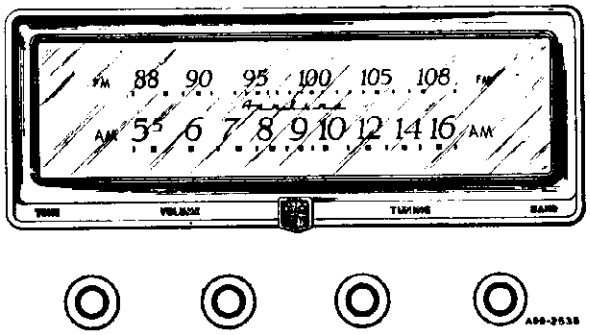
TYPE G.I. — 28A169 RECORD CHANGER PARTS

G.I.-56-76507	Motor Assembly, 60 cycles 105-125 Volts AC
G.I.-69-73657	Tone Arm
S-P81	Crystal Cartridge & Needle (Shure)
S-85-35	Needle



NOTE—C-24 is 10 mmf, C-33 is .02 mf and R-19 is not used.

MODEL 05WG-2749D



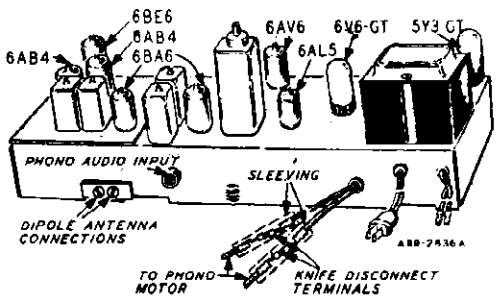
GENERAL DESCRIPTION

This is a two band, eight 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—455 KC FM—10.7 MC
Selectivity	AM—45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 25 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



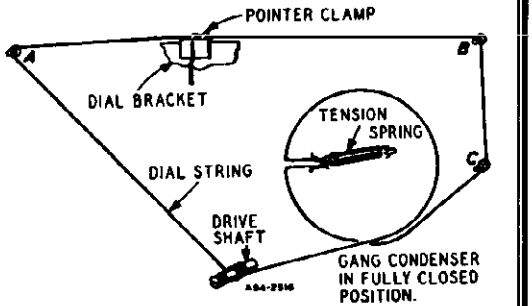
Tube and Dial Lamp Complement

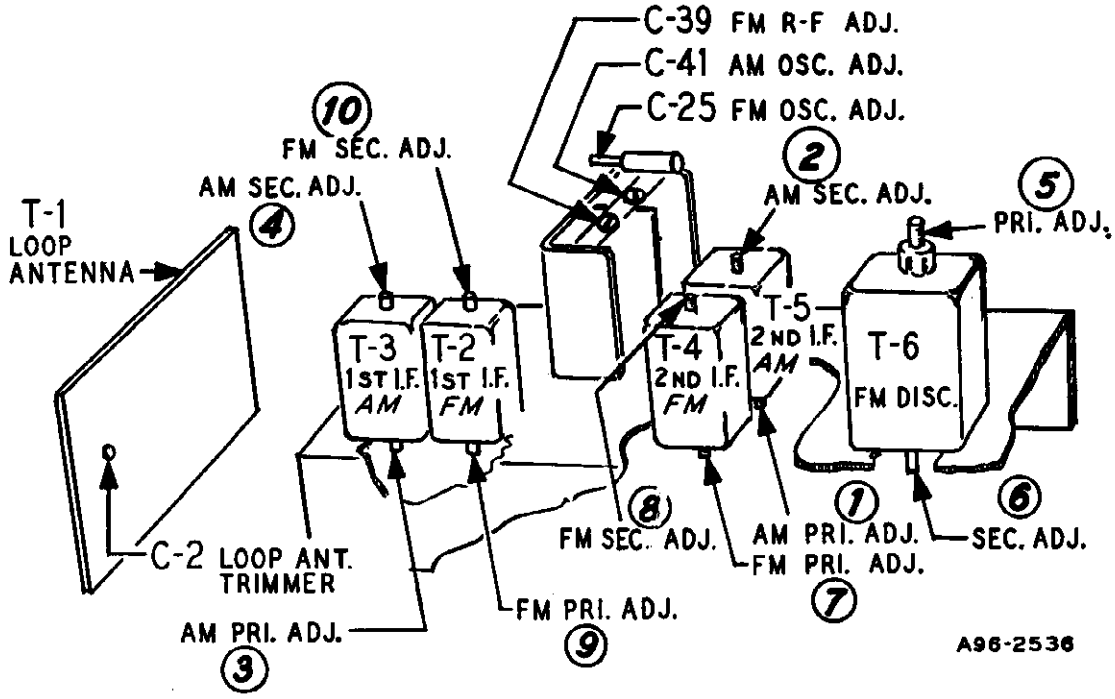
1 6BE6 AM Converter & FM Osc.
1 6BA6 1st I-F Amplifier
1 6BA6 2nd I-F Amplifier
1 6AL5 FM Discriminator
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
1 6V6GT Audio Output
1 5Y3GT Rectifier
1 6AB4 R-F Amplifier
1 6AB4 Mixer
2 No. 47 Dial Lamps

DRIVE CORD REPLACEMENT

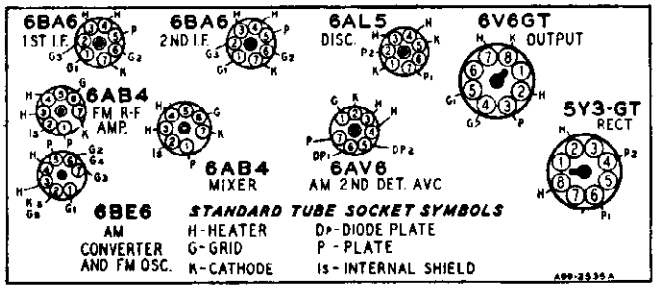
DIAL POINTER CORD

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.

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 Terminal	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.

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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		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	
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	Deflection Maximum
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.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
		CAPACITORS	
C-1	14A209	Gang Condenser Assembly	1
C-2	17A235	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	47X523	10 mmf Ceramic	1
C-25	17A255	1-8 mmf Trimmer	1
C-26, C-44	B66503	.05 mf 200 V Tubular	2
C-28A	45X359	20 mf 25 V Dry Electrolytic	1
C-28B		20 mf 350 V	
C-28C		40 mf 350 V	
C-28D		40 mf 350 V	

Ref. No.	Part No.	Description	Qty. Used in Set
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, C-36	B66103	.01 mf 200 V Tubular	2
C-34	D66502	.005 mf 400 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

		Ohms	Watts		
R-1	B85470	47	0.5	Carbon	1
R-2, R-6	B85102	1000	0.5	Carbon	2
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	40X310	.5 meg.		Tone Control	1
R-27	B85106	10 meg.	0.5	Carbon	1
R-28A	43X224	1000	4.0	Wirewound	1
R-28B		1400	6.0		
R-29	B85105	1 meg.	0.5	Carbon	1
R-30	B84271	270	0.5	Carbon	1
R-31	B84274	270 K	0.5	Carbon	1

TRANSFORMERS AND COILS

L-1	35A5	Insulated Choke	1
L-2	9A2103	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	9A2161	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

12A502	12" P.M. Speaker	1
3A435	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket (1st 6BA6)	1
3A427	Tube Socket	3
3A439	Tube Socket (Miniature)	3
3A305	Phono Socket—Single Pin Tip	1
2A393	Band Change Switch	1
13X546	Line Cord and Plug Assembly	1
4X1049	Escutcheon	1
10A735	Knob	4

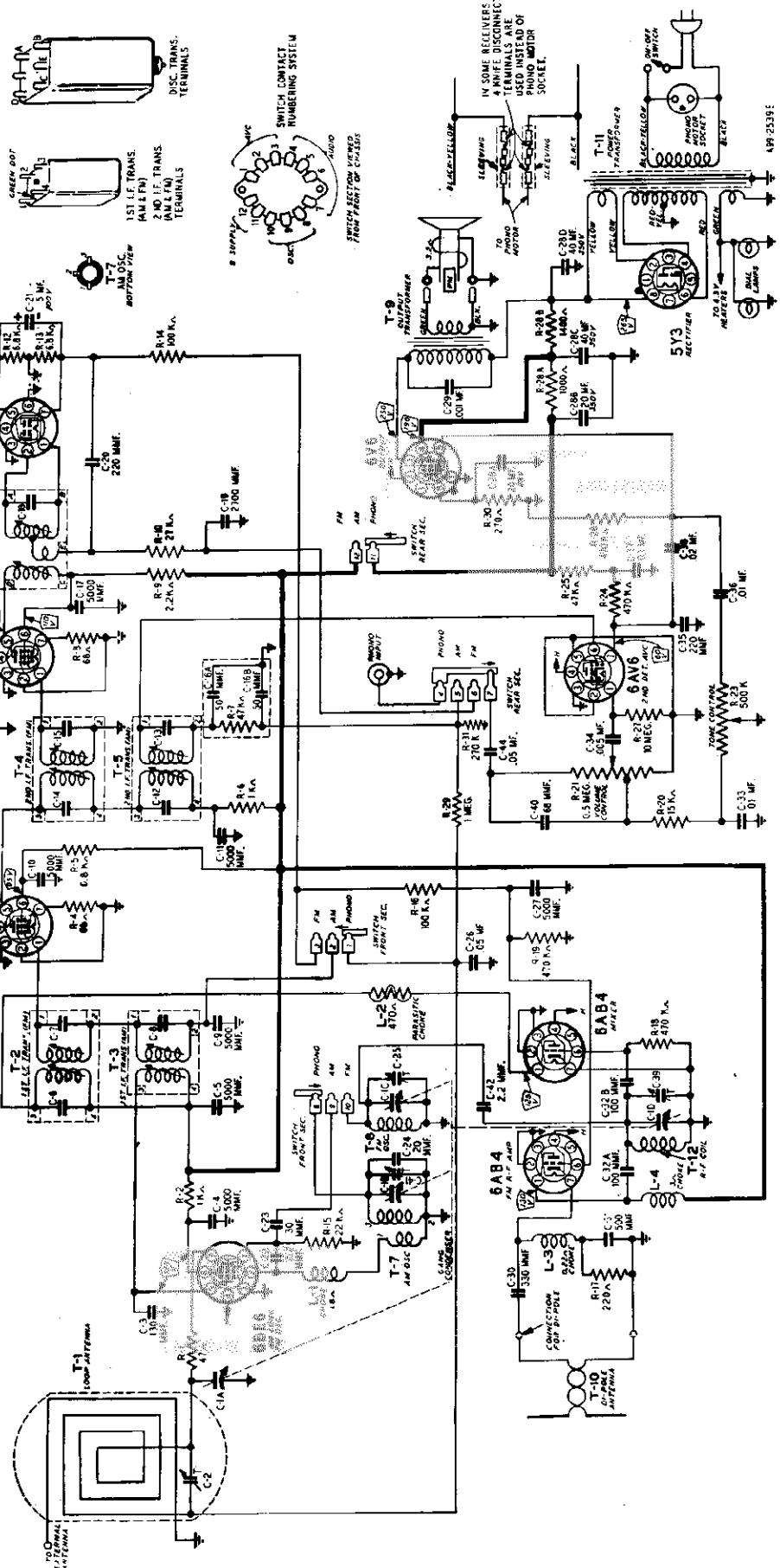
DIAL AND DRIVE ASSEMBLY

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
41X88	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 W-28A176 RECORD CHANGER PARTS

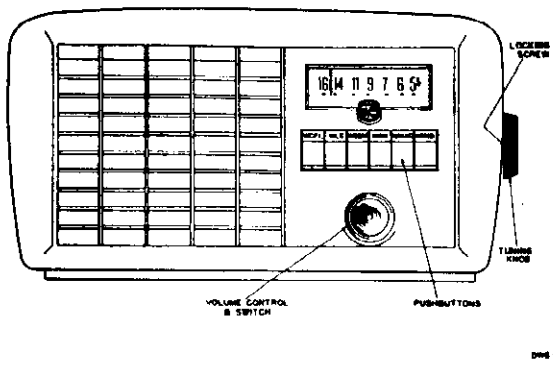
W-15X106-26	Motor Assembly, 60 cycles 105-125 Volts AC	1
W-49X123-5C	Pickup Arm	1
W-R A7M-1	Crystal Cartridge & Needles	1
W-R-13017	Needle, Microgroove (Red)	1
W-R-13016	Needle, Regular	1

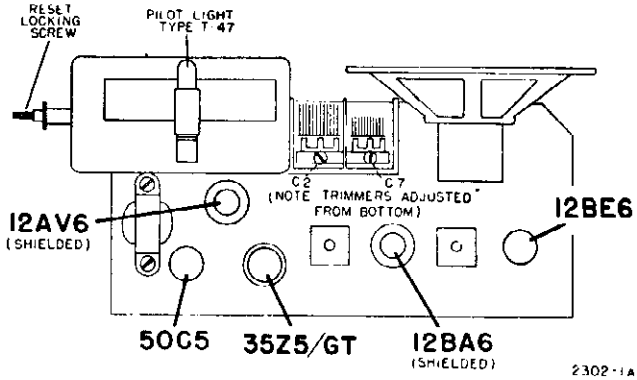
MODEL 05WG-2749D



NOTE—In later production C-24 is 10 mmf.

MODELS 15BR-1536B, 15BR-1537B





CHASSIS VIEW, SHOWING TUBE LOCATIONS

SERVICE DATA

GENERAL DESCRIPTION

This receiver is a single-band, AC-DC set which uses 4 tubes plus a rectifier. The antenna input and oscillator circuits are tuned by a two-gang capacitor. A loop antenna is built into the cabinet; provision is made also for the connection of an external antenna. AVC voltage is applied to the grid of the IF-amplifier and converter tubes.

ELECTRICAL SPECIFICATIONS

Power Supply	115 volts, DC or 50-60 cycles AC, 35 watts.
Frequency Range	540 to 1600 kc.
Intermediate Freq.	455 kc.
Selectivity	At 1000 kc, 55 kc at 1000 x signal
Sensitivity	140 microvolts average for .05 watt output (By radiation.)
Power Output	0.8 watts undistorted, 1 watt maximum.
Loud Speaker	5" P.M., v.c. impedance 3.2 ohms
Tube Complement	12BE6, converter, 12BA6, I.F. amplifier. 12AV6, detector, AVC, audio amplifier. 50C5, output amplifier. 35Z5, rectifier.

ALIGNMENT PROCEDURE AND RECEIVER STAGE SENSITIVITIES

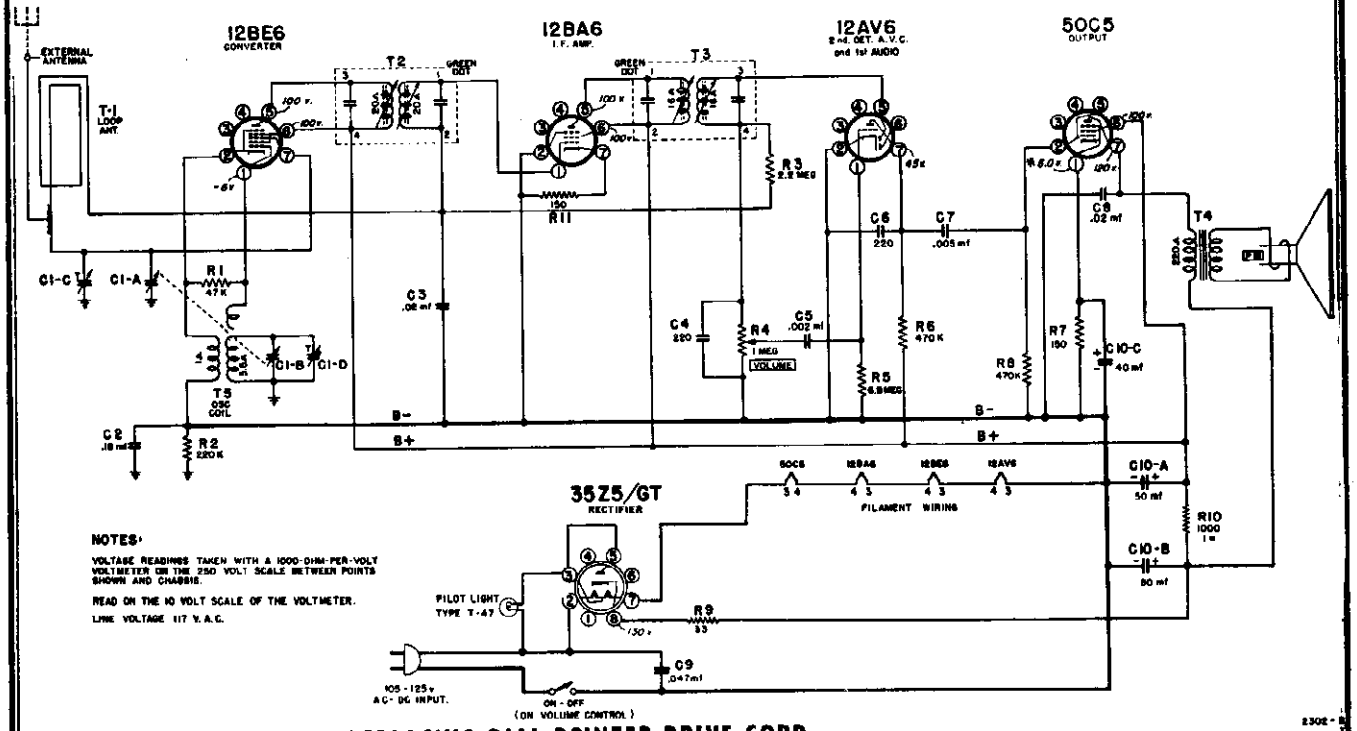
The signal source must be an accurately calibrated signal generator capable of supplying R. F. signals modulated 30% with a 400-cycle audio signal. A 400-cycle source is necessary for the audio measurement.

The table below lists the sensitivity at various points. All measurements are based on an output of 50-milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm, 5-watt resistor across the secondary winding of the output transformer. A reading of .4 volts AC across this resistor will be equivalent to a 50-milliwatt output with the speaker connected. Variations of plus or minus 25% are usually permissable. Volume control at maximum for all adjustments.

SIGNAL GENERATOR				TUNER SETTING	ADJUST FOR MAXIMUM OUTPUT	INPUT FOR 50-MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection			
455 kc.	.1 mf.	Pin No. 7 of 12BE6	Buss wire	Rotor full open	Trimmers on output and input I.F. cans	50 microvolts
1700 kc.	.1 mf.	Pin No. 7 of 12BE6	Buss wire	Rotor full open	Oscillator trimmer C7 (on top)	———
1400 kc.	none	See note A	none	Set dial at 1400	Antenna trimmer C2 (on top)	———
1400 kc.	.1 mf.	External antenna clip	Buss wire	1400 kc.	———	50 microvolts
400 cycles	.1 mf.	12AV6, Pin 1	Buss wire	———	———	.03 volts

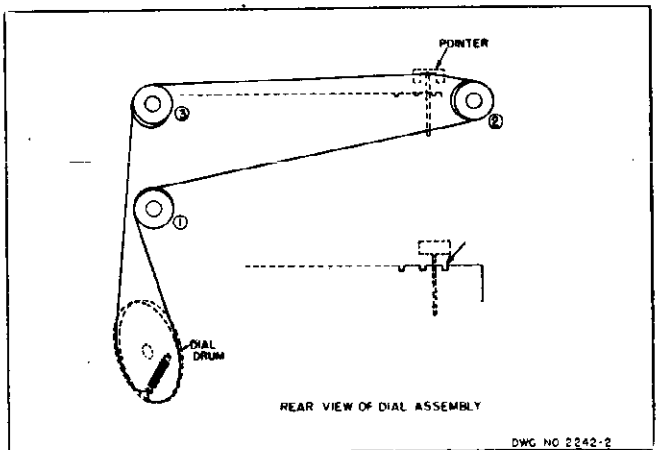
Note A: Lay output lead of generator in back of loop antenna. Turn up generator output. Loop antenna will pick up energy.

MODELS 15BR-1536B,
15BR-1537B



REPLACING DIAL POINTER DRIVE CORD—

1. Rotate tuning knob to extreme clockwise position. This closes the tuning condenser. Knob should remain in this postion until installation of cord is completed.
2. Tie cord to loop in spring in drum. Pass around drum in direction shown.
3. Pass over idler pulley number 1, then around idler pulley number 2 as shown.
4. Pass cord over idler pulley number 3, then down around drum as shown. Tie to loop in spring in such a manner that the spring is partly stretched.
5. Place pointer on top edge of dial plate. Guide cord through the three fingers on the back of the pointer.
6. Make sure the tuning knob is in the extreme clockwise position. Slide the dial pointer along the edge of the dial plate until the left edge of the pointer coincides with the right hand notch on the gold background plate, when viewed from the front.
7. Push the cord firmly into the three fingers and clamp them tightly together.



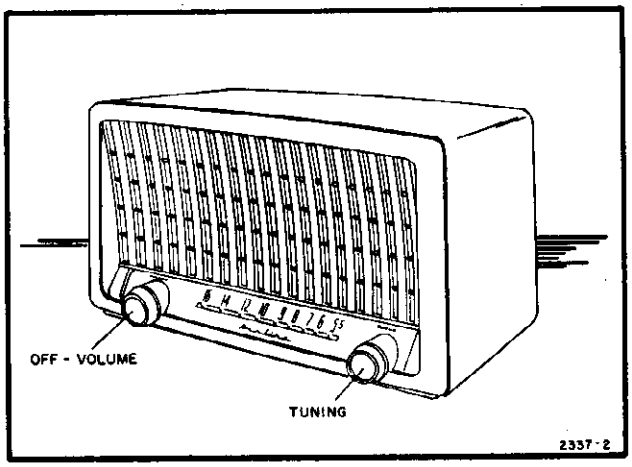
SETTING THE PUSHBUTTONS—The pushbuttons may be used, after proper adjustment, for the automatic tuning of any six stations which you select. They can be set up in any order.

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

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description
		TUNER ASSEMBLY
	115448	End plate (right hand bracket)
	115448C	End plate (left hand bracket)
	115146	Cams
	115143	Key washers (12 used on camshaft)
	115143C	Key washer (one used)
	117528	Brass spacer (one used on camshaft)
	117602	Brass spacer (four used on camshaft)
	131181	Spring washer for locking collar
	117604	Locking collar
	117600	Lever shaft
	115361	Lever with roller
	120283	Return spring for levers
	A-2G-15449	Pointer
	A-55A-10989	Dial cord (24")
	C-2C-15428	Dial plate assembly
	A-200-15463	Drum pulley
	A-3H-10299	Idler pulley
	120285	Drum spring
	B-2M-10383	Cinch button
	A-2C-15450	Background plate
		CHASSIS ASSEMBLY
		CAPACITORS
C-1A,B,C,D	B-8A-18708	2-gang, variable condenser
C2	C-8D-11111	.18 mmf x 400 volts
C3, 8	C-8D-10774	.02 mmf x 400 volts
C4, 5, 6, 7	A-201-14397	Audio coupling plate
C9	C-8J-16081	.047 mfd x 400 volts
C10, A, B, C	A-8C-18713	Electrolytic condenser
		RESISTORS
R1	C-9B1-82	47K ohms, 1/2 watt, 10%
R2	C-9B1-27	220K ohms, 1/2 watt, 20%
R3	C-9B1-33	2.2 megohms, 1/2 watt, 20%
R4	A-10A-10626	Volume control and switch
R5	C-9B1-36	6.8 megohms, 1/2 watt, 20%
R6, 8	C-9B1-29	470K ohms, 1/2 watt, 20%
R7, 11	C-9B1-52	150 ohms, 1/2 watt, 10%
R9	C-9B1-44	33 ohms, 1/2 watt, 10%
R10	C-9B2-62	1K ohm, 1 watt, 10%
		TRANSFORMERS
T1	C-13E-18714	Loop antenna assembly
T2	B-13B-17731	Input IF transformer
T3	B-13B-17731	Output IF transformer
T4	B-12C-18723	Output transformer
T5	B-12D-18741	Oscillator coil
		MISCELLANEOUS
	A-18A-18712	5" PM speaker
	A-46A-10793	Pilot light, T-47
	A-47A-15451	Pilot light assembly
*	A-15C-16007	7-prong, miniature tube socket
	A-2M-17589	Tube shield base
	A-2H-17588	Tube shield
	A-2D-15279	Loop mounting bracket
	A-2M-17580	Coil locking clip
	B-14M-10088-5	AC line cord and plugs
	A-23A-10344	Line cord lock
	A-15B-10440	Octal tube socket
		CABINET ASSEMBLY
	5C-14286-36	Cabinet (62-1536)
	5C-14286-82	Cabinet (62-1537)
	C-6D-15422	Dial Scale
	134123	Rubber bumper (bottom of cabinet)
	B-2M-15200	Cinch button (for dial scale)
	B-5B-18717-78	Volume knob (62-1537)
	B-5B-18717-74	Volume knob (62-1536)
	A-5B-10994-77	Tuning knob (62-1537)
	B-5B-10994-36	Tuning knob (62-1536)
	B-5B-14298-78	Pushbutton
	120388	Locking spring (for tuning knob)
	A-3F-10995	Locking screw (for tuning knob)
	A-23L-11900	Call letters, set
	A-6C-14299	Acetate tabs (call letters set)
	A-2H-10996	Reset key
	13141	Cinch buttons to cover trimmer holes in cabinet

MODELS 15BR-1543A,
15BR-1544A



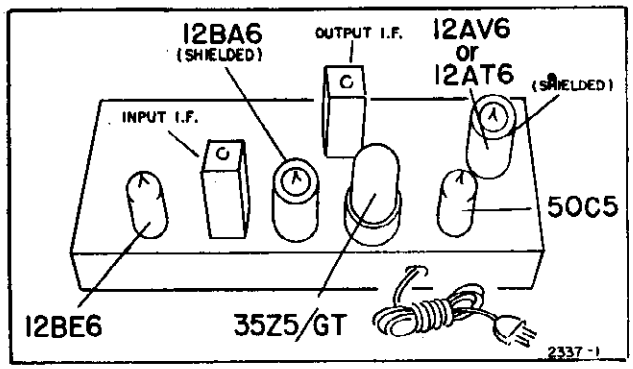
Front Cabinet View

SERVICE DATA

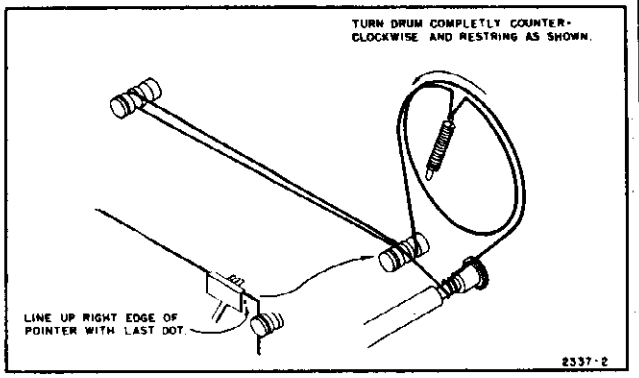
Power Supply	115 volts, DC or 50-60 cycle AC, 24 watts.
Frequency Range	540 to 1600 Kc.
Intermediate Freq.	455 Kc.
Selectivity	At 1000 Kc., 60 Kc. at 1000 x signal
Sensitivity	150 u. v. per meter.
Power Output	0.8 watts undistorted, 1.0 watt max.
Loud Speaker	4" PM., v.c. impedance, 3.2 ohms.

Tube Complement

12BE6, Converter
12BA6, IF Amplifier
12AV6 or 12AT6, Detector, AVC, Audio
50C5, Audio output
35Z5, Rectifier



Top Chassis View



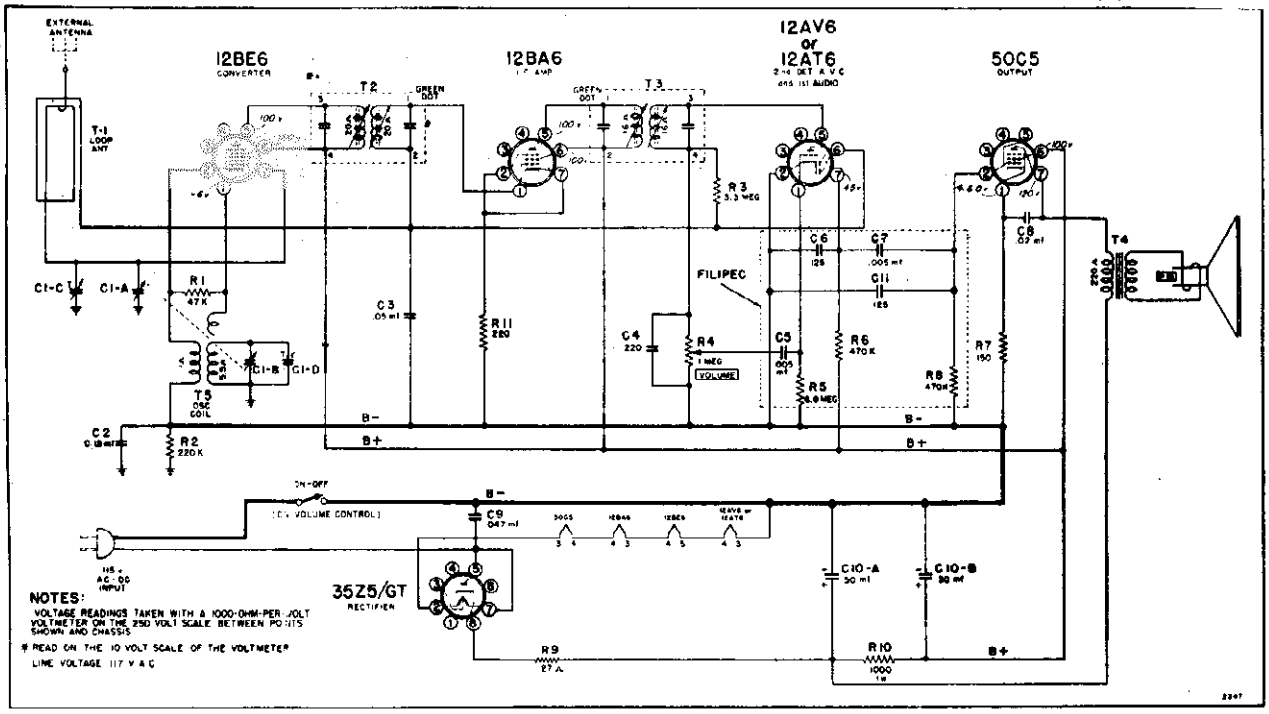
Dial Stringing Diagram

ALIGNMENT PROCEDURE

● Loop must be connected and set volume to maximum.

SIGNAL GENERATOR				TUNER SETTING	ADJUST FOR MAXIMUM OUTPUT	INPUT FOR 50-MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection			
455 kc.	.1 mf	12BE6, Pin 7	HEAVY BUSS LEAD ACROSS CENTER OF CHASSIS	Capacitor fully open (plates out of mesh)	Top and bottom Cores in output and input I.F. cans	65 microvolts
1620 kc.	.1 mf	12BE6, Pin 7		Capacitor fully open (plates out of mesh)	Oscillator trimmer C1-D on gang	70 microvolts
535 kc.	.1 mf.	12BE6, Pin 7		Capacitor fully closed	Check for adequate range	70 microvolts
1400 kc.	———	Lay generator lead near back of cabinet		Tune in 1400 kc. signal	Antenna trimmer C-1C on gang	200 to 400 microvolts
400 cycles	.1 mf	12AT6, Pin 1		———	———	.06 volts

MODELS 15BR-1543A,
15BR-1544A



NOTE: Capacitor C4 is included in filpec.

SCHEMATIC DIAGRAM

REPLACEMENT PARTS LIST

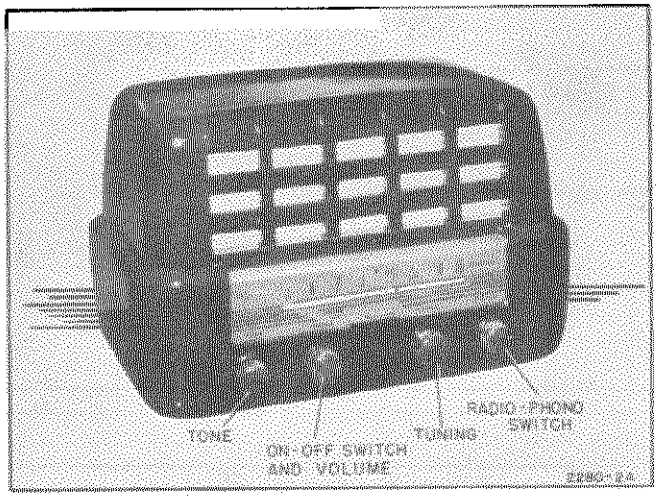
Please specify part number and chassis model number when ordering replacements.

Use only Genuine Factory Replacement Parts

Ref. No.	Part No.	Description
		CAPACITORS
C1A, B	8A-17377	2-gang condenser
C1C, D		Trimmers on gang
C2	8D-11111	.18 mfd x 400 volts
C3	8D-10770	.05 mfd x 200 volts
C4		Included in filpec
C5-6-7-11- and R5-6-8	201-19303	Filpec
C8	8D-10774	.02 mfd x 400 volts
C9	8J-16081	.047 mfd x 400 volts
C10A, B	8C-17391	Electrolytic condenser
		RESISTORS
R1	9B1-82	47K ohms, 1/2 watt, 10%
R2	9B1-27	220K ohms, 1/2 watt, 20%
R3	9B1-34	3.3 megohms, 1/2 watt, 20%
R4	10A-19616	Volume control and switch
R5-6-8		See Filipec
R7	9B1-52	150 ohms, 1/2 watt, 10%
R9	9B1-43	27 ohms, 1/2 watt, 10%
R10	9B2-62	1000 ohms, 1 watt, 10%
R11	9B1-54	220 ohms, 1/2 watt, 10%
		TRANSFORMERS AND COILS
T1	13E-19621	Loop antenna assembly
T2-3	13B-17731	IF transformer
T4	12C-19302 or	Output transformer
	12C-17595	Output transformer
T5	13D-17583	Oscillator coil
		DIAL PARTS
	3A-19617	Tuning shaft
	40A-17591	Bushing

Ref. No.	Part No.	Description
	29E-17592	Spring washer
	43D-17609	Tinnerman clip
	29C-10630	"C" washer
	53A-18547	Dial string (approx 20")
	49A-10078	Take up spring
	2C-19619	Pointer plate
	2G-19620	Pointer
	3M-19623	String guide
	37A-19626	Dial background
	6D-19625	Dial scale
	2M-19624	Dial mounting strip
		MISCELLANEOUS
	5C-19532-9	Cabinet (Ivory)
	5C-19532-36	Cabinet (Walnut)
	5B-19790-8	Knob (Ivory)
	5B-19790-74	Knob (Walnut)
	23J-19627	Grill cloth and baffle board
	18A-19618	Speaker, 4" PM
	43D-12779	Tinnerman clip
	2H-17588 or	Tube shield
	2H-19188	Tube shield
	2M-17589 or	Tube shield base
	2M-19187	Tube shield base
	2M-17580	IF locking clip
	15C-16007	7-prong, socket
	15B-10440	Octal socket
	14M-10088-4	AC line cord and plug
	2D-15432-1	Loop mounting bracket
	23A-10344	Line cord lock
	42A10-19851	Chassis mounting bolt
	29A-3528	Steel washer
	29J-16690	Rubber washer

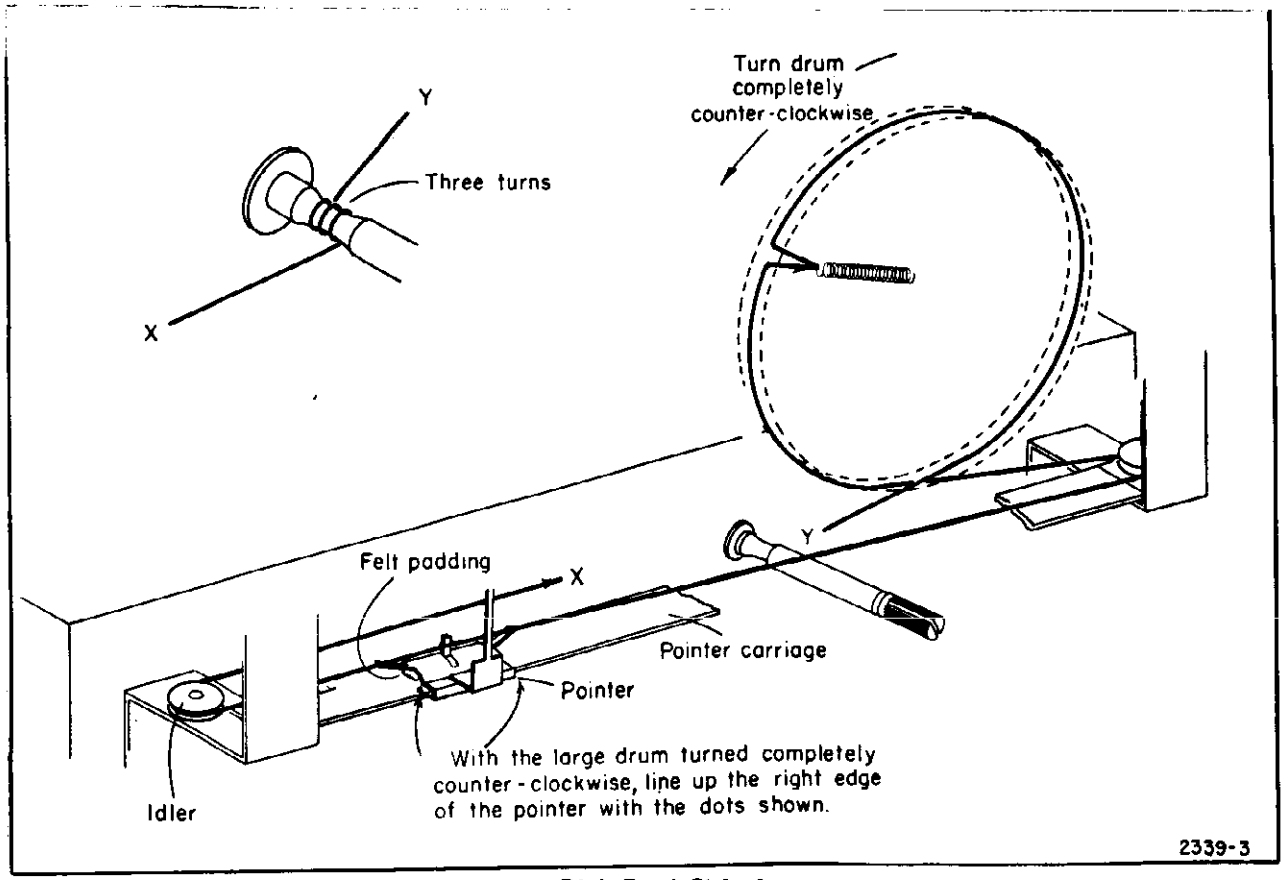
MODEL 15BR-1547A



SERVICE DATA

ELECTRICAL SPECIFICATIONS

Power Supply	115 volts; 60-cycle AC, 60 watts.	Sensitivity	20 microvolts average for .05 watts output.
Frequency Range	540 to 1600 kc.	Power Output	1.0 watts undistorted, 2.0 watts maximum.
Intermediate Freq.	455 kc.	Loud Speaker	5 x 7 P. M., v.c. impedance 3.2 ohms.
Selectivity	At 1000 kc. 50 kc. at 1000 x signal		



Dial Cord Stringing

ALIGNMENT PROCEDURE AND RECEIVER STAGE SENSITIVITIES

Alignment must be done in the cabinet.

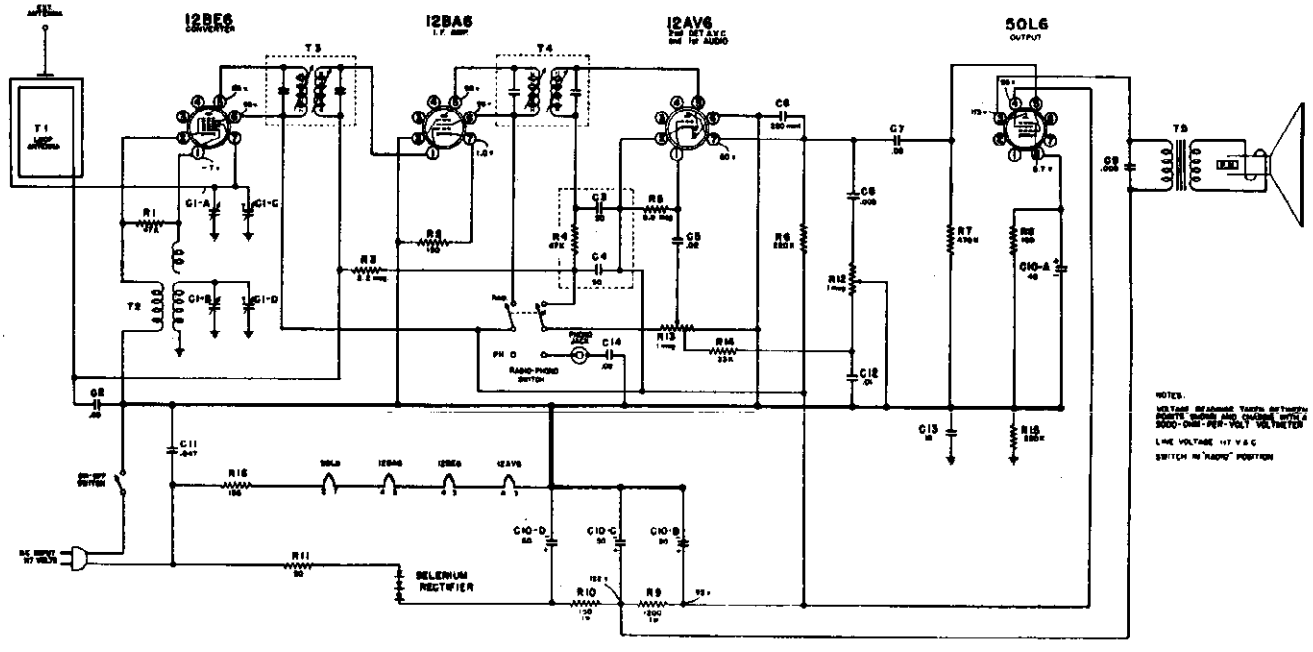
The signal source must be an accurately calibrated signal generator capable of supplying 455 Kc and up to 1620 Kc signals modulated 30% with a 400-cycle audio signal.

To connect the output meter, disconnect the speaker and substitute a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. Connect output meter across 3.2 ohm resistor.

- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.
- Loop antenna should be connected to receiver and in its proper position when making adjustments.

SIGNAL GENERATOR				TUNER SETTING	ADJUST FOR MAXIMUM OUTPUT
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection		
455 kc.	.1 mf.	12BE6, Pin 7	B MINUS POINT BUSS LEAD	Capacitor fully open (plates out of mesh)	Top and bottom Cores in output and input I.F. cans
1620 kc.	.1 mf.	12BE6, Pin 7		Capacitor fully open (plates out of mesh)	Oscillator trimmer C1-D on gang
535 kc.	.1 mf.	12BE6, Pin 7		Capacitor fully closed	Check for adequate range
1400 kc.	———	Lay Generator lead near back of cabinet.		Set dial pointer at 1400 kc.	Antenna trimmer C1-C on gang

SCHEMATIC DIAGRAM WITH VOLTAGES



NOTE: Either a 12AT6 or a 12AV6 tube may be used.

MODEL 15BR-1547A

TUBE COMPLEMENT

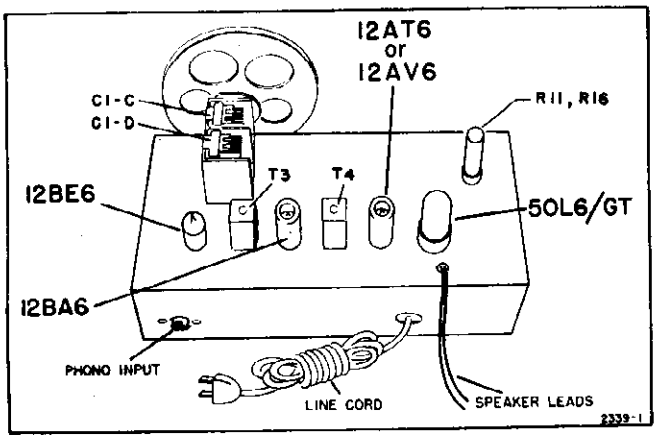
12BE6, Converter.

12BA6, I.F. Amplifier.

12AT6 or 12AV6, Detector, AVC, audio amplifier.

50L6, Output amplifier.

Selenium rectifier.



Top Chassis View

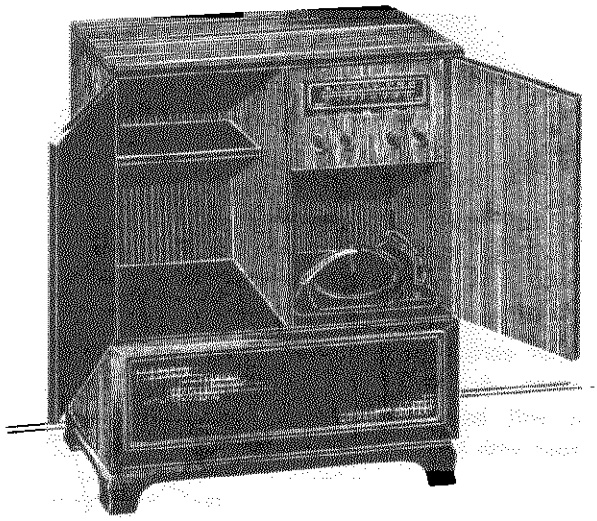
REPLACEMENT PARTS LIST

Please specify PART number and chassis Model Number when ordering replacements.

Ref. No.	Part No.	Description
		CAPACITORS
C1A,B	8A-18997	2 gang condenser
C1C,D		Trimmer on gang
C2-7	8D-10770	.05 mfd x 200 volts, paper
C3-4 and R4	201-15005	Filpec
C5	8D-11304	.02 mfd x 200 volts, paper
C6	8G-14459	220 mmf, ceramic
C8-9	8D-10935	.005 mfd x 600 volt, paper
C10A,B,C,D	8C-19829	Electrolytic condenser
C11	8J-16081	.047 mfd x 400 volt, molded case
C12	8D-17258	.01 mfd x 200 volt, paper
C13	8D-11111	.18 mfd x 400 volt, paper
C14	8D-11251	.09 mfd x 400 volts, paper
		RESISTORS
R1	9B1-82	47K ohms, 1/2 watt, 10%
R2-8	9B1-52	150 ohms, 1/2 watt, 10%
R3	9B1-33	2.2 megohms, 1/2 watt, 20%
R4		See Filipec
R5	9B1-36	6.8 megohms, 1/2 watt, 20%
R6-15	9B1-90	220K ohms, 1/2 watt, 10%
R7	9B1-29	470K ohms, 1/2 watt, 10%
R9	9B2-63	1200 ohms ,1 watt, 10%
R10	9B2-52	150 ohms, 1 watt, 10%
R11-16	9M-19778	Clarostat resistor 50 ohms, 4 watts, 10% 195 ohms, 4 1/2 watts, 10%
R12	11B-15852	Tone control (1 meg.)
R13	10A-19606	Volume control & switch (1 meg.)
R14	9B1-80	33K ohms, 1/2 watt, 10%
		TRANSFORMERS AND COILS
T1	13E-19830	Loop antenna
T2	13D-19064	Oscillator coil
T3-4	13B-17731	IF transformer
T5	12C-19009-1	Output transformer

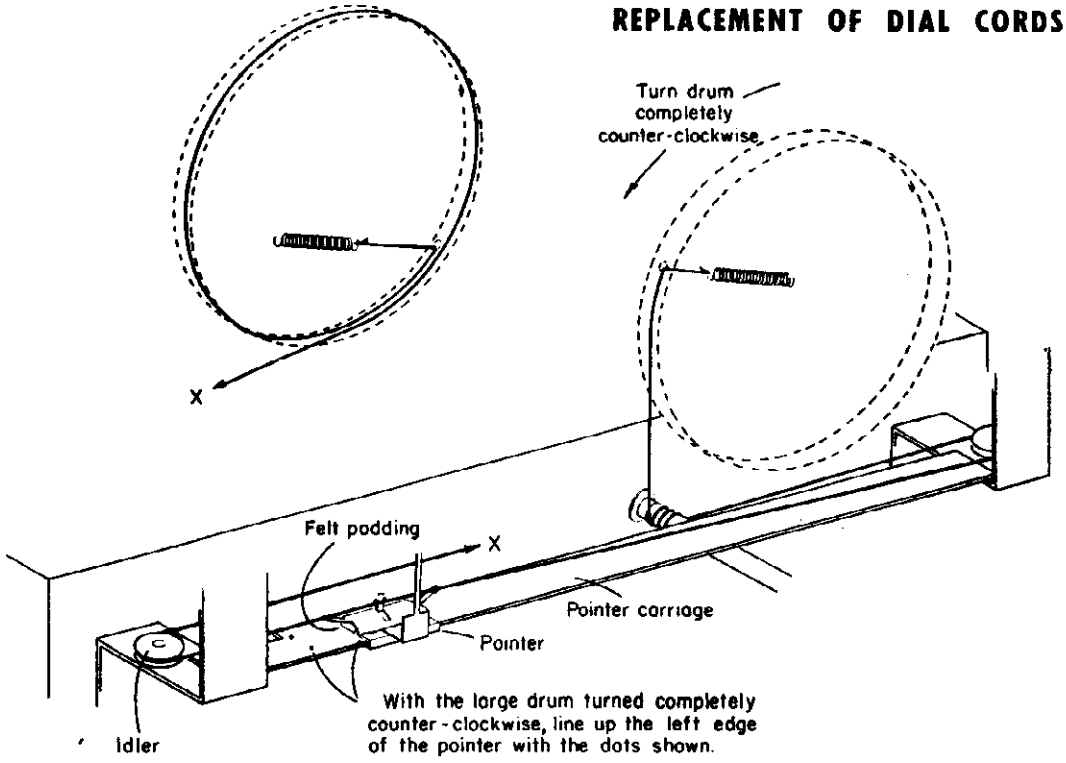
Ref. No.	Part No.	Description
		DIAL PARTS
	3A-18116	Tuning shaft
	2D-10033	Tuning shaft bracket
	29E-466	Spring washer
	29C-10393	"C" washer
	29J-18188	Rubber washer
	2D-17627	Pointer bar bracket
	2M-19825	Pointer bar
	3M-10299	Pulley
	27A-10102	Shoulder rivet
	2G-18119	Dial pointer
	53A-18547	Dial string (approx. 60")
	49A-11324	Tension spring
	50A-16434	Felt strip for pointer
	2M-18440	Dial mounting bracket
	2M-19777	Dial scale
		MISCELLANEOUS
	2M-17580	IF clip
	20A-19660	Radio Phono switch
	43F-15390	Pal nut
	23J-19826	Background plate
	21J-19594	Selenium rectifier
	2H-10974	Tube shield
	15C-16007	7-pin, tube socket
	2H-17008	Tube shield base
	15B-10440	8-pin, tube socket
	23A-10344	Line cord lock
	14M-11479-5	Line cord and plug
	19B-12170	Pickup socket
	39A-14155	Insulator
	2D-15432-1	Loop mounting bracket
	5C-18396-36	Bakelite cabinet
	23K-19822	Grille cloth
	24M-18433-1	Baffle board
	18A-19896 or 18A-17637	Speaker, 7" PM
	5B-11131-74	Knob
	5B-16057-74	Knob (with dot)

MODELS 15BR-2756B
15BR-2757A



2330

REPLACEMENT OF DIAL CORDS



Pointer Stringing and Alignment

2268-2

ELECTRICAL SPECIFICATIONS

Power Supply	115 volts, AC, 60-cycles; radio only 75 watts, with phono operation 100 watts.
Frequency Ranges	Broadcast Band—540 to 1600 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)—12 microvolts average.
Power Output	2.0 watts. 10% distortion. 4.5 watts maxmium.
Loud Speaker	8" PM. Voice coil impedance 3.2 ohms, 400 cycles.
Tube Complement	T-44, Pilot light; 12AT7, FM-RF amp. mixer; 6AL5, FM detector; 6BA7, AM converter, FM oscillator; 6AV6, AM detector and 1st audio; 6BA6, IF amplifier; 6V6 output; 6AU6, FM driver; 5Y3, rectifier.
Automatic Changer	See Manual 5089A.

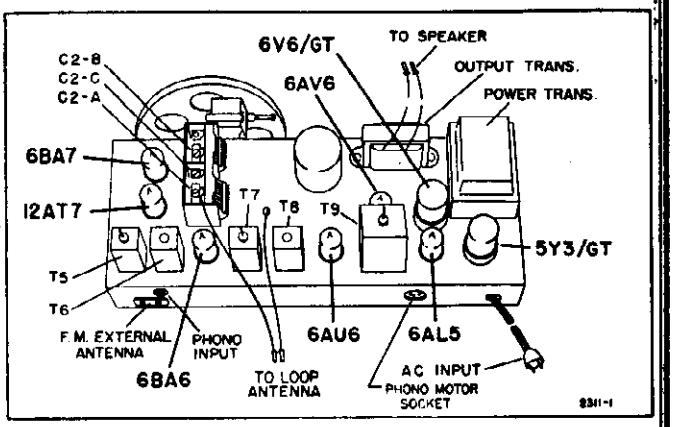
MODELS 15BR-2756B,
15BR-2757A

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 left 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
1600 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.

MODELS 15BR-2756B
15BR-2757A

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 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 side 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 resistors must be matched within 5%. Connect vacuum tube voltmeter between the midpoint of the resistors and point zz.

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 necessary.

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 zz.

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 left hand edge of dial marker at the extreme left when gang is closed.

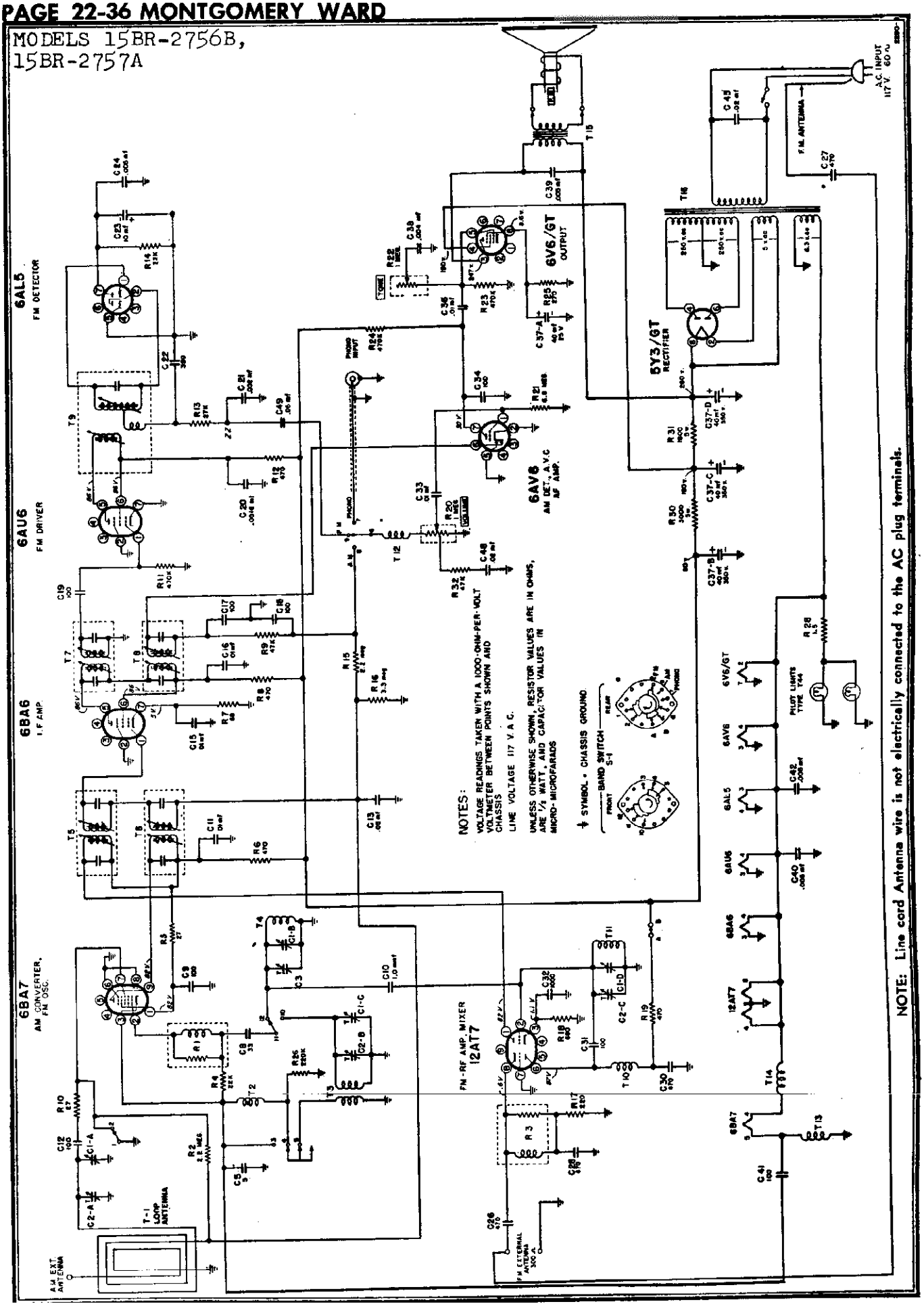
For adjustment, see dial mechanism illustration.

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.

MODELS 15BR-2756B,
15BR-2757A



MODELS 15BR-2756B,
15BR-2757A

REPLACEMENT PARTS INFORMATION

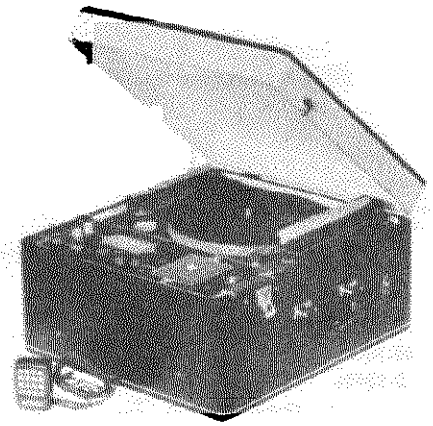
Please specify *PART* number and chassis model number when ordering replacements.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description
		CAPACITORS
C1A,B,C,D	B-8A-17673	Gang tuning condenser
C2A,B,C,		Trimmers on gang
C3	A-201-15142	Trimmer condenser
C5	C-8G-12166	5 mmf, ceramic, 10%
C8	C-8G-14172	33 mmf, ceramic, 10%
C9-31-41	C-8G-12759	100 mmf, ceramic, 10%
C10	A-8G-12495-1	1.0 mmf, ceramic, 20%
C11-16-36	C-8D-17270	.01 mfd, 400 volts, 20%
C12	C-8G-13131	100 mmf, ceramic, 10%
C13-49	C-8D-10770	.05 mfd, 200 volts, 20%
C15-33	C-8D-11738	.01 mfd, 200 volts, 20%
C17-18	A-8F-13127	100 mmf, dual mica +30% —20%
C19-34	C-8G-11734	100 mmf, ceramic, 10%
C20	C-8D-19565	.0016 mfd, 600 volts, 10%
C21	C-8G-16049	.002 mfd, ceramic, 10%
C22	C-8F3-120	390 mmf, mica, 10%
C23	A-8C-18128	10 mfd, 50 volts
C24-40-42	A-8G-13962	.005 mfd, ceramic
C26-27-28-30	C-8G-11732	470 mmf, ceramic, 20%
C32	C-8G-13201	1000 mmf, ceramic
C37-A-B-C-D	A-8C-18125	40 mfd x 25 volts, 40-40-40 mfd x 350 volts
C38	C-8D-10788	.004 mfd, 600 volts, 20%
C39	C-8D-10935	.005 mfd, 600 volts, +40% —15%
C45	C-8J-11321	.02 mfd, 600 volts, 20%
C48	C-8D-11304	.02 mfd, 200 volts, 20%
		RESISTORS
R1	A-16B-16615	Suppressor
R2-15	C-9B1-33	2.2 megohms, ½ watt, 20%
R3	A-16B-16616	Suppressor
R4-14	C-9B1-78	22K ohms, ½ watt, 10%
R5-10	C-9B1-43	27 ohms, ½ watt, 10%
R6-8-12-19	C-9B1-58	470 ohms, ½ watt, 10%
R7	C-9B1-48	68 ohms, ½ watt, 10%
R9-32	C-9B1-82	47K ohms, ½ watt, 10%
R11-23-24	C-9B1-94	470K ohms, ½ watt, 10%
R13	C-9B1-79	27K ohms, ½ watt, 10%
R16	C-9B1-34	3.3 megohms, ½ watt, 20%
R17	C-9B1-54	220 ohms, ½ watt, 10%
R18	C-9B1-60	680 ohms, ½ watt, 10%
R20	A-10A-17971	1 megohm, (volume control and switch)
R21	C-9B1-36	6.8 megohms, ½ watt, 20%
R22	A-11B-16502	1 megohm, (tone control)
R25	C-9B1-55	270 ohms, ½ watt, 10%
R26	C-9B1-27	220K ohms, ½ watt, 20%
R28	C-9C2-1065	1.5 ohms, 1 watt, 10%
R30	C-9C12-2059	3000 ohms, 5 watts, 5%
R31	C-9C12-1102	1800 ohms, 5 watts, 10%

Ref. No.	Part No.	Description
		COILS, TRANSFORMERS, CHOKES
T1	C-13E-18924-1	Loop antenna assembly
T2-T13-T14	A-16B-16023	RF choke coil assembly
T3	B-13D-18996	Oscillator coil (AM)
T4	A-13D-16617	Oscillator coil (FM)
T5	B-13A-18567	Input IF transformer (FM)
T6	B-13A-16662	Input IF transformer (AM)
T7	B-13B-18568	Output IF transformer (FM)
T8	B-13A-16662	Output IF transformer (AM)
T9	B-13M-19356	Ratio detector transformer
T10	A-16B-16613	RF choke coil
T11	A-13E-16618	RF coil (FM)
T12	A-16A-18676	RF choke coil
T15	B-12C-18143-1	Output transformer
T16	B-12A-18137	Power transformer
		MISCELLANEOUS
	A-15B-13430	9-prong, miniature tube socket
	A-15B-10440	8-prong, octal socket
	A-15C-16007	7-prong, miniature tube socket
	B-20A-19475	Band change switch
	B-14M-11479-3	AC line cord and plug
	A-23A-10344	Line cord lock
	A-19B-12170	Phono pick-up socket
	A-7B-13050	Dipole socket
	B-47A-18870	Pilot light assembly
	A-46A-11971	Pilot light bulb, T-44
	A-19B-12468	Phono motor socket
	B-18A-18872	Speaker, 8" PM
	B-2G-18868	Escutcheon
	B-30A-18869	Dial scale
	B-5B-18876-74	Knob
	B-5B-18877-74	Knob (with indicator)
		DIAL PARTS
	A-3A-18548	Tuning shaft
	A-2D-10033	Tuning shaft bracket
	A-2M-16034	Dial mounting bracket
	B-6M-17622	Background diffuser
	B-2M-16656	Pointer bar
	A-2D-17627	Pointer bar bracket
	A-3M-10299	Pulley
	B-27A-10102	Shoulder rivet
	B-2G-18119	Dial pointer
	A-50A-16434	Felt Strip for Pointer
	A-49A-11324	Tension spring
		PHONO PARTS
	C-21H-19575	Record Changer assembly, (GI model 700F)
		Shure P-81 cartridge
		Needle
	A-39A-17837	45 RPM fiber inserts

MODEL 15GAA-3967C



Power Output . . .	8.9 watts maximum; 2.4 watts, 10% distortion
Loud Speaker . . .	5" permanent magnet dynamic - 1.47 oz. Alnico 5 magnet - voice coil impedance 3.2 ohms at 400 cycles.
Tubes and Dial Light Complement .	1 6SA7 GT Mixer 1 6SK7 GT IF Amplifier 1 6SQ7 GT 2nd. Det. 1st AF 1 6V6 GT Power Amp. 1 6X5 GT Rectifier 1 6SQ7 GT Mike Amp. 2 NE-51 Neon Lamps 1 No. 47 Dial Lamp
Recorder Unit . . .	General Industries - Model GI-R80L - 115 volts 60 cycle AC - Part No. 2305
Microphone	Crystal - Electro Voice Model 915, Part No. 2510

SPECIAL INSTRUCTIONS

REMOVAL OF RADIO CHASSIS

Remove the four sheet metal screws at the edge of the metal panel. Remove the two machine screws from the front of the cabinet. Lift chassis enough to remove the small three-prong (antenna) plug from the top of the chassis. Then disconnect the three plugs from the rear of the chassis, and lift the chassis out of the cabinet.

NOTE: In cabinets that have a panel in bottom, remove this panel and disconnect the four plugs through this opening; then proceed as above.

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC, 60 cycles, 45 watts normal, 75 watts recorder operating.
Frequency Range. . .	535-1620 KC
Intermediate Frequency	455 KC
Selectivity	36 KC broad at 1000 times signal, 1000 KC
Sensitivity	(for 0.5 watt output - with loop antenna) 200 microvolts per meter average.

REMOVAL OF RECORDER UNIT

After the radio chassis has been removed, unscrew the four machine screws at the corners of the unit. Lift "Recorder" arm three inches, swing it halfway towards the turntable center and then lower it. Grasp the unit at the edges and lift it out.

When testing the radio, the loop antenna should be removed from the cabinet and reconnected to the chassis.

OPERATING INSTRUCTIONS

Operating the AIRLINE Radio Recorder is not complicated or difficult. However, the better you understand it the better your results will be. Read these instructions carefully so that you may derive the greatest pleasure and satisfaction from your Radio-Recorder.

INSTALLATION

IMPORTANT During shipment the base plate, on which are mounted the *motor* and the *recording* and *play-back arms*, is secured firmly to case by four bolts located at each corner of the base plate. *These bolts must be loosened about 2 complete turns* to allow the recording assembly to float freely on the rubber shock absorbers under the plate.

Before connecting your Radio-Recorder, make certain that the line voltage is 105-125 volts AC, 60 Cycles.

For best results the unit must be operated on a firm and level support. This is important to insure proper "tracking" of the arms when making or playing recordings.

OPERATION

TO OPERATE RADIO

Turn *"Function Selector"* switch knob to *Radio* position. Turn *OFF-ON* switch to the right and allow time for tubes to warm up, then tune in desired station. Adjust the *Tone* and *Volume* controls to the most pleasing tonal balance.

TO RECORD FROM RADIO

1. Raise the *Recording Arm* and insert the cutting needle in the cutting head, making sure that the point of the retaining screw bears against the flattened shank of the needle. Tighten the screw firmly with your fingers - *DO NOT USE PLIERS*. *RE-TIGHTEN* the screw after each recording.
2. Turn *"Function Selector"* switch to *Radio* position and tune in station desired.
3. Turn *"Function Selector"* switch knob to *Record Radio* position. Turn *Tone Control* all the way to the right-Treble position. *THIS IS IMPORTANT*. Recordings made with the *Tone Control* in any other position will have a tendency to sound muffled. Adjust *Volume Control* to a point where the lower neon indicator lamp will glow continuously while the upper one will light up only during loud passages of music or speech. The correct setting of the *Volume Control* is very IMPORTANT. Either excessive or insufficient volume will result in poor recording. Too much volume will produce distorted recordings while insufficient volume will cause excessive groove and surface noise. *WARNING - Excessive volume can permanently damage the crystal recording head. NEVER ADVANCE the VOLUME CONTROL any farther than is required to light up the upper neon indicator lamp on loud passages of music or speech.*
4. Place a blank recording disc on the turntable so that the *Retractable Pin* protrudes through the small hole near the center hole of the recording disc.
5. The AIRLINE Radio-Recorder is equipped with a two-speed recording unit. Recordings can be made either at the standard speed (78 RPM) or the professional slow speed (33-1/3 RPM). At 33-1/3 RPM the recording time is almost doubled. For example: at 78 RPM on a 10 inch record the recording time is approximately 4½ minutes, while at 33-1/3 RPM on a 10 inch record the time is approximately 9½ minutes. Select the recording speed desired and start the turntable. Raise the *Recording Arm* about three inches, move horizontally and place on the recording disc. The record is now being cut and a fine thread or shaving cut from the record will be directed toward the center post. Allow this shaving to collect around the center post until the recording is finished. When the recording is finished, raise the *Recording Arm* about 3 inches and return it to the arm rest. Turn motor off and remove the shavings that have collected around the center post.

TO RECORD FROM MICROPHONE

Turn *"Function Selector"* knob to *Record Microphone* position and follow the same procedure as outlined in *To Record From Radio*. The microphone should be used as far away from the recorder as possible to reduce possible acoustic feedback, a howl that results from excessive sound from the loud speaker re-entering the microphone. For best results the microphone should be used from 6 to 8 inches from the source of the sound to be recorded.

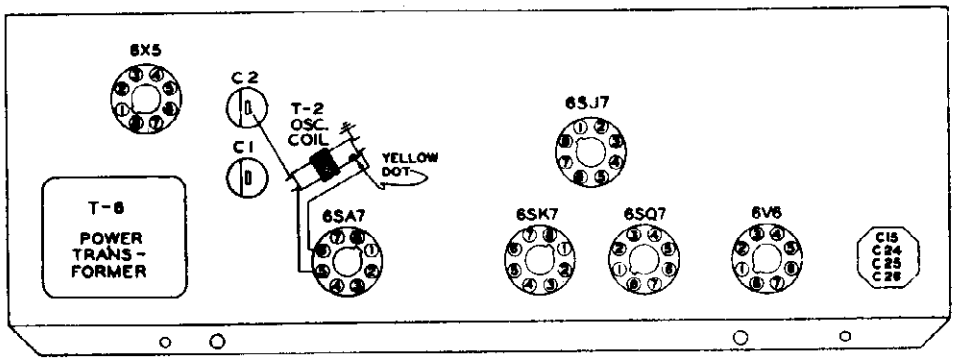
TO PLAY RECORDS

Turn *"Function Selector"* knob to *"Phonograph"* position. Select the proper speed 33 or 78 RPM, start the turntable and place the *"Playback arm"* on the record. Adjust tone and Volume to pleasing setting. LP microgroove records are played with speed selector in "33" position.

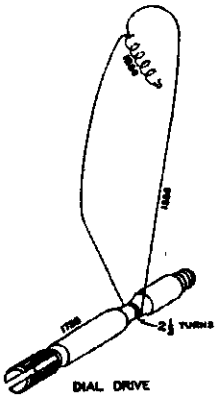
TO USE AS PUBLIC ADDRESS SYSTEM

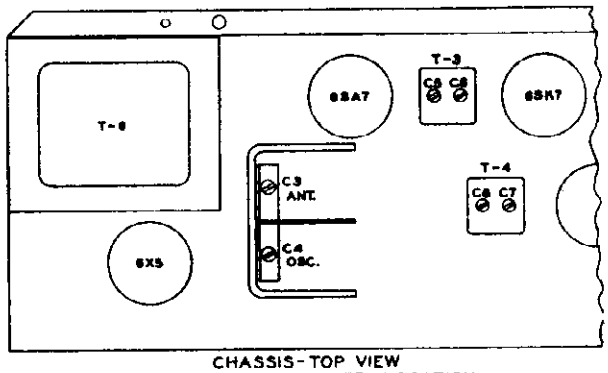
Turn *"Function Selector"* knob to *Public Address* position. As in *Recording From Microphone*, the microphone should be used as far away from the recorder as possible to reduce possible acoustic feedback. The setting of the volume control will depend on the position and the distance of the microphone in relation to the loud speaker.

MODEL 15GAA-3967C



CHASSIS - BOTTOM VIEW





CHASSIS - TOP VIEW
ALIGNMENT TRIMMER LOCATION

ALIGNMENT PROCEDURE

The following equipment is required for aligning:

A signal generator which will provide an accurately calibrated signal at the indicated test frequencies; an output indicating meter; a non-metallic screwdriver.

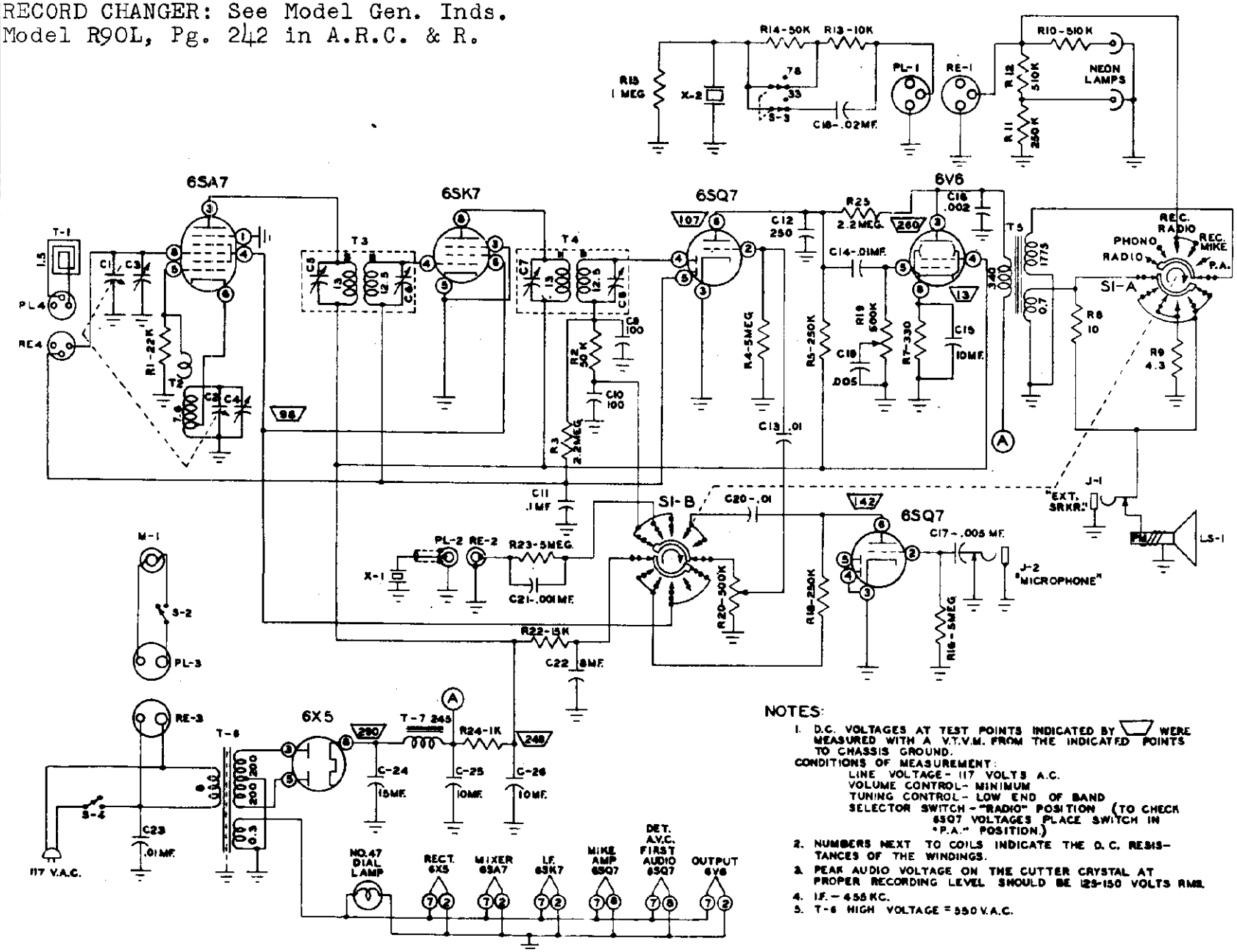
Radiation Loop: 2-turn loop, 6 inches in diameter.

Conditions for Alignment:

Tone - Treble
Volume - Maximum
Selector Switch - "Radio" position
Test loop coupled loosely to receiver by spacing - receiver loop in same position as it will be with chassis in cabinet.

SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	REMARKS	ADJUST FOR MAXIMUM OUTPUT
LOOP	455 KC	Low End of Band	Across Voice Coil	Short out osc. tuning gang section C-2; compress C-3	C-8, C-7, C-6, C-5
LOOP	1620 KC	High End of Band	"	Remove short across C-2	C-4
LOOP	1400 KC	Point of Maximum Output	"	Set pointer to 140 on dial	C-3
LOOP	600 KC	Point of Maximum Output	"	Knife C-1 plates for maximum output	
LOOP	1400 KC	1400	"	Recheck alignment.	C-3 if necessary

RECORD CHANGER: See Model Gen. Inds.
Model R90L, Pg. 242 in A.R.C. & R.



NOTES:

1. D.C. VOLTAGES AT TEST POINTS INDICATED BY ▽ WERE MEASURED WITH A V.T.V.M. FROM THE INDICATED POINTS TO CHASSIS GROUND.
   CONDITIONS OF MEASUREMENT:
   LINE VOLTAGE - 117 VOLTS A.C.
   VOLUME CONTROL - MINIMUM
   TUNING CONTROL - LOW END OF BAND
   SELECTOR SWITCH - "RADIO" POSITION (TO CHECK 6SQ7 VOLTAGES PLACE SWITCH IN "P.A." POSITION.)
2. NUMBERS NEXT TO COILS INDICATE THE D.C. RESISTANCES OF THE WINDINGS.
3. PEAK AUDIO VOLTAGE ON THE CUTTER CRYSTAL AT PROPER RECORDING LEVEL SHOULD BE 125-150 VOLTS RMS.
4. I.F. - 455 KC.
5. T-6 HIGH VOLTAGE = 550 V.A.C.

MODEL 15GAA-3967C

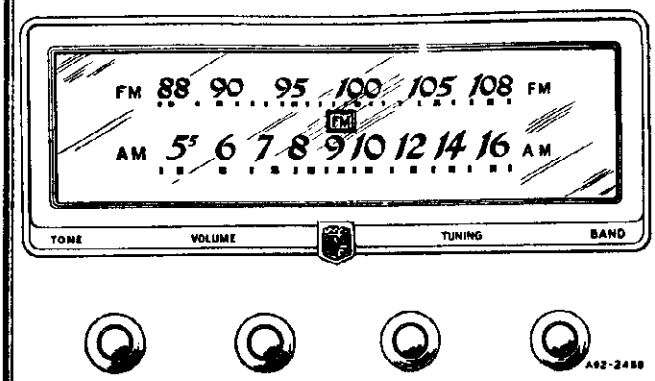
RADIO REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used
		CAPACITORS	
C-1, C-2 C-3, C-4	1004	Tuning Gang and Trimmer Assembly	1
C-5, C-6 C-7, C-8		Part of I. F. Assemblies	
C-11	807	.1 uf 400 V Tubular	1
C-12	809	250 uuf Ceramic	1
C-15 C-24 C-25 C-26	1005	10 uf 25 V 14 uf 450 V Dry 8 uf 450 V Electrolytic 8 uf 450 V	1
C-16	810	.002 uf 600 V Tubular	1
C-18	808	.02 uf 400 V Tubular	1
C-23	802-A	.01 uf 600 V Tubular	1
C-17 C-19		5000 MMF. Ceramic Cond.	
C-22		8 MF - 350 V Cond.	
		CAPRISTORS (Combination Capacitors and Resistors)	
C-9, C-10 R-2	811	100 uuf - 50 K OHM - 100 uuf Dual Shunt Connection	1
C-13, R-4	813	.01 uf - 5 Meg Ohm, Common Terminal Connection	1
C-14, R-5 C-20, R-18	814	.01 uf - 250 K Ohm, Common Terminal Connection	2
C-21, R-23	812	.001 uf - 5 Meg Ohm, Parallel Connection	1
		RESISTORS	
R-1	517	22,000 Ohm 0.5 Watt Carbon	1
R-3, R-25	615	2.2 Meg. 0.5 Watt Carbon	2
R-10, R-12	501	510,000 Ohm 0.5 Watt Carbon	2
R-7	602	330 Ohm 1.0 Watt Carbon	1
R-8	527	10 Ohm 0.5 Watt Carbon	1
R-9	526	4.3 Ohm 1.0 Watt Wire	1
R-11	529	250,000 Ohm 0.5 Watt Carbon	1
R-13	522	10,000 Ohm 0.5 Watt Carbon	1

RADIO REPLACEMENT PARTS LIST (Cont.)

Ref. No.	Part No.	Description	Qty. Used
R-14	523	50,000 Ohm 0.5 Watt Carbon	1
R-15	516	1.0 Meg. Ohm 0.5 Watt Carbon	1
R-16	525	5.0 Meg. Ohm 0.5 Watt Carbon	1
R-19	408	500,000 Ohm Tone Control	1
R-20, S-4	401	500,000 Ohm Volume Control, Off-On Switch	1
R-22	606	15,000 Ohm 2.0 Watt Carbon	1
R-24	607	1,000 Ohm 1.0 Watt Carbon	1
		TRANSFORMERS AND COILS	
T-1	1512	Loop Antenna	1
T-2	1403	Oscillator Coil	1
T-3, T-4	1402	I.F. Transformer and Can Assembly	2
T-5	1202	Output Transformer	1
T-6	1101	117 Volt, 60 Cycle Standard Power Transformer	1
T-7	1301	Filter Choke	1
		DIAL DRIVE AND PANEL ASSEMBLY	
	1722	Dial Scale	1
	1736	Dial Pointer	1
	2307	Dial Bezel	1
	1738	Tuning Shaft	1
	1879	Fiber Washer for Tuning Shaft	1
	1878	Hairpin Cotter	1
	1555	Dial Cable	1
	1880	Dial Cable Spring	1
	1513	Pilot Lamp Assembly	1
	2202-A	NE-51 Neon Lamp	2
	2306	Neon Protector - plastic	2
J-1, J-2	1875	Shorting Type Jack	2
	2406	Knob, Walnut Plastic	1
	2407	Knob, Walnut Plastic with White dot.	2
	2409	Knob, Walnut Plastic - white dot - Steel insert	1
	2127-A	Front Panel, Metal	1
	2131	Speaker Grille with emblem	1
	2103-A	Case, Plywood, leatherette covered.	1

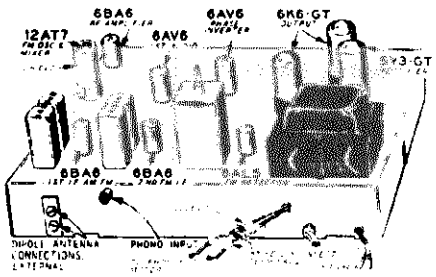
MODEL 15WG-2745C



GENERAL DESCRIPTION

This is a two band, nine tube (plus rectifier tube) AM and FM receiver with an 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.



DRIVE CORD REPLACEMENT

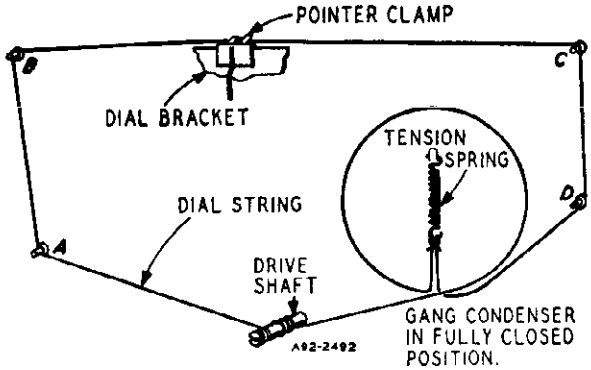
Use a new 10X54 drive cord assembly or a new length of cord 48 inches long for the installation, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation, rotate the drive shaft a few turns to take up the slack in the cord.

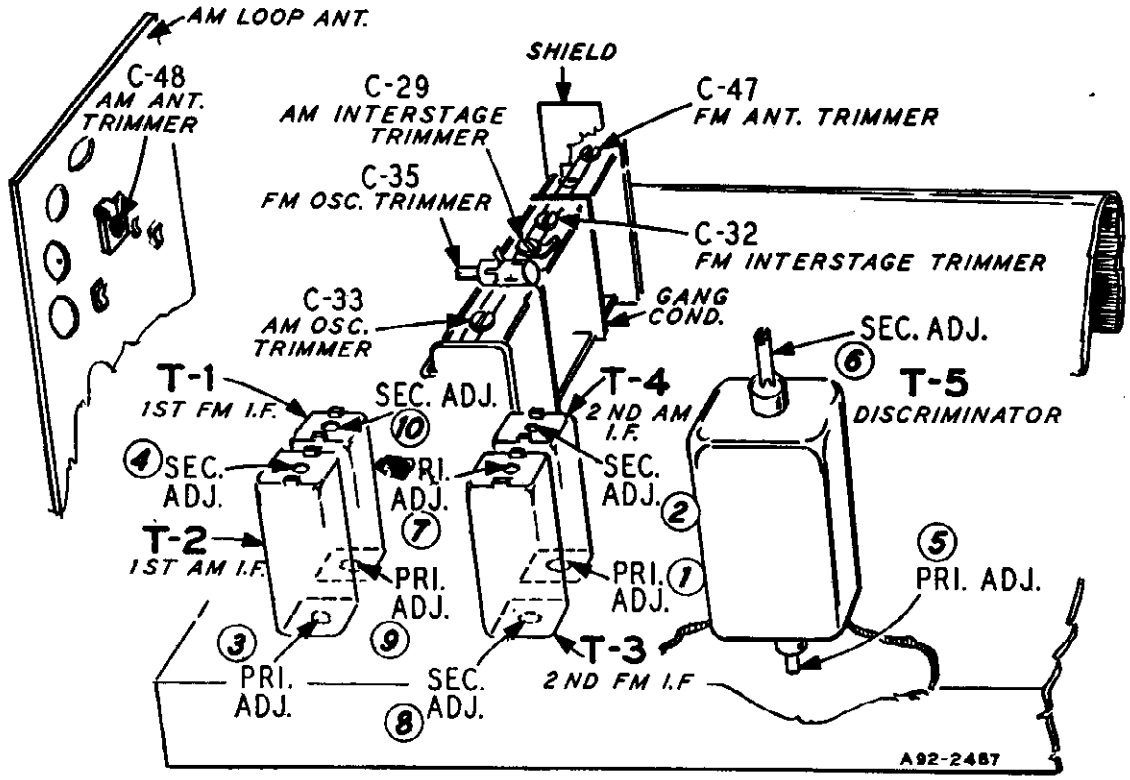
ELECTRICAL SPECIFICATIONS

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

Tube and Dial Lamp Complement

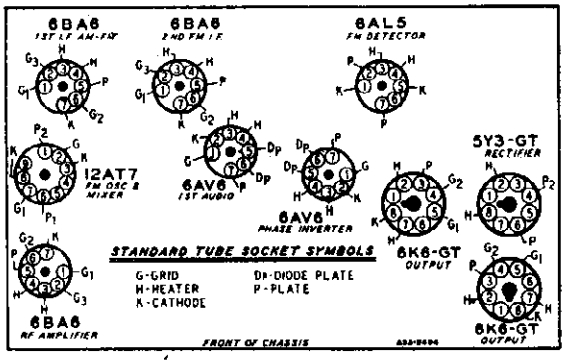
1 6BA6 AM-FM R-F Amplifier
1 12AT7 FM & AM Osc. & Mixer
1 6BA6 FM-AM 1st I-F Amplifier
1 6BA6 FM 2nd I-F Amplifier
1 6AL5 FM Detector
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
2 6K6-GT Audio Output
1 5Y3-GT Rectifier
1 6AV6 Phase Inverter
2 No. 47 Dial Lamps





NOTE—T-5 discriminator transformers with Part No. 9A1970 stamped on the can must be aligned as outlined in this service manual.

Discriminator transformers with Part No. 9A2064 stamped on the can have the primary adjustment at the top and the secondary adjustment at the bottom.



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.

ALIGNMENT PROCEDURE

AM STAGES

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

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

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

MODEL 15WG-2745C

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		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
I-F	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	2nd I-F Pri. Note A and D (7) 2nd I-F Sec. Note A and E (8)	Maximum Deflection
Discriminator	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (6) Note C	Zero Center
	10.7 MC Note F	FM-RF Gang Condenser terminal	.01 mf	FM	Rotor Fully Open	1st I-F Pri. (9) 1st I-F Sec. (10) Notes A, D & E	Maximum Deflection
Recheck I-F Adjustments in order given							
R-F & Osc.	108.4 Note H	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Oscillator C-35 Note G	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	FM Interstage C-32	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	Ant. C-47	Maximum Deflection
Recheck R-F and Osc. Adjustments in order given							

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

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

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

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

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

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

NOTE G—Oscillator frequency above signal frequency.

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

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
		CAPACITORS	
C-1	14A207	Gang Condenser	1
C-2, C-3, C-7, C-9, C-13, C-16, C-17, C-18, C-19, C-27, C-42	47X507	5000 mmf Ceramic	11
C-4	47X497	100 mmf Ceramic	1
C-5	47X499	47 mmf Ceramic	1
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

Ref. No.	Part No.	Description			Qty. Used in Set
C-25, C-26, C-45	47X496	500 mmf		Ceramic	3
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 40 mf 40 mf	450 V 450 V 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	Wirewound	1
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-31, R-35, R-38	B85474	470K	0.5	Carbon	3
R-32	B84822	8200	0.5	Carbon	1
R-36	B84682	6800	0.5	Carbon	1
R-37	B84562	5600	0.5	Carbon	1

TRANSFORMERS AND COILS

L-2	9A2025	Interstage Coil (AM)	1
L-3	9A2024	Interstage Coil (FM)	1
L-4	9A2022	Oscillator Coil (AM)	1
L-5	35A5	Insulated Choke	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
OR			
T-5	9A2064	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

DIAL AND DRIVE ASSEMBLY

58X723	Dial Glass	1
25X1634	Dial Bracket	1
41X88	Dial Light Reflector	2
15X251	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

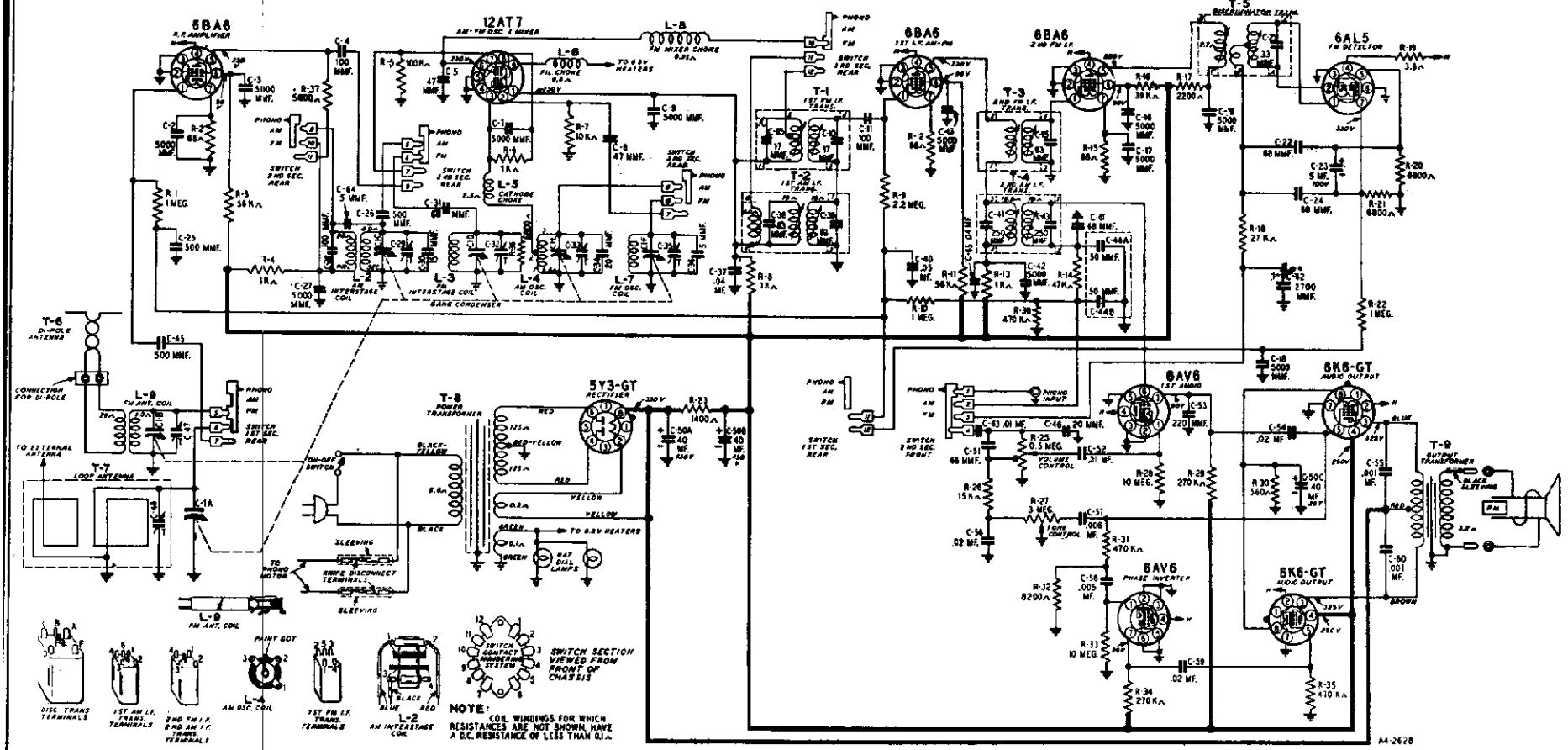
MISCELLANEOUS

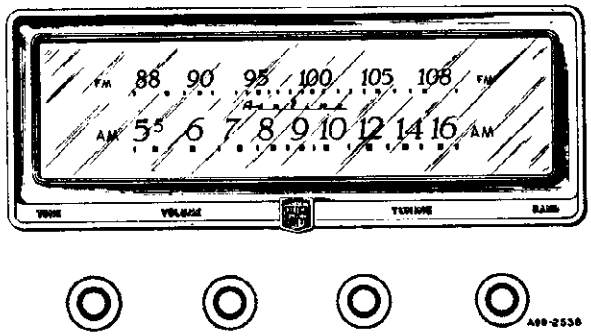
12A502	Speaker 12" P.M.	1
3A305	Phono Socket—Single Pin Tip	1
3A435	Tube Socket—Octal (8 prong) Molded	3
3A436	Tube Socket—Noval (miniature)	1
32X388	Tube Shield—Noval	1
32X390	Tube Shield (miniature)	1
3A439	Tube Socket (miniature)	6
2A391	Band Change Switch	1
13X546	Line Cord & Plug Assembly	1
10A713	Knobs	4
4X1049	Escutcheon	1

TYPE W-28A175 RECORD CHANGER PARTS

W-15X106-26	Motor Assembly, 60 cycles 105-125 Volts AC	1
W-49X123-5C	Pickup Arm	1
S-P77V	Crystal Cartridge & Needle (Shure Bros.)	1
S-85-18	Needle, Microgroove (Red)	1
S-85-16	Needle, Regular	1

RECORD CHANGER: See Webster Chgo. Model 100, Pgs. RCD.CH.21-1 to RCD.CH.21-10.





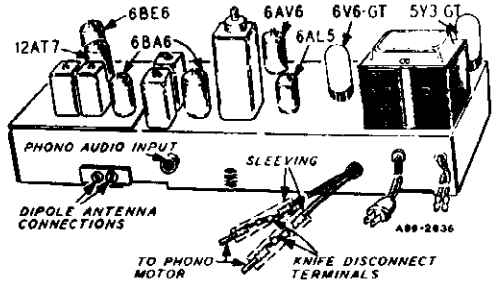
GENERAL DESCRIPTION

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—455 KC FM—10.7 MC
Selectivity	AM—45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 25 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



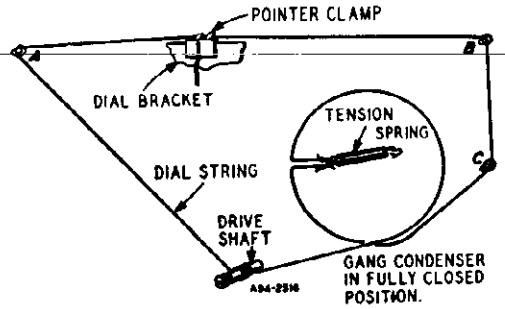
Tube and Dial Lamp Complement

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

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.



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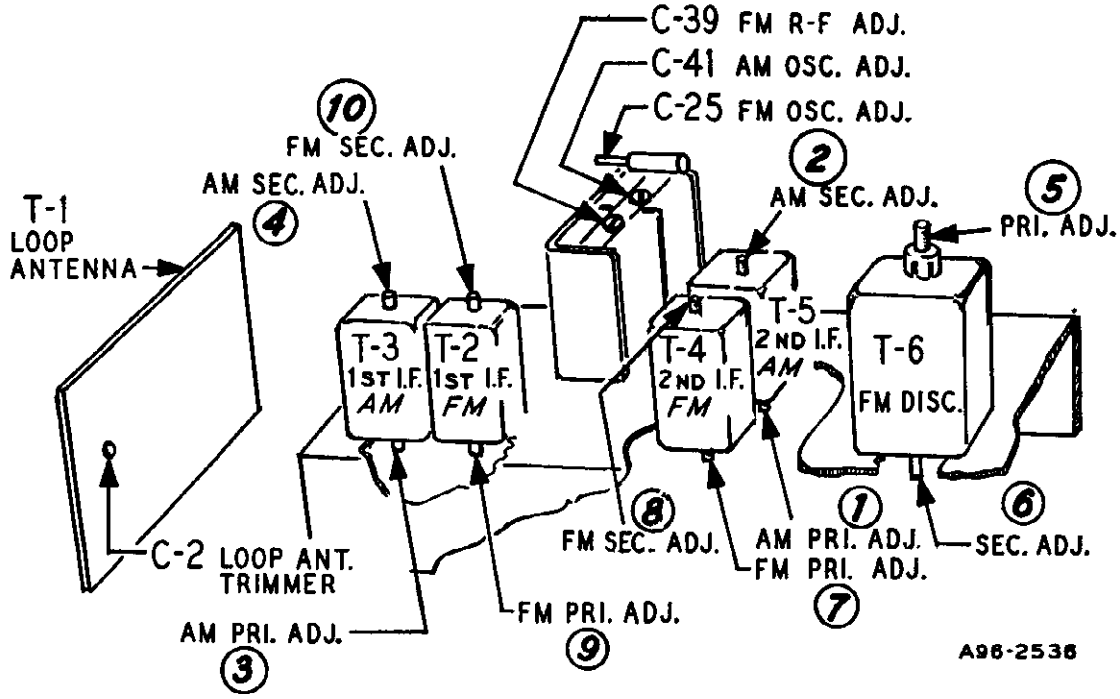

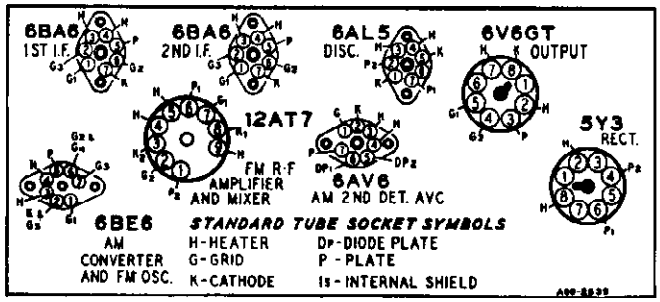

TUBE SOCKET VOLTAGES

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

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

A variation of ±10% is usually permissible.

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 50 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	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 Terminal	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			THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST [6]	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	

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	Deflection Maximum
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.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
		CAPACITORS	
C-1	14A209	Gang Condenser Assembly	1
C-2	17A235	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	47X523	10 mmf Ceramic	1
C-25	17A255	1-8 mmf Trimmer	1
C-26, C-44	B66503	.05 mf 200 V Tubular	2
C-28A	45X359	20 mf 25 V Dry Electrolytic	1
C-28B		20 mf 350 V	
C-28C		40 mf 350 V	
C-28D		40 mf 350 V	
C-29	H66102	.001 mf 800 V Tubular	1
C-30	47X470	330 mmf Molded Mica	1
C-31	47X508	500 mmf Ceramic	1

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Ref. No.	Part No.	Description			Qty. Used In Set
C-32A, C-32B	76X4	100 mmf		Dual Ceramic	1
C-33	B66203	.02 mf	200 V	Tubular	1
C-34	D66502	.005 mf	400 V	Tubular	1
C-36	B66103	.01 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

		Ohms	Watts		
R-1	B85470	47	0.5	Carbon	1
R-2, R-6, R-9	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-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-24, R-26	B85474	470 K	0.5	Carbon	3
R-20	B85153	15 K	0.5	Carbon	1
R-21	36X372	.5 meg.		Volume Control & Switch	1
R-23	40X310	.5 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	B84274	270 K	0.5	Carbon	1

TRANSFORMERS AND COILS

L-1	35A5	Insulated Choke	1
L-2	9A2103	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	9A2161	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

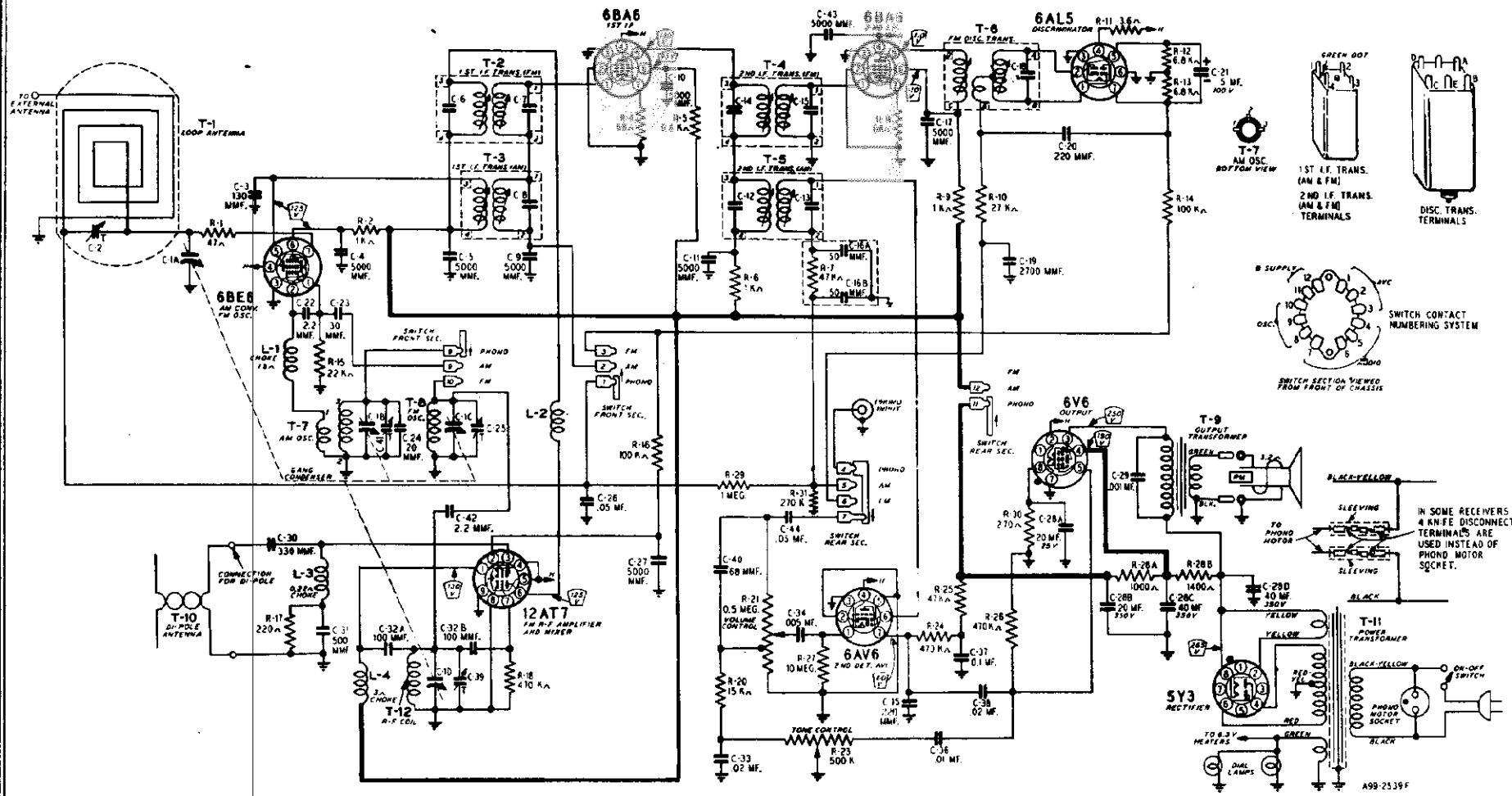
12A502	12" P.M. Speaker	1
3A435	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket (1st 6BA6)	1
3A427	Tube Socket	1
3A443	Tube Socket (12AT7)	1
3A439	Tube Socket (Miniature)	3
3A305	Phono Socket—Single Pin Tip	1
2A393	Band Change Switch	1
13X546	Line Cord and Plug Assembly	1
4X1049	Escutcheon	1
10A735	Knob	4

DIAL AND DRIVE ASSEMBLY

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
41X88	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

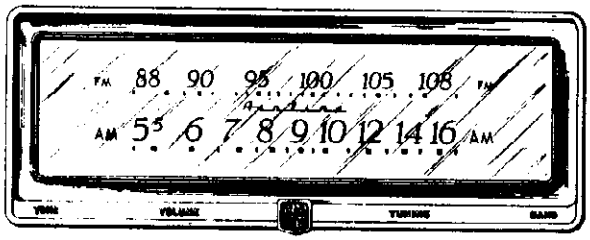
TYPE W-28A176 RECORD CHANGER PARTS

W-15X106-26	Motor Assembly, 60 cycles 105-125 Volts AC	1
W-49X123-5C	Pickup Arm	1
W-R A7M-1	Crystal Cartridge & Needles	1
W-R-13017	Needle, Microgroove (Red)	1
W-R-13016	Needle, Regular	1



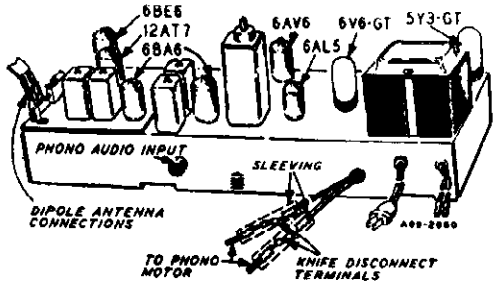
RECORD CHANGER: See Webster Chgo. Model 100, Pgs. RCD.CH.21-1 to RCD.CH.21-10.

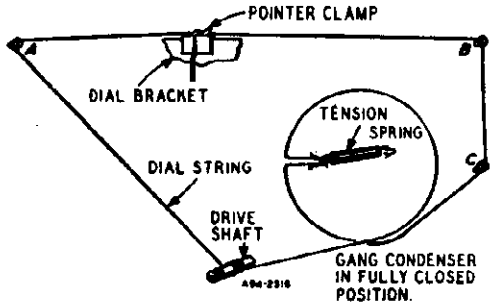
MODEL 15WG-2749F



GENERAL DESCRIPTION

This is a two band, seven tube (plus rectifier tube) AM and FM receiver. Controls are provided at the front of the cabinet for tuning, volume, tone and band or phono selection. A phono input socket is provided at the rear of the receiver to which a record player may be connected. The I-F stages use high gain miniature type tubes. 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.





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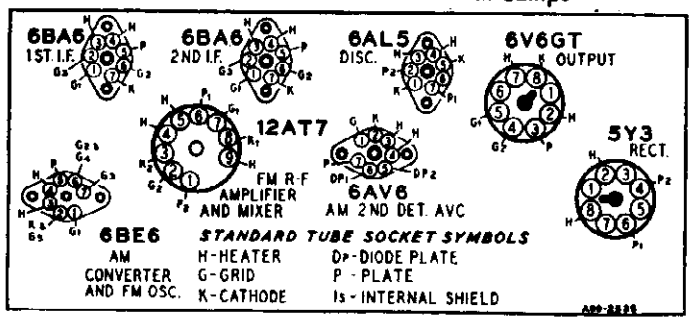
DRIVE CORD REPLACEMENT

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.

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles, 60 watts. 80 watts with record changer.
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
Intermediate Frequency	AM—455 KC FM—10.7 MC
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
FM Sensitivity	(For .5 watt output) 25 microvolts average
AM Sensitivity	(For .5 watt output with external antenna) 25 microvolts average
Loud Speaker	8" PM Dynamic
Power Output	4.5 watts maximum 2.5 watts 10% distortion
Voice Coil Impedance	3.2 ohms 400 cycles
Record Changer	See Manual 5096A
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



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.

ALIGNMENT PROCEDURES

MODEL 15WG-27491

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 50 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	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 Terminal	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			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	
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	Deflection Maximum
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.

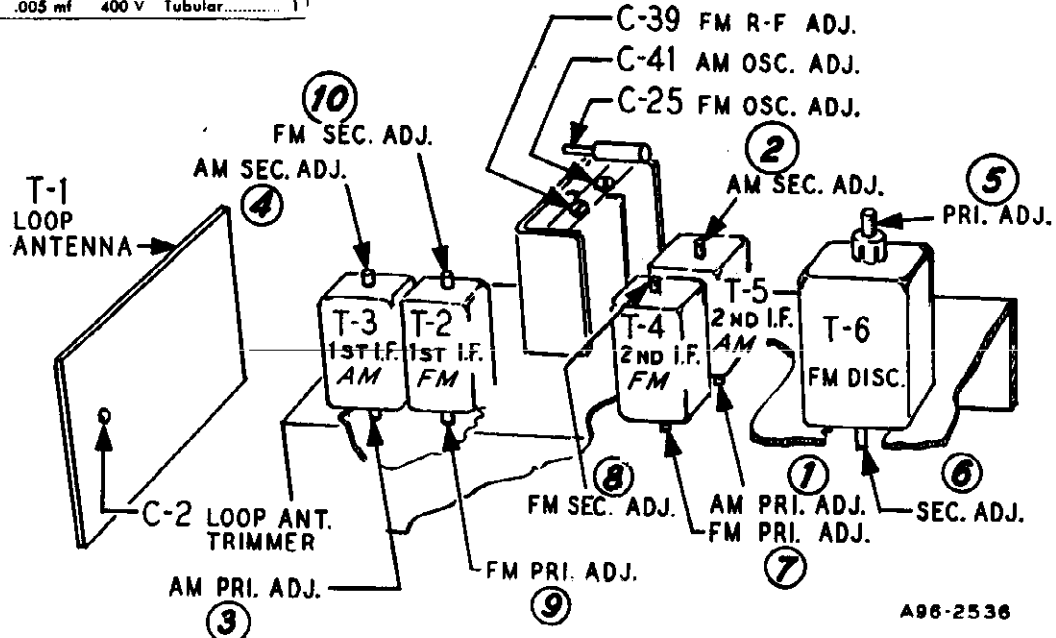
MODEL 15WG-2749F

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
CAPACITORS			
C-1	14A209	Gang Condenser Assembly	1
C-2	17A235	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	47X538	30 mmf Ceramic	1
C-24	47X523	10 mmf Ceramic	1
C-25	17A255	1-8 mmf Trimmer	1
C-26, C-44	B66503	.05 mf 200 V Tubular	2
C-28A	45X359	20 mf 25 V	1
C-28B		20 mf 350 V	
C-28C		40 mf 350 V	
C-28D		40 mf 350 V Dry Electrolytic	
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	B66203	.02 mf 200 V Tubular	1
C-34	D66502	.005 mf 400 V Tubular	1
C-36	B66103	.01 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

Ref. No.	Part No.	Ohms	Watts	Description	Qty. Used in Set
RESISTORS					
R-1	B85470	47	0.5	Carbon	1
R-2, R-6, R-9	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-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-24, R-26	B85474	470 K	0.5	Carbon	3
R-20	B85153	15 K	0.5	Carbon	1
R-21	36X372	.5 meg.		Volume Control & Switch	1
R-23	40X341	1.0 meg.		Tone Control	1
R-27	B85106	10 meg.	0.5	Carbon	1
R-28A	43X224	1000	4.0	Wirewound	1
R-28B		1400	6.0		
R-29	B85105	1 meg.	0.5	Carbon	1
R-30	B84271	270	0.5	Carbon	1
R-31	B84274	270 K	0.5	Carbon	1

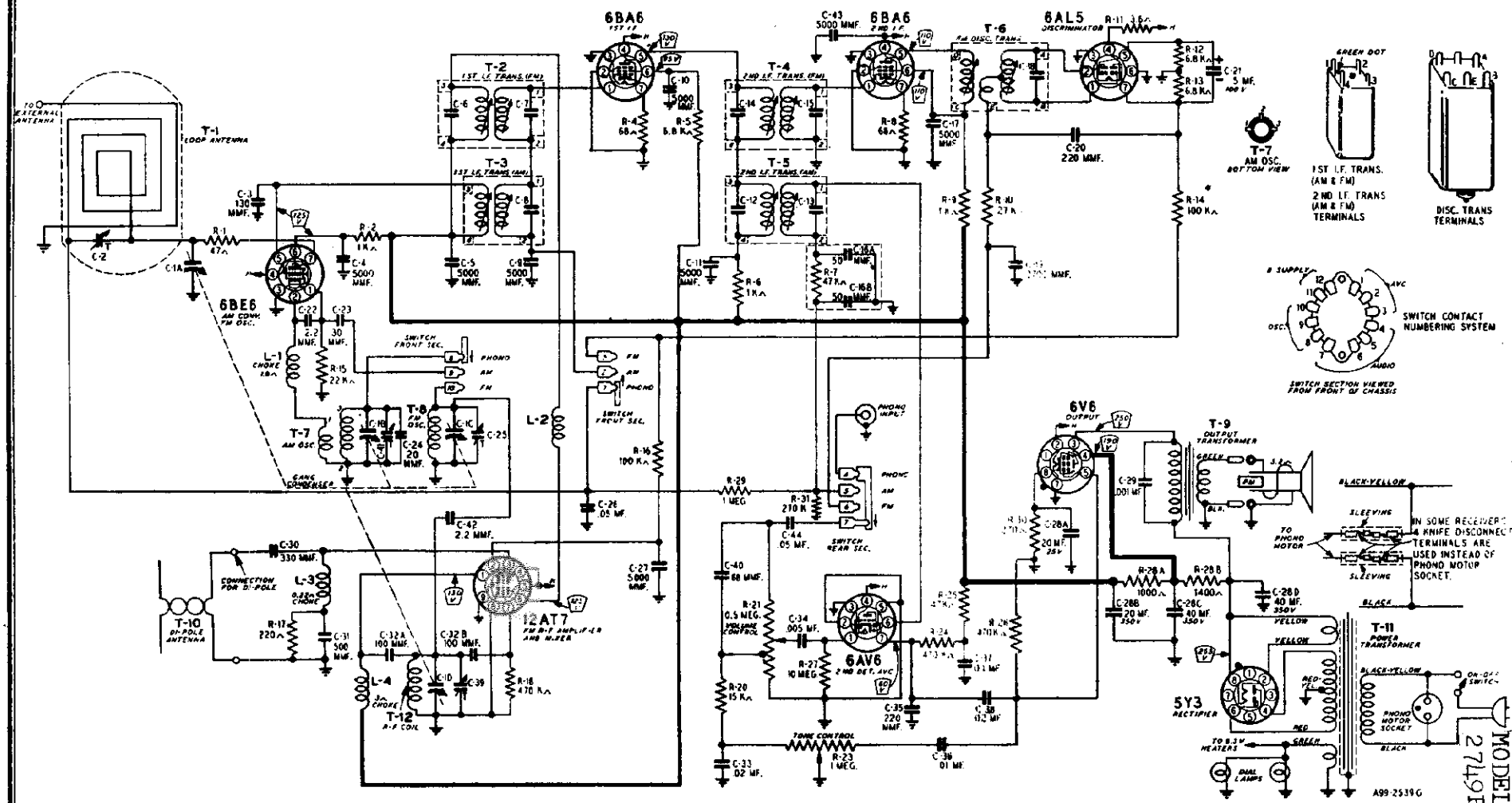
Ref. No.	Part No.	Description	Qty. Used in Set
TRANSFORMERS AND COILS			
L-1	35A5	Insulated Choke	1
L-2	9A2103	Parasitic Choke Assembly	1
L-3	35A9	Insulated Choke	1
L-4	35A8	Insulated Choke	1
T-1	9A1972	"B" Range Loop Antenna	1
T-2	9A2060	1st I-F Trans. (FM)	1
T-3	9A2062	1st I-F Trans. (AM)	1
T-4	9A2061	2nd I-F Trans. (FM)	1
T-5	9A2063	2nd I-F Trans. (AM)	1
T-6	9A2161	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	9A2209	Dipole Antenna	1
T-11	53X290	Power Transformer	1
T-12	9A2066	Antenna Coil (FM)	1
MISCELLANEOUS			
	12A505	8" P.M. Speaker	1
	3A435	Tube Socket—Octal (8 prong) Molded	2
	3A426	Tube Socket (1st 6BA6)	1
	3A427	Tube Socket	1
	3A439	Tube Socket (Miniature)	3
	3A443	Tube Socket (12AT7)	1
	3A305	Phono Socket—Single Pin Tip	1
	2A393	Band Change Switch	1
	13X546	Line Cord and Plug Assembly	1
	4X1049	Escutcheon	1
	10A735	Knob	4
DIAL AND DRIVE ASSEMBLY			
	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
	41X88	Reflector, Dial Light	2
	28X113	Drive Cord Tension Spring	1



TYPE V-28A172 RECORD CHANGER PARTS

10X38	Drive Cord Assembly	1
19X192	"C" Washer (Mtg. drive Shaft)	2
6X66	Rubber Grommet (Mtg. gang cond.)	3
See Note	Motor Assembly, 60 cycles 105-125 Volts AC	1
V-3429B	Pickup Arm	1
W-R-A1M	Crystal Cartridge & Needles	1
W-R-13017	Needle, Microgroove (Red)	1
W-R-13016	Needle, Regular	1

NOTE—Specify part number stamped on motor assembly.



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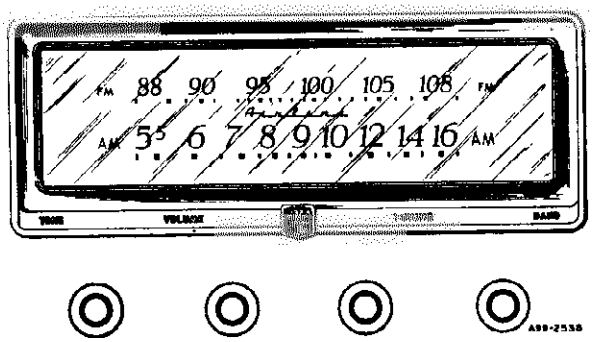
MODEL 2749F



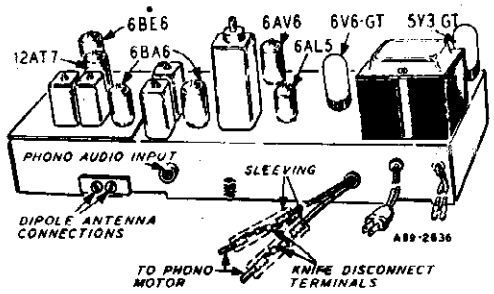
GENERAL DESCRIPTION

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—455 KC FM—10.7 MC
Selectivity	AM—45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 25 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



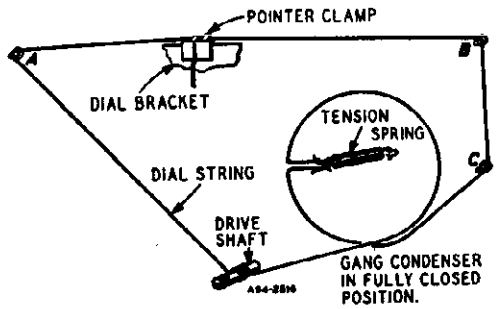
Tube and Dial Lamp Complement

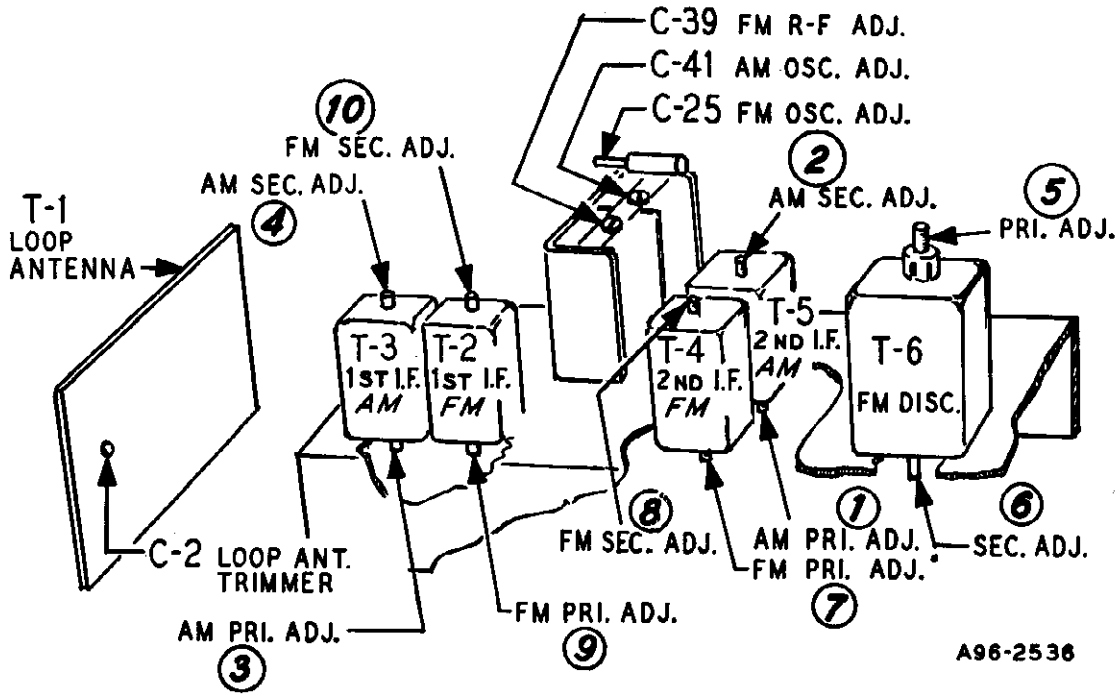
1 6BE6 AM Converter & FM Osc.
1 6BA6 1st I-F Amplifier
1 6BA6 2nd I-F Amplifier
1 6AL5 FM Discriminator
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
1 6V6GT Audio Output
1 5Y3GT Rectifier
1 12AT7 R-F Amplifier & Mixer
2 No. 47 Dial Lamps

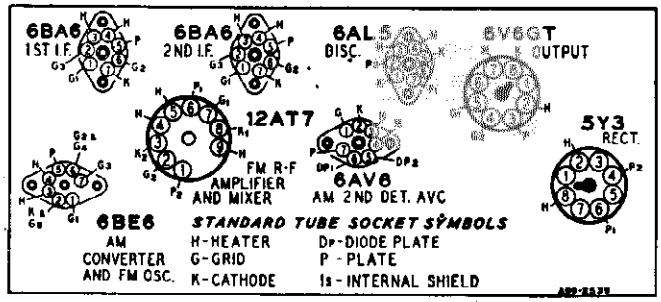
DRIVE CORD REPLACEMENT

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.

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 50 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	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 Terminal	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.

MODEL 15WG-2752D

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			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	

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	Deflection Maximum
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.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
CAPACITORS			
C-1	14A209	Gang Condenser Assembly	1
C-2	17A235	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	47X523	10 mmf Ceramic	1
C-25	17A255	1-8 mmf Trimmer	1
C-26, C-44	B66503	.05 mf 200 V Tubular	2
C-28A	45X359	20 mf 25 V Dry Electrolytic	1
C-28B		20 mf 350 V	
C-28C		40 mf 350 V	
C-28D		40 mf 350 V	
C-29	H66102	.001 mf 800 V Tubular	1

Ref. No.	Part No.	Description			Qty. Used In Set
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	B66203	.02 mf	200 V	Tubular	1
C-34	D66502	.005 mf	400 V	Tubular	1
C-36	B66103	.01 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

		Ohms	Watts		
R-1	B85470	47	0.5	Carbon	1
R-2, R-6, R-9	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-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-24, R-26	B85474	470 K	0.5	Carbon	3
R-20	B85153	15 K	0.5	Carbon	1
R-21	36X372	.5 meg.		Volume Control & Switch	1
R-23	40X310	.5 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	B84274	270 K	0.5	Carbon	1

TRANSFORMERS AND COILS

L-1	35A5	Insulated Choke	1
L-2	9A2103	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	9A2161	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

12A502	12" P.M. Speaker	1
3A435	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket (1st 6BA6)	1
3A427	Tube Socket	1
3A443	Tube Socket (12AT7)	1
3A439	Tube Socket (Miniature)	3
3A305	Phono Socket—Single Pin Tip	1
2A393	Band Change Switch	1
13X546	Line Cord and Plug Assembly	1
4X1049	Escutcheon	1
10A754	Knob	4

DIAL AND DRIVE ASSEMBLY

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
41X88	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 W-28A176 RECORD CHANGER PARTS

W-15X106-26	Motor Assembly, 60 cycles 105-125 Volts AC	1
W-49X123-5C	Pickup Arm	1
W-R A7M-1	Crystal Cartridge & Needles	1
W-R-13017	Needle, Microgroove (Red)	1
W-R-13016	Needle, Regular	1

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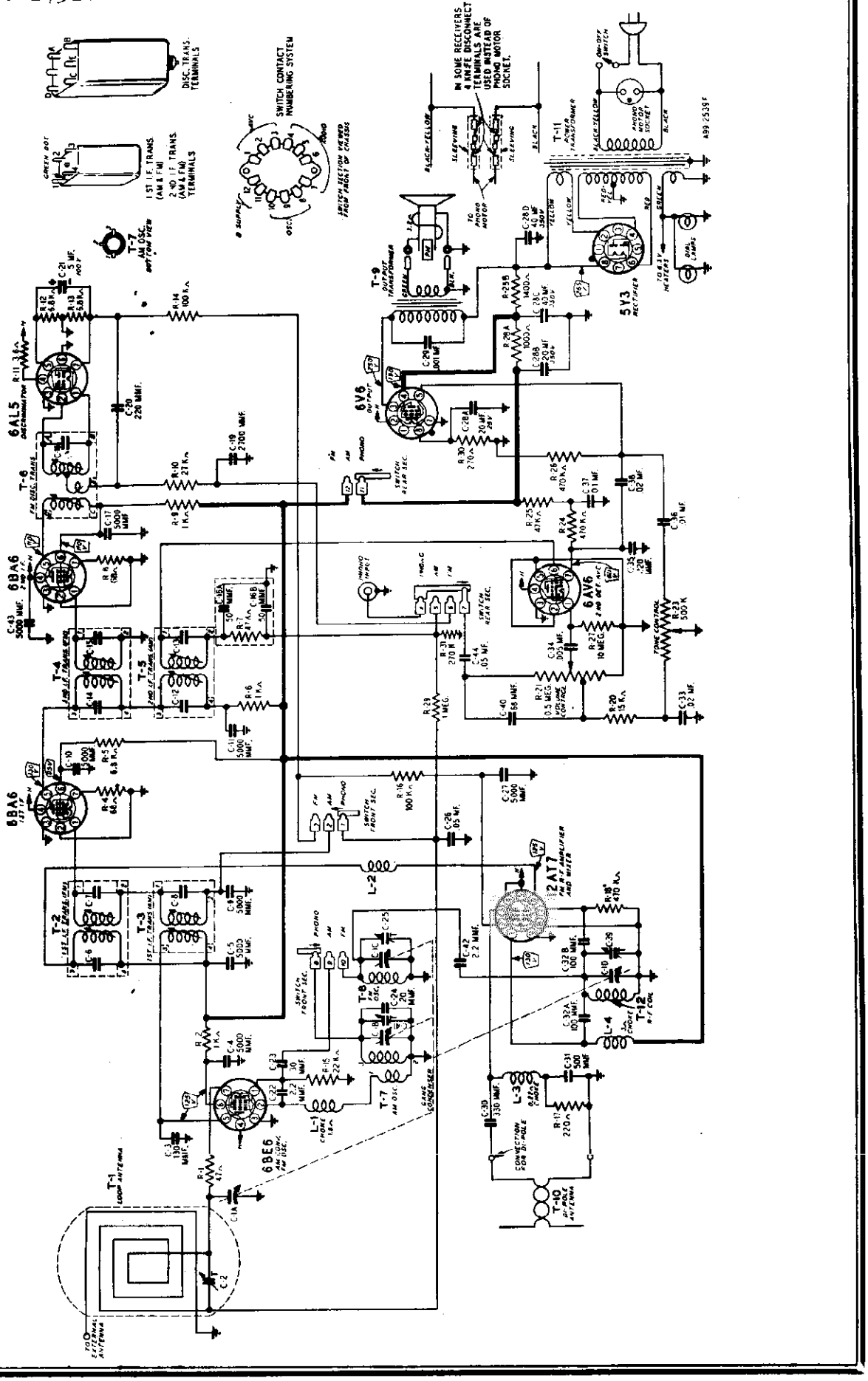
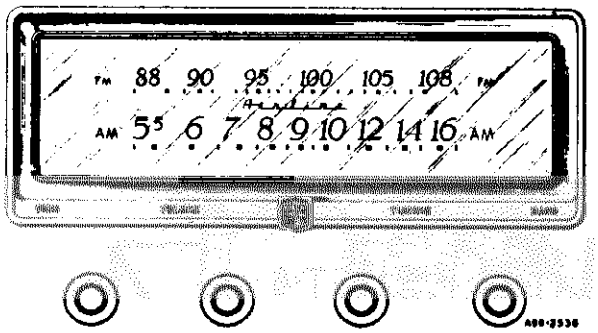
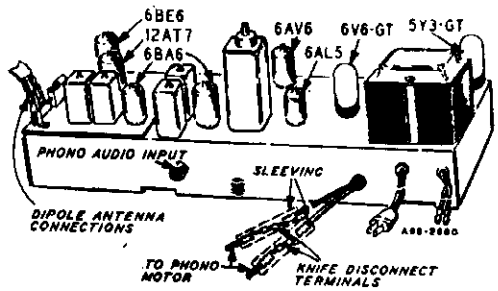




GENERAL DESCRIPTION

This is a two band, seven tube (plus rectifier tube) AM and FM receiver. Controls are provided at the front of the cabinet for tuning, volume, tone and band or phono selection. A phono input socket is provided at the rear of the receiver to which a record player may be connected. The I-F stages use high gain miniature type tubes. 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.



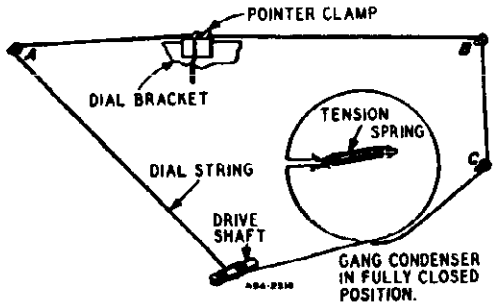
ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles, 60 watts. 80 watts with record changer.
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 20(times down
AM Sensitivity	(For .5 watt output with external antenna) 25 microvolts average
FM Sensitivity	(For .5 watt output) 25 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 5096A
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

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.



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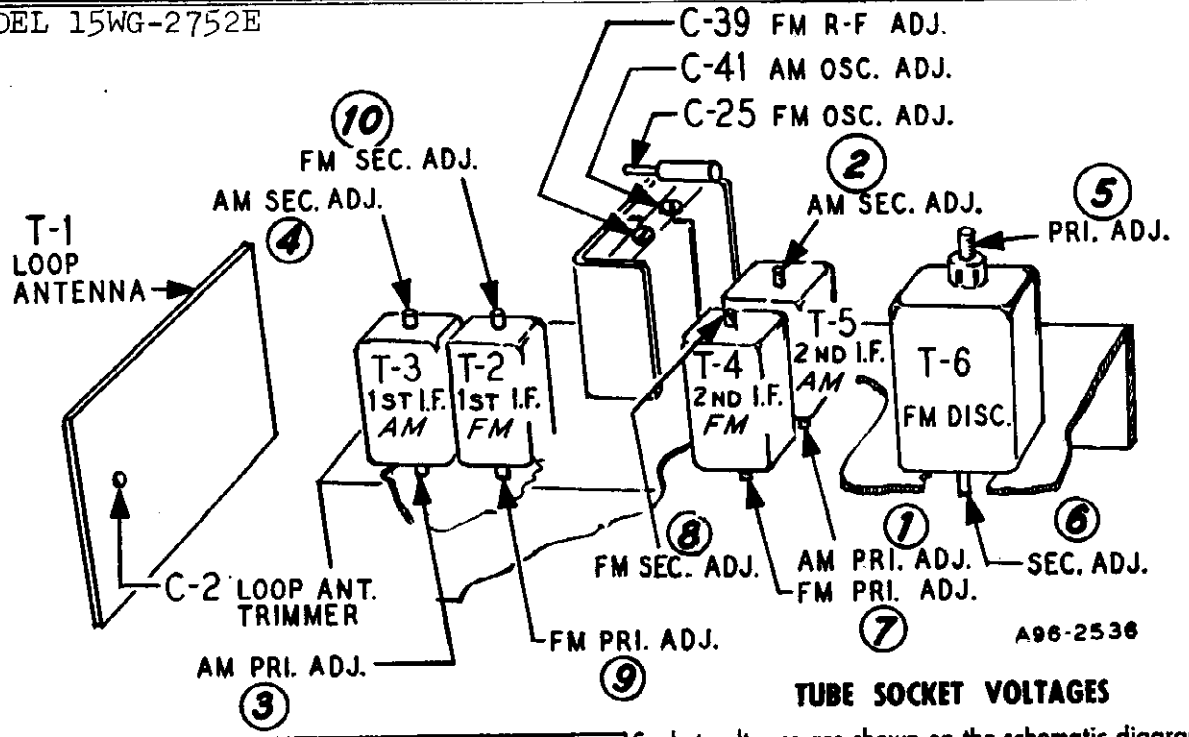
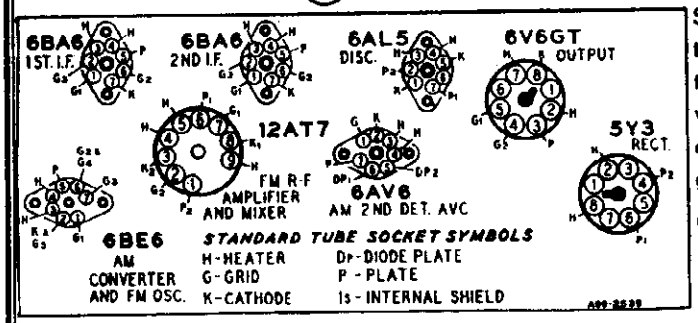




TUBE SOCKET VOLTAGES

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

Conditions of measurement are:

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

A variation of ±10% is usually permissible.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description		Qty. Used in Set
		CAPACITORS		
C-1	14A209	Gang Condenser Assembly		1
C-2	17A235	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	47X523	10 mmf	Ceramic	1
C-25	17A255	1-8 mmf	Trimmer	1
C-26, C-44	B66503	.05 mf 200 V	Tubular	2
C-28A	45X359	20 mf 25 V	Dry Electrolytic	1
C-28B		20 mf 350 V		
C-28C		40 mf 350 V		
C-28D		40 mf 350 V		
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	B66203	.02 mf 200 V	Tubular	1
C-34	D66502	.005 mf 400 V	Tubular	1
C-36	B66103	.01 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

REPLACEMENT PARTS LIST (continued)

Ref. No.	Part No.	Description	Qty. Used in Set
		RESISTORS	
		Ohms Watts	
R-1	B85470	47 0.5 Carbon	1
R-2, R-6, R-9	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-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-24, R-26	B85474	470 K 0.5 Carbon	3
R-20	B85153	15 K 0.5 Carbon	1
R-21	36X372	.5 meg. Volume Control & Switch	1
R-23	40X341	1.0 meg. Tone Control	1
R-27	B85106	10 meg. 0.5 Carbon	1
R-28A, R-28B	43X224	1000 4.0 / 1400 6.0 Wirewound	1
R-29	B85105	1 meg 0.5 Carbon	1
R-30	B84271	270 0.5 Carbon	1
R-31	B84274	270 K 0.5 Carbon	1
		TRANSFORMERS AND COILS	
L-1	35A5	Insulated Choke	1
L-2	9A2103	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	9A2161	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	9A2209	Dipole Antenna	1
T-11	53X290	Power Transformer	1
T-12	9A2066	Antenna Coil (FM)	1

Ref. No.	Part No.	Description	Qty. Used in Set
		MISCELLANEOUS	
	12A505	8" P.M. Speaker	1
	3A435	Tube Socket—Octal (8 prong) Molded	2
	3A426	Tube Socket (1st 6BA6)	1
	3A427	Tube Socket	1
	3A439	Tube Socket (Miniature)	3
	3A443	Tube Socket (12AT7)	1
	3A305	Phono Socket—Single Pin Tip	1
	2A393	Band Change Switch	1
	13X546	Line Cord and Plug Assembly	1
	4X1049	Escutcheon	1
	10A754	Knob	4
		DIAL AND DRIVE ASSEMBLY	
	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
	41X88	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-28A172 RECORD CHANGER PARTS	
See Note		Motor Assembly, 60 cycles 105-125 Volts AC	1
	V-3429B	Pickup Arm	1
	W-R-A1M	Crystal Cartridge & Needles	1
	W-R-13017	Needle, Microgroove (Red)	1
	W-R-13016	Needle, Regular	1

NOTE—Specify part number stamped on motor assembly.

MODEL 15WG-2752E

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 50 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	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 Terminal	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		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	

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	Deflection Maximum
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

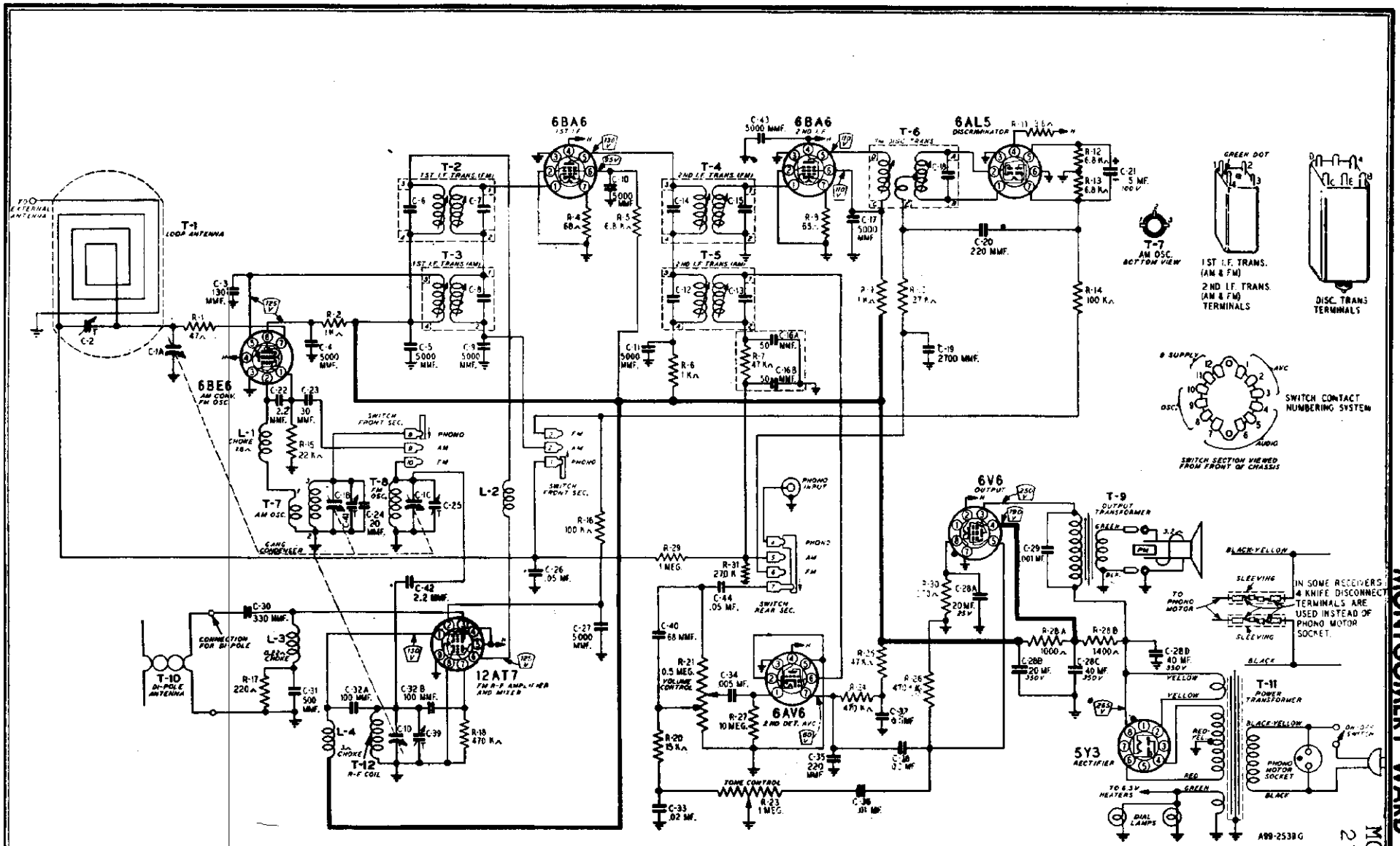
FM ALIGNMENT NOTES

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.



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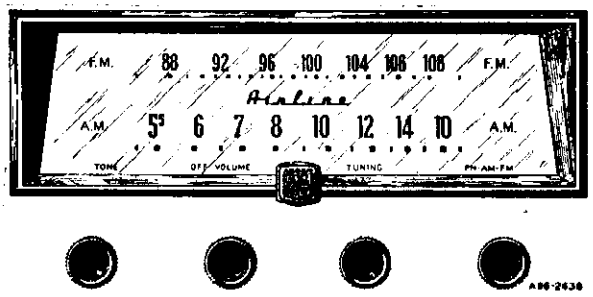
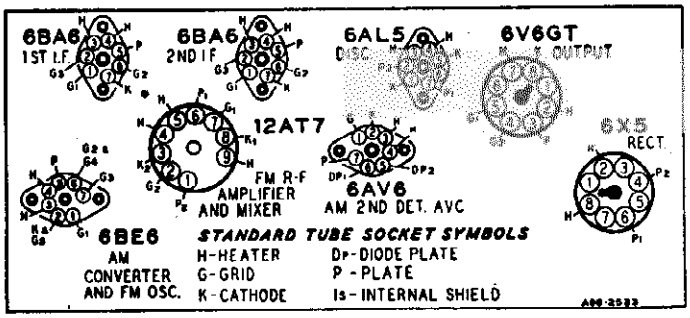




ELECTRICAL SPECIFICATIONS

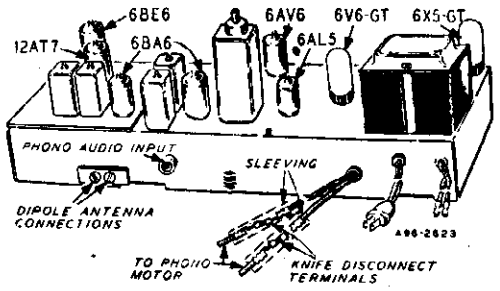
Power Supply	105-125 volts AC 60 cycles, 40 watts. 60 watts with record changer.
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 25 microvolts average
FM Sensitivity	(For .5 watt output) 25 microvolts average
Power Output	1.9 watts maximum 0.8 watts 10% distortion
Loud Speaker	10" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles
Record Changer	See Manual 5089A
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

TUBE SOCKET VOLTAGES

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

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

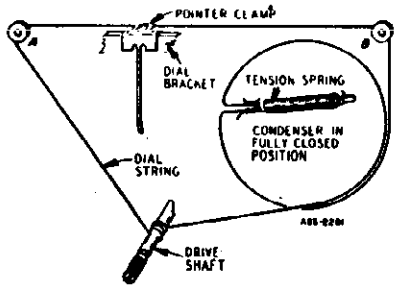
A variation of ±10% is usually permissible.



DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X72 drive cord assembly or a new length of cord 44 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 15WG-2758A

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 50 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	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 Terminal	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			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	

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	Deflection Maximum
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

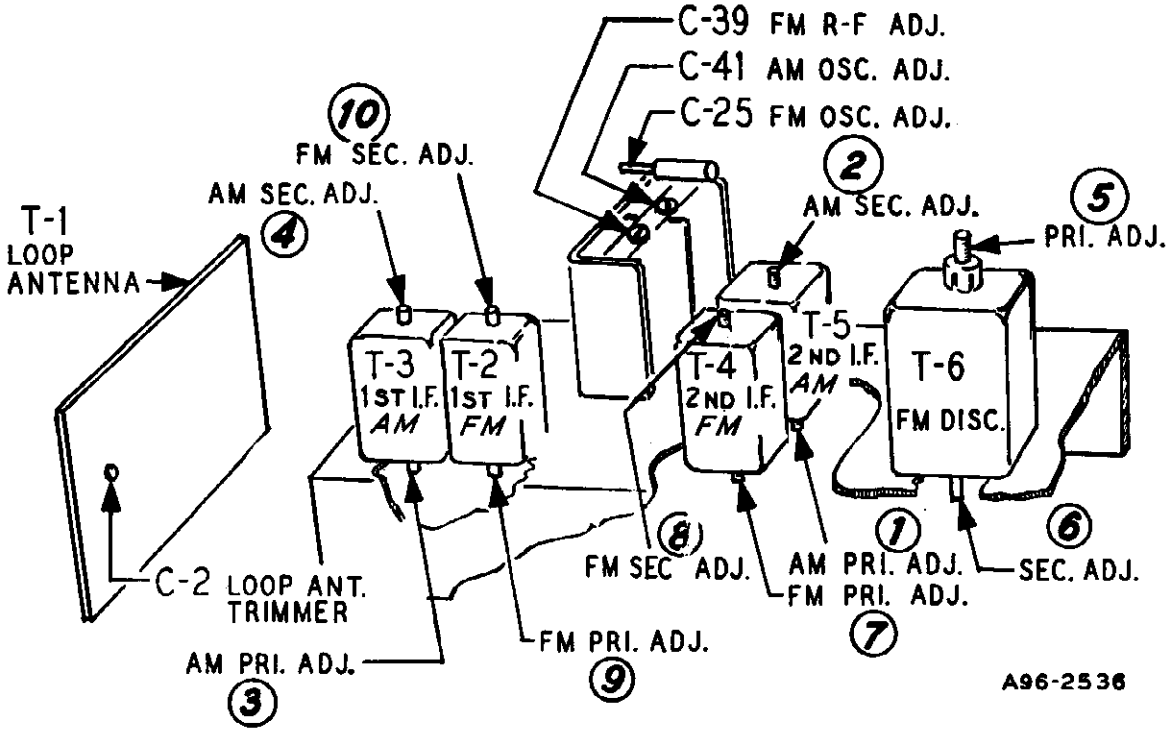
NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

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 15WG-2758A



REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
		MISCELLANEOUS	
	12A480	10" P.M. Speaker	1
	3A435	Tube Socket—Octal (8 prong) Molded	2
	3A426	Tube Socket (1st 6BA6)	1
	3A427	Tube Socket	1
	3A443	Tube Socket (12AT7)	1
	3A439	Tube Socket (Miniature)	3
	3A305	Phono Socket—Single Pin Tip	1
	2A393	Band Change Switch	1
	13X546	Line Cord and Plug Assembly	1
	4X1114	Escutcheon	1
	10A759	Knob	4

Ref. No.	Part No.	Description	Qty. Used in Set
		DIAL AND DRIVE ASSEMBLY	
	58X741	Dial Glass	1
	15X251	Pointer	1
	25X1650	Dial Bracket	1
	7A103	No. 47 Pilot Light Bulb	2
	7A199	Pilot Light Socket Assembly	1
	26X486	Drive Shaft	1
	41X88	Reflector, Dial Light	2
	28X113	Drive Cord Tension Spring	1
	10X72	Drive Cord Assembly	1
	19X192	"C" Washer (Mtg. drive Shaft)	2
	6X66	Rubber Grommet (Mtg. gang cond.)	3

TYPE G.I. — 28A169 RECORD CHANGER PARTS

G.I.-56-76507	Motor Assembly, 60 cycles 105-125 Volts AC	
G.I.-69-73657	Tone Arm	
S-P81	Crystal Cartridge & Needle (Shure)	
S-85-35	Needle	

REPLACEMENT PARTS LIST

CAPACITORS

Ref. No.	Part No.	Description	Qty. Used In Set
C-1	14A209	Gang Condenser Assembly	1
C-2	17A235	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	47X523	10 mmf Ceramic	1
C-25	17A255	1-8 mmf Trimmer	1
C-26, C-44	B66503	.05 mf 200 V Tubular	2
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	B66203	.02 mf 200 V Tubular	1
C-34	D66502	.005 mf 400 V Tubular	1
C-36	B66103	.01 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

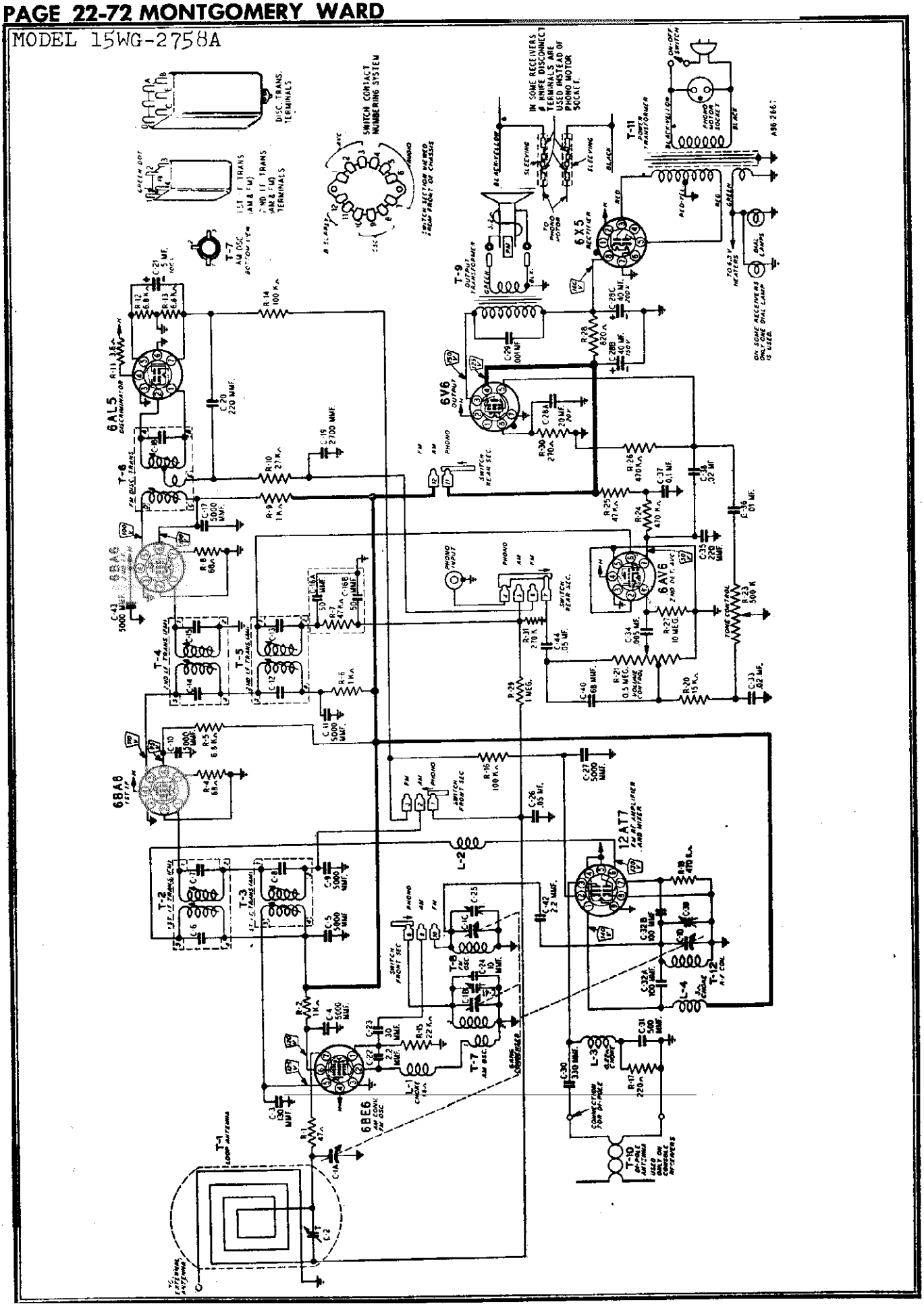
RESISTORS

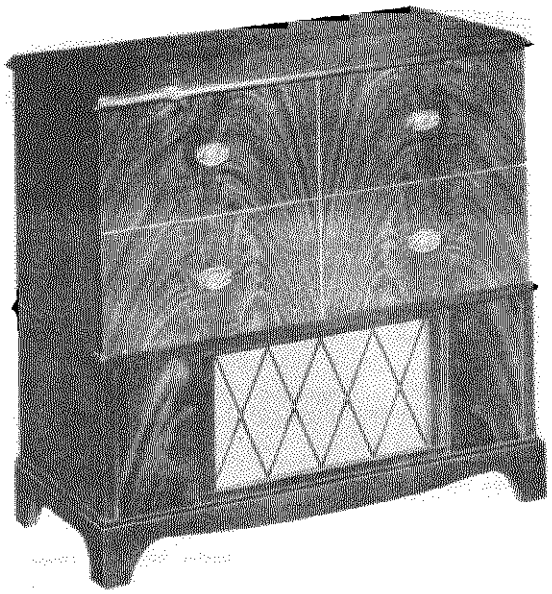
Ref. No.	Part No.	Ohms	Watts		Qty. Used In Set
R-1	B85470	47	0.5	Carbon	1
R-2, R-6, R-9	B85102	1000	0.5	Carbon	3
R-4, R-8	B84680	68	0.5	Carbon	2
R-5, R-12, R-13	B84682	6800	0.5	Carbon	3
R-7, R-25	B85473	47 K	0.5	Carbon	2
R-10	B85273	27 K	0.5	Carbon	1
R-11	43X233	3.6	0.5	Wirewound	1
R-14, R-16	B85104	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-24, R-26	B85474	470 K	0.5	Carbon	3
R-20	B85153	15 K	0.5	Carbon	1
R-21	36X372	.5 meg.		Volume Control & Switch	1
R-23	40X310	.5 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
R-31	B84274	270 K	0.5	Carbon	1

TRANSFORMERS AND COILS

L-1	35A5	Insulated Choke	1
L-2	9A2103	Parasitic Choke Assembly	1
L-3	35A9	Insulated Choke	1
L-4	35A8	Insulated Choke	1
T-1	9A2146	"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	9A2161	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

MODEL 15WG-2758A

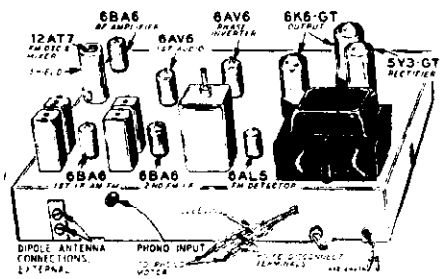


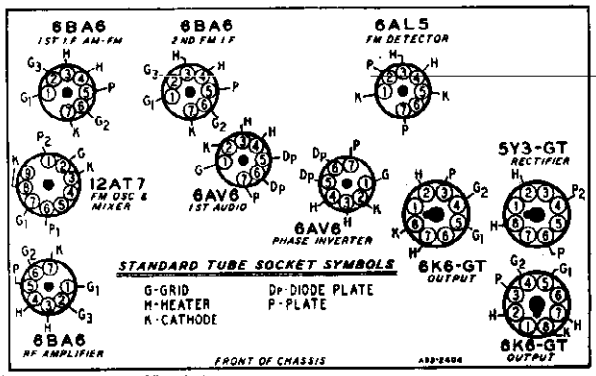


GENERAL DESCRIPTION

This is a two band, nine tube (plus rectifier tube) AM and FM receiver with an 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 externa 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. 5098A
Tube and Dial Lamp Complement	1 6BA6 AM-FM R-F Amplifier 1 12AT7 FM & AM Osc. & Mixe 1 6BA6 FM-AM 1st I-F Amplifier 1 6BA6 FM 2nd I-F Amplifier 1 6AL5 FM Detector 1 6AV6 Audio Amplifier, AM 2n Detector and AVC 2 6K6-GT Audio Output 1 5Y3-GT Rectifier 1 6AV6 Phase Inverter 2 No. 47 Dial Lamps

TUBE SOCKET VOLTAGES

Socket voltages are shown on the Schematic diagrar at the tube socket terminals. All voltages are betwee the socket terminal and chassis ground. Plate, screen an cathode voltages were taken with a 1000 ohm-per-vol meter with a 300 volt scale used for plate and scree voltages. Audio grid voltages were read with a vacuun tube volt-meter. Conditions of measurement are:

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

MODEL 15WG-2765A

ALIGNMENT PROCEDURE

AM STAGES

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

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

SIGNAL GENERATOR		CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING						
I-F	455 kc	12AT7 Pin 7 and Chassis	.1 mf	Broadcast	Rotor Fully Open	2nd I-F Pri. & Sec. (1) & (2) 1st I-F Pri. & Sec. (3) & (4)	Maximum Output
Broadcast	1620 kc	External ant. term.	200 mmf	Broadcast	Rotor Fully Open	Broadcast Oscillator C-33	
	1400 kc	External ant. term.	200 mmf	Broadcast	Turn Rotor to Max. Output	Broadcast Interstage C-29	
	1400 kc	External ant. term.	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		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
I-F	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	2nd I-F Pri. Note A and D (7) 2nd I-F Sec. Note A and E (8)	Maximum Deflection
Discriminator	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (6) Note C	Zero Center
	10.7 MC Note F	FM-RF Gang Condenser terminal	.01 mf	FM	Rotor Fully Open	1st I-F Pri. (9) 1st I-F Sec. (10) Notes A, D & E	Maximum Deflection
Recheck I-F Adjustments in order given							
R-F & Osc.	108.4 Note H	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Oscillator C-35 Note G	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	FM Interstage C-32	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	Ant. C-47	Maximum Deflection
Recheck R-F and Osc. Adjustments in order given							

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

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

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

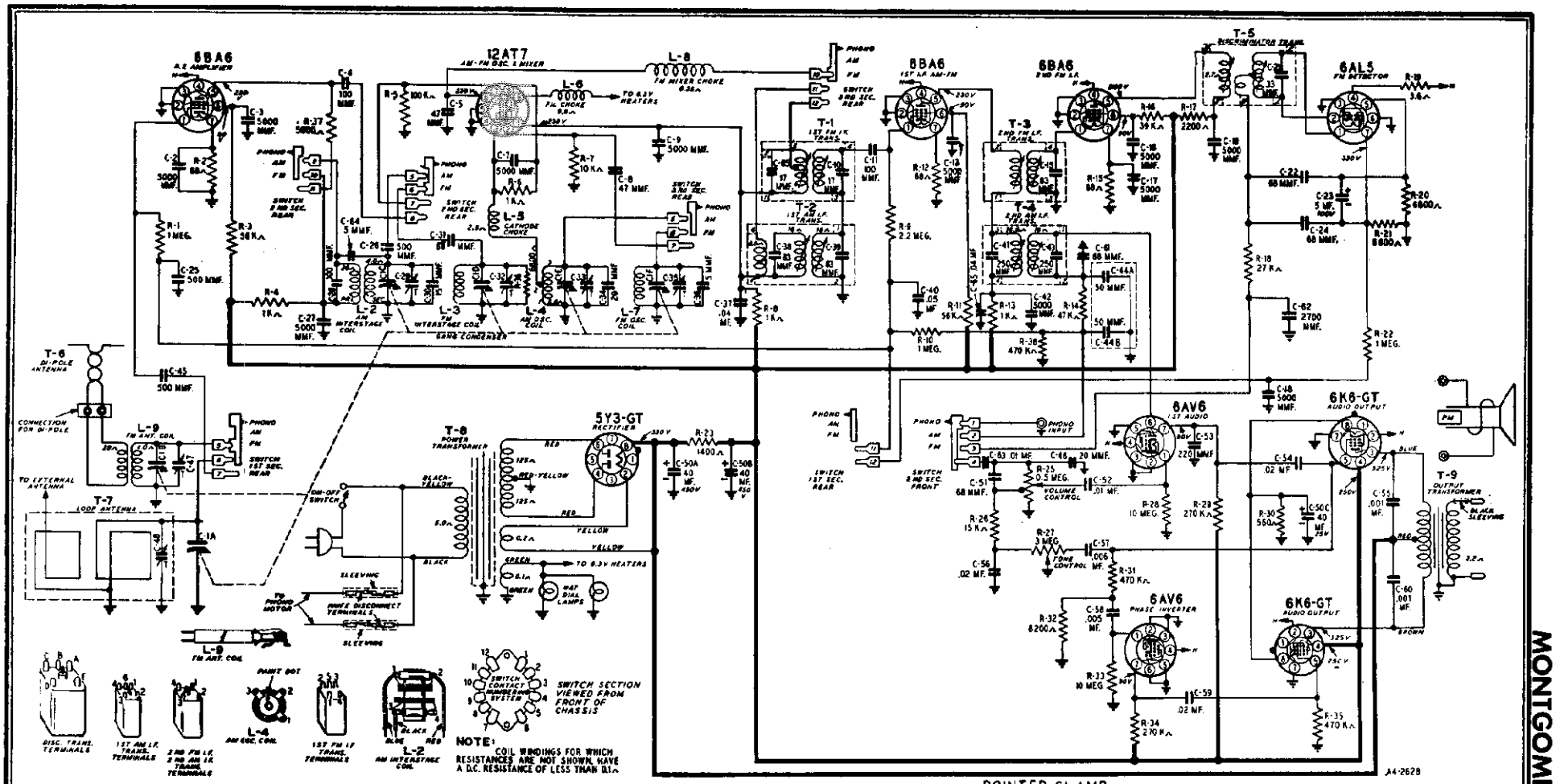
NOTE D—Before adjusting Pri. core connect 1000 ohm load resistor across the 2nd I.F. secondary terminals. Input may have to be increased to .1 volt if receiver is *badly* mis-aligned.

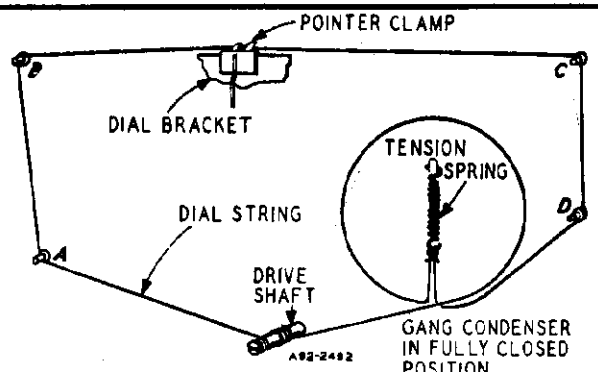
NOTE E—Disconnect 1000 ohm load resistor from secondary terminals and connect across the 2nd I.F. primary terminals. Input may have to be increased to .1 volt if receiver is *badly* mis-aligned.

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

NOTE G—Oscillator frequency above signal frequency.

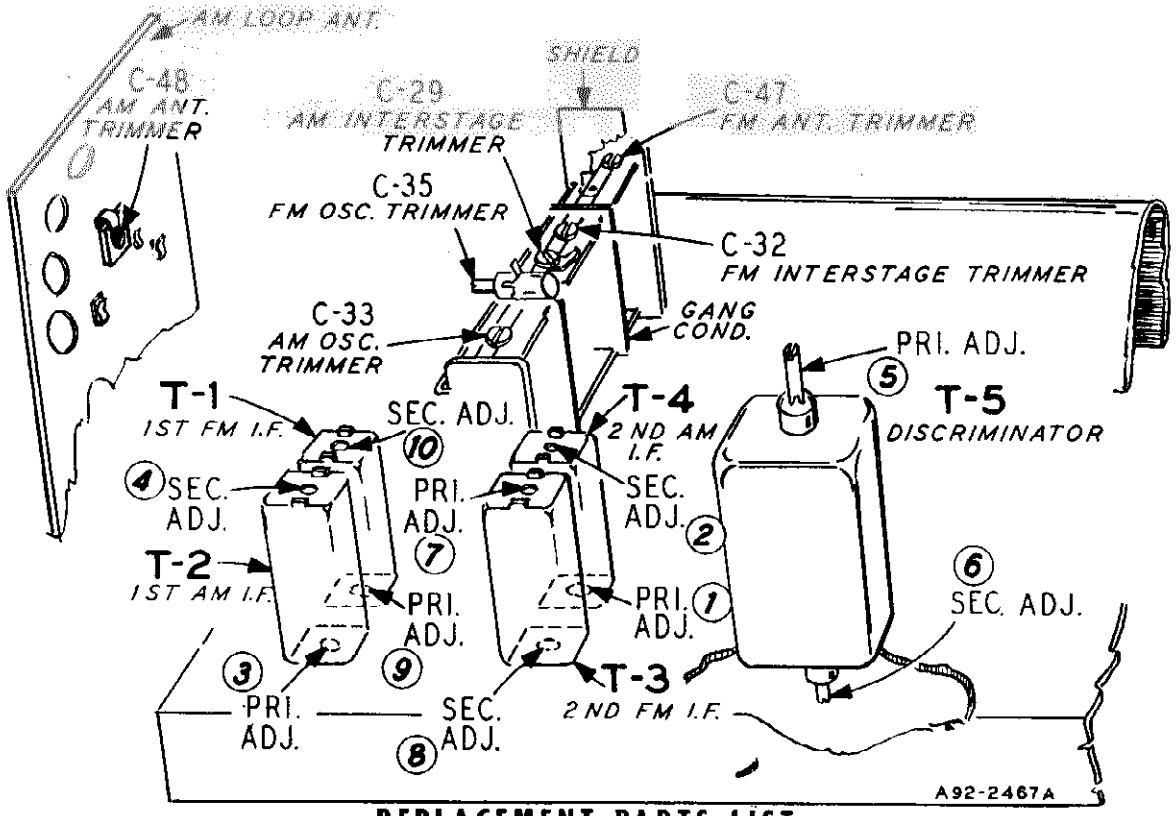
NOTE H—Remove the 1000 ohm load resistor before attempting to check the R-F and oscillator adjustments.





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.



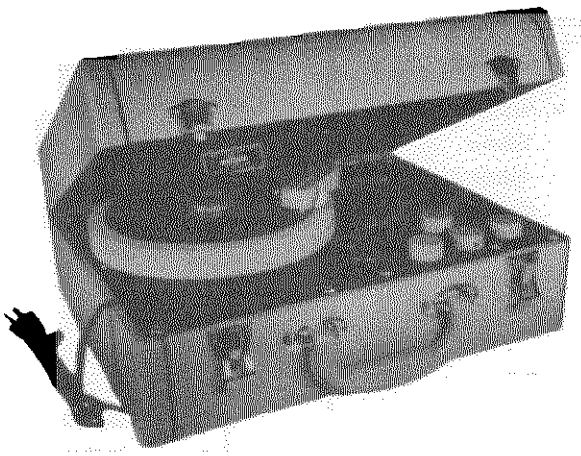
REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
		CAPACITORS	
C-1	14A207	Gang Condenser	1
C-2, C-3, C-7, C-9, C-13, C-16, C-17, C-18, C-19, C-27, C-42	47X507	5000 mmf Ceramic	11
C-4	47X497	100 mmf Ceramic	1
C-5	47X499	47 mmf Ceramic	1
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-25, C-26, C-45	47X496	500 mmf Ceramic	3
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

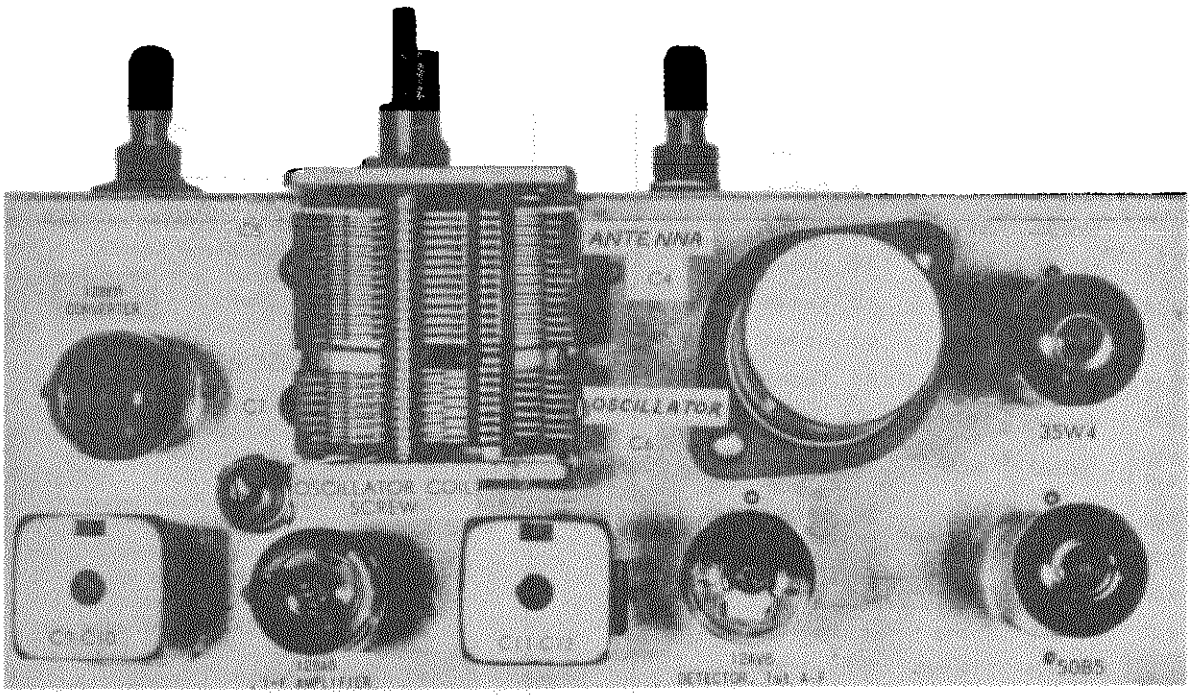
Ref. No.	Part No.	Description	Qty. Used in Set
		CAPACITORS—Cont.	
C-56	B66203	.02 mf 200 V Tubular	1
C-57	F66602	.006 mf 600 V Tubular	1
C-58	B66502	.005 mf 200 V Tubular	1
C-61	47X471	68 mmf Ceramic	1
C-62	47X492	2700 mmf Molded Mica	1
C-63	46X328	.01 mf 120 V Tubular	1
		RESISTORS	
		Ohms Watts	
R-1, 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 Wirewound	1
R-20, R-21	B83682	6800 0.5 Carbon	2
R-23	43X242	1400 5.0 Wirewound	1
R-25	36X372	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-31, R-35, R-38	B85474	470K 0.5 Carbon	3
R-32	B84822	8200 0.5 Carbon	1
R-36	B84682	6800 0.5 Carbon	1
R-37	B84562	5600 0.5 Carbon	1

Ref. No.	Part No.	Description	Qty. Used in Set
		TRANSFORMERS AND COILS	
L-2	9A2025	Interstage Coil (AM)	1
L-3	9A2024	Interstage Coil (FM)	1
L-4	9A2022	Oscillator Coil (AM)	1
L-5	35A5	Insulated Choke	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	9A2064	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
		DIAL AND DRIVE ASSEMBLY	
	58X723	Dial Glass	1
	25X1634	Dial Bracket	1
	41X88	Dial Light Reflector	2
	15X251	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	
	12A502	Speaker 12" P.M.	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
		TYPE W-28A176 RECORD CHANGER PARTS	
W-17X467		Motor Assembly, 60 cycles 105-125 Volts AC	1
W-49X123-5C		Pickup Arm	1
W-R A7M-1		Crystal Cartridge & Needles	1
W-R-13017		Needle, Microgroove (Red)	1
W-R-13016		Needle, Regular	1

MODELS 05GHM-934A, 15GHM-934A, 94GHM-934A



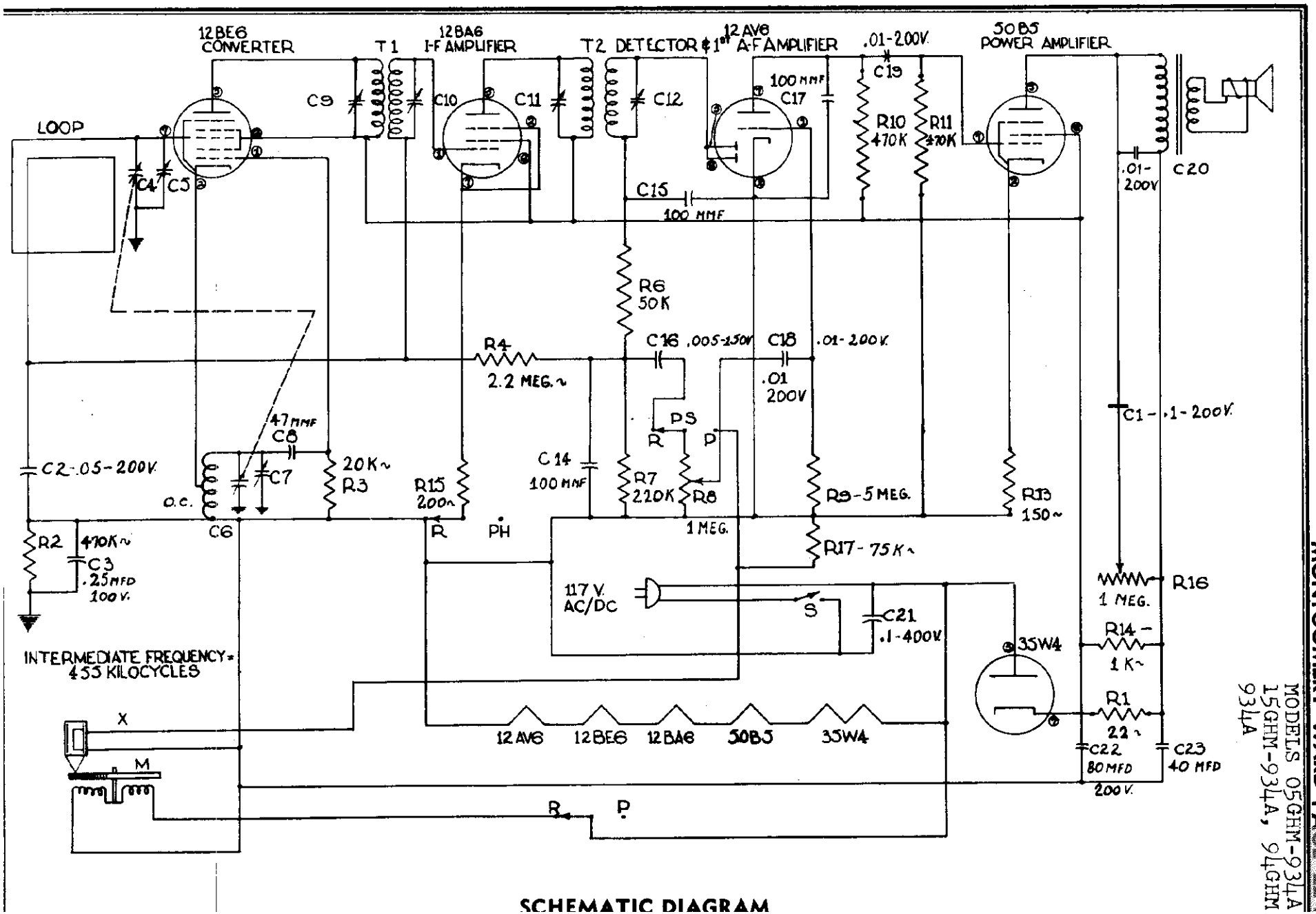
TUBE AND TRIMMER CONDENSER LAYOUT



ELECTRICAL SPECIFICATIONS:

POWER SUPPLY:	105-125 volts A. C. 60 cycle
POWER OUTPUT:	1.8 watts
LOUD SPEAKER:	5" P.M. with transformer
TUBE COMPLEMENT:	1—12BE6 1—50B5
	1—12BA6 1—35W4
	1—12AV6

NOTE: C10 is located on bottom of 1st I.F. Transformer.
C12 is located on bottom of 2nd I.F. Transformer.



SCHEMATIC DIAGRAM

MODELS 05GHM-934A
15GHM-934A, 94GHM
934A

MODELS 05GHM-934A, 15GHM-934A, 94GHM-934A

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Allow Chassis and Signal Generator to "Heat Up" for several Minutes.
The equipment in column at right is required for aligning:
Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter; Non-Metallic Screwdriver.
Dummy Antennas—.1 mf.

Frequency Setting	SIGNAL GENERATOR Coupling Capacitor	SIGNAL GENERATOR Connection to Radio	Ground Connection	Variable Condenser Setting	ADJUST TRIMMERS TO MAXIMUM See Trimmer Illustration
455 KC	.1	CONTROL GRID OF 12 BE6	TO B-BUS BAR	CLOSED	1st AND 2nd I.F. C9-C10-C11-C12
540 KC	.1	CONTROL GRID OF 12 BE6	TO B-BUS BAR	CLOSED	OSCILLATOR COIL SCREW
1640 KC	.1	CONTROL GRID OF 12 BE6	BAR TO B-BUS	WIDE OPEN	OSCILLATOR TRIMMER C7
1400 KC	.1	CONTROL GRID OF 12 BE6	TO B-BUS BAR	TO 1400 KC SIGNAL	ANTENNA TRIMMER C5

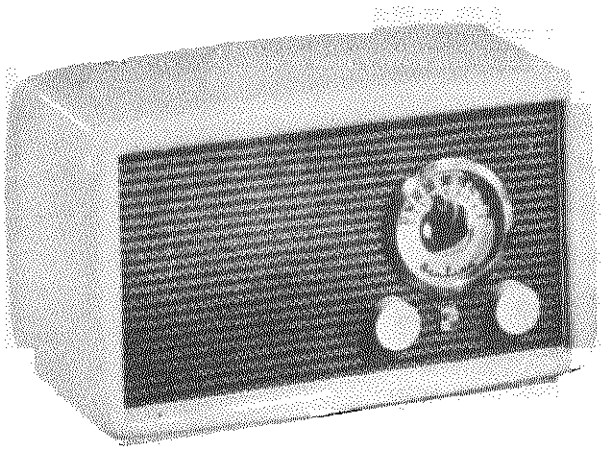
REPEAT PROCEDURE

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
		RESISTORS
R 1	RA10	22 ohm 1 watt
R 2-10-11	RA11	470K ohm ½ watt
R 3	RA12	20K " ½ watt
R 4	RA13	2.2 meg. ohm ½ watt
R 6	RA15	50K ohm ½ watt
R 7	RA16	220K " ½ watt
R 8	RA17	1 meg. volume control
R 9	RA18	5 meg. ohm ½ watt
R 13	RA19	150 ohm ½ watt
R 14	RA20	1K " ½ watt
R 15	RA21	200 " ½ watt
R 16	RA22	25K " tone control with switch
R 17	RA9	75K " ½ watt
		CONDENSERS
C 1	RA23	.1MFD-200 volts
C 2	RA24	.05-200v.
C 3	RA25	.25-100v.
C 4-5-6-7	RA26	Variable tuning cond. 2 gang
C 8		47MMF-200v.
C 9-10-11-12		I.F. trimmers
C 14-15-17	RA28	100MMF-200v.
C 16	RA29	.005-150v.
C 18-20	RA30	.01-200v.
C 21	RA31	.1-400v.
C 22-23	RA32	80/40MFD-200v. filter block

REF. NO.	PART NO.	DESCRIPTION
		MISCELLANEOUS
X	RA33	Pickup cartridge, Electro-Voice #167T (Use 60H19)
	RA33A	Needle for #16 cartridge (Use 61H10)
X	RA34	Pickup cartridge, Electro-Voice #33-4 (Use 60H21)
	RA34A	Needle for #33-4 cartridge (Use 61H12)
X	RA35	Pickup cartridge, Electro-Voice #13 (Use 60H21)
	RA35A	Needle for #13 cartridge (Use 61H12)
	RA36	Pickup arm complete (with Electro-Voice #167T cartridge)
PS	RA37	Phono-radio switch, 3 pole D.T.
S	—	Line switch (on tone control)
	RA38T	Knob, Tone
	RA38V	Knob, Volume
	RA38PR	Knob, Phono-Radio
	RA38P	Knob, Plain
	RA39	Speaker with output transformer
M	RA40	Three speed motor (Alliance)
OC	RA41	Oscillator coil
T1	RA42	I.F. Transformer, input (450KC-4 lugs)
T2	RA43	I.F. Trnasformer, output (450KC-6 lugs)
	RA44	Dial pointer
		Dial face
	RA45	Motor speed indicator plate
	RA46	Loop antenna
	RA47	Cabinet
	RA48	Line cord, with plug
	RA49	Tube socket, 7 prong - miniature
	RA50	45 RPM record disc adapter

INSTALLATION



UNPACKING - Check all shipping instruction tags carefully be fore removing them.

POWER SUPPLY - This radio must be operated from a 105 t 125 volt DC or 105-125 volt-60 cycle AC outlet. If you are i doubt or unfamiliar with the voltage and frequency rating of you utility service, consult your local power company. Attemptin to operate from other sources of power than specified above ma involve costly repairs to the receiver. If the receiver does nc respond after a one minute warm up period when operated fror a 105-125 volt DC (Direct-Current) source, the power plug ma have to be reversed at the wall outlet to obtain proper polarizatior

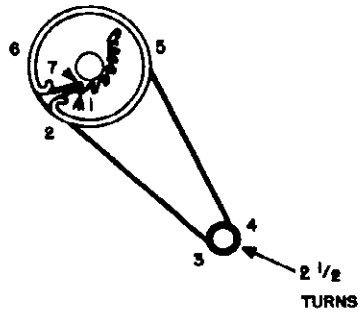
ANTENNA - The receiver is equipped with a loop type antenn eliminating the use of an external antenna. Due to the directiona effect of a loop antenna, it may be necessary to rotate the re ceiver to obtain maximum performance from some particula station. To place the receiver in operation, simply connect th power plug to the wall receptacle and operate.

VOLUME control - This is the left hand control. It serves the function of power switch as well as volume control. To turn on the receiver, turn this control to the right past the point at which it clicks and similarly when turning off the set turn it to the left until the tell-tale click is heard and the dial light is extinguished. Turn the control clockwise to increase volume and counter-clockwise to decrease volume.

TUNING control - This is the control knob on the right. To tune in a station, turn the volume control to the right until the background noise is audible, then turn the tuning knob back and forth across the station frequency until the station is heard the clearest. Reset the volume control for the desired volume level. Never set the volume by detuning the receiver from the station. Undesired distortion results from this practice.

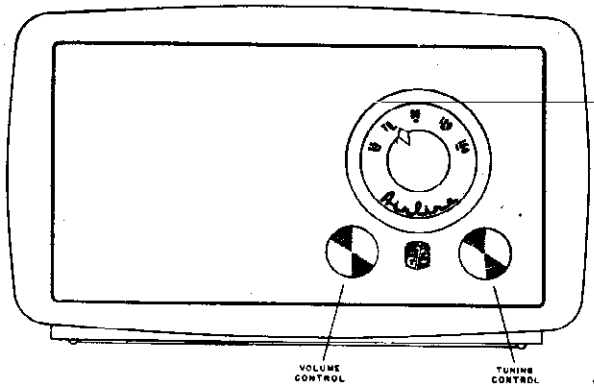
The dial is calibrated so that a zero must be added to the number appearing on the dial to obtain the station frequency in kilocycles. This will be helpful when setting the receiver dial to the station frequency listed in the radio logs of most newspapers.

DIAL CORD STRINGING INSTRUCTIONS



To restring the dial cable, pull the two control knobs and di pointer from their shafts remove the chassis bolts and pull tl chassis from the cabinet. Restring the dial drive with a 12-in length of 30 lb. test dial cord following the stringing sequen shown in the accompanying illustration. Reinstall the receiv chassis and replace the knobs. Set the tuning condenser at max mum capacity and clip on the dial pointer so that its pointer fal on the left hand limit of the dial scale.

OPERATION



SERVICE DATA

This radio is a condenser tuned receiver using a cut plat tracking mixer section and employs four tubes in a conventiona superheterodyne circuit. The loop provides for signal pickup a well as the inductive component in the tuned circuit of the mixe stage. No provision is made for the use of an external antenna.

The receiver is encased in a plastic cabinet which is supplie in two colors, Brown (62-1527) or Ivory (62-1528).

MODELS 94HA-1527C,
94HA-1528C

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts DC or 60 cycle AC, 25 watts
Frequency Range	Broadcast 540-1620 KC
Intermediate Frequency	455 KC
Antenna	Built in loop
Power Output	0.6 watt
Speaker	5 inch P.M.
Voice Coil Impedance	3 ohms
Tube and Dial Lamp Complement	12SA7 Mixer 12SK7 I.F. Amplifier 12SQ7 Detector & Audio 50L6GT Power Amplifier 35Z5GT Rectifier Mazda No. 47 Dial Lamp

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

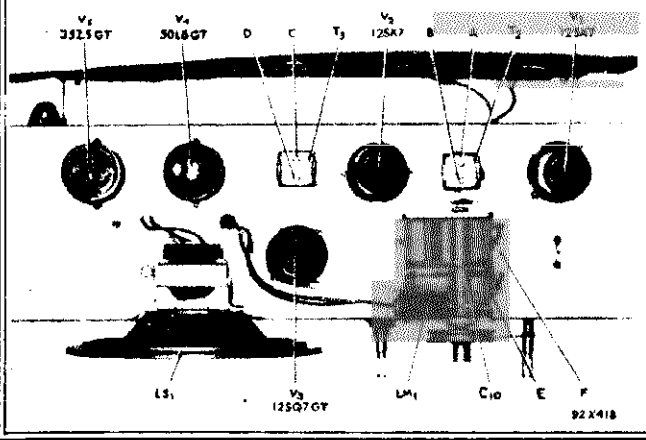
ALIGNMENT PROCEDURE

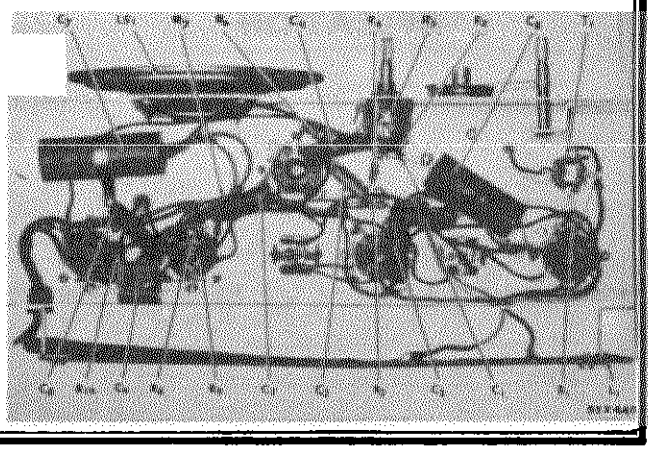
Output meter connection	Across voice coil
Generator ground	To chasis
Volume control position	Maximum

ALIGNMENT CHART

Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Radio Tuned To	Adjust	Remarks
0.01 mfd. cap.	Connect to pin #5 of of 12SA7 through dummy ant.	455 kc	1000 kc	A,B,C.D	Adjust for max. output. IF sensitivity for 50 milliwatt output is approx. 150 microvolts.
None	Do not couple directly to loop, pickup generator signal by radiation only	1500 kc	1500 kc	E*F	Adjust for max. output.

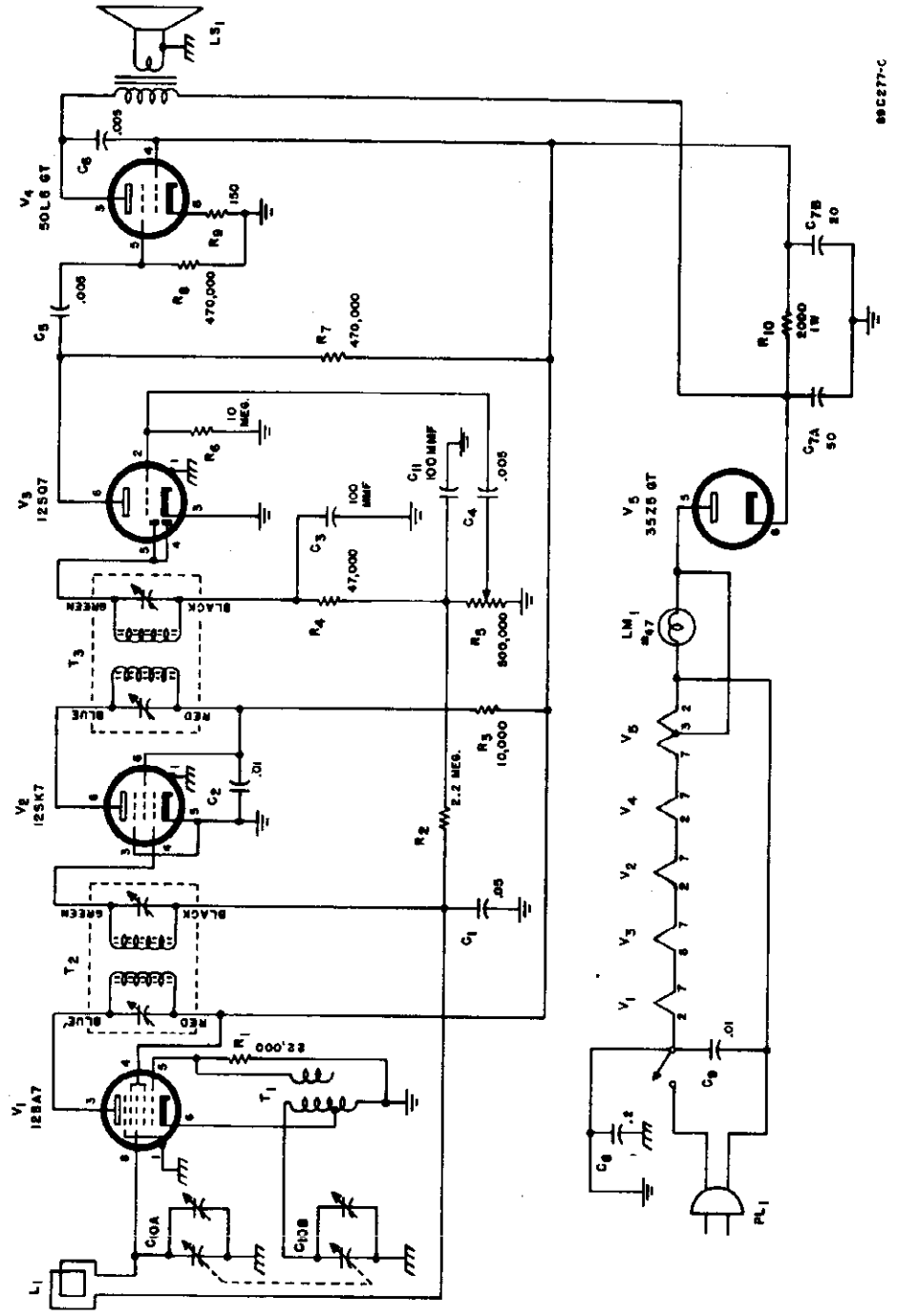
*Note - Calibration adjustment.





MODELS 94HA-1527C
94HA-1528C

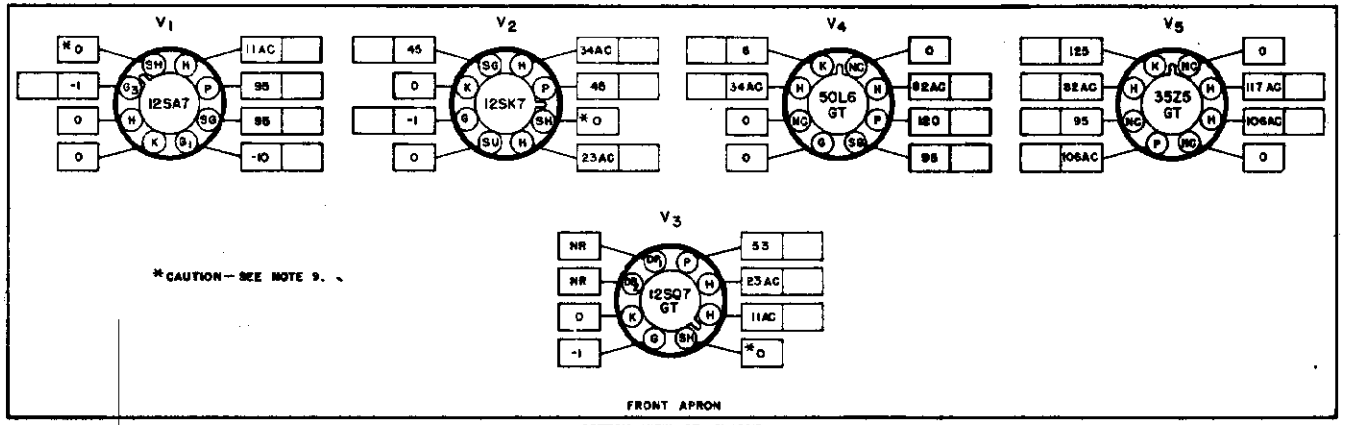
SCHEMATIC DIAGRAM



NOTE- RESISTOR VALUES ARE IN OHMS.
ALL RESISTORS ARE 1/2 W. UNLESS OTHERWISE SPECIFIED.
CAPACITOR VALUES ARE IN MFD. UNLESS OTHERWISE SPECIFIED.
⏚ INDICATES ELECTRICAL GROUND
⏚ INDICATES CHASSIS GROUND

LAST RESISTOR SYMBOL — R-10
LAST CAPACITOR SYMBOL — C-11

TUBE SOCKET VOLTAGE CHART



REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description
		CONDENSERS
C-1	46AY503J	.05 mfd. 600 V., tubular
C-2	46AZ103J	.01 mfd. 600 V., tubular
C-3,11	CM20A101M	100 mmf. 500 V., mica
C-4,5,6	46AZ502J	.005 mfd. 600 V., tubular
C-7	45B151	50-20 mfd. 150 V., electrolytic
C-8	46AX204H	.2 mfd. 600 V., tubular
C-9	46BR103J6	.01 mfd. 600 V., molded paper
C-10	48B201	Tuning condenser
		RESISTORS
R-1	RC20AE223M	22,000 ohms ½ watt, carbon
R-2	RC20AE225M	2.2 megohms ½ watt, carbon
R-3	RC20AE103M	10,000 ohms ½ watt, carbon
R-4	RC20AE473M	47,000 ohms ½ watt, carbon
R-5	25B641	Volume control
R-6	RC20AE106M	10 megohms ½ watt, carbon
R-7,8	RC20AE474M	470,000 ohms ½ watt, carbon
R-9	RC20AE151M	150 ohms ½ watt, carbon
R-10	RC30AE202M	2000 ohms 1 watt, carbon
		COILS AND TRANSFORMERS
L-1	57C119	Loop antenna
T-1	51B1058	Oscillator coil
T-2,3	50B374	Transformer IF & Det.

NOTES-
1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS AND ELECTRICAL GROUND (NOT CHASSIS) WITH ZERO SIGNAL INPUT.
3. LINE VOLTAGE ___ 117 V. AC.
4. ALL VOLTAGES SHOWN ARE DC UNLESS OTHERWISE SPECIFIED. AC VOLTAGES SHOWN BECOME DC WHEN OPERATING FROM A DC LINE.
5. DC VOLTAGES SHOWN WERE MEASURED WITH AN ELECTRONIC VOLTMETER.
6. "NC"— NO CONNECTION. (VOLTAGE SHOWN FOR THIS TERMINAL ONLY WHEN TERMINAL IS USED AS A TIE LUG).
7. "NR"— NOT READABLE. (READING GENERALLY MEANINGLESS).
8. [ ] SPACE PROVIDED FOR SERVICE METER READINGS.
9. ALL READINGS TAKEN WITH LINE PLUG POLARIZED SO THAT GROUND BUSS AND CHASSIS ARE AT THE SAME POTENTIAL WITH THE CHASSIS GROUNDED.

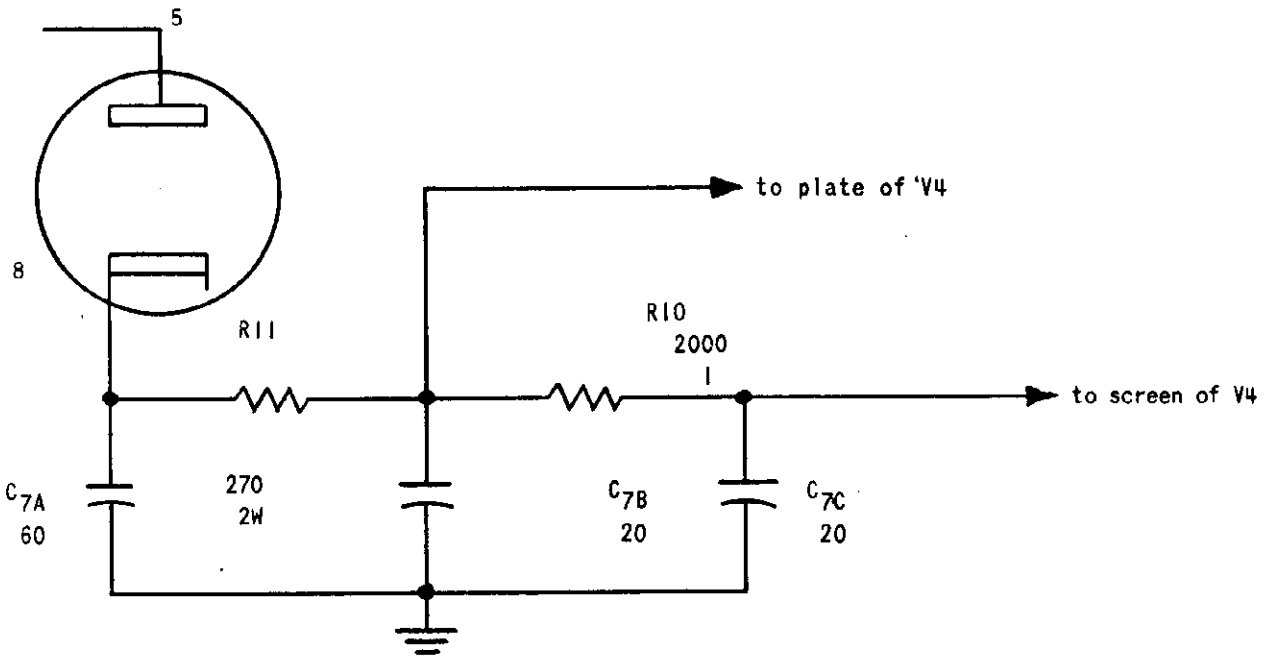
92C420

Ref. No.	Part No.	Description
		MISCELLANEOUS
LS-1	85C073	Speaker
	86B066	Pilot light socket & bracket
	6A296	Socket, octal
	87B1669	Line cord
	76A397	Line cord lock
	7C073	Escutcheon
	82B150	Pointer
	22C218	Dial scale
	15B068-5	Knob, ivory
	15B068-6	Knob, brown
	66E450	Cabinet, ivory finish
	66E450-1	Cabinet, brown finish

REPLACEMENT PARTS

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.

SCHEMATIC



REPLACEMENT PARTS

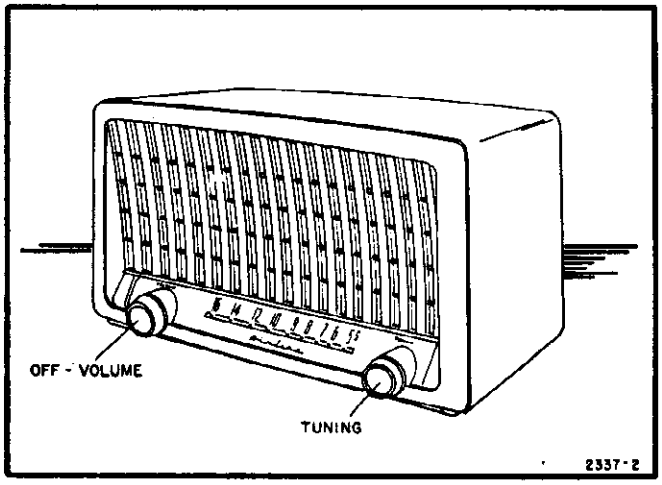
Ref. No.	Part No.	Description
C-7	45B128	60-20-20 mfd 175 V., electrolytic
R-11	RC40AF271K	276 ohms 2 watts, carbon

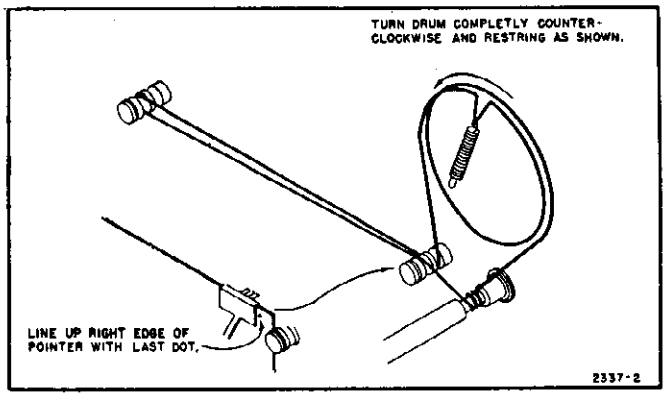
NOTE - Some sets will use condenser 45B151 with an additional single 10 mfd. condenser unit. For service replacement use condenser 45A128 wired as shown.

MODELS 15BR-1543B,
15BR-1544B

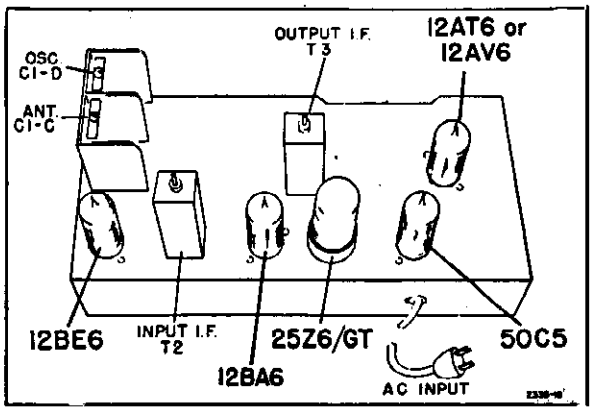
SERVICE DATA

Power Supply.....115 volts, DC or 50-60 cycle AC, 24 watts.
Frequency Range.....540 to 1600 Kc.
Intermediate Freq.....455 Kc.
Selectivity.....At 1000 Kc., 60 Kc. at 1000 x signal
Sensitivity.....150 u. v. per meter.
Power Output.....0.8 watts undistorted, 1.0 watt max.
Loud Speaker.....4" PM., v.c. impedance, 3.2 ohms.
Tube Complement.....
12BE6, Converter
12BA6, IF Amplifier
12AV6 or 12AT6, Detector, AVC, Audio
50C5, Audio output
25Z6, Rectifier





Dial Stringing Diagram



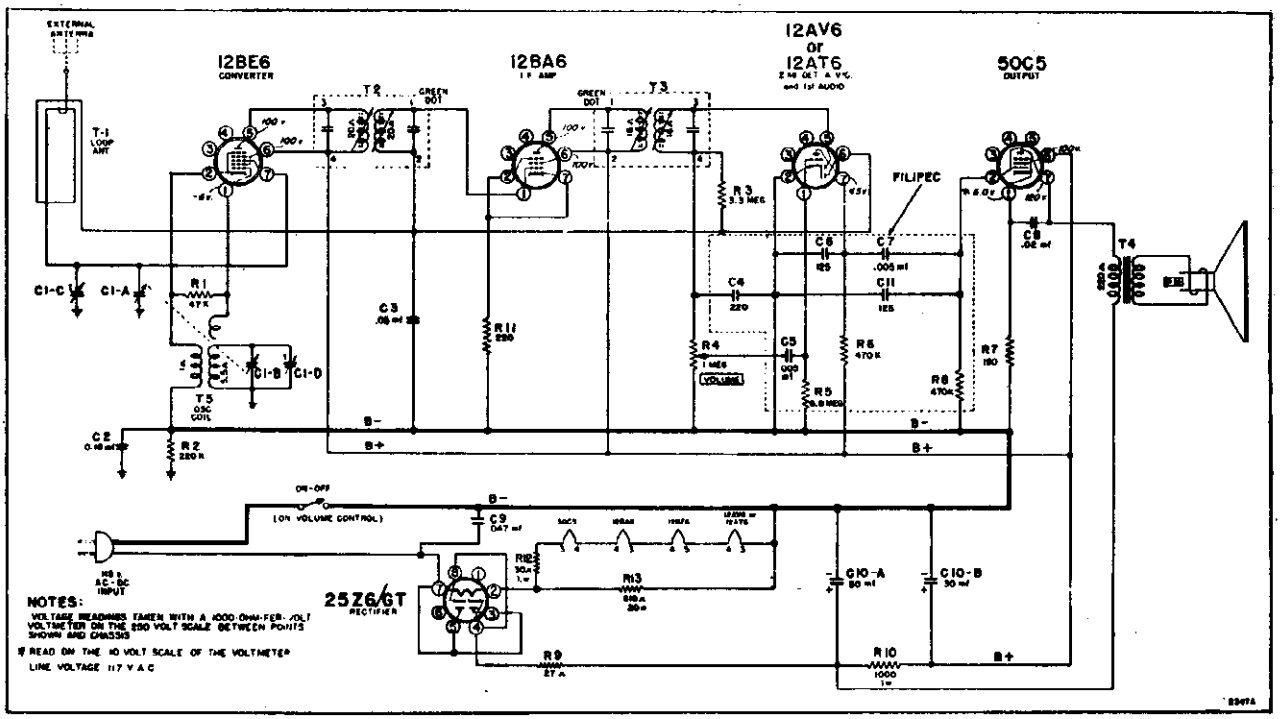
Top Chassis View

ALIGNMENT PROCEDURE

Loop must be connected and set volume to maximum.

SIGNAL GENERATOR				TUNER SETTING	ADJUST FOR MAXIMUM OUTPUT	INPUT FOR 50-MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection			
455 kc.	.1 mf	12BE6, Pin 7	HEAVY BUSS LEAD ACROSS CENTER OF CHASSIS	Capacitor fully open (plates out of mesh)	Top and bottom Cores in output and input I.F. cans	65 microvolts
1620 kc.	.1 mf	12BE6, Pin 7		Capacitor fully open (plates out of mesh)	Oscillator trimmer C1-D on gang	70 microvolts
535 kc.	.1 mf.	12BE6, Pin 7		Capacitor fully closed	Check for adequate range	70 microvolts
1400 kc.	———	Lay generator lead near back of cabinet		Tune in 1400 kc. signal	Antenna trimmer C-1C on gang	200 to 400 microvolts
400 cycles	.1 mf	12AT6, Pin 1		———	———	.06 volts

MODELS 15BR-1543B,
15BR-1544B



SCHEMATIC DIAGRAM

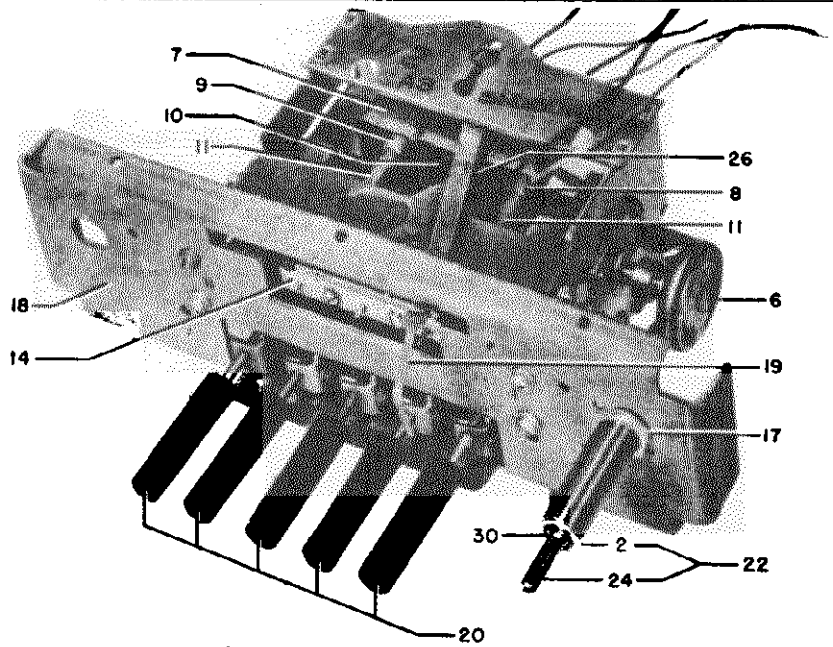
REPLACEMENT PARTS LIST

Please specify part number and chassis model number when ordering replacements.

Ref. No.	Part No.	Description
		CAPACITORS
C1A, B	8A-17377	2-gang condenser
C1C, D		Trimmers on gang
C2	8D-11111	.18 mfd x 400 volts
C3	8D-10770	.05 mfd x 200 volts
C4-5-6-7-11- and R5-6-8	201-19303	Filipec
C8	8D-10774	.02 mfd x 400 volts
C9	8J-16081	.047 mfd x 400 volts
C10A, B	8C-17391	Electrolytic condenser
		RESISTORS
R1	9B1-82	47K ohms, 1/2 watt, 10%
R2	9B1-27	220K ohms, 1/2 watt, 20%
R3	9B1-34	3.3 megohms, 1/2 watt, 20%
R4	10A-19616	Volume control and switch
R5-6-8		See Filipec
R7	9B1-52	150 ohms, 1/2 watt, 10%
R9	9B1-43	27 ohms, 1/2 watt, 10%
R10	9B2-62	1000 ohms, 1 watt, 10%
R11	9B1-54	220 ohms, 1/2 watt, 10%
R12	9C-19769	30 ohms, 1 watt, 10%
R13	9M-19602	618 ohms, 20 watts, 10%
		TRANSFORMERS AND COILS
T1	13E-19621	Loop antenna assembly
T2-3	13B-17731	IF transformer
T4	12C-19302 or	Output transformer
	12C-17595	Output transformer
T5	13D-17583	Oscillator coil
		DIAL PARTS
	3A-19617	Tuning shaft
	40A-17591	Bushing

Ref. No.	Part No.	Description
	29E-17592	Spring washer
	43D-17609	Tinnerman clip
	29C-10630	"C" washer
	53A-18547	Dial string (approx. 20")
	49A-10078	Take up spring
	2C-19619	Pointer plate
	2G-19620	Pointer
	3M-19623	String guide
	37A-19626	Dial background
	6D-19625	Dial scale
	2M-19624	Dial mounting strip
		MISCELLANEOUS
	5C-19532-9	Cabinet (Ivory)
	5C-19532-36	Cabinet (Walnut)
	5B-19790-8	Knob (Ivory)
	5B-19790-74	Knob (Walnut)
	23J-19627	Grill cloth and baffle board
	18A-19618	Speaker, 4" PM
	43D-12779	Tinnerman clip
	2H-17586 or	Tube shield
	2H-19188	Tube shield
	2M-17589 or	Tube shield base
	2M-19187	Tube shield base
	2M-17580	IF locking clip
	15C-16007	7-prong, socket
	15B-10440	Octal socket
	14M-10088-4	AC line cord and plug
	2D-15432-1	Loop mounting bracket
	23A-10344	Line cord lock
	42A10-19851	Chassis mounting bolt
	29A-3528	Steel washer
	29J-16690	Rubber washer

MODEL AT-81, Tuner



GENERAL INFORMATION

Automatic Tuner AT-81 is used in Motorola auto receiver, Model 1MF.

This is a 3-gang permeability type tuner, mechanically operated by movement of its push buttons or manual tuning control. Five pre-set tuning positions are provided. Stations can also be selected simply by turning manual control until desired station is tuned in.

TO SET THE PUSH BUTTONS

1. Turn receiver "on" and allow it to warm up for a few minutes.

2. 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. The pointer will indicate the station being set up.

3. Loosen by turning counterclockwise the automatic tuning push button you wish to use.

4. Push the automatic push button in as far as it will go and tighten by turning clockwise until moderately tight.

5. Push button now will automatically bring station selected simply by pushing button all the way in.

6. Remaining push buttons can be set up in the same manner.

SERVICE INFORMATION

CORE REPLACEMENT

When tuner is in the set, the following method of removing cores is recommended:

1. Remove knobs, dial escutcheon and background.

2. Mark core insulator and core bracket to re-mount core assembly the same as before removal.

3. Remove the two #4-40 x 3/16" core assembly mounting screws.

4. Gently pull out core and insulator assembly through holes of core mounting bracket.

5. Soften cement holding core screw to insulator and unscrew from insulator.

6. Replace core and insulator assembly into same position as before removal.

7. Realign tuner.

8. Cement core screws to insulator.

COIL REPLACEMENT

First remove tuning cores by following steps 1 through 4 of CORE REPLACEMENT. With cores out of the way, push coil out of rubber grommet and gently ease out of tuner. CAUTION: In replacing coils, be careful not to nick or damage coil by hitting sides of shields, etc. Cement coil to rubber grommet with any household rubber cement, replace cores, and realign tuner.

TUNER ALIGNMENT

The tuner cores have been correctly aligned at the factory. Field alignment is not recommended unless components have been replaced or tampered with. If found necessary to realign, construct two core alignment tools. These are made by gluing strips of rubber to two wood sticks, as shown in Figure 1. Refer to Figure 1 for proper use of tools. Alignment instructions are given in Model 1MF service manual.

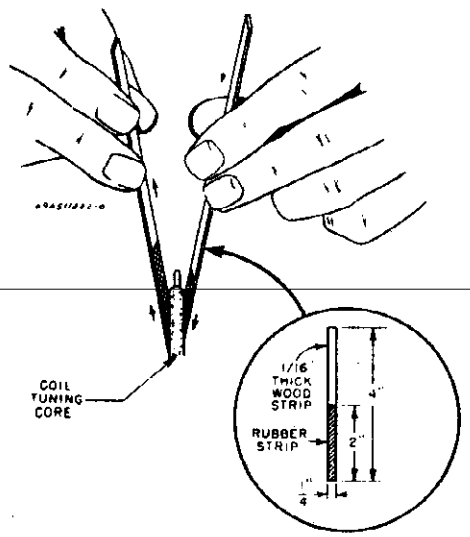
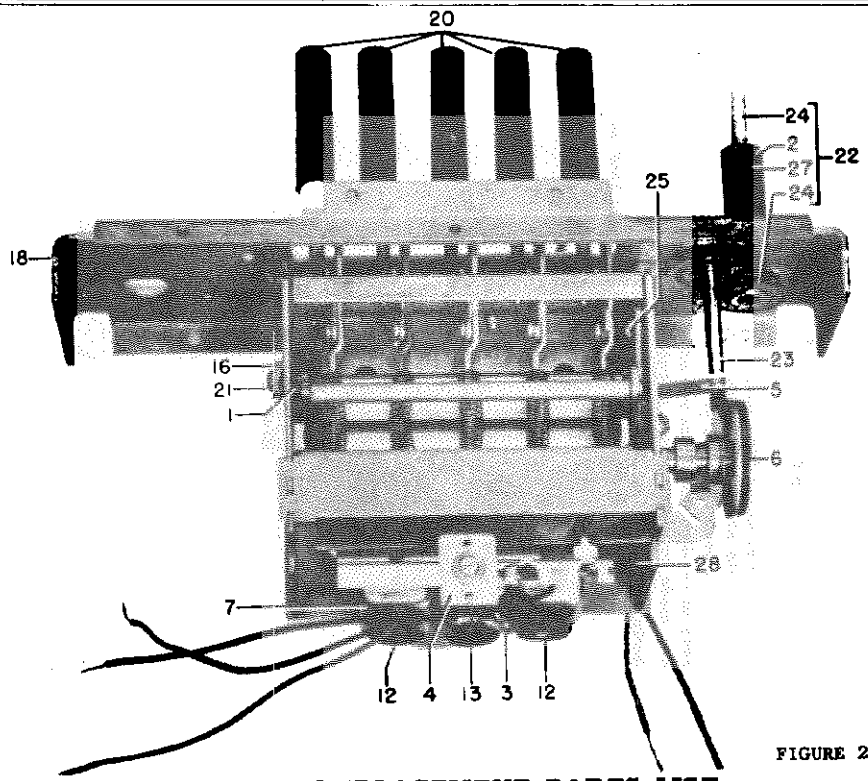


FIGURE 1. CORE ALIGNMENT DETAIL



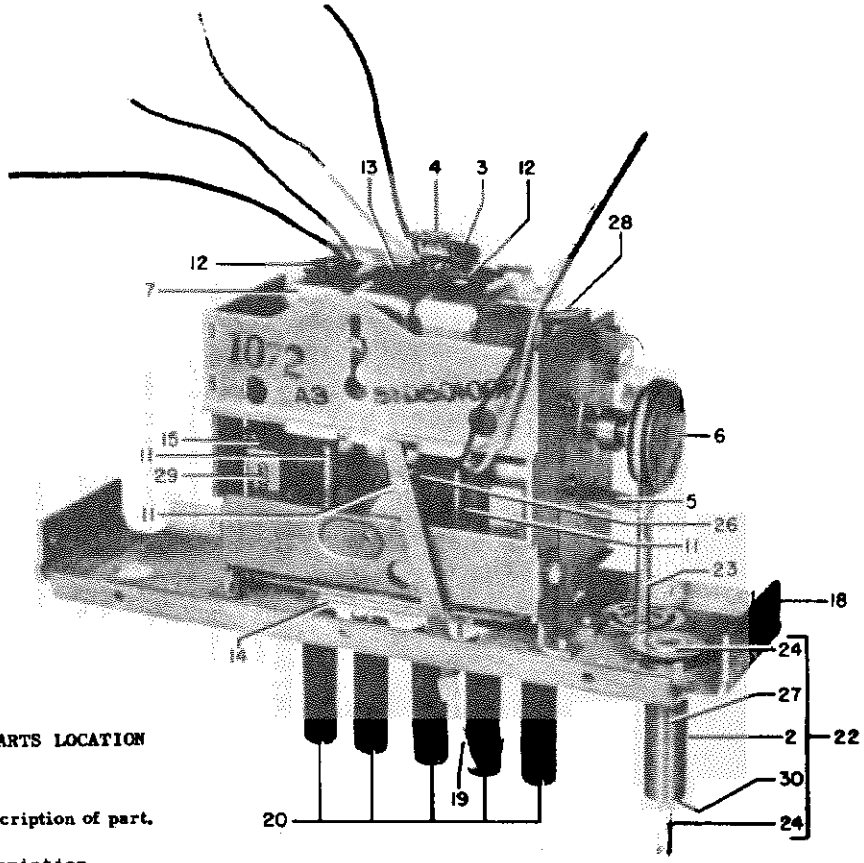


FIGURE 2. PARTS LOCATION

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of tuner in addition to part number and description of part.

Ref. No.	Part Number	Description
	51D501008	Tuner, Model AT-81:
1	43A4326	Ball, steel: .125" diameter (tuner drive carriage bearings).....
2	43A501147	Bushing, manual shaft.....
3	21K114068	Capacitor, compensating: 43 mmf.....
4	20A510111	Capacitor, variable: mica; 470 mmf (osc trim).....
5	43A500920	Clamp, clutch support.....
6	51A500995	Clutch Drive Assembly: consists of friction washers, hub crown gear, pinion gear etc.....
7	51X510776	Coil Assembly complete: consists of coil shield, ant, RF and osc coils, osc trim, and 43 mmf ceramic cap.....
8	24B510175	Coil antenna.....
9	24K510176	Coil, RF.....
10	24B510112	Coil, oscillator.....
11	46A510788	Core, iron (tuning cores)...
12	5A501016	Grommet, rubber (ant and RF coil mtg).....
13	5A501017	Grommet, rubber (osc coil mtg).....
14	14A510154	Insulator, core, (tuning core mtg).....
15	45A501035	Link, connecting (core brkt)
16	2S7048	Nut, hex: 10-32 x 5/16"; steel; cad pl (carriage set-screw lock).....
17	2S8397	Nut, hex: ½-28 x 5/8"; steel cad pl (manual shaft bushing assem mtg).....
18	64C501141	Plate, front mtg.....
19	52A510159	Pointer, dial: with adj cam.
20	51B500602	Pushbutton and Screw Assembly
21	3S3859	Setscrew, 10-32 x ¼"; slotted headless; cup point machine screw (tuner drive carriage mtg).....
22	51B502838	Shaft and Bushing Assembly, manual tuning: complete....
23	51A501042	Shaft, Drive Disc and Pinion Assembly.....
24	51K502839	Shaft Assembly, manual drive: includes 2 pinch washers...
25	41B501025	Spring, compression (on split gear).....
26	41K501096	Spring, pointer anti-backlash
27	41A501027	Spring, compression (part of shaft and bushing assem)...
28	41A501047	Spring, tension (on clutch gate release).....
29	41A501037	Spring, tension (link retaining).....
30	4A501015	Washer, "C" (manual shaft retaining).....

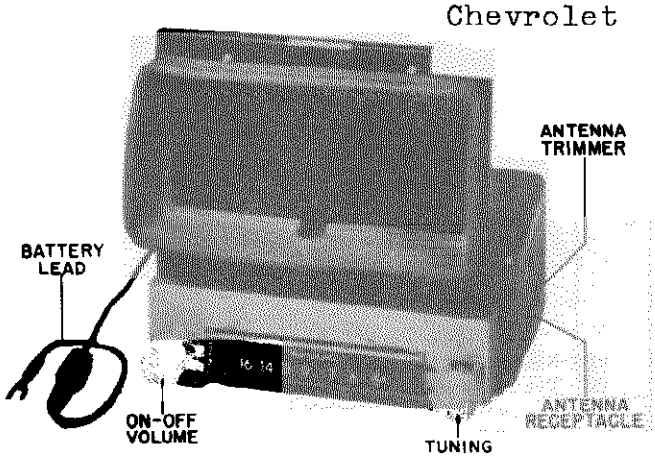
GENERAL INFORMATION

TYPE - An automotive superheterodyne receiver, designed for 1951 Chevrolet. An external speaker is used.

TUNING RANGE - 540 to 1600 Kc IF - 455 Kc

TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Detector-AVC-AF Amp
6AQ5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 6.3 volts DC, 5 amperes



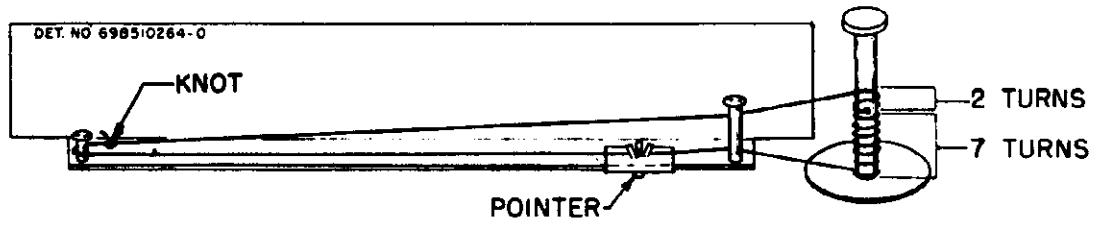


FIGURE 1. DIAL CORD RESTRINGING DETAIL

ALIGNMENT

Equipment Required:

1. A small fibre screwdriver for IF and RF adjustments.
2. An accurately calibrated AM signal generator.
3. A low range output meter.
4. A dummy antenna for RF and tuner alignment. (Construct dummy antenna as shown in Figure 3.)

Procedure:

1. Remove top and bottom covers to expose alignment adjustments.
2. Connect output meter across voice coil of the speaker.
3. Connect a 6 volt DC source of power between "A" lead and receiver ground. Turn receiver on and permit it to warm up for a few minutes. Then proceed as per instructions in the alignment chart.

NOTE: 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.

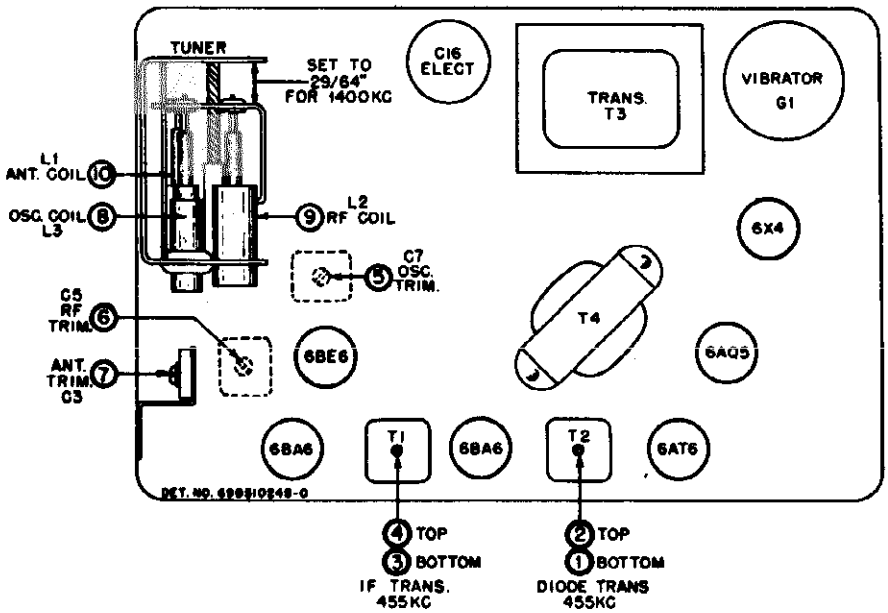


FIGURE 2. TUBE & TRIMMER LOCATIONS.

MODEL CT1M,
Chevrolet

INSTALLATION INFORMATION

INSTALL DISTRIBUTOR SUPPRESSOR

Cut the high tension lead, which runs from the center terminal of the car distributor to the ignition coil, approximately 1-1/2 inches from the distributor. See Figure 6. Screw the distributor suppressor in series with the two pieces of high tension wire, and plug the end terminal of the lead into the center receptacle of the distributor.

INSTALL CAPACITOR ON GENERATOR

Mount the noise suppression capacitor (Motorola Part Number 8A4491) on the generator frame, under the ground lead screw. See Figure 7. Connect the capacitor lead to the armature terminal of the generator. WARNING: DO NOT CONNECT THE CAPACITOR LEAD TO THE FIELD TERMINAL.

ADDITIONAL MOTOR NOISE HINTS

1. When checking the car for motor noise, clamp the hood down tight.
2. Hood Bonds (Motorola Part Number 39A4205) may be installed at the shoulders so that the hood makes a good ground to the cowl of the car.

TIRE STATIC

After completion of radio installation, road test car for tire static on dry concrete and blacktop pavements, under the following conditions:

1. At both low and high car speeds.
2. With antenna extended to operating position.
3. With radio at full volume and tuned off station.

If tire static noise is encountered, inject Tire Static Elimination Powder (available in kit form - Motorola Part No. 51B591494) into tires, following instructions given on the package.

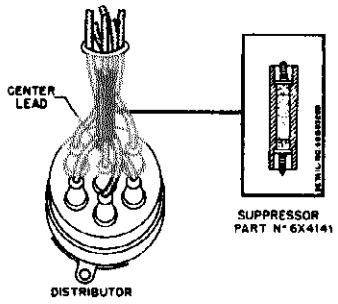


FIGURE 6. DISTRIBUTOR SUPPRESSOR INSTALLATION.

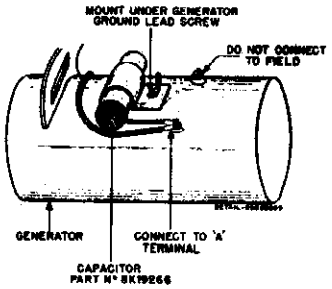


FIGURE 7. GENERATOR CAPACITOR INSTALLATION.

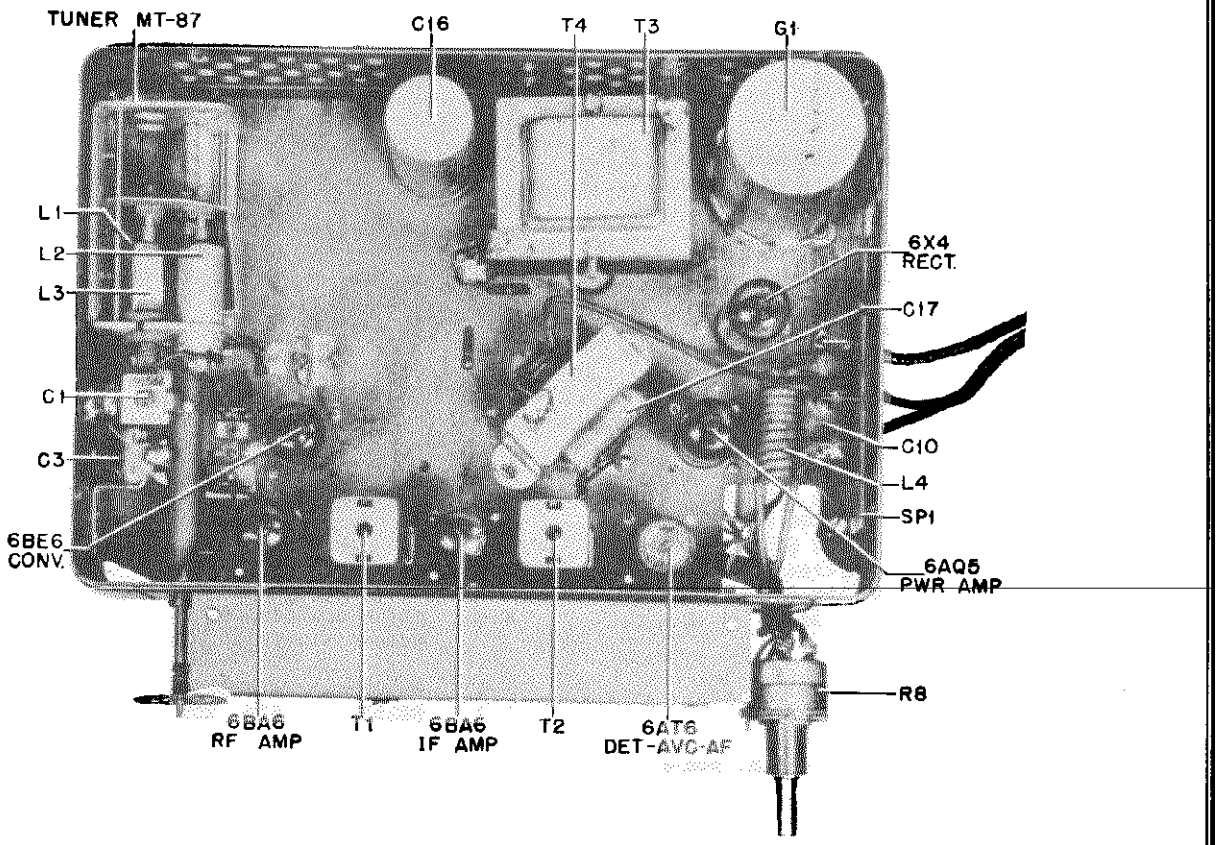


FIGURE 8. TOP VIEW OF CHASSIS.

MODEL CT1M,
Chevrolet

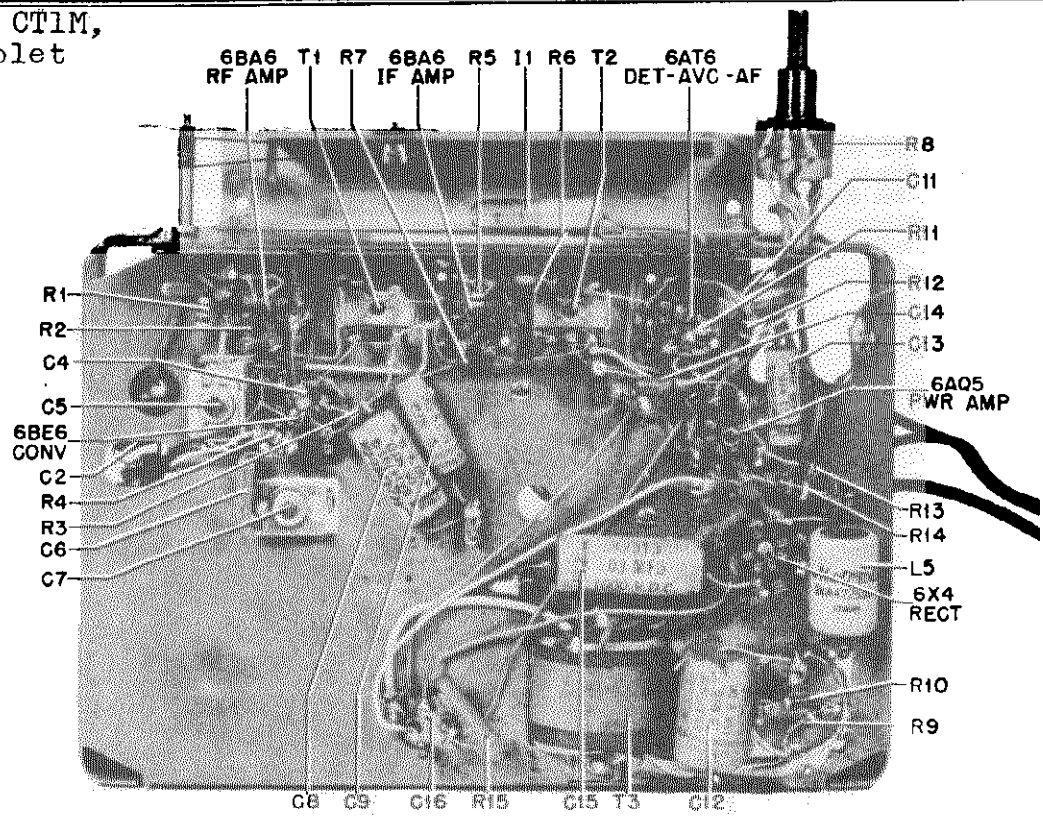


FIGURE 9. BOTTOM VIEW OF CHASSIS.

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21A591682	Ceramic: 90 mmf 500V.....
C-2	8A4529	Paper: .006 mf 100V.....
C-3	20A502338	Trimmer, mica: 50 to 280 mmf.....
C-4	21K70720	Molded: 5 mmf 500V.....
C-5	20A481526	Trimmer, mica: 20 to 80 mmf
C-6	21K77373	Ceramic: 47 mmf.....
C-7	20A485708	Trimmer, mica: 395 to 470 mmf.....
C-8	8K14791	Paper: .05 mf 400V.....
C-9	8R13514	Paper: .05 mf 100V.....
C-10	8K17028	Paper: .5 mf 100V.....
C-11	8R472754	Paper: .01 mf 100V.....
C-12	8K17028	Paper: .5 mf 100V.....
C-13	8R23690	Paper: .01 mf 400V.....
C-14	21K481377	Ceramic: 500 mmf.....
C-15	8K400883	Paper: .03 mf 1000V.....
C-16	23A485677	Electrolytic: 15-10-20 mf/350-350-25V.....
C-17	8K71909	Paper: .004 mf 400V.....
Fuse		
F-1	65K16248	Fuse: 9 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	24B502472	Antenna Coil Assembly (specify color coding on old coil when ordering).....
L-2	24B502473	RF Coil Assembly (specify color coding on old coil when ordering).....
L-3	24B502474	Oscillator Coil Assembly (specify color coding on old coil when ordering)..
L-4	24K580706	Choke, RF.....
L-5	24A472535	Choke, hash.....
Speaker		
LS-1	50B510532	Speaker, EM: 5" x 7"...
or		
LS-2	50K510064	Speaker, PM: 5" x 7"; 3.2 ohm VC.....
Resistors		
Note:		All resistors are insulated carbon type unless otherwise specified.
R-1	6R6032	470,000 20% ½W.....
R-2	6R3933	220 20% ½W.....
R-3	6R6075	100,000 20% ½W.....
R-4	6R6056	47,000 20% ½W.....
R-5	6R6010	330 20% ½W.....
R-6	6R490001	6800 10% 1W N.I.....
R-7	6R6004	1 meg 20% ½W.....

R-8	18K510011	Volume control: .5 meg; includes on-off switch....
R-9	6R5614	56 10% ½W.....
R-10	6R5614	56 10% ½W.....
R-11	6R2122	4.7 meg 20% ½W.....
R-12	6R6032	470,000 20% ½W.....
R-13	6R6414	270,000 10% ½W.....
R-14	6R6336	270 10% 1W.....
R-15	6R488312	2200 10% 1W N.I.....

Spark Plate

SP-1	1B501290	Spark Plate Assembly.....

Transformers

T-1	24B485553	
or	24K502819	IF, 455 Kc: complete.....
T-2	24K485554	Diode, 455 Kc: complete...
T-3	25C501303	Power Transformer.....
T-4	25B70171	Output Transformer.....

CHASSIS PARTS - MECHANICAL

1X510137	Bracket, dial background: includes shoulder rivets.....
7C510065	Bracket, dial mtg.....
43K510014	Bushing, manual shaft.....
1X510135	Cable Assembly, speaker (for PM spkr).....
1X510195	Cable, Assembly, speaker (for EM spkr).....
42A510012	Clip, dial scale retainer.....
42A485548	Clip, coil can mtg (T-1 & T-2)..
42A4215	Clip, vibrator grounding.....
11M8877	Cord, dial: 20 lb; black.....
58A501296	Coupling, tuning shaft: less insert springs.....
9K510086	Lead Assembly, fuse: complete with fuse.....
2S8397	Nut, hex: 1/2-28 x 5/8; cad pl (tuning shaft bushing and volume control mtg).....
1A510007	Pointer and Slider Assembly.....
9A472148	Receptacle, antenna.....
5K71246	Rivet, shoulder: .187 lg (dial cord guide).....
5A71735	Rivet, shoulder: ½" long (dial cord guide).....
34B510062	Scale, dial.....
3S7247	Screw, machine: 6-32 x 3/16; slotted locking type; stl; cad pl (tuner mtg).....
1X510142	Shaft Assembly, manual drive: includes 2 pinch-type drive washers.
1X510138	Shaft, Drive Disc, & Dial Cord Assembly.....
9K592354	Socket, dial light: includes mtg bracket.....
9A70208	Socket, tube: 4-prong (for vibrator).....
9A472534	Socket, tube: miniature; 7-prong..
9K580218	Socket, tube: miniature; 7-prong; with dummy lug.....
41A485380	Spring, insert (inside tuning shaft coupling).....
29A76280	Terminal, pin and washer: black (for PM speaker).....
29K76282	Terminal, pin and washer: white .....
29K502828	Terminal, pin and washer: yellow (for EM Speaker).....
4K501364	Washer, "C" (tuning shaft retainer)

Part Number	Description

HOUSING PARTS

15K501283	Cover, bottom.....
15K501306	Cover, top.....

MOUNTING PARTS & ACCESSORIES

7A72256	Bracket, receiver mtg (on hsng)....
7B510058	Bracket, speaker plate mtg.....
7A484424	Bracket and Stud Assembly (receiver mtg).....
43A502927	Bushing, spacer (receiver mtg to instrument panel).....
8A4491	Capacitor, noise suppression (generator).....
32C510039	Gasket, speaker.....
36K510180	Knob, control.....
4S7688	Lockwasher, int-ext: ¼; stl; cad pl (receiver mtg).....
2S7022	Nut, hex: ¼-20 x 7/16; stl; cad pl (receiver mtg).....
2S8397	Nut, hex: ½-28 x 5/8; stl; cad pl (receiver mtg to instrument panel) .....
1X510130	Plate and Gasket Assembly, speaker.
3S488298	Screw, sheet metal: #8 x ¼ slotted hex head; stl; cad pl (mtg brkt mtg-rear).....
3S7295	Screw, machine: ¼-20 x 3/4; plain hex head; stl; cad pl (receiver mtg strap).....
3S9694	Screw, machine: ¼-20 x 1½; plain hex head; stl; cad pl (receiver mtg to firewall).....
3S7118	Setscrew (control knob).....
42A485718	Strap, receiver mtg.....
6A4141	Suppressor, noise (distributor)....
4S1758	Washer, flat: 13/16 x .515 x .040 thick; stl; nkl pl (receiver mtg to instrument panel).....

TUNER - MODEL MT-87

Note: Electrical parts of the tuner are included in the Electrical Chassis Parts List.

51D502490	Tuner, Model MT-87: complete.....
43A502513	Bushing, stop (stop on manual drive shaft).....
42A502507	Clip, spring (manual drive shaft retainer).....
46A502505	Core, iron (L-1, 2, & 3 tuning - specify color coding on old core when ordering).....
5A502510	Grommet (L-1 & 2 mtg).....
5K502516	Grommet (L-3 mtg).....
5A501503	Grommet (L-1, 2, & 3 core mtg)..
2A502508	Nut, tension drive (on tuner carriage).....
47A502509	Shaft, manual drive.....
46A502506	Sleeve, iron (inside L-1 & 2, shields).....
4K502518	Washer, fibre (on manual drive shaft).....
4A502517	Washer, paper (inside L-1 & 2, shields).....

MODEL CT1M,
Chevrolet

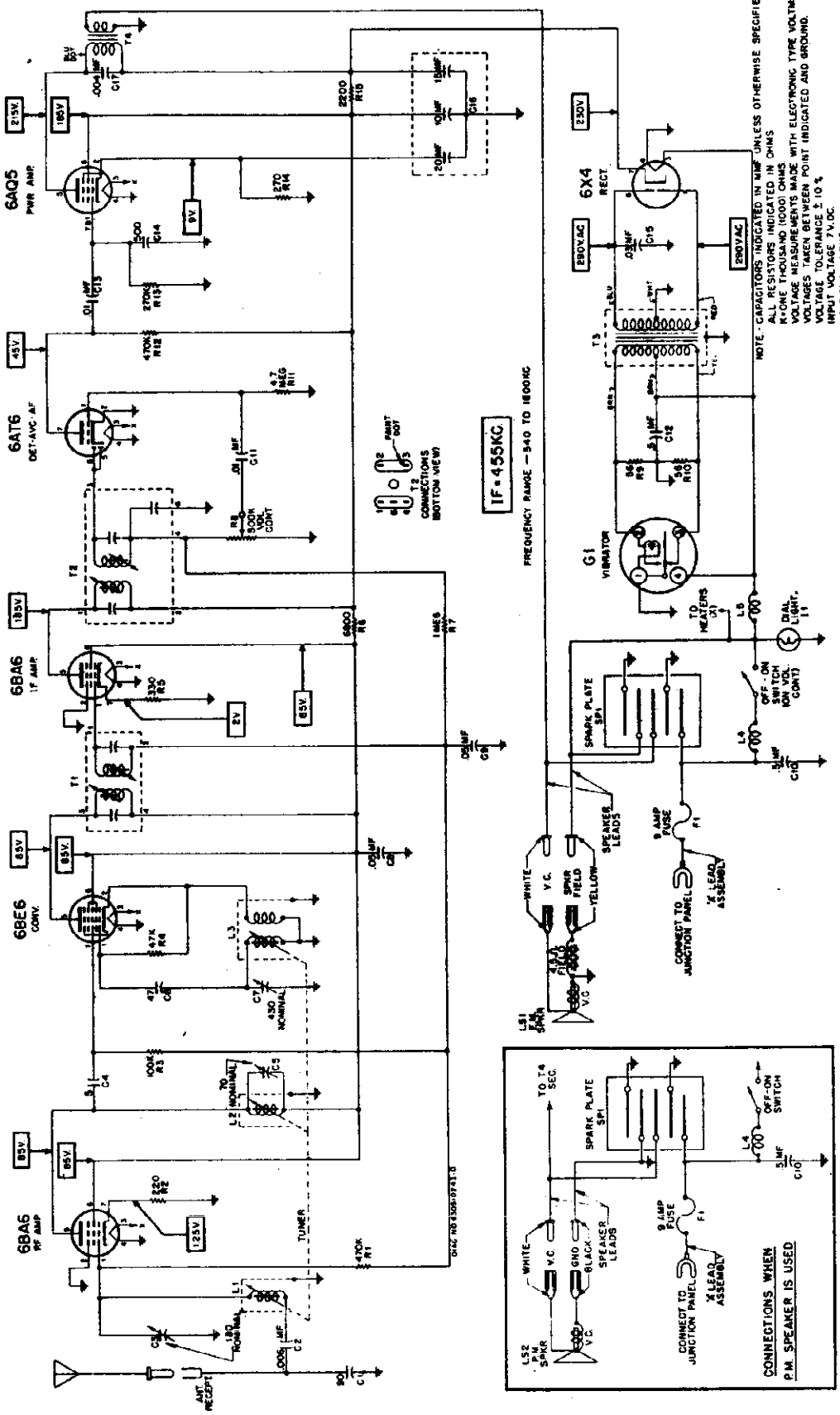


FIGURE 10. SCHEMATIC DIAGRAM.

MODELS 16VF8B, 16VF8R,
Ch. HS-211; 19F1, 19F1B,
Ch. HS-230

GENERAL INFORMATION

NOTE: This manual contains complete service information and replacement parts list for AM-FM radio chassis HS-211 and HS-230. Service data for the television chassis and the record changers will be found in their respective service manuals.

RECEIVER MODELS

Model	Radio Chassis Used	Record Changer Used	TV Chassis Used
16VF8R	HS-211	M3RC	TS-16 series
16VF8B	HS-211	M3RC	TS-16 series
19F1	HS-230	RC-36	TS-67 series
19F1B	HS-230	RC-36	TS-67 series

RADIO CHASSIS - HS-211: Radio chassis HS-211 contains 9 tubes and receives both AM and FM broadcast programs. Except for common speakers, it operates entirely independently of the television receiver.

HS-230: Similar to chassis HS-211 except for the addition of a separate phono motor power switch, connected to the AM-FM-PHONO switch control shaft.

RADIO TUNING RANGE - AM -535 to 1620 Kc
FM - 88 to 108 Mc

RADIO IF FREQUENCIES - AM IF - 455 Kc
FM IF - 10.7 Mc

RADIO ANTENNAS - Separate AM and FM loop antennas, mounted in cabinet

SPEAKERS - Dual 12" PM and 5" PM, common to both radio and television chassis.

POWER SUPPLY - 117 volts, 60 cycle alternating current only

RADIO POWER CONSUMPTION - 100 watts, including phono motor

RADIO AUDIO OUTPUT - 8 watts

RADIO CHASSIS TUBE COMPLEMENT -

6AU6	- FM-AM RF Amplifier
6BA7	- FM-AM Converter
6BA6	- FM-AM IF Amplifier
6AU6	- FM IF Amplifier
6AL5	- FM Ratio Detector
6AV6	- AM Detector & 1st Audio Amp
6V6GT	- Power Amplifier
6V6GT	- Power Amplifier
7Z4	- Rectifier

INSTALLATION & OPERATING INSTRUCTIONS

ANTENNAS

No outside antenna or ground is normally required for standard broadcast (AM) reception, as a loop antenna is located inside the cabinet. Antenna connections are shown in Figure 1. In locations where additional pick-up is desired, an external antenna may be connected to the clip marked "EXT BC ANT" on the loop antenna.

An FM loop antenna, mounted inside the cabinet, 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.

In "fringe" or weak signal areas, improved FM reception can be obtained by using an outside FM antenna. The loop connections should be removed from the terminal strip on the rear of the chassis and the outside antenna should be connected, through a 300 ohm twin transmission line, to the terminal strip, as shown in Figure 1. Orient the antenna to obtain maximum volume of the FM stations.

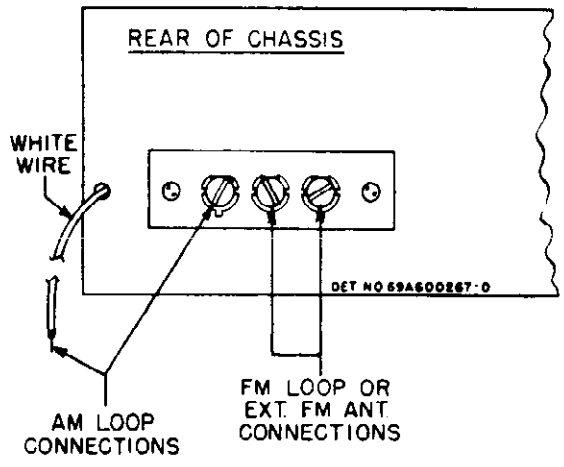


FIGURE 1. EXTERNAL ANTENNA CONNECTIONS

MODELS 16VF8B, 16VF8R,
Ch. HS-211; 19F1, 19F1B,
Ch. HS-230

SERVICE NOTE

TO REMOVE RADIO CHASSIS FROM CABINET

1. Pull off the four radio knobs on the front of the cabinet.
2. Remove the AC power plug from the receptacle attached to the cabinet.
3. Remove the large panel covering the rear of the cabinet.
4. Disconnect the AM and FM loop leads from the receiver.
5. Disconnect the phono power plug from the chassis.
6. Disconnect the speaker leads.
7. Remove the three chassis mounting screws.
8. Slide the chassis from the cabinet.

CONTROLS

Refer to Figure 2 for the location of the radio controls.

POWER SWITCH AND VOLUME CONTROL. The volume control and power switch for both radio and phonograph operation are combined and are operated with the extreme left-hand knob. **CAUTION:** The power switches on the AM-FM radio and on the television receiver are independent. Make sure both are turned off when the set is not in use.

TONE CONTROL. Tone is varied by adjusting the second knob from the left.

AM-FM-PHONO SWITCH. The third control from the left operates a three-position switch. The extreme counterclockwise position selects the AM (Standard Broadcast) band, the center position selects the FM (Frequency Modulation) band, and the extreme clockwise position is used for phonograph operation. **NOTE:** On the 19F1 model, rotating the control to the "PHONO" position also starts the phono motor, whereas model 16VF8 has a separate power switch on the record changer itself.

TUNING CONTROL. The extreme right-hand control selects the desired FM or AM station. The standard broadcast scale (AM) is read in kilocycles by adding one '0' to the figures. The frequency modulation scale (FM) is read in megacycles (88 to 108).

Tuning of FM stations should be done very carefully, for best sound reproduction, not necessarily for strongest volume received.

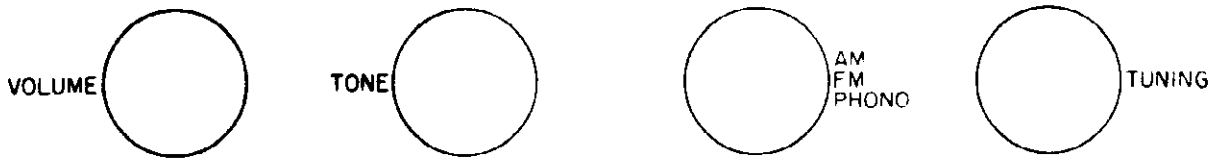


FIGURE 2. RADIO CONTROLS

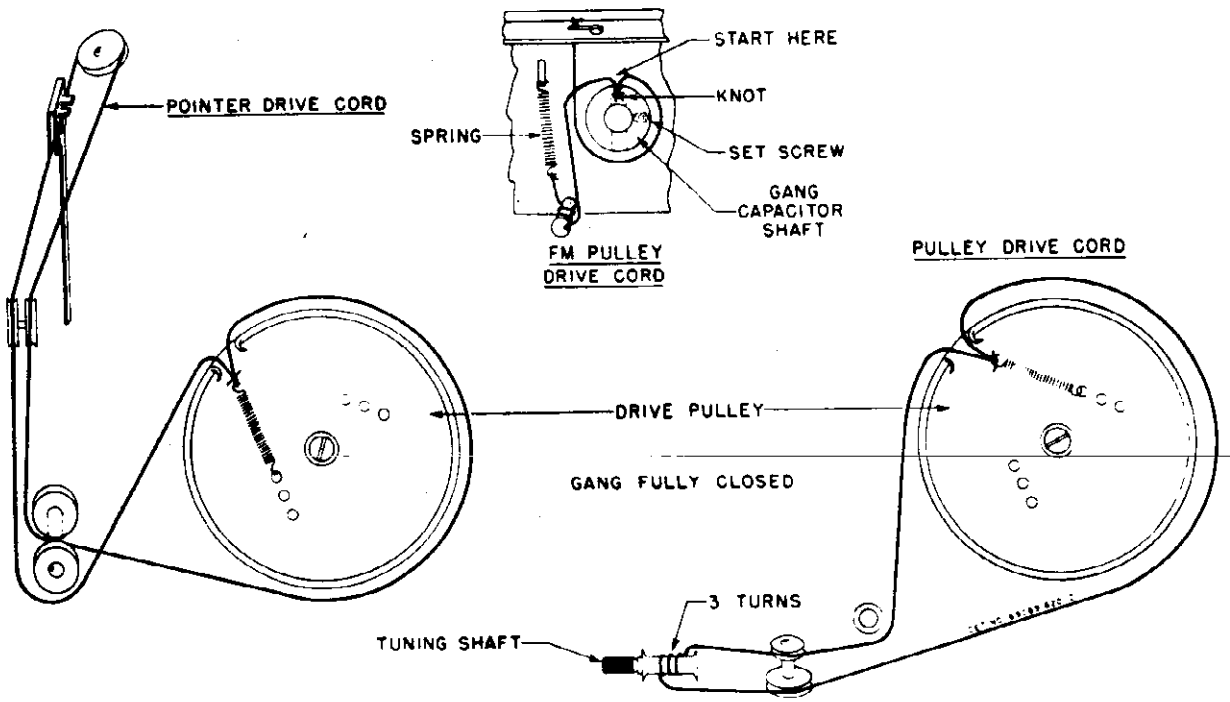


FIGURE 3. STRING DRIVE DETAIL

MODELS 16VF8B, 16VF8R
Ch. HS-211; 19F1,
19F1B, Ch. HS-230

ALIGNMENT

GENERAL INFORMATION

1. Maximum performance can be obtained only if extreme care is exercised during alignment.

2. Use a small fibre screwdriver for aligning the IF transformers.

3. Refer to Figure 4 for the location of all alignment trimmers and cores.

4. As the stages are brought into alignment, reduce the signal generator output to a low value to avoid overloading the receiver.

ORDER OF ALIGNMENT AND EQUIPMENT REQUIRED

1. Broadcast Band IF & RF Alignment
   a. 455 to 1620 Kc AM Signal Generator
   b. Low range output meter

2 (A) FM Band IF & RF Alignment (Preferred Method)
   a. 10.7 to 108 Mc FM signal generator
   b. Oscilloscope

(B) FM Band IF & RF Alignment (Alternate Method)
   a. 10.7 to 108 Mc signal generator (unmod.)
   b. Low range DC electronic voltmeter.

BROADCAST BAND - IF & RF ALIGNMENT

1. With the gang fully closed, adjust the pointer to coincide with the calibration marks at the left of the "55" on the dial scale.

2. Connect the AM signal generator as in chart below, with 400 cycle, 30% modulation.

3. Connect the output meter across the speaker voice coil. Throughout alignment reduce the generator output to a level which produces less than 1.27 volts (.5 watt) across the voice coil, to avoid overloading the receiver.

4. Set the bandswitch to the AM position.

5. Turn the receiver volume control to maximum.

6. Proceed as shown in the following chart.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. V-2 (pin 7, 6BA7)	455 Kc	Fully opened	1, 2, 3, & 4 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	.1 mf	Grid of conv. V-2 (pin 7, 6BA7)	1620 Kc	Fully opened	5 (AM osc)	Adjust for maximum.
3.	.1 mf	Grid of conv. V-2 (pin 7, 6BA7)	1400 Kc	Tune in signal	6 (AM RF)	Adjust for maximum.
4.	-	-	-	-	-	Connect AM loop to chassis.
5.	-	Across radiation loop*	1400 Kc	Tune in signal	7 (AM ant)	Adjust for maximum.

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

MODELS 16VF8B, 16VF8R, Ch. HS-211; 19F1, 19F1B, Ch. HS-230

FM BAND - IF & RF ALIGNMENT (PREFERRED METHOD)

1. The following FM alignment procedure, using an FM signal generator and an oscilloscope, is to be preferred because the actual response pattern may be observed on the scope and adjusted for best symmetry and maximum amplitude.

2. Connect the vertical input terminals of the oscilloscope between the chassis and the junction of resistor R-17 (47K) and capacitor C-21 (1000 mmf).

3. Connect the FM signal generator sync voltage output terminals, through a phase shifting network, to the horizontal input terminals of the scope, as in Figure 5. (Other values of resistance and capacitance may be required, depending upon the scope). The phasing control should be adjusted to give only one trace on the scope. NOTE: If the FM generator has a built-in phase control, the phase shifting network is not necessary.

4. Set the bandswitch to the FM position.

5. Throughout alignment, reduce the generator output to keep the signal just above the noise level, to avoid overloading the receiver.

6. Proceed as shown in the following chart.

GENERATOR CONNECTION	STEP	DUMMY ANTENNA	GENERATOR FREQUENCY	TUNER SETTING	ADJUST	REMARKS
	IF ALIGNMENT					
Grid of 2nd IF Amp V-4 (pin 1, 6AU6)	1.	1000 mmf	10.7 mc ±100 Kc dev.	Fully opened	8 (ratio det pri)	Adjust for maximum amplitude of pattern.*
Grid of 2nd IF Amp V-4 (pin 1, 6AU6)	2.	1000 mmf	10.7 mc ±100 Kc dev.	Fully opened	9 (ratio det sec)	Adjust for symmetrical curve, as shown in Figure 6.
-	3.	-	-	-	-	Repeat steps 1 & 2 for maximum amplitude and best symmetry.
Grid of 1st IF Amp V-3 (pin 1, 6BA6)	4.	1000 mmf	10.7 mc ±100 Kc dev.	Fully opened	10 & 11 (2nd IF sec & pri)	Adjust for maximum amplitude of pattern.*
Grid of conv. V-2 (pin 7, 6BA7)	5.	1000 mmf	10.7 mc ±100 Kc dev.	Fully opened	12 & 13 (1st IF sec & pri)	Adjust for maximum amplitude of pattern.*
Grid of conv. V-2(pin 7, 6BA7)	6.	1000 mmf	10.7 mc ±100 Kc dev.	Fully opened	10, 11 12 & 13	Readjust for maximum amplitude and best symmetry.
	RF ALIGNMENT					
FM terminal 19 on rear of chassis	7.	270 ohms	105 mc ±22½ Kc dev.	105 mc on dial	14 (osc core)	Adjust for maximum amplitude of pattern.*
-	8.	-	-	Fully closed	15 & 16 (RF & ant cores)	Turn counterclockwise until cores are at bottom of pipe, then turn two turns clockwise.
FM terminal 19 on rear of chassis	9.	270 ohms	90 mc ±22½ kc dev.	Tune in signal	17 & 18 (RF & ant tuning plugs)	Adjust for maximum amplitude of pattern.*
FM terminal 19 on rear of	10.	270 ohms	105 mc ±22½ kc dev.	Tune in signal	15 & 16 (RF & ant cores)	Adjust for maximum amplitude of pattern.*
-	11.	-	-	-	-	Repeat steps 9 & 10 until no further adjustment is necessary.

An output meter across the speaker voice coil will also indicate maximum amplitude. It should not be used in place of the scope, however, since it will not show symmetry of the curve.

MODELS 16VF8B, 16VF8R
Ch. HS-211; 19F1,
19F1B, Ch. HS-230

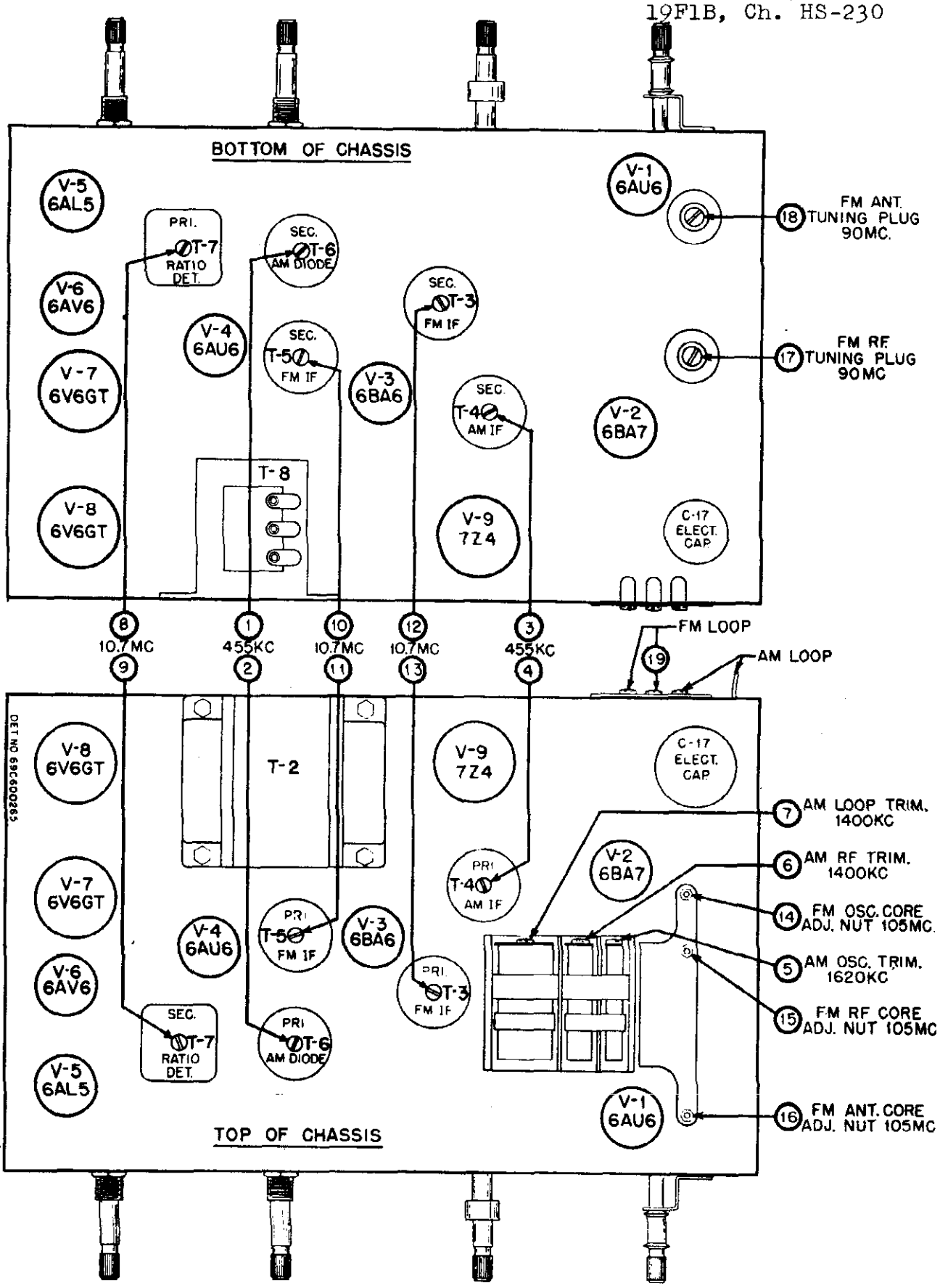


FIGURE 4. TUBE & TRIMMER LOCATIONS

MODELS 16VF8B, 16VF8R,
Ch. BS-211; 19F1,
19F1B, Ch. BS-230

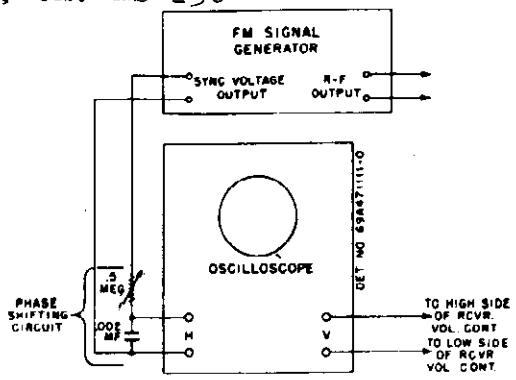


FIGURE 5.

FM SIGNAL GENERATOR & OSCILLOSCOPE HOOK-UP

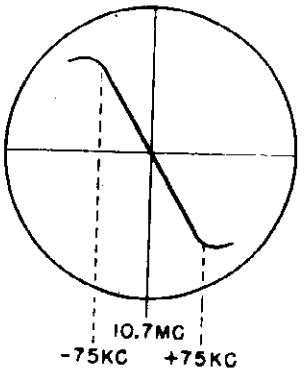


FIGURE 6.

RATIO DETECTOR WAVEFORM

FM BAND - IF & RF ALIGNMENT (ALTERNATE METHOD)

1. The following procedure for FM alignment, with an unmodulated carrier generator and a DC electronic voltmeter, is not as desirable as the preceding method; but it may be used if no FM generator is available.

2. Connect the signal generator as in chart below, with no modulation.

3. Set the bandswitch to the FM position.

4. Except in step 2 below, connect the electronic voltmeter across resistor R-21 (33K) in the ratio detector stage.

5. Throughout alignment reduce the signal generator output to a value which produces no more than a 5 volt rise above no signal voltage, to avoid overloading the receiver.

6. In step 2 below, connect two 100K ohm resistors in series across R-21. Connect the electronic voltmeter between the volume control side of resistor R-17 (47K) and the junction of the two 100K resistors, with the low side of the meter at the 100K resistors.

7. Proceed as shown in the following chart.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	1000 mmf	Grid of conv. V-2 (pin 7, 6BA7)	10.7 mc	Fully opened	8, 10, 11, 12 & 13 (IF cores)	Adjust for maximum.
2	1000 mmf	Grid of conv. V-2 (pin 7, 6BA7)	10.7 mc	Fully opened	9 (ratio det sec)	Adjust for zero. (Connect meter as in step 6 above)
RF ALIGNMENT						
3.	270 ohms	FM terminal 19 on rear of chassis	105 mc	105 mc on dial	14 (osc core)	Adjust for maximum.
4.	-	-	-	Fully closed	15 & 16 (RF & ant cores)	Turn counterclockwise until cores are at bottom of pipe, then turn two turns clockwise.
5.	270 ohms	FM terminal 19 on rear of chassis	90 mc	Tune in signal	17 & 18 (RF & ant tuning plugs)	Adjust for maximum.
6.	270 ohms	FM terminal 19 on rear of chassis	105 mc	Tune in signal	15 & 16 (RF & ant cores)	Adjust for maximum.
7.	-	-	-	-	-	Repeat steps 5 & 6 until no further adjustment is necessary.

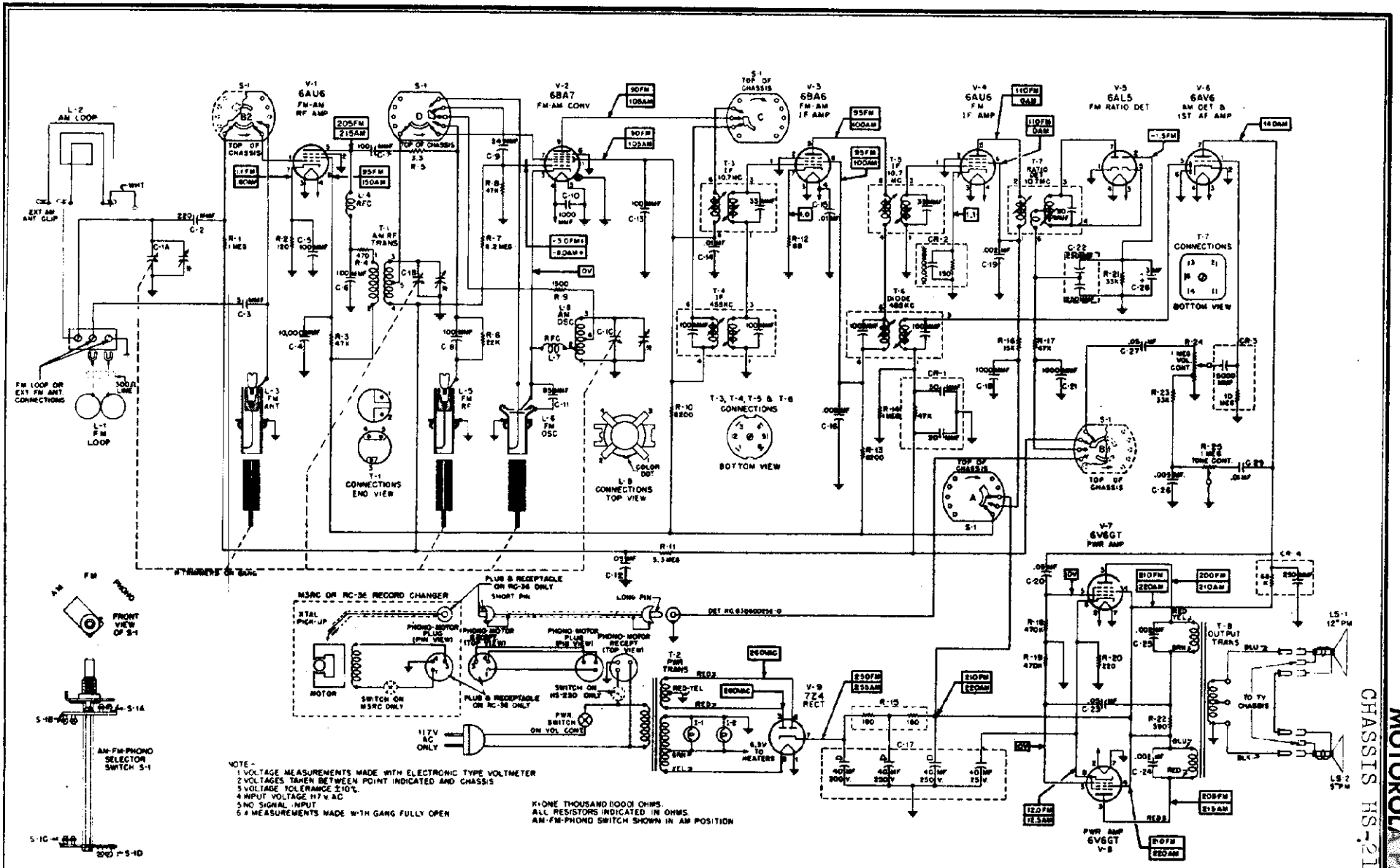


FIGURE 7. SCHEMATIC DIAGRAM

RECORD CHANGER: For Model RC-36, See Pgs. RCD.CH.21-1 through RCD.CH.21-15,16.

MODELS 16VF8B, 16VF8R,
Ch. HS-211; 19F1,
19F1B, Ch. HS-230

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
SPEAKERS		
LS-1	50C791631	Speaker: 12" PM; 3.2 ohm VC
LS-2	50C790701 or 50C791430	Speaker: 5" PM; 3.2 ohm VC..
RESISTORS		
		Note: All resistors are carbon insulated type unless otherwise specified.
R-1	6R6004	1 meg 20% ½W .....
R-2	6R5551	120 10% ½W .....
R-3	6R6048	47,000 10% ½W .....
R-4	6R3949	470 20% ½W .....
R-5	6R490131	3.3 10% ½W .....
R-6	6R6028	22,000 20% ½W .....
R-7	6R5585	8.2 meg 10% ½W .....
R-8	6R6048	47,000 10% ½W .....
R-9	6R6038	1500 10% ½W .....
R-10	6R5725	8200 10% 2W .....
R-11	6R6497	3.3 meg 10% ½W .....
R-12	6R2039	68 10% ½W .....
R-13	6R5725	8200 10% 2W .....
R-14	6R6046	1 meg 10% ½W .....
R-15	17A690973	Wirewound: 360 10% 3W; center tapped .....
R-16	6R6431	15,000 10% 1W .....
R-17	6R6056	47,000 20% ½W .....
R-18	6R6032	470,000 20% ½W .....
R-19	6R6032	470,000 20% ½W .....
R-20	6R6389	220 10% 1W.....
R-21	6R6410	33,000 10% ½W .....
R-22	6R5598	390 10% 1W .....
R-23	6R6012	33,000 20% ½W .....
R-24	18K691192	Volume Control: 1 meg; tapped at 300,000 ohms; includes on-off switch .....
R-25	18K77399	Tone Control: 1 meg .....
SWITCHES		
S-1	40B690977	Band Switch: AM-FM-PHONO.....
S-2	-	On-off Switch (on volume control)
S-3	40A691922	Phono-Radio-Switch; SPST (HS-234)
TRANSFORMERS		
T-1	24B690899	AM RF Transformer .....
T-2	25B691035	Power Transformer .....
T-3	24B690540	1st FM IF Transformer (orange dot): 10.7 mc; complete with capacitor and cores; less shield
T-4	24B482863	AM IF Transformer (brown dot): 455 Kc: complete with capacitors and cores; less shield....
T-5	24B690541	2nd FM IF Transformer (yellow dot): 10.7 mc; complete with capacitor and cores; less shield
T-6	24B482865	AM Diode Transformer (red dot): 455 Kc: complete with capacitors and cores; less shield....
T-7	24B690542	Ratio Detector Transformer: 10.7 mc: complete with capacitors, cores and shield.....
T-8	25B690898	Audio Output Transformer.....

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	19B690978	Variable, 3 gang .....
C-2	21K77375	Ceramic: 220 mmf 500V .....
C-3	21K70720	Ceramic: 5 mmf 500V .....
C-4	21K482726	Ceramic, disc type: 10,000 mmf 450V .....
C-5	21B77286	Ceramic: 100 mmf 500V .....
C-6	21B77286	Ceramic: 100 mmf 500V .....
C-7	21B77286	Ceramic: 100 mmf 500V .....
C-8	21R6554	Mica: 100 mmf 10% 500V .....
C-9	21K28816	Ceramic: 24 mmf 500V .....
C-10	21K478410	Ceramic: 1000 mmf 500V .....
C-11	21K691203	Ceramic: 85 mmf 500V .....
C-12	8R9821	Paper: .05 mf 200V .....
C-13	21B77286	Ceramic: 100 mmf 500V .....
C-14	8R9809	Paper: .01 mf 400V .....
C-15	8R9809	Paper: .01 mf 400V .....
C-16	8R9813	Paper: .005 mf 600V .....
C-17	23B690975	Electrolytic: 40 mf/300V, 40-40 mf/250V, 40 mf/25V..... ....
C-18	21K478410	Ceramic: 1000 mmf 500V .....
C-19	8R9824	Paper: .002 mf 400V .....
C-20	8K470606	Paper: .05 mf 400V .....
C-21	21K478410	Ceramic: 1000 mmf 500V .....
C-22	21B484337	Ceramic: dual; 250-250 mmf/450V.
C-23	8K470606	Paper: .05 mf 400V .....
C-24	8R9824	Paper: .002 mf 400V .....
C-25	8R9824	Paper: .002 mf 400V .....
C-26	8R9813	Paper: .005 mf 600V .....
C-27	8R9821	Paper: .05 mf 200V .....
C-28	23K690543	Electrolytic: 3 mf 50V .....
C-29	8R9809	Paper: .01 mf 400V .....
CAPACITOR-RESISTOR		
CR-1	21K690980	Capacitor-Resistor: 50 mmf-50 mmf 47,000 ohms .....
CR-2	21K680007	Capacitor-Resistor: 10,000 mmf 150 ohms .....
CR-3	21K691125	Capacitor-Resistor: 5000 mmf 10 meg .....
CR-4	21K690979	Capacitor-Resistor: 250 mmf 68,000 ohms .....
DIAL LIGHT		
I-1, I-2	65X11854	Bulb, dial light: #47; 6-8V; .15 amp; clear; bayonet base .....
COILS		
L-1	24K690985	FM Loop antenna: with lead.....
L-2	24C690896	AM Loop antenna .....
L-3	24C690584	Inductor and Capacitor Assembly: FM antenna: less tuning core...
L-4	24A484025	RF choke .....
L-5	24C690584	Inductor and Capacitor Assembly: FM RF; less tuning core .....
L-6	24K690996	Inductor and Capacitor Assembly: FM oscillator; less tuning core
L-7	24K780128	RF choke: insulated .....
L-8	24B690976	AM oscillator coil .....

MODELS 16VF8B, 16VF8R, Ch. HS-211; 19F1, 19F1B, Ch. HS-230

PART NUMBER	DESCRIPTION
CHASSIS PARTS - MECHANICAL	
1X690717	Bracket Assembly, tuning core mtg: includes shoulder rivet and single anti-backlash clip .....
1X691127	Bracket & Pullies Assembly: includes two pullies and shoulder rivet (cord guides on chassis front) .....
7C690567	Bracket, tuner mtg (gang mtg).....
7A77337	Bracket, tuning shaft .....
43K890398	Bushing, line cord retainer (use with 43A890397) .....
43A890397	Bushing, line cord strain relief (use with 43K890398) .....
42A690560	Clip, anti-backlash: double (on tuner mounting brkt) .....
42K690561	Clip, anti-backlash: single (on core mtg brkt) .....
42B482867	Clip, spring: blued finish (holds IF transformer) .....
11M488137	Cord, dial (core drive) .....
11M8944	Cord, dial (pointer drive).....
30K21859	Cord, line: with plug: 9 ft long .....
46B692164	Core, iron and screw: green dot (FM osc tuning core) .....
46K692165	Core, iron and screw (FM RF and ant tuning core) .....
34C690897	Dial scale: glass .....
1X691136	Dial Scale and Plate Assembly: complete with cord pulleys .....
5S7866	Eyelet: .125 x .091; brass; nkl pl (core drive cord retainer).....
1X600081	Link Assembly, bandswitch actuating: complete with bushings; less setscrews
4S9751	Lockwasher, int-ext: #8; cad pl (pointer drive pulley mtg).....
2S7019	Nut, hex: 4-40 x 1/4; cad pl (FM tuning core mtg) .....
2S7051	Nut, hex palnut: 3/8-32 x 9/16; cad pl (bandswitch, tone and volume control mtg) .....
52B481704	Pointer, dial .....
49A21741	Pulley, cord: 3/8" groove (on chassis front) .....
49A73807	Pulley, cord: 1/2" groove (on chassis side and on dial plate) .....
49A26433	Pulley, cord: 21/32" groove (on chassis front) .....
49A690562	Pulley, core drive: brass .....
1K691145	Pulley, pointer drive: 3-1/2" diameter
9K592170	Receptacle, phono pick-up: 1 prong....
9A27674	Receptacle, phono power: 3-prong.....
5S8497	Rivet: .088 x 1/8 stl; nkl pl (single anti-backlash clip mtg) .....
5S7771	Rivet: .088 x 3/16; stl; nkl pl (min and midget tube socket mtg)....
5S7707	Rivet: .122 x 5/32; stl; nkl pl (loctal tube socket, terminal strip, output transformer mtg).....
5S7701	Rivet: .122 x 3/16 stl; nkl pl (power receptacle, ant term strip, and tuning shaft bracket mtg).....
5S7700	Rivet: .122 x 1/4; stl; nkl pl (octal tube socket mtg).....
5K13896	Rivet, shoulder (tuning core cord guide and pulley mtg on front of chassis) .....
5K71246	Rivet, shoulder (pulley mtg on side of chassis and on left side of dial plate) .....
5K481770	Rivet, shoulder (for double pullies on dial plate) .....
3S7462	Screw, machine: 6-32 x 3/16 plain hex head; cad pl (electrostatic shield mtg) .....
3S7326	Screw, machine: 8-32 x 3/16 plain locking hex head; cad pl (gang mtg) .....
3S7163	Screw, machine: 8-32 x 1/4 plain hex head; cad pl (pointer drive pulley mtg) .....
3S2695	Screw, sheet metal: #6 x 3/16 PKZ plain hex head; cad pl (tuner brkt mtg) .....
3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; cad pl (dial plate assembly mtg) .....
3S7475	Screw, sheet metal: #8 x 1/4 PKZ slotted acorn head; cad pl (power trans mtg) .....
3S7103	Setscrew: 8-32 x 1/8 Allen head; cad pl (core drive pulley mtg).....
3S7113	Setscrew: 8-32 x 1/4 slab head; cad pl (bandswitch link assembly mtg).
47A690893	Shaft, bandswitch actuating (HS-211)..
1X691134	Shaft, tuning: complete with pulley...
26K485936	Shield, coil: for IF transformers.....
26A470013	Shield, dial light .....
26K690984	Shield, electrostatic (gang shield)...
26K690981	Shield, tube: spring type .....
26A692080	Shield, tube (for V-9) .....
9K471935	Socket, dial light: includes brkt.....
9A72519	Socket, tube: loctal .....
9A690129	Socket, tube: midget; 7 prong (for V-1)
9K484167	Socket, tube: miniature; 7 prong .....
9A485495	Socket, tube: noval; 9-prong .....
9A76209	Socket, tube: octal .....
41A690598	Spring, coil: 7 turns; cosmoline dipped (FM RF & ant core mtg) .....
41K691840	Spring, coil: 8 turns; copper plated (FM osc core mtg) .....
41A14244	Spring, tension (core & pointer drive cord) .....
41K692081	Spring, tube shield retaining (for V-9 shield) .....
37K21114	Strip, channel: rubber; 1" long (dial scale mtg) .....
31K37504	Strip, terminal: 1 insulated lug; #1 mtg; 3/8" spacing .....
31K51251	Strip, terminal: 1 insulated lug, #1 gnd; 3/8" spacing .....
31K471565	Strip, terminal: 3 insulated lugs, #4 gnd; 3/8" spacing .....
31A690974	Strip, terminal: 7 insulated lugs, #4 & 9 gnd; 3/8" spacing .....
31K471498	Strip, terminal: 3-screw (antenna input) .....
29K5412	Terminal, plain pin (on speaker leads) .....
4A70015	Washer, 'C' (tuning shaft retainer) .....
CABINET PARTS	
39K17396	Contact, pin terminal (in molded phono motor receptacle)(19F1)..
13C791478	Escutcheon, radio dial: brass...
5A71081	Eyelet (radio chassis mtg).....

CHASSIS HS-211,
HS-230, HS-230A

PART NUMBER	DESCRIPTION
5A71092	Grommet, rubber (radio chassis mtg)
14K791482	Insulator, fibre (clamps phono and antenna leads) .....
36B790569	Knob, control: no dot; beige plastic (radio controls) .....
36K791630	Knob, control: with dot; beige plastic (radio controls) .....
1X792530	Lead and Plugs Assembly, phono pick-up (shielded lead with two phono pick-up plugs)(19F1) .....
64D791510	Panel, cabinet back: fibre (covers radio and phono compartments)(16VF8)
64K792522	Panel, cabinet back: fibre (covers radio and phono compartments)(19F1)..
28K71775	Plug, phono pick-up (short plug on phono lead)(19F1) .....
28K22183	Plug, phono pick-up (long plug on phono lead)(19F1) .....
28K30736	Plug, phono motor: 3-pin; includes shell (on phono motor lead).....
9K470402	Receptacle, phono motor: 5-prong; molded; includes contacts (19F1) ....
9A600040	Receptacle, phono motor: 3-prong; includes shell (19F1) .....
3S7536	Screw, sheet metal: #6 x 3/8 PKA slotted acorn head; antique copper finish (cabinet back panel mtg).
3S7534	Screw, sheet metal: #8 x 1-3/8 PKA plain hex head; cad pl (radio chassis mtg) .....
15K74443	Shell, plug (on 28K30736 phono motor plug) .....
15A690616	Shell, receptacle (on 9A600040 phono motor receptacle)(19F1) .....
4S490513	Washer, flat: 3/4 x 7/32 x .042 stl; cad pl (radio chassis mtg)...

GENERAL INFORMATION

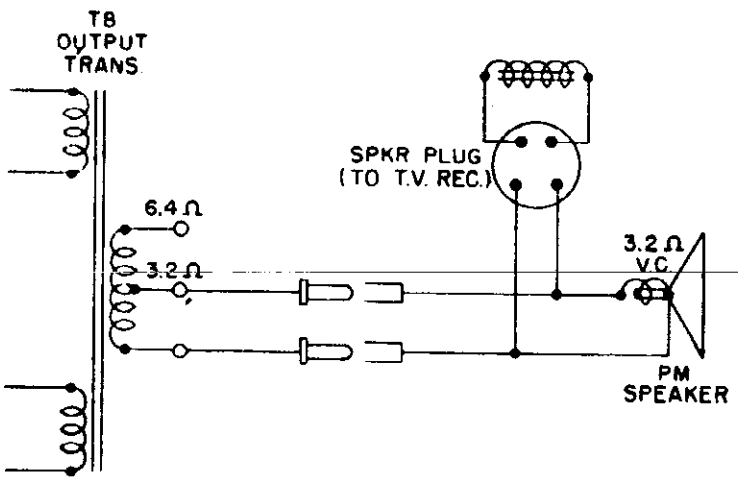
AM-FM radio chassis HS-230A is the same as chassis HS-230 except that the output transformer secondary winding is connected for use with one speaker instead of dual speakers.

SERVICE NOTE

The following service note applies only to television-radio combinations, where both chassis use the same speaker:

One side of the output transformer secondary winding is grounded in some HS-230A chassis. If the leads to the speaker are not correctly polarized, a 60 cycle hum may be induced into the speaker from the power line because of coupling between the radio and TV chassis. This AC hum will be noticed even with both the radio and the TV power switches turned off.

To eliminate the hum, reverse the leads from the radio at the receptacles on the speaker.



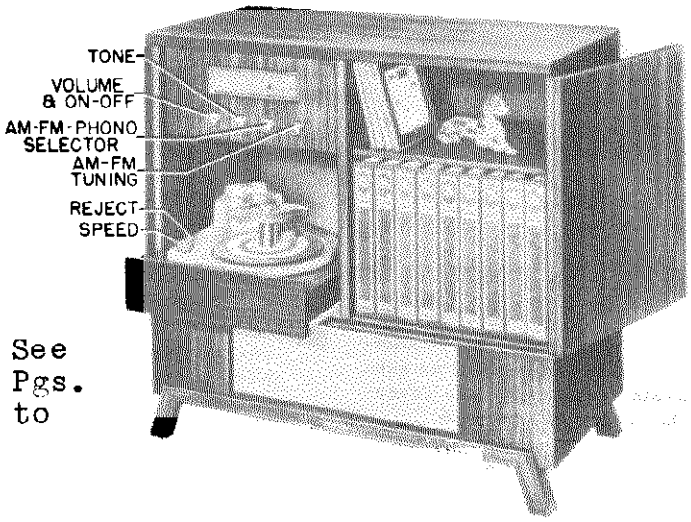
REVISED SPEAKER CIRCUIT IN CHASSIS HS-230A

GENERAL INFORMATION

TYPE - AM-FM Radio-Phonograph Combination

CHASSIS - HS-230A. Refer to HS-230 & HS-230A Service Manual for service information.

PHONOGRAPH - Model RC-37, three-speed; 33, 45 & 78 RPM. Refer to RC-37 Service Manual for record changer service information.



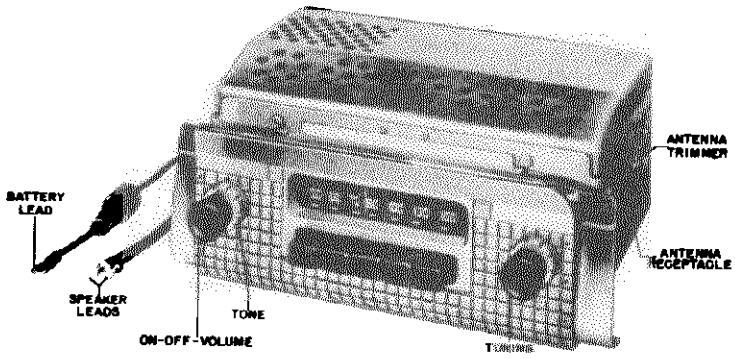
RECORD CHANGER: See Model RC-37, on Pgs. RCD.CH.21-17,18 to RCD.CH.21-29.

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part. For chassis & record changer replacement parts, refer to their respective service manuals.

Part Number	Description
CABINET PARTS	
16F610008	Cabinet, console: red-brn mahogany; complete, less escutcheon, loop antennas, and speaker.....
55B72307	Catch, bullet: statuary bronze finish (door latch on cabinet)...
13K700763	Cloth, grille: 22-5/8 x 7-5/8; mahogany & gold.....
15D610006	Cover, cabinet back.....
13B72750	Escutcheon, dial.....
5A71081	Eyelet, chassis mtg: plain; 9/32" long.....
5A600963	Eyelet, chassis mtg: pierced; 1/8" long.....
5A71092	Grommet, chassis mtg.....
55K790566	Handle, door: brass plated.....
55K791499RH	Hinge, stop: statuary bronze finish (upper right & lower left).....
55K791499LH	Hinge, stop: statuary bronze finish (upper left & lower right).....
36C701150	Knob, control.....
1X601844	Lead Assembly, phono motor: complete
1X601843	Lead & Plug Assembly: phono pick-up (includes shielded lead and plugs)
62K70581	Logotype: "Motorola"; gold finish.
24C690896	Loop Antenna, AM.....
24C482890	Loop Antenna, FM; with lead.....
55C790564	Plate, door: brass plated.....
28K22183	Plug, phono pick-up.....
28A27573	Plug, phono motor: 3-pin.....
9A600040	Receptacle, phono motor: 3-prong..
3K791011	Screw, machine: 8-32 x 1-1/4; oven head cross slot (door pull mtg)
3S7526	Screw, sheet metal: #8 x 1-1/8; plain hex head (chassis mtg)..
15A690616	Shell, receptacle: with insulator (phono motor receptacle).....
15K74442	Shell, receptacle: with insulator (phono motor plug).....
50C610000	Speaker, PM: 6" x 9" oval.....
55K72308	Strike, bullet: statuary bronze finish; with 1/2" nail (door latch on door).....
55K601672	Track & Channel, record changer drawer.....
4S490513	Washer, flat: 3/4 x 7/32 x .042 cad pl (chassis mtg).....

MODEL KR1,
Ch. 1A



TYPICAL RECEIVER USING CHASSIS 1A.
MODEL KR1 ILLUSTRATED

GENERAL INFORMATION

TYPE - Automotive type universal radio chassis. In addition to Model KR1, this chassis will be used on subsequent models. Separate service manuals covering these models will be issued as required.

TUNING RANGE - 540 to 1600 Kc IF - 455 Kc

TUBE COMPLEMENT -

6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Diode, detector, AVC & 1st AF Amp
6AQ5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 6.8 amps at 6.3V DC

POWER OUTPUT - 3.5 watts (max)

TUNER - Model AT-86 or AT-90. See AT-86 or AT-90 Service Manual for Replacement Parts.

OPERATING INSTRUCTIONS

TO TURN RADIO "ON"

The On-Off switch is combined with the volume control. Turn the knob clockwise until a "click" indicates the receiver is "on". Wait a few seconds for the tubes to heat up, before tuning-in a station.

STATION SELECTOR

Turn the volume "up" until stations can be heard; then turn the station selector knob until the desired station is received. After station is tuned in properly, adjust the volume control to the desired level.

SET AUTOMATIC TUNING

The receiver has 5 buttons for automatic station selection. To set the push buttons on automatic tuning, proceed as follows:

1. Turn volume up until stations can be heard.

2. Pull out button to unlock tuner and with the station selector, tune to the station desired.

3. Push button in to lock tuner. This station is now set for automatic tuning.

4. Follow the same procedure for the remaining four buttons.

NOTE: The numbers on the dial scale indicate the frequency range of the receiver. Tune carefully until you are exactly on the station; tuning to either side of it will result in poor tone quality and excessive noise. When setting automatic tuning, it is preferred that the left-hand buttons tune in the lower KC stations and the right-hand buttons tune in the higher KC stations.

TO TURN THE RADIO "OFF"

Turn the volume knob counterclockwise until a "click" indicates that the receiver is "off".

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 2.

PROCEDURE:

1. To expose the alignment adjustments, remove the top and bottom covers. If the tuner cores require adjustment, remove the escutcheon and dial scale bracket assembly.

2. Connect a PM speaker (3.2 ohm VC) to "VC" and "GND" terminals of the receiver.

3. Connect an output meter across the speaker voice coil.

4. Connect 6.3 volts to the receiver "A" lead terminal and chassis.

5. Turn the receiver "on" and allow it to warm up for a few minutes. Set receiver volume control at maximum and tone control to "high" position.

6. For greatest accuracy, keep the output of the receiver at 1 watt (1 watt = 1.79 volts on output meter) by reducing signal generator output (not receiver volume control) as stages are brought into alignment.

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.

7. 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 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.

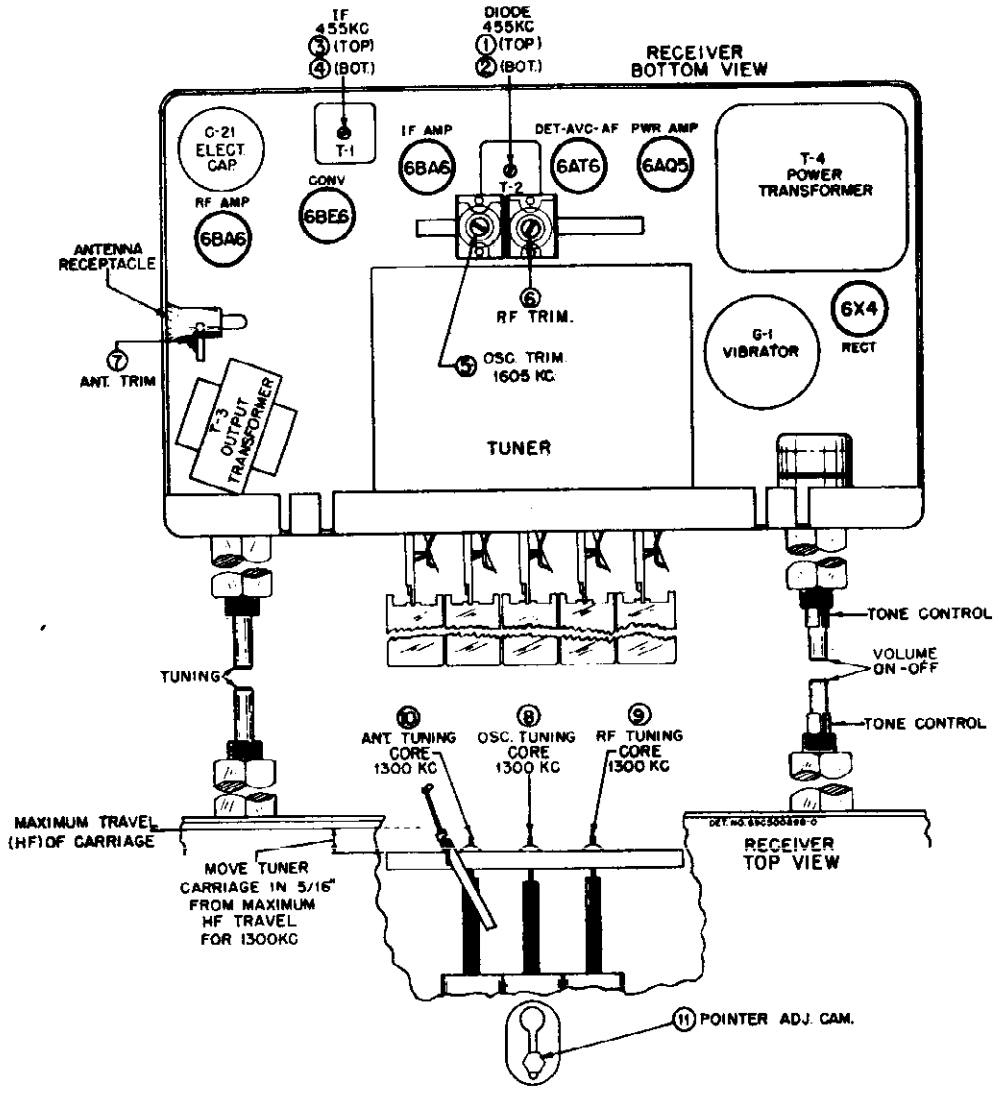


FIGURE 1. TUBE AND TRIMMER LOCATIONS

MODEL KR1,
Ch. 1A

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Hi side -6BE6 grid (pin #7) Low side-chassis	455 kc	Extreme high frequency end of travel	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating procedure.
RF ALIGNMENT						
	NOTE: If the tuner is tracking properly over its entire range, the tuner cores 8, 9, & 10 will not require adjustment - proceed as follows:					
2.	Dummy-see Fig. 1	Ant. receptacle thru dummy antenna	1605 kc	Extreme high frequency end of travel	5	Peak for maximum.
3.	"	"	1300 kc	With tuning knob, tune to maximum signal	6 & 7	Peak for maximum in order indicated.
4.	-	-	-	-	-	Repeat steps 2 & 3.
	NOTE: If the tuner coils or cores have been replaced or tampered with, or the tuner does not cover the required range, the tuner cores 8, 9, & 10 require adjustment - proceed as follows:					
5.	Dummy-see Fig. 1	Ant receptacle thru dummy antenna	1605 kc	Extreme high frequency end of travel	5, 6, & 7	Remove escutcheon and dial scale bracket. Peak for maximum in order indicated.
6.	"	"	1300 kc	With tuning knob, move carriage "in" 5/16" from position in step 5.	8, 9, & 10	Peak for maximum in order indicated.
7.	"	"	1605 kc	With tuning knob, tune for maximum signal at high frequency end.	5, 6, & 7	Peak for maximum in order indicated.
8.	"	"	1300 kc	With tuning knob, tune to maximum signal	8, 9, & 10	Peak for maximum in order indicated.
9.	-	-	-	-	-	Repeat step 7.

POINTER ADJUSTMENT

10. Tune receiver to 1300 kc and adjust pointer by means of eccentric cam (11) on the tie plate to the 1300 kc calibration mark on dial scale.

11. With set installed in car, peak ant trim (7) for maximum signal at approximately 1400 kc. Car antenna should be fully extended.

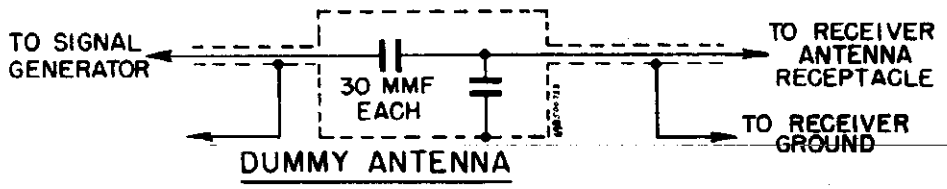


FIGURE 2. DUMMY ANTENNA DETAIL

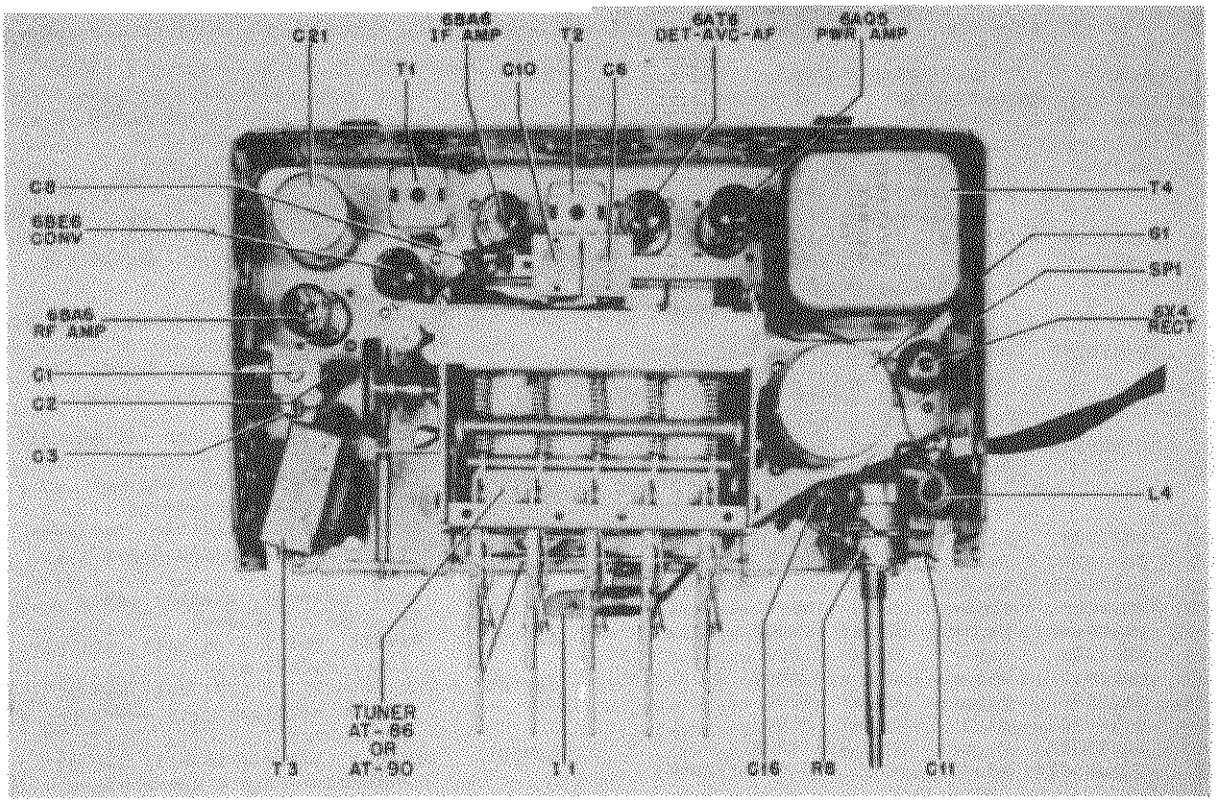


FIGURE 3. TOP VIEW OF CHASSIS

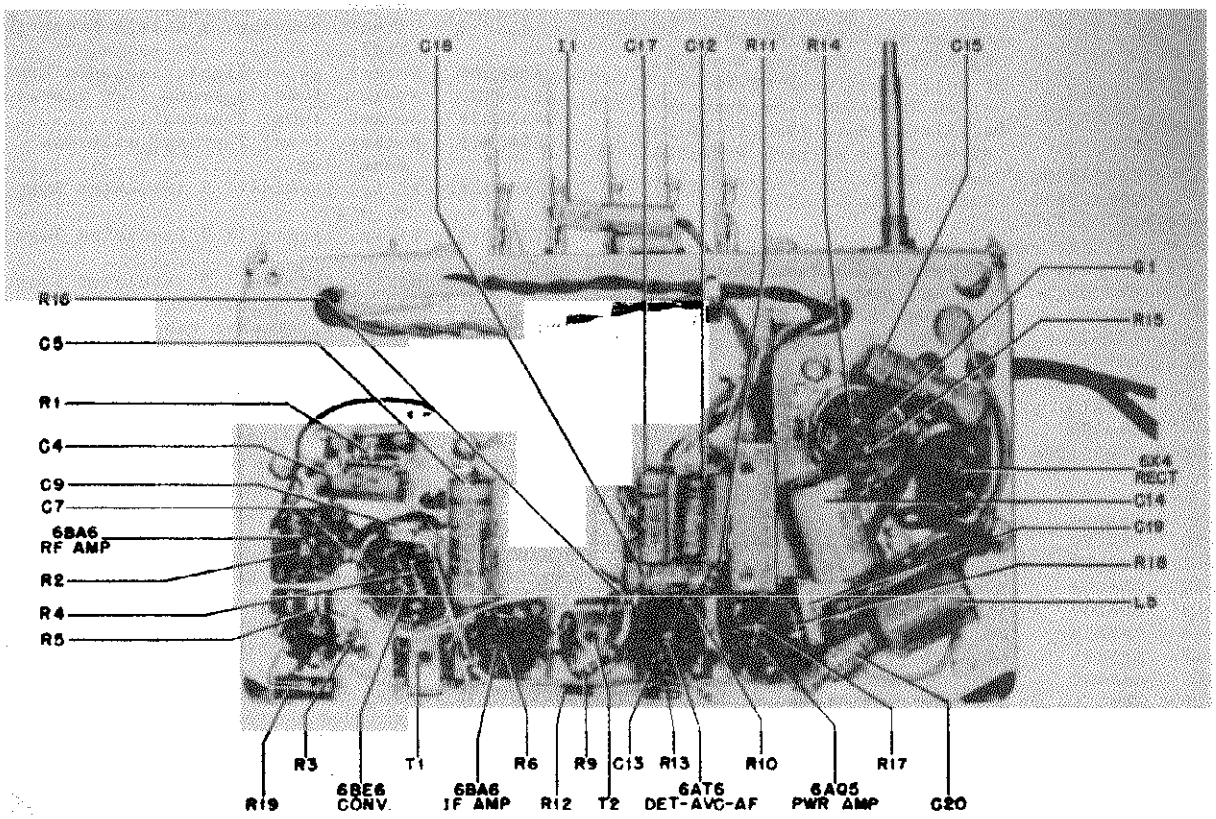


FIGURE 4. BOTTOM VIEW OF CHASSIS

MODEL KR1,
Ch. 1A

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref No.	Part Number	Description
CHASSIS 1A ELECTRICAL PARTS		
Capacitors		
C-1	21A591682	Mica, metal: 90 mmf 500V...
C-2	8A4529	Paper: .006 mf 100V .....
C-3	20A501419	Mica, variable: 50 to 280 mmf; includes bracket .....
C-4	8R13514	Paper: .05 mf 100V .....
C-5	8R13166	Paper: .1 mf 400V .....
C-6	-	Variable, mica: RF trimmer (See AT-86 or AT-90 Service Manuals) .....
C-7	21K70720	Molded, miniature: 5 mmf 500V
C-8	-	Ceramic: temperature compensating (See AT-86 or AT-90 Tuner Service Manuals).....
C-9	21R6513	Mica: 50 mmf 500V .....
C-10	-	Variable, mica: osc trimmer (See AT-86 or AT-90 Tuner Service Manuals) .....
C-11	8K17028	Paper: .5 mf 100V .....
C-12	8R472754	Paper: .01 mf 100V .....
C-13	21K70720	Molded, miniature: 5 mmf 500V
C-14	8K17028	Paper: .5 mf 100V .....
C-15	8R490449	Paper: .02 mf 1000V .....
C-16	8R51209	Paper: .02 mf 100V .....
C-17	8K71910	Paper: .006 mf 400V .....
C-18	8R23690	Paper: .01 mf 400V .....
C-19	21R6590	Mica: 500 mmf 500V .....
C-20	8K71909	Paper: .004 mf 400V .....
C-21	23A485677	Electrolytic: 15-10 mf/350V; 20 mf/25V .....
Fuse		
F-1	65K16248	9 amp .....
Vibrator		
G-1	48B3333	Vibrator, non-sync 4-pin ..
Pilot Light		
I-1	65X10867	Bulb: 6.3V .25A .....
Coils		
L-1	-	Antenna coil (See AT-86 or AT-90 Tuner Service Manuals)
L-2	-	RF coil (See Tuner AT-86 or AT-90 Tuner Service Manuals)
L-3	-	Oscillator coil (See AT-86 or AT-90 Tuner Service Manuals)
L-4	24K592269	Choke, hash .....
L-5	24A472535	Choke, hash .....
Resistors		
	Note:	All resistors are carbon insulated type, unless otherwise specified.
R-1	6R6032	470,000 20% 1/2W.....
R-2	6R3992	150 20% 1/2W .....
R-3	6R6075	100,000 20% 1/2W ....
R-4	6R6012	33,000 20% 1/2W .....
R-5	6R476012	3900 10% 2W .....
R-6	6R6010	330 20% 1/2W .....
R-7	6R6394	12,000 10% 1/2W .....
R-8A,B	18B501206	Volume-On-Off-Tone Control (R-8A 250,000 ohms; R-8B 1 meg) .....
R-9	6R6056	47,000 20% 1/2W .....
R-10	6R2122	4.7 meg 20% 1/2W .....
R-11	6R5577	2700 10% 1/2W .....
R-12	6R6004	1 meg 20% 1/2W .....
R-13	6R6004	1 meg 20% 1/2W .....
R-14	6R5614	56 10% 1/2W .....
R-15	6R5614	56 10% 1/2W .....
R-16	6R6032	470,000 20% 1/2W .....
R-17	6R6015	220,000 20% 1/2W .....
R-18	6R6336	270 10% 1W .....
R-19	6R476130	2200 20% 2W .....
Spark Plate		
SP-1	1A501207	Spark Plate Assembly .....
Transformers		
T-1	24B485553	IF Transformer, 455 kc: complete with padding capacitor and tuning cores .....
T-2	24B485555	Diode Transformer, 455 kc: complete with padding capacitor and tuning cores .....
T-3	24B500727	Output Transformer .....
T-4	25B472533	Power Transformer .....
Tuner - Model AT-86		
	51D501442	Tuner, Model AT-86: complete with pinion shaft (See AT-86 Tuner Service Manual for breakdown) .....
OR		
Tuner - Model AT-90		
	51D502000	Tuner, Model AT-90: complete with pinion shaft (See AT-90 Tuner Service Manual for breakdown) .....
CHASSIS 1A MECHANICAL PARTS		
	7B501472	Bracket, shield (near vib socket)
	42A485548	Clip, coil can mtg .....
	42B500725	Clip, bottom cover retainer ...
	42A4215	Clip, vibrator grounding .....
	1X500714	Cover Assembly, bottom: includes clips and grounding wiper .....
	5C500663	Cover, top .....
	1X501612	Lead Assembly, speaker cable ...
	9A472148	Receptacle, antenna .....
	5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg).....
	5S7706	Rivet: .122 x 1/8; stl; nkl pl (cover retainer clip and terminal strip mtg) .....
	5S7701	Rivet: .122 x 3/16 stl; nkl pl (vibrator clip & spark plate mtg) .....
	5S7707	Rivet: .122 x 5/32; stl; nkl pl (output transformer & capacitor mtg) .....
	3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; stl; cad pl (pwr trans, housing, & shield bracket mtg) .....
	9A500709	Socket, pilot light: includes brkt.
	9A70208	Socket, tube: 4-prong (for vibrator)
	9A472534	Socket, tube: 7-prong .....
	9K580218	Socket, tube: 7-prong; with one dummy lug .....
	31K490142	Strip, terminal: 2 insulated lugs, #1 mtg .....
	31K490143	Strip, terminal: 2 insulated lugs, #2 mtg .....
	31A500705	Strip, terminal: 3 insulated lugs, #2 mtg .....
	29A76280	Terminal, speaker cable: black.
	29K76282	Terminal, speaker cable: white..
	39K470032	Wiper, grounding (bottom cover).
RECEIVER KR1 - MOUNTING PARTS, ACCESSORIES		
	7B501170	Bracket, dial background .....
	7C501187	Bracket, dial mtg .....
	7D501138	Bracket, radio mtg .....
	43A501167	Bushing, tuning and volume control mtg .....
	1X501247	Button, push .....
	8A4491	Capacitor, noise suppression .....
	42A591931	Clip, dial glass retaining .....
	32B501170	Gasket, speaker .....
	36K592304	Knob, dummy: notched disc; chrome pl
	36B473538	Knob, tone control: notched disc; chrome pl .....
	36K501199	Knob, tuning and volume control: includes setscrew .....
	4S7658	Lockwasher: #10 int; stl; cad pl (speaker mtg) .....
	4S7668	Lockwasher: 3/8 ext; stl; cad pl (tuning and volume control mtg) .....
	4S7653	Lockwasher: 5/16 int-ext; stl; cad pl (receiver mtg) .....

4S7690	Lockwasher: 5/16 ext; stl; cad pl (receiver mtg) .....
2S7003	Nut, hex: 8-32 x 5/16; stl; cad pl (speaker mtg) .....
2S2869	Nut, hex: 7/16-28 x 9/16; pol nkl (overlay mtg) .....
2S2863	Nut, hex: 5/16-18 x 9/16; stl; cad pl (receiver mtg) .....
13D501171	Overlay, instrument panel: chrome pl
64C501135	Plate, front cover .....
1X501249	Plate and Gasket Assembly, spkr....
1X501245	Pointer and Sleeve Assembly .....
1X501252	Receptacle, fuse and lead: complete
9K580650	Receptacle, fuse .....
34B501134	Scale, dial .....
3S400346	Screw, machine: 5/16-18 x 2-1/2; plain hex head; stl; cad pl (receiver mtg brkt mtg) .....
3S7487	Screw, sheet metal: 8-32 x 5/16; plain hex head; stl; cad pl (front plate to tuner mtg) .....
3S7454	Screw, sheet metal:#8 x 1/4; PKZ; plain hex head; stl; cad pl (dial background bracket mtg, dial brkt mtg, receiver mtg brkt mtg, front plate mtg) .....
3S7104	Setscrew: 8-32 x 3/16; slotted headless; stl; cad pl (control knob retainer) .....
51D501253	Shaft and Bushing Assembly, manual drive (complete) .....
51A501042	Shaft and Drive Disc Assembly, pinion (complete) .....
50B501989	Speaker, PM: 6" x 6"; 3.2 ohm VC
41A77592	Spring, compression (behind control knob) .....
6A4141	Suppressor, distributor .....
4A501015	Washer, "C" (tuning shaft bushing retainer) .....
4S400351	Washer, flat: 1/8 x .328 x .067 thick; stl; cad pl (recvr mtg)

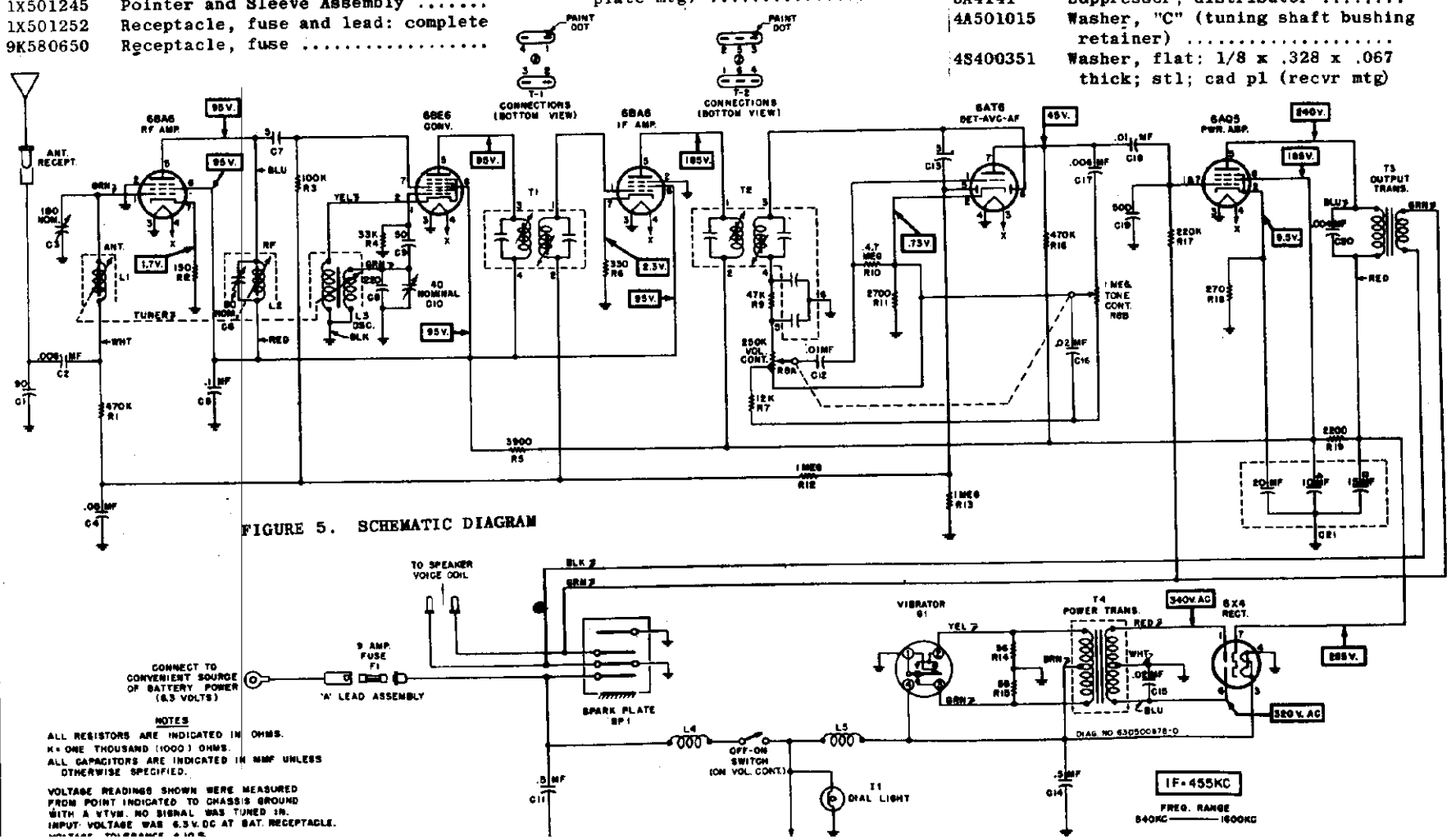


FIGURE 5. SCHEMATIC DIAGRAM

NOTES

ALL RESISTORS ARE INDICATED IN OHMS.
K= ONE THOUSAND (1000) OHMS.
ALL CAPACITORS ARE INDICATED IN MMF UNLESS OTHERWISE SPECIFIED.

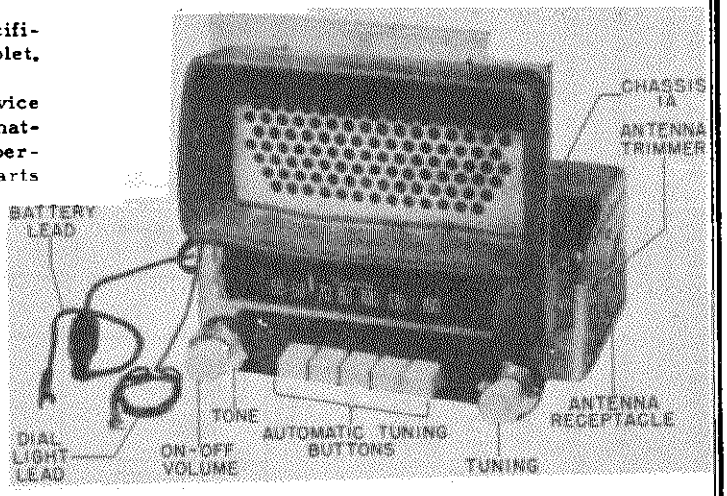
VOLTAGE READINGS SHOWN WERE MEASURED FROM POINT INDICATED TO CHASSIS GROUND WITH A VTVM. NO SIGNAL WAS TUNED IN. INPUT VOLTAGE WAS 6.3 V. DC AT BAT. RECEPTACLE.

MODEL CT1, Ch. 1A,
Chevrolet

GENERAL INFORMATION

TYPE - Automotive type superheterodyne receiver specifically designed for installation in the 1951 Chevrolet.

CHASSIS USED - Chassis 1A. Refer to Chassis 1A Service Manual, Part No. 54P501584 for schematic, alignment, push button set-up, operating instructions, and replacement parts list.



INSTALLATION INFORMATION

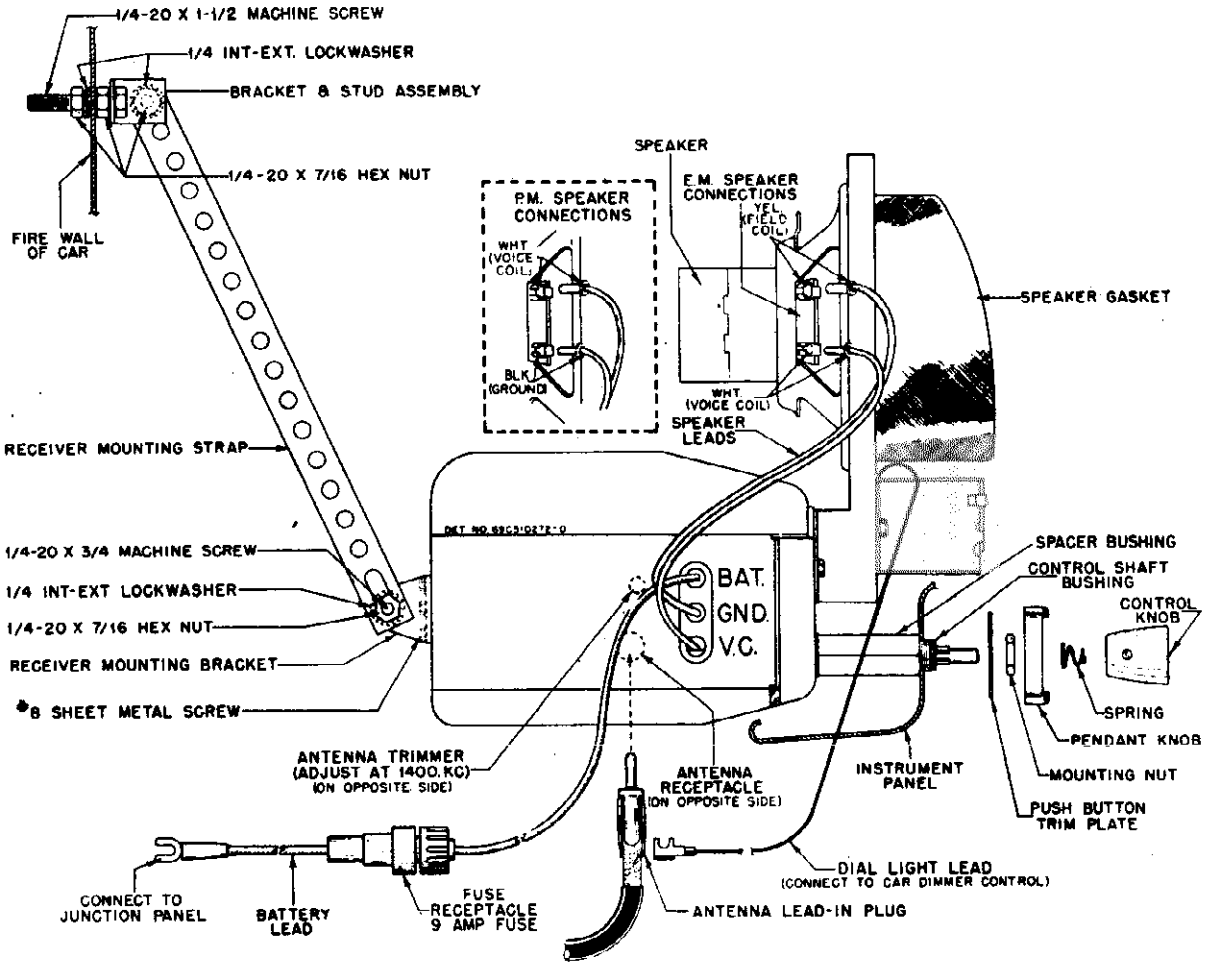


FIGURE 1. RECEIVER INSTALLATION DETAIL

INSTALL DISTRIBUTOR SUPPRESSOR

Cut the high tension lead, which runs from the center terminal of the car distributor to the ignition coil, approximately 1-1/2 inches from the distributor. See Figure 2. Screw the distributor suppressor in series with the two pieces of high tension wire, and plug the end terminal of the lead into the center receptacle of the distributor.

INSTALL CAPACITOR ON GENERATOR

Mount the noise suppression capacitor (Motorola Part Number 8A4491) on the generator frame, under the ground lead screw. See Figure 3. Connect the capacitor lead to the armature terminal of the generator. WARNING: DO NOT CONNECT THE CAPACITOR LEAD TO THE FIELD TERMINAL.

ADDITIONAL MOTOR NOISE HINTS

1. When checking the car for motor noise, clamp the hood down tight.
2. Hood Bonds (Motorola Part Number 39A4205) ma be installed at the shoulders so that the hood makes a goo ground to the cowl of the car.

TIRE STATIC

After completion of radio installation, road test car fo tire static on dry concrete and blacktop pavements, unde the following conditions:

1. At both low and high car speeds.
2. With antenna extended to operating position.
3. With radio at full volume and tuned off station.

If tire static noise is encountered, inject Tire Stati Elimination Powder (available in kit form -Motorola Pa No. 51B591494) into tires, following instructions given o the package.

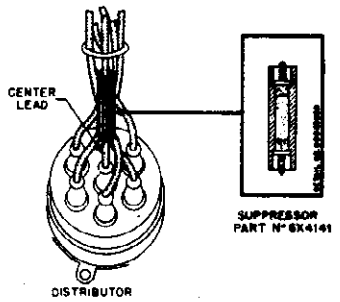


FIGURE 2. DISTRIBUTOR SUPPRESSOR INSTALLATION

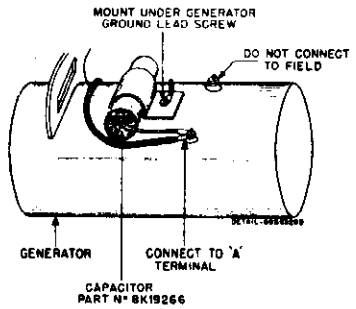


FIGURE 3. GENERATOR CAPACITOR INSTALLATION

REPLACEMENT PARTS LIST

For Chassis replacement parts, refer to Chassis 1A Service Manual.

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Part Number	Description
7B510025	Bracket, dial background.....
7C510040	Bracket, dial scale mtg.....
7A472857	Bracket, receiver mtg (on rear of set).....
7A484424	Bracket and Stud Assembly, receiver mtg.....
43K510047	Bushing, tuning shaft and volume control mtg.....
1X510098	Button, push: complete.....
8A4491	Capacitor, noise suppression.....
42A500196	Clip, dial scale mtg.....
32C510039	Gasket, speaker.....
36K592302	Knob, dummy: chrome pl (behind tuning knob).....
36K473550	Knob, tone: chrome pl.....
36K510051	Knob, tuning and volume: includes setscrew.....
9K510086	Lead Assembly fuse: complete with fuse.....
4S7668	Lockwasher, ext: 3/8; stl; cad pl (tuning and volume control mtg)
4S7688	Lockwasher, int-ext: ¼; stl; cad pl (receiver mtg).....
2S2878	Nut, hex: ¼-20 x 7/16; stl; cad pl (receiver mtg).....
1X510555	Plate, front: includes wiper (tuner mtg - for AT-90).....
64B510022	Plate, push button trim.....
1X510092	Pointer.....
34B510021	Scale, dial.....
3S2956	Screw, machine: ¼-20 x 3/4 plain hex head; stl; cad pl (receiver mtg).....
3S9694	Screw, machine: ¼-20 x 1½ plain hex head; stl; cad pl (receiver mtg).....
3S488298	Screw, sheet metal: #8 x ¼ slotte hex head; stl; cad pl (mtg brkt - rear).....
3S8176	Screw, sheetmetal: #10 x 3/8; s cad pl (speaker mtg).....
3S7104	Setscrew: 8-32 x 3/16; headless: stl; cad pl (knobs).....
51B502001	Shaft Assembly, manual drive: com plete.....
51A502012	Shaft and Drive Disc Assembly: wit pinion on one end (for AT-90)....
1X510096	Shield and Crystal Assembly, light
9A510075	Socket, pilot light: with bracket
41A77592	Spring, compression (behind contro knobs).....
50B510063 or 50B510577	Speaker, PM: 5 x 7; 3.2 ohm VC Speaker, EM: 5 x 7; 3.2 ohm VC
1X511064	Speaker Plate & Gasket Assembly: less speaker.....
42A485718	Strap, receiver mtg.....
6A4141	Suppressor, distributor.....
42A510531	Wiper, spring (on front plate)..

MODEL NH1C, 1951
Nash Rambler

GENERAL INFORMATION

TYPE - Specifically designed for installation in the 1951 Nash (Rambler Series cars only).

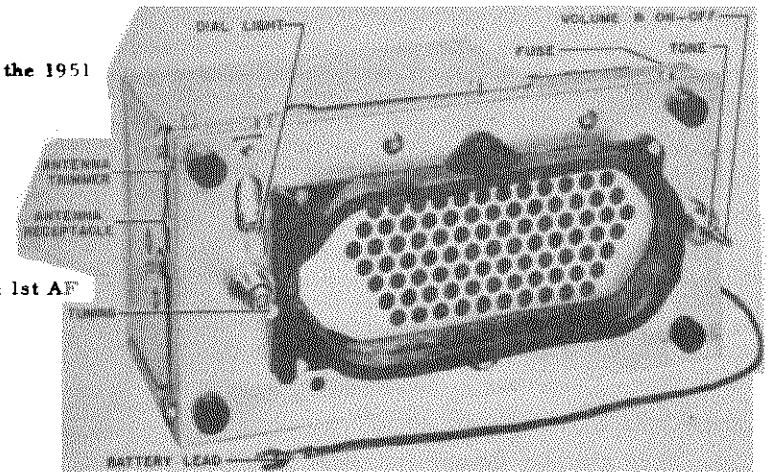
TUNING RANGE - 540 to 1600 Kc

IF FREQUENCY - 455 Kc

TUBE COMPLEMENT - 6BE6 - Converter
6BA6 - IF Amplifier
6AV6 - Detector, AVC & 1st AF Amplifier
6AS5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 5.0 amps at 6.3V DC

POWER OUTPUT-2 watts (maximum)



OPERATING INSTRUCTION

VOLUME CONTROL & ON-OFF SWITCH. The volume control and on-off switch are combined and are operated with the inner right-hand knob. Turn radio on by turning knob to the right until a "click" is heard. Continued rotation to the right will increase volume. To turn radio off, turn knob fully to left until "click" is heard.

TONE CONTROL. The outer right-hand knob operates the tone control.

TUNING. Tune stations with the left-hand knob. Always tune carefully until you are exactly on the station; tuning to either side of it will result in poor tone quality.

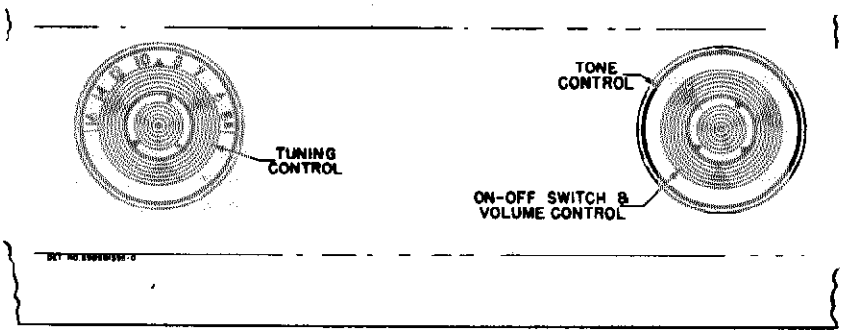


FIGURE 1. OPERATING CONTROLS

SERVICE NOTES

TO REPLACE TUBES. To replace tubes, it will be necessary to remove radio from car. Proceed as follows:

1. Disconnect "A" lead from car terminal located behind instrument panel.
2. Remove antenna plug from antenna receptacle located on left side of radio.
3. Pull off control knobs and pointer.
4. Remove two nuts, two washers and dial scale assembly.
5. Remove radio from behind instrument panel.
6. Remove large cover from radio to expose tubes.

RADIO NOISE SUPPRESSION. A capacitor installed on the car generator, a capacitor on the ignition coil, and a suppressor in the car's ignition system distributor circuit, eliminate motor noise from these sources.

TO REPLACE VIBRATOR OR FUSE. The plug-in type vibrator and radio fuse are accessible from the rear of the instrument panel. Should those require replacement, it is only necessary to pull out old vibrator or fuse and plug in a new one.

MODEL NH1C, 1951
Nash Rambler

ALIGNMENT

EQUIPMENT REQUIRED

1. A small screwdriver for IF and RF alignment.
2. An accurately calibrated 400 cycle, AM modulated signal generator.
3. A low range output meter.
4. A special dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 2.

PROCEDURE

1. All adjustments are accessible without removing the covers, through holes provided.

2. Connect an 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.

4. For greatest accuracy, keep output of receiver at approximately 1/2 watt (1/2 watt = 1.25 volts on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Hi side -6BE6 grid (pin #7) Lo side-chassis	455 Kc	High freq. end	1, 2 3 & 4	Peak for maximum in order indicated. Check by repeating procedure.
RF ALIGNMENT						
2.	Special-see Figure 2	Ant receptacle through special dummy	1605 Kc	Gang open	5	Peak for maximum.
3.	"	"	1400 Kc	Tune in signal	6	Peak for maximum.
4.	"	"	600 Kc	"	7	Peak antenna padder for maximum while rocking gang.

5. Repeat steps 3 & 4 until maximum output is obtained. The last adjustment should be trimmer (6).

6. With set installed in car, peak antenna trimmer (6) for maximum noise or volume of a weak station. Car antenna should be fully extended.

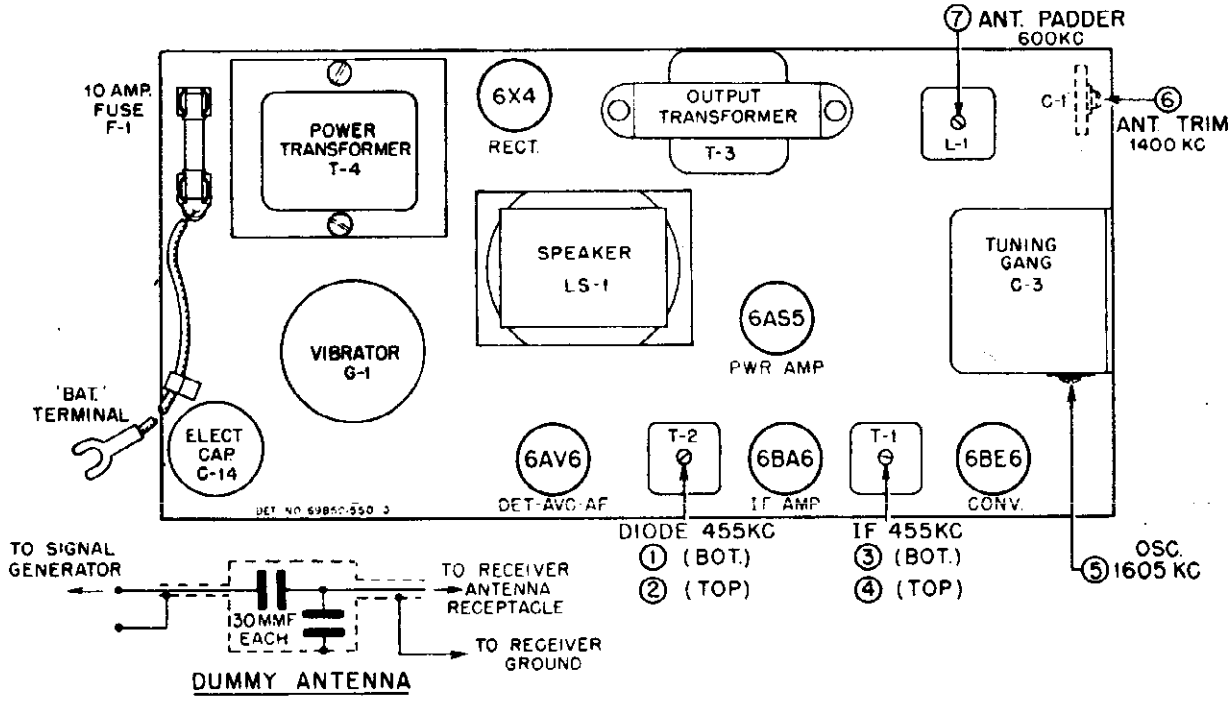


FIGURE 2. TUBE & TRIMMER LOCATION AND DUMMY

MODEL NH1C, 1951
Nash Rambler

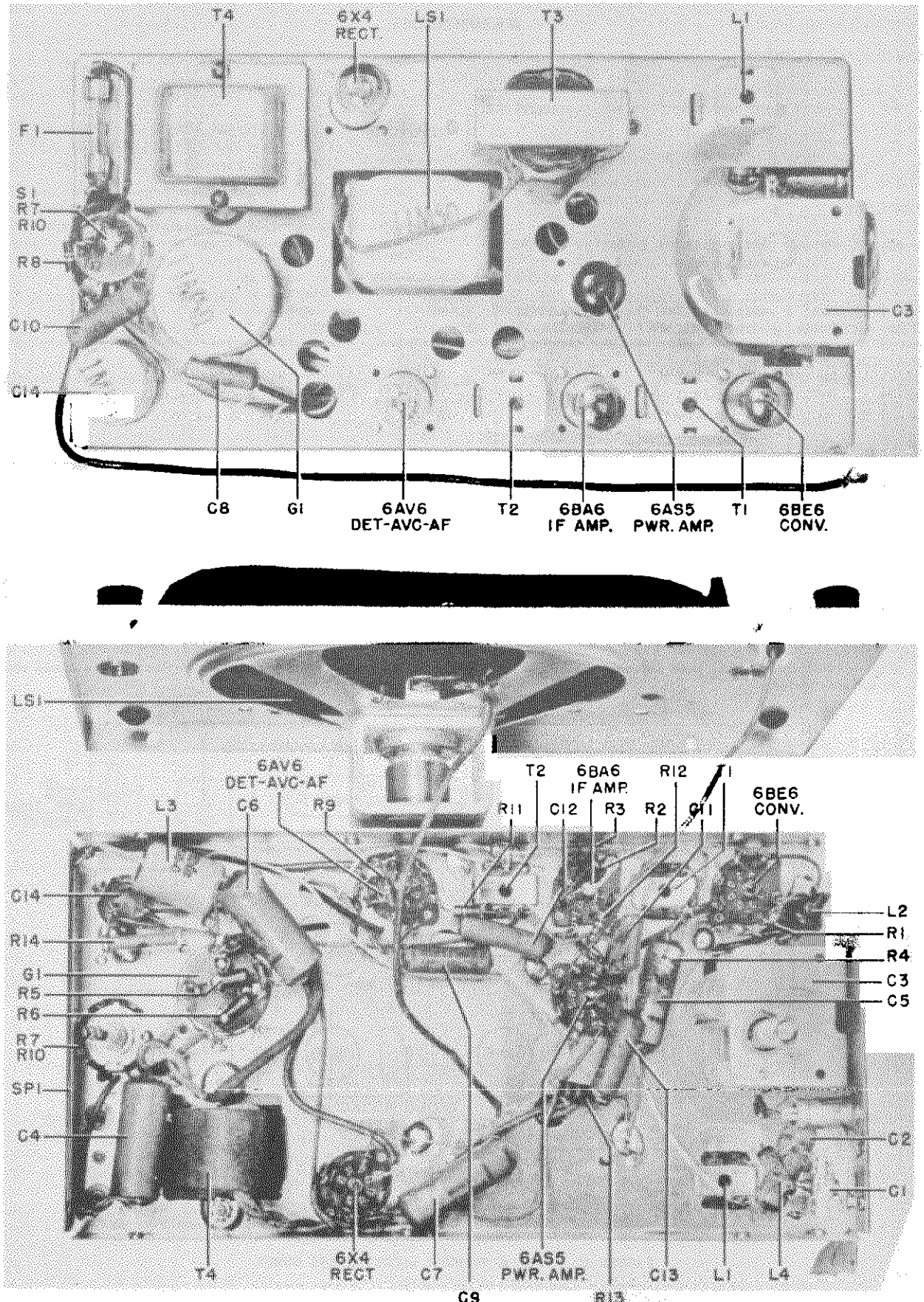


FIGURE 3. PARTS LOCATION

MODEL NH1C, 1951
Nash Rambler

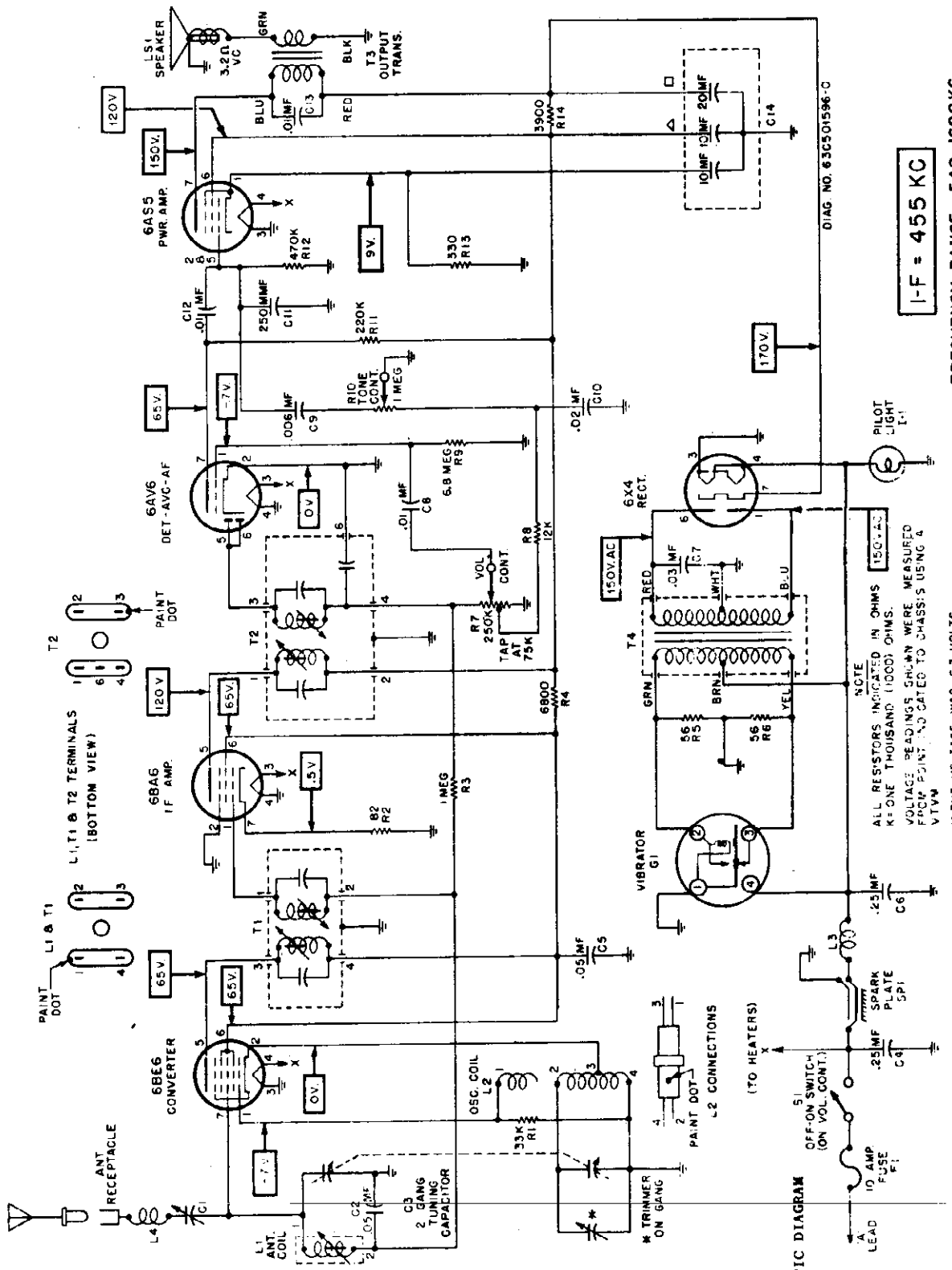
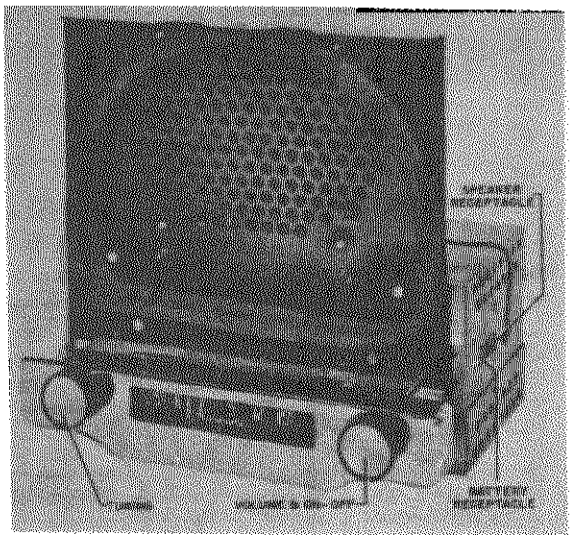


FIGURE 4. SCHEMATIC DIAGRAM

REPLACEMENT PARTS LIST

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	20K481527	Trimmer, variable mica: 70 mmf; includes mounting brkt
C-2	8R13514	Paper: .05 mf 100V
C-3	19B501790	Variable, 2-gang
C-4	8R4283	Paper: .25 mf 100V
C-5	8R23146	Paper: .05 mf 200V
C-6	8R4283	Paper: .25 mf 100V
C-7	8R592154	Paper: .03 mf 600V
C-8	8R472754	Paper: .01 mf 100V
C-9	8K71910	Paper: .006 mf 400V
C-10	8R51209	Paper: .02 mf 100V
C-11	21R6543	Mica: 250 mmf 500V
C-12	8R23053	Paper: .01 mf 200V
C-13	8R23690	Paper: .01 mf 400V
C-14	23A500059	Electrolytic: 10 mf-10 mf 250V; 10 mf 25V
Fuse		
F-1	65A10266	Fuse: 10 amp
Vibrator		
G-1	48B3333	Vibrator: non-sync; 4-pin full wave
Bulb		
I-1	65X10867	Bulb: 6-8V; .25 amp; round; bayonet base; clear
Coils		
L-1	24B591628	Antenna coil
L-2	24A591629	Oscillator coil
L-3	24A472535	Choke, hash
L-4	24K592197	Choke, antenna spark
Speaker		
LS-1	50C501823	Speaker, PM: 4" x 6"; 3.2 ohm VC
Resistors		
		Note: All resistors are carbon, insulated type unless otherwise specified.
R-1	6R6012	33,000 20% 1/2W
R-2	6R2035	82 10% 1/2W
R-3	6R6004	1 meg 20% 1/2W
R-4	6R6428	6800 10% 1/2W
R-5	6R5614	56 10% 1/2W
R-6	6R5614	56 10% 1/2W
R-7	18B501837	Volume Control: 250,000 ohms tapped at 25,000 ohms; includes on-off and tone control
R-8	6R6394	12,000 10% 1/2W
R-9	6R3987	6.8 meg 20% 1/2W
R-10		Tone Control: 1 meg (part of volume control R-7)
R-11	6R6015	220,000 20% 1/2W
R-12	6R6032	470,000 20% 1/2W
R-13	6R6254	330 10% 1W
R-14	6R488313	3900 10% 1W N.I.
Switch		
S-1		Switch: part of volume control R-7
Spark Plate		
SP-1	1A591512	Spark Plate Assembly
Transformers		
T-1	24K591556	IF, 455 Kc: complete
T-2	24K591555	Diode, 455 Kc: complete
T-3	25B502142	Output Transformer
T-4	25C591533	Power Transformer
CHASSIS PARTS - MECHANICAL		
	1X591534	"A" Lead Assembly
	42A591508	Clamp, cable: cad pl (for "A" lead)
	42A485548	Clip, coil can mtg (for T-1, T-2, & antenna coil)
	42A4215	Clip, vibrator grounding
	4S7666	Lockwasher, ext: #6; cad pl (power transformer mtg)
	4S7655	Lockwasher, int: 3/8; cad pl (volume control mtg)
	2S1376	Nut, hex: 3/8-32 x 1/2; stl; cad pl (volume control mtg)
	2S7005	Nut, hex: 6-32 x 1/4; cad pl (power transformer mtg)
	9A472148	Receptacle, antenna contact
	5S7771	Rivet: .088 x 3/16 stl; pol nkl (tube socket mtg)
	5S7707	Rivet: .122 x 5/32; stl; pol nkl (capacitor brkt mtg and spark plate mtg)
	5S7701	Rivet: .122 x 3/16; stl; pol nkl (vibrator and output trans mtg)
	5S7703	Rivet: .122 x7/32; stl; pol nkl (fuse strip mtg)
	3S7350	Screw, machine: 6-32 x 1/4; slotted hex head; locking type; cad pl (gang mtg)
	3S7506	Screw, sheet metal: #6 x 1/4; PKZ; plain hex head; cad pl ("A" lead cable clamp mtg)
	9A70208	Socket, tube: 4-prong (for vibrator)
	9A472534	Socket, tube: miniature; 7-prong
	9K580218	Socket, tube: miniature; 8-prong (for power amplifier tube 6AS5)
	31A591516	Strip, fuse mtg
HOUSING PARTS & ACCESSORIES		
	35K591519	Bumper, grommet type: rubber; large (on front cover)
	35K591518	Bumper, grommet type: rubber; small (on front cover)
	8A500108	Capacitor, noise suppression (ignition coil)
	8A500109	Capacitor, noise suppression (generator)
	15D501838	Cover, rear
	1X502097	Cover Assembly, front: includes speaker, bushings and pilot light socket
	32B501848	Gasket, speaker: rubber
	36B502202	Knob, tone control
	36B502200	Knob, tuning control
	36K502201	Knob, volume control
	2A502084	Nut, hex: 9/16-24 x 11/16 stl; cad pl (receiver mtg to instrument panel)
	52A502203	Pointer, dial
	5S7701	Rivet: .122 x 3/16; stl; nkl pl (pilot light socket mtg)
	5S490641	Rivet: .187 x 3/16; stl; nkl pl (spkr mtg)
	34C502204	Scale, dial: includes frame
	3S7454	Screw, sheet metal: #8 x 1/4; PKZ plain hex head; stl; cad pl (front & back cover mtg)
	9A502284	Socket, pilot light
	6A4141	Suppressor, noise
	4S400868	Washer, flat: 3/4 x 19/32 x .042 thick; stl; cad pl (receiver mtg to instrument panel)
M-470C ANTENNA		
	1B592409	Antenna Lead-In Assembly
	1B592622	Antenna Tube Assembly
	15A592617	Cap, antenna trim
	42K500171	Clip, speed
	14B592618	Insulator, antenna mtg tube
	2S2884	Nut, hex: 5/16-32 x 1/2 x 3/16; brass; cad pl
	4S490837	Washer, flat: 1-1/16 O.D. x .317 I.D x .032 thick; stl; cad pl
	4A592619	Washer, gasket
	4K592453	Washer, rubber



TYPICAL RECEIVER USING CHASSIS 1B.
MODEL SR1B ILLUSTRATED

GENERAL INFORMATION

TYPE - Automotive type universal, manually tuned, radio chassis. In addition to Model SR1B, this chassis will be used on subsequent models. Supplements covering these models will be issued as required. An external speaker is used.

TUNING RANGE - 540 to 1600 Kc IF - 455 Kc

TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AV6 - Det-AVC & AF Amp
6AS5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 5 amps at 6.3V DC

POWER OUTPUT - 2 watts

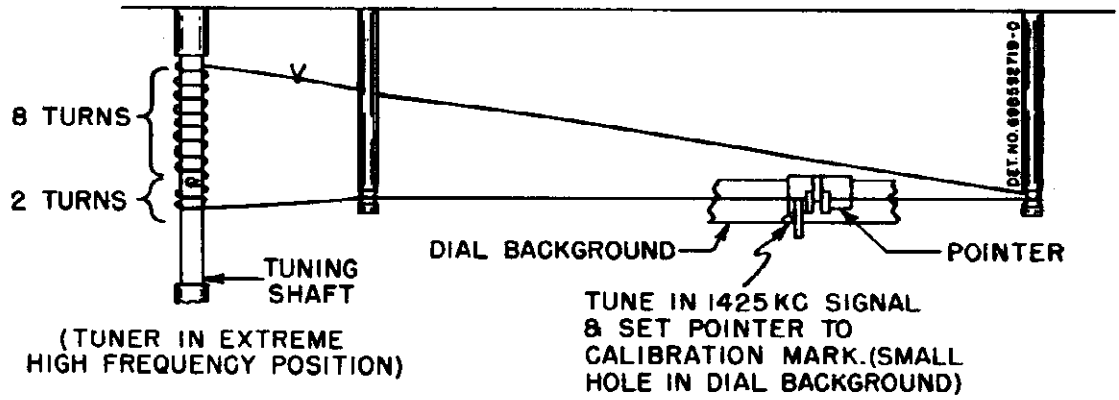


FIGURE 1. STRING DRIVE DETAIL FOR MODEL SR1B

ALIGNMENT

Remove receiver top and bottom housing covers, escutcheon and speaker plate to expose all alignment adjustments.

Connect a 6 volt storage battery to BAT terminal and chassis of receiver.

Connect a 3.2 ohm PM speaker to VC terminal and chassis of receiver.

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 the tuner carriage and result in inaccurate alignment.

MODEL SR1B,
Ch. 1B

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7) & chassis	455 Kc	High freq end (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating step.
RF ALIGNMENT						
2.	See Fig. 2	Antenna receptacle through dummy	1610 Kc	High freq end; cores should project 1-1/8" from cans (Screw out if necessary)	5, 6 & 7	Peak for maximum in order indicated.
3.	"	"	1425 Kc	1425 Kc-per Figure 2	8, 9, & 10	Peak for maximum in order indicated.

4. When receiver is installed in car, extend antenna fully, set dial to approximately 1400 Kc and repeak antenna trimmer (7) for maximum volume of a weak station or noise between stations.

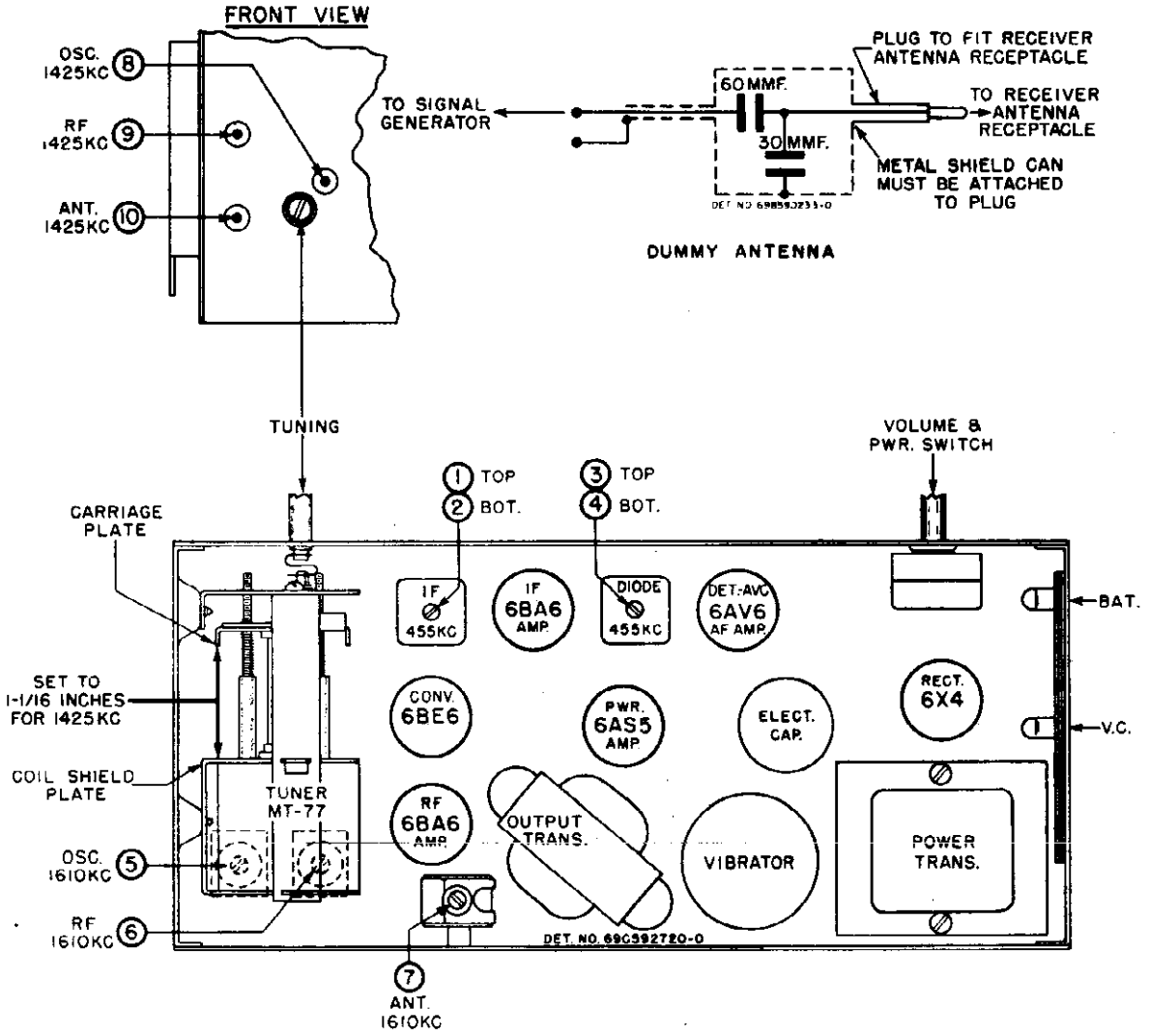


FIGURE 2. TUBE & TRIMMER LOCATIONS AND DUMMY ANTENNA DETAIL

MODEL SR1B,
Ch. 1B

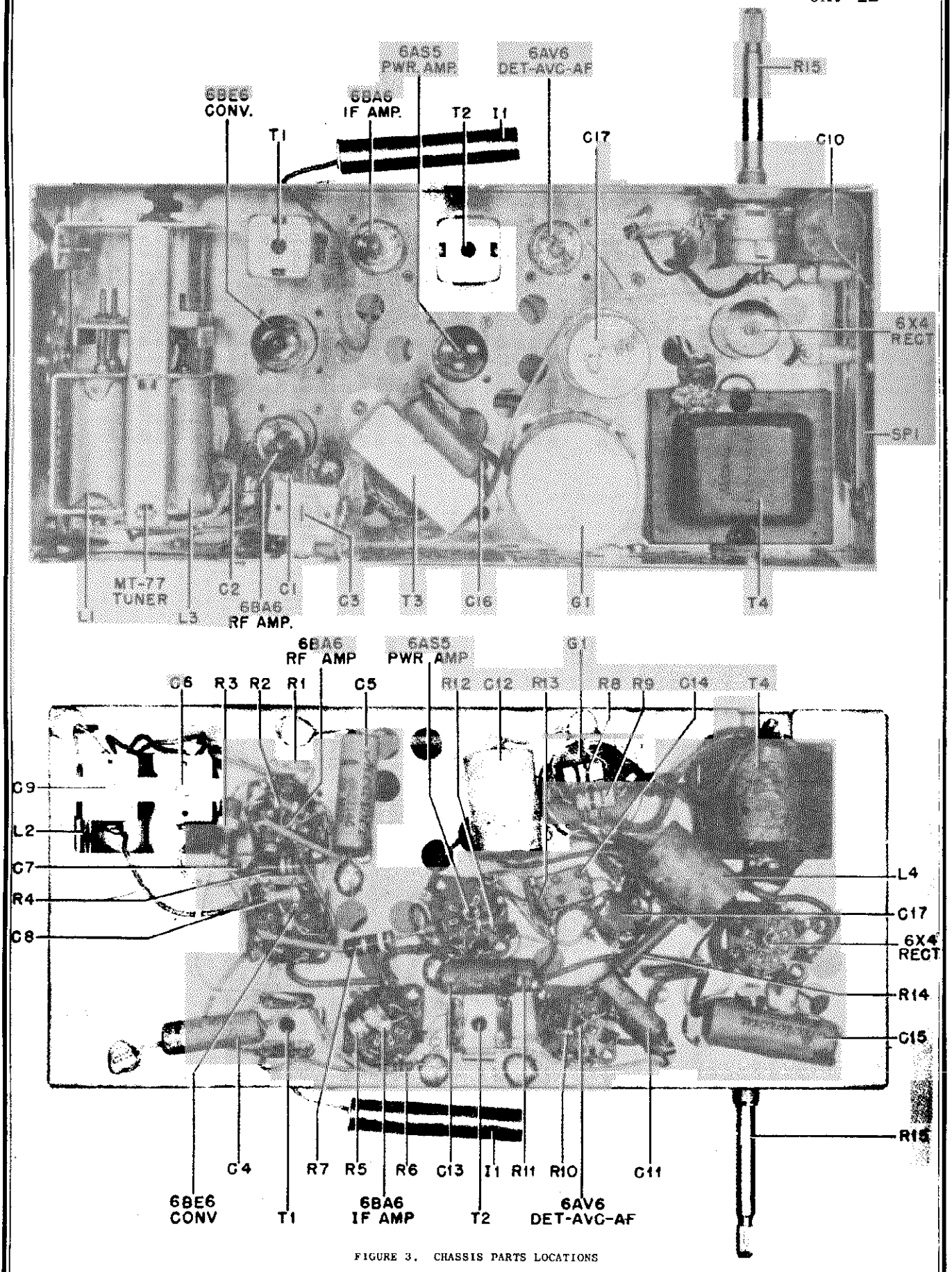


FIGURE 3. CHASSIS PARTS LOCATIONS

REPLACEMENT PARTS LIST

Ref. No.	Part Number	Description
CHASSIS 1B ELECTRICAL PARTS		
Capacitors		
C-1	21B77562	Ceramic: 100 mmf 500V.....
C-2	8A4529	Paper: .006 mf 100V .....
C-3	20K591969	Trimmer, variable: 180 mmf nominal .....
C-4	8K13514	Paper: .05 mf 100V .....
C-5	8R23146	Paper: .05 mf 200V .....
C-6	20A481526	Trimmer, variable: 70 mmf nominal .....
C-7	21K70720	Molded: 5 mmf 500V .....
C-8	21K592375	Molded: 47 mmf 500V .....
C-9	20A591977	Trimmer, variable: 540 mmf nominal .....
C-10	8K17028	Paper: .5 mf 100V .....
C-11	8K472754	Paper: .01 mf 100V .....
C-12	8K17028	Paper: .5 mf 100V .....
C-13	8R23690	Paper: .01 mf 400V .....
C-14	21R6543	Mica: 250 mmf 20% 500V..
C-15	8K592154	Paper: .03 mf 600V .....
C-16	8R23690	Paper: .01 mf 400V .....
C-17	23A500059	Electrolytic: 10-20/250V; 10/25V .....
Fuse		
F-1	65K16248	Fuse: 9 amp .....
Pilot Light		
I-1	65X10867	Bulb: 6.3V; .25 amp; tubular bayonet base; clear; #44...
Vibrator		
G-1	48B3333	Vibrator: non-sync; 4-pin ..
Coils		
L-1,2	24B71881	RF & Antenna Coil (specify color of paint dots on old coil when ordering).....
L-3	24B592153	Oscillator Coil (specify color of paint dots on old coil when ordering) .....
L-4	24A472535	Choke, hash .....
Resistors		
		Note: All resistors are insulated carbon type unless otherwise specified.
R-1	6R6032	470,000 20% 1/2W ....
R-2	6R6090	470 10% 1/2W .....
R-3	6R6075	100,000 20% 1/2W ....
R-4	6R6056	47,000 20% 1/2W .....
R-5	6R5554	390 10% 1/2W .....
R-6	6R6004	1 meg 20% 1/2W .....
R-7	6R5618	3900 10% 1W .....
R-8	6R5614	56 10% 1/2W .....
R-9	6R5614	56 10% 1/2W .....
R-10	6R2122	4.7 meg 20% 1/2W ....
R-11	6R6015	220,000 20% 1/2W ....
R-12	6R6032	470,000 20% 1/2W ....
R-13	6R6336	270 10% 1W .....
R-14	6R6006	2200 20% 1W .....
R-15	18A591978	Volume Control: 500,000 ohms; includes SPST switch .....
Spark Plug		
SP-1	1B592173	Spark Plate Assembly: complete .....
Transformers		
T-1	24B485553	IF, 455 Kc: complete.
T-2	24B485554	Diode, 455 Kc: comple
T-3	25B70171	Output Transformer ..
T-4	25C591533	Power Transformer ..
CHASSIS 1B MECHANICAL PARTS		
	42A485548	Clip, coil can mtg .....
	42A591959	Clip, spring (tuner drive).....
	42A4215	Clip, vibrator grounding .....
	15K592073	Cover, housing (top & bottom).....
	1X473150	Light Shield & Plug Assembly .....
	4S7666	Lockwasher, ext: #6; cad pl (power transformer mtg) .....
	4S7691	Lockwasher, int: 3/8"; cad pl (vol control mtg) .....
	2S7005	Nut, hex: 6-32 x 1/4; cad pl (pwr trans mtg) .....
	2S1376	Nut, hex: 3/8-32 x 1/2; cad pl (vol control mtg) .....
	64A591992	Plate, rear cover .....
	9A472148	Receptacle, antenna contact.....
	5S7706	Rivet: .122 x 1/8; stl; nkl pl (dial light brkt mtg) .....
	5S7707	Rivet .122 x 5/32; stl; nkl pl (terminal strip, output trans, and capacitor bracket mtg) .....
	5S7771	Rivet: .088 x 3/16;stl; nkl pl (tube socket mtg) .....
	5S7701	Rivet: .122 x 3/16; stl; nkl pl (vibrator socket mtg).....
	5S7700	Rivet: .122 x 1/4; stl; nkl pl (spark plate mtg) .....
	3S7454	Screw, sheet metal: #8 x 1/4; PKZ; plain hex head; (tuner mtg, rear cover mtg) .....
	3S8140	Screw, sheet metal: #8 x 3/16; PKZ; plain hex head (tuner mtg)..
	9A591971	Socket, pilot light & brkt .....
	9A70208	Socket, tube: 4-pin; with grounding lug (vibrator socket) .....
	9A472534	Socket, tube: miniature; 7-prong...
	9K580218	Socket, tube: miniature; 8-prong...
	31C490140	Strip, terminal: 1 insulated lug, #1 mtg .....

TUNER PARTS - MECHANICAL	
Note:	Electrical parts of the tuner are included in the Electrical Chassis Parts List.
1X592120	Model MT-77 Manual Tuner: complete.
1X592099	Base, Sleeve, Shields & Channels Assembly .....
1X78034	Carriage Plate, Slug Insulator & Center Guide Rod Assembly .....
42A70184	Clip, core adjustment .....
46B591654	Core, iron & screw .....
14A70876	Insulator, coil sleeve .....
14B78007	Insulator, slug: bakelite .....
2A77596	Nut, floating: without ear (on manual lead screw) .....
2A78005	Nut, floating: with ear (on manual lead screw) .....
64K592064	Plate, tuner front .....
5S7770	Rivet: .088 x 5/32; stl; pol nkl (slug insulator mtg) .....
47A78002	Rod, carriage guide .....
3S7352	Screw, machine: 8-32 x 2"; slotted round head; stl; cad pl (front plate mtg) .....
3A591998	Screw, manual lead (tuning shaft).
43A70881	Sleeve, coil: iron .....
41A77595	Spring, coil slug .....
41A77592	Spring, compression (on manual lead screw) .....
4A21577	Washer, "C" spring (manual lead screw mtg) .....
4A70873	Washer, coil spacer .....
4A74571	Washer, fishpaper .....
4A70956	Washer, slug insulator .....
MODEL SR1B MOUNTING PARTS, ACCESSORIES, ETC.	
3A592058	Bolt, radio mounting .....
7C592046	Bracket, escutcheon mtg (mounts escutcheon to speaker plate).....
8A4491	Capacitor, noise suppression (generator capacitor) .....
42A591931	Clip, dial scale retaining .....
11M8877	Cord, dial: 20 lb; nylon;black.
61A473514	Crystal, transparent green (for dial light) .....
13C592066	Escutcheon, dial: chrome plated.
32C591967	Gasket, speaker: rubber .....
36K591949	Knob, control: tuning & volume....
9B473111	Lead Assembly, fuse .....
1K592062	Pointer & Slider Assembly .....
34B592149	Scale, dial: glass .....
3S7462	Screw, machine: 6-32 x 3/16 slotted hex head; cad pl (escutcheon mtg) .....

3S7454	Screw, sheet metal: #8 x 1/4; PKZ; plain hex head; cad pl (cover, escutcheon bracket & spkr brkt to chassis mtg)	47A592070	Shaft, tuning	1X500090	Speaker Plate & Gasket Assembly: less spkr, pointer, tuning shaft & escutcheon mtg brkt.....
3S7468	Screw, sheet metal: #10 x 3/8 PKZ; plain hex head; cad pl (speaker mtg)	50B592106 or 50B592479	Speaker, PM: 5 x 7"; 3.2 ohm voice coil	6A4141	Suppressor, distributor .....
				29K5407	Terminal, insulated pin: white (spkr lead) .....
				4B592098	Washer, "C" (tuning shaft retainer) .....

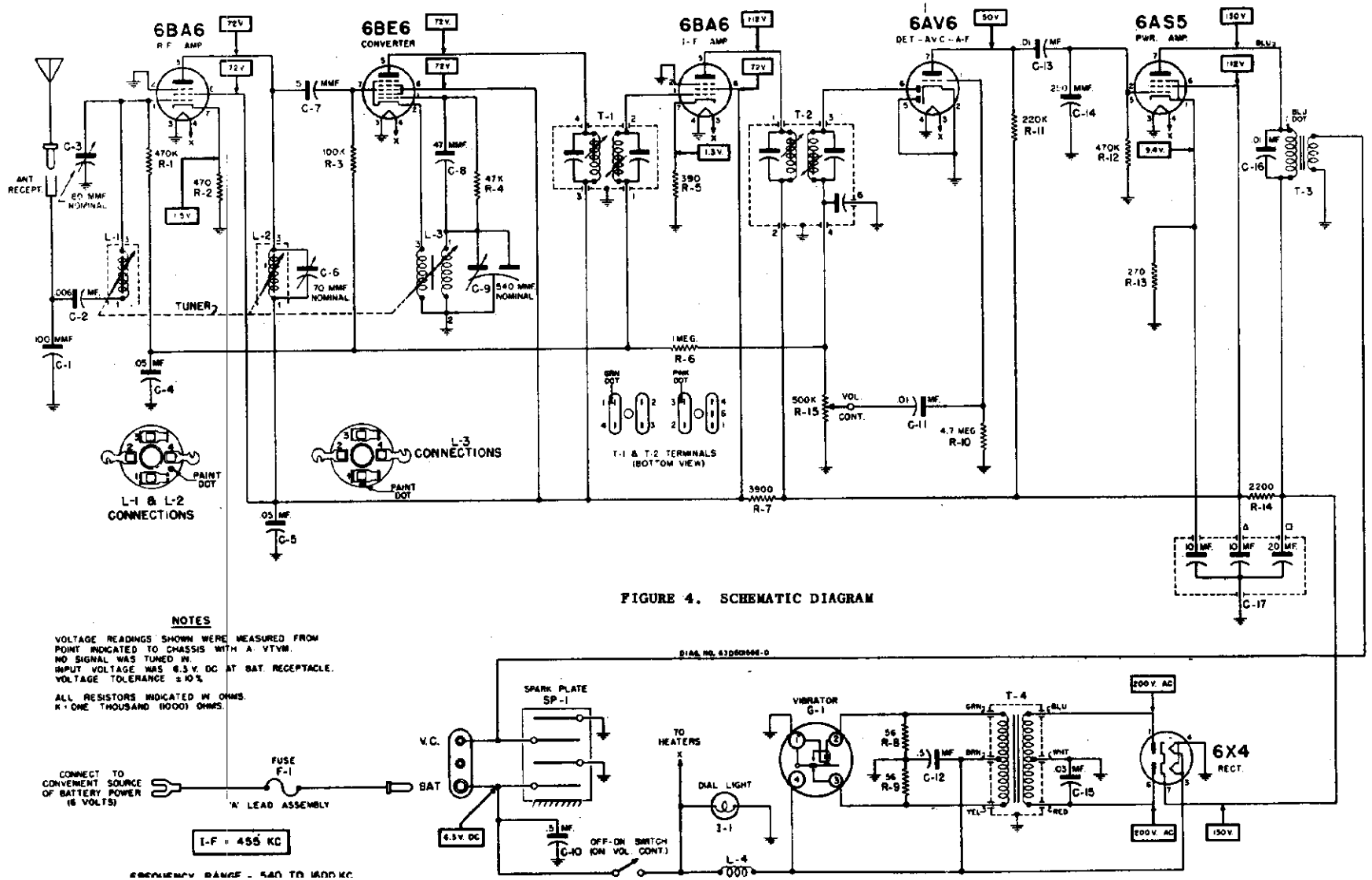
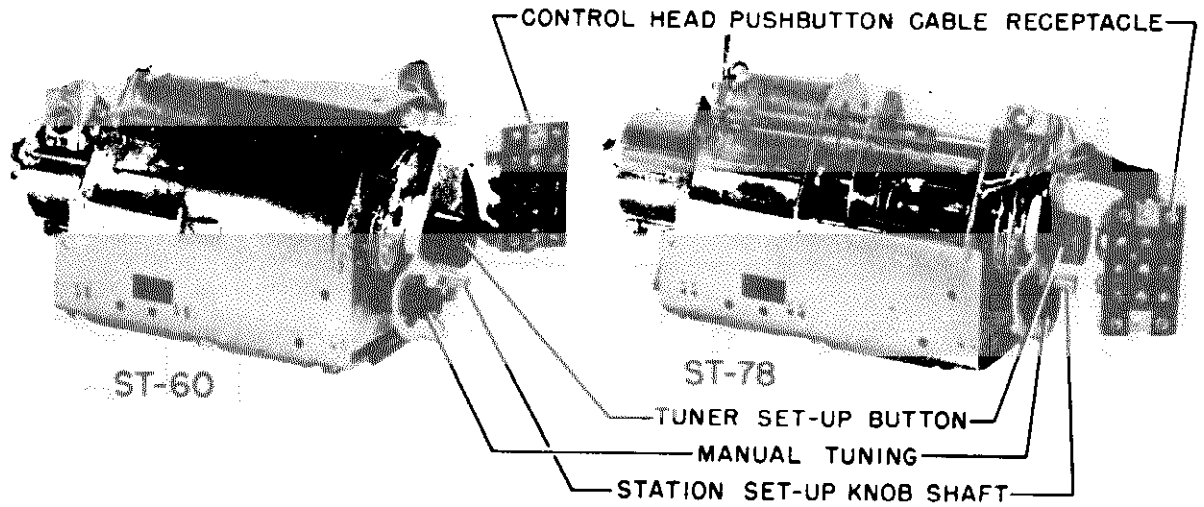


FIGURE 4. SCHEMATIC DIAGRAM

MODELS ST-60,
ST-78, Tuners



GENERAL

Solenoid Tuners ST-60 and ST-78 are used in Motorola electric push-button standard auto receivers.

Fundamentally ST-60 and ST-78 tuners are the same. The two tuners differ in push-button switch lead lengths, oscillator coil, sleeve and shield, tuning cores, antenna trimmer and cover over ST-60 carriage. These tuners are similiar to the original Motorola ST-54 solenoid tuner.

This is a 3 gang permeability type tuner operated by a solenoid. Five pre-set and one manual tuning positions are provided. The frequency range is 535 to 1600 kc. The pre-set positions can be set to any frequency within this range.

The tuner is designed to operate satisfactorily with 4.5 to 7.3 volts input. Before attempting any service work on a tuner that operates too slowly or one that doesn't operate at all, check the battery voltage directly at the receiver spark plate. Normally, this voltage is 6.3 volts. At the moment any push-button is pressed, the voltage at the spark plate should not drop to less than 4.5 volts. If the voltage is less than 4.5, it is an indication of poor wiring between the car battery and receiver or a defective car battery.

This tuner depends on "dash-pot" action between the plunger and the solenoid for proper operation. When the fit between the plunger and solenoid is too tight, the air can't get out fast enough. The result is a slow or sluggish operating tuner. All ST-60 and ST-78 tuners have an adjustable air release in the solenoid end plate. See Figures 1 & 3.

The tuner solenoid coil must be in a horizontal or near horizontal position or the tuner will not operate properly. If it is operated with the coil in a vertical position, the solenoid and carriage return spring may not be strong enough to operate the tuner.

TO SET UP AUTOMATIC TUNER

a. Turn receiver on and allow it to warm up for a few minutes.
b. Collapse antenna until signal is weak.
c. Press Manual "M" button on control head.
d. Turn tuning knob until desired station is tuned in. (Make a mental note of the program). For best results choose only local stations.
e. Press desired button and wait until tuning mechanism completes its operation.
f. Press automatic tuner set-up button until "click" is heard. (See detail above.)
g. Turn automatic tuner set-up knob until previously noted program is heard. NOTE: Check the setting of the automatic button just set up by pressing the "M" button and manually tune in the station. There should be no difference in volume or clarify when the station is tuned in either manually or automatically. If a difference is noted, reset the automatic tuner push button more accurately by repeating above procedure. Also make sure the push button is set to same station that was selected manually and not to a weak distant station carrying the same network program.
h. Repeat steps c, d, e, f and g for balance of buttons.

THEORY OF OPERATION

NOTE: Throughout these paragraphs, it is suggested that constant reference be made to Figure 1.

When any push-button is pressed, current flows through the solenoid coil, causing the plunger to pull into the coil. Near the end of the plunger travel, through a ratchet mechanism inside the plunger, the selector switch shaft is rotated 60°, moving the selector switch and stop plate to their new position.

An instant later, the solenoid switch is opened breaking solenoid current and the carriage return spring then pulls the plunger out, closing the solenoid switch again. If the selector switch is now resting at the position selected by the push-button (cut away section of selector switch resting in front of contact selected by push-button), the solenoid plunger will continue to be pulled out until the stop plate is resting on the selected lead screw stop. In the event the selector switch is not resting in the position selected by the push-button when the solenoid plunger is on its return trip, the moment the plunger moves out far enough to actuate the solenoid switch, current will again flow through solenoid causing the plunger to be pulled in again. The plungers inward motion again rotates the stop plate and selector switch

through another 60°. This last operation is repeated automatically until the selector switch comes to rest at the position selected by the push-button, at which time the solenoid circuit is opened and the plunger moves out until the stop plate is resting on the selected lead screw stop. The stops are adjusted to the desired positions during the station setting up procedure, through the set-up gear train assembly.

Refer to Figure 2 for mechanics behind station setting-up mechanism detail.

When the button on which a station is to be set up is first pressed, the tuner operates and the stop plate comes to rest against the selected lead screw stop. The pressure of the stop plate against the lead screw stop moves the lead screw forward until its shoulder rests against the tuner end plate. The square end of the lead screw does not engage i the square hole of the set-up gear until the set-up button i pushed in and the station set-up knob is turned. A latch o one end of the detent lever engages the gear lever, holdin the set-up gear train in contact with the selected lead screw. Now the selected lead screw stop can be moved on its lea screw by turning the station set-up knob. None of the othe lead screws turn because the stop plate is not resting a gainst them. After the button is set up, pressing any othe button will unlatch the gear lever and disengage the lea screw from the set-up gear. See Figure 2.

Since the coil tuning iron cores are attached to the carriage plate and move in unison with the plunger, the poin at which they are brought to a stop (by means of the lea screw stop) determines the frequency to which the coils are tuned.

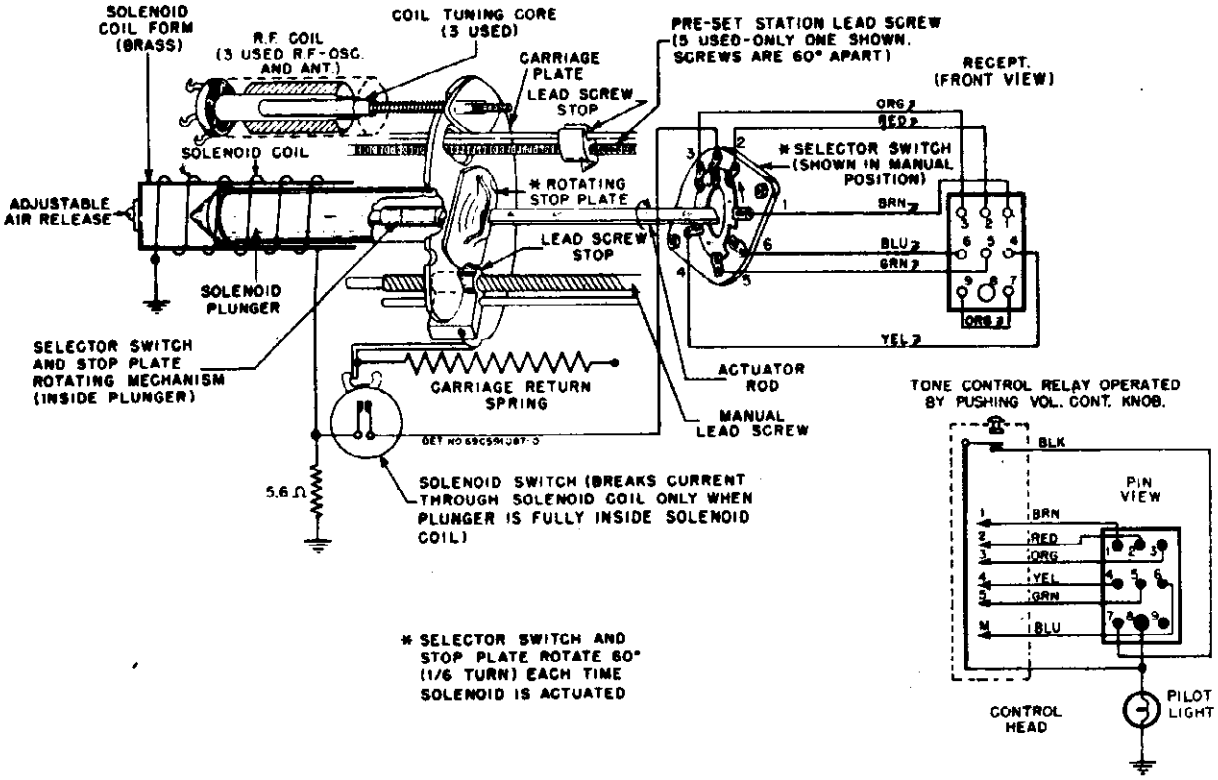
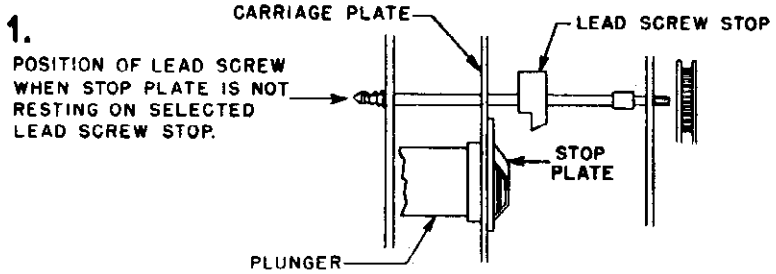


FIGURE 1. TUNER FUNCTIONAL DETAIL



MODELS ST-60,
ST-78, Tuners

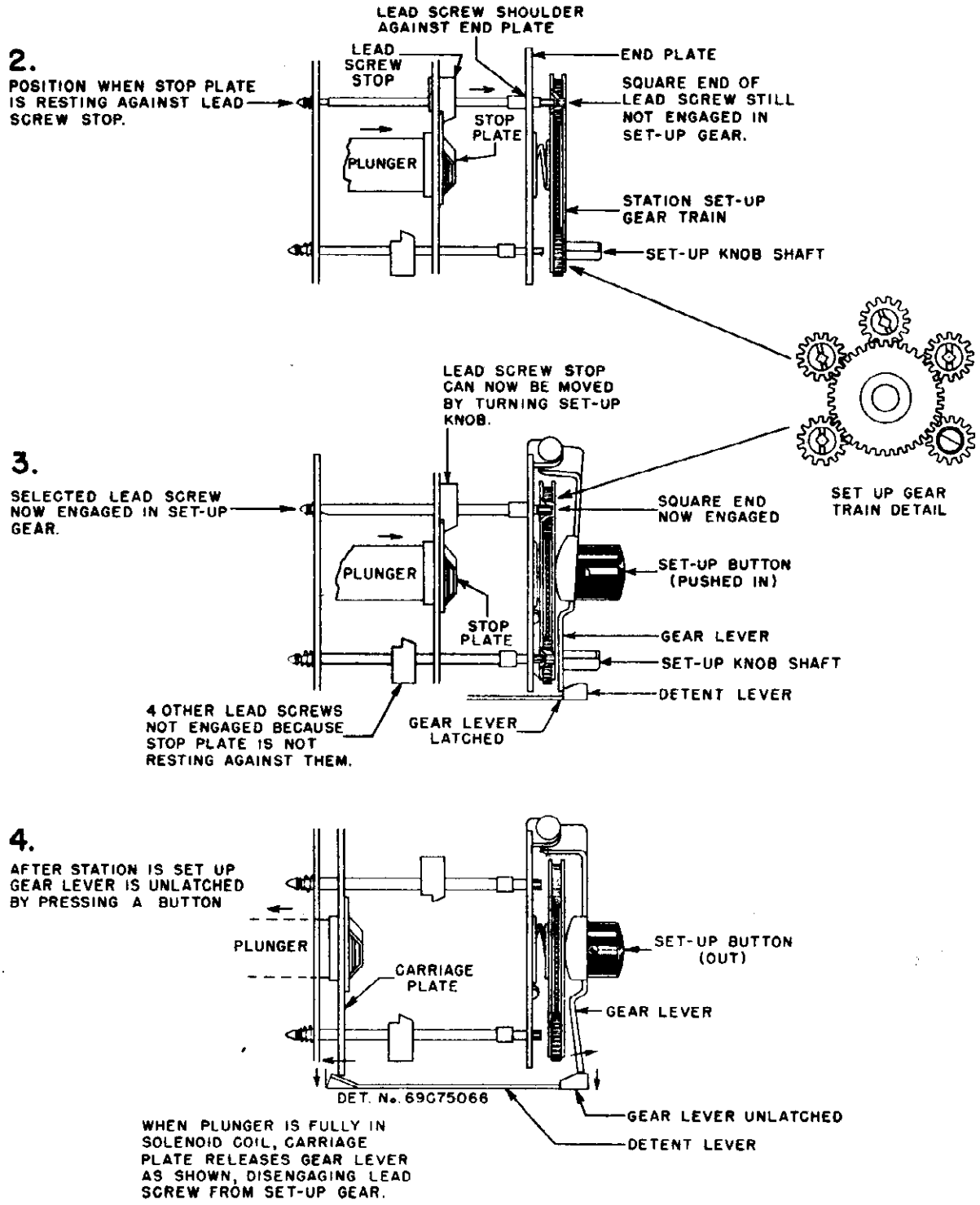


FIGURE 2. STATION SET-UP MECHANISM

TO REMOVE TUNER FROM CHASSIS

Should it become necessary to remove the solenoid tuner from the receiver chassis, proceed as follows:

1. Remove the covers from the set, completely exposing the chassis.

2. Mark all leads connecting tuner to receiver.

3. Disconnect all leads connecting tuner to receiver. The control head connecting receptacle is to be removed by unscrewing the two self-tapping screws. Do not unsolder leads from the tuner selector switch.

4. The tuner is held to the chassis by self-tapping screws driven into the sides of the tuner. Do not remove any other screws.

ADJUSTMENTS

AIR RELEASE ADJUSTMENT

The speed at which the tuner operates is governed by dash-pot action of the solenoid plunger within the closed solenoid coil form. The rate at which air is allowed to enter or escape determines the speed of the plunger.

An adjustable air release is provided on all ST-60 and ST-78 tuners. See Fig. 3. To adjust, loosen the screw and move the eccentric washer which covers the air release hole to expose or cover more of the air release hole as required.

1. If tuner operates too slowly, open the air release hole. Open it only far enough to secure reliable operation. Too little "dash-pot" action (air release open too much) may cause the plunger to hammer and sometimes even to make the tuner operate continuously due to the selector switch rotor being turned so rapidly as to overshoot its contacts.

2. If the tuner operates too rapidly increase dash-pot action by closing the air release hole slightly. Close it only enough to eliminate hammering.

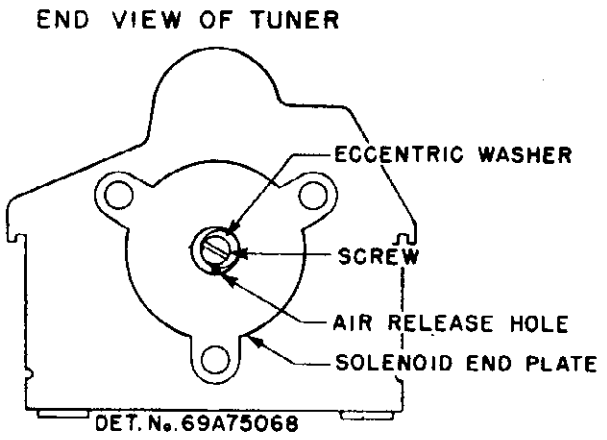


FIGURE 3. AIR RELEASE ADJUSTMENT

PLUNGER RATCHET ADJUSTMENT

The plunger ratchet mechanism is shown in Figure 4. This mechanism rotates the actuator rod which, in turn, rotates the carriage stop plate and the selector switch 60° for each inward motion of the plunger.

If this adjustment is incorrect, tuner may operate continuously once current is applied.

Correct ratchet adjustment is indicated when 1/64" to 1/32" clearance is observed between selector switch contacts and the selector switch rotor as shown in Figure 5. Slowly work the plunger by hand and observe clearance at each contact position. If the average clearance is not 1/64" to 1/32", correction can be made by loosening ratchet adjustment setscrew and turning actuator rod by hand until correct clearance is observed.

Before ratchet adjustment setscrew is finally tightened, push fixed ratchet 1/32" back into plunger. This increases spring tension against rotating ratchet, thus insuring more positive operation.

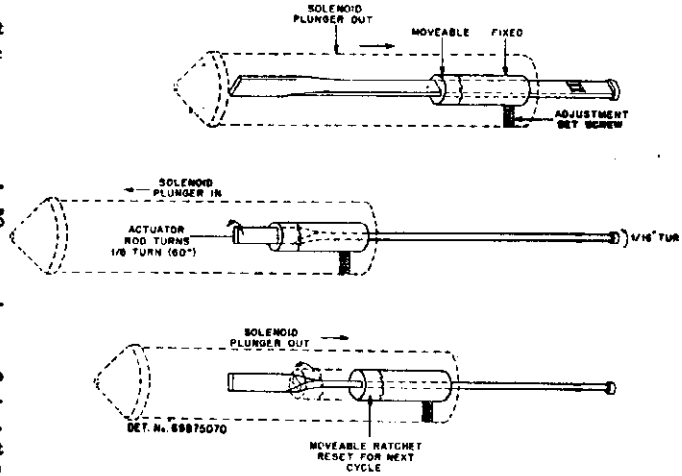


FIGURE 4. PLUNGER RATCHET MECHANISM

SOLENOID SWITCH TRIP ADJUSTMENT

The solenoid switch tripping mechanism should be adjusted as shown in Figure 6.

If the solenoid switch is tripped too early, the ratchet mechanism may fail to operate; if it trips too late, the plunger may hammer violently or should the solenoid switch fail to trip, the plunger would be held within the solenoid.

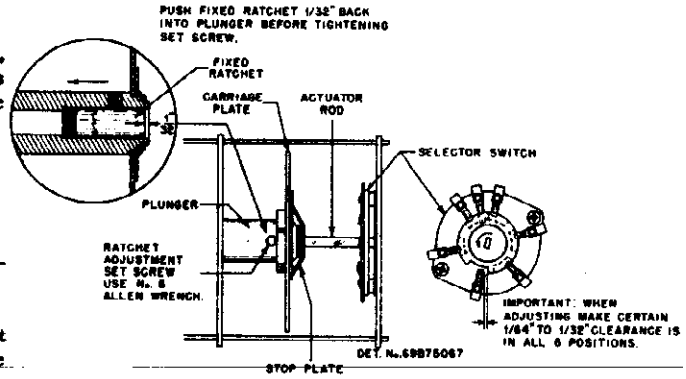


FIGURE 5. PLUNGER RATCHET ADJUSTMENT

ADJUSTMENT OF GEAR LEVER LATCH

The gear lever latch holds the station set-up gear train in position while setting up stations. Failure of the latch to engage properly when the set-up button is pushed in will result in the inability to set up pre-set stations. Failure of the latch to disengage after station is set-up will result in faulty automatic tuning because the lead screws might not seat themselves properly against the tuner end plate. Figure 7 shows the latch detail and adjustment.

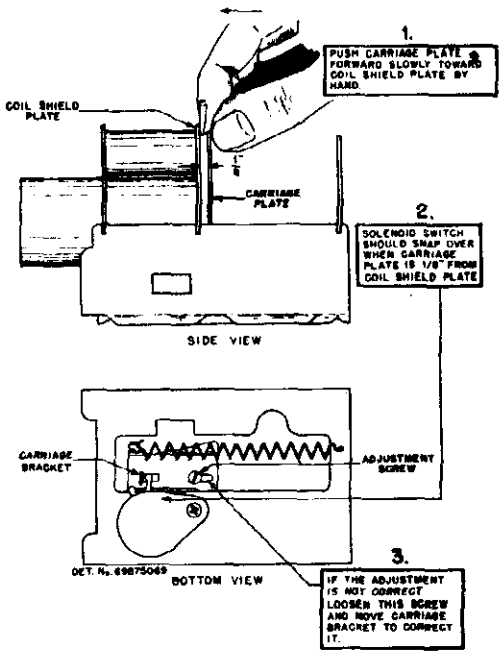


FIGURE 6. SOLENOID SWITCH ADJUSTMENT

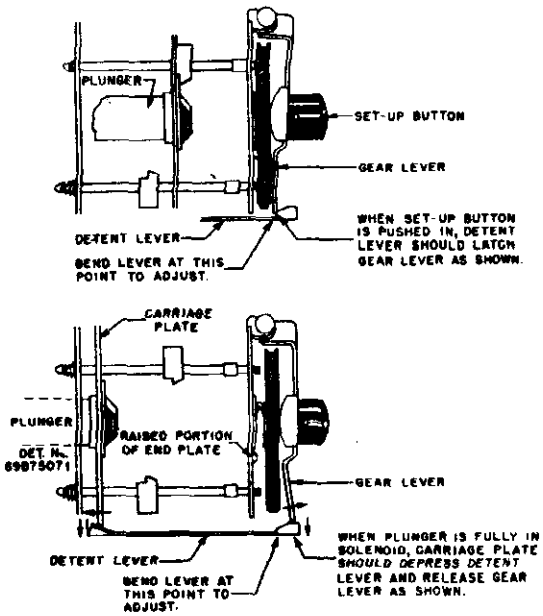


FIGURE 7. GEAR LEVER LATCH ADJUSTMENT

SERVICE NOTES

FAILURE OF SOME LEAD SCREW TO ENGAGE IN SET-UP GEARS

If some of the lead screws fail to engage in the set-up gears during station setting up procedure, check the gear lever to see if it is bent. When the set-up button is pushed in and the gear lever latches on the detent lever, the set-up gear train should be parallel with the tuner end plate and the bottom of the gear train should be resting on the raised portions of the tuner end plate.

LUBRICATION

Should lubrication ever be required, it is recommended that a very fine grease, commercially called DOW-CORNING Silicone (DC 44 Medium Grade), or its equivalent be used.

Remove all old and sticky lubricant with a solvent such as carbon tetrachloride and then, very sparingly, lubricate only the following points:

1. Carriage guide rods.
2. Actuator rod.
3. Manual lead screw.

IMPORTANT

Do not lubricate or permit lubricant to get on Selector Switch contacts. The friction drag is required for proper operation of tuner.

LEAD DRESSING

Make sure that the selector switch and solenoid coil leads are dressed so that carriage plate does not rub against them. Leads rubbing against the carriage plate may cause the tuner to stick, especially at the high frequency end.

REPLACEMENT OF SOLENOID COIL OR SOLENOID PLUNGER

Should replacement of the solenoid coil or solenoid plunger be required, it will be necessary to replace the entire tuner. A close fit between solenoid plunger and solenoid coil form is required; a proper match can only be secured at the factory. When service of this kind is required, return the tuner to the factory for exchange.

ALIGNMENT

In the event that some part of the R.F. circuit has been changed or the adjustments shifted by mishandling, it is suggested that the receiver be realigned. Follow the alignment instructions found in the receiver service manual.

The tuner must be in good working order and assembled onto the chassis before attempting alignment of its tuned circuits.

TO REPLACE ANT. R.F., OR OSC. COILS

IMPORTANT: When ordering replacement coils, order by part number and also specify the color coding (paint dots) on old coil. THE REPLACEMENT COIL SHOULD CARRY THE SAME COLOR CODING AS THE ORIGINAL OR THE TUNER WILL NOT TRACK PROPERLY.

1. Unsolder the two lugs holding the coil to the tuner plate.
2. Carefully remove the old coil. Save the thin paper washer that is found at the base of the coil.
3. Slip the paper washer over the replacement coil and slip coil into shield can.
4. Orient coil so its lugs are in same position as before and resolder to tuner plate.
5. Reassemble tuner and install in receiver.
6. Realign ANT., R.F. and OSC. stages per instructions found in the receiver service manual.

TO REPLACE ANT. R.F. OR OSC. COIL TUNING CORES

IMPORTANT: When ordering coil tuning cores, order by part number and also specify the color coding (paint spot) on the old core. ALL 3 TUNING CORES MUST CARRY THE SAME COLOR CODING OR THE TUNER WILL NOT TRACK PROPERLY.

1. Remove the carriage return spring.
2. Move the carriage plate back as far as it can go. The tuning cores can now be screwed "out" or "in" by grasping the portion that sticks out the back of the coil. When installing a new core, make sure that the insulating washer and adjustment clip are replaced properly. The insulating washer goes on the core side; the core adjustment clip has an ear on it and this ear must fit into a hole in the bakelite insulator on the carriage plate. Refer to Figure 8.
3. Replace the carriage return spring.
4. Install tuner in receiver.
5. Realign ANT., R.F. and OSC. stages following the instructions found in the receiver service manual.

PLUNGER RATCHET REMOVAL

To remove ratchets, proceed as follows:
(Refer to Figure 8 for parts identification).

1. Remove gear plate mounting screw (55).
2. Pull out actuator rod (46). Don't lose washers (83 (88) and (89).
3. Remove stop plate bracket (4) by sliding it out of th retaining slots.
4. Loosen setscrew (50).
5. The large fixed ratchet (34), small floating ratchet (3 and ratchet spring (70) can now be removed.
6. Reassemble in reverse order.

TUNER HANGS UP

The beginning of this trouble is usually a conditio where the tuner "runs wild" (fails to stop at a station). E ventually, the stop plate gets "hung up" by getting on th wrong side of the station stops (56). The cause of the trou ble is that the selector switch (74) does not turn the corre amount with each dash of the plunger.

Since the actuator rod (46) determines the rotation the selector switch, it is usually at fault. Check the twi in the actuator rod. It should be 82 degrees. Also chec the fit between the "head" end of the actuator rod (46) an the rotary section of the selector switch (77). We hav found that some sloppiness sometimes occurs at this poin If the fit is loose, replace the actuator rod (46). This ca be easily done by removing gear plate mounting screw (55

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of tuner in addition to part number and description of part

Ref. No.	Part Number	Description
	1X472634	Model ST-60 Solenoid Tuner (complete).....
	1X592280	Model ST-78 Solenoid Tuner (complete).....
1	1X71358	Base & Spring Assembly.....
2	7A70928	Bracket, carriage.....
3	7A70986	Bracket, lead screw stop....
4	7A500429	Bracket, stop plate (stainless steel).....
5	38A70945	Button, lever and gear (set-up button) .....
6	36A70954	Button, mute switch; fibre..
7	20K472612	Capacitor, variable: mica; 30-60 mmf; with mounting bracket.....
8	20K472613	Capacitor, variable: mica; 50-280 mmf; with mounting bracket (ST-60 only).....
9	20K481527	Capacitor, variable: mica; 20-180 mmf; with mounting bracket.....
10	42A70980	Clip, lead screw.....
11	42A70184	Clip, core adjustment....
12	1A71881	Coil, antenna or RF (specify color of paint dot on old coil when ordering).....
13	24B592153	Coil, oscillator; (ST-78) (specify color of paint dot on old coil when ordering).
13	24B71879	Coil, oscillator; (ST-60) (specify color of paint dot on old coil when ordering).
14	59B70889	Coil, solenoid (RETURN entire tuner to factory for exchange when this part requires replacement).....
15	46K592080	Core, powdered iron: with molded-in adj screw (ST-78) (specify color of paint dot o old core when ordering)....
15	46A70880	Core, powdered iron: with molded-in adj screw (ST-60) (specify color of paint dot on old core when ordering).
16	32A70972	Gasket, solenoid.....doz
17	14A70876	Insulator, coil sleeve: armite.....doz
18	14A74198	Insulator, magnet winding: armite.....doz
19	14A70979	Insulator, slug: bakelite .....doz
20	14A70973	Insulator, switch: armite .....doz
21	45B70926	Lever, detent.....
22	45B70930	Lever, gear.....
23	29R3014	Lug, solder (ST-78 only).doz
24	29R5331	Lug, solder (ST-60 only).doz
25	4S7651	Lockwasher, steel: #8 internal; cad pl.....per/c
26	2S7003	Nut, steel: 8-32 x 5/16 hex; cad pl.....per/c
27	1X73012	Plate, Bushing and Stud Assembly: stop end plate with actuator rod bushing and gear locating stud.....
28	1X73007	Plate & Coil Shields Assembly: consists of tuner plate solenoid shield, 3 coil shields and 3 solenoid mtg bolts (ST-60 only).....
28	1X592275	Plate & Coil Shields Assembly: consists of tuner plate, solenoid shield, 3 coil shields and 3 solenoid mtg bolts (ST-78 only).....

MODELS ST-60,
ST-78, Tuners

Ref. No.	Part Number	Description
29	1X76556	Plate, end: solenoid end plate assembly; with gasket and adjustable air release.
30	1X71359	Plate & Gears Assembly (station set-up gear train)
31	1X73008	Plate & Plunger Assembly: consists of carriage plate with 3 bakelite core screw insulators and solenoid plunger rod with ratchets and stop plate (RETURN entire tuner to factory for exchange when this part requires replacement).....
32	1X592268	Plate & Trimmers Assembly: consists of coil end plate, 2 trimmers and terminal strip (ST-78).....
32	1X472639	Plate & Trimmers Assembly: consists of coil end plate, 3 trimmers and terminal strip (ST-60).....
33	64K472055	Plate, switch mounting...
34	43A70905	Ratchet, fixed (large)...
35	43A70904	Ratchet, floating (small)
36	9K500055	Receptacle, plug: 9-pin.....
37	17K484497	Resistor, wire-wound: 5.6 ohms 10% 1W (in parallel with solenoid coil).....
38	5S2833	Rivet, brass: .064 x 1/8 (part of actuator rod adj).....
39	5S7770	Rivet, steel: .088 x 5/32; nkl pl (slug insulator mtg).....
40	5S7706	Rivet, steel: .122 x 1/8; nkl pl (lock-up spring mtg).....
41	5S7707	Rivet, steel: .122 x 5/32; nkl pl (trimmer mtg)..
42	5S8497	Rivet, steel: .088 x 1/8; nkl pl (terminal strip mtg).....
43	47A472003	Rod, carriage guide.....
44	47A73787	Rod, manual stop guide..
45	47A70921	Rod, stop guide.....
46	47A480767	Rod, actuator.....
47	3S2950	Screw, machine: 4-40 x 1/4; slotted locking, stl; 3 index head cad pl (carriage brkt mtg).....
48	3S2681	Screw, steel: #4 x 3/8 Phillips filister head; cad pl (selector switch mtg)...
49	3S7327	Screw, machine: 5-40 x 3/8; slotted hex head; stl; cad pl (mute switch mtg)..
50	3S7104	Setscrew, steel: 8-32 x 3/16 slotted headless; cad pl (part of actuator rod adj).....
51	3S7148	Setscrew, steel: 6-32 x 1/8; Allen head; nkl pl (ratchet setscrew in plunger).....
52	3S7200	Screw, machine: 6-32 x 3/16; slotted filister head; stl; cad pl (air release adj screw).....
53	3S2684	Screw, sheet metal: #6 x 1/4 Phillips filister head; stl; cad pl (solenoid switch mtg).....
54	3S7205	Screw (lockscrew): 8-32 x 1/4; slotted hex head; cad pl (base mtg).....
55	3A74390	Screw, special (gear plate mtg).....
56	3S8175	Screw, sheet metal: #4 x 3/16; PKZ; slotted hex head; stl; cad pl (holds lead screw stop brkt to manual lead stop) .....
57	58A70902	Screw & Coupling Assembly: manual lead screw with bakelite coupling.....
58	1A73015	Screw & Stop Assembly: lead screw with carriage stop...
59	47A70934	Shaft, lever.....
60	26K592104	Shield, coil (Osc ST-78)...
61	26A70878	Shield, coil (ST-60 Ant, RF & Osc) (ST-78 Ant & RF)....
62	26B472568	Shield, tuner (ST-60 carriage cover).....
63	43A70881	Sleeve, coil: powdered iron (not in Osc ST-78).....
64	43A70953	Spacer, selector switch: fibre.....
65	2S7988	Speednut, steel: for .093 diameter rod.....
66	41A70958	Spring, coil: iron core .....
67	41A70968	Spring, gear plate.....
68	41A70949	Spring, lead screw.....
69	41A70971	Spring, lock-up.....
70	41A70955	Spring, ratchet.....
71	41A70941	Spring, carriage.....
72	41A472134	Spring, carriage balance.....
73	41A472480	Spring, actuator rod adjustment.....
74	46A70983	Stop, manual lead.....
75	31A70948	Strip, terminal lug.....
76	40A472644	Switch, mute.....
77	40B70952	Switch, selector.....
78	1B70944	Switch, solenoid: with mtg plate.....
79	4A73378	Washer, bumper.....
80	4A70015	Washer, "C" (lever shaft retainer).....
81	47A70873	Washer, coil spacer: fibre.....
82	4A76542	Washer, eccentric (air release hole adjustable cover).....
83	4A70974	Washer, insulator (actuator rod).....
84	4A70956	Washer, iron core insulator; bakelite.....
85	4A74571	Washer, paper.....
86	4A73621	Washer, spring (manual lead screw).....
87	4A70932	Washer, "C" spring (manual lead screw retainer)....
88	4A70961	Washer, actuator rod: rectangular hole.....
89	4A70962	Washer, bearing (actuator rod).....
90	4A75683	Washer, brass: special.

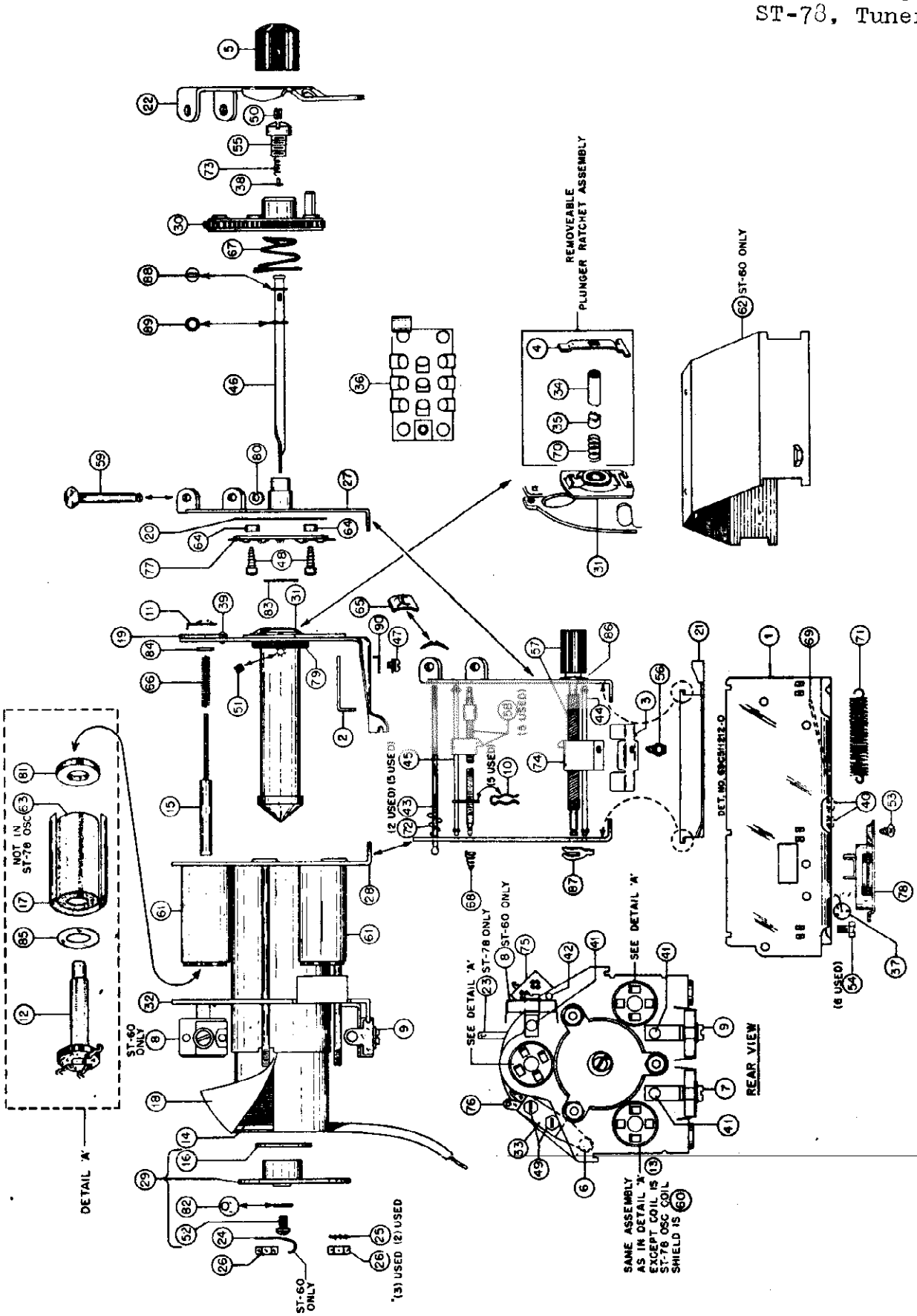


FIGURE 8. PARTS LOCATION

MODEL WS1C, 1951
Willys-Overland

GENERAL INFORMATION

TYPE - Automotive type radio receiver designed for installation in 1951 Willys-Overland cars. An external speaker is used.

TUNING RANGE - 540 to 1600 Kc IF - 455 Kc

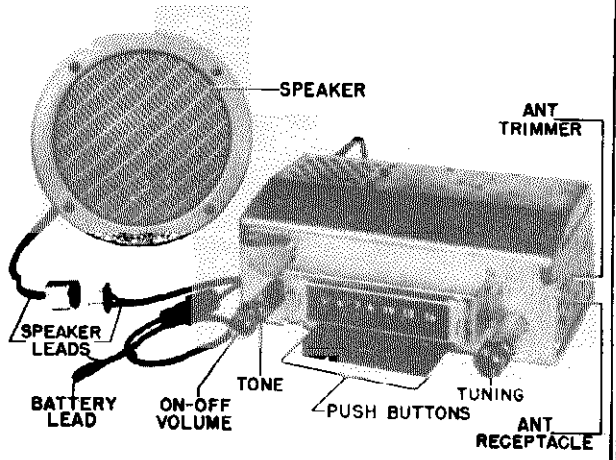
TUBE COMPLEMENT -

6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Diode detector, AVC & 1st AF Amp
6AQ5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 6.8 amps at 6.3V DC

POWER OUTPUT - 3.5 watts (max)

TUNER - Model AT-90. See AT-90 Service Manual for Replacement Parts.



TO SET THE PUSHBUTTONS

Receiver has 5 buttons for automatic station selection. To set the push buttons, proceed as follows:

1. Turn volume up until stations can be heard.

2. Pull button out and with the station selector, tune to the station desired.

3. Push button in. This station is now set for automatic tuning.

4. Follow the same procedure for the remaining four buttons.

NOTE: The numbers on the dial scale indicate the frequency range of the receiver. Before setting the pushbutton, tune carefully until you are exactly on the station; tuning to either side of it will result in poor tone quality and excessive noise. When setting automatic tuning, it is preferred that the left-hand buttons tune in the lower KC stations and the right-hand buttons tune in the higher KC stations.

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 and 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.

PROCEDURE

1. To expose the alignment adjustments, remove the top and bottom covers. If the tuner cores require adjustment, remove the dial scale bracket assembly and dial background.

2. Connect a PM speaker (3.2 ohm VC) to speaker cable terminals of the receiver.

3. Connect an output meter across the speaker voice coils.

4. Connect 6.3 volts to the receiver "A" lead terminal and chassis.

5. Turn the receiver "on" and allow it to warm up for a few minutes. Set receiver volume control at maximum and tone control to "high" position.

6. For greatest accuracy, keep the output of the receiver at 1 watt (1 watt 1.79 volts on output meter) by reducing signal generator output (not receiver volume control) as stages are brought into alignment.

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.

7. 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 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.

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ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Hi side - 6BE6 grid (pin #7) Low side-chassis	455 Kc	Extreme high frequency end of travel	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating procedure.
RF ALIGNMENT						
	NOTE: If the tuner is tracking properly over its entire range, the tuner cores 8, 9, & 10 will not require adjustment proceed as follows:					
2.	Dummy -see Figure 1	Ant receptacle thru dummy antenna	1605 Kc	Extreme high frequency end of travel	5	Peak for maximum.
3.	"	"	1300 Kc	With tuning knob, tune to maximum signal	6 & 7	Peak for maximum in order indicated.
4.	-	-	-	-	-	Repeat steps 2 & 3.
	NOTE: If the tuner coils or cores have been replaced or tampered with, or the tuner does not cover the required range, the tuner cores 8, 9, & 10 require adjustment - proceed as follows:					
5.	Dummy -see Figure 1	Ant receptacle thru dummy antenna	1605 Kc	Extreme high frequency end of travel	5, 6 & 7	Remove dial scale bracket and dial background. Peak for maximum in order indicated.
6.	"	"	1300 Kc	With tuning knob, move carriage "in" 5/16" from position in step 5.	8, 9 & 10	Peak for maximum in order indicated.
7.	"	"	1605 Kc	With tuning knob, tune for maximum signal at high frequency end.	5, 6 & 7	Peak for maximum in order indicated.
8.	"	"	1300 Kc	With tuning knob, tune to maximum signal	8, 9 & 10	Peak for maximum in order indicated.
9.	-	-	-	-	-	Repeat step 7.

POINTER ADJUSTMENT

10. Tune receiver to 1300 Kc and adjust pointer by means of eccentric cam (11) on the tie plate to the 1300 Kc calibration mark on dial scale.

11. With set installed in car, peak ant trim (7) for maximum signal at approximately 1400 Kc. Car antenna should be fully extended.

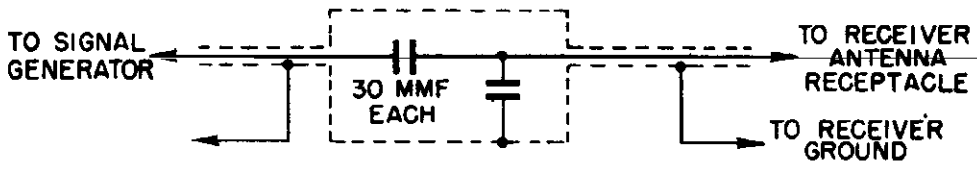


FIGURE 1. DUMMY ANTENNA

MODEL WS1C, 1951
Willys-Overland

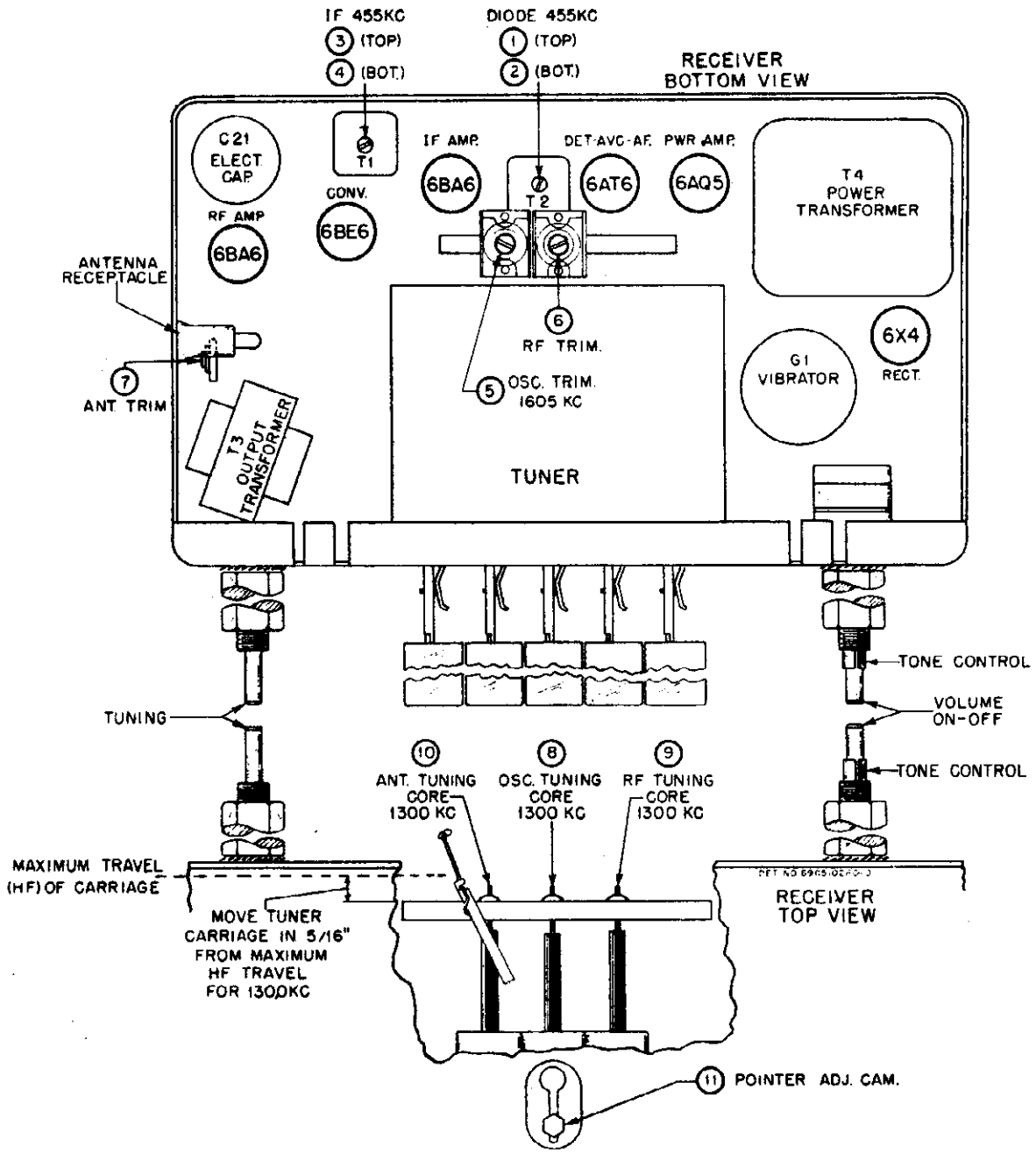


FIGURE 2. TUBE AND TRIMMER LOCATIONS

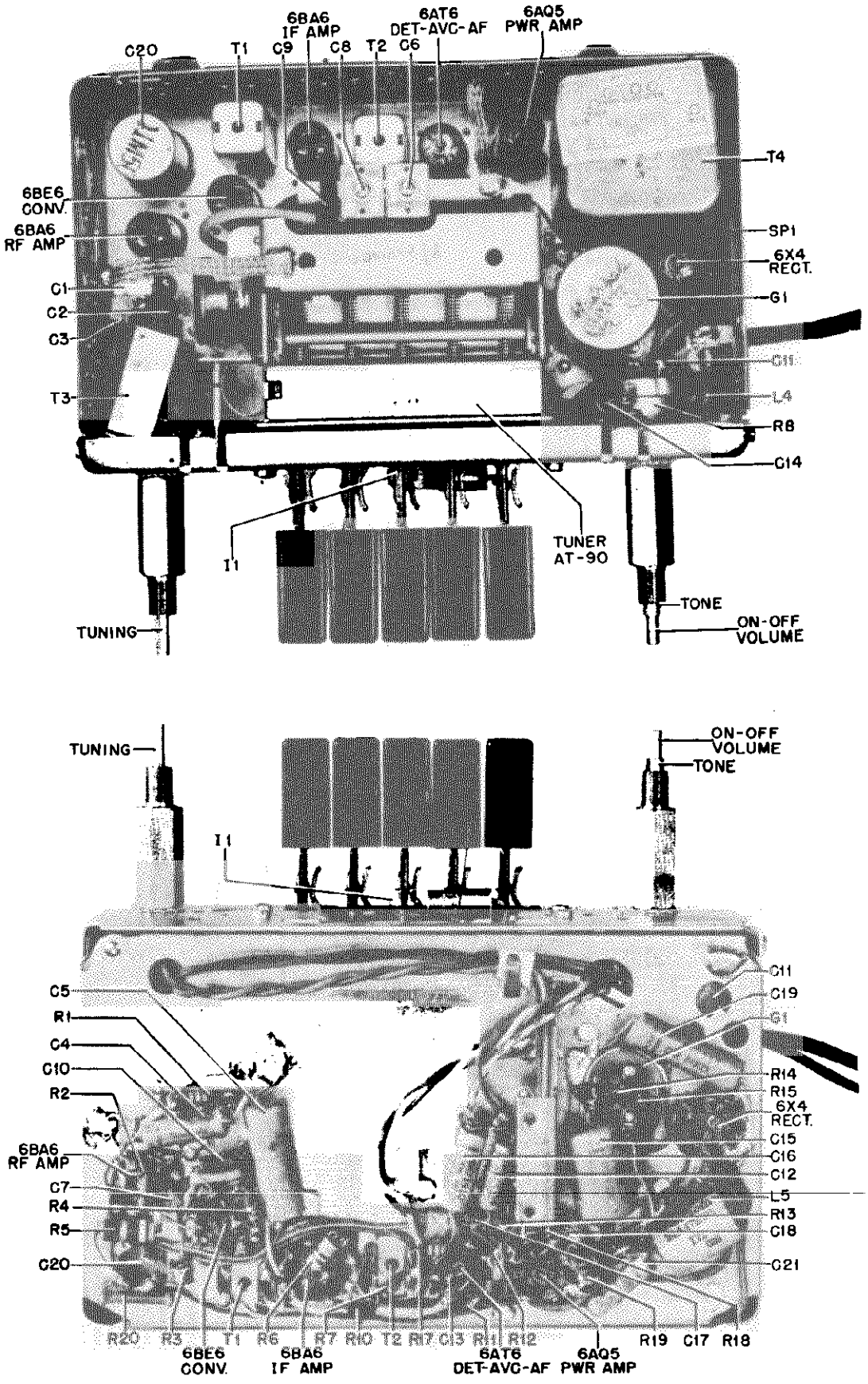


FIGURE 3. CHASSIS PARTS LOCATIONS

MODEL WS1C, 1951
Willys-Overland

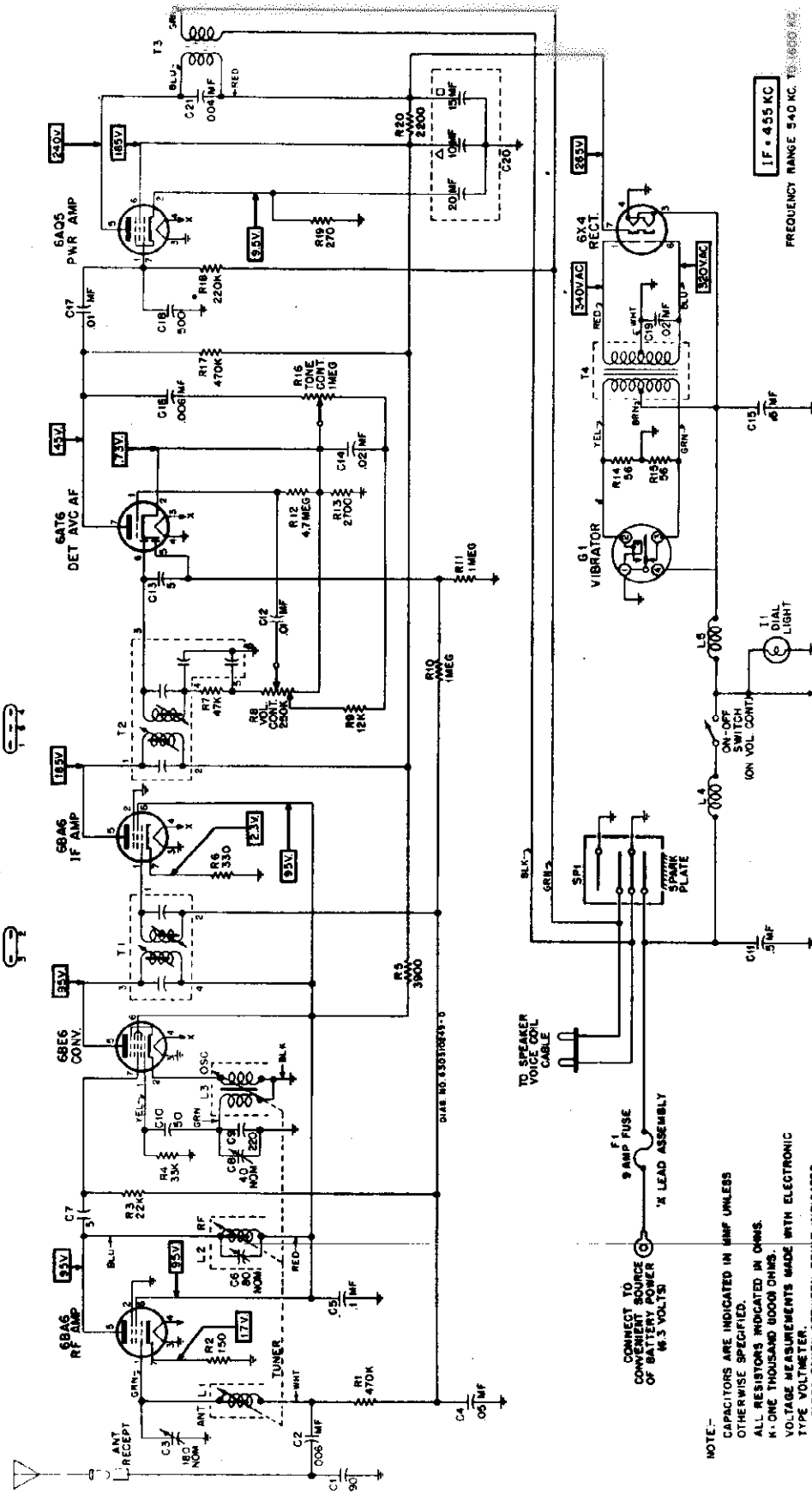


FIGURE 4. SCHEMATIC DIAGRAM

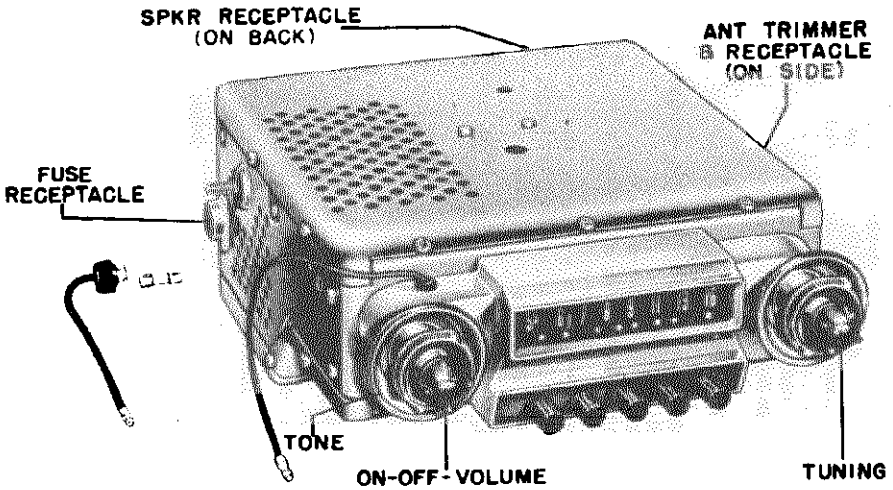
NOTE:-
CAPACITORS ARE INDICATED IN MMF UNLESS OTHERWISE SPECIFIED.
ALL RESISTORS INDICATED IN OHMS.
K= ONE THOUSAND 1000 OHMS.
VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
VOLTAGES TAKEN BETWEEN POINT INDICATED AND CHASSIS.
VOLTAGE TOLERANCE ± 10%
NO SIGNAL INPUT.

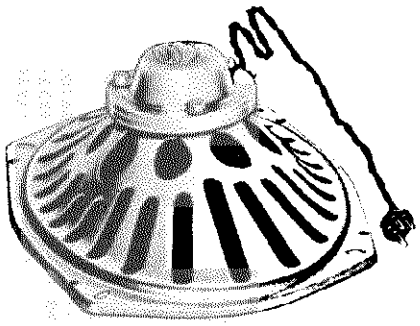
Part Number	Description
SSIS PARTS - ELECTRICAL	
acitors	
21A591682	Mica, metal: 90 mmf 500V....
8A4529	Paper: .006 mf 100V.....
20A501419	Mica, variable: 50 to 280 mmf; includes bracket.....
8R13514	Paper: .05 mf 100V.....
8R13166	Paper: .1 mf 4000V.....
-	Variable, mica: RF trimmer (see AT-90 Service Manual).
21K70720	Molded, miniature: 5 mmf 500V
-	Variable, mica: osc trimmer (see AT-90 Tuner Service Manual).....
-	Ceramic: temperature compensating (see AT-90 Tuner Service Manual).....
21R6513	Mica: 50 mmf 500V.....
8K17028	Paper: .5 mf 100V.....
8R472754	Paper: .01 mf 100V.....
21K70720	Molded, miniature: 5 mmf 500V
8R51209	Paper: .02 mf 100V.....
8K17028	Paper: .5 mf 100V.....
8K71910	Paper: .006 mf 400V.....
8R23690	Paper: .01 mf 400V.....
21R6580	Mica: 500 mmf 500V.....
8K114137	Paper: .02 mf 1000V.....
23A485677	Electrolytic: 15-10 mf/350V, 20 mf/25V.....
8K71909	Paper: .004 mf 400V.....
e	
65K16248	Fuse: 9 amp.....
rator	
48B3333	Vibrator, non-sync: 4-pin...
ot Light	
65K10867	Bulb: 6.3V; .25A; #44 bayonet base.....
ls	
-	Antenna coil (see AT-90 Tuner Service Manual).....
-	RF coil (see AT-90 Tuner Service Manual).....
-	Oscillator coil (see AT-90 Tuner Service Manual).....
24K592269	Choke, hash.....
24A472535	Choke, hash.....
istors	
Note:	All resistors are carbon insulated type unless otherwise specified.
6R6032	470,000 20% ½W.....
6R3992	150 20% ½W.....
6R6028	22,000 20% ½W.....
6R6012	33,000 20% ½W.....
6R476012	3900 10% 2W.....
6R6010	330 20% ½W.....
6R6056	47,000 20% ½W.....
18K502898	Volume-On-Off: 250,000 ohms; includes tone control R-16.

Ref. No.	Part Number	Description
R-12	6R2122	4.7 meg 20% ½W.....
R-13	6R5577	2700 10% ½W.....
R-14	6R5614	56 10% ½W.....
R-15	6R5614	56 10% ½W.....
R-16	18K502898	Tone control: 1 meg; includes volume control R-8..
R-17	6R6032	470,000 20% ½W.....
R-18	6R6014	220,000 20% ½W.....
R-19	6R6336	270 10% 1W.....
R-20	6R476130	2200 20% 2W.....
Spark Plate		
SP-1	1A501207	Spark Plate Assembly.....
Transformers		
T-1	24C485553	IF Transformer, 455 Kc: complete with padding capacitors and tuning cores....
T-2	24K485555	Diode transformer, 455 Kc: complete with padding capacitors and tuning cores....
T-3	25B500727	Output Transformer.....
T-4	25B472533	Power Transformer.....
Tuner - Model AT-90		
	51D502000	Tuner, Model AT-90 (see AT-90 Tuner Service Manual for breakdown).....
CHASSIS PARTS - MECHANICAL		
7B501177		Bracket, dial background.....
7C501187		Bracket, dial scale mounting.....
7B501472		Bracket, shield.....
43K502884		Bushing, control shaft (volume and tuning shaft mtg).....
42B500725		Clip, bottom cover retainer.....
42B485548		Clip, coil can mounting.....
42K510959		Clip, dial retaining.....
42A4215		Clip, vibrator grounding.....
1X500714		Cover Assembly, bottom: includes clips and grounding wiper.....
15C500663		Cover, top.....
9K510182		Lead Assembly, fuse: complete; with fuse.....
4S7668		Lockwasher, ext: 3/8; stl; cad pl (volume and tuning shaft mtg).
4S7686		Lockwasher, ext: #5; spring stl; cad pl (dial light socket mtg).....
51A502012		Pinion Shaft and Drive Disc Assembly.....
64K510429		Plate, chassis front.....
28A791030		Plug, 2-pin (on spkr cable).....
1X510728		Pointer, dial.....
9A472148		Receptacle, antenna.....
34B502890		Scale, dial.....
2S2878		Nut, hex: 1/4-20 x 7/16; stl; cad pl (receiver mtg).....
2S2869		Nut, hex: 5/16-18 x 9/16; pol nkl (receiver and bezel mtg).....

3S410073	Screw, machine: 8-32 x 3/4; Phillips oval head; chrome pl (spkr mtg).....
3S7454	Screw, sheet metal: #8 x 1/4; plain hex head; stl; cad pl (mtg plate mtg).....
3S1849	Screw, machine: 1/4-20 x 1/2; slotted round head; stl; cad pl (support bracket mtg).....
3S410095	Screw, machine: 1/4-20 x 5/8; plain hex head; stl; cad pl (support brkt mtg to dash).....
3S7104	Setscrew: 8-32 x 3/16; slotted headless; stl; cad pl (control knob).....
15K74442	Shell and insulator (for spkr receptacle).....
50B500707 or	
50B592352	Speaker, PM; 6"; 3.2 ohm VC.....
41A77592	Spring, compression (behind volume control knob).....
6A4141	Suppressor, distributor.....
4S7562	Washer, flat: 7/16 x .187 x .033; stl; cad pl (spkr mtg).....
4S1792	Washer, flat: 5/8 x 9/32 x .090; stl; cad pl (support bracket mtg to mtg plate).....
4S1730	Washer, flat: 3/4 x .453 x .040; stl; cad pl (bezel mtg).....
4A580282	Washer, spring (behind dummy knob).....
51K502894	Shaft Assembly, manual drive: complete.....
9K580218	Socket, tube: 7-prong; with one dummy lug.....
9A70208	Socket, 4-prong (vibrator).....
9K510960	Socket, dial light: includes brkt.
31K490142	Strip, terminal: 2 insulated lugs, #1 mtg.....
31K490143	Strip, terminal: 2 insulated lugs, #2 mtg.....
31A500705	Strip, terminal: 3 insulated lugs, #2 mtg.....
39K502418	Wiper, ground (used on vibrator socket).....
39K470032	Wiper, grounding (bottom cover)...
13K510082	Bezel, speaker.....
1X510730	Button, push.....
7B502885	Bracket, receiver mtg.....
8A4491	Capacitor, noise suppression.....
32B502889	Gasket, speaker.....
1X473155	Knob, tuning and volume: chrome pl
37K472939	Knob, tone control: chrome pl.....
36K502896	Knob, dummy: chrome pl (behind tuning knob).....
4S7688	Lockwasher, int-ext: 1/4; stl; cad pl (receiver mtg).....
4S7657	Lockwasher, ext: #8; cad pl (spkr

MODEL 1MF, Ford
Part No. 1A-18805-A2





GENERAL INFORMATION

TYPE - Automotive superheterodyne receiver with external speaker.

TUNING RANGE - 540 to 1610 Kc IF - 265 Kc

TUBE COMPLEMENT - 6SK7GT - RF Amplifier, 6SA7GT - Converter, 6SK7GT - IF Amplifier, 6SQ7GT - Det, AVC & AF Amp, 6V6GT - AF Output Amplifier, 6X5GT - Rectifier

OPERATES FROM - 6 volt storage battery

TUNER - Model AT-81 Service Manual for Replacement Parts.

TO SET THE PUSH BUTTONS

Automatic push button tuning is provided for selection of five favorite local stations. The five push buttons may be adjusted to any of the desired stations. In order to simplify the identification of these stations, it is advisable to set the push buttons in sequence according to their frequencies, beginning with the station broadcasting on the lowest frequency and progressing to the station broadcasting on the highest frequency. The push buttons should be set up during the daytime because at night, distant stations will be heard with the same intensity as local stations, making it difficult to select local stations. To set the push buttons proceed as follows:

1. Collapse the antenna.

2. Turn the receiver on and allow it to operate for at least fifteen minutes in order for each part to reach normal operating temperature.

3. Loosen the first push button on the left by turning it (with your fingers) counterclockwise one turn.

4. Select the station desired and with low volume tune it in by turning the manual tuning knob. Tune very carefully for clearest reception.

5. Press the first push button in firmly, then release and tighten (with your fingers) by turning clockwise.

The first push button is now set for this station selection. Follow the above procedure for setting each of the other four buttons.

When the five push buttons have been set to the desired stations, return the antenna to the lowest position necessary for good reception. It is only necessary to press a push button to receive the station for which the adjustment was made. The dial pointer will automatically indicate the frequency of the selected station.

MODEL 1MF, Ford
Part No. 1A-18805-A

ALIGNMENT

Connect the receiver "A" lead and receiver chassis to a 6 volt storage battery. Rotate volume and tone controls to maximum clockwise position. Connect an output meter across the speaker voice coil. Use an insulated screwdriver for making all adjustments. 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. Remove receiver escutcheon, dial scale, and top & bottom covers to expose a alignment adjustments. See Figure 1.

To adjust the pointer, tune the receiver to a 1300 k signal, and rotate the adjusting cam (see Figure 1) until t pointer coincides with the 1300 Kc marker on the dial scal This cam may be adjusted thru a hole provided in the t cover.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Converter grid (6SA7GT pin 8)	265 Kc	HF end stop	1, 2, 3 & 4	Adjust for maximum. Repeat fo greater accuracy.
RF ALIGNMENT						
2.	See Fig. 1	Ant. receptacle	1608 Kc	HF end stop*	C-12, C-8 C-1	Adjust for maximum.
3.	See Fig. 1	Ant. receptacle	1300 Kc	Move carriage "in" 21/64" from HF end stop position. See Fig. 1.	L-4, L-3 L-1	Adjust for maximum.
4.	See Fig. 1	Ant. receptacle	1608 Kc	HF end stop	C-12, C-8 C-1	Adjust for maximum.
5.	Repeat steps 3 & 4 until no further increase is obtainable. After final adjustment is made, cement core adjustments place with speaker cement.					
SENSITIVITY CONTROL						
6.	See Fig. 1	Ant. receptacle	Set to 600 kc & 4 microvolts output	Tune for max	Sensitivity control	Set sensitivity control for 1 watt output (1.79 volts on output meter).
ANTENNA TRIMMER ADJUSTMENT						
7.	-	-	-	Weak station at approx. 1400 Kc	C-1	With receiver installed in car, peak antenna trimmer for maximum volume. Ant. should be fully extended.

*Tuner cores should be backed out to project 1-3/8" from end of coil forms so they will have no effect on trimmer adj.

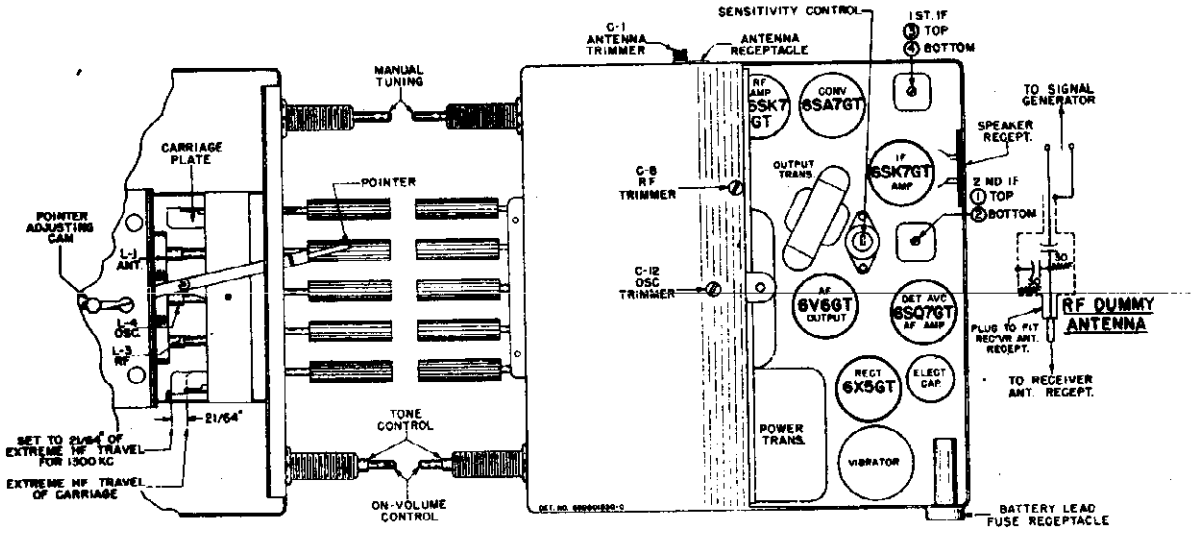


FIGURE 1. TUBE AND TRIMMER LOCATIONS

MODEL 1MF, Ford
Part No. 1A-18805-A2

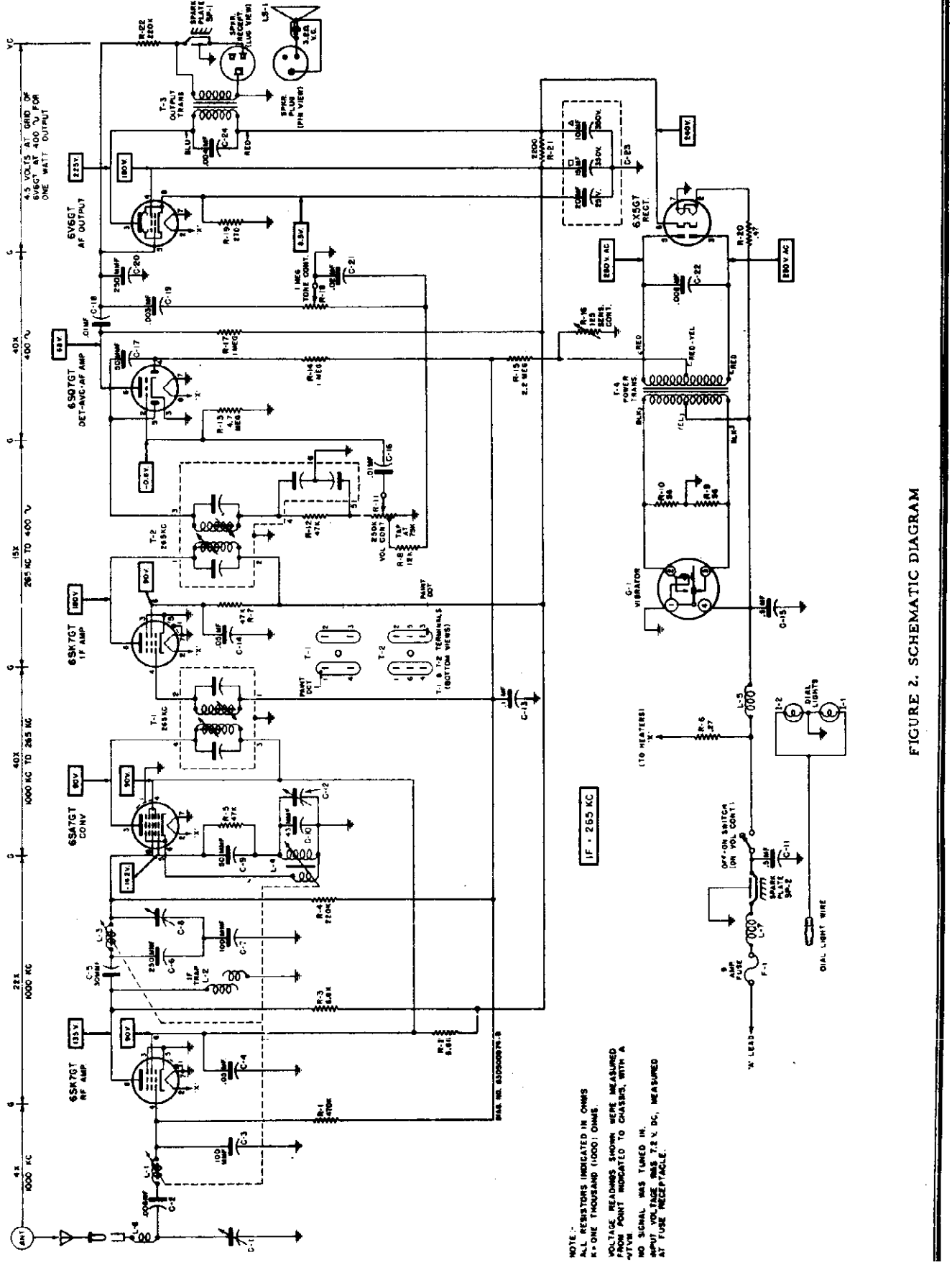


FIGURE 2. SCHEMATIC DIAGRAM

MODEL 1MF, Ford
Part No. 1A-18805-A

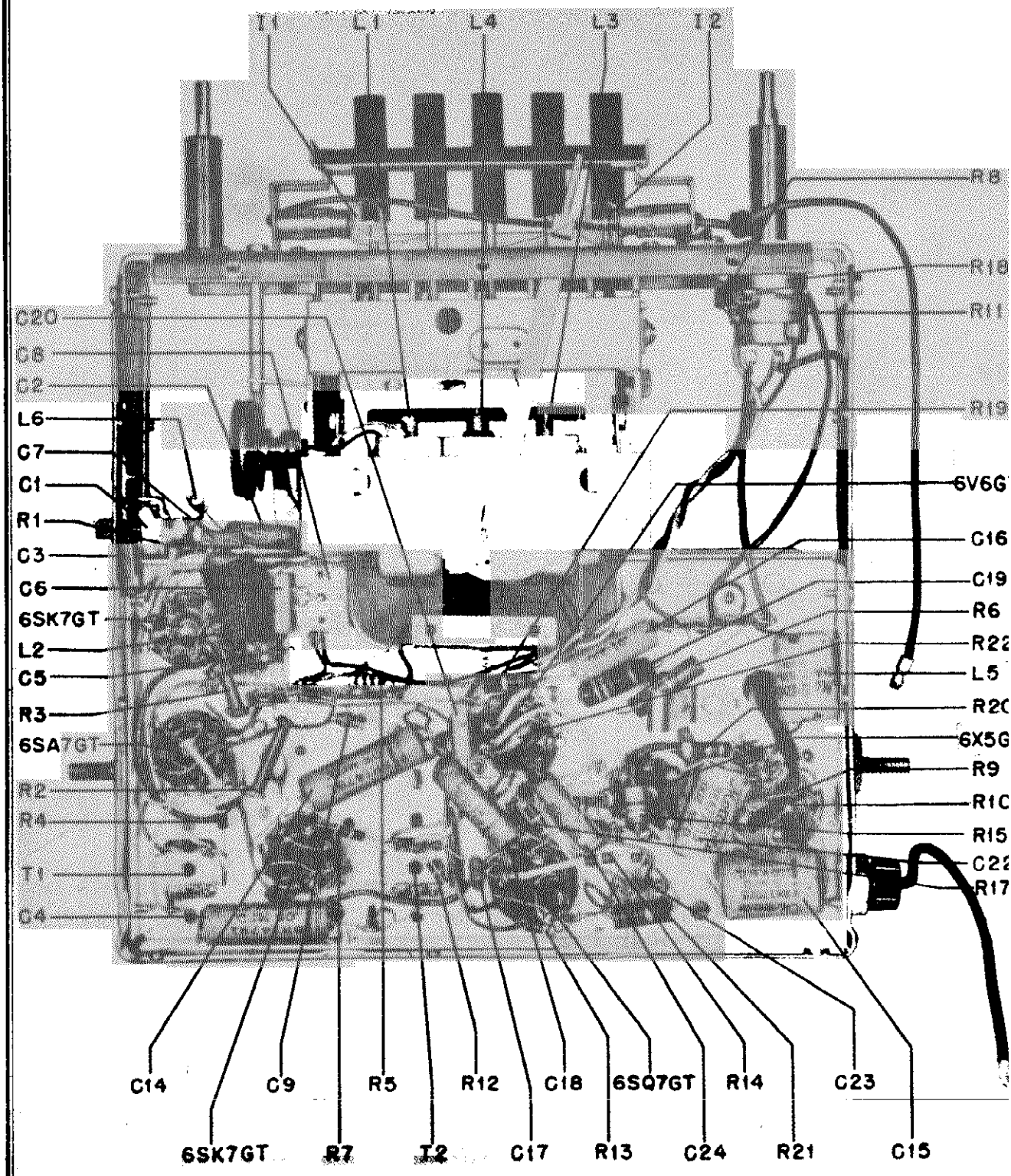


FIGURE 3. PARTS LOCATION

MODEL 1MF, Ford
Part No. 1A-18805-A2

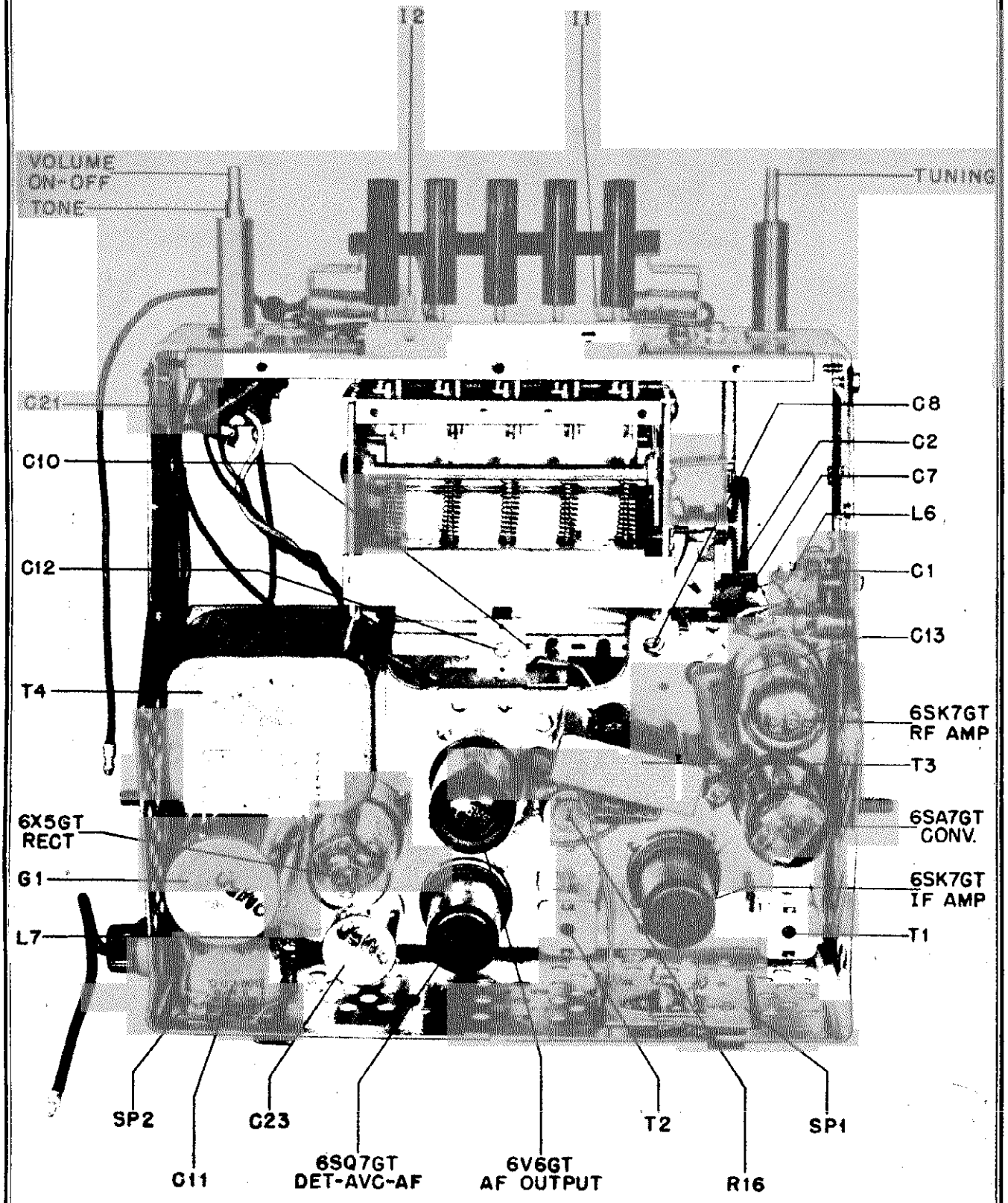


FIGURE 4. PARTS LOCATION

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Motorola Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	20B591289	Mica, variable: 5 to 80 mmf; includes bracket & thumbscrew
C-2	8A4529	Paper: .006 mf 100V
C-3	21R6619	Mica: 100 mmf 5% 500V
C-4	8R14791	Paper: .05 mf 400V
C-5	21R6665	Mica: 30 mmf 10% 500V
C-6	21R6662	Mica: 250 mmf 10% 500V
C-7	21R6631	Mica: 100 mmf 10% 300V
C-8	20A591272	Mica, variable: 5 to 80 mmf; includes bracket
C-9	21R6513	Mica: 50 mmf 10% 300V
C-10	-	Compensating -See AT-81 Tuner Service Manual
C-11	8K17028	Paper: .5 mf 100V
C-12	-	Mica, variable -See AT-81 Tuner Service Manual
C-13	8R472035	Paper: .1 mf 100V
C-14	8R14791	Paper: .05 mf 400V
C-15	8K17028	Paper: .5 mf 100V
C-16	8R472754	Paper: .01 mf 100V
C-17	21R6513	Mica: 50 mmf 10% 300V
C-18	8R23690	Paper: .01 mf 400V
C-19	8R490437	Paper: .003 mf 400V
C-20	21R6648	Mica: 250 mmf 20% 500V
C-21	8R51209	Paper: .02 mf 100V
C-22	8R472215	Paper: .008 mf 1600V
C-23A, B & C	23A485677	Electrolytic: 10-15-20 mf/ 350-350-25V
C-24	8K71909	Paper: .004 mf 400V
Fuse		
F-1	65X16248	Fuse, 8 amp
Vibrator		
G-1	48B3333	Vibrator, 4-prong: full wave; non sync
Dial Light		
I-1,2	65X4151	Bulb, pilot: 6-8V; .2A, round bayonet base; #55
Coils		
L-1	-	Antenna Coil Assembly -See AT-81 Tuner Service Manual.
L-2	24A591317	Coil, IF trap: 265 kc
L-3	-	RF Coil Assembly -See AT-81 Tuner Service Manual
L-4	-	Oscillator Coil Assembly -See AT-81 Tuner Service Manual.
L-5	24A472535	Choke, hash
L-6	24K592197	Choke, antenna spark
L-7	24A501320	Choke, "A" spark

Ref. No.	Motorola Part Number	Description
Speaker		
LS-1	50C501741 or 50C502806 or 50C501867	Speaker, PM: 6" x 9"; 3.2 ohm VC; with cable & plug (Ford 1A-18808-A)
Resistors		
NOTE: All resistors are insulated carbon type unless otherwise specified.		
R-1	6R6032	470,000 20% 1/2W
R-2	6R6287	6800 20% 1W N.I.
R-3	6R490492	6800 20% 1W
R-4	6R6015	220,000 20% 1/2W
R-5	6R6056	47,000 20% 1/2W
R-6	17K488267	Wirewound: .27 10% 1W.
R-7	6R6056	47,000 20% 1/2W
R-8	6R6394	12,000 10% 1/2W
R-9	6R5614	56 10% 1/2W
R-10	6R5614	56 10% 1/2W
R-11	18B501153	Volume & tone control: dual; 250,000 ohms each section; rear section tapped at 75,000 ohms; with switch
R-12	6R6056	47,000 20% 1/2W
R-13	6R2122	4.7 meg 20% 1/2W
R-14	6R6046	1 meg 20% 1/2W
R-15	6R3927	2.2 meg 20% 1/2W
R-16	18K591265	Control, sensitivity: 125
R-17	6R6046	1 meg 20% 1/2W
R-18	-	Tone control (part of R-11).
R-19	6R6338	270 10% 1W
R-20	17K488266	Wirewound: .47 10% 1/2W
R-21	6R6006	2200 20% 1W N.I.
R-22	6R6015	220,000 20% 1/2W
Spark Plug		
SP-1	1A591220	Spark Plug Assembly: spkr
SP-2	1A591221	Spark Plug Assembly: "A"
Transformers		
T-1	24B580193	1st IF transformer: 265 Kc; iron core tuning
T-2	24K591267	2nd IF transformer: 265 Kc; iron core tuning
T-3	25B501909	Transformer, output
T-4	25C591264	Transformer, power
Tuner		
	51D501008	Permeability Tuner: Model AT-81 (See AT-81 Service Manual)

Motorola Part Number	Description
Tubes	
6BK7GT	Tube, vacuum: 6BK7GT (RF amp)
6BA7GT	Tube, vacuum: 6BA7GT (converter)
6SK7GT	Tube, vacuum: 6SK7GT (IF amp)
6SQ7GT	Tube, vacuum: 6SQ7GT (detector-AVC-AF amp)
6V6GT	Tube, vacuum: 6V6GT (output)
6X5GT	Tube, vacuum: 6X5GT (rectifier)
CHASSIS PARTS - MECHANICAL	
7A912109	Bracket, front cover mounting
51B501304	Bracket and Socket Assembly, dial: complete with leads & bullet terminal; less bulbs
42A485548	Clip, coil can
42A4215	Clip, vibrator ground
1X501260	Escutcheon and Dial Scale Assembly.
9K501325	Fusebody Retainer: includes body, spring and contact assembly
37K85556	Grommet, rubber (dial light lead insulator)
2S2882	Nut, hex: 1/2-28 x 11/16; stl; cad pl (volume control and escutcheon mtg)
2S488296	Nut, speed (fuse retainer mtg).
5S7706	Rivet: .122 x 1/8; stl; nkl pl (grounding wiper mtg)
5S7707	Rivet: .122 x 5/32; stl; nkl pl (tube socket, spark plate, shield, front cover bracket, sensitivity control, terminal strip and antenna socket mtg)
5S7703	Rivet: .122 x 7/32; stl; nkl pl (vibrator clip mtg)
5S7708	Rivet: .122 x 9/32; stl; nkl pl (speaker socket mtg)
34B500603	Scale, dial
3S7350	Screw, machine: 6-32 x 1/4; slotted hex head; locking type; stl; cad pl (ant & RF trim mtg)
3S3397	Screw, sheet metal: #8 x 5/16 PKZ; plain hex head; stl; cad pl (pwr transformer mtg)
3S488298	Screw, sheet metal: #8 x 1/4 PKZ; slotted hex head; stl; cad pl (output trans, tuner mtg and housing screws)
3S7454	Screw, sheet metal: #8 x 1/4 PKZ; plain hex head; stl; cad pl (dial brkt assem mtg)
26A591208	Shield, hash
9A912113	Socket, antenna connector
9A912114	Socket, speaker: 3-prong
9A590099	Socket, tube: octal; molded
9A70208	Socket, tube: 4-prong, wafer
31K490143	Strip, terminal: 2 insulated lugs, #2 mtg; 3/8" spacing
31K490147	Strip, terminal, 3 insulated lugs, #2 mtg; 3/8" spacing
31K490151	Strip, terminal: 4 insulated lugs, #2 mtg; 3/8" spacing
28A501322	Terminal, bullet type (on dial light lead)
4A501321	Washer, insulating (fuse retainer)
39A591399	Wiper, ground (pwr transformer)
HOUSING PARTS & ACCESSORIES	
30K501326	Cable, fuse: includes knob & insert.
8A590751	Capacitor, fuel gauge (Ford 51AF-18871)
8B591375	Capacitor, generator (Ford 51AF-18827)
8B500736	Capacitor, oil gauge (Ford 8M18826).
8A500737	Capacitor, voltage regulator (Ford 8M18832)
42A591234	Clip, cover tension
1X501404	Cover, bottom front: includes brkt & grounding wiper
15C591222	Cover, bottom rear
15D500675	Cover, top
1C501211	Baffle and Gasket Assembly, speaker (Ford 1A-18836)
13B500596	Bezel, cup: chrome pl (Ford 1A-18835)
7C500695	Bracket, receiver mtg: RH (Ford 1A-18888)
7X500697	Bracket, receiver mtg: LH (Ford 1A-18890)
1X501261	Knob, manual tuning: chrome pl (Ford 1A-18824)
36B500598	Knob, tone control: chrome pl (Ford 1A-18830)
1X501262	Knob, volume control and on-off (Ford 1A-18820)
4S7693	Lockwasher, split: 1/4; stl; cad pl (receiver mtg) (Ford 34805-S8)
2S2878	Nut, hex: 1/4-20 x 7/16; stl; cad pl (receiver mtg) (Ford 33795-S8)
2S2882	Nut, hex: 1/2-28 x 11/16; stl; cad pl (receiver mtg to instrument panel and bezel cup mtg)(Ford 356098-S8)
2A912119	Nut, wing: 8-32; stl; cad pl (spkr mtg) (Ford 33900-S8)
3A580587	Screw, cap: cad pl (bottom cover mtg)
3S488298	Screw, sheet metal: #8 x 1/4 PKZ; slotted hex head; stl; cad pl (housing screws)
6A912121	Suppressor, distributor (Ford 1GA-18811-A)
4A500702	Washer, serrated (receiver mtg) (Ford OL-18869)
1X591404	Wheel Static Collector Assembly
39A51490	Wiper ground (on bottom front cover)

MODELS 5C4, Ch. HS-270;
5C5, Ch. HS-271;
5C6, Ch. HS-272

GENERAL INFORMATION

TYPE - AC table model superheterodyne with appliance outlet and self-contained electric clock for controlling automatically the operation of the radio and the outlet.

APPLIANCE OUTLET - For use with 117 volt AC appliances only, rated at 1100 watts or less.

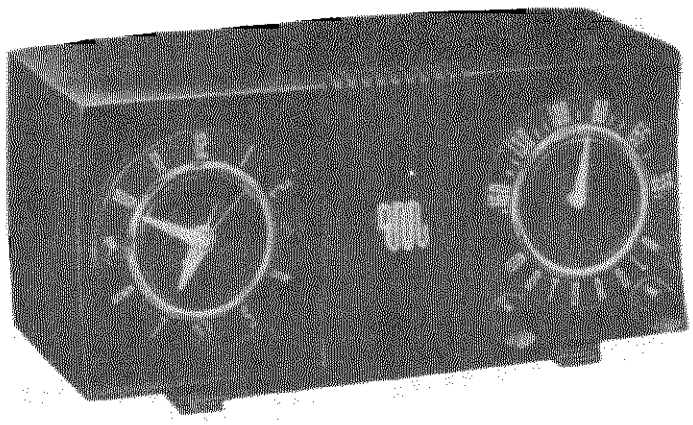
RECEIVER MODELS -

Model	Color	Chassis
5C4	Green	HS-270
5C5	Ivory	HS-271
5C6	Walnut	HS-272

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT -

12BE6	Converter
12BA6	IF Amplifier
12AT6	Det, AVC & AF Amp
50C5	Power Amplifier
35W4	Rectifier



POWER SUPPLY - Operates from 117 volts, 60 cycle, alternating current only. Power consumption 37 watts.

CLOCK - Telechron self-starting electric clock (Telechron basic movement No. C-57, with Motorola face, hands, and escutcheon).

INSTALLATION & OPERATING INSTRUCTIONS

The locations and functions of the clock and radio controls are shown in Figure 1.

NORMAL RADIO OPERATION

Knob "A" on the clock turns the radio on or off. Select stations with the TUNING knob, and adjust volume with the VOLUME control.

A built-in loop antenna eliminates the need for an outside antenna in most locations. When receiving a weak station, rotate the receiver slightly for best signal strength. If additional pick-up is necessary, connect an external antenna to the radio by following the instructions printed on the rear panel. CAUTION: Never connect the radio chassis to a water pipe, radiator, or other ground.

CLOCK OPERATION

The clock will start as soon as the receiver is plugged into an electrical outlet. To set the hands to the correct time, rotate the TIME SET knob (on the rear of the radio) in a clockwise direction only.

ALARM OPERATION

To set the alarm, pull out knob "C" and rotate it in a counterclockwise direction to the desired time on the alarm dial scale. The alarm will ring for one hour, or until knob "C" is pushed in. The alarm function is completely independent of the other controls on the clock.

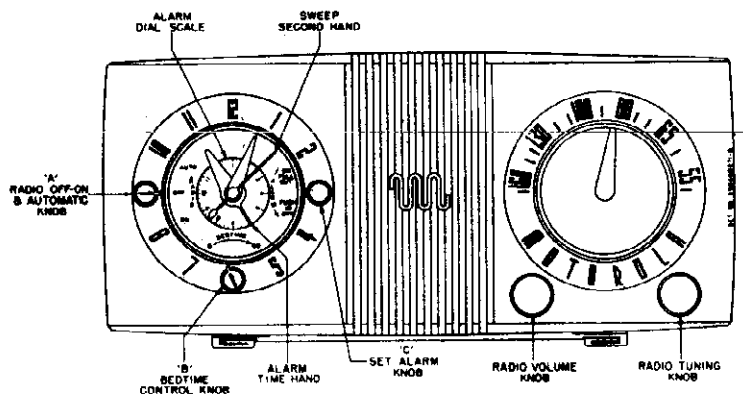


FIGURE 1. OPERATING CONTROLS

MODELS 5C4, Ch. HS-270
5C5, Ch. HS-271;
5C6, Ch. HS-272

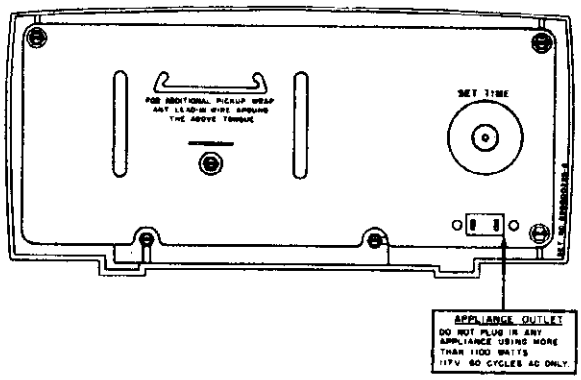


FIGURE 2. REAR VIEW

APPLIANCE OUTLET

To control an electrical appliance automatically, plug it into the receptacle on the back of the radio. See Figure 2. It will then be turned on or off simultaneously with the radio. CAUTION: Note that the rating of the outlet is 1100 watts or less.

If radio reception is not desired when operating the appliance, rotate the radio volume control to the minimum volume position.

BEDTIME CONTROL

The BEDTIME control will turn the radio and appliance off after any pre-set interval of time up to one hour.

Turn knob "A" to the "OFF" position and rotate knob "B" to any period of time between 0 and 60 minutes. The radio and appliance will be turned off automatically after the proper time has elapsed, and they will remain off until turned on again manually.

AUTOMATIC RADIO OPERATION

The clock controls may be pre-set to turn the radio on automatically at any time up to twelve hours in advance.

If an appliance is plugged into the receptacle on the back of the receiver, it will be turned on automatically, along with the radio.

Pull out knob "C", rotate it counterclockwise to the desired time on the alarm dial scale, and push the knob back in. Rotate knob "A" first to the "OFF" and then to the "AUTO" position. At the pre-set time, the radio will come on and will continue to play until turned off manually. The alarm will ring also if the knob "C" is left pulled out. The radio will come on first and, after an interval of about ten minutes, the alarm will ring.

BEDTIME AND AUTOMATIC OPERATIONS COMBINED

By combining the operations in the two sections above the radio may be turned off automatically and on again automatically.

When setting the BEDTIME control, rotate knob "A" to the "AUTO" position instead of "OFF". IMPORTANT: It is necessary to turn knob "A" first to the "OFF" position before proceeding to "AUTO", otherwise the radio may not shut off.

ALIGNMENT

NOTE: It is recommended that an isolation transformer be placed between the power line and the receiver to avoid hum and electrical shocks. If an isolation transformer is not available, connect the low side of the signal generator to B- through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.

2. Connect the low side of the signal generator to B-.

3. Set the signal generator for 400 cycle, 30% modulation.

4. Turn the receiver volume control to maximum.

5. Use a small fibre screwdriver for aligning the IF and diode transformers.

6. As stages are brought into alignment, reduce the signal generator output to a level which produces less than .4 volts (.05 watt) across the voice coil to avoid overloading the receiver.

7. See Figure 3 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	1 mf	Grid of conv. (pin 7, 12BE6)	455 Kc	Fully open	1, 2, 3 & 4 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	-	-	-	Fully closed	-	Set pointer to horizontal position.
3.	-	Grid of conv. (pin 7, 12BE6)	1620 Kc	Fully open	5 (Osc)	Adjust for maximum.
4.	-	Radiation loop*	1400 Kc	Tune for max	6 (Ant)	Adjust for maximum.

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

MODELS 5C4, Ch. HS-270;
5C5, Ch. HS-271;
5C6, Ch. HS-272

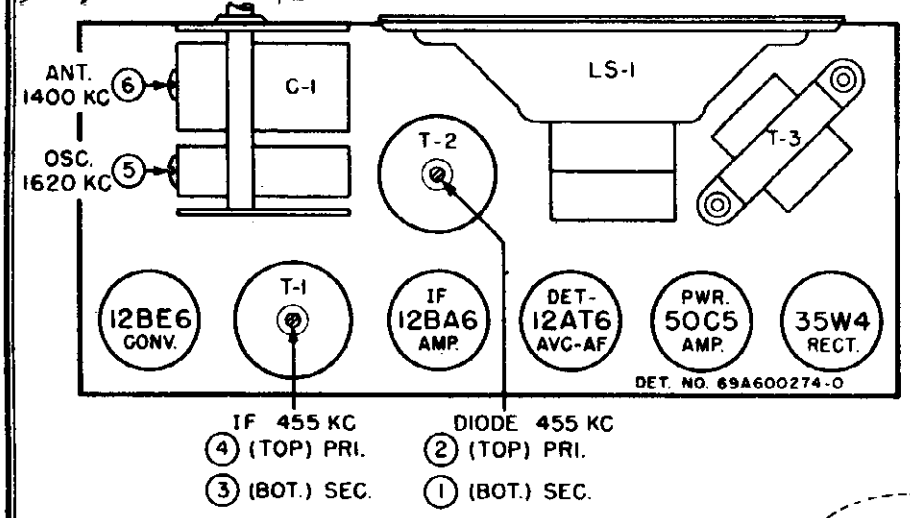


FIGURE 3. TUBE & TRIMMER LOCATIONS

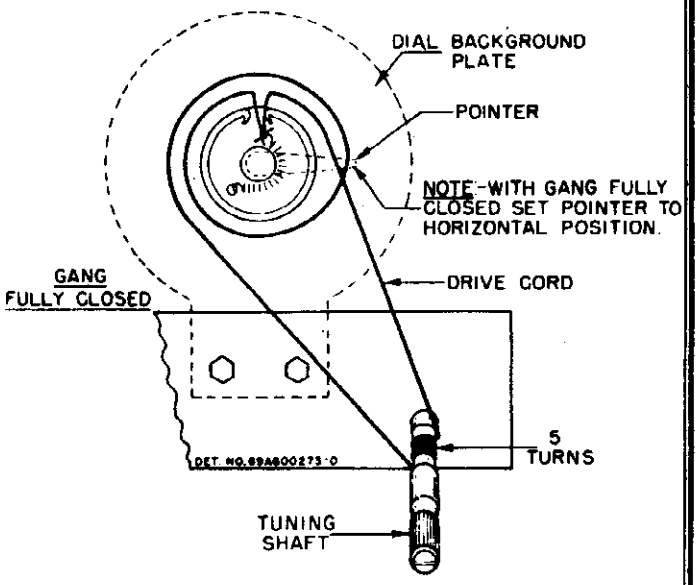


FIGURE 4. STRING DRIVE DETAIL

SERVICE NOTES

TO REMOVE RADIO CHASSIS FROM CABINET

1. Pull off the two radio control knobs.
2. Remove the three hex head screws which hold the loop to the cabinet.
3. From the back of the cabinet, remove the two hex head screws at the rear edge of the radio chassis.
4. Slide the radio chassis and loop from the cabinet.
5. Disconnect the power leads to the radio chassis and to the appliance receptacle.

TO REMOVE CLOCK FROM CABINET

1. Remove radio chassis as above.
2. Remove the three nuts and lockwashers holding the shield behind the clock.
3. Slide the shield from the cabinet.
4. Turn the BEDTIME control knob to "60".
5. Pull out the ALARM set knob.
6. Turn the RADIO control knob to "AUTO".
7. While observing the clock from the back to avoid bending or breaking any parts, gently push the clock forward, at the same time twisting it slightly to eliminate binding.

TO REPLACE CLOCK DIAL FACE

1. Remove the clock from the cabinet as above.
2. Pull off the RADIO control and BEDTIME knobs.
3. Turn the ALARM set knob clockwise to remove.
4. Remove the escutcheon and crystal.
5. Carefully pull off the three hands.
6. Remove the alarm dial and the clock face.
7. Turn the radio control shaft to "AUTO" position.
8. Slowly rotate the time set shaft clockwise until the switch contacts behind the radio control shaft close.
9. Reassemble the clock face, alarm dial and three hands. Set all the hands to indicate 12 o'clock. Set the figure "12" on the alarm dial to index with the small pointer on the hour hand.
10. Replace the crystal, the escutcheon, and the knobs.
11. Check the automatic operation to be sure the switch contacts close at the time indicated on the alarm dial.

MODELS 5C4, Ch. HS-270;
5C5, Ch. HS-271;
5C6, Ch. HS-272

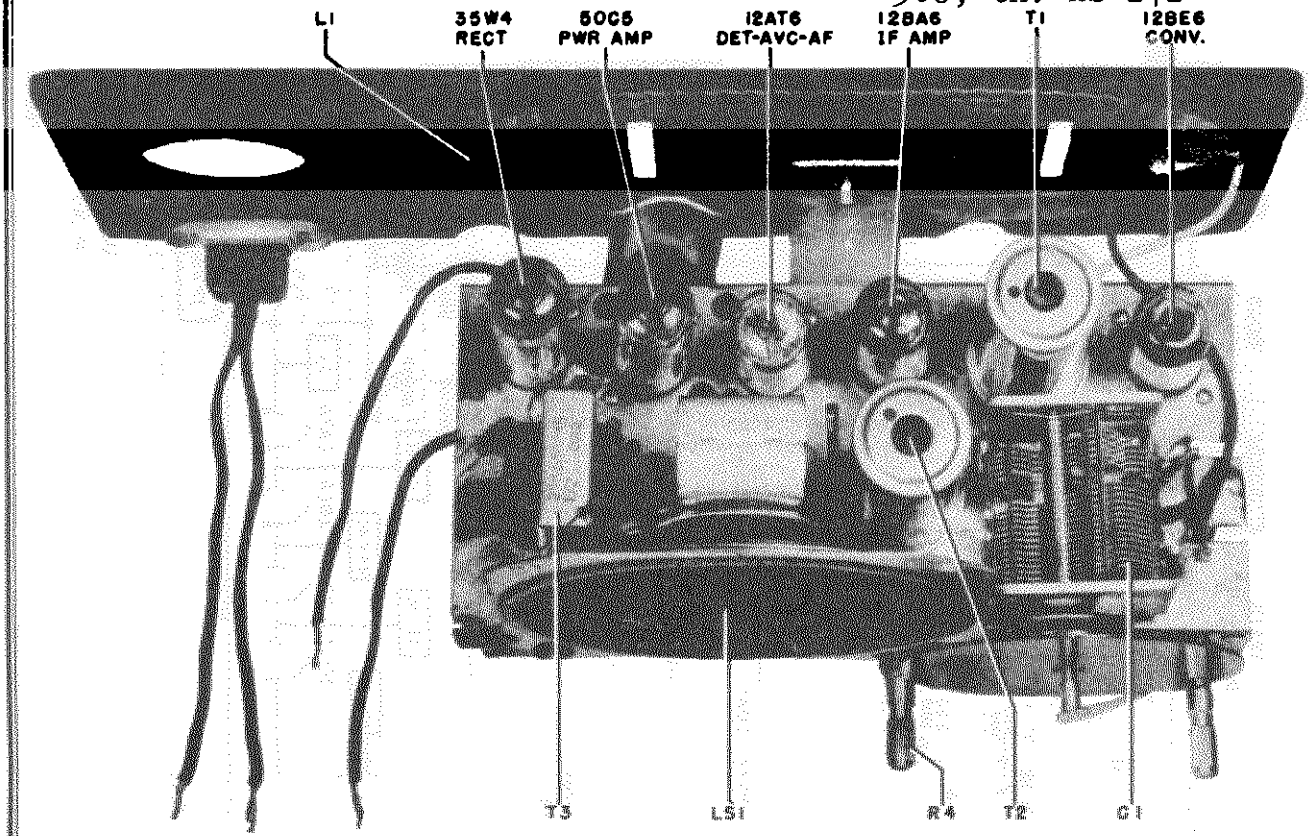


FIGURE 5. TOP VIEW OF CHASSIS

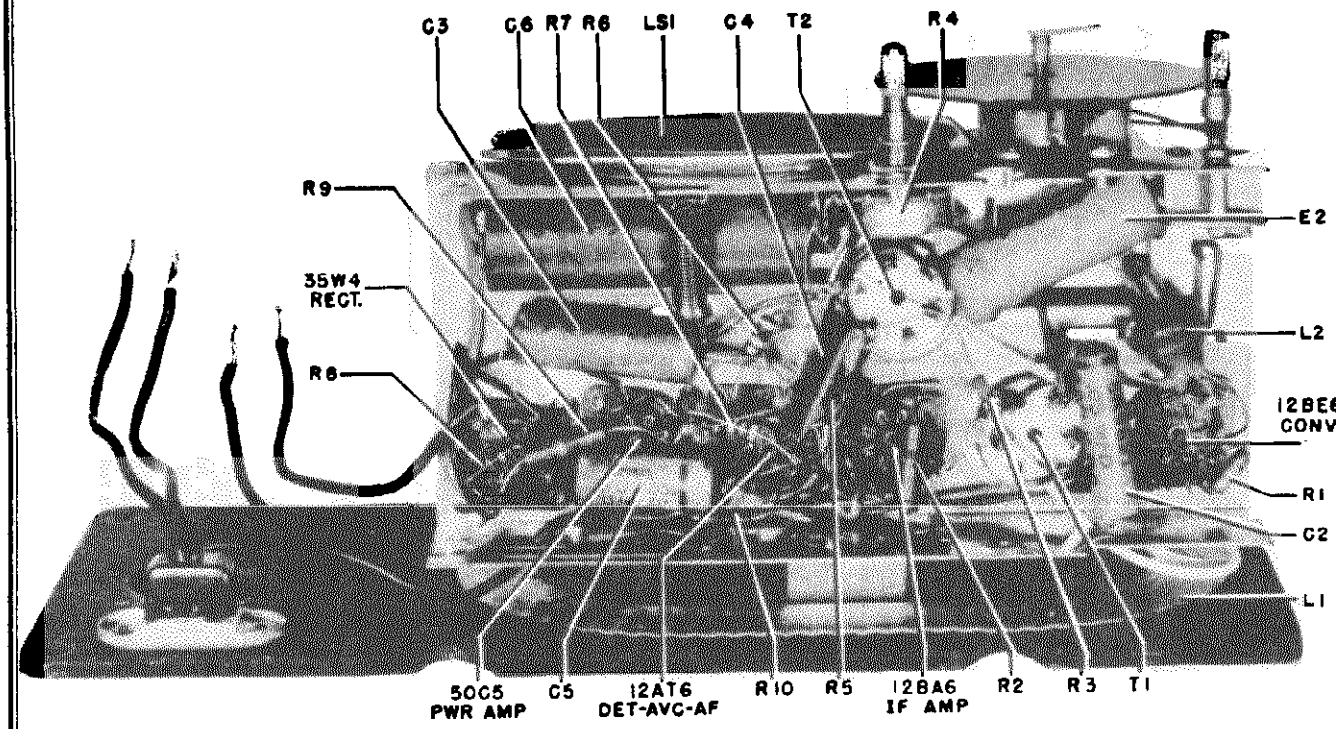
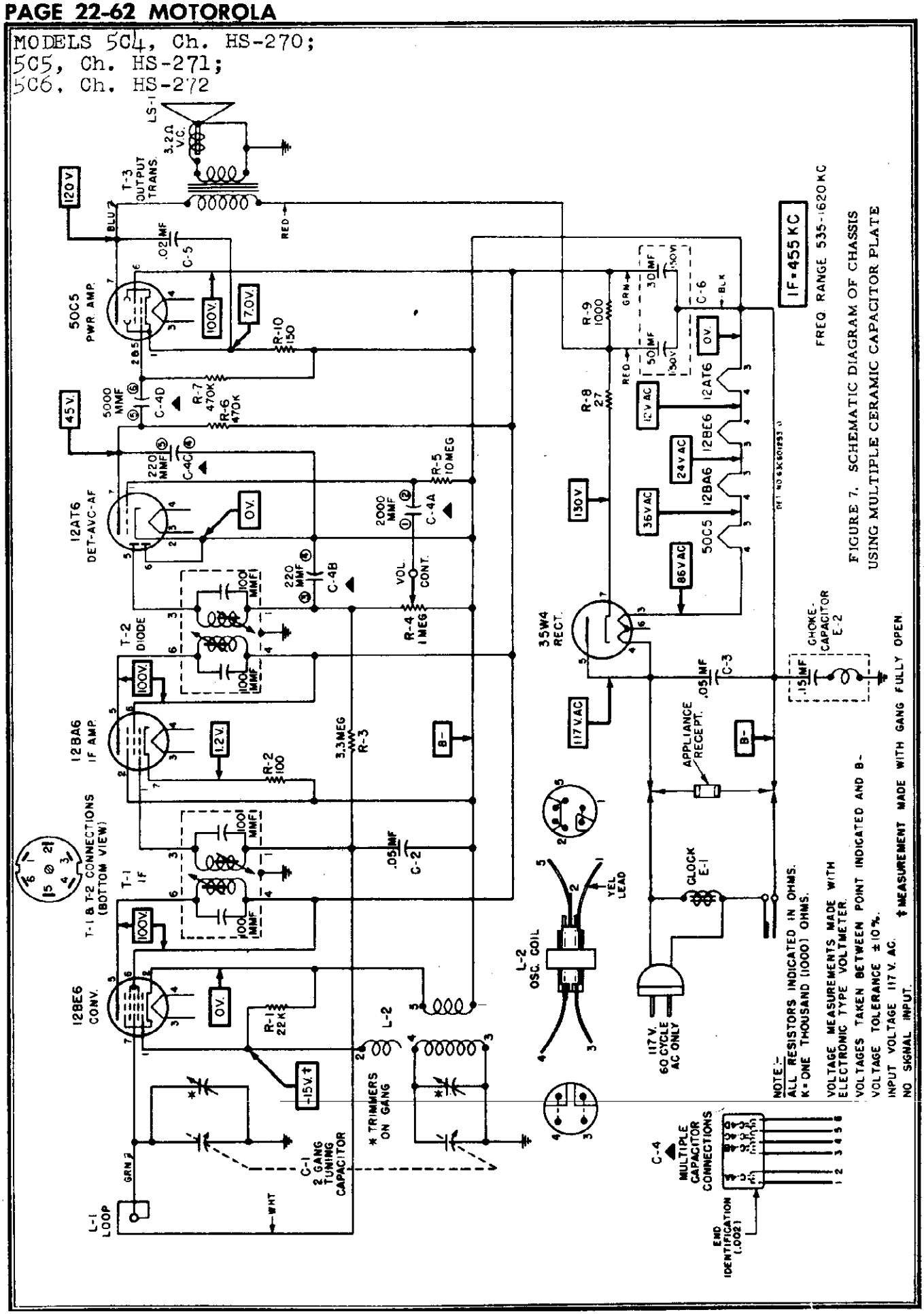
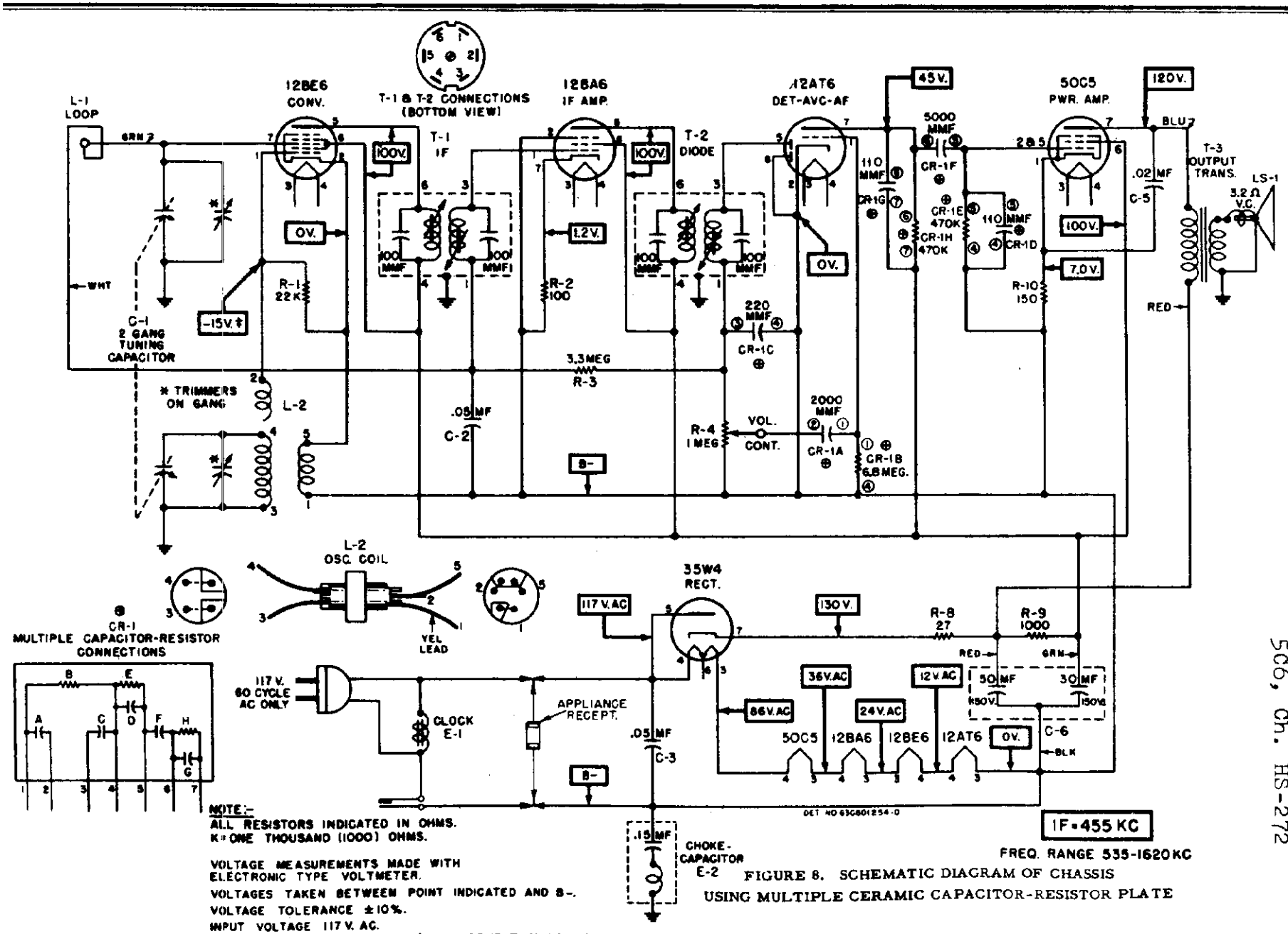


FIGURE 6. BOTTOM VIEW OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

MODELS 5C4, Ch. HS-270;
5C5, Ch. HS-271;
5C6, Ch. HS-272





NOTE:-
ALL RESISTORS INDICATED IN OHMS.
K = ONE THOUSAND (1000) OHMS.

VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
VOLTAGES TAKEN BETWEEN POINT INDICATED AND 8-.
VOLTAGE TOLERANCE ±10%.
INPUT VOLTAGE 117 V. AC.
NO SIGNAL INPUT

‡MEASUREMENT MADE WITH GANG FULLY OPEN.

FIGURE 8. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR-RESISTOR PLATE

REPLACEMENT PARTS LIST

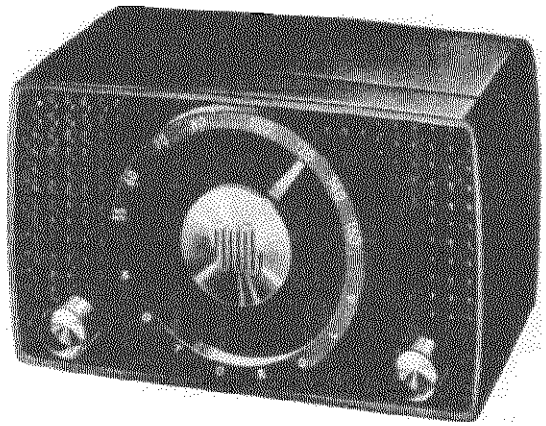
NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	19B600021	Variable: 2 gang; with pulley .....
C-2	8R9821	Paper: .05 mf 200V .....
C-3	8R9816	Paper: .05 mf 400V .....
C-4	21B482847	Ceramic, multiple: 2000 mmf, 220 mmf, 220 mmf, 5000 mmf .....
C-5	8R9802	Paper: .02 mf 400V .....
C-6	23B600855	Electrolytic: 50-30 mf/150V.....
Capacitor-Resistor		
CR-1	21B601007	Capacitor-Resistor: 2000, 220, 110, 5000, 110 mmf; 6.8 meg; 470,000, 470,000 ohms .....
Clock		
E-1	59C600007	Electric Clock Assembly: Telechron movement No. C-57,with Motorola face, hands, crystal, escutcheon and knobs (for green cabinet)(5C4)
	59K600198	Same as above except color (for ivory cabinet)(5C5) .....
	59K600788	Same as above except color (for walnut cabinet)(5C6) .....
Choke & Capacitor		
E-2	8A690487	Choke & .15 mf paper capacitor ....
Coils		
L-1	1X601033	Antenna Loop, Panel, and Receptacle Assembly: complete .....
	24K601023	Antenna Loop and Panel Assembly: less receptacle .....
L-2	24B680364	Oscillator coil .....
Speaker		
LS-1 or	50C600017 50C600857	Speaker: 4" PM; 3.2 ohm VC .....
Resistors		
	Note:	All resistors are insulated carbon type unless otherwise specified.
R-1	6R6028	22,000 20% 1/2W .....
R-2	6R6018	100 20% 1/2W .....
R-3	6R2118	3.3 meg 20% 1/2W .....
R-4	18A600018	Volume control: 1 meg .....
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 .....
Transformers		
T-1	24B482863	IF Transformer (brown dot): 455 Kc: complete with capacitor and cores; less shield .....
T-2	24B482865	Diode Transformer (red dot): 455 Kc: complete with capacitors and cores; less shield .....
T-3	25K680345	Output Transformer .....
CHASSIS PARTS - MECHANICAL		
	7A478118	Bracket, loop mtg .....
	7A77337	Bracket, tuning shaft .....
	42B482867	Clip, spring: blued finish (holds IF transformers) .....
	11M8944	Cord, dial: 18 lb; black .....
	5A484268	Grommet, speaker mtg: rubber .....
	14A478119	Insulator, loop brkt mtg: fibre .....
	4S7691	Lockwasher, internal: 3/8; cad pl (vol control mtg) .....
	2A780465	Nut, knurled (vol control mtg) .....
	64A600025	Plate, dial background: green (HS-270) .
	64K600193	Plate, dial background: ivory (HS-271) .
	64K600779	Plate, dial background: walnut (HS-272)..
	52A600027	Pointer, dial: light green color (HS-270 & HS-272) .....
	52K600194	Pointer, dial: dark green color (HS-271).
	9A601018	Receptacle, appliance (on loop panel) ...
	5S7771	Rivet: .088 x 3/16 stl; nkl pl (tube socket mtg) .....
	5S7707	Rivet: .122 x 5/32 stl; nkl pl (output trans mtg) .....
	5S7701	Rivet: .122 x 3/16 stl; nkl pl (tuning shaft brkt mtg) .....
	5S7703	Rivet: .122 x 7/32 stl; nkl pl (loop bracket & speaker mtg) .....
	5S7700	Rivet: .122 x 1/4 stl; nkl pl (appliance receptacle mtg) .....
	3S7247	Screw, machine: 6-32 x 3/16 slotted locking hex head; cad pl (gang mtg) .....
	3S7506	Screw, sheet metal: #6 x 1/4 PKZ plain hex head; cad pl (dial background plate mtg) .....
	3S7467	Screw, sheet metal: #8 x 3/8 PKZ plain hex head; cad pl (loop mtg) .....
	47A600022	Shaft, tuning .....
	26K485936	Shield, coil (for IF transformers).....
	26A478117	Shield, electrostatic (on rear of chassis) .....
	43A600095	Sleeve, paper: black (on pointer shaft) (HS-270 & HS-272) .....
	43K600195	Sleeve, paper: ivory (on pointer shaft) (HS-271) .....
	9A472534	Socket, tube: miniature; 7-prong ..
	41A73996	Spring, tension (electrolytic mtg)..
	41A73619	Spring, tension (gang drive cord)...
	4A70015	Washer, "C" (tuning shaft mtg).....
	4S7633	Washer, flat: 9/16 x 11/64 x .033 stl; cad pl (loop mtg) .....
	14A11493	Washer, shoulder: fibre (loop bracket mtg) .....
CABINET PARTS		
	16E600005	Cabinet, table model: plastic; green (5C4)
	16K600199	Cabinet, table model: plastic; ivory (5C5)
	16K600791	Cabinet, table model: plastic; walnut(5C6)
	28A600064	Connector, wire (connects clock & radio power leads) .....
	61A600001	Crystal: plastic (cover over radio dial).
	13K600003	Escutcheon, radio dial: green (5C4).....
	13K600197	Escutcheon, radio dial: ivory (5C5).....
	13K600790	Escutcheon, radio dial: walnut (5C6).....
	14A16304	Grommet, fibre (on clock shield).....
	36A600065	Knob, radio control: green plastic(5C4)..
	36K600192	Knob, radio control: ivory plastic (5C5).
	36K600787	Knob, radio control: walnut plastic (5C6)
	4S7667	Lockwasher: #4 ext: cad pl (clock shield mtg).....
	13A792195	Medallion: brass (on front of speaker grille) .....
	2S7019	Nut, hex: 4-40 x 1/4 stl; cad pl (clock shield mtg) .....
	3S476083	Screw, machine: 6-32 x 5/16 slotted locking hex head; cad pl (radio chassis mtg) .....
	3S2991	Screw, machine: 6-32 x 1/2 plain hex head; cad pl (mounts loop to cabinet).....
	1X600799	Shield, clock: with grommet (covers rear of clock) .....
	2S490840	Speednut: for 1/16" stud (medallion mtg) .....
	11M488253	Tape, aluminum foil (inside top of cabinet) .....
	4S7633	Washer, flat: 9/16 x 11/64 x .033 stl; cad pl (mounts loop to cabinet).....
CLOCK PARTS		
	Note:	The following Motorola parts are for use with the basic Telechron clock movement No. C-57.
	34K600993	Alarm dial: green color (5C4) .....
	34K600994	Alarm dial: ivory color (5C5) .....
	34K600995	Alarm dial: walnut color (5C6) .....
	30K600980	Cord, line: with plug; 6 ft long .....
	61A600001	Crystal: plastic (cover over face of clock)
	34K600990	Dial Face: green color (5C4) .....
	34K600991	Dial Face: ivory color (5C5) .....
	34K600992	Dial Face: walnut color (5C6) .....
	13C600002	Escutcheon, clock: green color (5C4) ....
	13K600196	Escutcheon, clock: ivory color (5C5) ....
	13K600789	Escutcheon, clock: walnut color (5C6)....
	52K600996	Hand, hour: light green color (5C4 & 5C6)
	52K600997	Hand, hour: dark green color (5C5).....
	52K600998	Hand, minute: light green color (5C4 & 5C6) .....
	52K600999	Hand, minute: dark green color (5C5).....
	52K601001	Hand, second: brass .....
	36K600987	Knob, clock control: plain; green (5C4)..
	36K600988	Knob, clock control: plain; ivory (5C5)..
	36K600989	Knob, clock control: plain; walnut (5C6).
	36K600984	Knob, clock control: with arrow; green (5C4) .....
	36K600985	Knob, clock control: with arrow; ivory (5C5) .....
	36K600986	Knob, clock control: with arrow; walnut (5C6) .....
	36K601002	Knob, time set .....

MODELS 5H11, 5H12, 5H13, Ch. HS-256

GENERAL INFORMATION

TYPE - AC-DC table model superheterodyne receiver with loop antenna.



RECEIVER MODELS

Model	Color
5H11	Walnut
5H12	Ivory
5H13	Green

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

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

POWER SUPPLY - 117 volts AC or DC, 35 watts

INSTALLATION & OPERATING INSTRUCTIONS

VOLUME CONTROL & OFF-ON SWITCH. The "off-on" switch and volume control are combined and are operated with the left-hand knob. NOTE: If the receiver does not operate from DC power, reverse the plug in the power outlet. When operating from AC power, reception may sometimes be improved by reversing the power plug in the outlet.

TUNING CONTROL. Stations are tuned in with the right-hand knob.

ANTENNA. A built-in loop antenna eliminates the need for an outside antenna in most locations. When receiving a weak station, rotate the receiver slightly for best signal strength. If additional pick-up is necessary, connect an external antenna to the radio by following the instructions printed on the rear panel. CAUTION: Never connect the radio chassis to a water pipe, radiator, or other ground.

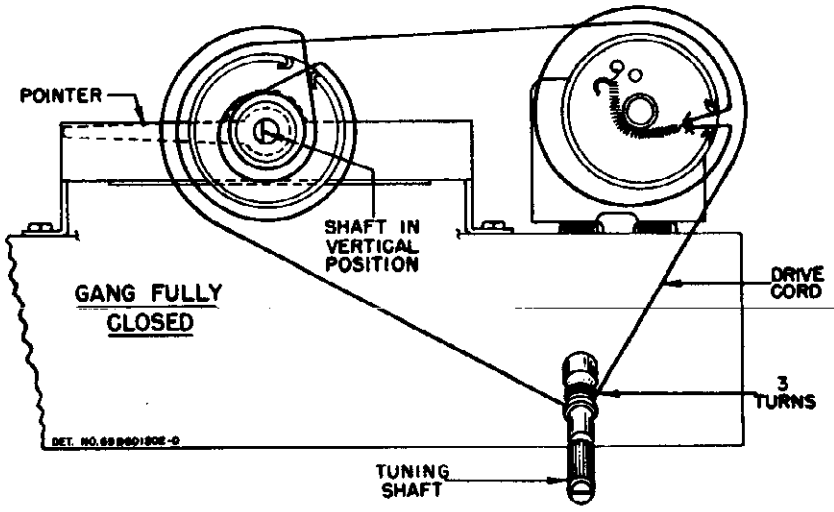


FIGURE 1. STRING DRIVE DETAIL

MODELS 5H11, 5H12,
5H13, Ch. HS-256

SERVICE NOTES

The chassis of this receiver is connected directly to the power line. When operating the chassis (from an AC line) outside of its cabinet, use an isolation transformer between the power line and the receiver to reduce the possibility of an electrical shock.

TO REMOVE THE CHASSIS FROM THE CABINET:

1. Pull off the two radio control knobs.
2. Pull off the brass cover over the pointer.
3. Pull off the pointer.
4. Remove the split plugs which hold the loop to the cabinet.
5. From the back of the cabinet, remove the two hex head screws at the rear edge of the radio chassis.
6. Slide the radio chassis and loop from the cabinet.

ALIGNMENT

NOTE: If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver to avoid hum and electrical shocks. If an isolation transformer is not available, connect the low side of the signal generator to chassis through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.
2. Connect the low side of the signal generator to chassis.
3. Set the signal generator for 400 cycle, 30% modulation.
4. Turn the receiver volume control to maximum.
5. Use a small fibre screwdriver for aligning the IF and diode transformers.
6. As stages are brought into alignment, reduce the signal generator output to a level which produces less than .40 volts (.05 watt) across the voice coil to avoid overloading the receiver.
7. See Figure 2 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. (pin 7, 12BE6)	455 Kc	Fully open	1, 2, 3, & 4 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	-	Grid of conv. (pin 7, 12BE6)	1620 Kc	Fully open	5 (Osc)	Adjust for maximum.
3.	-	Radiation loop*	1400 Kc	Tune for max	6 (Ant)	Adjust for maximum.

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

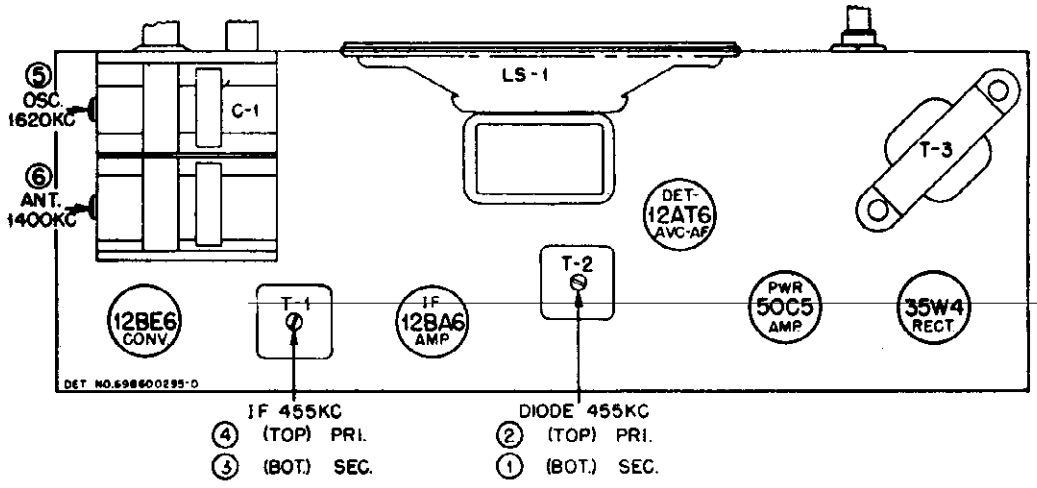


FIGURE 2. TUBE & TRIMMER LOCATIONS

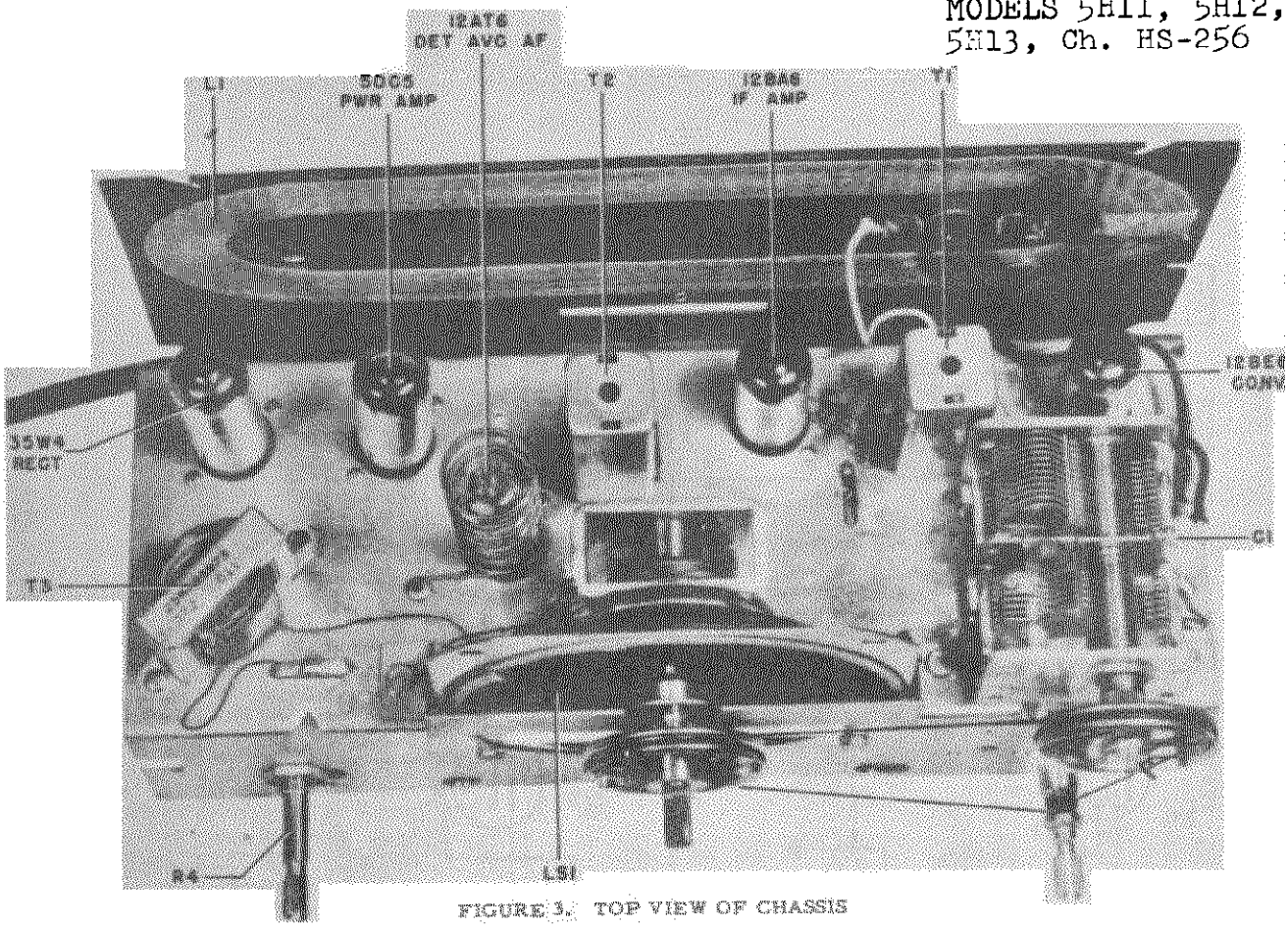


FIGURE 3. TOP VIEW OF CHASSIS

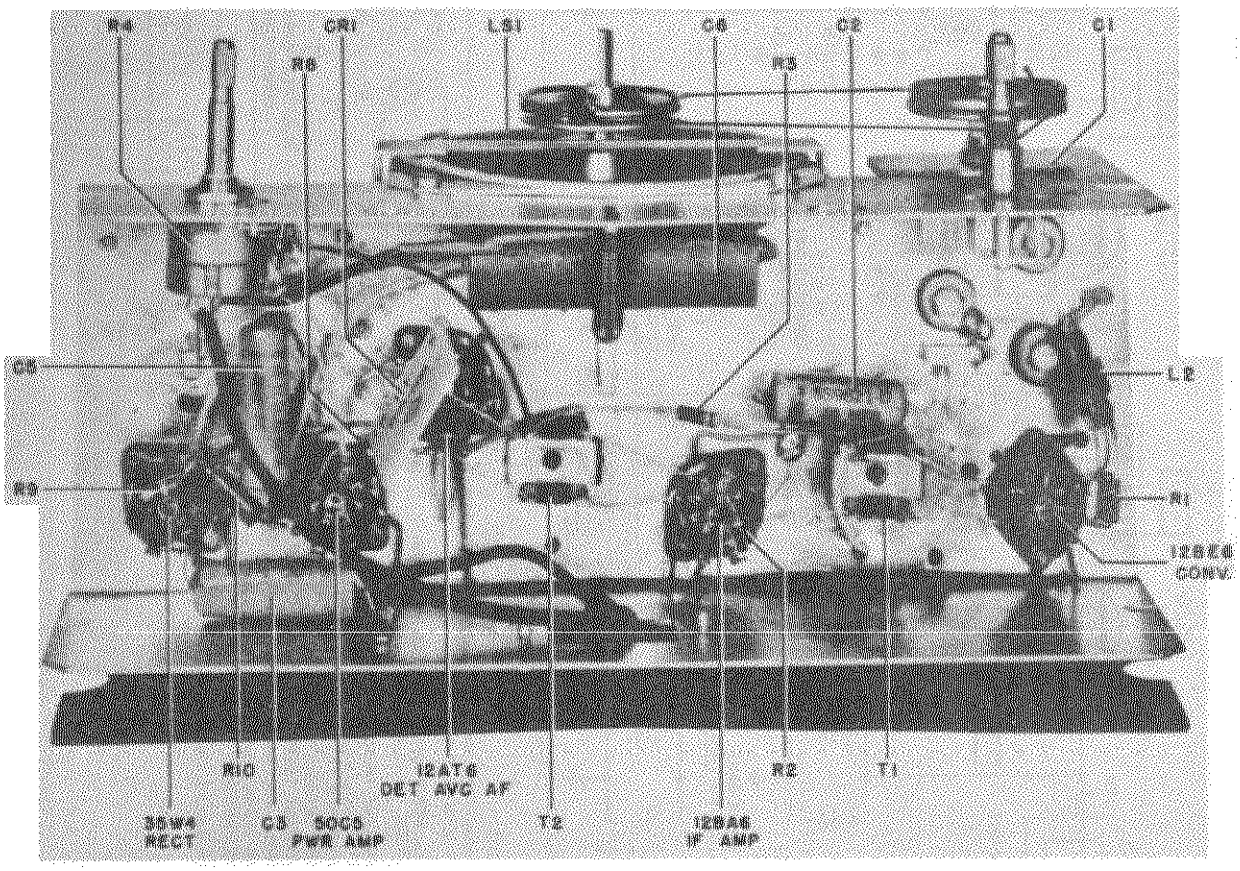
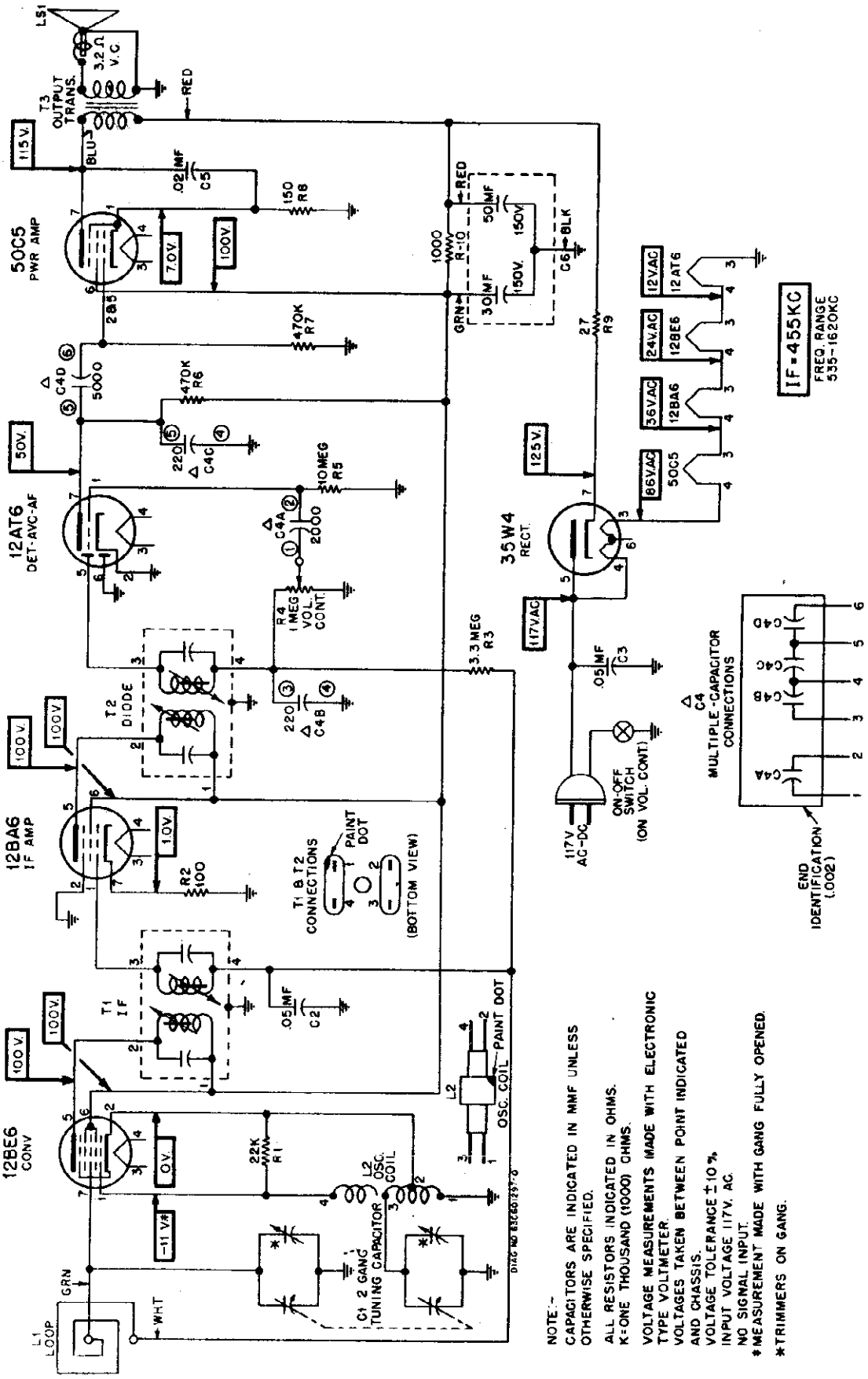


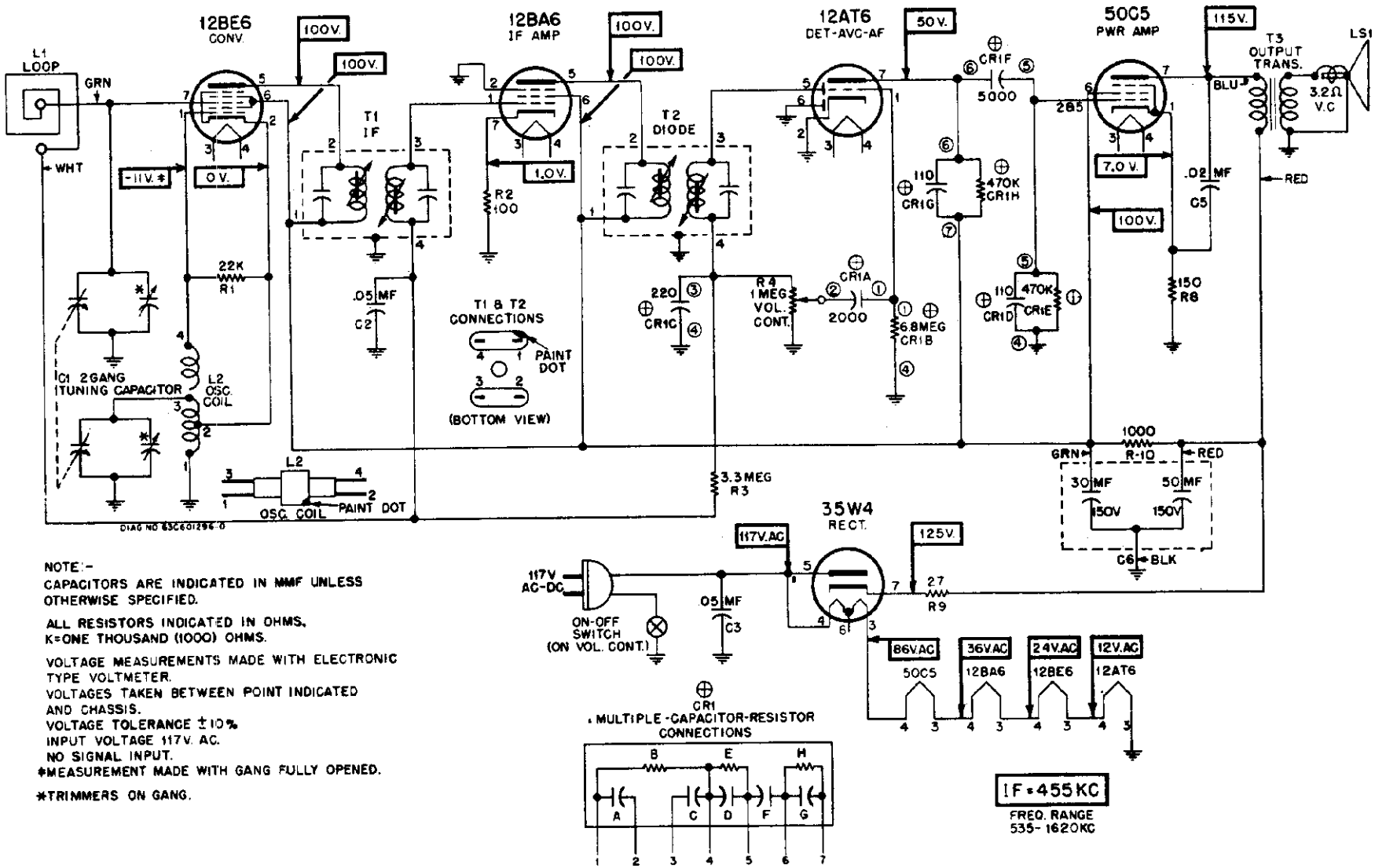
FIGURE 4. BOTTOM VIEW OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR-RESISTOR PLATE

MODELS 5H11, 5H12,
5H13, Ch. HS-256



NOTE:-
CAPACITORS ARE INDICATED IN MMF UNLESS OTHERWISE SPECIFIED.
ALL RESISTORS INDICATED IN OHMS. K=ONE THOUSAND (1000) OHMS.
VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
VOLTAGES TAKEN BETWEEN POINT INDICATED AND CHASSIS.
VOLTAGE TOLERANCE ± 10%.
INPUT VOLTAGE 117V. AC.
NO SIGNAL INPUT.
*MEASUREMENT MADE WITH GANG FULLY OPENED.
*TRIMMERS ON GANG.

FIGURE 5. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE



NOTE:-
CAPACITORS ARE INDICATED IN MMF UNLESS OTHERWISE SPECIFIED.

ALL RESISTORS INDICATED IN OHMS, K=ONE THOUSAND (1000) OHMS.

VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
VOLTAGES TAKEN BETWEEN POINT INDICATED AND CHASSIS.
VOLTAGE TOLERANCE ±10%
INPUT VOLTAGE 117V. AC.
NO SIGNAL INPUT.
*MEASUREMENT MADE WITH GANG FULLY OPENED.

*TRIMMERS ON GANG.

FIGURE 6. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR-RESISTOR PLATE

MODELS 5H11, 5H12, 5H13, Ch. HS-256

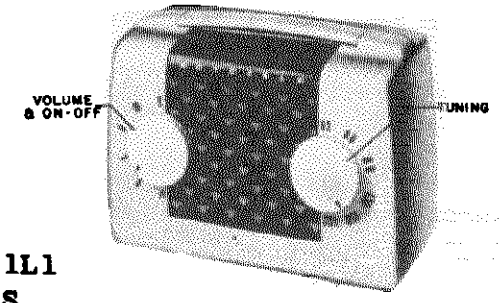
REPLACEMENT PARTS LIST

NOTE: When ordering parts specify model number of set in addition to part number and description of part.

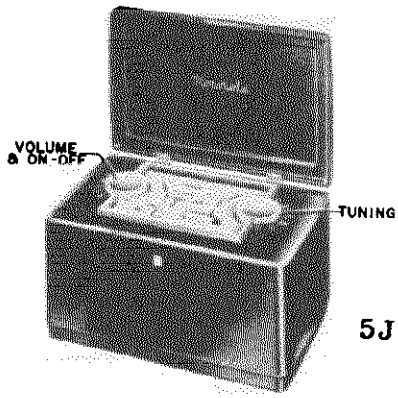
Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	19B600483	Variable: 2 gang; with pulley
C-2	8R9821	Paper: .05 mf 200V
C-3	8R9816	Paper: .05 mf 400V
C-4	21B482847	Ceramic, multiple: 2000,220 220, 5000 mmf
C-5	8R9802	Paper: .02 mf 400V
C-6	23B600855	Electrolytic: 50-30 mf/150V
Capacitor-Resistor		
CR-1	21B601007	Capacitor-resistor: 2000, 220,110,110,5000 mmf; 6.8 meg; 470,000, 470,000 ohms
Coils		
L-1	24C600518	Loop Antenna Assembly: includes back panel
L-2	24K600896	Oscillator coil(green dot).
Speaker		
LS-1	50C691401	Speaker: 4" PM; 3.2 ohm VC.
Resistors		
	Note:	All resistors are insulated carbon type unless other 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	18K600473	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	6R3992	150 20% 1/2W
R-9	6R5683	27 10% 1/2W
R-10	6R3953	1000 20% 1W
Transformers		
T-1,2	24B485553	IF and Diode transformer (green dot): 455 Kc; complete with capacitors, cores, and shield
T-3	25K485973	Output transformer

Ref. No.	Description
CHASSIS PARTS - MECHANICAL	
7K485971	Bracket, loop mtg
7A600476	Bracket,tuning shaft mtg
1X600606	Bracket, pointer shaft mtg: with bushing
42A485548	Clip, IF coil mtg
11M8944	Cord, dial: 18 lb; black
30A470651	Cord, line: with plug; 6 ft long
5A19658	Eyelet, spacer (gang mtg)
5A70404	Grommet, rubber (gang mtg)
14A482844	Insulator,line cord: fibre
29R3010	Lug, soldering (under gang mtg screw)
2S7051	Nut, hex palnut: 3/8-32 x 9/16 (volume control mtg)
1X600590	Pulley and Bushing Assembly, pointer drive
5S7771	Rivet: .088 x 3/16 stl; nkl pl (tube socket mtg)
5S7707	Rivet: .122 x 5/32 stl; nkl pl (tube shield, output transformer, and tuning shaft bracket mtg)
3S2294	Screw, machine: 6-32 x 1/2 plain hex head lock screw; cad pl (gang mtg)
3S7477	Screw, machine: 3-32 x 1/4; type #1; plain hex head; cad pl (back panel mtg)
3S2695	Screw, sheet metal: #6 x 3/16 PKZ plain hex head; cad pl (pointer bracket mtg)
3S3398	Screw, sheet metal: #6 x 3/8 PKZ plain hex head; cad pl (loop bracket mtg)
3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; cad pl (speaker mtg)
3S7148	Setscrew: 6-32 x 1/8; Allen head; cad pl (pointer drive pulley mtg)
47K600598	Shaft, pointer
1K600594	Shaft, tuning
26A481521	Shield, spring (for 12BA6 tube)
9A472534	Socket, tube: miniature; 7-prong.
41A73996	Spring, tension(electrolytic mtg)
41A14244	Spring, tension (pointer drive cord)
4K692188	Washer, "C" (tuning shaft and pointer shaft mtg)
4S7633	Washer, flat: 9/16 x 11/64 x .033 stl; cad pl (back panel mtg)
4K482859	Washer, shoulder: fibre (loop bracket mtg)
CABINET PARTS	
16E600461	Cabinet, table model: walnut(5H11)
16K600463	Cabinet, table model: ivory (5H12)
16K600465	Cabinet, table model: green (5H13)
15B600569	Cover, pointer
36B600566	Knob, control: walnut (5H11)
36K600567	Knob, control: ivory (5H12)
36K600568	Knob, control: green (5H13)
38A25507	Plug, split (back panel mtg)
52B600537	Pointer, dial
3S3371	Screw, sheet metal: #8 x 3/8 PKF plain hex head; cad pl (chassis mtg)

MODELS 5L1, 5L1U, Rev.; 5L2, 5L2U, 51L1U, 51L2U; 5J1, 5J1U, Rev.; 5J2, 5J2U; Ch. HS-224, HS-250



5L1 & 51L1 SERIES



5J1 SERIES

GENERAL INFORMATION

TYPE - Three-power (AC/DC, Battery) portable receiver. Four miniature type tubes and a selenium rectifier are used in a superheterodyne circuit.

MODEL	COLOR	CHASSIS
5L1	Tan	HS-250
5L1U	Tan	HS-224
5L2	Maroon	HS-250
5L2U	Maroon	HS-224
51L1U	Green	HS-224
51L2U	Maroon	HS-224
5J1	Black	HS-250
5J1U	Black	HS-224
5J2	Green	HS-250
5J2U	Green	HS-224

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT -

Type	Function
1R5	Converter
1U4	IF Amplifier
1U5	Det. AVC & 1st AF Amp
3S4	Power Amplifier
Rect	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 - 67-1/2V "B" battery (Eveready #467 or equivalent)

OPERATING INSTRUCTIONS

TO OPEN FRONT COVER (5J1 & 5J2 Series). The front covers of the models 5J1 and 5J2 Series contain the loop antenna. They may be opened simply by lifting them upward with the fingers. A special hinge holds the covers in either the closed, half-opened, or fully open position.

VOLUME CONTROL & OFF-ON SWITCH. The "off-on" switch and volume control are operated with the left-hand knob.

TO TURN OFF. Turn the receiver "off" by rotating the volume knob to the left until a click is heard.

TUNING CONTROL. Stations are tuned in with the right-hand knob.

TO OPEN BACK COVER. The back cover may be opened by inserting the fingertips into the slots in the cover and pulling it open. When closing the cover be careful not to pinch the power line cord or other leads between the cover and the cabinet.

117 VOLT AC OR DC OPERATION. The power cord is located inside the cabinet and may be reached by opening the back cover. Pass the line cord through the slot on the side of the receiver, and plug it into any 117 volt AC or DC power outlet. If the receiver does not operate from DC power, reverse the plug in the power outlet. When operating from AC power, reception may sometimes be improved by reversing the power plug in the outlet. It is not necessary that batteries be installed if the receiver is to be operated only from house power lines.

BATTERY OPERATION. Open the back cover and install the batteries, following the instructions on the label inside the back cover (or see Figure 1). Insert the line cord plug into the receptacle on the chassis, or the receiver will not play from batteries. If the receiver is to be operated for a long period of time from 117 volts AC or DC, or is to be placed in storage, remove the batteries and store in a cool place. IMPORTANT: Never leave low or run-down batteries in the receiver, as they will leak or swell and damage it.

ANTENNA. A loop antenna is built into the front cover of models 5J1 and 5J2 series and into the rear cover of models 5L1, 5L2 and 51L1U and 51L2U Series. Because of the slightly directional characteristics of the loop antenna, re-

MODELS 5L1, 5L1U, Rev.;
5L2, 5L2U, 51L1U, 51L2U;
5J1, 5J1U, Rev.; 5J2,
5J2U; Ch. HS-224, HS-250

ception from some stations may be improved by rotating the entire receiver. In extremely noisy locations, rotate the receiver until minimum noise and maximum signal pickup are obtained.

BATTERY REPLACEMENT. If low volume or fuzzy tone is noticed when operating from batteries, replace the flashlight cells. Normally, the 67-1/2V "B" battery will last for 3 or 4 changes of the flashlight cells. The condition of the batteries will not affect the operation of the receiver from 117 volts AC or DC. Complete battery replacement instructions will be found inside the cabinet back cover (or see Figure 1).

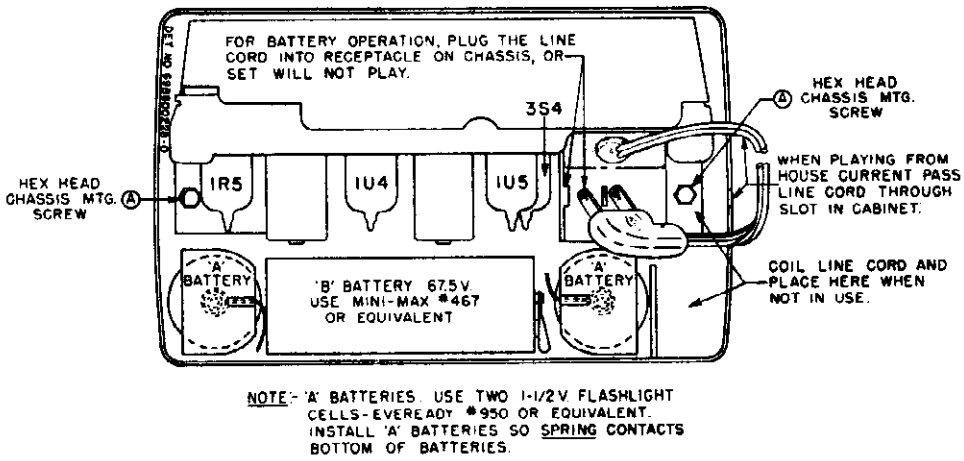


FIGURE 1. BATTERY INSTALLATION AND CHASSIS REMOVAL INSTRUCTIONS

ALIGNMENT

NOTE: The receiver may be operated either from a battery or from the commercial power lines during alignment. If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver. If an isolation transformer is not available, connect the low side of the signal generator to B- through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.
2. Connect the low side of the signal generator to B-.
3. Set the signal generator for 400 cycle, 30% modulation.
4. Turn the receiver volume control to maximum.
5. Use a small fibre screwdriver for aligning the IF and diode transformers.
6. As stages are brought into alignment, reduce the signal generator output to keep the output of the receiver at approximately .05 watt (.05 watt = .40 volts on the output meter) to avoid overloading the receiver.
7. See Figure 2 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. (pin 6, 1R5)*	455 Kc	Fully open	1, 2 & 3 (IF Cores)	Adjust for maximum.
RF ALIGNMENT						
2.	.1 mf	Grid of conv. (pin 6, 1R5)*	1620 Kc	Fully open	4 (osc.)	Adjust for maximum.
3.	-	-	-	-	-	Install chassis in cabinet, leaving output meter connected to speaker. NOTE: Batteries should be in cabinet.
4.	-	Radiation loop**	1400 Kc	Tune for maximum	5 (Ant.)	Adjust for maximum. Trimmer is reached through hole under plug button on side of cabinet.

*On chassis HS-250 return the grid of the converter tube to AVC either through the loop or through a 4.7 meg resistor (as in chassis HS-224).
**Connect generator output across 5" diameter, 5 turn loop and couple inductively to receiver loop. Keep loops at least 12" apart.

MODELS 5L1, 5L1U, Rev.; 5L2, 5L2U, 51L1U, 51L2U; 5J1, 5J1U, Rev.; 5J2, 5J2U; Ch. HS-224, HS-250

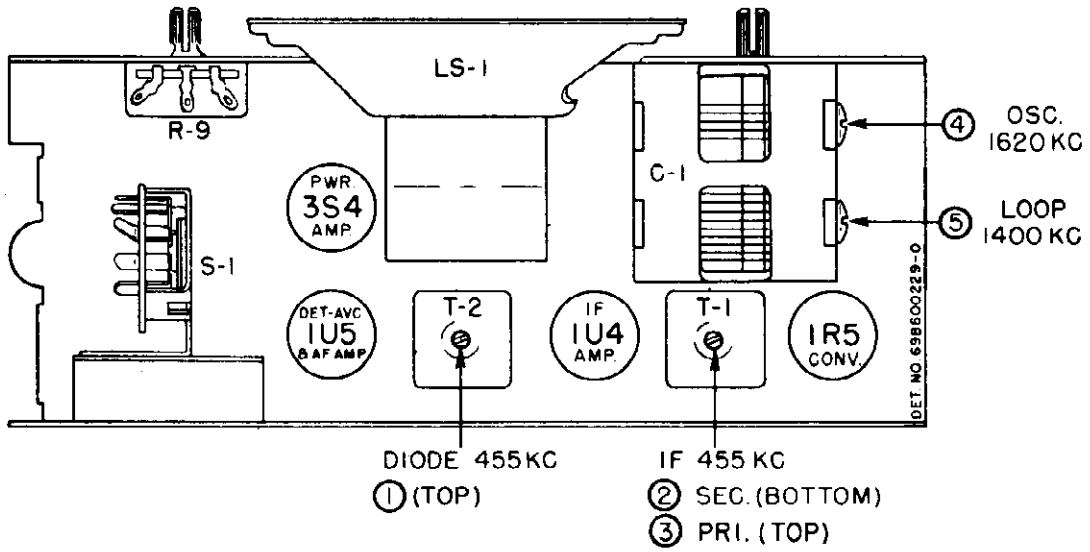


FIGURE 2. TUBE AND TRIMMER LOCATIONS

SERVICE NOTES

GENERAL

The chassis of this receiver is isolated from the AC power line circuit by a capacitor-choke assembly to eliminate the shock hazard when handling the receiver. However, as an additional precaution when aligning or servicing the receiver from AC, an isolation transformer should be inserted between the power line and the chassis.

The tubes are exposed when the rear cover is opened. It is not necessary to remove the chassis to replace tubes.

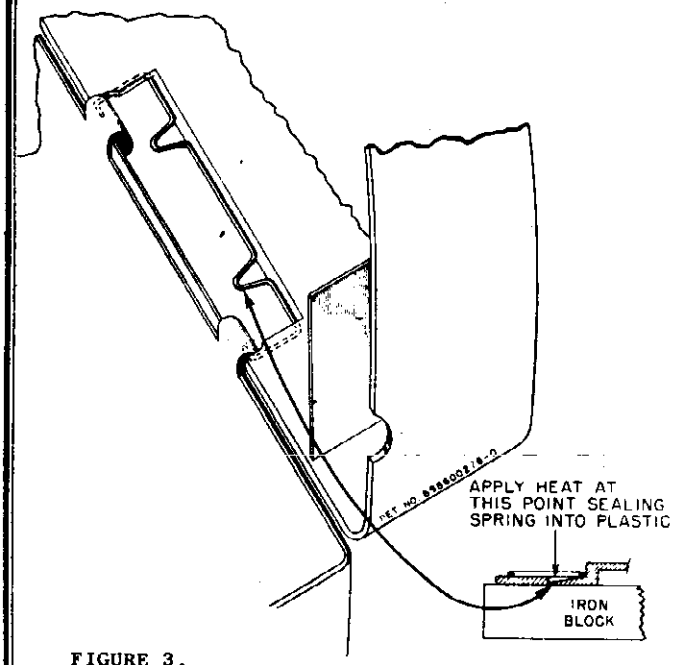


FIGURE 3.

HINGE INSTALLATION FOR 5L1 AND 51L1U SERIES

TO REMOVE THE CHASSIS FROM THE CABINET:

1. Pull off the two control knobs on the front of the cabinet.
2. Open the rear cover and remove the batteries.
3. Disconnect the two loop antenna leads from the chassis.
4. Remove the two hex head screws holding the chassis to the cabinet ("A" - "A" in Figure 1).
5. Slide the chassis from the cabinet.

PRODUCTION REVISIONS

The following revisions in the chassis and cabinets have been made from early production receivers:

1. Alternate IF and diode transformers have been added, with connections as shown on the circuit diagrams. Electrically, the original and the alternate transformers are interchangeable.

2. A multiple capacitor-resistor plate is used in some chassis to replace several resistors and capacitors in the audio circuit. Refer to the appropriate circuit diagram when servicing a chassis.

3. A battery retainer spring, which clips to the rear edge of the chassis, has been provided for the 5J1 and 5J2 series models to prevent the "B" battery from forcing off the rear cover.

4. The rear cover locking clips on the early 5J1 and 5J2 series models were replaced with a different type to provide better locking. The new type clips are interchangeable with the old clips.

REAR COVER HINGE INSTALLATION

The proper method for installing a new hinge in the 5L1, 5L2 and 51L1U, 51L2U series is shown in Figure 3. Note that the under side of the cabinet should rest on an iron block during the heating process to prevent the formation of a heat bubble on the bottom of the cabinet.

MODELS 5L1, 5L1U, Rev.;
5L2, 5L2U, 51L1U, 51L2U;
5J1, 5J1U, Rev; 5J2, 5J2U;
Ch. HS-224, HS-250

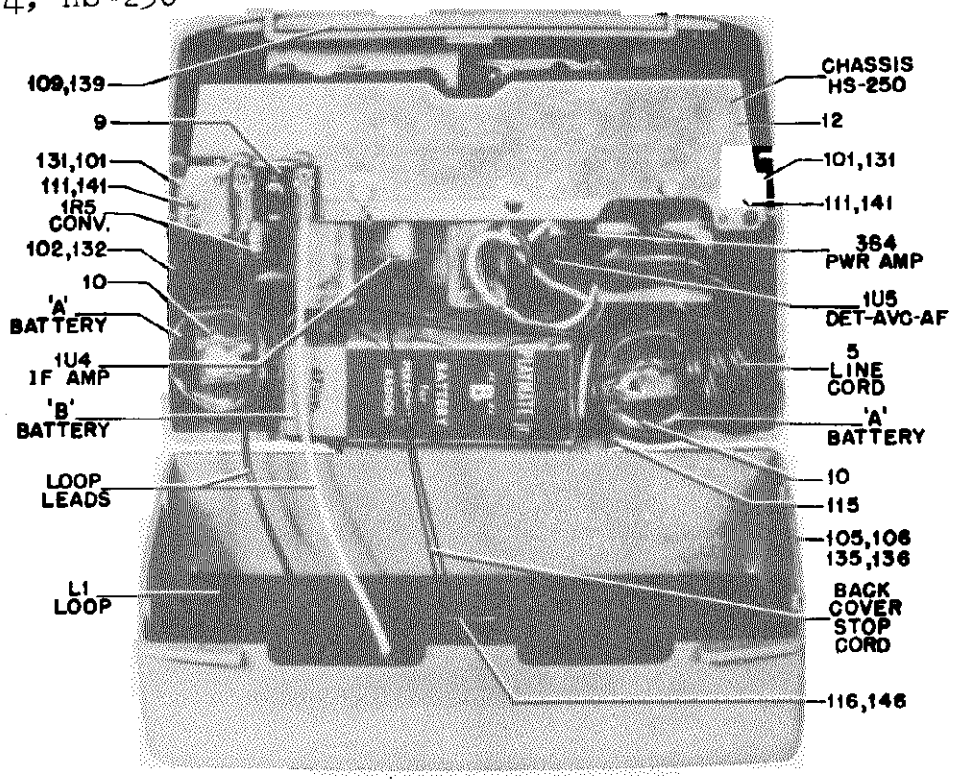


FIGURE 4. 5L1 AND 5L2 REAR VIEW

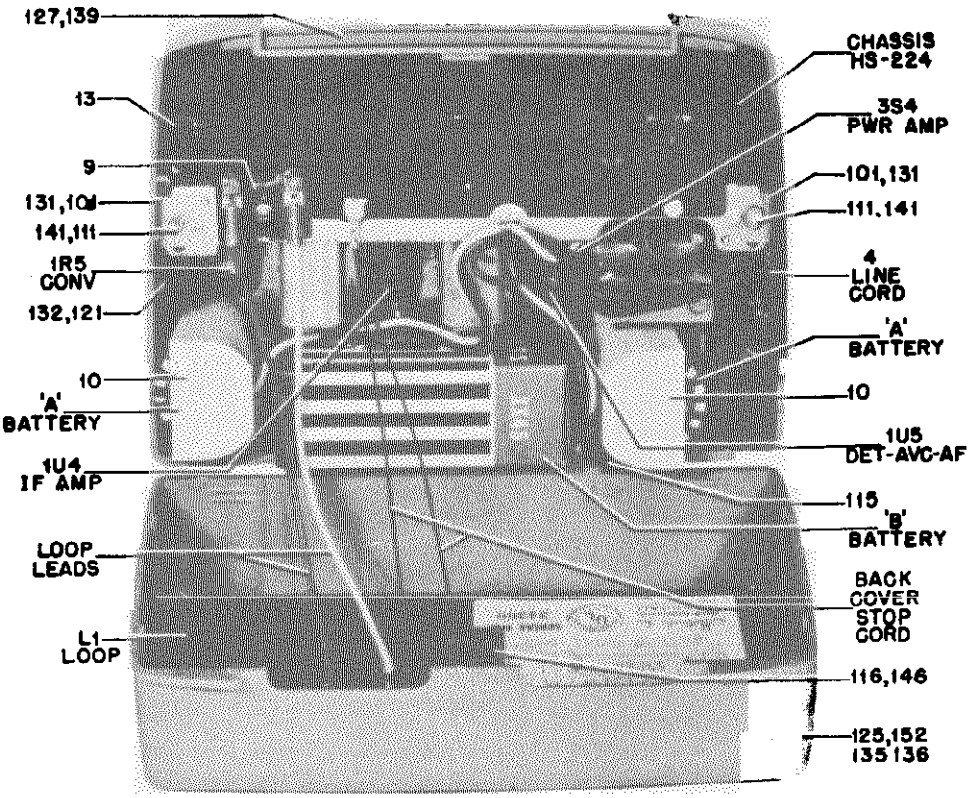


FIGURE 5. 51L1U AND 51L2U REAR VIEW

MODELS 5L1, 5L1U, Rev.; 5L2, 5L2U, 51L1U, 51L2U; 5J1, 5J1U, Rev.; 5J2, 5J2U; Ch. HS-224, HS-25C

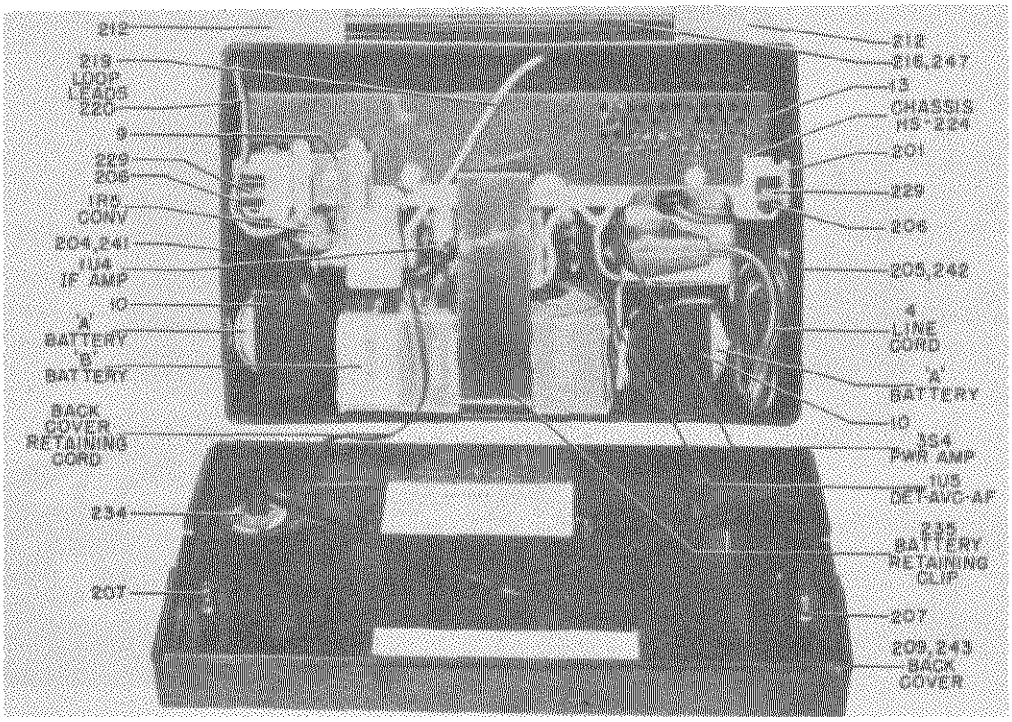


FIGURE 6. 5J1U AND 5J2U REAR VIEW

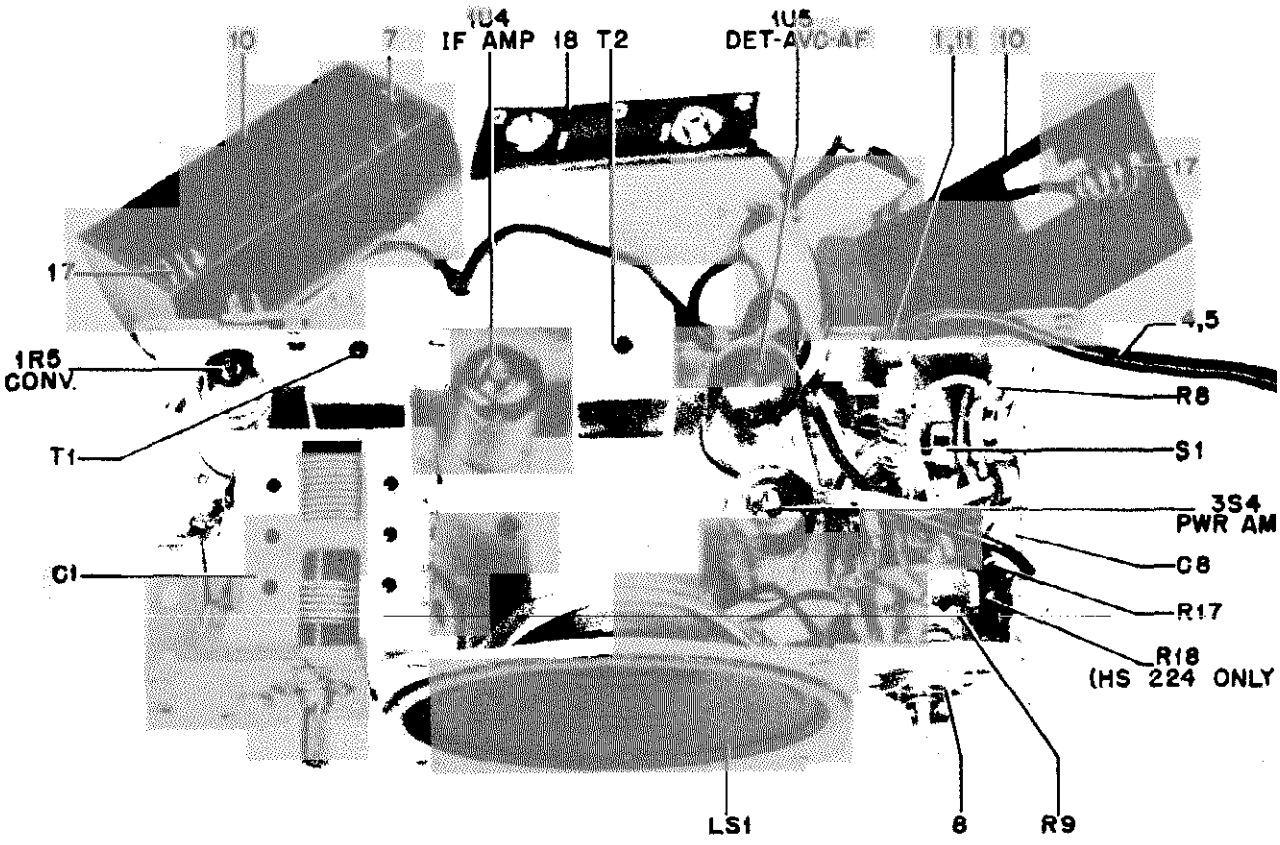


FIGURE 7. HS-224 AND HS-250 TOP VIEW OF CHASSIS

MODELS 5L1, 5L1U, Rev.;
5L2, 5L2U, 51L1U, 51L2U;
5J1, 5J1U, Rev.; 5J2,
5J2U; Ch. HS-224, HS-250

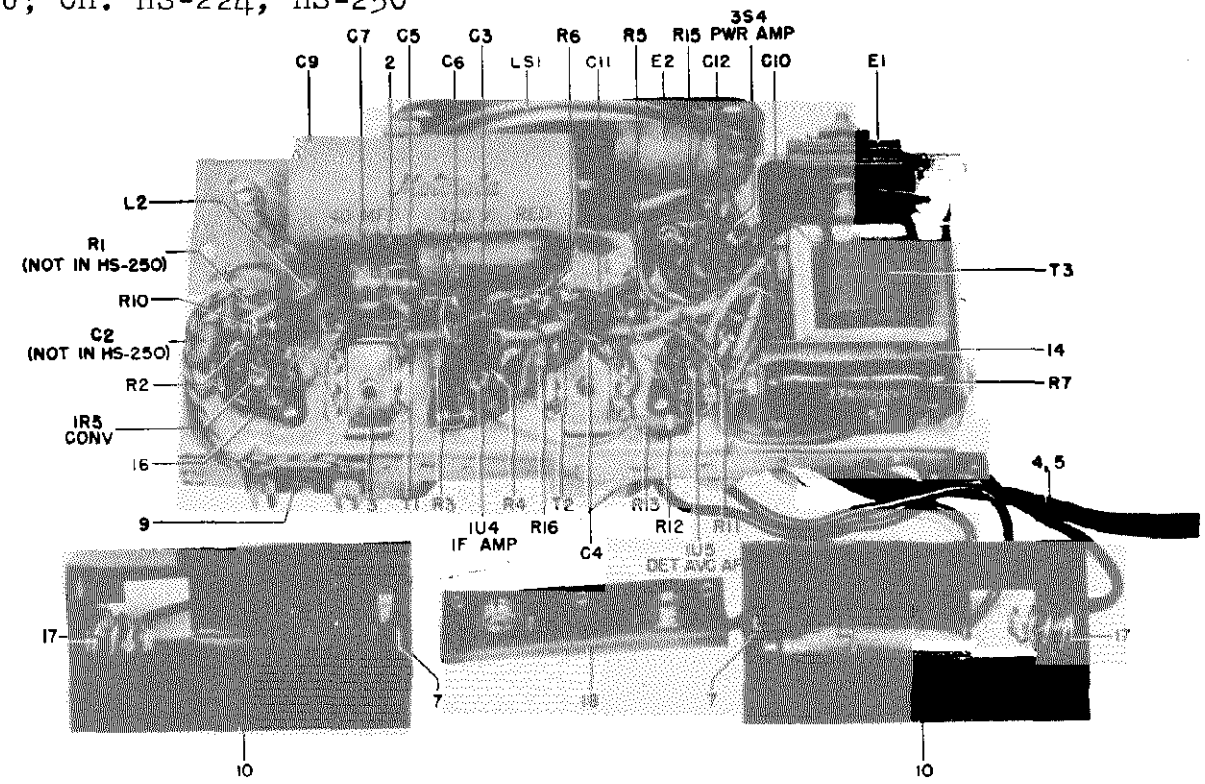


FIGURE 8. BOTTOM VIEW OF CHASSIS HS-224 AND HS-250 SHOWING MULTIPLE CAPACITOR PLATE

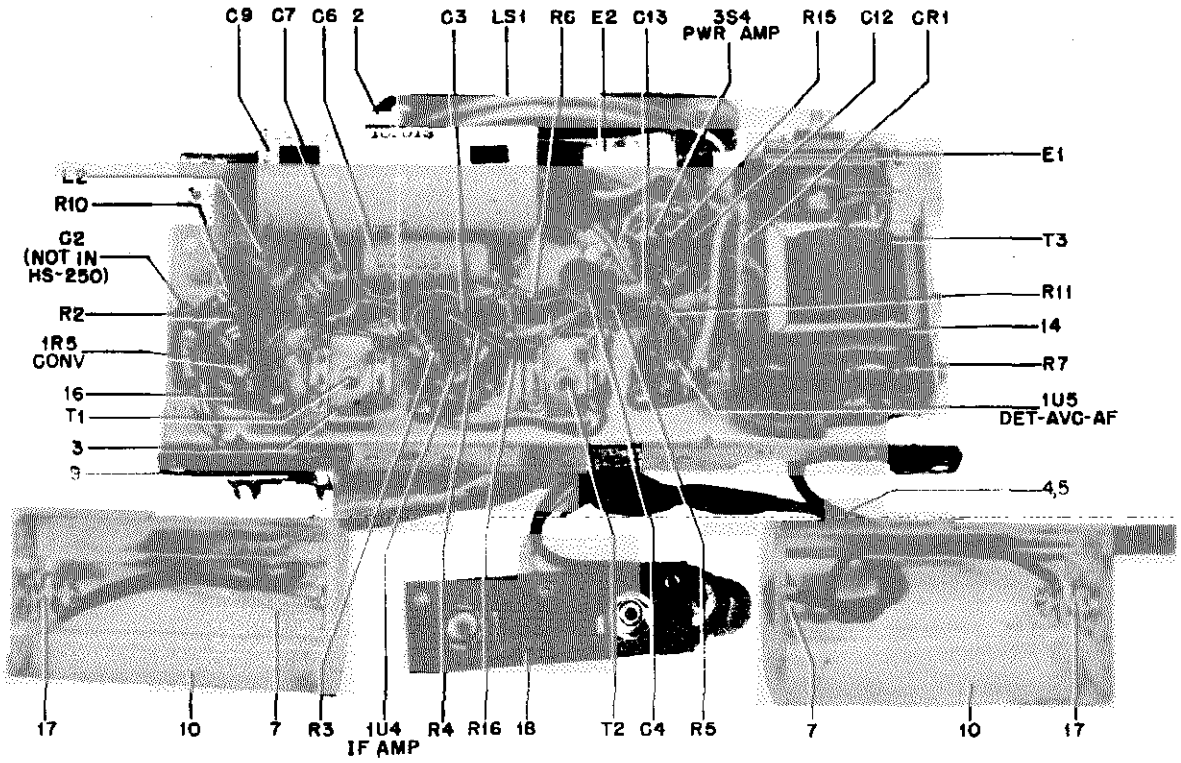
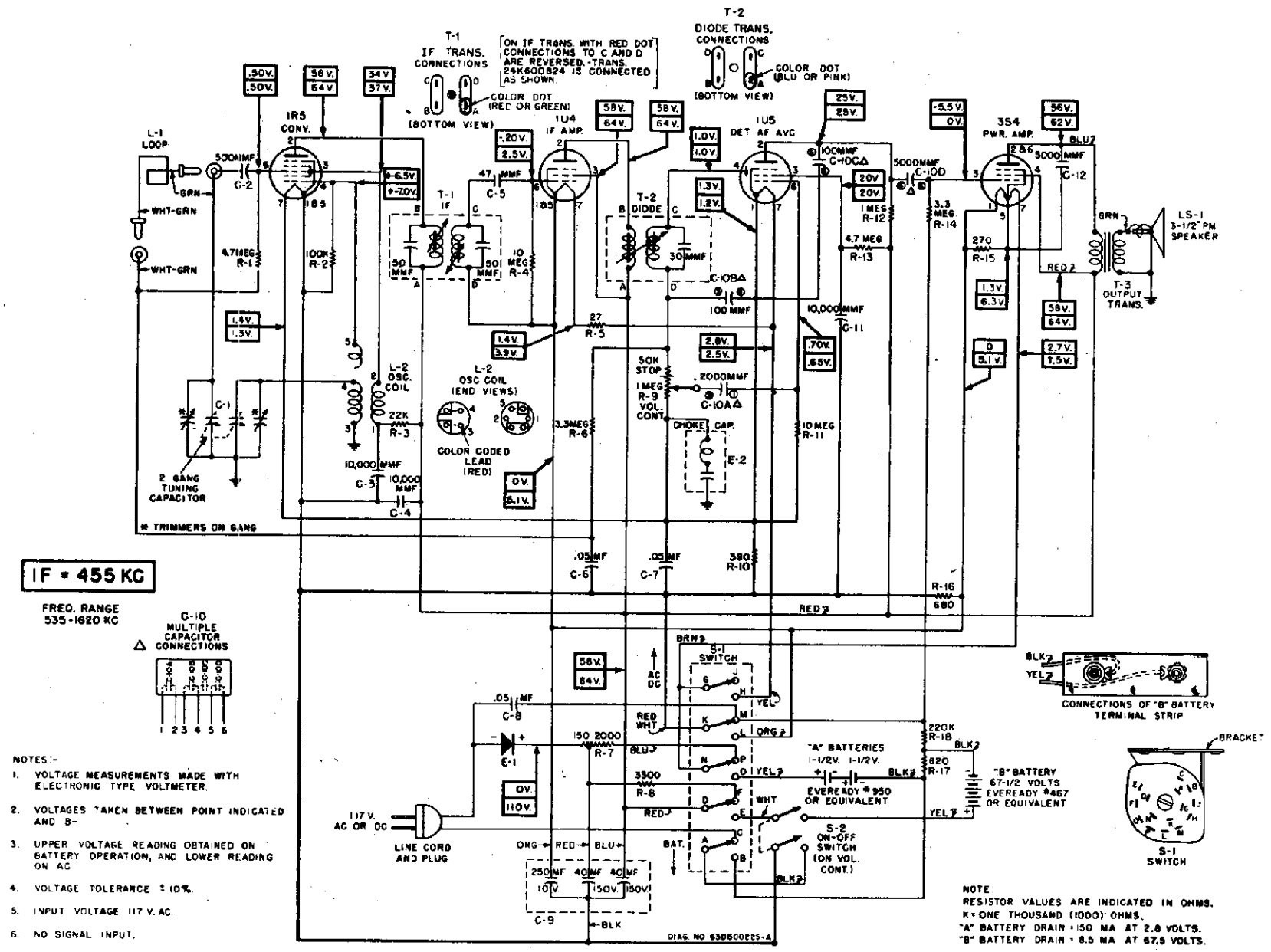


FIGURE 9. BOTTOM VIEW OF CHASSIS HS-224 AND HS-250 SHOWING MULTIPLE CAPACITOR-RESISTOR PLATE

MODELS 5L1U, 5L2U, 5L1U, 5L2U, 5J1U 5J2U, Ch. HS-224

FIGURE 10. SCHEMATIC DIAGRAM OF HS-224 USING MULTIPLE CAPACITOR PLATE.



NOTES:-

1. VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
2. VOLTAGES TAKEN BETWEEN POINT INDICATED AND B-
3. UPPER VOLTAGE READING OBTAINED ON BATTERY OPERATION, AND LOWER READING ON AC
4. VOLTAGE TOLERANCE ± 10%.
5. INPUT VOLTAGE 117 V. AC.
6. NO SIGNAL INPUT.
7. * MEASUREMENT MADE WITH GANG FULLY OPEN.

NOTE:
RESISTOR VALUES ARE INDICATED IN OHMS.
K = ONE THOUSAND (1000) OHMS.
"A" BATTERY DRAIN = 150 MA AT 2.8 VOLTS.
"B" BATTERY DRAIN = 8.5 MA AT 67.5 VOLTS.

MODELS 5L1U, 5L2U,
51L1U, 51L2U, 5J1U,
5J2U, Ch. HS-224

FIGURE 11. SCHEMATIC DIAGRAM OF CHASSIS HS-224 USING MULTIPLE CAPACITOR-RESISTOR PLATE

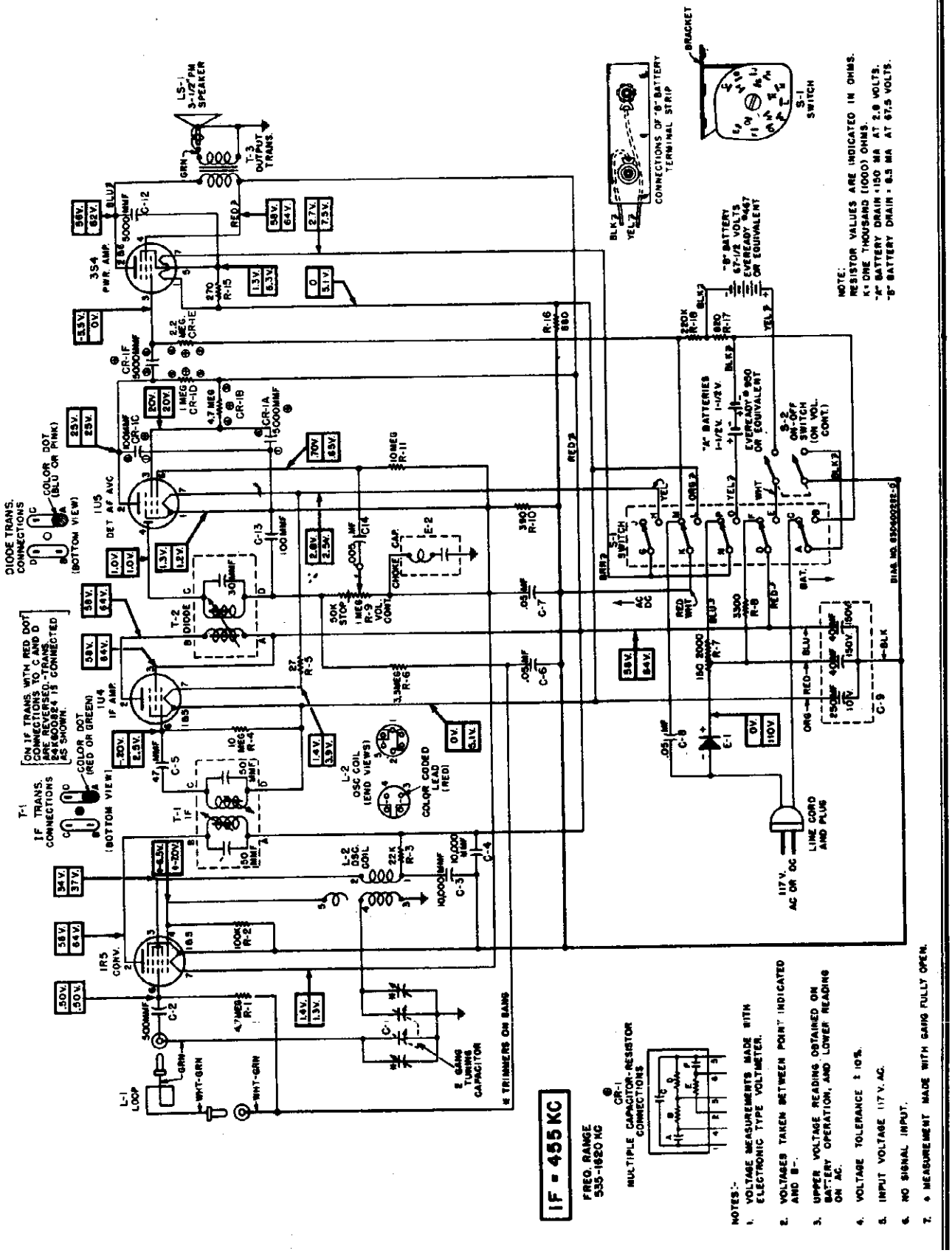
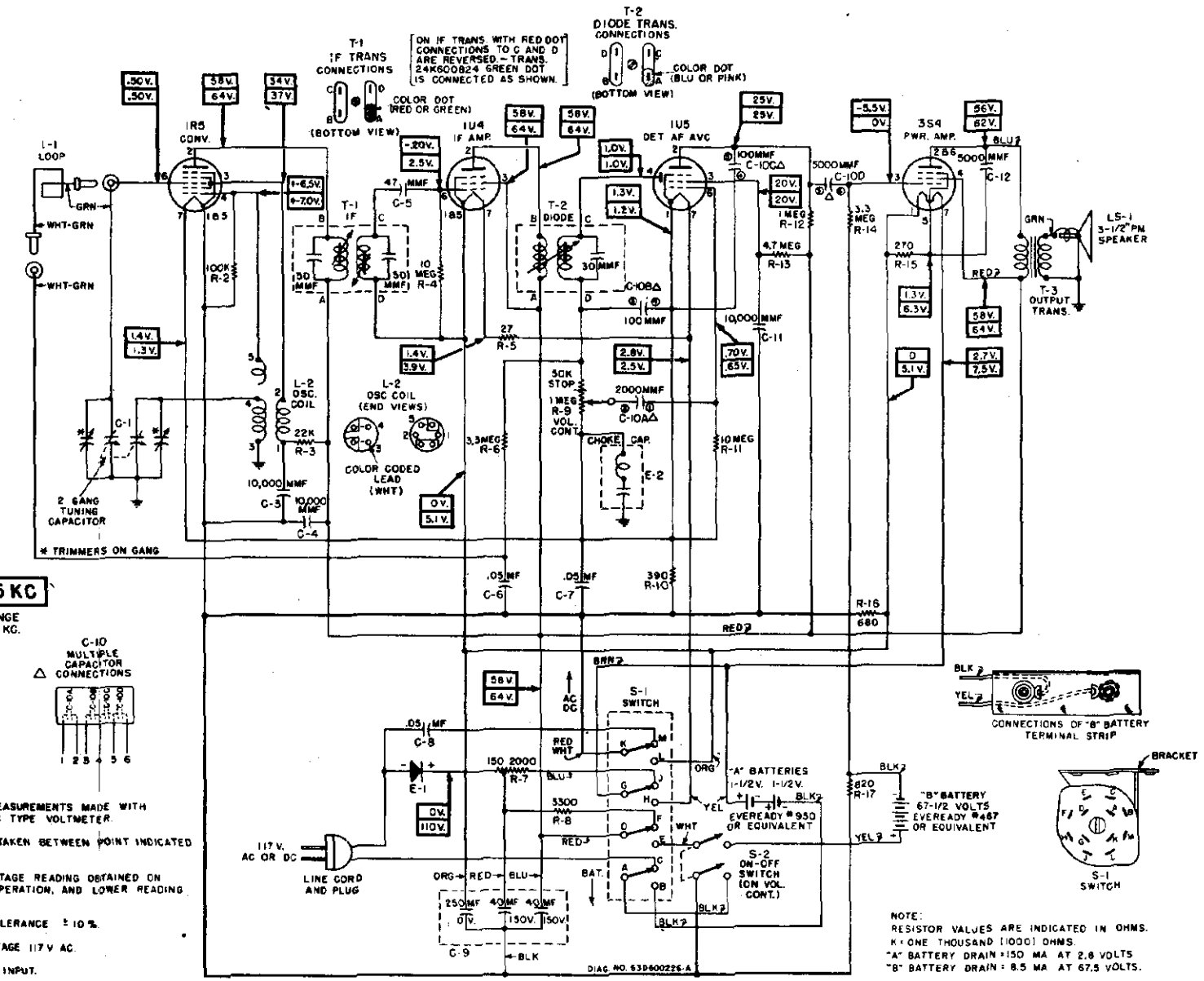


FIGURE 12. SCHEMATIC DIAGRAM OF CHASSIS HS-250 USING MULTIPLE CAPACITOR PLATE



NOTES:-

1. VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
2. VOLTAGES TAKEN BETWEEN POINT INDICATED AND B-
3. UPPER VOLTAGE READING OBTAINED ON BATTERY OPERATION, AND LOWER READING ON AC.
4. VOLTAGE TOLERANCE ± 10 %.
5. INPUT VOLTAGE 117 V AC.
6. NO SIGNAL INPUT.
7. * MEASUREMENT MADE WITH GANG FULLY OPEN.

NOTE:
RESISTOR VALUES ARE INDICATED IN OHMS.
K = ONE THOUSAND (1000) OHMS.
"A" BATTERY DRAIN = 150 MA AT 2.8 VOLTS
"B" BATTERY DRAIN = 8.5 MA AT 67.5 VOLTS.

MODELS 5L1, 5L2, 5J1,
5J2, Ch. HS-250

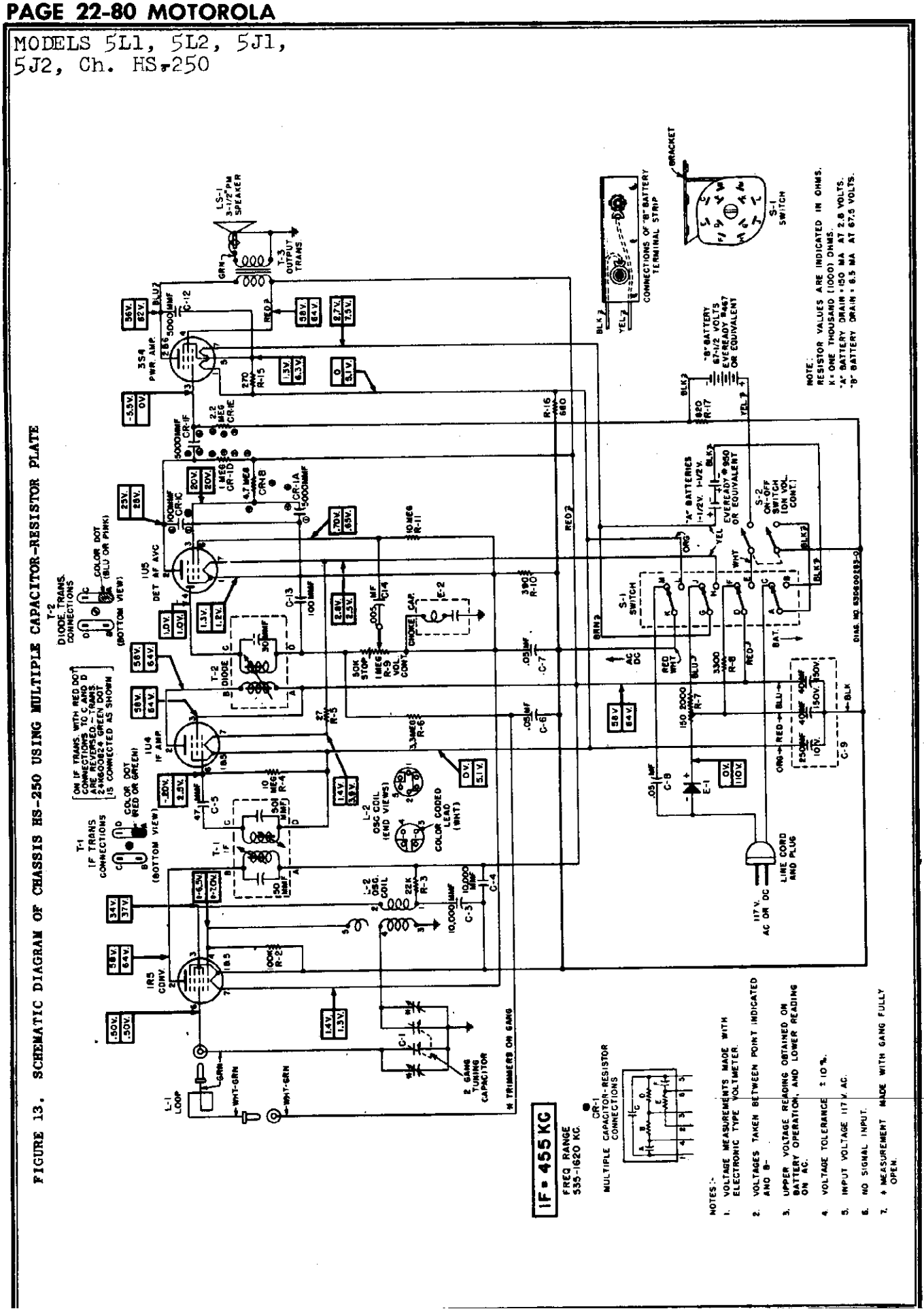


FIGURE 13. SCHEMATIC DIAGRAM OF CHASSIS HS-250 USING MULTIPLE CAPACITOR-RESISTOR PLATE

MODELS 5L1, 5L1U, Rev.; 5L2, 5L2U, 51L1U, 51L2U 5J1, 5J1U, Rev.; 5J2, 5J2U; Ch. HS-224, HS-25

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	19K692008	Variable, 2 gang.....
C-2	21K481377	Ceramic: 500 mmf 500V.....
C-3	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-4	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-5	21K77373	Ceramic, 47 mmf 500V.....
C-6	8K71213	Paper: .05 mf 100V.....
C-7	8K71213	Paper: .05 mf 100V.....
C-8	8K471635	Paper: .05 mf 400V.....
C-9	23B691995	Electrolytic: 40-40 mf 150V/250 mf 10V.....
C-10	21K691992	Ceramic, multiple: 2000 mmf, 100 mmf, 100 mmf 5000 mmf.....
C-11	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-12	21A470789	Ceramic, disc type: 5000 mmf 450V.....
C-13	21B772286	Ceramic: 100 mmf 500V.....
C-14	8A24966	Paper: .005 mf 100V.....
Capacitor-Resistor		
CR-1	21B601036	Capacitor-Resistor: 5000 mmf, 100 mmf, 5000 mmf; 4.7 meg, 1 meg, 2.2 meg...
Rectifier		
E-1	48B791092	Selenium Rectifier: half wave.....
Choke & Capacitor		
E-2	24K691986	Choke & .05 mf 200V Paper Capacitor.....
Coils		
L-1	1X692056	Antenna Loop & Lead Assembly (5L1 & 51L1 series)...
	1X692141	Antenna Loop, Panel & Hinge Assembly: less front cover; black plastic (5J1 series)
	1X600437	Antenna Loop, Panel & Hinge Assembly: less front cover; green plastic (5J2 series)
	24B691936	Antenna Loop & Panel Assembly: less hinges; black plastic (5J1 series).....
	24K600403	Antenna Loop & Panel Assembly: less hinges; green plastic (5J2 series).....
L-2	24B691987	Oscillator Coil (red code) (HS-224 only).....
	24K600154	Oscillator Coil (white code) (HS-250 only).....
Speaker		
LS-1	50B692037	Speaker: 3½" PM; 3.2 ohm VC
or	50B692038	Speaker: 3½" PM; 3.2 ohm VC

Ref. No.	Part Number	Description
Resistors		
Note: All resistors are insulated carbon typ unless otherwise specified.		
R-1	6R2122	4.7 meg 20% ½W .....
R-2	6R6031	100,000 10% ½W .....
R-3	6R6397	22,000 10% ½W .....
R-4	6R2109	10 meg 20% ½W .....
R-5	6R5683	27 10% ½W .....
R-6	6R2118	3.3 meg 20% ½W .....
R-7	17K692009	Wire Wound: 2150 5% 10W; tapped.....
R-8	6R5581	3300 10% ½W .....
R-9	18A692018	Volume Control: 1 meg; with on-off switch.....
R-10	6R5554	390 10% ½W .....
R-11	6R2109	10 meg 20% ½W .....
R-12	6R6004	1 meg 20% ½W .....
R-13	6R2122	4.7 meg 20% ½W .....
R-14	6R2118	3.3 meg 20% ½W .....
R-15	6R6432	270 10% ½W .....
R-16	6R6040	680 10% ½W .....
R-17	6R6269	820 10% ½W .....
R-18	6R6015	220,000 20% ½W .....
Switches		
S-1	40B471927	Rotary Switch, 5PDT (AC/DC, battery selector) (HS-224 only).....
	40K600156	Rotary Switch, 4PDT (AC/DC, battery selector) (HS-250 only).....
Transformers		
T-1	24K600824	IF Transformer, 455 Kc: complete with capacitors and shield (green dot).....
or	24B692014	IF Transformer, 455 Kc: complete with capacitors and shield (red dot).....
T-2	24K600825	Diode Transformer 455 Kc: complete with capacitors and shield (pink dot).....
or	24B692015	Diode Transformer, 455 Kc: complete with capacitors and shield (blue dot).....
T-3	25K692006	Output Transformer.....
CHASSIS PARTS - MECHANICAL		
1	43A692012	Bushing, strain relief: line cord (use with 43K692013).....
2	42K75826	Clip, electrolytic mtg..
3	42A485548	Clip, IF Coil mtg.....
4	30B691994	Cord, line: with plug; 6 ft long (HS-224 only).....
5	30K600125	Cord, line: with plug; 6 ft long (HS-250 only).....
	29R5294	Lug, soldering (holds battery leads).....
7	29R3020	Lug, soldering: battery contact (in "A" battery retainer) .....

CHASSIS HS-224, HS-250

Ref. No.	Part Number	Description
8	2S7051	Nut, hex: Palnut; 3/8-32 x 9/16; volume control mtg) .....
9	9A691988	Receptacle, 2 pin (antenna lead receptacle).....
10	15B481896	Retainer, "A" battery.....
11	43K692013	Retainer, strain relief (on line cord bushing).....
12	26K600155	Shield, back (on rear of chassis)(HS-250 only).....
13	26C691983	Shield, bottom: black (over chassis bottom) (HS-224 only).....
14	26A692005	Shield, heat (around R-7) .....
	26K691997	Shield, switch: (over AC/DC Battery switch).....
16	9A690129	Socket, tube: miniature; 7 prong.....
17	41K680029	Spring, battery contact (in "A" battery retainer).....
18	31K691985	Strip, "B" battery terminal with leads.....
	31K37504	Strip, terminal: 1 insulated lug; #1 mtg.....
	31K470746	Strip, terminal: 3 insulated lugs #2 mtg.....
	4K470939	Washer, fibre (antenna receptacle mtg & R-7 mtg) .....

MODELS 5L1 & 5L1U CABINET PARTS

101	7B600059	Bracket, chassis support (on sides of chassis).....
102	38K692051	Button, plug: tan.....
	16E691902	Cabinet & Grille Assembly, front section; complete, less carrying handle; tan plastic.....
	16K691903	Cabinet, front section: less grille & carrying handle; tan plastic.....
105	1X600168	Cover and Loop Assembly cabinet back: complete with latch spring and stop cord; tan plastic.....
106	16D691905	Cover, cabinet back: tan plastic; less latch spring and loop antenna.....
	5S7855	Eyelet: .156 x .484 (on loop leads).....
	16K691904	Grille, speaker: brown plastic.....
109	1X600082	Handle Assembly, complete: tan.....
	36B691906	Knob, tuning: tan plastic..
111	3S8175	Screw, sheet metal: #4 x 3/16 PKZ; plain hex head (chassis support bracket mtg).....
	3S490390	Screw, thread-cutting: #4 x 3/8; type 25 phillips round head(speaker grille mtg) .....
	3S488009	Screw, thread-cutting: #6 x 3/8; type 25 plain hex head (mounts chassis to cabinet)
	2S7089	Speednut: for .187 stud; black (loop mtg).....
115	41A480094	Spring, hinge (rear cover) .....
116	55B692068	Spring, rear cover latch..

MODEL 51L1U CABINET PARTS - Same as 5L1 & 5L1U except

121	38K692050	Button, plug: green.....
	16K610023	Cabinet & Grille Assembly, front section: complete, less carrying handle; green plastic.....
	16K610024	Cabinet, front section: less grille & carrying handle; green plastic.....
125	16K601704	Cover, cabinet back: less latch spring and loop antenna; green plastic.....
	16K610025	Grille, speaker: green plastic.....
127	1X610018	Handle Assembly, complete: green.....
	36K610022	Knob, tuning: green.....

MODEL 5L2 & 5L2U CABINET PARTS

131	7B600059	Bracket, chassis support (on sides of chassis)....
132	38K600106	Button, plug: maroon.....
	16K600410	Cabinet & Grille Assembly, front section: complete, less carrying handle; maroon plastic.....
	16K600411	Cabinet, front section: less grille and carrying handle ;maroon plastic ...
135	1X600431	Cover and Loop Assembly, cabinet back: complete with latch spring, and stop cord;maroon plastic
136	16K600413	Cover, cabinet back: less latch spring and antenna loop; maroon plastic.....
	5S7855	Eyelet: .156 x .484 (on loop leads).....
	16K600412	Grille, speaker: maroon plastic.....
139	1X600429	Handle Assembly, complete: maroon.....
	36K600406	Knob, tuning: maroon plastic
141	3S8175	Screw, sheet metal: #4 x 3/16 PKZ; plain hex head (chassis support bracket mtg).....
	3S490390	Screw, thread-cutting: #4 x 3/8; type 25 phillips round head;(speaker grille mtg).....
	3S488009	Screw, thread-cutting: #6 x 3/8; type 25 plain hex head (mts chassis to cabinet).
	2S7089	Speednut: for .187 stud: black (loop mtg).....
145	41A480094	Spring, hinge (rear cover). .....
146	55B692068	Spring, rear cover latch.

MODELS 5L1, 5L1U, Rev.; 5L2, 5L2U, 51L1U, 51L2U; 5J1, 5J1U, Rev.; 5J2, 5J2U; Ch. HS-224, HS-25(

Ref. No.	Part Number	Description
MODEL 51L2U CABINET PARTS - Same as 5L2 & 5L2U except:		
152	16K601703	Cover, cabinet back: less latch spring and loop antenna.....
	36K610034	Knob, tuning: maroon plastic
MODEL 5J1 & 5J1U CABINET PARTS		
201	7A600078	Bracket, chassis support (on sides of chassis).....
	7A692061	Bracket, hinge mtg: black nickel finish (inside cabinet front).....
	14K600713	Bushing, insulating: bakelite (on handle mtg cover) .....
204	38K692052	Button, plug: black.....
205	16E691798	Cabinet, front section: less grille, loop and front cover; black plastic
206	42A600664	Clip, cabinet locking (on front section of cabinet) (replaces 42K692143)..
207	42A600665	Clip, cabinet locking (on rear cover) (replaces 42A480078).....
	13A691938	Cloth, grille.....
209	1X600173	Cover Assembly, cabinet back: complete with locking clip and stop cord; black plastic.....
	1X692139	Cover and Loop Assembly, cabinet front: complete with hinges and medallion; black plastic.....
	15D691894	Cover, cabinet front: less medallion and loop; black plastic.....
212	55A692058	Cover, handle mtg: brass plated (over ends of handle).....
	7A691932	Frame, grille: satin brass finish (around top of speaker grille).....
	7K691934	Frame, grille: satin brass finish (around bottom of speaker grille).....
	13C691896	Grille, speaker: green plastic.....
216	55A691944	Handle, carrying: black plastic; less spring.....
	1X692142	Hinge Assembly, front cover: complete.....
	36B691923	Knob, control: green plastic
219	1X692137	Lead and Eyelet Assembly: white (loop lead).....
220	1X692138	Lead and Eyelet Assembly: green (loop lead).....
	29R3037	Lug, soldering: #6 hole (loop lead connector-on loop panel).....
	13A691927	Medallion: brass plated (on front cover).....
	64A692191	Plate, handle mtg (under ends of handle).....
	64A600044	Plate, loop panel support (under loop hinges on loop panel).....
	5S490843	Rivet: .122 x 7/32 stl; black nkl (mounts hinge to loop panel).....
	3S7327	Screw, machine: 5-40 x 3/8 plain hex head (handle mtg).....
	3S7155	Screw, machine: 6-32 x 3/16; plain hex head (holds hinge to hinge mtg bracket).....
	3S490018	Screw, sheet metal: #2 x ¼; PKZ; phillips flat head; blk nkl (mounts loop to front cover).....
229	3S8136	Screw, sheet metal: #4 x ¼; PKZ; phillips round head; blk nkl (chassis support bracket mtg).....
	3S400036	Screw, thread cutting: #6 x ¼; PKF; slotted binder head (holds hinge mtg brkt).....
	3S488009	Screw, thread cutting: #6 x 3/8; type 25 plain hex head (mounts chassis to cabinet).....
	2S490840	Speednut: for 1/16 stud; black parkerized finish (medallion mtg).....
	2S7092	Speednut: for .125 stud; black parkerized finish (spkr grille mtg).....
234	2S490842	Speednut: for .271 stud; black parkerized finish (holds cover stop cord) .....
235	42A600663	Spring, battery retainer..
	41A692060	Spring, handle (inside plastic handle).....
	4S1719	Washer, flat; 3/8 x .140 x .030 stl; (handle mtg)
MODEL 5J2 & 5J2U CABINET PARTS - Same as 5J1 excep		
241	38K600402	Button, plug: green.....
242	16K600409	Cabinet, front section: less grille, loop and front cover; green plastic
243	1X600438	Cover Assembly, cabinet back: complete with locking clip and stop cord; green plastic.....
	1X600435	Cover and Loop Assembly, cabinet front: complete with hinges and medallion; green plastic.....
	15K600414	Cover, cabinet front: less medallion and loop; green plastic.....
	13K600408	Grille, speaker: black plastic.....
247	55K600401	Handle, carrying: less spring; green plastic.....
	36K600859	Knob, control black plastic
	5S7773	Rivet: .122 x 7/32 stl; ant copper (mounts hinge to loop panel).....
	3S3389	Screw, sheet metal: #2 x ¼ PKZ; phillips flat head; statuary bronze finish (mounts loop to front cover) .....

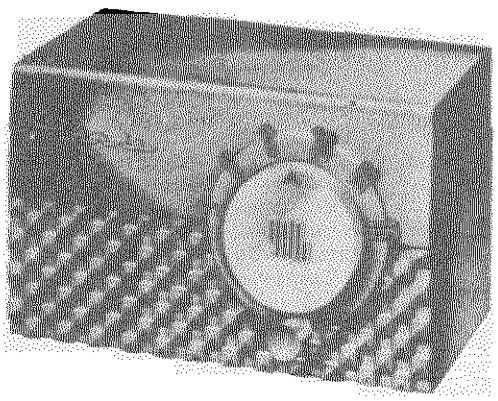
MODELS 5R11, 5R12,
5R13, 5R14, 5R15,
5R16, Ch. HS-254

GENERAL INFORMATION

TYPE - AC-DC table model superheterodyne receiver with loop antenna.

RECEIVER MODELS -

Model	Color
5R11	Walnut-Mahogany
5R12	Ivory
5R13	Maroon
5R14	Gray
5R15	Green
5R16	Yellow



TUBE COMPLEMENT -

12BE6	Converter
12BA6	IF Amplifier
12AT6	Det, AVC & AF Amp
50C5	Power Amplifier
35W4	Rectifier

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

POWER SUPPLY - 117 volts, AC or DC; 35 watts

INSTALLATION & OPERATING INSTRUCTIONS

POWER SWITCH & VOLUME CONTROL. The "off-on" switch and the volume control are combined and are operated with the small lower knob. NOTE: If the receiver does not operate from DC power, reverse the plug in the power outlet. When operating from AC power, reception may sometimes be improved by reversing the power plug in the outlet.

TUNING CONTROL. Stations are tuned in with the large upper knob.

ANTENNA. A built-in loop antenna eliminates the need for an outside antenna in most locations. When receiving a weak station, rotate the receiver slightly for best signal strength. If additional pick-up is necessary, connect an external antenna to the radio by following the instructions printed on the rear panel. CAUTION: Never connect the radio chassis to a water pipe, radiator, or other ground.

SERVICE NOTES

The chassis of this receiver is connected directly to the power line. When operating the chassis (from an AC line) outside of its cabinet, use an isolation transformer between the power line and the receiver to reduce the possibility of an electrical shock.

TO REMOVE CHASSIS FROM CABINET:

1. Pull off the two control knobs from the front of the receiver.

2. Remove the two split plugs which hold the loop to the cabinet.

3. Remove the two hex head screws at the rear edge of the chassis.

4. Slide the chassis from the cabinet.

MODELS 5R11, 5R12
5R13, 5R14, 5R15,
5R16, Ch. HS-254

ALIGNMENT

NOTE: If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver to avoid hum and electrical shocks. If an isolation transformer is not available, connect the low side of the signal generator to chassis through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.

2. Connect the low side of the signal generator to chassis.

3. Set the signal generator for 400 cycle, 30% modulation.

4. Turn the receiver volume control to maximum.

5. Use a small fibre screwdriver for aligning the IF and diode transformers.

6. As stages are brought into alignment, reduce the signal generator output to a level which produces less than .4 volts (.05 watt) across the voice coil to avoid overloading the receiver.

7. See Figure 1 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. (pin 7, 12BE6)	455 Kc	Fully open	1, 2, 3, & 4 (IF cores)	Adjust for maximum
RF ALIGNMENT						
2.	-	Grid of conv. (pin 7, 12BE6)	1620 Kc	Fully Open	5 (Osc)	Adjust for maximum
3.	-	Radiation loop*	1400 Kc	Tune for max	6 (Ant)	Adjust for maximum

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

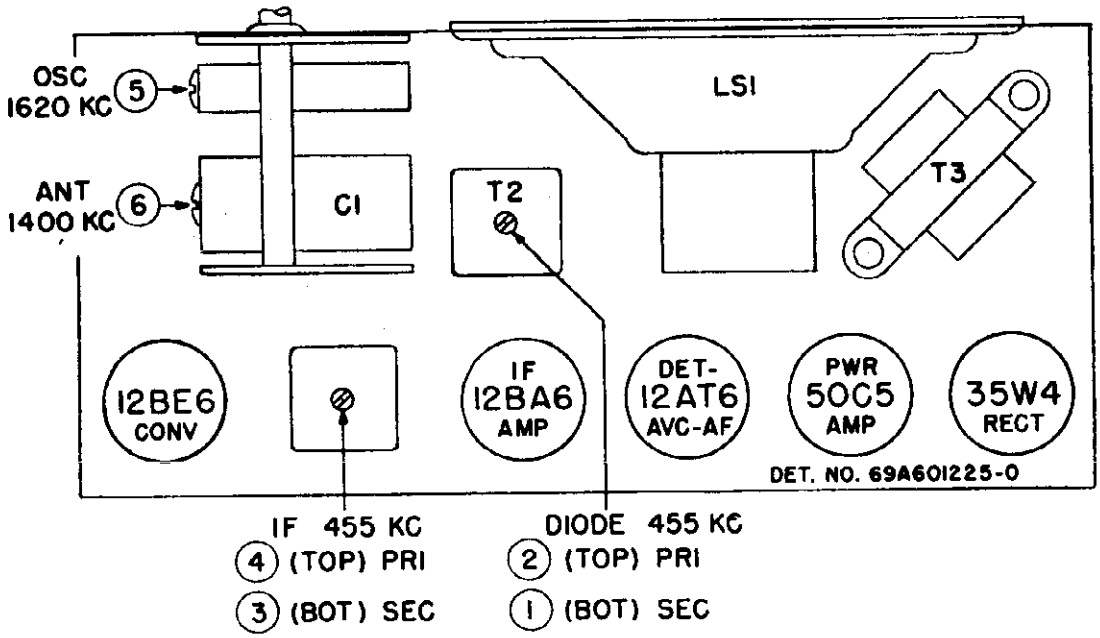


FIGURE 1. TUBE AND TRIMMER LOCATIONS

MODELS 5R11, 5R12,
5R13, 5R14, 5R15,
5R16, Ch. HS-254

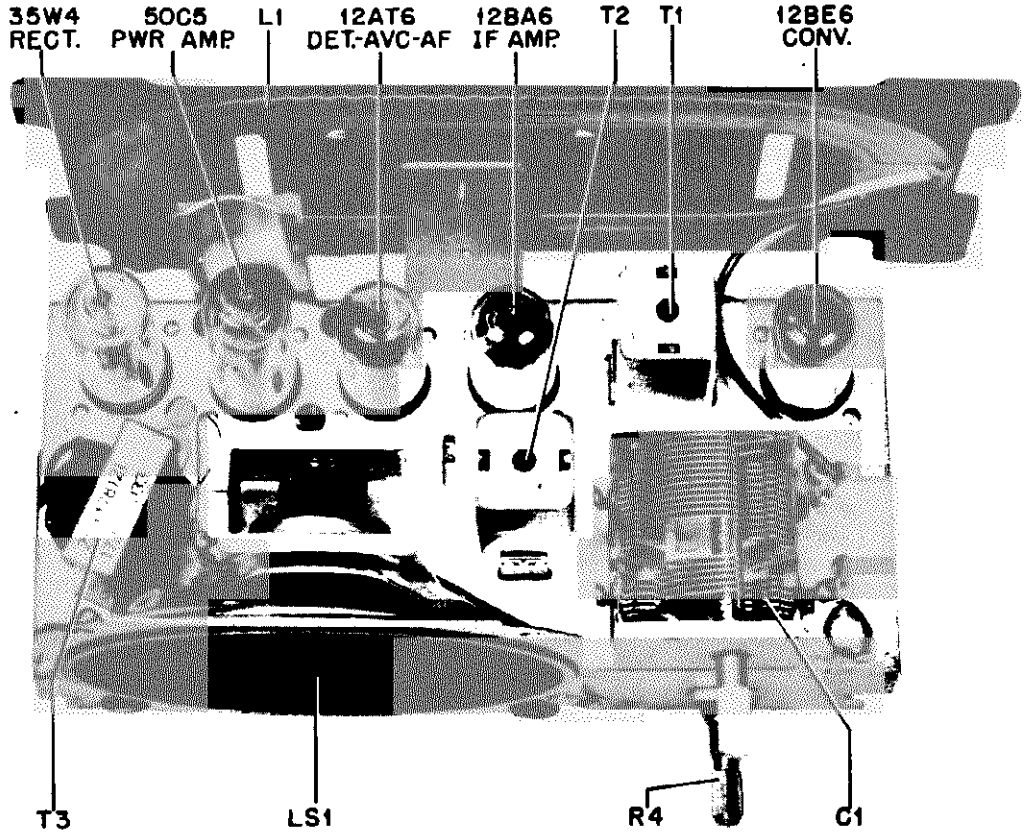


FIGURE 2. TOP VIEW OF CHASSIS

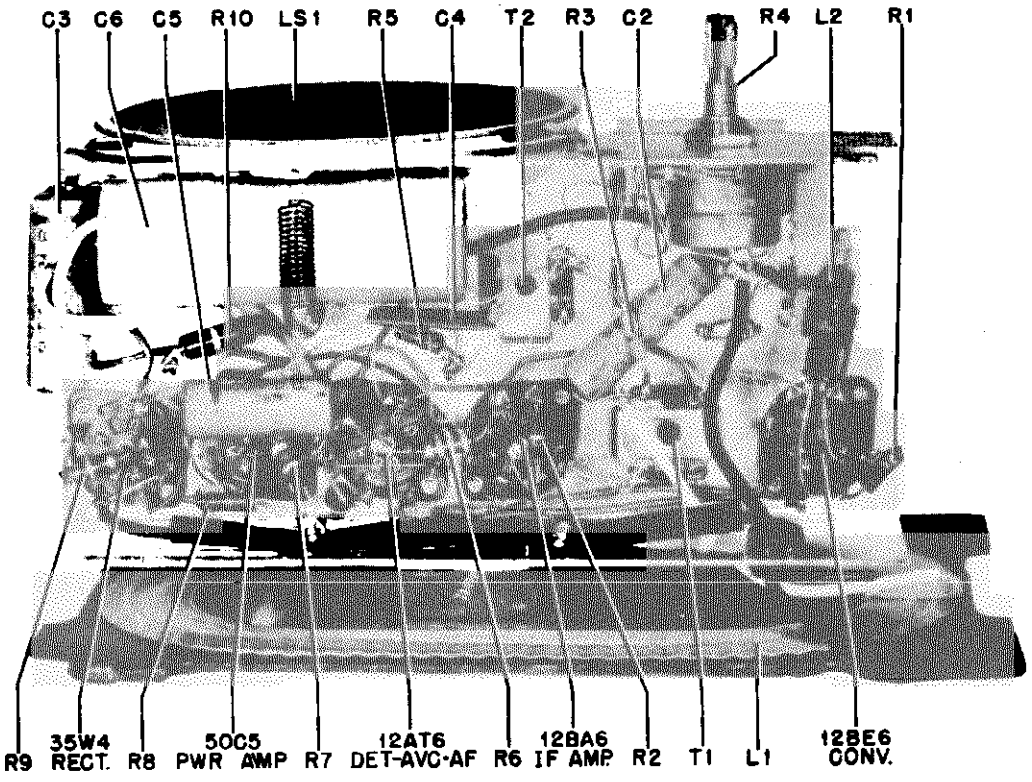
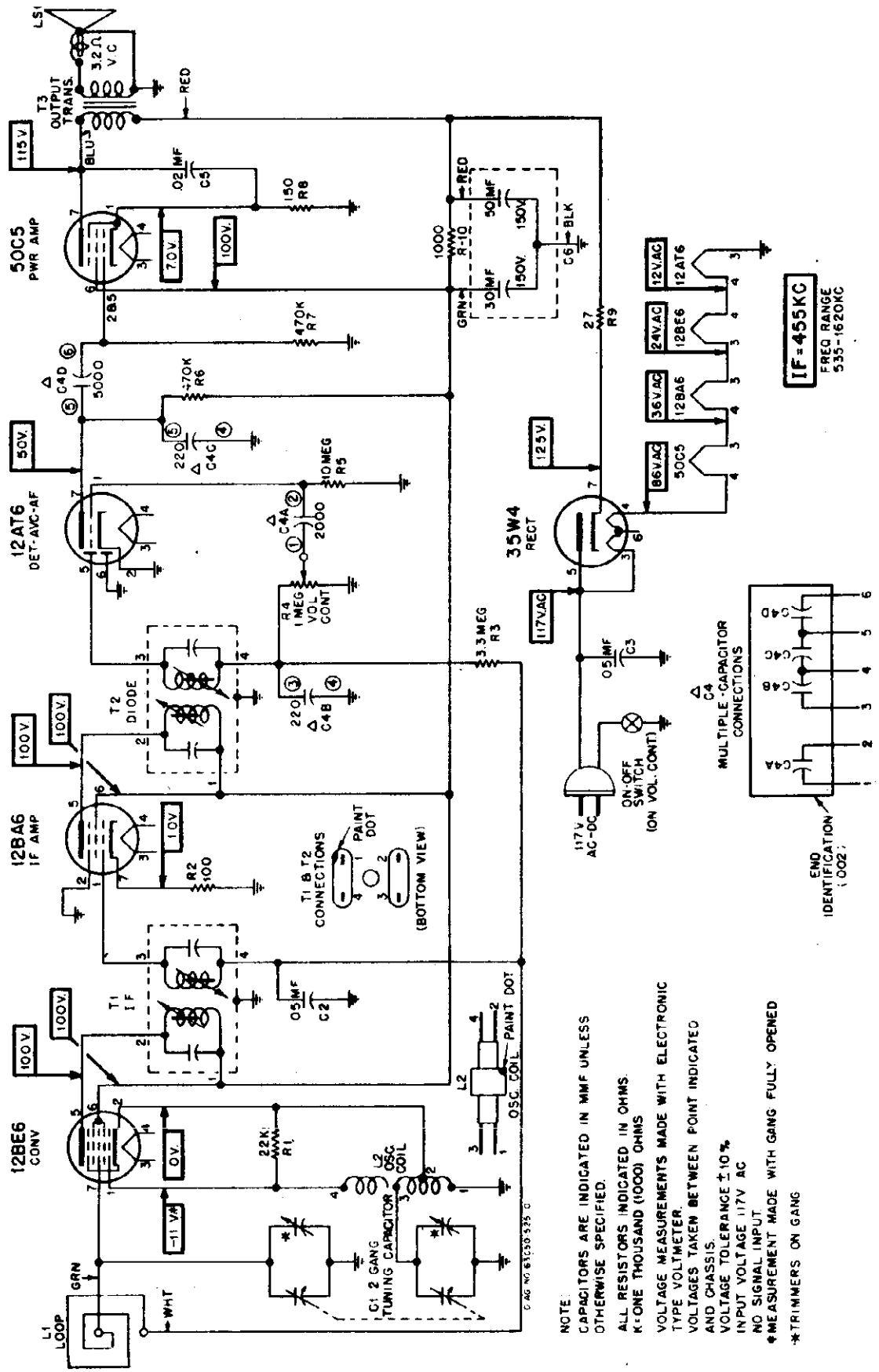


FIGURE 3. BOTTOM VIEW OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

MODELS 5R11, 5R12, 5R13, 5R14, 5R15, 5R16, Ch. HS-254



NOTE:
CAPACITORS ARE INDICATED IN MMF UNLESS OTHERWISE SPECIFIED.

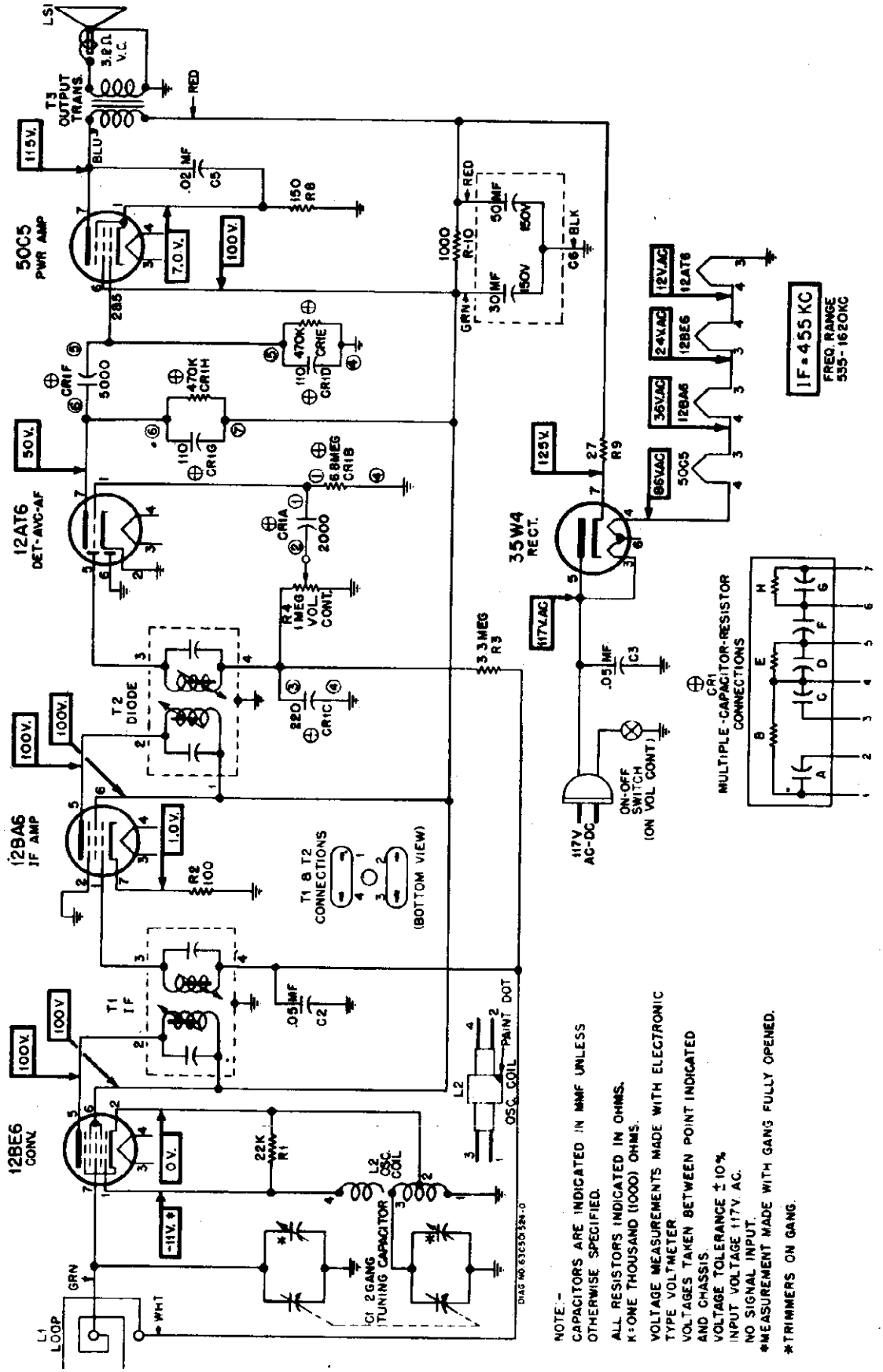
ALL RESISTORS INDICATED IN OHMS. K=ONE THOUSAND (1000) OHMS

VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
VOLTAGES TAKEN BETWEEN POINT INDICATED AND CHASSIS.
VOLTAGE TOLERANCE ±10%
INPUT VOLTAGE 117V AC
NO SIGNAL INPUT.
*MEASUREMENT MADE WITH GANG FULLY OPENED

*TRIMMERS ON GANG

FIGURE 4. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

MODELS 5R11, 5R12,
5R13, 5R14, 5R15,
5R16, Ch. HS-254



NOTE:-
CAPACITORS ARE INDICATED IN MMF UNLESS OTHERWISE SPECIFIED.
ALL RESISTORS INDICATED IN OHMS.
K=ONE THOUSAND (1000) OHMS.
VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
VOLTAGES TAKEN BETWEEN POINT INDICATED AND CHASSIS.
VOLTAGE TOLERANCE ±10% INPUT VOLTAGE 117V AC.
NO SIGNAL INPUT.
*MEASUREMENT MADE WITH GANG FULLY OPENED.
*TRIMMERS ON GANG.

FIGURE 6. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR-RESISTOR PLATE

MODELS 5R11, 5R12, 5R13, 5R14, 5R15, 5R16, Ch. HS-254

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

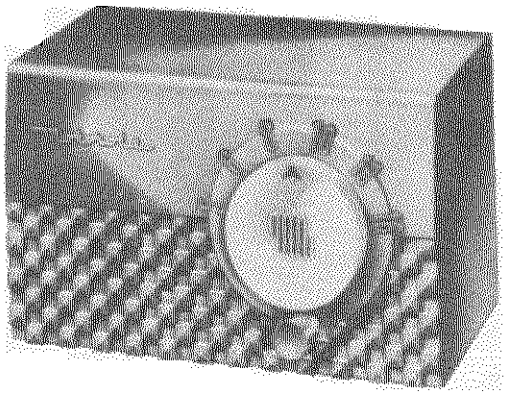
Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	19B600458	Variable: 2 gang; with pulley.....
C-2	8R9821	Paper: .05 mf 200V.....
C-3	8R9816	Paper: .05 mf 400V.....
C-4	21B482847	Ceramic, multiple: 2000, 220,220, 5000 mmf.....
C-5	8R9802	Paper: .02 mf 400V.....
C-6	23B600855	Electrolytic: 50-30 mf/150V
Capacitor-Resistor		
CR-1	21B601007	Capacitor-Resistor: 2000, 220, 5000, 110, 110 mmf, 6.8 meg, 470,000, 470,000 ohms.....
Coils		
L-1	24C600543	Antenna Loop and Panel Assembly.....
L-2	24A478129	Oscillator coil (red dot)..
Speaker		
LS-1	50B690661	Speaker: 4" PM; 3.2 ohm VC.
Resistors		
		Note: All resistors are insulated carbon type unless otherwise specified
R-1	6R6028	22,000 20% 1/2W.....
R-2	6R6018	110 20% 1/2W.....
R-3	6R2118	3.3 meg 20% 1/2W.....
R-4	18K600449	Volume control: 1 meg; with 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	6R3992	150 20% 1/2W.....
R-9	6R5683	27 10% 1/2W.....
R-10	6R3953	1000 20% 1W.....
Transformers		
T-1,2	24B485553	IF and Diode Transformer (green dot): 455 KC; complete with capacitors, cores, and shield.....
T-3	25B478121	Output Transformer.....

Part No.	Description
CHASSIS PARTS - MECHANICAL	
7A478118	Bracket, loop mtg.....
43A692012	Bushing, strain relief: line cord (use with 43K692013).....
42A485548	Clip, IF coil mtg.....
30K478137	Cord, line: with plug; 6 feet long
5A484268	Grommet, rubber (speaker mtg).
14A478119	Insulator, loop bracket mtg: fibre
2S7051	Nut, hex palnut: 3/8-32 x 9/16 (volume control mtg).....
43K692013	Retainer, strain relief: line cord (use with 43A692012).....
5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg).....
5S7707	Rivet: .122 x 5/32; stl; nkl pl (output trans mtg).....
5S7703	Rivet: .122 x 7/32; stl; nkl pl (loop bracket and speaker mtg).....
3S7247	Screw, machine: 6-32 x 3/16 slotted locking hex head; cad pl (gang mtg).....
26A478117	Shield, electrostatic (on rear of chassis).....
9A472534	Socket, tube: miniature; 7 prong..
41A73996	Spring, tension (electrolytic mtg)
46A478145	Stud, tri-mount (mounts loop to bracket).....
14A11493	Washer, shoulder: fibre (loop bracket mtg).....
CABINET PARTS	
16K600181	Cabinet, table model: walnut-mahogany (5R11).....
16E600157	Cabinet, table model: ivory(5R12).
16K600183	Cabinet, table model: maroon(5R13)
16K600184	Cabinet, table model: gray (5R14).
16K600185	Cabinet, table model: green(5R15).
16K600186	Cabinet, table model: yellow(5R16)
36B600485	Knob, tuning: ivory (5R11,5R13, 5R14, and 5R15).....
36K600486	Knob, tuning: red (5R12).....
36K600487	Knob, tuning: blue(5R16).....
36B600544	Knob, volume control: walnut(5R11)
36K600545	Knob, volume control: ivory (5R12)
36K600546	Knob, volume control: maroon(5R13)
36K600547	Knob, volume control: gray(5R14)..
36K600548	Knob, volume control: green (5R15)
36K600549	Knob, volume control: yellow(5R16)
3S476083	Screw, machine: 6-32 x 5/16; slotted locking hex head; cad pl; (chassis mtg).....
38A25507	Plug, split (mounts back panel to cabinet).....
11M488253	Tape, aluminum foil: 2 1/2"

MODELS 5R11A, 5R12A,
5R13A, 5R14A, 5R15A,
5R16A, Ch. HS-280

GENERAL INFORMATION

TYPE - AC-DC table model superheterodyne receiver with loop antenna.



RECEIVER MODELS -

Model	Color
5R11A	Walnut-Mahogany
5R12A	Ivory
5R13A	Maroon
5R14A	Gray
5R15A	Green
5R16A	Yellow

TUBE COMPLEMENT -

Type	Function
12BE6	Converter
12BA6	IF Amplifier
12AT6	Det, AVC & AF Amp
50C5	Power Amplifier

RECTIFIER - Selenium type

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

POWER SUPPLY - 117 volts AC or DC; 35 watts

INSTALLATION & OPERATING INSTRUCTIONS

ON-OFF SWITCH & VOLUME CONTROL. Operated with the small lower knob. NOTE: To operate on DC, the line plug must be inserted in the electrical outlet for correct polarity. If the set does not function, reverse the plug. When operating from AC, reversal of the line plug may improve reception.

TUNING CONTROL. Stations are tuned in with the large upper knob.

ANTENNA. The built-in loop antenna provides satisfactory reception in most locations. When receiving a distant or weak station, rotate the receiver slightly to get maximum signal pick-up. If additional pick-up is necessary, connect an external antenna by following the instructions printed on the rear panel. CAUTION: Never connect the chassis to a water pipe, radiator or other ground.

SERVICE NOTES

This receiver has one lead of the power line connected directly to the chassis. If AC power is used, it is recommended, when operating the chassis outside of its cabinet, that an isolation transformer be placed between the power line and the receiver to reduce the possibility of an electrical shock.

TO REMOVE CHASSIS FROM CABINET:

1. Pull off the two control knobs from the front of the receiver.

2. Remove the two split plugs which hold the loop to the cabinet.

3. Remove the two hex head screws at the rear edge of the chassis.

4. Slide the chassis from the cabinet.

MODELS 5R11A, 5R12A
5R13A, 5R14A, 5R15A
5R16A, Ch. HS-280

ALIGNMENT

NOTE: If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver to avoid hum and electrical shocks. If an isolation transformer is not available, connect the low side of the signal generator to chassis through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.

2. Connect the low side of the signal generator to chassis.

3. Set the signal generator for 400 cycle, 30% modulation.

4. Turn the receiver volume control to maximum.

5. Use a small fibre screwdriver for aligning the IF and diode transformers.

6. As stages are brought into alignment, reduce the signal generator output to a level which produces less than .4 volts (.05 watt) across the voice coil to avoid overloading the receiver.

7. See Figure 1 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. (pin 7, 12BE6)	455 Kc	Fully open	1, 2, 3, & 4 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	.1 mf	Grid of conv. (pin 7, 12BE6)	1620 Kc	Fully open	5 (Osc)	Adjust for maximum.
3.	-	Radiation loop*	1400 Kc	Tune for max	6 (Ant)	Adjust for maximum.

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

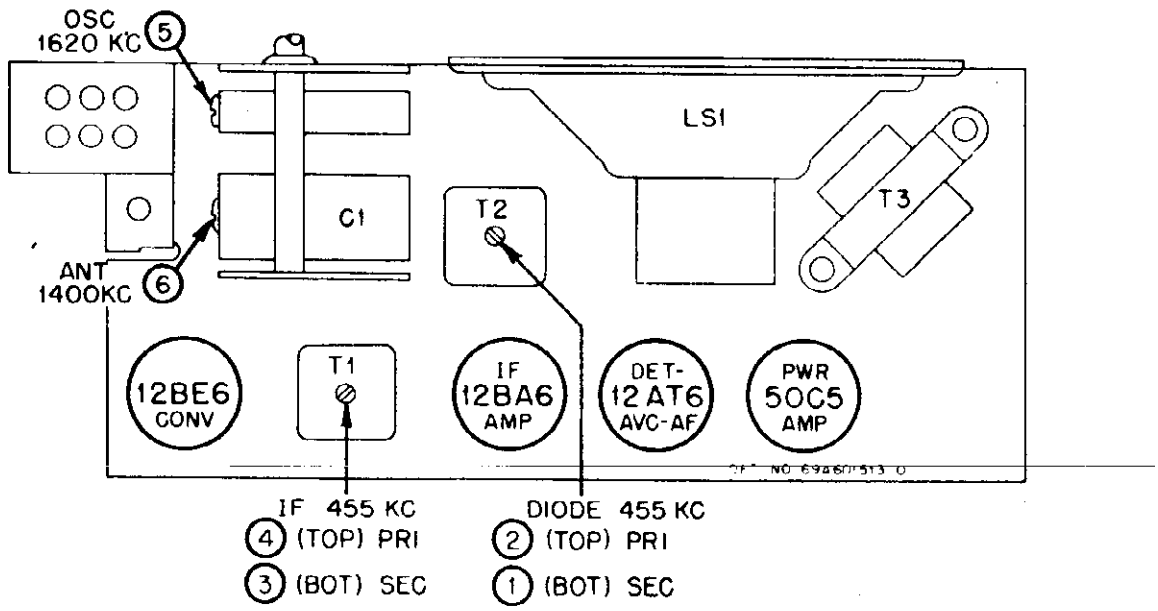
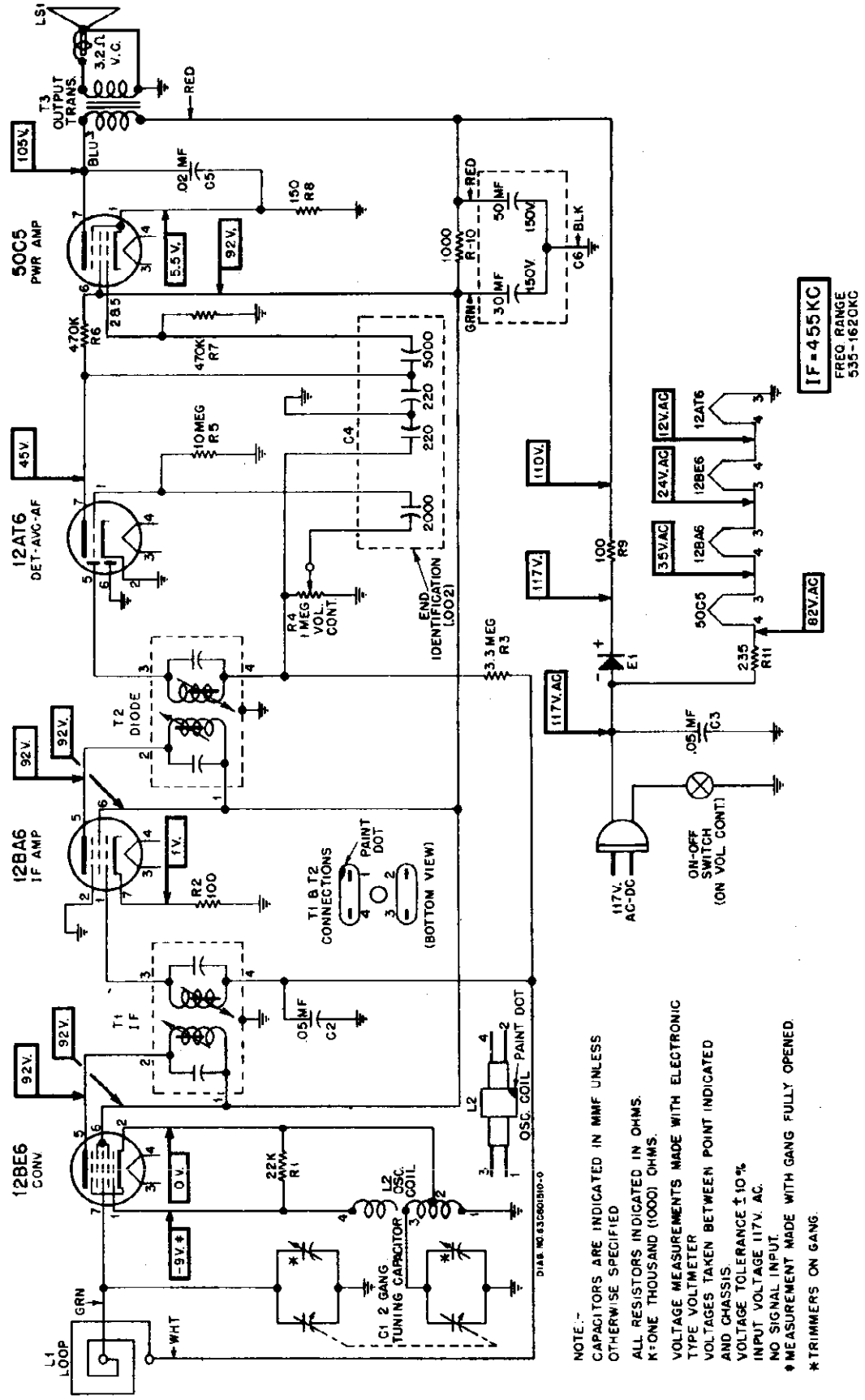


FIGURE 1. TUBE AND TRIMMER LOCATIONS

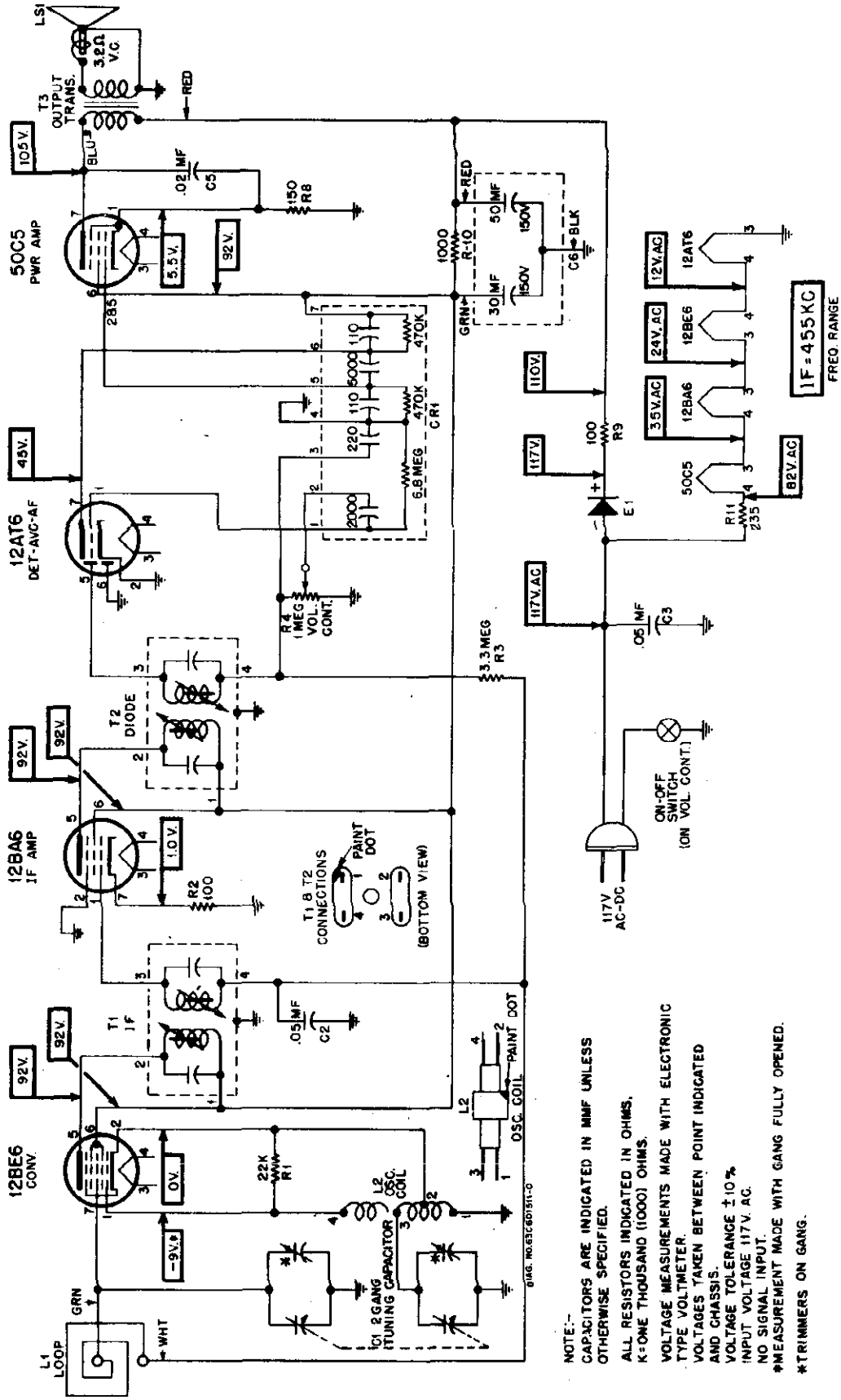
MODELS 5R11A, 5R12A,
5R13A, 5R14A, 5R15A,
5R16A, Ch. HS-280



NOTE:-
CAPACITORS ARE INDICATED IN MMF UNLESS OTHERWISE SPECIFIED
ALL RESISTORS INDICATED IN OHMS.
K=ONE THOUSAND (1000) OHMS.
VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER
VOLTAGES TAKEN BETWEEN POINT INDICATED AND CHASSIS.
VOLTAGE TOLERANCE ±10%
INPUT VOLTAGE 117V. AC.
NO SIGNAL INPUT.
♦MEASUREMENT MADE WITH GANG FULLY OPENED.
*TRIMMERS ON GANG.

FIGURE 4. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

MODELS 5R11A, 5R12A,
5R13A, 5R14A, 5R15A,
5R16A, Ch. HS-280



NOTE:-
CAPACITORS ARE INDICATED IN MMF UNLESS OTHERWISE SPECIFIED.

ALL RESISTORS INDICATED IN OHMS, K=ONE THOUSAND (1000) OHMS.

VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
VOLTAGES TAKEN BETWEEN POINT INDICATED AND CHASSIS.
VOLTAGE TOLERANCE ±10%
INPUT VOLTAGE 117 V. AC.
NO SIGNAL INPUT.
#MEASUREMENT MADE WITH GANG FULLY OPENED.

*TRIMMERS ON GANG.

FIGURE 5. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR-RESISTOR PLATE

REPLACEMENT PARTS LIST

MODELS 5R11A, 5R12A, 5R13A, 5R14A, 5R15A, 5R16A, Ch. HS-280

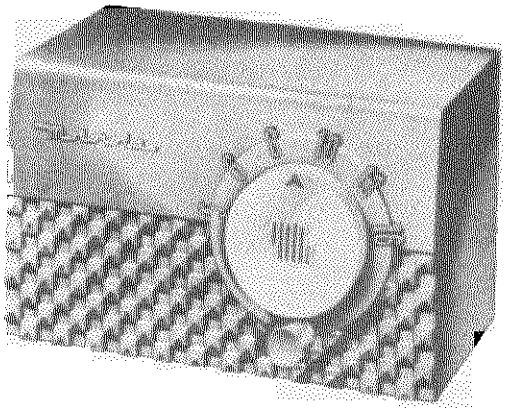
NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	19B600485	Variable: 2 gang; with pulley
C-2	8R9821	Paper: .05 mf 200V
C-3	8R9816	Paper: .05 mf 400V
C-4	21B482847	Ceramic, multiple: 2000 mmf, 220 mmf, 220 mmf, 5000 mmf
C-5	8R9802	Paper: .02 mf 400V
C-6	23B600855	Electrolytic: 50-30 mf/150V
Capacitor-Resistor		
CR-1	21B601007	Capacitor-Resistor: 2000 mmf, 220 mmf, 5000 mmf, 110 mmf, 110 mmf, 6.8 meg, 470,000 ohms, 470,000 ohms
Rectifier		
E-1	48B791092	Rectifier, selenium: half wave
Coils		
L-1	24K601662	Antenna Loop and Panel Assembly
L-2	24A478129	Oscillator coil
Speaker		
LS-1	50B690661	Speaker: 4" PM; 3.2 ohm VC
Resistors		
		Note: All resistors are insulated carbon type unless otherwise specified.
R-1	6R6028	22,000 20% 1/2W
R-2	6R6018	100 20% 1/2W
R-3	6R2118	3.3 meg 20% 1/2W
R-4	18K600449	Volume control: 1 meg; with 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	6R3992	150 20% 1/2W
R-9	6R6415	100 10% 1W
R-10	6R3953	1000 20% 1W
R-11	17A601647	Wirewound: 235 10% 5W.
Transformers		
T-1,2	24B485553	IF and Diode, Transformer (green dot): 455 KC; complete with capacitors, cores, and shield
T-3	25B478121	Output Transformer
CHASSIS PARTS - MECHANICAL		
7A478118		Bracket, loop mtg
7B601649		Bracket, rectifier mtg
43A692012		Bushing, strain relief(line cord)
43A692013		Bushing, retainer: strain relief (line cord)
42A485548		Clip, IF & Diode Transformer mtg
30K478137		Cord, line and plug: 6 feet long
5A484268		Grommet, rubber (speaker mtg).
14A478119		Insulator, fibre (loop bracket mtg)
2S7051		Nut, hex: 3/8-32 x 9/16; stl; cad pl (volume control mtg)
5S7771		Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg)
5S7707		Rivet: .122 x 5/32; stl; nkl pl (output trans mtg & rect bracket mtg)
5S7703		Rivet: .122 x 7/32; stl; nkl pl (loop bracket and speaker mtg)
3S7247		Screw,machine: 6-32 x 3/16 slotted hex head; locking type; stl; cad pl (gang mtg)
3S490507		Screw, sheet metal: #6 x 18 x 1 plain hex head; stl; cad pl (rectifier mtg)
26A478117		Shield, electrostatic (on rear of chassis)
9A472534		Socket, tube: miniature; 7 prong..
41A73996		Spring, tension (electrolytic mtg)
31K83993		Strip, terminal: 2 insulated lugs, #1 gnd; 3/8" spacing
46A478145		Stud, tri-mount (loop mtg to bracket)
14A11493		Washer, shoulder: fibre (loop bracket mtg)
CABINET PARTS		
16K600181		Cabinet, table model : walnut-mahogany (5R11A)
16E600157		Cabinet, table model: ivory (5R12A)
16K600183		Cabinet, table model: maroon (5R13A)
16K600184		Cabinet, table model: gray (5R14A)
16K600185		Cabinet, table model: green (5R15A)
16K600186		Cabinet, table model: yellow (5R16A)
36B600485		Knob, tuning: ivory (5R11A, 5R13A, 5R14A, and 5R15A)
36K600486		Knob, tuning: red (5R12A)
36K600487		Knob, tuning: blue (5R16A)
36B600544		Knob, volume control: walnut (5R11A)
36K600545		Knob, volume control: ivory (5R12A)
36K600546		Knob, volume control: maroon (5R13A)
36K600547		Knob, volume control: gray (5R14A)
36K600548		Knob, volume control: green (5R15A)
36K600549		Knob, volume control: yellow (5R16A)
3S476083		Screw, machine: 6-32 x 5/16; slotted hex head; stl; cad pl; locking type (chassis mtg)
38A25507		Plug, split (back mtg to cabinet
11N488253		Tape; aluminum foil: 2 1/2" wide

MODELS 5R11AU, 5R12AU,
5R13AU, 5R14AU, 5R15AU,
5R16AU, Ch. HS-281

GENERAL INFORMATION

TYPE - AC-DC table model superheterodyne receiver with loop antenna.



RECEIVER MODELS - Model	Color
5R11AU	Walnut-Mahogany
5R12AU	Ivory
5R13AU	Maroon
5R14AU	Gray
5R15AU	Green
5R16AU	Yellow

TUBE COMPLEMENT - Type	Function
12BE6	Converter
12BA6	IF Amplifier
12AT6	Det, AVC & AF Amp
50C5	Power Amplifier
Rectifier	Selenium Type

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

POWER SUPPLY - 117 volts AC or DC; 35 watts

INSTALLATION & OPERATING INSTRUTIONS

ON-OFF SWITCH & VOLUME. Operated with the small lower knob. NOTE: To operate from DC, the line plug must be inserted in the electrical outlet for correct polarity. If the receiver does not function, reverse the plug. When operating from AC, reversal of the line plug may improve reception.

TUNING. Stations are tuned in with the large upper knob.

ANTENNA. The built-in loop antenna provides satisfactory reception in most locations. When receiving a distant or weak station, rotate the receiver slightly to get maximum signal pick-up. If additional pick-up is necessary, connect an external antenna by following the instructions printed on the rear panel. CAUTION: Never connect the chassis to a water pipe, radiator or other ground.

SERVICE NOTES

The chassis of this receiver is isolated from the power line by a capacitor to eliminate the shock hazard, when handling the chassis outside the cabinet. However, as an additional precaution when aligning or servicing the receiver from AC, an isolation transformer should be inserted between the power line and the receiver.

TO REMOVE CHASSIS FROM CABINET:

1. Pull off the two control knobs from the front of the receiver.

2. Remove the two split plugs which hold the loop to the cabinet.

3. Remove the two hex head screws at the rear edge of the chassis.

4. Slide the chassis from the cabinet.

MODELS 5R11AU, 5R12AU, 5R13AU, 5R14AU, 5R15AU, 5R16AU, Ch. HS-281

ALIGNMENT

NOTE: If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver to avoid hum and electrical shocks. If an isolation transformer is not available, connect the low side of the signal generator to B- through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.
2. Connect the low side of the signal generator to B-.
3. Set the signal generator for 400 cycle, 30% modulation.
4. Turn the receiver volume control to maximum.
5. Use a small fibre screwdriver for aligning the IF and diode transformers.
6. As stages are brought into alignment, reduce the signal generator output to a level which produces less than .40 volts (.05 watt) across the voice coil to avoid overloading the receiver.
7. See Figure 1 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. (pin 7, 12BE6)	455 Kc	Fully open	1, 2, 3 & 4 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	.1 mf	Grid of conv. (pin 7, 12BE6)	1620 Kc	Fully open	5 (Osc)	Adjust for maximum.
3.	-	Radiation loop*	1400 Kc	Tune for max	6 (Ant)	Adjust for maximum.

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

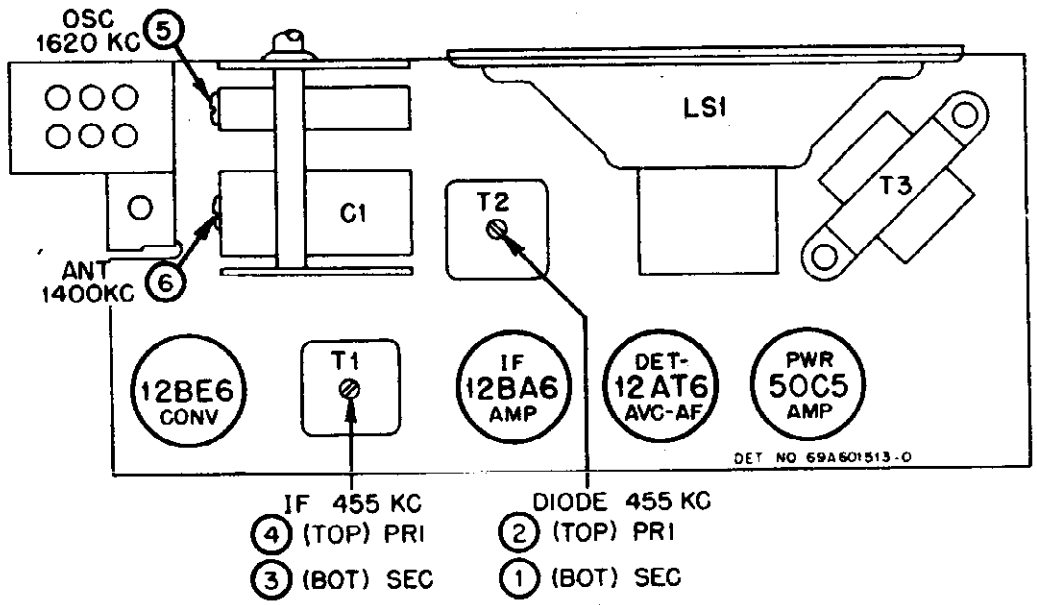


FIGURE 1. TUBE AND TRIMMER LOCATIONS

MODELS 5R11AU, 5R12AU,
5R13AU, 5R14AU, 5R15AU,
5R16AU, Ch. HS-281

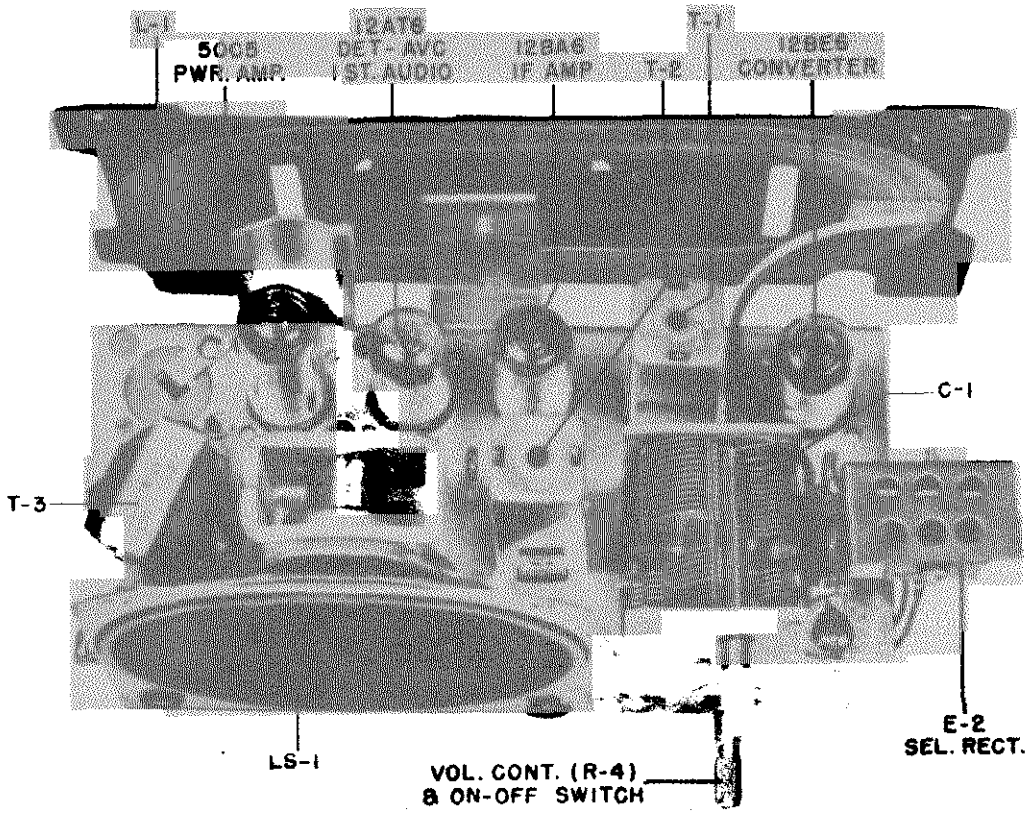


FIGURE 2. TOP VIEW OF CHASSIS

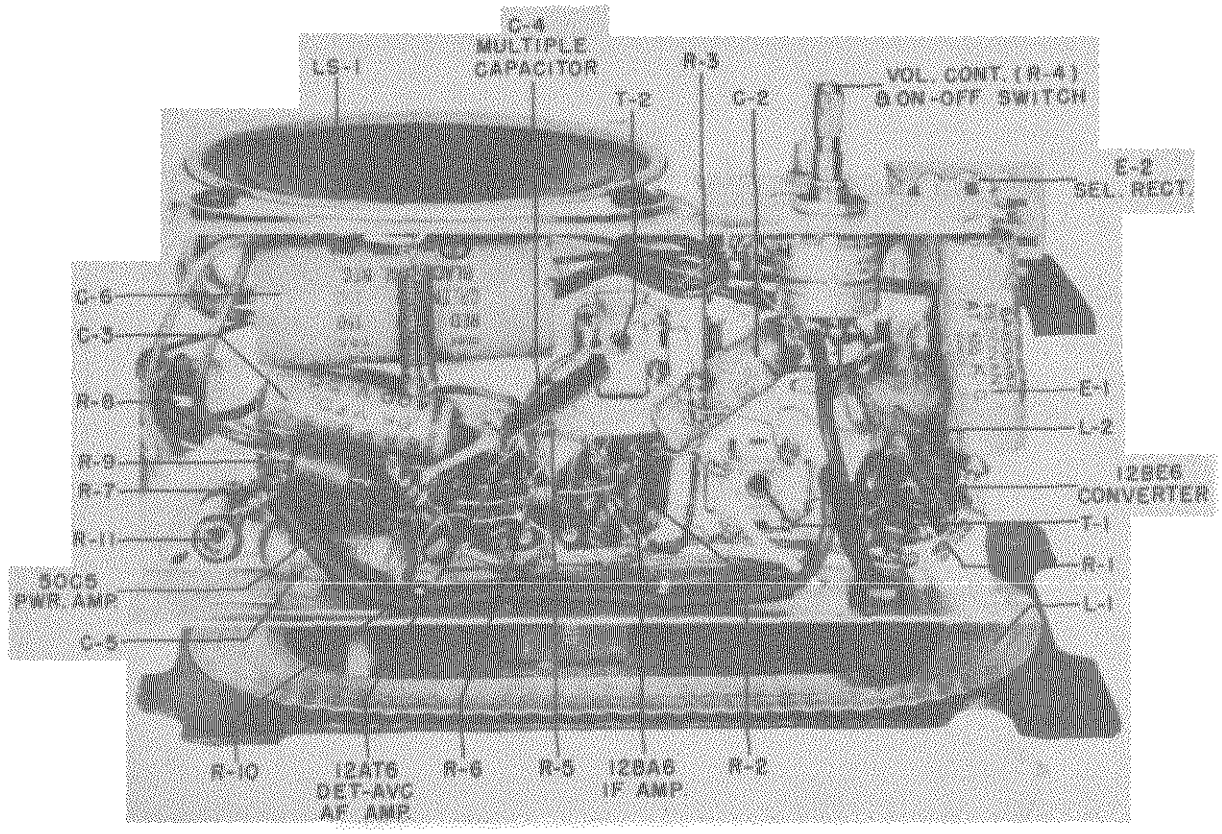


FIGURE 3. BOTTOM VIEW OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

MODELS 5R11AU, 5R12AU, 5R13AU, 5R14AU, 5R15AU, 5R16AU, Ch. HS-281

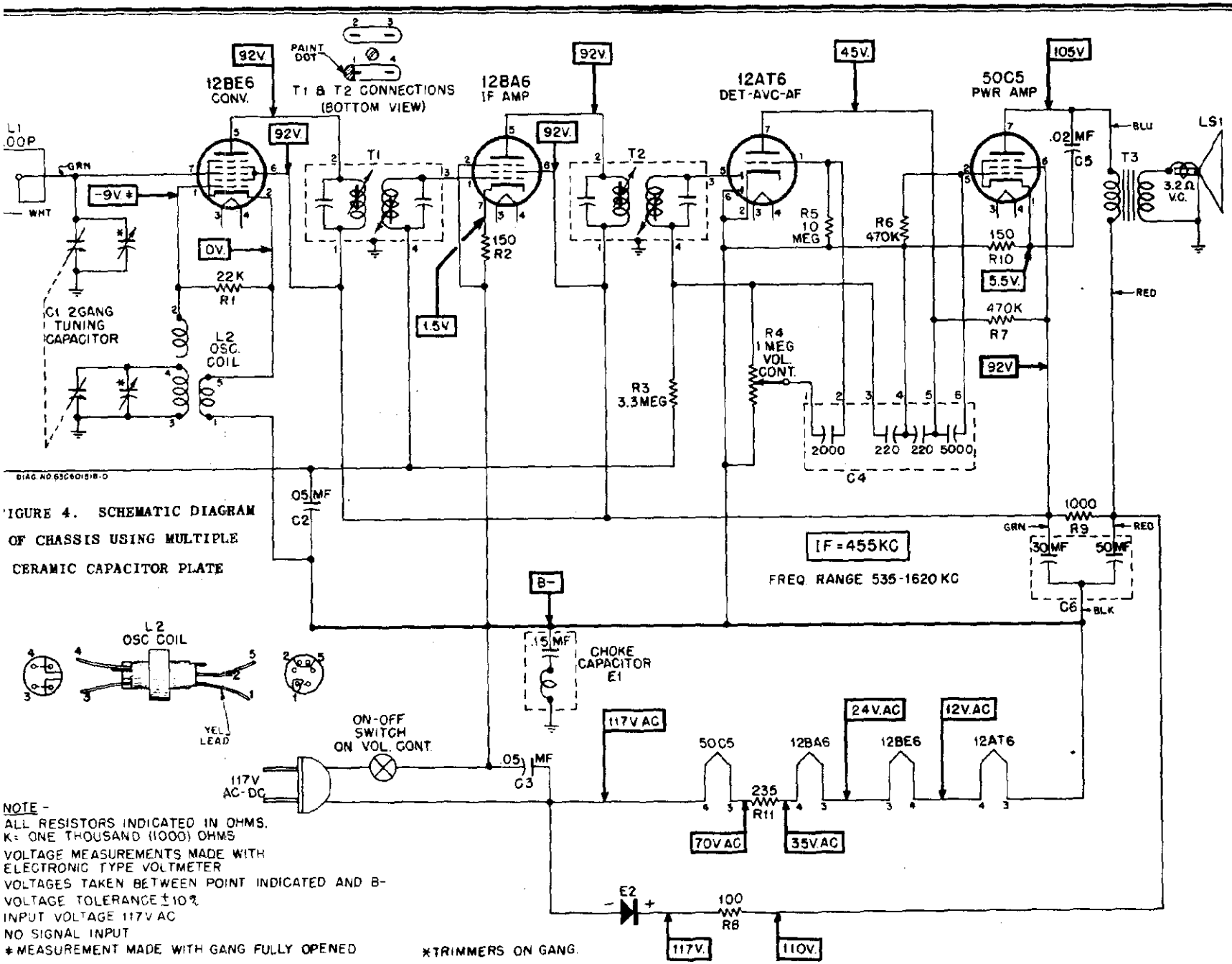


FIGURE 4. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

NOTE -
ALL RESISTORS INDICATED IN OHMS.
K= ONE THOUSAND (1000) OHMS
VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER
VOLTAGES TAKEN BETWEEN POINT INDICATED AND B-
VOLTAGE TOLERANCE ±10%
INPUT VOLTAGE 117V AC
NO SIGNAL INPUT
*MEASUREMENT MADE WITH GANG FULLY OPENED

*TRIMMERS ON GANG.

MODELS 5R11AU, 5R12AU,
5R13AU, 5R14AU, 5R15AU,
5R16AU, Ch. HS-281

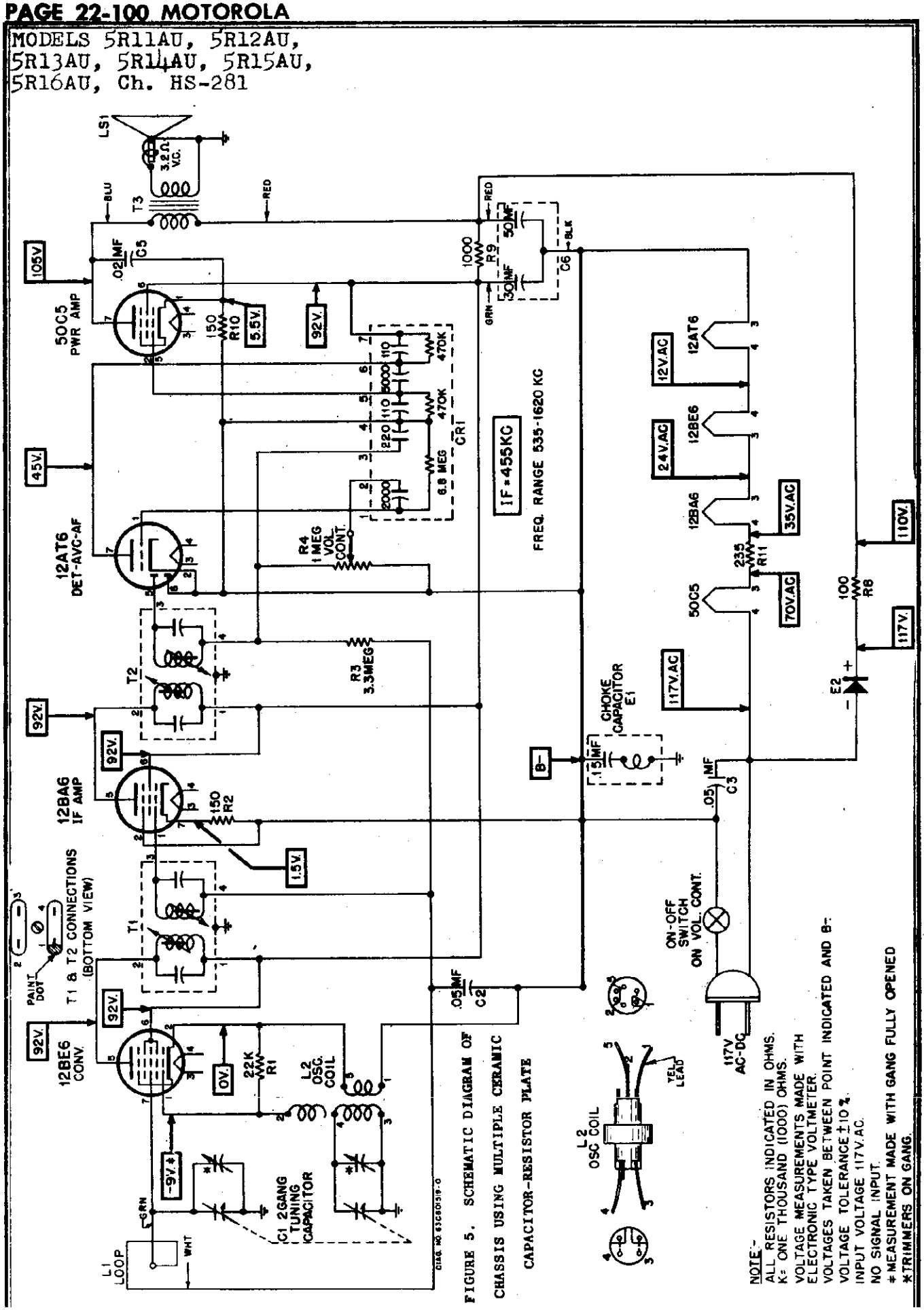


FIGURE 5. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR-RESISTOR PLATE

NOTE:-
ALL RESISTORS INDICATED IN OHMS.
K= ONE THOUSAND (1000) OHMS.
VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
VOLTAGES TAKEN BETWEEN POINT INDICATED AND B-
VOLTAGE TOLERANCE ±10%.
INPUT VOLTAGE 117V.AC.
NO SIGNAL INPUT.
* MEASUREMENT MADE WITH GANG FULLY OPENED
*TRIMMERS ON GANG.

MODELS 5R11AU, 5R12AU, 5R13AU, 5R14AU, 5R15AU 5R16AU, Ch. HS-281

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
C-1	19B600458	Variable, 2 gang: with pulley
C-2	8R9821	Paper: .05 mf 200V
C-3	8R9816	Paper: .05 mf 400V
C-4	21B482847	Ceramic, multiple: 2000 mmf, 220 mmf, 220 mmf, 5000 mmf..
C-5	8R9802	Paper: .02 mf 400V
C-6	23B600855	Electrolytic: 50-30 mf/150V..
CAPACITOR-RESISTOR		
CR-1	21B601007	Capacitor-Resistor: 7 lead; 2000 mmf, 220 mmf, 5000 mmf, 110 mmf, 110 mmf, 6.8 meg, 470,000 ohms, 470,000 ohms..
CHOKE & CAPACITOR		
E-1	8A690487	Choke & .15 mf paper capacitor
RECTIFIER		
E-2	48B791092	Rectifier, selenium
COILS		
L-1	24K601662	Antenna Loop and Panel Assem.
L-2	24B680364	Oscillator coil
SPEAKER		
LS-1	50B690661	Speaker: 4" PM; 3.2 ohm VC...
Resistors		
		Note: All resistors are insulated carbon type unless otherwise specified.
R-1	6R6028	22,000 20% 1/2W
R-2	6R3992	150 20% 1/2W
R-3	6R2118	3.3 meg 20% 1/2W
R-4	18K600449	Volume control: 1 meg; with 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	6R6415	100 10% 1W
R-9	6R3953	1000 20% 1W
R-10	6R3992	150 20% 1/2W
R-11	17A601647	Wirewound: 235 10% 5W...
TRANSFORMERS		
T-1,2	24B485553	IF and Diode, 455 Kc: complete with capacitors, cores and shield
T-3	25K680345	Output Transformer

Part Number	Description
CHASSIS PARTS - MECHANICAL	
7A478118	Bracket, loop mtg
7B601649	Bracket, rectifier mtg
43A692012	Bushing, strain relief (line cord)
43K692013	Bushing, retainer: strain relief (line cord)
42A485548	Clip, coil can mtg (for T-1 & T-2)
30K680352	Cord, line and plug: 6 ft long ..
5A484268	Grommet, rubber (spkr mtg).....
14A478119	Insulator, fibre (loop bracket mtg).....
2S7051	Nut, hex: 3/8-32 x 9/16; stl; cad pl (volume control mtg).....
5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg)
5S7707	Rivet: .122 x 5/32; stl; nkl pl (output trans and shield mtg).
5S7703	Rivet: .122 x 7/32; stl; nkl pl (loop bracket and speaker mtg)
3S490507	Screw, sheet metal: #6 x 1; plain hex head; stl; cad pl (rectifier mtg)
3S7247	Screw, machine: 6-32 x 3/16 slotted hex head; locking type; stl; cad pl (gang mtg)
26A478117	Shield, electrostatic (on rear of chassis)
9A472534	Socket, tube: 7-prong
41A73996	Spring, tension (electrolytic mtg)
46A478145	Stud, tri-mount (back mtg to chassis)
14A11493	Washer, shoulder: fibre (loop brkt mtg)
CABINET PARTS	
16K600181	Cabinet, table model: molded; walnut-mahogany finish (5R11AU).....
16E600157	Cabinet, table model: molded; ivory finish (5R12AU)
16K600183	Cabinet, table model: molded; maroon finish (5R13AU)
16K600184	Cabinet, table model: molded; gray finish (5R14AU)
16K600185	Cabinet, table model: molded; green finish (5R15AU)
16K600186	Cabinet, table model: molded; yellow finish (5R16AU)
36B600485	Knob, tuning: ivory (5R11AU, 5R13AU, 5R14AU, and 5R15AU)
36K600486	Knob, tuning: red (5R12AU).....
36K600487	Knob, tuning: blue (5R16AU).....
36B600544	Knob, volume control: walnut (5R11AU)
36K600545	Knob, volume control: ivory (5R12AU)
36K600546	Knob, volume control: maroon (5R13AU)
36K600547	Knob, volume control: gray (5R14AU).
36K600548	Knob, volume control: green (5R15AU)
36K600549	Knob, volume control: yellow(5R16AU)
3S476083	Screw, machine: 6-32 x 5/16; slotted hex head; stl; cad pl; locking type (chassis mtg)
38A25507	Plug, split (back mtg to cabinet)
11M488253	Tape, aluminum foil: 2-1/2" wide.

MODELS 6L1, 6L2
Rev.; 61L1, 61L2,
Ch. HS-226

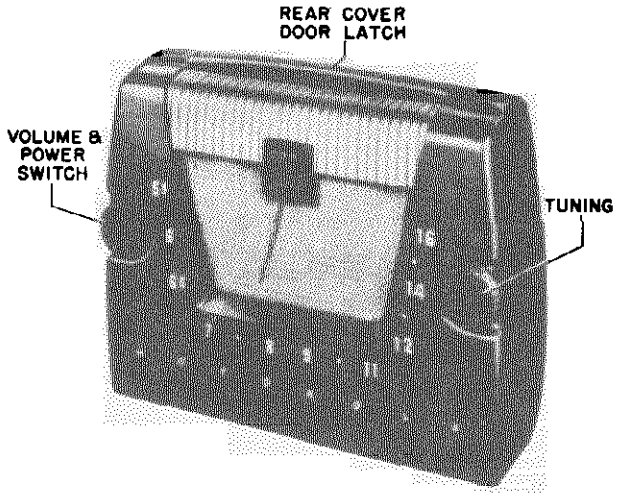
GENERAL INFORMATION

TYPE - Five tube, three-power (AC/DC, Battery) portable, with a selenium rectifier. A loop antenna is housed in the back cover.

MODEL	COLOR
6L1	Green plastic
6L2	Brown plastic
61L1	Green plastic
61L2	Maroon plastic

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT - 1U4 - RF Amplifier
1R5 - Converter
1U4 - IF Amplifier
1U5 - Det, AVC & 1st AF Amp
3V4 - Power Amplifier
Rectifier - Selenium type



POWER SUPPLY - Operates from 117 volts AC or DC (15 watts), or self-contained battery pack. Use an Eveready #753, A General #60A-6F6-5, or equivalent battery pack.

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.

TO OPEN BACK COVER. With your finger, press down on the latch button located at the top of the cabinet and pull the cover open: to close, press the latch button down and snap the cover shut.

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 in the side of the cabinet before closing the cover. Insert the power plug into any 117 volt AC or DC outlet. If the receiver does not operate from DC power, reverse the line cord plug in the power outlet.

BATTERY OPERATION. Open the back cover and install the battery pack, following the instructions in Figure 1. Insert 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 from AC or DC. Never leave a low or run-down battery in the receiver because it will leak or swell and damage the receiver.

ANTENNA. A loop antenna is built into the rear cover of this receiver. Because of the slightly directional characteristics of the loop antenna, reception from some stations may be improved by rotating the receiver. In extremely noisy locations, rotate the entire receiver until minimum noise and maximum signal pickup are obtained.

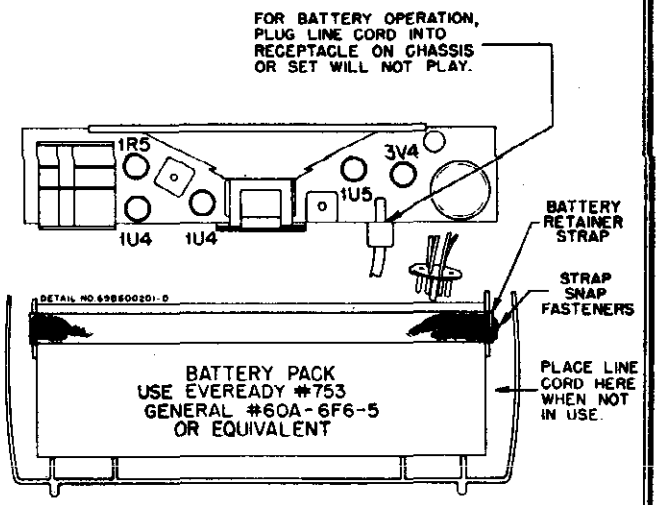


FIGURE 1. BATTERY REPLACEMENT & TUBE LOCATIONS

ALIGNMENT

NOTE: The receiver may be operated either from a battery or from the commercial power lines during alignment. If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver. If an isolation transformer is not available, connect the low side of the signal generator to B- through a .1 mf capacitor.

PROCEDURE:-

1. Connect a low range output meter across the speaker voice coil.

2. Connect the low side of the signal generator to B-.

3. Set the signal generator for 400 cycle, 30% modulation.

4. Turn the receiver volume control to maximum.

5. Use a small fibre screwdriver for aligning the IF and diode transformers.

6. As stages are brought into alignment, reduce the signal generator input to keep the output of the receiver at approximately .05 watts (.05 watt - .40 volts on the output meter) to avoid overloading the receiver.

7. See Figure 2 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. (pin 6, 1R5)	455 Kc	Fully open	1, 2, 3 & 4	Adjust for maximum.
RF ALIGNMENT						
2.	-	-	-	Fully closed	Pointer	Set pointer as shown in Figure 3.
3.	.1mf	Grid of RF Amp (pin 6, 1U4)	1620 Kc	Fully open	5	Adjust for maximum.
4.	.1 mf	"	1400 Kc	Tune for maximum	6	Adjust for maximum.
5.	-	Radiation loop*	"	"	7	With chassis installed in cabinet and output meter connected to speaker, open rear cover slightly and adjust for maximum. NOTE: Battery pack should be in cabinet.

*Connect generator output across 5" diameter, 5-turn loop and couple inductively to receiver loop. Keep loops at least 12" apart.

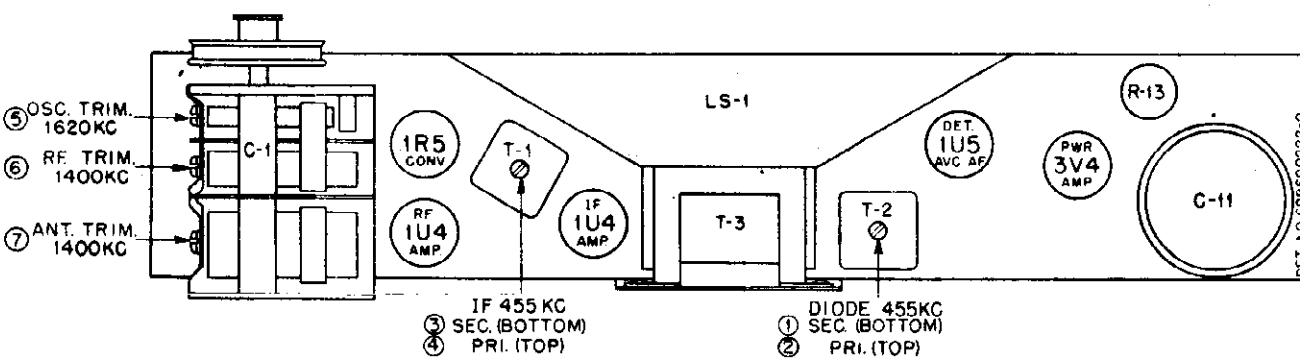


FIGURE 2. TUBE & TRIMMER LOCATIONS

MODELS 6L1, 6L2 Rev.;
61L1, 61L2. Ch. HS-226

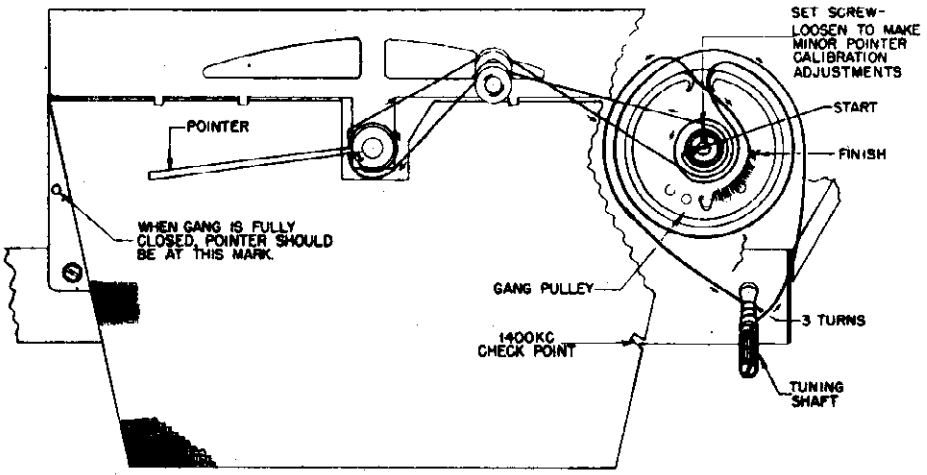


FIGURE 3. DIAL CORD RESTRINGING DETAIL

SERVICE NOTES

The chassis of this receiver is isolated from the AC power line circuit by a capacitor to eliminate the shock hazard when handling the receiver. However, as an additional precaution when aligning or servicing the receiver from AC, an isolation transformer should be inserted between the power line and the chassis.

The tubes are exposed when the rear cover is opened. It is not necessary to remove the chassis to replace tubes.

TO REMOVE THE CHASSIS FROM THE CABINET:

1. Open the rear cover and remove the battery pack.
2. Disconnect the two leads from the chassis to the loop antenna.
3. Remove screw holding stop cord to chassis. CAUTION: With stop cord removed back cover may be seriously damaged if it is allowed to fall back.
4. Pull off the two control knobs on the front of the cabinet.
5. Remove the two hex head screws located under the knobs.
6. Slide the chassis out of the cabinet.

PRODUCTION REVISIONS (6L1 & 6L2)

REAR COVER LATCH ASSEMBLY

The rear cover latch was revised to provide better locking and to eliminate breakage of the projecting studs on the cover.

The new latch may be added to early cabinets by referring to Figure 5 and following the instructions below:

1. Remove the locking clips from the cabinet (optional).
2. File away the tongue in the top center of the back cover.
3. Drill a .136" hole in the top of the cabinet.
4. Drill a 5/16" hole in the top of the back cover.
5. Rivet the spring and stud assembly to the cabinet.

REAR COVER STOP CORD

A cord, fastened to the chassis and to the rear cover, was added to prevent the cover from opening too far and becoming damaged.

REAR COVER HINGE INSTALLATION

The proper method for installing a new hinge is shown in Figure 4. Note that the under side of the cabinet should rest on an iron block during the heating process to prevent the formation of a heat bubble on the bottom of the cabinet.

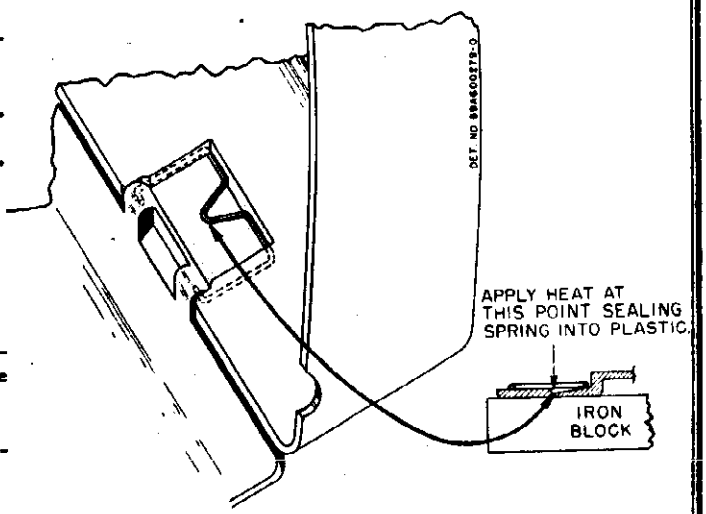


FIGURE 4. REAR COVER HINGE INSTALLATION

MODELS 6L1, 6L2
Rev.; 61L1, 61L2,
Ch. HS-226

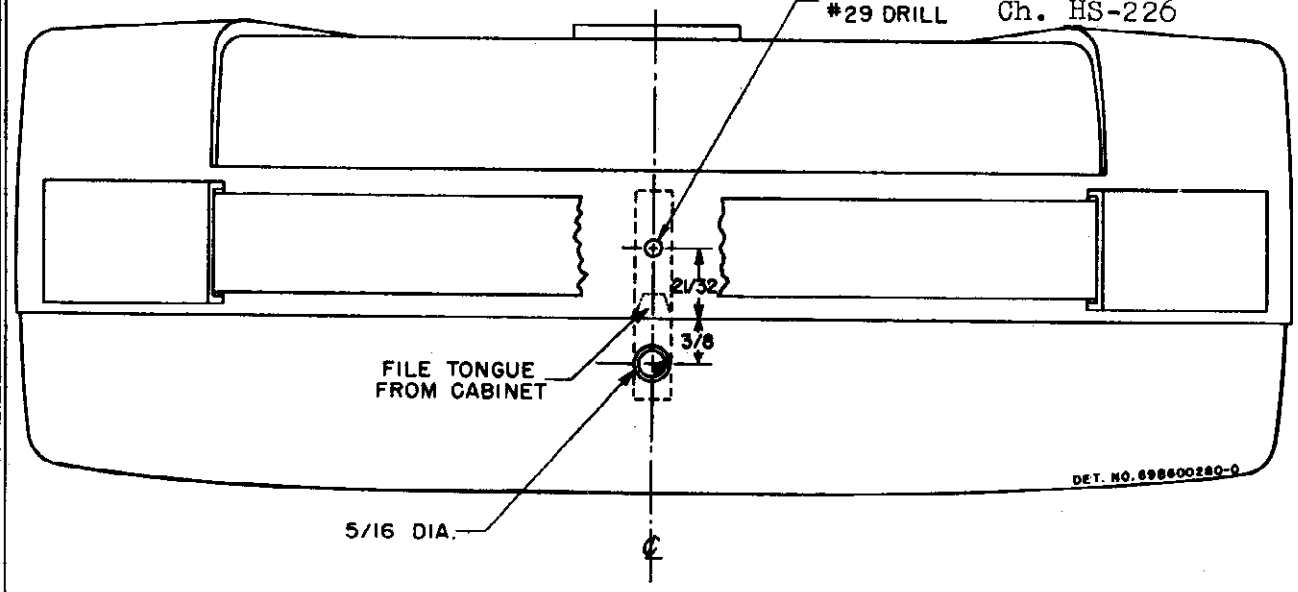


FIGURE 5. REAR COVER LATCH INSTALLATION

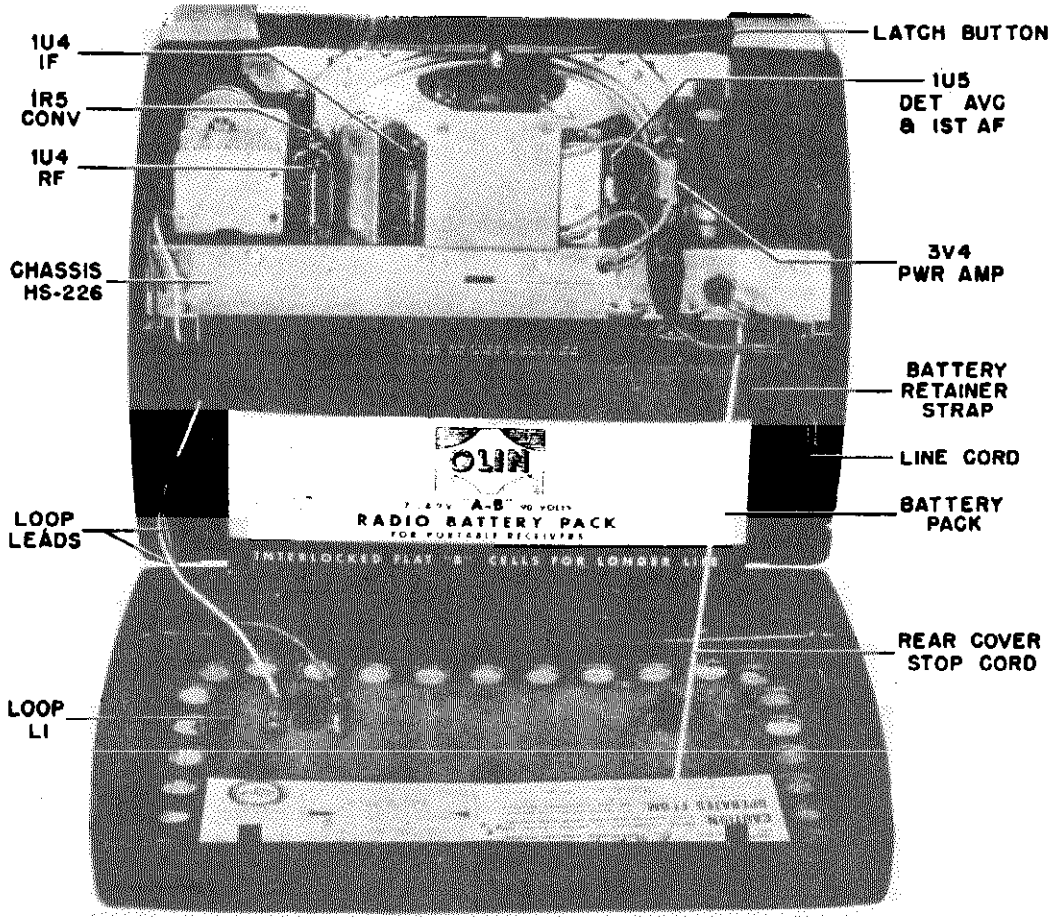


FIGURE 6. REAR VIEW OF CABINET

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MODELS 6L1, 6L2 Rev.; 61L1, 61L2, Ch. HS-226

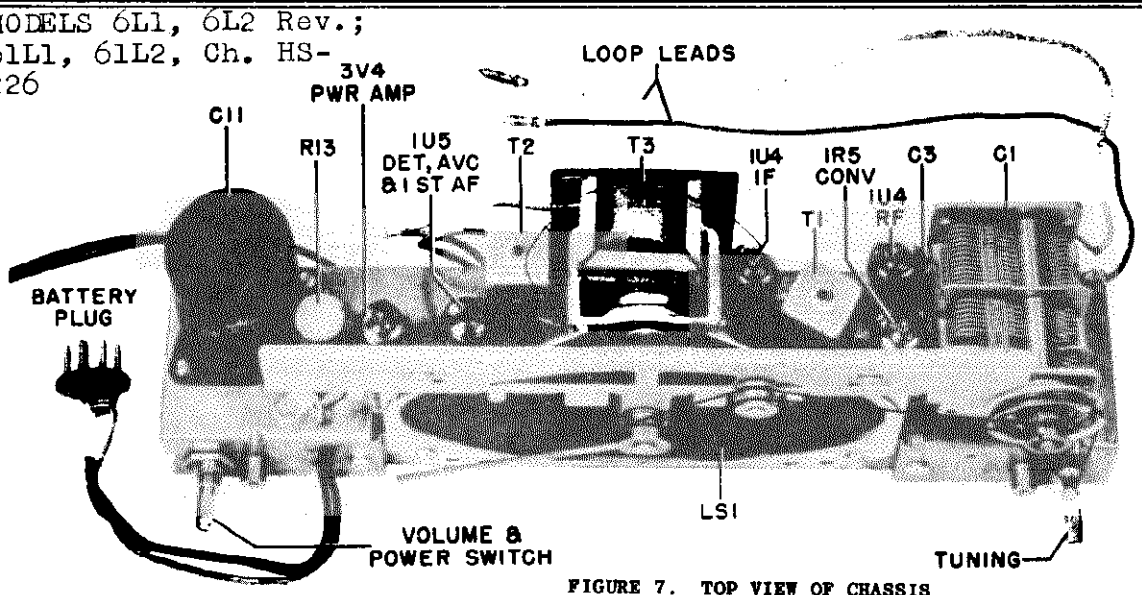

FIGURE 7. TOP VIEW OF CHASSIS

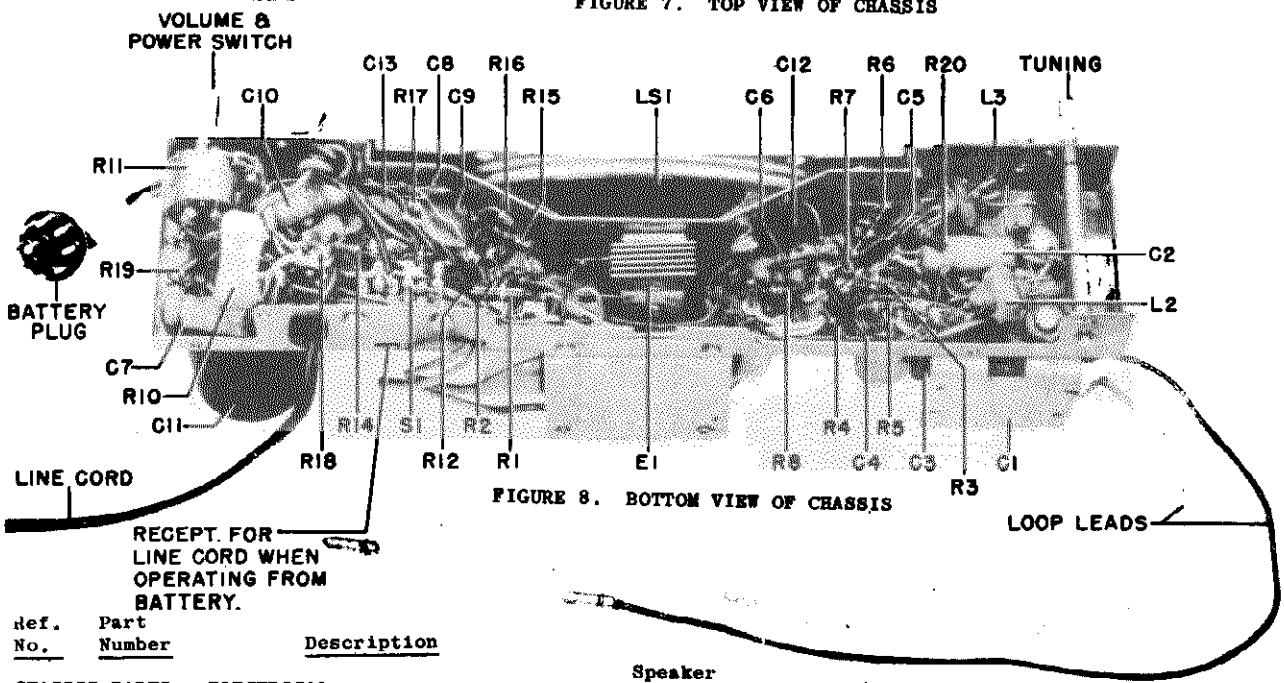

FIGURE 8. BOTTOM VIEW OF CHASSIS

Ref. No.	Part Number	Description
		CHASSIS PARTS - ELECTRICAL
		Capacitors
C-1	19B692045	Variable: 3-gang.....
C-2	8K71213	Paper: .05 mf 100V.....
C-3	21B77286	Ceramic: 100 mmf 500V.....
C-4	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-5	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-6	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-7	8K471635	Paper: .05 mf 400V.....
C-8A, B,C,D	21B482847	Ceramic, multiple: 2000 mmf, 220 mmf, 220 mmf, 5000 mmf
C-9	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-10	8K71213	Paper: .05 mf 100V.....
C-11	23K76985	Electrolytic: 40-40-20 mf/ 150V, 80 mf/25V; includes cover.....
C-12	8R490210	Molded: .01 mf (100,000 mmf) 200V.....
C-13	21A470789	Ceramic, disc type: 5000 mmf 450V.....
		Speaker
LS-1	50C692044	Speaker: 4" x 6" PM; 3.2 ohm VC.....
		Rectifier
E-1	48K692077	Selenium Rectifier: half-wave; 75ma.....
		Coils
L-1	24C692074	Loop Antenna Assembly: includes panel.....
L-2	24B692115	RF Coil.....
L-3	24B692114	Oscillator Coil.....
		Resistors
		Note: All resistors are insulated carbon type unless otherwise specified.
R-1	6R3927	2.2 meg 20% ½W.....
R-2	6R3988	5.6 meg 10% ½W.....
R-3	6R2118	3.3 meg 20% ½W.....
R-4	6R3927	2.2 meg 20% ½W.....
R-5	6R6301	1000 20% ½W.....
R-6	6R6075	100,000 20% ½W.....
R-7	6R6012	33,000 20% ½W.....
R-8	6R5585	8.2 meg 10% ½W.....
R-9	6R6004	1 meg 20% ½W.....

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NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

R-10	17A76986	Wire wound: 150 10% 2-½W.
R-11	18K480039	Volume control: 1 meg; with sw.....
R-12	6R2109	10 meg 20% ½W.....
R-13	17B692047	Wire wound: 2000; center tapped.....
R-14	6R6269	820 10% ½W.....
R-15	6R3927	2.2 meg 20% ½W.....
R-16	6R6004	1 meg 20% ½W.....
R-17	6R2118	3.3 meg 20% ½W.....
R-18	6R3933	220 20% ½W.....
R-19	6R3949	470 20% ½W.....
R-20	6R6010	330 20% ½W.....

Switches

S-1	40A27114	Slider Switch: 3PDT.....
S-2	-	Power Switch: on volume control.....

Transformers

T-1,2	24K600013	IF & Diode Transformer, 455 Kc: includes capacitors; less shield.....
T-3	25B692076	Output Transformer.....

CHASSIS PARTS - MECHANICAL

16K692102	Baffle, speaker: includes cloth...
1X692121	Bottom Cover Assembly: includes brackets & battery strap.....
7B600711	Bracket, chassis front (sel rect mtg).....
43A692012	Bushing, line cord strain relief (use with 43K692013).....
1X692118	Cable Assembly, battery: includes 9-pin plug.....
42A485548	Clip, coil can mtg (IF coils)..
11M8944	Cord, dial: 18#; black.....
30K692049	Cord, line: with plug 6 ft long
5A19658	Eyelet, spacer (gang mtg).....
5A70404	Grommet, ruber (gang mtg).....
9A22056	Insulator, electrolytic mtg....
2S7051	Nut, hex (Palnut): 3/8-32 x 9/16; cad pl (vol cont mtg).....
29K5401	Pin, loop lead.....
64A692072	Plate, output trans mtg.....
28K77272	Plug, 9-pin (on battery cable).
1X601811	Pointer, dial: red.....
49A21741	Pulley, cord.....
49A692078	Pulley, pointer drive.....
1A692119	Pulley Assembly (on gang).....
1X692120	Pulley and Plate Assembly: pointer drive: includes mtg plate and 3 pullies.....
43K692013	Retainer, strain relief bushing (use with 43A692012).....
5K74560	Rivet, shoulder (drive cord pulley mtg).....
5A692104	Rivet, shoulder (pointer drive pulley mtg).....
3S9700	Setscrew: 6-32 x 3/16 Allen head; cad pl (gang pulley mtg).....
47A692106	Shaft, tuning.....
9A690129	Socket, tube: miniature; 7-prong.
41A14244	Spring, tension (dial drive)..
35K692125	Strap, battery: with button.....
31K692075	Strip, terminal: 1 insulated lug; end mtg; 3/8" spacing.....
46A600011	Stud, chassis mtg (on front of chassis).....
4A70015	Washer, "C" (on tuning shaft) .....
4S8253	Washer, flat: 5/8 x .390 x .020 brass (vol cont mtg).....
4K71133	Washer, spring (on tuning shaft)

CABINET PARTS

16E691796	Cabinet, front section: green plastic; less grille, handle and hardware (6L1 & 61L1).....
16K600109	Cabinet, front section: brown plastic; less grille, handle and hardware (6L2).....
16K610027	Cabinet, front section: maroon plastic; less grille, handle and hardware (61L2).....
16D691797	Cabinet, rear section: green plastic; less antenna loop and hardware (6L1 & 61L1).....
16K600110	Cabinet, rear section: brown plastic; less antenna loop and hardware (6L2).....
16K601710	Cabinet, rear section: maroon plastic; less antenna loop and hardware (61L2).....
35A692073	Channel, rubber (inside cabinet front).....
42K891863	Clip, cabinet locking (inside cabinet front) (early models).
42A480078	Clip, cabinet locking (inside cabinet back) (early models).
42A600010	Clip, retainer (speaker grille)..
1X600798	Cord, cover stop: complete.....
55A692127	Cover, handle mtg (over ends of carrying handle).....
13B691958	Grille, speaker: plastic.....
55A691943	Handle, carrying: green plastic; less spring (6L1 & 61L1).....
55K600111	Handle, carrying: brown plastic; less spring (6L2).....
55K601711	Handle, carrying: maroon plastic (61L2).....
14A600096	Insulator: fibre (on carrying handle).....
36B691956	Knob, control: green plastic (6L1 & 61L1).....
36K600112	Knob, control: brown plastic (6L2).
36K601713	Knob, control: maroon plastic (61L2)
4S7650	Lockwasher, internal: #6; cad pl (handle mtg).....
13K691929	Medallion (on front of cabinet).
64A692129	Plate, handle mtg: cad pl (under ends of carrying handle).....
64A691941	Plate, medallion (under Medallion)
5S400302	Rivet: .122 x 7/32; stl; brs pl (mts back cover latch).....
3S2949	Screw, machine: 6-32 x 5/16 plain hex head; cad pl (handle mtg)
3S476083	Screw, machine: 6-32 x 5/16 slotted locking hex head; cad pl (chassis mtg).....
3S488008	Screw, thread cutting: #4 x ¼ Phillips round head; cad pl (cover stop cord mtg).....
2S490840	Speednut: for 1/16" stud (medallion mtg).....
2S400170	Speednut: for .156" stud (spkr grille and ant loop mtg) (replaces 2S476112).....
1X600686	Spring & Stud Assembly: rear cover latch.....
41A692126	Spring, handle (inside carrying handle).....
41A691939	Spring, hinge (on bottom of cabinet).....
4K780040	Washer, felt (under knobs).....
4S7610	Washer, flat: 3/8 x 5/32 x .015 stl; cad pl (chassis mtg)..
4S490841	Washer, flat: 3/4 x .156 x .032; cad pl (handle mtg).....

Ch. HS-226

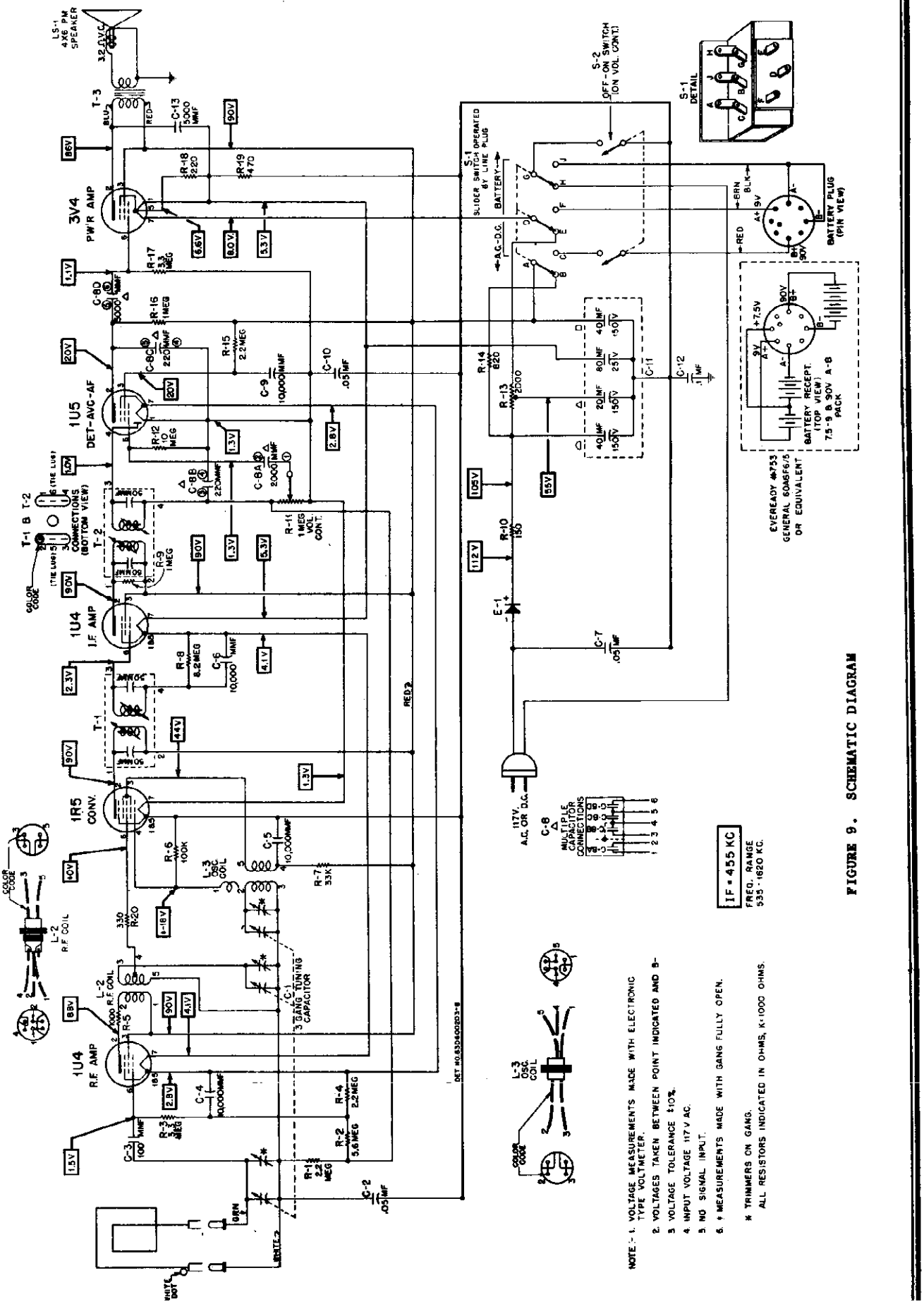


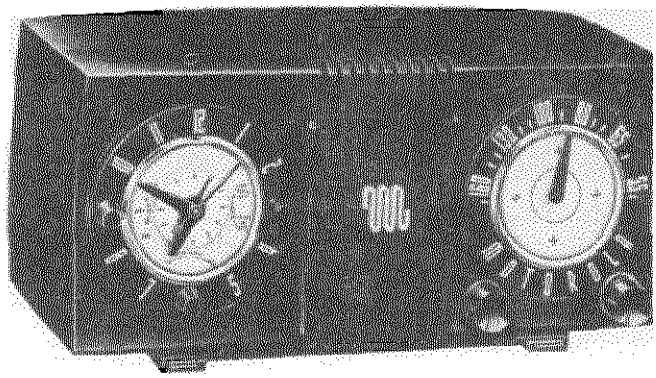
FIGURE 9. SCHEMATIC DIAGRAM

NOTE:- 1. VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
2. VOLTAGES TAKEN BETWEEN POINT INDICATED AND B-
3. VOLTAGE TOLERANCE ±10%.
4. INPUT VOLTAGE 117 V AC.
5. NO SIGNAL INPUT.
6. * MEASUREMENTS MADE WITH GANG FULLY OPEN.

* TRIMMERS ON GANG.
ALL RESISTORS INDICATED IN OHMS, K-1000 OHMS.

MODELS 51C1, 51C2,
51C3, 51C4, Ch. HS-22

GENERAL INFORMATION



TYPE - AC table model superheterodyne with appliance outlet and self-contained electric clock for controlling automatically the operation of the radio and the outlet.

RECEIVER MODELS -

Model	Color
51C1	Walnut
51C2	Ivory
51C3	Tan
51C4	Green

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT -

Type	Function
12BE6	Converter
12BA6	IF Amplifier
12AT6	Det, AVC & AF Amp
50C5	Power Amplifier
35W4	Rectifier

APPLIANCE OUTLET - For use with 117 volt AC appliances only, rated at 1100 watts or less.

POWER SUPPLY - Operates from 117 volts, 60 cycle, alternating current only. Power consumption 37 watts.

CLOCK - Telechron self-starting electric clock (Telechron basic movement No. C-57, with Motorola face, hands, and escutcheon).

OPERATING INSTRUCTIONS

The locations and functions of the clock and radio controls are shown in Figure 1.

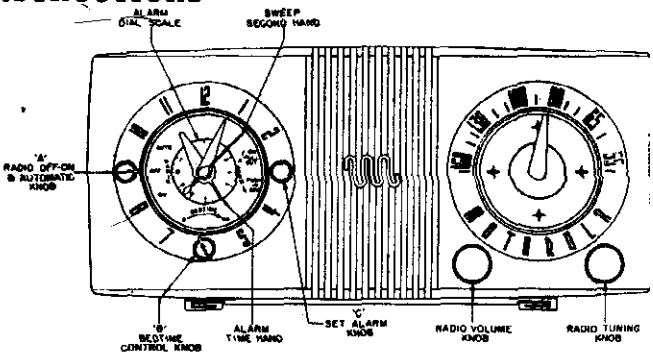


FIGURE 1. OPERATING CONTROLS

NORMAL RADIO OPERATION

Knob "A" on the clock turns the radio on or off. Select stations with the TUNING knob, and adjust volume with the VOLUME control.

A built-in loop antenna eliminates the need for an outside antenna in most locations. When receiving a weak station, rotate the receiver slightly for best signal strength. If additional pick-up is necessary, connect an external antenna to the radio by following the instructions printed on the rear panel. CAUTION: Never connect the radio chassis to a water pipe, radiator, or other ground.

CLOCK OPERATION

The clock will start as soon as the receiver is plugged into an electrical outlet. To set the hands to the correct time, rotate the TIME SET knob (on the rear of the radio) in a clockwise direction only.

ALARM OPERATION

To set the alarm, pull out knob "C" and rotate it in a counterclockwise direction to the desired time on the alarm dial scale. The alarm will ring for one hour, or until knob "C" is pushed in. The alarm function is completely independent of the other controls on the clock.

APPLIANCE OUTLET

To control an electrical appliance automatically, plug it into the receptacle on the back of the radio. See Figure 2. It will then be turned on or off simultaneously with the radio. CAUTION: Note that the rating of the outlet is 1100 watts or less.

If radio reception is not desired when operating the appliance, rotate the radio volume control to the minimum volume position.

BEDTIME CONTROL

The BEDTIME control will turn the radio and appliance off after any pre-set interval of time up to one hour.

Turn knob "A" to the "OFF" position and rotate knob "B to any period of time between 0 and 60 minutes. The radi and appliance will be turned off automatically after the prop er time has elapsed, and they will remain off until turne on again manually.

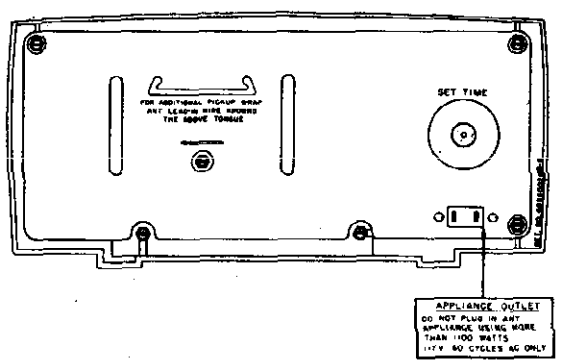


FIGURE 2. REAR VIEW

MODELS 51C1, 51C2,
51C3, 51C4, Ch. nS-228

AUTOMATIC RADIO OPERATION

The clock controls may be pre-set to turn the radio on automatically at any time up to twelve hours in advance.

If an appliance is plugged into the receptacle on the back of the receiver, it will be turned on automatically, along with the radio.

Pull out knob "C", rotate it counterclockwise to the desired time on the alarm dial scale, and push the knob back in. Rotate knob "A" first to the "OFF" and then to the "AUTO" position. At the pre-set time, the radio will come on and will continue to play until turned off manually. The alarm will ring also if the knob "C" is left pulled out. The radio will come on first and, after an interval of about ten minutes, the alarm will ring.

BEDTIME AND AUTOMATIC OPERATIONS COMBINED

By combining the operations in the two sections above the radio may be turned off automatically and on again automatically.

When setting the BEDTIME control, rotate knob "A" to the "AUTO" position instead of "OFF". IMPORTANT: It is necessary to turn knob "A" first to the "OFF" position before proceeding to "AUTO", otherwise the radio may not shut off.

ALIGNMENT

NOTE: It is recommended that an isolation transformer be placed between the power line and the receiver to avoid hum and electrical shocks. If an isolation transformer is not available, connect the low side of the signal generator to B- through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.

2. Connect the low side of the signal generator to B-.

3. Set the signal generator for 400 cycle, 30% modulation.

4. Turn the receiver volume control to maximum.

5. Use a small fibre screwdriver for aligning the IF and diode transformers.

6. As stages are brought into alignment, reduce the signal generator output to a level which produces less than .40 volts (.05 watt) across the voice coil to avoid overloading the receiver.

7. See Figure 3 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. (pin 7, 12BE6)	455 Kc	Fully open	1, 2, 3 & 4 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	-	-	-	Fully closed	-	Set pointer to horizontal position.
3.	.1 mf	Grid of conv. (pin 7, 12BE6)	1620 Kc	Fully open	5 (Osc)	Adjust for maximum.
4.	-	Radiation loop*	1400 Kc	Tune for max	6 (Ant)	Adjust for maximum.

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

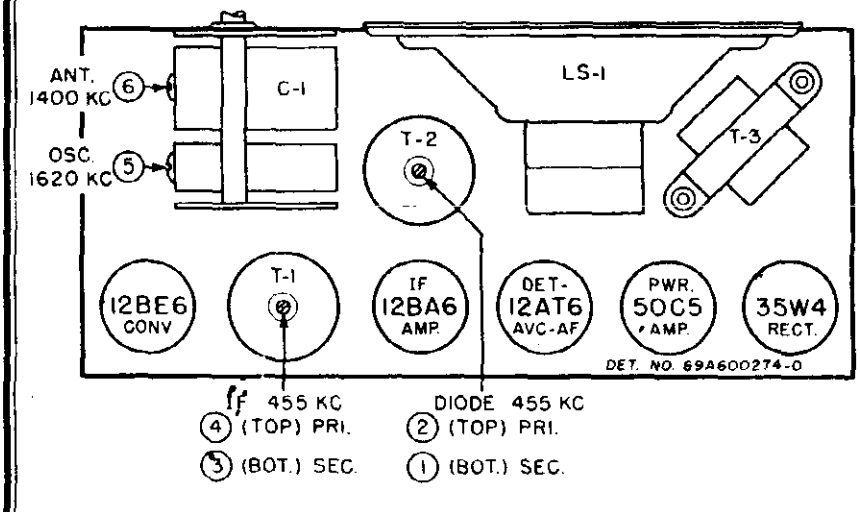


FIGURE 3. TUBE & TRIMMER LOCATIONS

MODELS 51C1, 51C2,
51C3, 51C4, Ch. HS-2

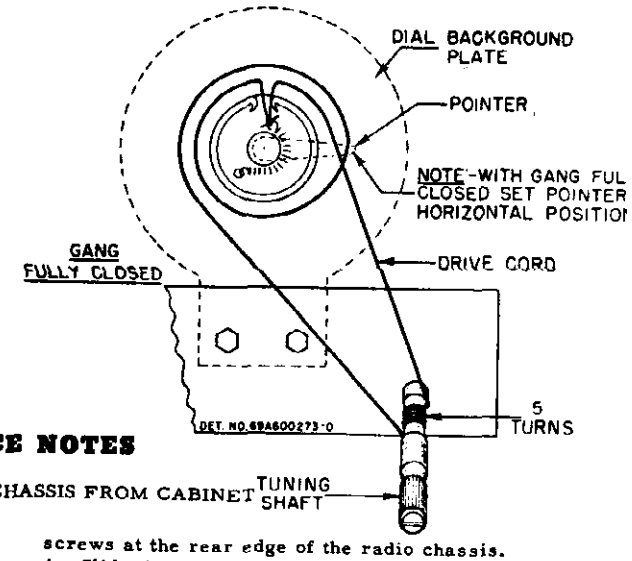


FIGURE 4. STRING DRIVE DETAIL

SERVICE NOTES

TO REMOVE RADIO CHASSIS FROM CABINET

1. Pull off the two radio control knobs.
2. Remove the three hex head screws which hold the loop to the cabinet.
3. From the back of the cabinet, remove the two hex head screws at the rear edge of the radio chassis.
4. Slide the radio chassis and loop from the cabinet.
5. Disconnect the power leads to the radio chassis and the appliance receptacle.

TO REMOVE CLOCK FROM CABINET

1. Remove radio chassis as above.
2. Remove the three nuts and lockwashers holding the shield behind the clock.
3. Slide the shield from the cabinet.
4. Turn the BEDTIME control knob to "60".
5. Pull out the ALARM set knob.
6. Turn the RADIO control knob to "AUTO".
7. While observing the clock from the back to avoid bend ing or breaking any parts, gently push the clock forwar at the same time twisting it slightly to eliminate binding.

TO REPLACE CLOCK DIAL FACE

1. Remove the clock from the cabinet as above.
2. Pull off the RADIO control and BEDTIME knobs.
3. Remove the ALARM set knob.
4. Remove the escutcheon and crystal.
5. Carefully pull off the three hands.
6. Remove the alarm dial and clock face.
7. Turn the radio control shaft to "AUTO" position.
8. Slowly rotate the time set shaft clockwise until the switch contacts behind the radio control shaft close.
9. Reassemble the clock face, alarm dial and three hand Set all the hands to indicate 12 o'clock. Set the figure "1 on the alarm dial to index with the small pointer on the ho hand.
10. Replace the crystal, the escutcheon, and the knobs.
11. Check the automatic operation to be sure the switc contacts close at the time indicated on the alarm dial.

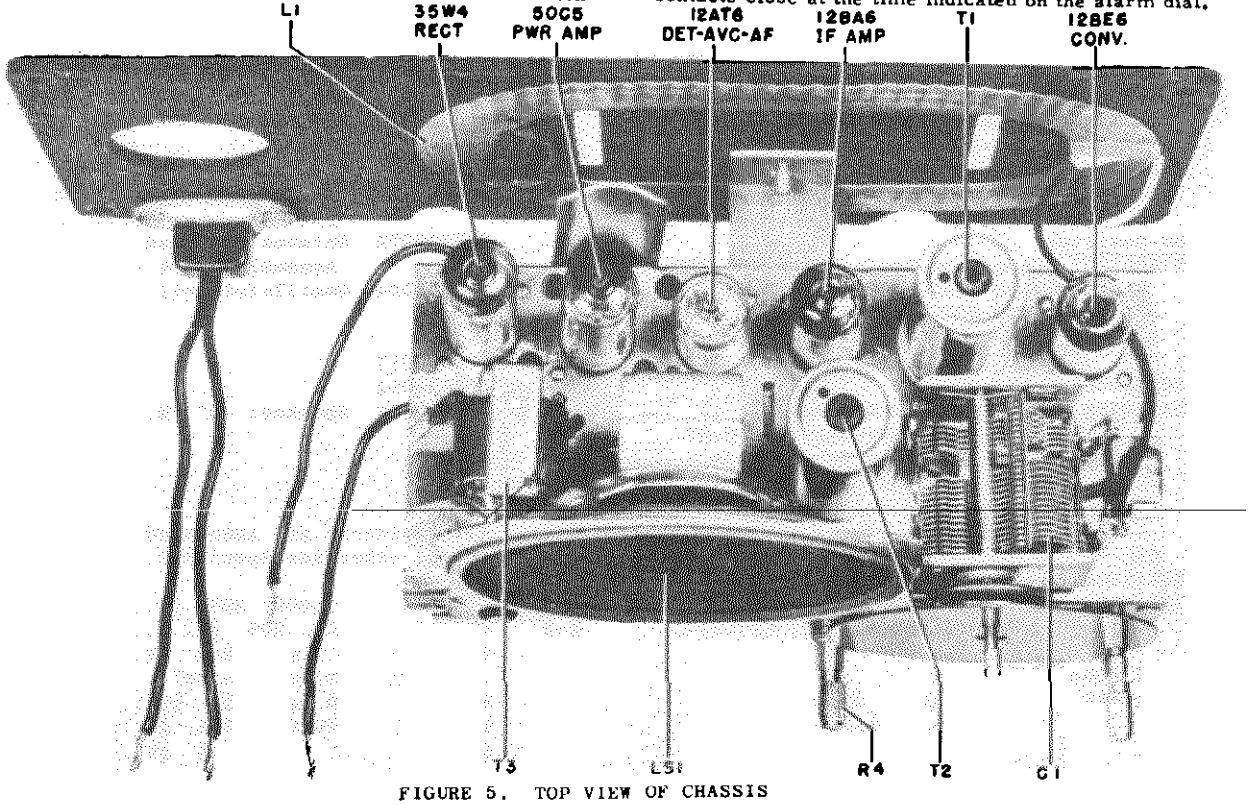


FIGURE 5. TOP VIEW OF CHASSIS

MODELS 51C1, 51C2,
51C3, 51C4, Ch. HS-228

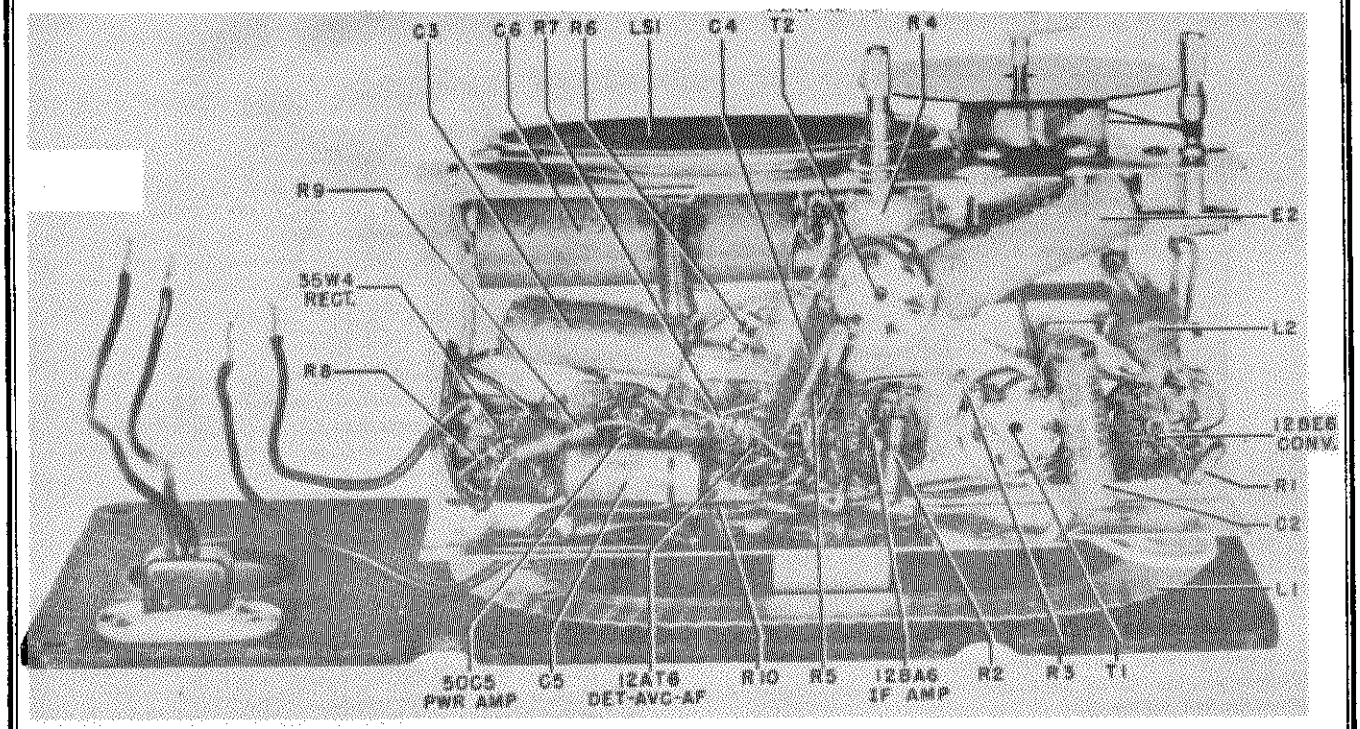


FIGURE 6. BOTTOM VIEW OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	19B600021	Variable: 2 gang; with pulley
C-2	8R9821	Paper: .05 mf 200V.....
C-3	8R490232	Paper: .047 mf 400V.....
C-4	21B482847	Ceramic, multiple: 2000-220-220-5000 mmf/400V.....
C-5	8R9802	Paper: .02 mf 400V.....
C-6	23B600855	Electrolytic: 50-30 mf/150V
Capacitor-Resistor		
CR-1	21B601007	Capacitor-Resistor: 2000-220 110-5000-110 mmf; 6.8 meg-470,000-470,000 ohms.....
Clock		
E-1	59K610068	
or	1X610107	Electric Clock Assembly: Telechron movement No. C-57 with Motorola face, hands, crystal, escutcheon and knobs (for walnut cabinet) (51C1).....
	59K610067	
or	1X610109	Same as above except color (for ivory cabinet) (51C2).
	59K610064	
or	1X610105	Same as above except color (for tan cabinet) (51C3)...
	59K610059	
or	1X610103	Same as above except color (for green cabinet) (51C4).
Choke-Capacitor		
E-2	8A690487	Choke and .15 mf paper capacitor.....
Coils		
L-1	1X610073	Antenna Loop, Panel and Receptacle Assembly: complete.....
	24K610072	Antenna Loop and Panel Assembly: less receptacle..
L-2	24B680364	Oscillator coil.....
Speaker		
LS-1	50C600017	
or	50B610052	
or	50C600857	Speaker: 4" PM; 3.2 ohm VC.
Resistors		
Note:		All resistors are insulated carbon type unless otherwise specified.
R-1	6R6028	22,000 20% ½W.....
R-2	6R6018	100 20% ½W.....
R-3	6R2118	3.3 meg 20% ½W.....
R-4	18A600018	Volume control: 1 meg...
R-5	6R2109	10 meg 20% ½W.....
R-6	6R6032	470,000 20% ½W.....
R-7	6R6032	470,000 20% ½W.....

Part Number		Description
R-8	6R3992	150 20% ½W.....
R-9	6R5683	27 10% ½W.....
R-10	6R3953	1000 20% 1W.....
Transformers		
T-1	24B482863	IF Transformer (brown dot): 455 Kc: complete with capacitor and cores; less shield.....
T-2	24B482865	Diode Transformer (red dot): 455 Kc: complete with capacitors and cores; less shield.....
T-3	25K680345	Output Transformer.....

CHASSIS PARTS - MECHANICAL

7A478118	Bracket, loop mtg.....
7A77337	Bracket, tuning shaft.....
42B482867	Clip, spring: blued finish (holds IF transformers).....
5A484268	Grommet, speaker mtg: rubber....
14A478119	Insulator, loop brkt mtg: fibre.
4S7691	Lockwasher, internal: 3/8; cad pl (vol control mtg).....
2A780465	Nut, knurled (vol control mtg).....
64B610056	Plate, dial background: ivory.....
52K610055	Pointer, dial (black).....
9A601018	Receptacle, appliance (on loop panel).....
3S7506	Screw, sheet metal: #6 x ¼ PKZ plain hex head; cad pl (dial background plate mtg).....
47A600022	Shaft, tuning.....
26K485936	Shield, coil (for IF transformers).
26A478117	Shield, electrostatic (on rear of chassis).....
43A600095	Sleeve, paper (on pointer shaft)
9A472534	Socket, tube: miniature; 7-prong...
41A73996	Spring, tension (electrolytic mtg).
41A73619	Spring, tension (gang drive cord) .....
4A70015	Washer, "C" (tuning shaft mtg)
4S7633	Washer, flat: 9/16 x 11/64 x .033 stl; cad pl (loop mtg).....
14A11493	Washer, shoulder: fibre (loop bracket mtg).....

CABINET PARTS

16K600791	Cabinet, table model: plastic; walnut (51C1).....
16K600199	Cabinet, table model: plastic; ivory (51C2).....
16K610069	Cabinet, table model: plastic; tan (51C3).....
16E600005	Cabinet, table model: plastic; green (51C4).....
28A600064	Connector, wire (connects clock & radio power leads).....
61A600001	Crystal, plastic (radio dial cover)
13K600790	Escutcheon, radio dial: walnut (51C1).....
13K600197	Escutcheon, radio dial: ivory (51C2).....
13K610058	Escutcheon, radio dial: tan (51C3)
13K600003	Escutcheon, radio dial: green (51C4).....
14A16304	Grommet, fibre (on clock shield)...
36K600787	Knob, radio control: brown plastic (51C1).....
36K600192	Knob, radio control: ivory plastic (51C2).....
36K610054	Knob, radio control: tan plastic (51C3).....
36A600065	Knob, radio control: green plastic (51C4).....
13A792195	Medallion: brass (on front of speaker grille).....
2S7019	Nut, hex: 4-40 x ¼ stl; cad pl (clock shield mtg).....
3S476083	Screw, machine: 6-32 x 5/16 slotted locking hex head; cad pl (radio chassis mtg).....
3S2991	Screw, machine: 6-32 x ½ plain hex head; cad pl (mounts loop to cabinet).....
1X600799	Shield, clock: with grommet (covers rear of clock).....
2S490840	Speednut: for 1/16" stud (medallion mtg).....
11M488253	Tape, aluminum foil (inside top of cabinet).....per ft
4S7633	Washer, flat: 9/16 x 11/64 x .033 stl; cad pl (mounts loop to cabinet).....

CLOCK PARTS

Note: The following Motorola parts are for use wi the basic Telechron clock movement No. C-57

34K610061	Alarm dial: ivory.....
30K600980	Cord, line: with plug; 6 ft long...
61A600001	Crystal, plastic (clock face cover)
34K610060	Dial face: ivory.....
13K600789	Escutcheon, clock: walnut (51C1)...
13K600196	Escutcheon, clock: ivory (51C2)....
13K610057	Escutcheon, clock: tan (51C3).....
13C600002	Escutcheon, clock: green (51C4)....
52K610062	Hand, hour: black.....
52K610063	Hand, minute: black.....
52K601001	Hand, second: brass.....
36K600989	Knob, clock control: plain; threaded type; walnut (51C1).....
36K600988	Knob, clock control: plain; threaded type; ivory (51C2).....
36K610066	Knob, clock control: plain; threaded type; tan (51C3).....
36K600987	Knob, clock control: plain; threaded type; green (51C4).....
36K600986	Knob, clock control: with arrow; push on type; walnut (51C1).....
36K600985	Knob, clock control: with arrow; push on type; ivory (51C2).....
36K610065	Knob, clock control: with arrow; push on type; tan (51C3).....
36K600984	Knob, clock control: with arrow; push on type; green (51C4).....
36K601002	Knob, time set.....

MODELS 51C1, 51C2,
51C3, 51C4, Ch. HS-228

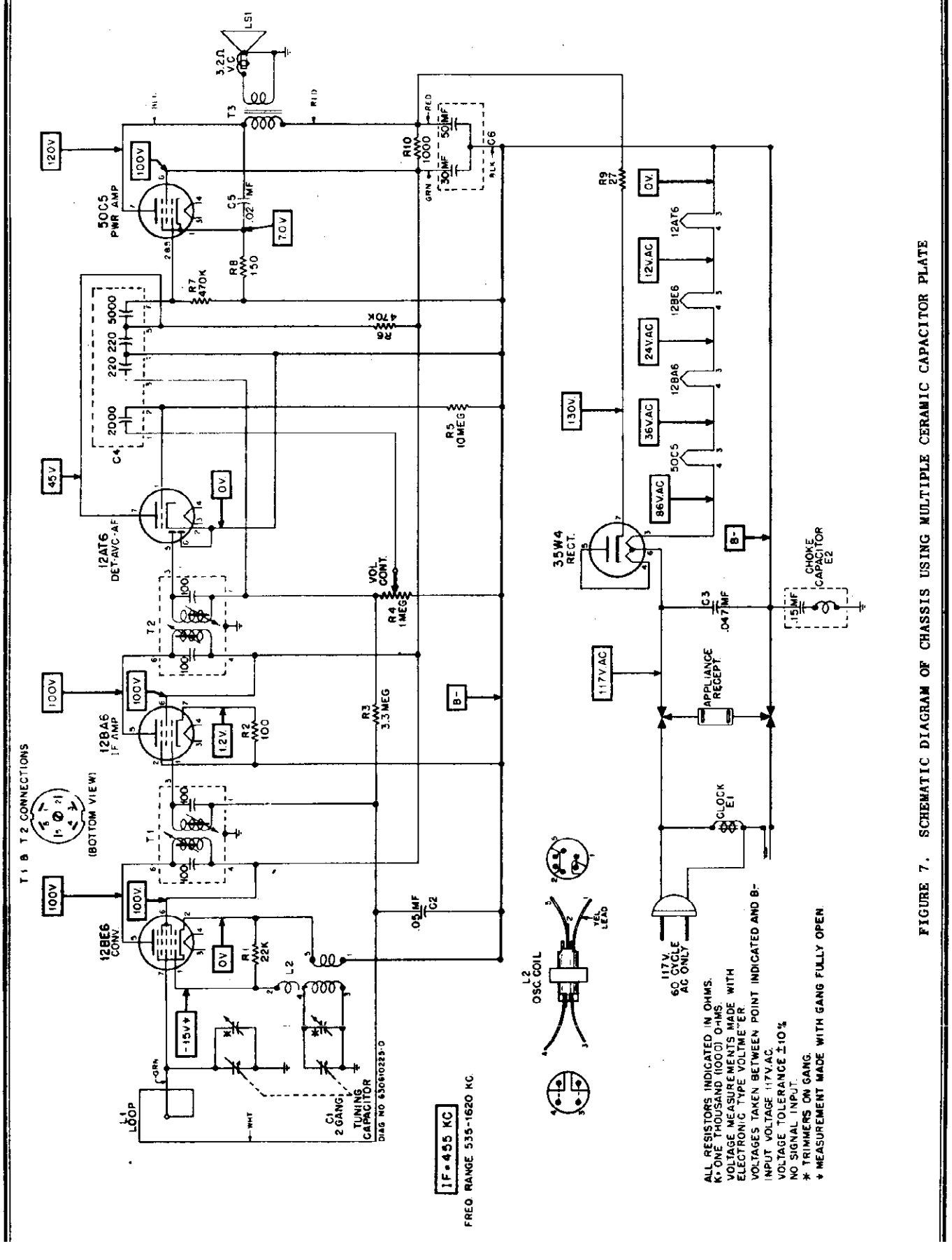
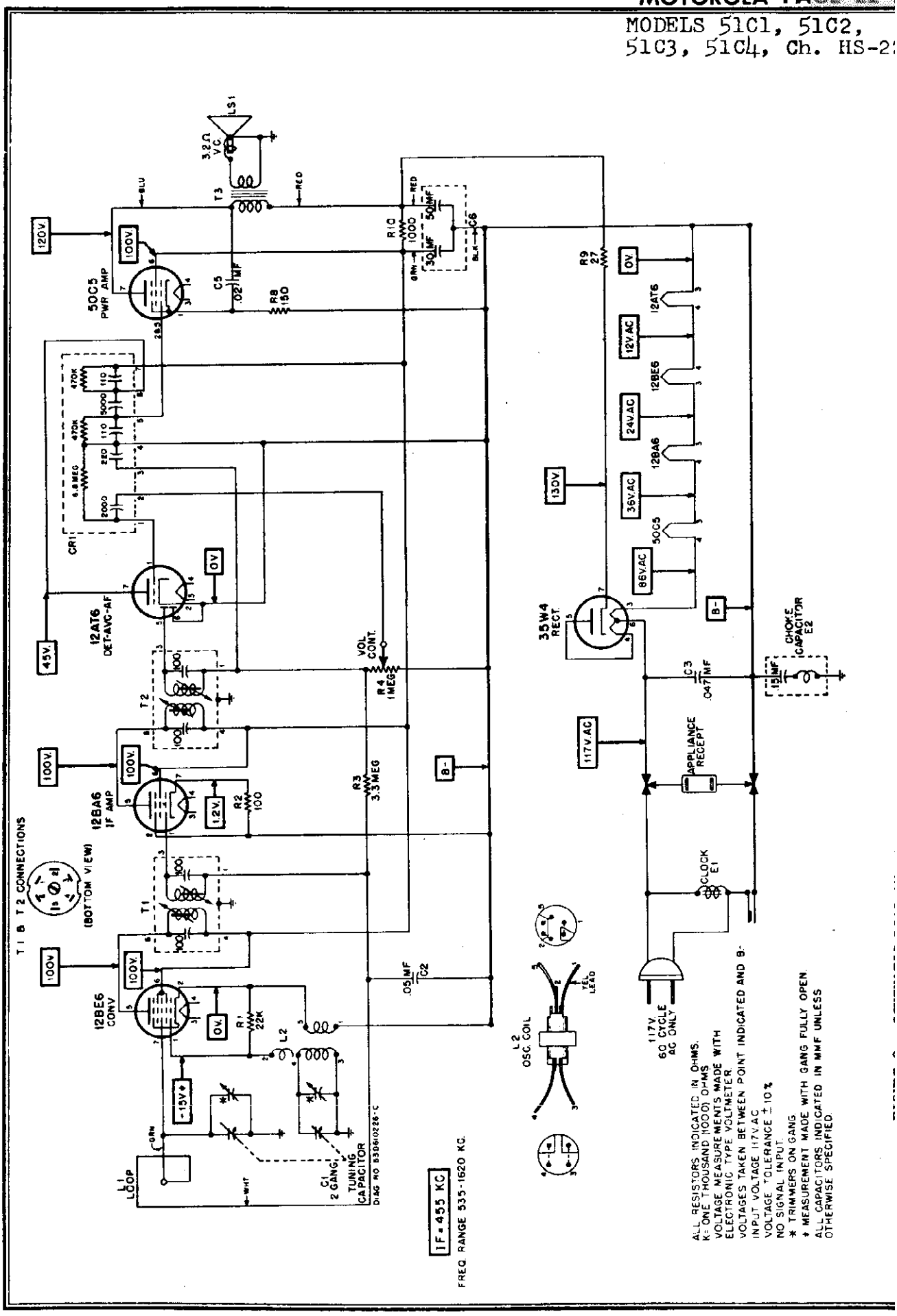


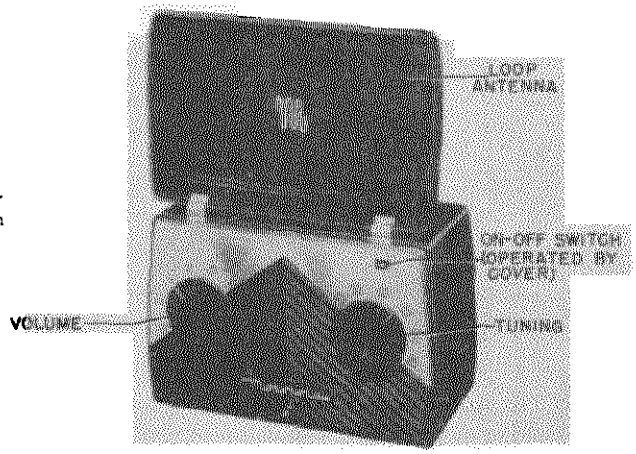
FIGURE 7. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

MODELS 51C1, 51C2,
51C3, 51C4, Ch. HS-2



MODELS 51M1U,
51M2U, Ch. HS-283

GENERAL INFORMATION



TYPE - Three-power (AC/DC, Battery) portable radio receiver. Four miniature type tubes and a selenium rectifier are used in a superheterodyne circuit.

Model	Color
51M1U	Green
51M2U	Maroon

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT -

Type	Function
1R5	Converter
1U4	IF Amplifier
1U5	Det, AVC & 1st AF Amp
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 - 67-1/2V "B" battery (Eveready #467 or equivalent)

OPERATING INSTRUCTIONS

TO OPEN FRONT COVER. The front cover is opened by pushing upward on the "M" bar located in the center of the cover. The receiver is automatically turned on when the front cover is opened and raised to a vertical position.

TO OPEN BACK COVER. The back cover may be opened by gently pulling it at the top. When closing the cover, be careful not to pinch the power line cord or other leads between the cover and the cabinet.

117 VOLT AC OR DC OPERATION. The power cord is located inside the cabinet and may be reached by opening the back cover. Pass the line cord through the slot on the side of the receiver, and plug it into any 117 volt AC or DC power outlet. If the receiver does not operate from DC power, reverse the plug in the power outlet. When operating from AC power, reception may sometimes be improved by reversing the power plug in the outlet. It is not necessary that batteries be installed if the receiver is to be operated only from house power lines.

BATTERY OPERATION. Open the back cover and install the batteries, following the instructions on the label inside the back cover (or see Figure 1). Insert the line cord plug into the receptacle on the chassis, or the receiver will not play from batteries. If the receiver is to be operated for a long period of time from 117 volts AC or DC, or is to be placed in storage, remove the batteries and store them in a cool place. IMPORTANT: Never leave low or run-down batteries in the receiver, as they will leak or swell and damage it.

TUNING CONTROL. 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.

VOLUME CONTROL. The left-hand knob controls volume.

TO TURN OFF. Closing the front cover will automatically turn off the receiver.

ANTENNA. A loop antenna is built into the front cover. Because of the slightly directional characteristics of the loop antenna, reception from some stations may be improved by rotating the entire receiver. In extremely noisy locations, rotate the receiver until minimum noise and maximum signal pick-up are obtained.

BATTERY REPLACEMENT. If low volume or fuzzy tone is noticed when operating from batteries, replace the flashlight cells. Normally, the 67-1/2V "B" battery will last for 3 or 4 changes of the flashlight cells. The condition of the batteries will not affect the operation of the receiver from 117 volts AC or DC. Complete battery replacement instructions will be found inside the cabinet back cover (or see Figure 1).

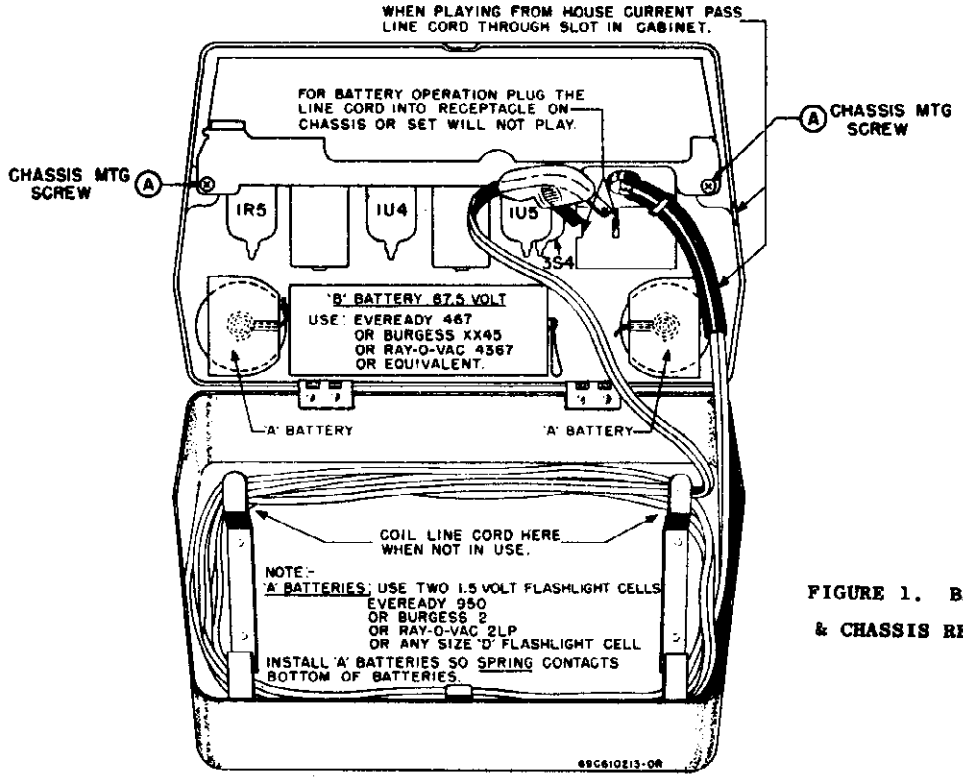


FIGURE 1. BATTERY INSTALLATION & CHASSIS REMOVAL INSTRUCTIONS

ALIGNMENT

NOTE: The receiver may be operated either from batteries or from the commercial power lines during alignment. If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver. If an isolation transformer is not available, connect the low side of the signal generator to B- through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.

2. Connect the low side of the signal generator to B-.

3. Set the signal generator for 400 cycle, 30% modulation.

4. Turn the receiver volume control to maximum.

5. Use a small fibre screwdriver for aligning the IF a diode transformers.

6. As stages are brought into alignment, reduce the sign generator input to keep the output of the receiver at appro imately .05 watt (.05 watt = .40 volts on the output mete to avoid overloading the receiver.

7. See Figure 2 for adjusting locations and the followi chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv (pin 6, 1R5)	455 Kc	Fully open	1, 2 & 3 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	.1 mf	Grid of conv (pin 6, 1R5)	1620 Kc	Fully open	4 (Osc)	Adjust for maximum.
3.	-	-	-	-	-	Install chassis in cabinet, leavi output meter connected to speak
4.	-	Radiation loop*	1400 Kc	Tune for max.	5 (Ant)	Adjust for maximum. Trimmer reached through hole under plug button on side of cabinet.

* Connect generator output across 5" diameter, 5 turn loop and couple inductively to receiver loop. Keep loops at le 12" apart.

MODELS 51M1U,
51M2U, Ch. HS-283

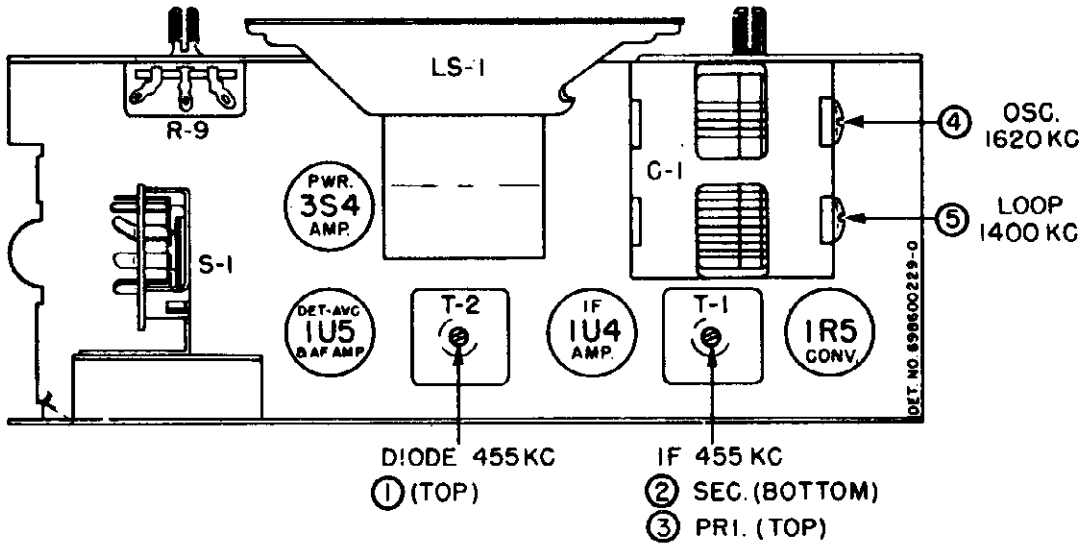


FIGURE 2. TUBE & TRIMMER LOCATIONS

SERVICE NOTES

The chassis of this receiver is isolated from the AC power line circuit by a capacitor-choke assembly to eliminate the shock hazard when handling the receiver. However, as an additional precaution when aligning or servicing the receiver from AC, an isolation transformer should be inserted between the power line and the chassis.

The tubes are exposed when the rear cover is opened. It is not necessary to remove the chassis to replace tubes.

TO REMOVE THE CHASSIS FROM THE CABINET:

1. Pull off the two control knobs on the front of the cabinet.
2. Open the rear cover and remove the batteries.
3. Remove the two Phillips head screws holding the chassis to the cabinet ("A" - "A" in Figure 1).
4. Slide the chassis out of the cabinet.
5. Disconnect the two leads from the chassis to the loop antenna hinges.

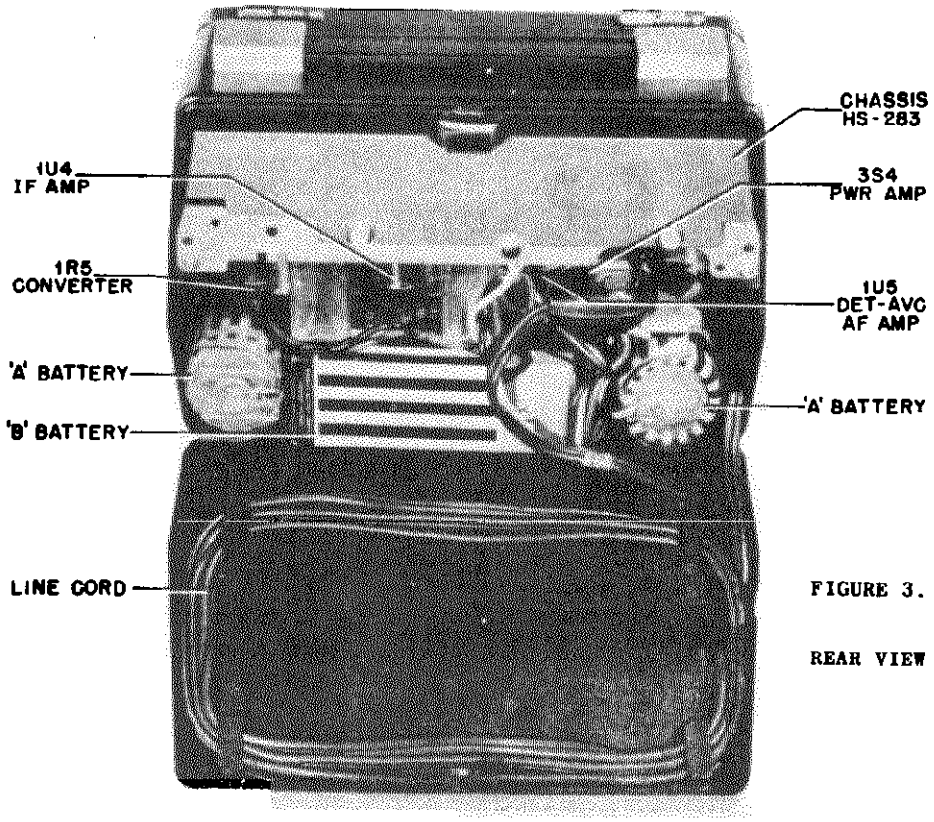


FIGURE 3.

REAR VIEW OF RECEIVER

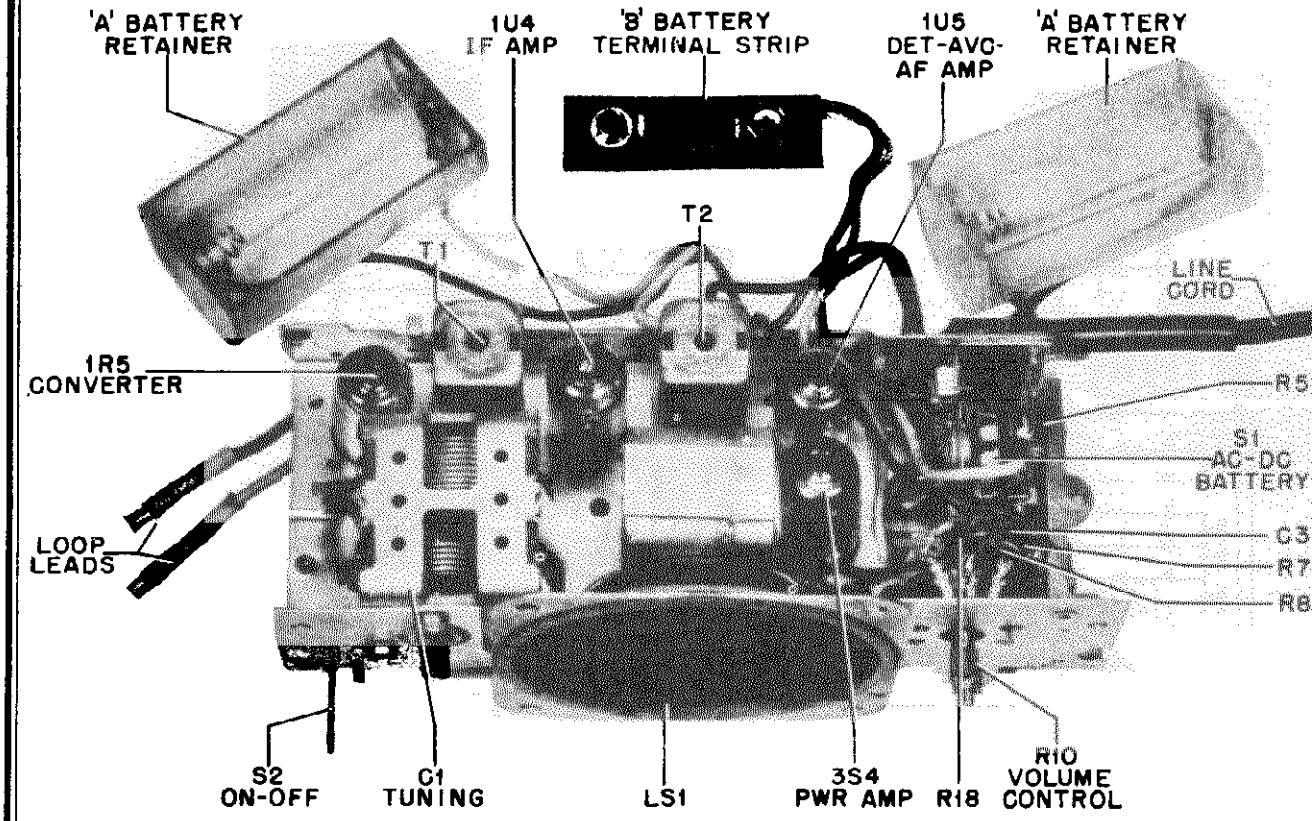


FIGURE 4. TOP VIEW OF CHASSIS

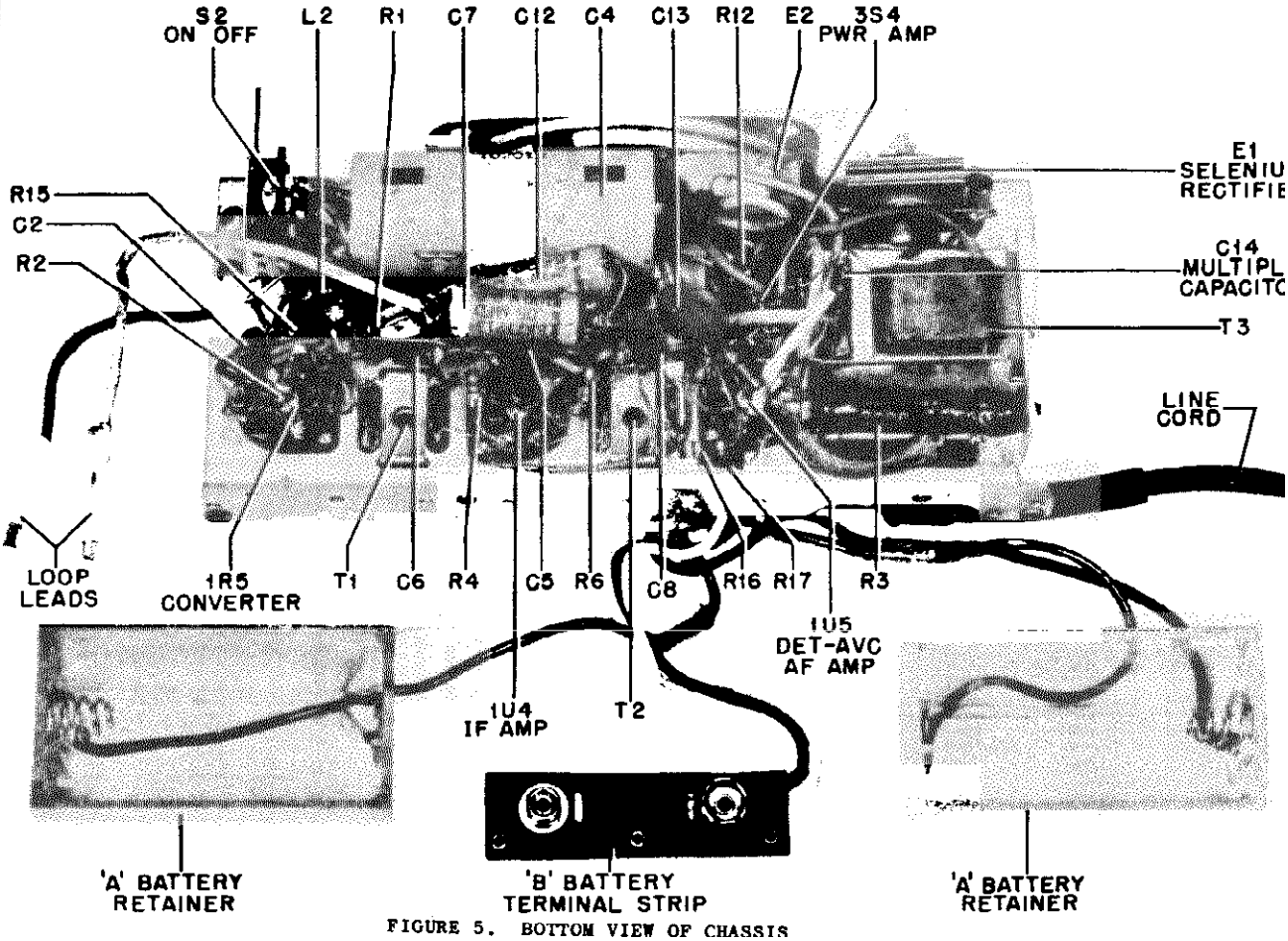


FIGURE 5. BOTTOM VIEW OF CHASSIS

MODELS 51M1U,
51M2U, Ch. HS-283

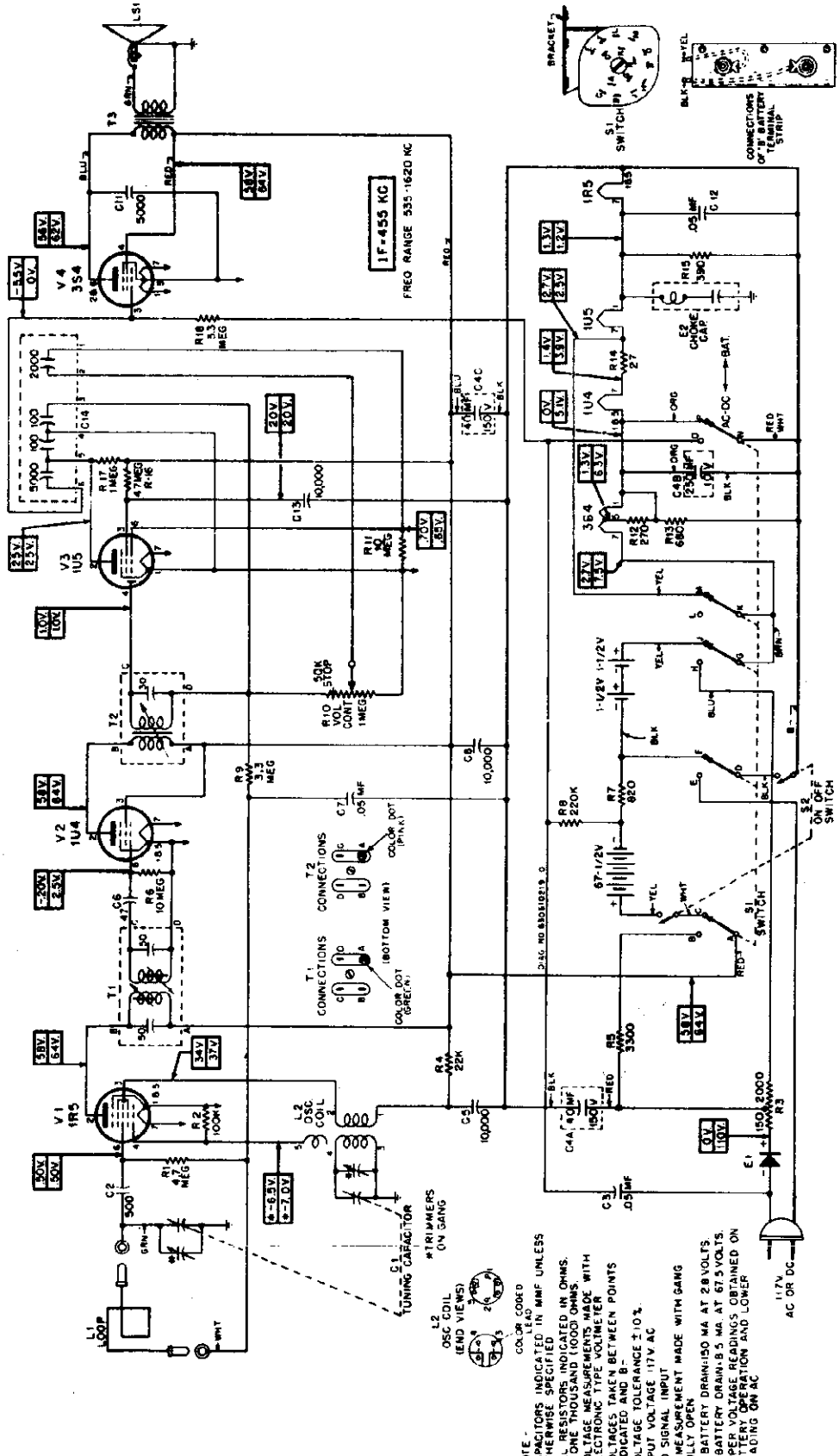


FIGURE 6. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

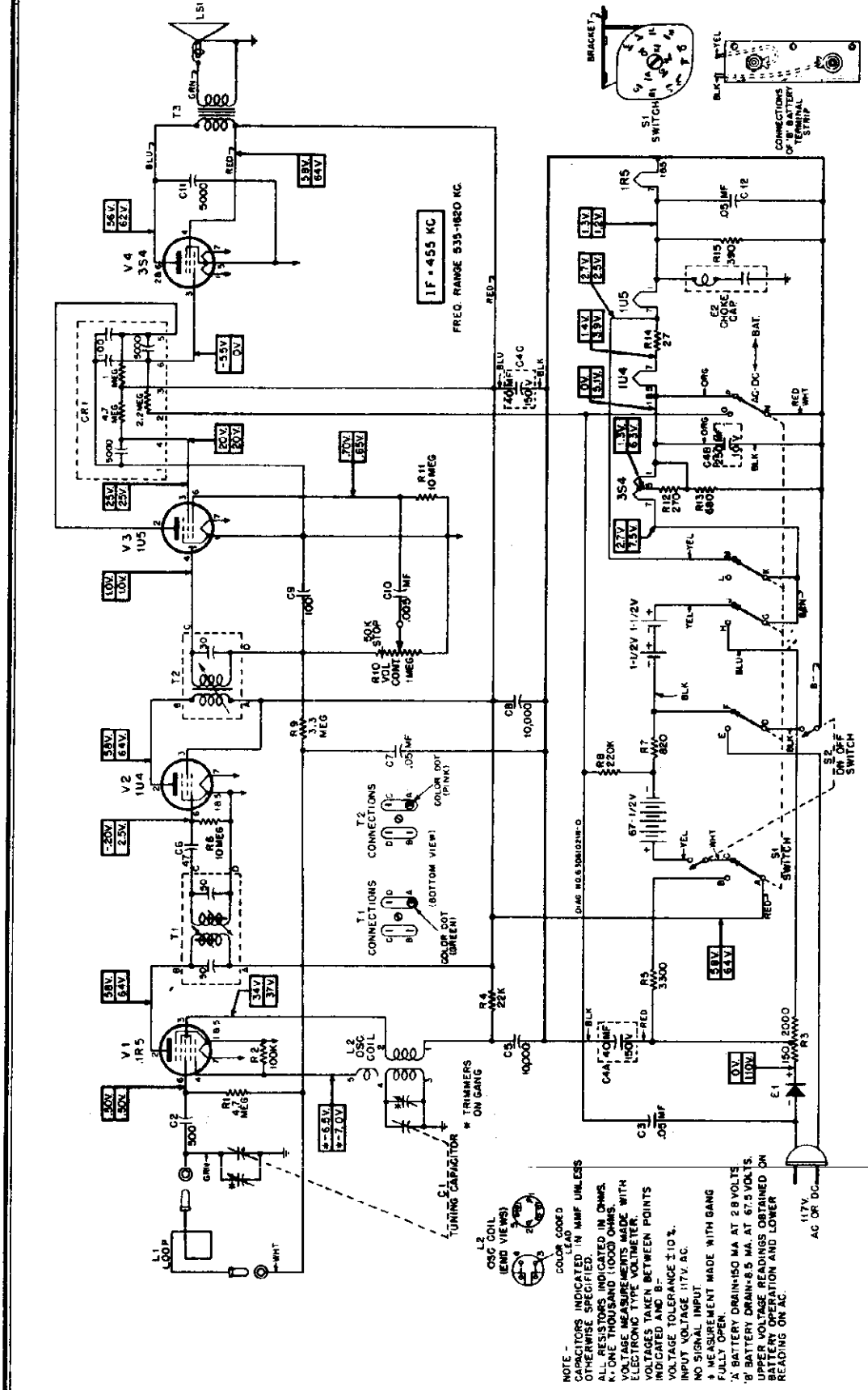


FIGURE 7. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR-RESISTOR PLATE

MODELS 51M1U,
51M2U, Ch. HS-283

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
C-1	19K692007	Variable, 2-gang.....
C-2	21K481377	Ceramic: 500 mmf 500V.....
C-3	8K471635	Paper: .05 mf 400V.....
C-4	23B691995	Electrolytic 40-40 mf 150V/ 250 mf 10V.....
C-5	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-6	21K77373	Ceramic: 47 mmf 500V.....
C-7	8K71213	Paper: .05 mf 100V.....
C-8	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-9	21B77286	Ceramic, disc type: 100 mmf 100V.....
C-10	8K24966	Ceramic, disc type: .005 mf 100V.....
C-11	21A470789	Ceramic, disc type: 5000 mmf 450V.....
C-12	8K71213	Paper: .05 mf 100V.....
C-13	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-14	21K691992	Ceramic, multiple: 2000 mmf, 100 mmf, 100 mmf, 5000 mmf
Capacitor-Resistor		
CR-1	21B601036	Capacitor-Resistor: 5000 mmf, 5000 mmf; 100 mmf, 100 mmf, 4.7 meg, 2.2 meg, 1 meg.....
Choke Capacitor		
E-2	24K691986	Choke & .05 mf 200V paper capacitor.....
Rectifier		
E-1	48B791092	Selenium Rectifier: half-wave.....
Coils		
L-1	1X692159	Antenna Loop & Front Cover Assembly: complete; green plastic (51M1U).....
	1X692160	Antenna Loop, Panel & Hinge Assembly: less front cover; green plastic (51M1U).....
	24B692200	Antenna Loop & Panel Assembly: less hinges: green plastic (51M1U).....
	1X600129	Antenna Loop & Front Cover Assembly: complete: maroon plastic (51M2U).....
	1X600130	Antenna Loop, Panel & Hinge Assembly: less front cover; maroon plastic (51M2U).....
	24K600132	Antenna Loop & Panel Assembly: less hinges; maroon plastic (51M2U).....
L-2	24K600097	Oscillator Coil (yellow code)

Ref. No.	Part Number	Description
Resistors		
Note:		All resistors are insulated, carbon type unless otherwise specified.
R-1	6R2122	4.7 meg 20% ½W.....
R-2	6R6031	100,000 10% ½W.....
R-3	17K692009	Wire wound: 2150 5% 10W; tapped.....
R-4	6R6397	22,000 10% ½W.....
R-5	6R5581	3300 10% ½W.....
R-6	6R2109	10 meg 20% ½W.....
R-7	6R6269	820 10% ½W.....
R-8	6R6015	220,000 20% ½W.....
R-9	6R2118	3.3 meg 20% ½W.....
R-10	18A691993	Volume control: 1 meg...
R-11	6R2109	10 meg 20% ½W.....
R-12	6R6432	270 10% ½W.....
R-13	6R6040	680 10% ½W.....
R-14	6R5683	27 10% ½W.....
R-15	6R5554	390 10% ½W.....
R-16	6R2122	4.7 meg 20% ½W.....
R-17	6R6004	1 meg 20% ½W.....
R-18	6R2118	3.3 meg 20% ½W.....
Switches		
S-1	40B471927	Rotary Switch, 5 PDT (AC/DC-Battery selector).....
S-2	40A691999	Slide Switch (on-off).....
Transformers		
T-1	24K600824	IF Transformer, 455 Kc: complete with capacitors..
T-2	24K600825	Diode Transformer, 455 Kc: complete with capacitor...
T-3	25K692006	Output transformer.....
CHASSIS PARTS - MECHANICAL		
	43A692011	Bushing, insulator: fibre (chassis mtg screw insulators).....
	43A692012	Bushing, strain relief: line cord (use with 43K692013).....
	42K75826	Clip, electrolytic mtg.....
	42A485584	Clip, IF transformer mtg.....
	30K601777	Cord, line: with plug; 6 ft long..
	29R3020	Lug, soldering: battery contact (in "A" battery retainer).....
	9A470980	Receptacle, loop (on loop leads)
	15B481896	Retainer, "A" battery: plastic....
	43K692013	Retainer, strain relief (on line cord bushing).....
	26B692001	Shield, back (on rear of chassis)
	26A692005	Shield heat (around R-3).....
	26B691996	Shield, switch (over AC/DC-Battery switch).....
	9A690129	Socket, tube: miniature; 7-prong..
	41K680029	Spring, battery contact (in "A" battery retainer).....

Part Number	Description
31K470880	Strip, "B" battery terminal: with leads
31K37504	Strip, terminal: 1 insulated lug, #1 mtg
31K470746	Strip, terminal: 3 insulated lugs, #2 mtg
4K470939	Washer, fibre (R-3 mtg)

MODEL 51M1U CABINET PARTS

7A600092	Bracket, escutcheon support (cabinet front support)
38K692050	Button, plug: green finish (loop trimmer adj hole cover)
1X601812	Cabinet: complete; less handle, grille and antenna loop and front cover assembly; green plastic
42A600094	Clip, grille retainer (holds grille to cabinet)
55A692058	Cover, handle mtg (over ends of handle)
13D691949	Escutcheon, dial & volume (on front of cabinet)
55A27113	Foot, cabinet bottom: felt
1X692162	Front Cover Assembly: complete; less loop; green plastic
1X692158	Grille Assembly: complete with escutcheon: green plastic
55K692166	Handle, carrying: green plastic; less spring
55C692202	Hinge, front cover: complete; left-hand
55K600087	Hinge, front cover: complete; right hand
55K30198	Hinge, rear cover
36B691899	Knob, control: green plastic
1X692163	Latch and Plate Assembly (inside front cover)
4S8406	Lockwasher, int: #2 (loop)
4S7695	Lockwasher, int: #5 (handle mtg)
29R5399	Lug, soldering (under front hinge, for loop connection)
13B691901	Medallion (on front cover)
28A692198	Pin, loop connector (on front hinge)
64K601618	Plate, handle mtg (under handle mtg covers)
5S8487	Rivet: .088 x 3/32; stl; blk nkl (rear cover hinges latch spring mtg)
5S8490	Rivet: .088 x 5/32; stl; blk nkl; (front hinge mtg)
5S7786	Rivet: .088 x 3/16; stl; blk nkl (front hinge mtg)
3S1512	Screw, machine: 4-40 x 3/8; Phillips round head (mounts front hinges to cabinet)
3S400335	Screw, sheet metal: #2 x 5/16; Phillips flat head; blk nkl (mounts loop to front cover)
3S490739	Screw, sheet metal: #4 x ¼ PKZ; Phillips binder head (chassis mtg)
3S2995	Screw, machine: 5-40 x 5/16 pl hex head; cad pl (handle mtg)
41A470909	Spring, door latch (inside front cover)
41K692167	Spring, handle (inside plastic handle)
41K601712	Spring, rear cover latch
42A692189	Strap, door latch retainer (inside front cover)
46A692151	Stud, latch retainer (front cover latch on grille)
46K690079	Stud, trimount: blk nkl (on loop panel - for operating on-off switch)

MODEL 51M2U CABINET PARTS-Same as Model 51M1U Except

38K600106	Button, plug: maroon finish (loop trimmer adj hole cover)
1X601816	Cabinet: complete, less handle, grille and antenna loop and front cover assembly; maroon plastic
13K600956	Escutcheon, dial & volume (on front of cabinet)
1X600131	Front Cover Assembly: complete, less loop; maroon plastic
1X600128	Grille Assembly: complete with escutcheon; maroon plastic
55K600107	Handle, carrying: maroon plastic; less spring
36K600105	Knob, control: maroon plastic
5S2827	Rivet: .088 x 5/32; stl; statuary bronze (front hinge mtg)
5S2828	Rivet: .088 x 3/16; stl; statuary bronze (front cover hinge mtg)
3S400336	Screw, sheet metal: #2 x 5/16; Phillips flat head; statuary bronze (mounts loop to front cover)
46K680035	Stud, trimount: statuary bronze (on loop panel - for operating on-off switch)

Speaker		
LS-1	50K600141	
or	50K600142	
or	50B610070	Speaker: 3½" PM; 3.2 ohm VC

MODELS 59X11,
59X12I, Ch. HS-180

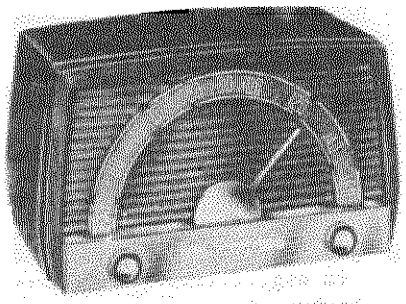
GENERAL INFORMATION

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
50C5 Power Amplifier
35W4 Rectifier

POWER SUPPLY - 117 volts AC or DC, 35 watts



MODEL 59X11 (Mahogany Plastic Cabinet) MODEL 59X12I (Ivory Plastic Cabinet)

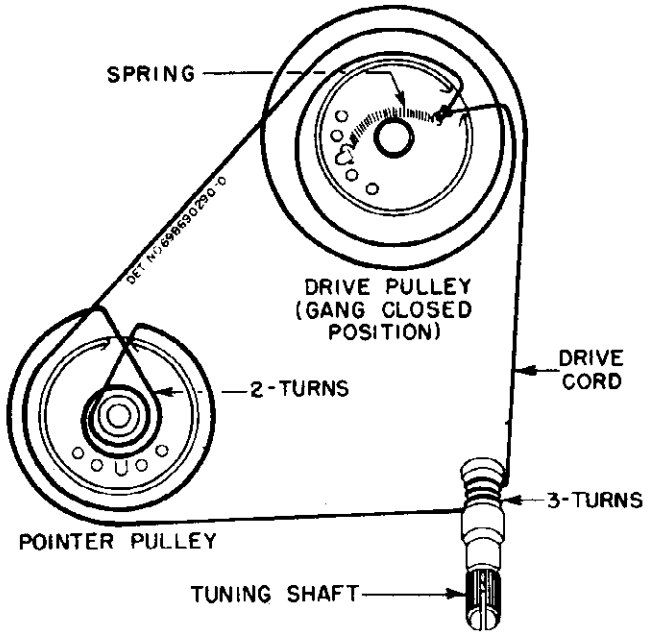


FIGURE 1. STRING DRIVE

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.

SERVICE NOTES

The chassis of this receiver is connected directly to the power line. When operating chassis (from AC line) outside of its cabinet, use an isolation transformer between power line and receiver to reduce possibility of electrical shock. If isolation transformer is not available, check the AC voltage between chassis and bench ground; if there is any indication of voltage, reverse the line plug before handling set.

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.

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.	-	Radiation loop*	1620 Kc	Gang fully opened	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.

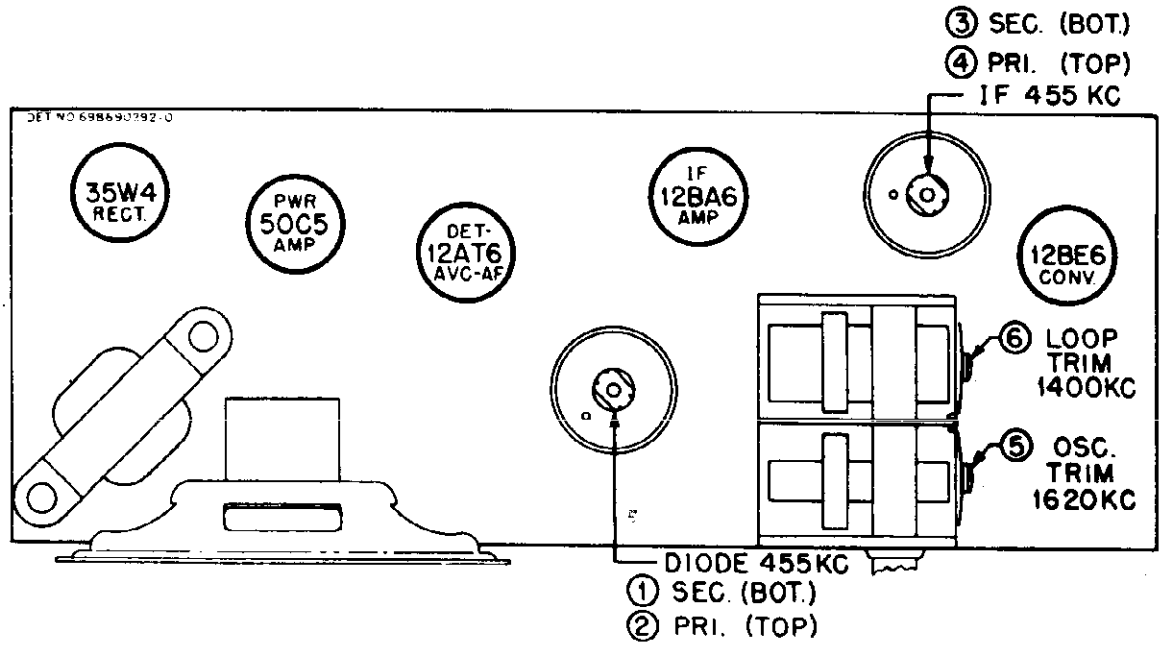


FIGURE 2. TUBE & TRIMMER LOCATIONS

MODELS 59X11,
59X12I, Ch. HS-180

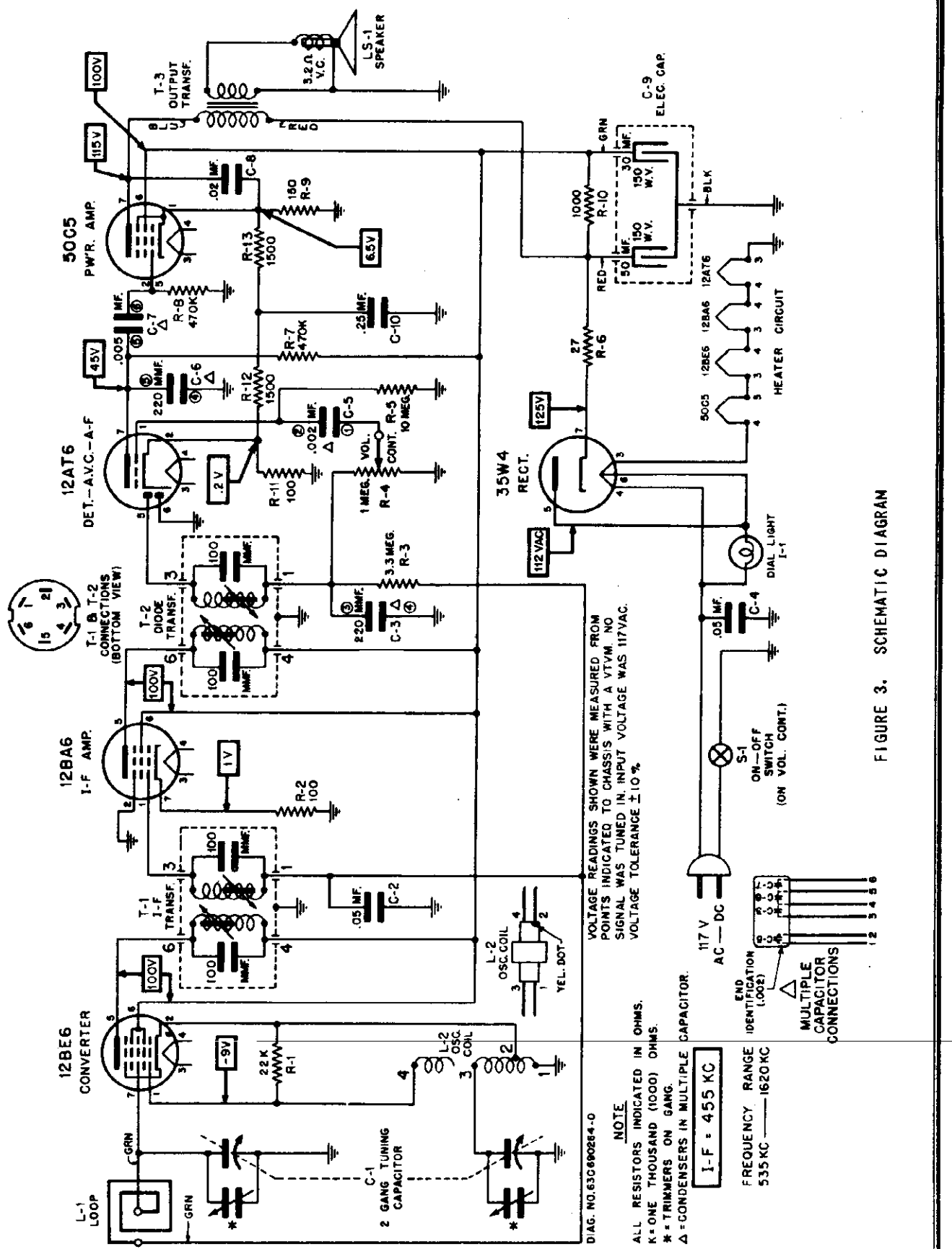


FIGURE 3. SCHEMATIC DIAGRAM

MODELS 59X11,
59X12I, Ch. HS-180

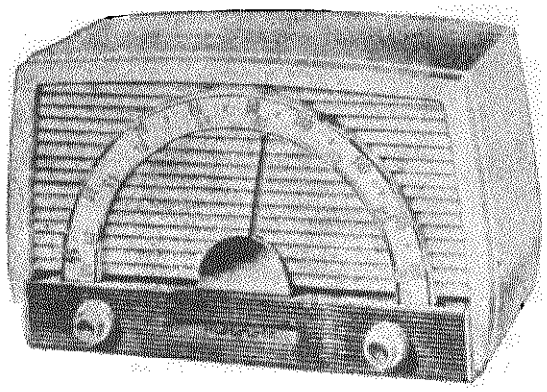
REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	1X690759	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..
C-10	8A470504	Paper: .25 mf 50V .....
PILOT LIGHT		
I-1	65K11854	Bulb: 6.3V-.15 amp; tubular, clear, #47 .....
COILS		
L-1	24K690657	Loop Antenna: includes back panel
L-2	24K482855	BC Oscillator coil .....
SPEAKER		
LS-1	50C478138	Speaker: 4" PM; 3.2 ohm voice coil .....
RESISTORS		
Note:		All resistors are insulated carbon type, 20%, unless otherwise specified.
R-1	6R6028	22,000 1/2 watt .....
R-2	6R6018	100 1/2 watt .....
R-3	6R2118	3.3 meg 1/2 watt .....
R-4	18A70032	Volume Control: 1 meg with SPST switch .....
R-5	6R2109	10 meg 1/2 watt .....
R-6	6R5683	27 10% 1/2 watt .....
R-7	6R6032	470,000 1/2 watt .....
R-8	6R6032	470,000 1/2 watt .....
R-9	6R3992	150 1/2 watt .....
R-10	6R3953	1000 1 watt .....
R-11	6R6028	100 1/2 watt .....
R-12	6R6161	1500 1/2 watt .....
R-13	6R6161	1500 1/2 watt .....
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	25K485973	Output Transformer .....
CHASSIS PARTS - MECHANICAL		
	7K485971	Bracket, loop mtg .....
	7A77337	Bracket, tuning shaft mtg ....
	1X690679	Bracket and Insulator Assembly, pointer shaft mtg .....
	46K680318	Core, iron (for T-1 & T-2) ...
	11M8944	Cord, dial: 18"; blk .....
	30K482856	Cord, line & plug: 6 ft long..
	5A19658	Eyelet, spacer (gang mtg).....
	5A70404	Grommet, spacer (gang mtg)....
	14A482844	Insulator, cord outlet .....
	29R3010	Lug, soldering: #6 hot-tinned.

REF. NO.	PART NO.	DESCRIPTION
	2S7051	Nut, hex: 3/8-32 x 9/16; stl; cad pl; Palnut (volume control mtg) .....
	5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg) .....
	5S7707	Rivet: .122 x 5/32; stl; nkl pl (output trans and tube shield mtg) .....
	5S7701	Rivet: .122 x 3/16; stl; nkl pl (tuning shaft bracket and pointer bracket assembly mtg)
	3S7477	Screw, machine: 8-32 x 1/4; plain hex head; stl; cad pl (loop panel mtg) .....
	3S2294	Screw, machine: 6-32 x 1/2; plain hex head locking type; stl; cad pl (gang mtg) .....
	3S7454	Screw, sheet metal: #8 x 1/4; PKZ plain hex head; stl; cad pl (speaker mtg) .....
	3S3398	Screw, sheet metal: #6 x 3/8; PKZ plain hex head; stl; cad pl (loop brkt and cord insulator mtg) .....
	1X690775	Shaft and Pulley Assembly, pointer .....
	1X690774	Shaft and Pulley Assembly, tuning .....
	26K485936	Shield, coil .....
	26A470013	Shield, light .....
	26A481521	Shield, tube: spring .....
	9K690673	Socket, pilot light .....
	9A472534	Socket, tube .....
	41A14244	Spring, pointer cord (tension) .....
	41A73996	Spring, tension (electrolytic mounting) .....
	4A70015	Washer, 'C' (tuning shaft and pointer shaft retainer).....
	4S7633	Washer, flat: 9/16 x 11/64 x .033 thick; stl; cad pl (loop panel mtg) .....
	4K482859	Washer, shoulder (loop bracket and cord insulator mtg).....
CABINET PARTS		
	16E690504	Cabinet, table model: molded; mahogany (59X11) .....
or	16K690659	Cabinet, table model: molded; ivory (59X12I) .....
	36K690668	Knob, control: mahogany (59X11)
or	36K690669	Knob, control: ivory (59X12I)
	64B690666	Plate, trim .....
	38A25507	Plug, split (antenna panel to cabinet mtg) .....
	52K690744	Pointer and Hub .....
	34C690662	Scale, dial .....
	3S7148	Setscrew: 6-32 x 1/8 Allen head; stl; cad pl (pointer and hub mtg) .....
	3S490381	Screw, drive: #00 x 1/4 PKU plain round head; brass (dial scale mtg) .....
	3S488098	Screw, sheet metal: #8 x 3/8 type 25; plain hex head; stl; cad pl (chassis mtg) .....
	46K690772	Stud, trimount (trim plate mtg) .....

MODELS 59X21U,
59X22IU, Ch. HS-192

GENERAL INFORMATION



TYPE - A combination standard broadcast and short wave table model receiver.

TUNING RANGE - Standard broadcast - 535 to 1620 Kc
Shortwave - 5.85 Mc to 18.1 Mc

IF - 455 Kc

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

POWER SUPPLY - 117V AC/DC 35 watts

INSTALLATION & OPERATING INSTRUCTIONS

ANTENNAS. For short wave reception, it is necessary to connect a length of wire (at least 10 feet long) to the screw terminal located on the radio rear panel. A commercial short wave antenna is recommended for best results.

No outside antenna is normally required for standard broadcast station reception. A loop antenna for receiving broadcast stations is built into the radio. If radio is located at a considerable distance from broadcast stations, it may be necessary to secure additional signal pickup by using an external antenna. The same antenna that is used for short wave reception can be used for additional pickup of standard broadcast stations by leaving it connected to the short wave terminal screw and winding two turns of the same wire in the slots located at the top of the radio rear panel.

CAUTION: Do not connect antenna or chassis to water pipe, radiator or other ground.

POWER SWITCH & VOLUME CONTROL. The power switch and volume control are combined and operated by the left-hand knob. If radio does not play from a DC power line after being turned on for a few minutes, reverse the power cord plug in the power outlet. When operating from AC power lines, reception can sometimes be improved by reversing the power cord in the power outlet.

BANDSWITCH. The small (inner) right-hand knob selects standard broadcast or short wave reception, as desired. Rotate this knob to the left for standard broadcast or to the right for short wave reception.

TUNING. The large (outer) right-hand knob is used for tuning both standard broadcast and short wave stations.

TO REMOVE CHASSIS FROM CABINET

1. Set pointer to extreme low frequency end to expose pointer setscrew. Loosen pointer setscrew through hole in bottom of cabinet.

2. Remove the knobs; they pull off.

3. Remove the two split plugs that hold the top of loop panel to cabinet.

4. Remove the two screws that hold the chassis to the cabinet. These screws are accessible through slots in the loop panel.

MODELS 59X21U,
59X22IU, Ch. HS-192

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.

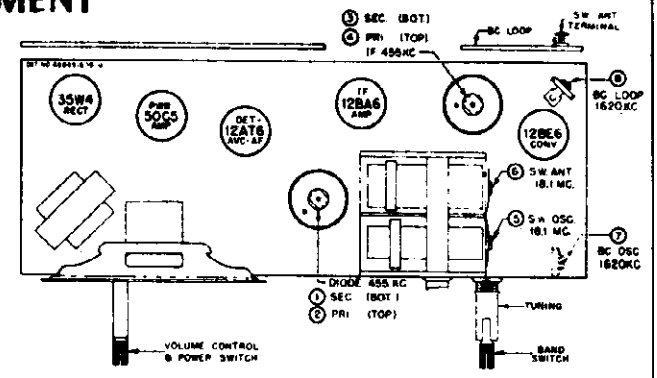
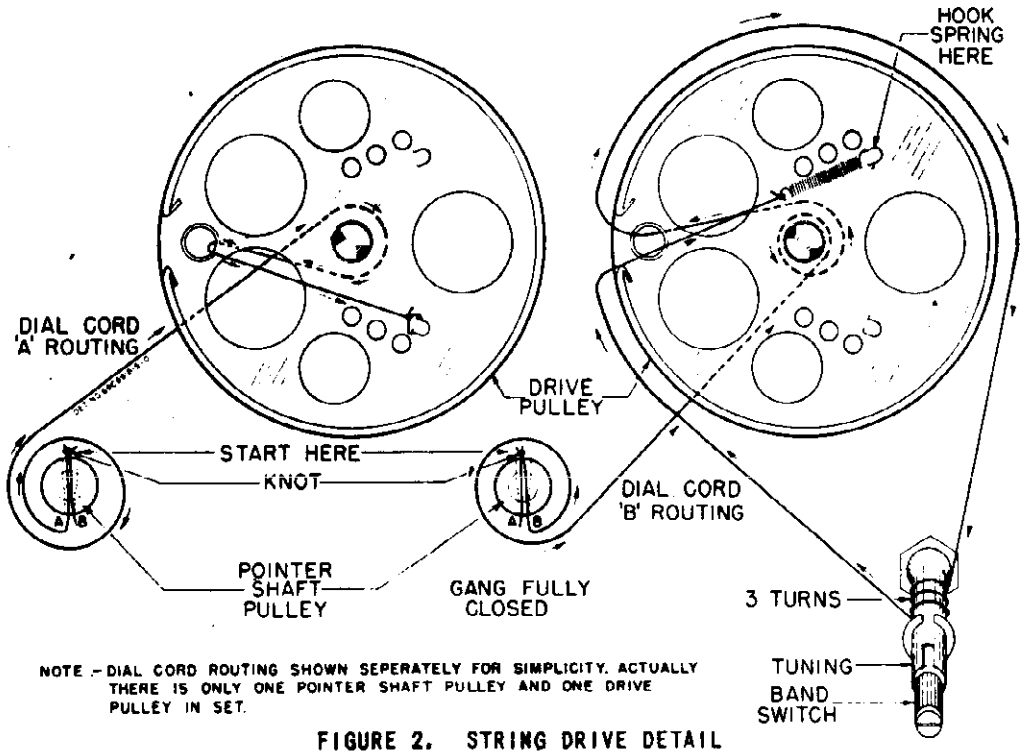


FIGURE 1. TUBE & TRIMMER LOCATION

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	BAND SWITCH	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.
SW BAND RF ALIGNMENT							
2.	400 ohms	SW Ant terminal	18.1 Mc	SW	Fully opened	5 & 6	Adjust for maximum.
BC BAND RF ALIGNMENT							
3.	.1 mf	Rear stator of tuning capacitor	1620 Kc	BC	Fully opened	7	Adjust for maximum.
4.	None	Radiation loop*	1400 Kc	BC	Tune for maximum	8	Adjust for maximum.

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



NOTE - DIAL CORD ROUTING SHOWN SEPERATELY FOR SIMPLICITY. ACTUALLY THERE IS ONLY ONE POINTER SHAFT PULLEY AND ONE DRIVE PULLEY IN SET.

FIGURE 2. STRING DRIVE DETAIL

MODELS 59X21U,
59X22IU, Ch. HS-192

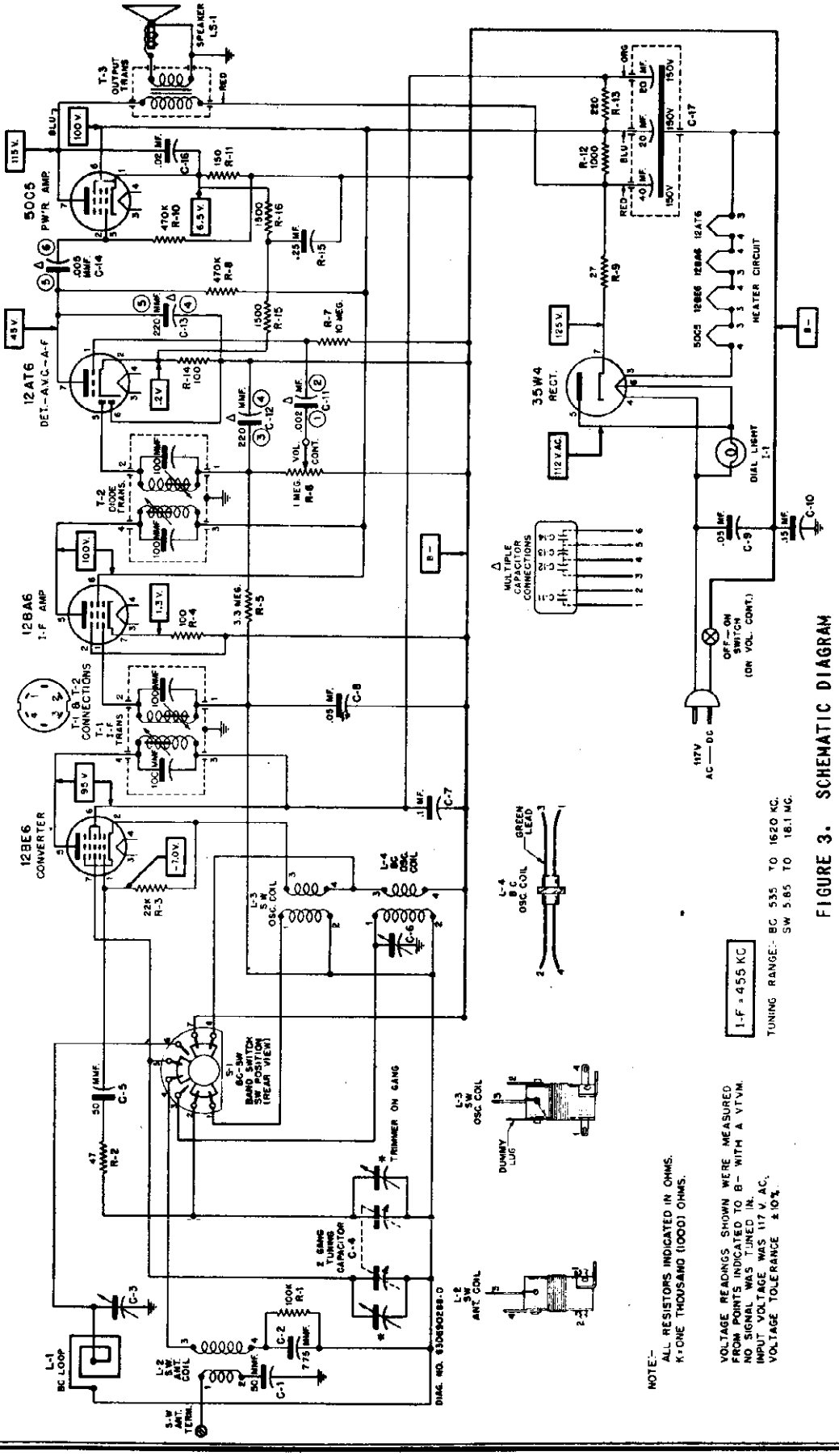


FIGURE 3. SCHEMATIC DIAGRAM

NOTE:-
ALL RESISTORS INDICATED IN OHMS.
K=ONE THOUSAND (1000) OHMS.

VOLTAGE READINGS SHOWN WERE MEASURED FROM POINTS INDICATED TO B- WITH A VTVM. NO SIGNAL WAS TUNED IN.
INPUT VOLTAGE WAS 117 V. AC.
VOLTAGE TOLERANCE ±10%.

MODELS 59X21U,
59X22IU, Ch. HS-192

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	21K77373	Ceramic: 50 mmf 500V .....
C-2	21A690643	Mica: 775 mmf 3% 300V .....
C-3	20K690655	Mica, variable: 3 to 20 mmf .....
C-4	1X690682	Variable: 2 gang & pulley .....
C-5	21K77373	Ceramic: 50 mmf 500V .....
C-6	20A680362	Mica, variable: 10 to 50 mmf .....
C-7	8S9807	Paper: .1 mf 400V .....
C-8	8S9821	Paper: .05 mf 200V .....
C-9	8S9816	Paper: .05 mf 400V .....
C-10	8A72686	Paper: .15 mf 200V .....
C-11,12, 13,14	21B482847	Ceramic, multiple: .002 mf, 220 mmf, 220 mmf & .005 mf .....
C-15	8A470504	Paper: .25 mf 50V .....
C-16	8S9802	Paper: .02 mf 400 V .....
C-17	23K690671	Electrolytic: 40-20-20 mf/150V .....
DIAL LIGHT		
I-1	65X11854	Bulb: 6.3V .15 amp; tubular bayonet base .....
COILS		
L-1	24K690656	Loop Antenna Assembly: includes back panel .....
L-2	24B690641	Coil, short wave antenna .....
L-3	24B690651	Coil, short wave oscillator .....
L-4	24A690652	Coil, BC oscillator .....
SPEAKER		
LS-1	50C478138	Speaker, PM: 4"; 3.2 ohm VC ....
RESISTORS		Note: All resistors are insulated carbon type unless otherwise specified.
R-1	6R6075	100,000 20% 1/2W .....
R-2	6R2108	47 20% 1/2W .....
R-3	6R6028	22,000 20% 1/2W .....
R-4	6R6326	100 10% 1/2W .....
R-5	6R2118	3.3 meg 20% 1/2W .....
R-6	18A70032	Volume Control: 1 meg; includes ON-OFF switch .....
R-7	6R2109	10 meg 20% 1/2W .....
R-8	6R6032	470,000 20% 1/2W .....
R-9	6R5683	27 10% 1/2W .....
R-10	6R6032	470,000 20% 1/2W .....
R-11	6R3992	150 20% 1/2W .....
R-12	6R3953	1000 20% 1W .....
R-13	6R3933	220 20% 1/2W .....
R-14	6R6326	100 10% 1/2W .....
R-15	6R6038	1500 10% 1/2W .....
R-16	6R6038	1500 10% 1/2W .....
SWITCH		
S-1	40K690672	Switch, band: 2-position .....
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	25K471947	Transformer, output .....
CHASSIS PARTS - MECHANICAL		
	1X690679	Bracket and Insulator Assembly, pointer shaft mtg .....
	7K485971	Bracket, loop mtg .....
	11M8944	Cord, dial: 18# black .....
	30A470651	Cord, line & plug: 6 ft lg .....
	46K680318	Core, iron: threaded (for T-1 & T-2) .....
	5A19658	Eyelet, spacer .....
	5A70404	Grommet, rubber (gang mtg).....
	29R3010	Lug, soldering .....
	14A482844	Insulator, cord outlet .....
	2S7051	Nut, hex: 3/8-32 x 9/16; stl; cad pl (band switch and volume control mtg) .....
	4S7019	Nut, hex: 4-40 x 1/4; stl; cad pl (coil and trimmer mtg).....
	5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg) .....
	5S7707	Rivet: .122 x 5/32; stl; nkl pl (pointer bracket & insulator assembly and spring mtg) ....
	4S2950	Screw, machine: 4-40 x 1/4 slotted binderhead; locking type; stl; cad pl (coil and trimmer mtg) .....
	3S2294	Screw, machine: 6-32 x 1/2 plain hex head; locking type; stl; cad pl (gang mtg) .....
	3S7477	Screw, machine: 8-32 x 1/4; type 1; plain hex head; stl; cad pl (loop back mtg) .....
	3S3398	Screw, sheet metal: #6 x 3/8 PKZ plain hex head; stl; cad pl (bracket and insulator mtg)..
	3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; stl; cad pl (spkr mtg and diode shield mtg) .....
	47A690645	Shaft, pointer .....
	47K690573	Shaft, tuning .....
	24K485936	Shield, coil (for T-1 & T-2) ..
	26A690748	Shield, diode .....
	26A470013	Shield, light .....
	26A481521	Shield, tube: spring .....
	9K690673	Socket, pilot light: includes leads.
	9A472534	Socket, tube .....
	41A14111	Spring, cord tension .....
	41A73996	Spring, tension (electrolytic mtg).
	4A70015	Washer 'C' (pointer shaft retainer) .....
	4A73639	Washer 'C' (tuning shaft retainer) .....
	4S7633	Washer, flat: 9/16 x 11/64 x .033 thick; stl; cad pl (loop back mtg) .....
	4K482859	Washer, shoulder: insulated (loop bracket and insulator mtg).....
CABINET PARTS		
	16E690504	Cabinet, table model: molded; mahogany (59X21U) .....
	16K690659	Cabinet, table model: molded; ivory (59X22IU) .....
	36K482767	Knob, band control: mahogany (59X21U)
	36K482788	Knob, band control: ivory (59X22IU).
	36K690668	Knob, tuning control: mahogany(59X21U
	36K690669	Knob, tuning control: ivory (59X22IU)
	36B690664	Knob, volume & ON-OFF control: mahogany (59X21U) .....
	36K690665	Knob, volume & ON-OFF control: ivory (59X22IU) .....
	64B690666	Plate, trim .....
	38A25507	Plug, split (loop back to cabinet mtg) .....
	52K690744	Pointer and hub .....
	34K690663	Scale, dial .....
	3S490502	Screw, drive: #00 x 1/4 PKU plain round head; brass (dial scale mtg) .....
	3S488098	Screw, sheet metal: #8 x 3/8; type 25; plain hex head; stl; cad pl (chassis mtg) .....
	3S7148	Setscrew: 6-32 x 1/8; Allen head; stl; cad pl (pointer & hub mtg)
	46K690772	Stud, trimount: brass pl (trim plate mtg) .....

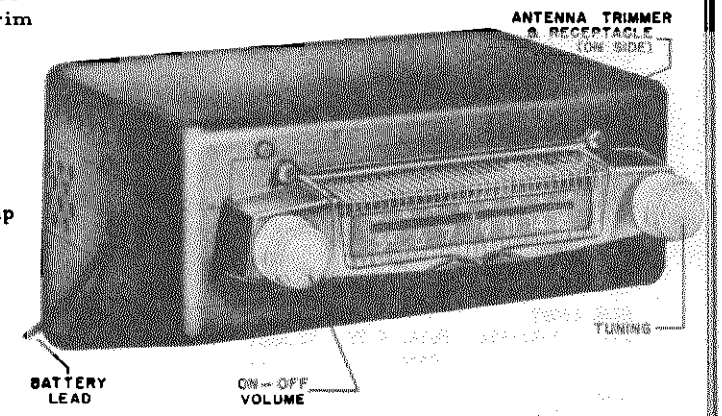
GENERAL INFORMATION

TYPE - Universal automotive type superheterodyne receiver with self-contained speaker. Designed for underdash mounting. Receiver may be mounted behind instrument panel of some cars by using Trim Plate AK-38.

TUNING RANGE - 535 to 1605 Kc IF - 455 Kc

TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Detector-AVC-AF Amp
6AQ5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 6.3 volts DC, 5 amperes



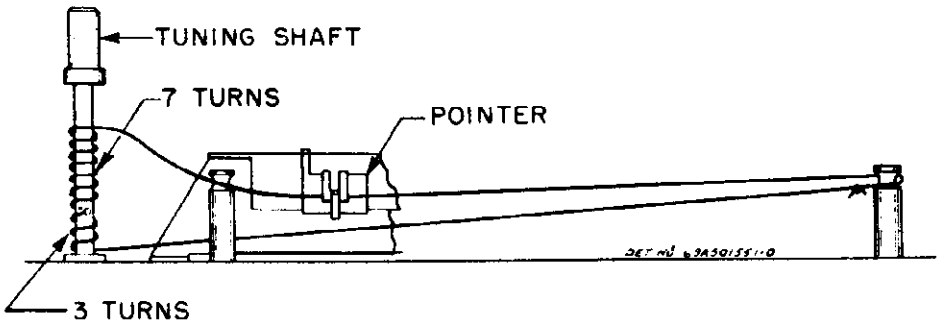


FIGURE 1. DIAL CORD RESTRINGING DETAIL

ALIGNMENT

Equipment Required:

1. A small fibre screwdriver for IF and RF adjustments.
2. An accurately calibrated AM signal generator
3. A low range output meter.
4. A dummy antenna for RF and tuner alignment. (Construct dummy antenna as shown in Figure 3.)

Procedure:

1. Remove top and bottom covers to expose alignment adjustments.
2. Connect output meter across voice coil of the speaker.
3. Connect a 6 volt DC source of power between "A" lead and receiver ground. Turn receiver on and permit it to warm up for a few minutes. Then proceed as per instructions in the alignment chart.

NOTE: 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.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7)	455 Kc	High frequency end of dial (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated
RF ALIGNMENT						
2.	See Fig. 3	Antenna receptacle through dummy	1605 Kc	"	5	Peak for maximum.
3.	"	"	1400 Kc	Tune for max.	6 & 7	"
TUNER ALIGNMENT						
NOTE: The tuner cores have been correctly aligned at the factory. Field alignment of the tuner is not recommended unless components have been replaced or tampered with. Construct two core alignment tools as shown in Figure 4. Refer to Figure 4 for proper use of tools, and proceed to align as follows:						
4.	See Fig. 3	Antenna receptacle through dummy	1610 Kc	High frequency end of dial; cores should project 1-1/32" from end of coil form - screw out if necessary	5, 6 & 7	Peak for maximum in order indicated.
5.	"	"	1400 Kc	1400 Kc-per Figure 2	8, 9 & 10	

6. With receiver installed in car, the antenna fully extended and dial set to approximately 1400 Kc, adjust antenna trimmer (7) for maximum signal of a weak station or noise between stations.

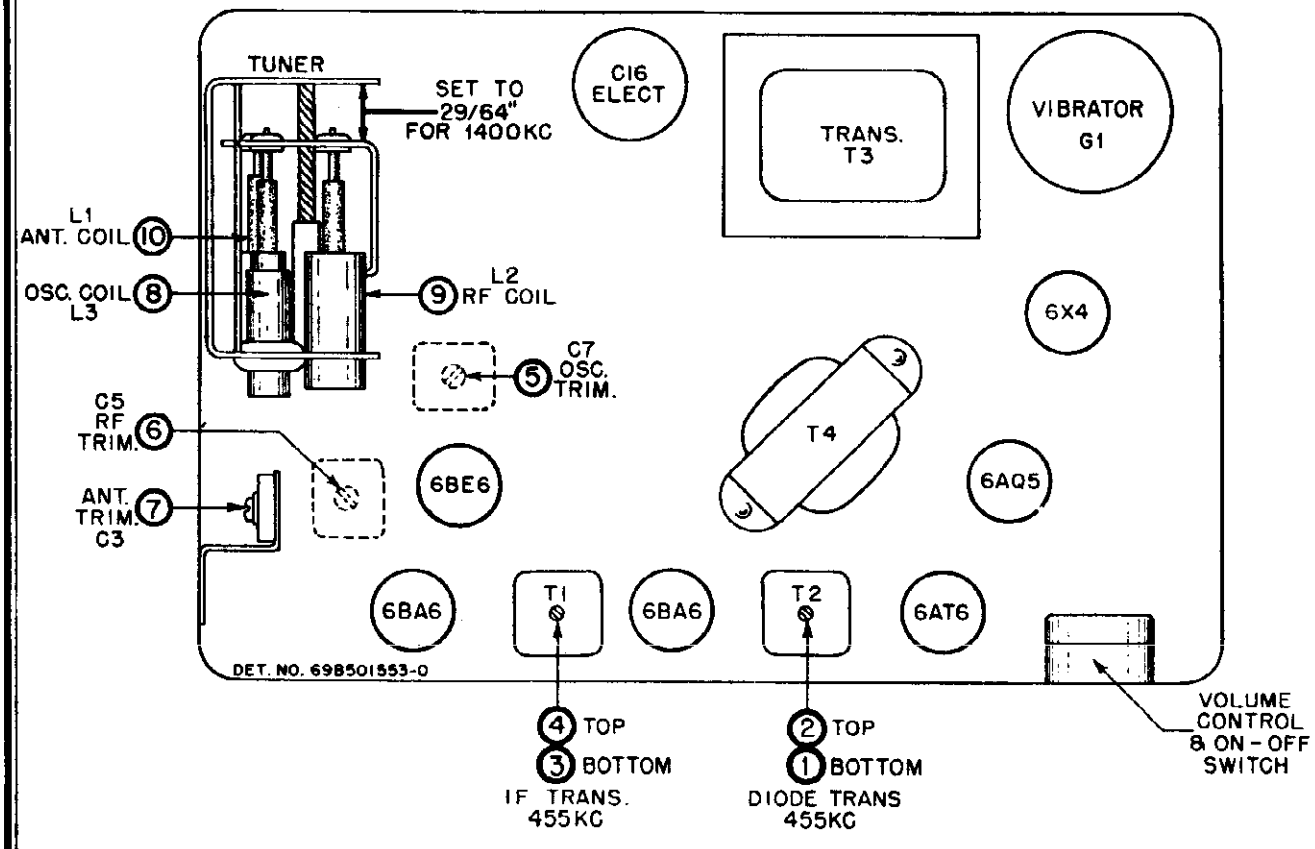


FIGURE 2. TUBE & TRIMMER LOCATIONS

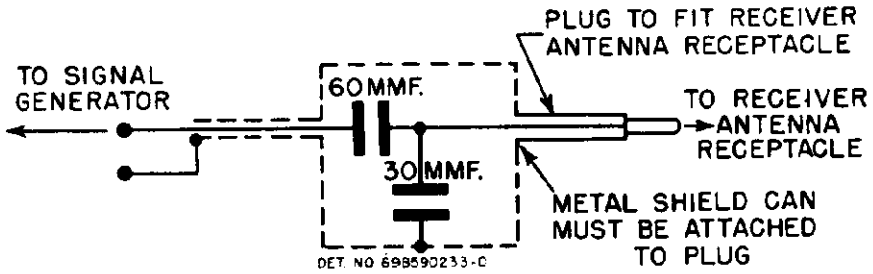


FIGURE 3. DUMMY ANTENNA

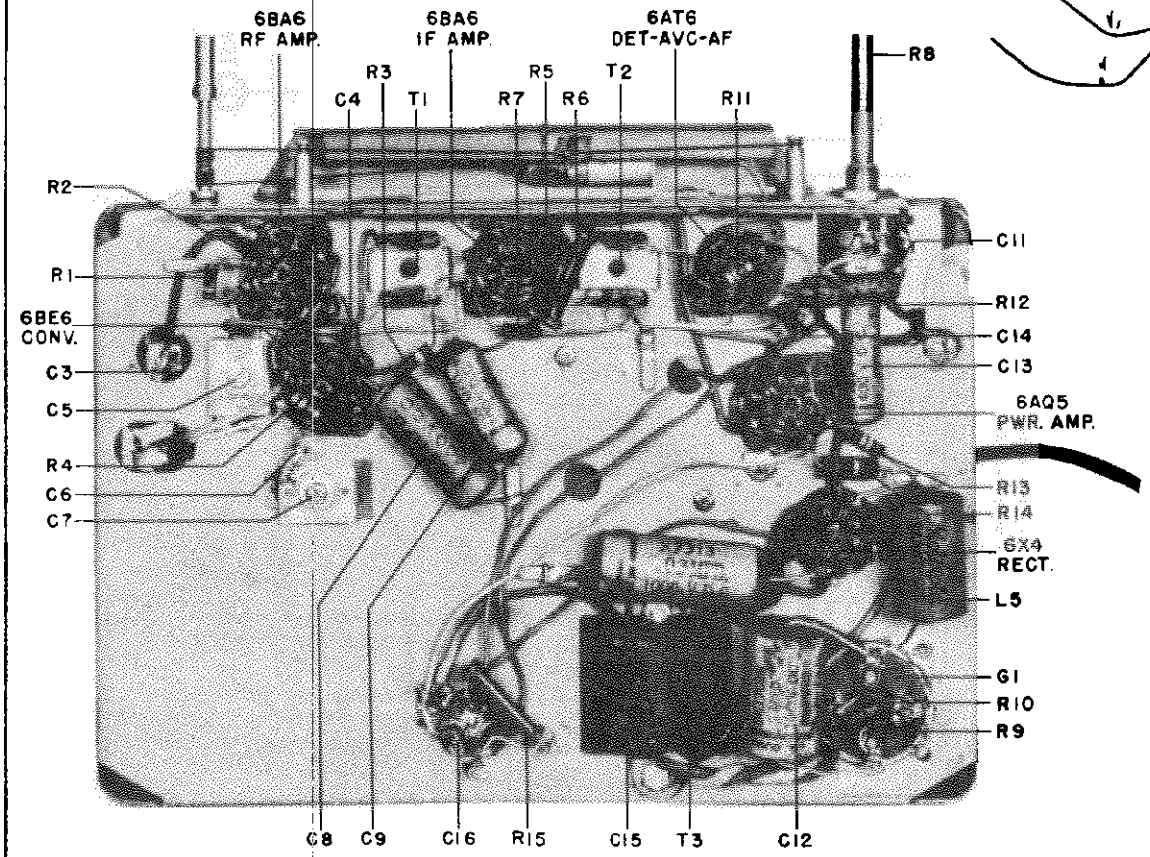


FIGURE 5. PARTS LOCATION

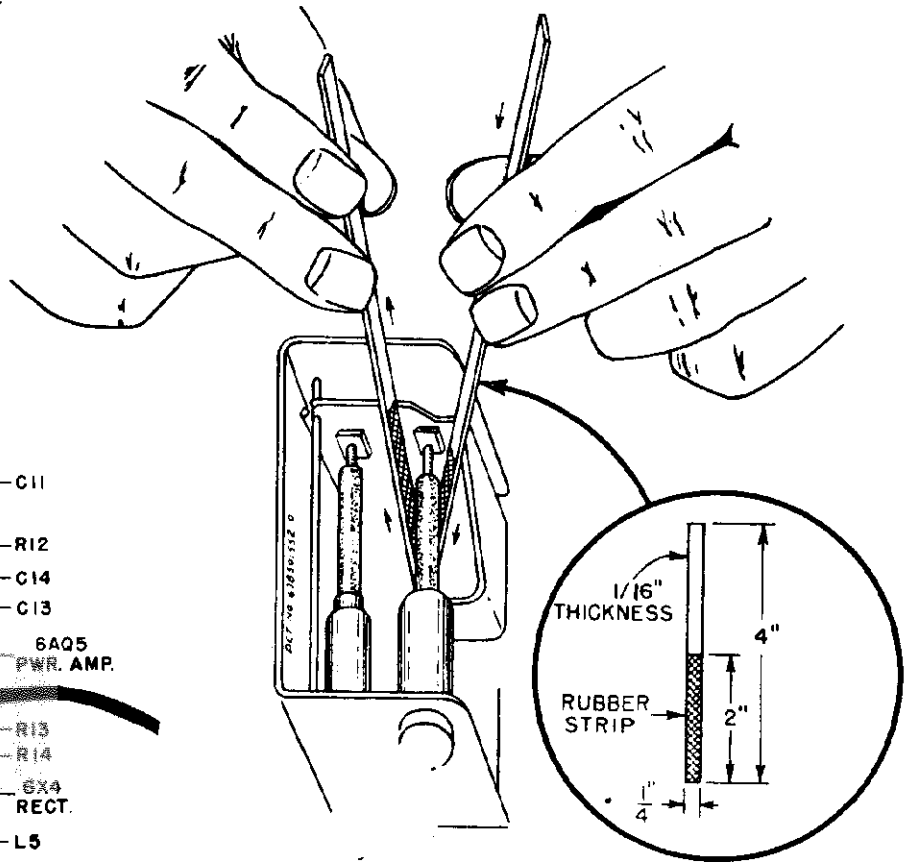


FIGURE 4. CORE ALIGNMENT DETAIL

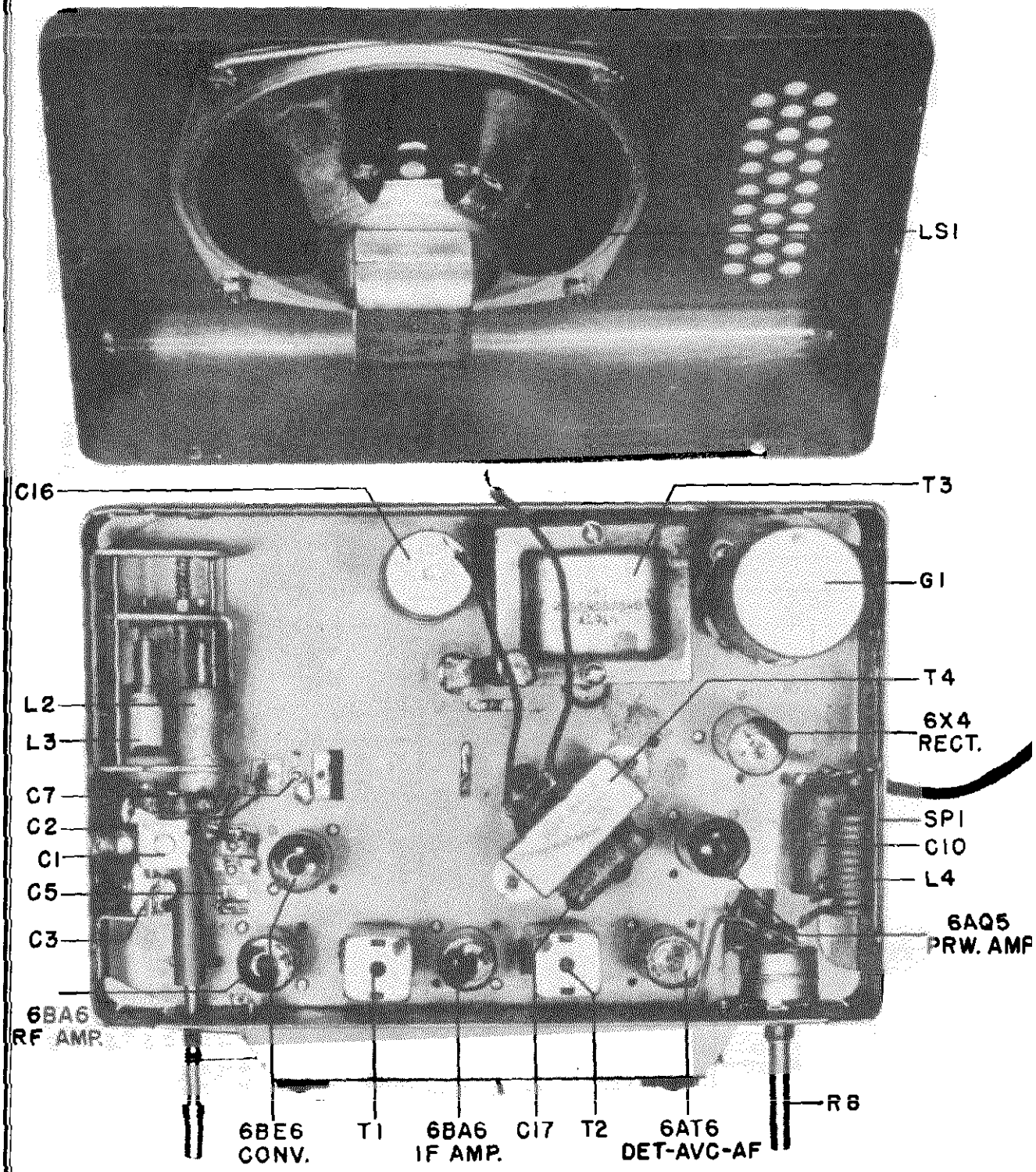
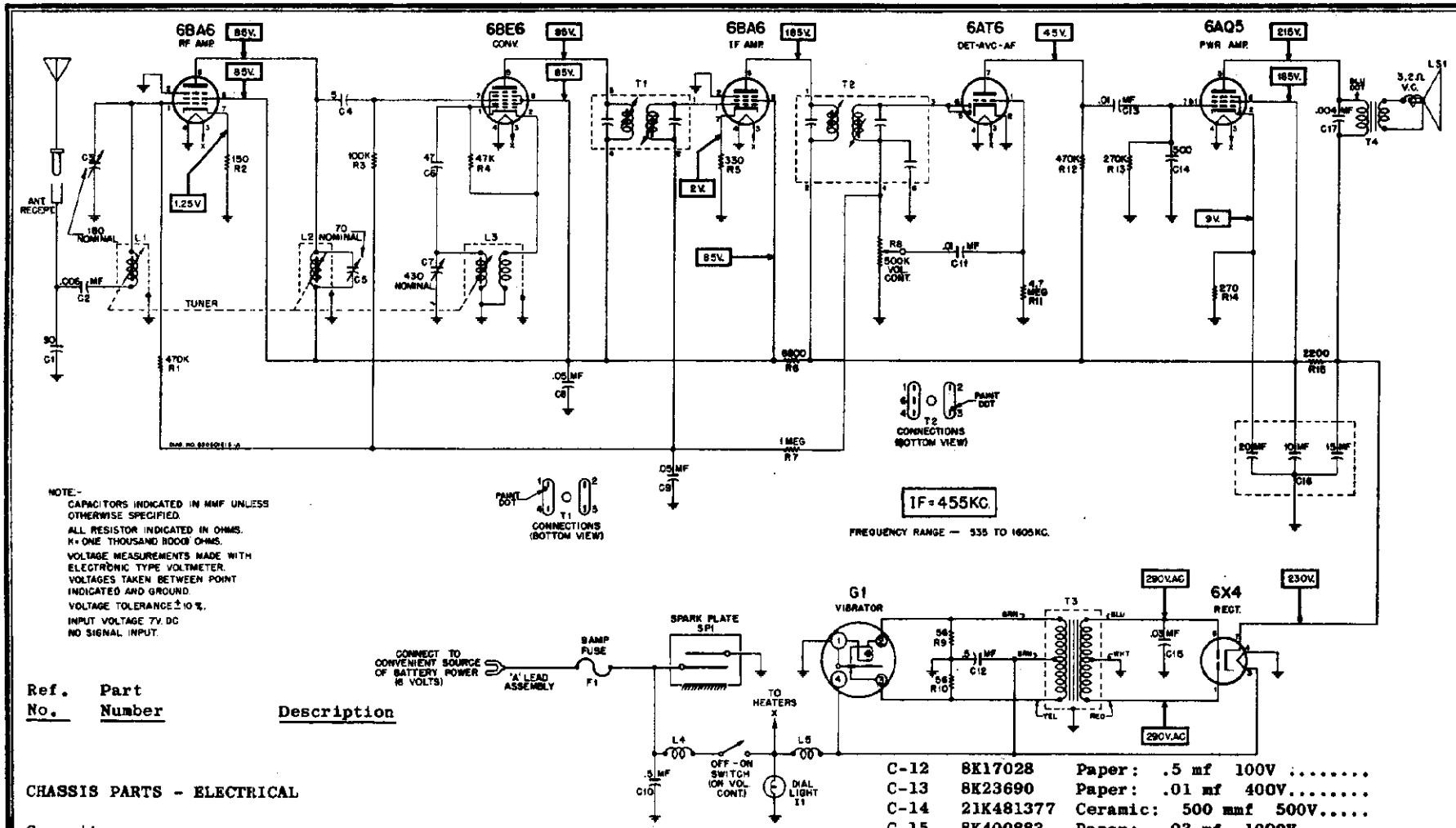


FIGURE 6. PARTS LOCATION



NOTE:-
CAPACITORS INDICATED IN MMF UNLESS OTHERWISE SPECIFIED.
ALL RESISTOR INDICATED IN OHMS. K= ONE THOUSAND 1000 OHMS.
VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER. VOLTAGES TAKEN BETWEEN POINT INDICATED AND GROUND.
VOLTAGE TOLERANCE ±10 %.
INPUT VOLTAGE 7V. DC NO SIGNAL INPUT.

FIGURE 7. SCHEMATIC DIAGRAM

CHASSIS PARTS - ELECTRICAL

Ref. No.	Part Number	Description
Capacitors		
C-1	21A591682	Ceramic: 90 mmf 500V.....
C-2	8A4529	Paper: .006 mf 100V.....
C-3	20A502338	Trimmer, mica: 50 to 180 mmf; with bracket .....
C-4	21K70720	Molded: 5 mmf 500V .....
C-5	20A481526	Trimmer, mica: 20 to 80 mmf.
C-6	21K77373	Ceramic: 47 mmf .....
C-7	20A485708	Trimmer, mica: 395 to 470 mmf
C-8	8K14791	Paper: .05 mf 400V .....
C-9	8K13514	Paper: .05 mf 100V .....
C-10	8K17028	Paper: .5 mf 100V .....
C-11	8K472754	Paper: .01 mf 100V.....
C-12	8K17028	Paper: .5 mf 100V .....
C-13	8K23690	Paper: .01 mf 400V.....
C-14	21K481377	Ceramic: 500 mmf 500V.....
C-15	8K400883	Paper: .03 mf 1000V .....
C-16	23A485677	Electrolytic: 15-10-20 mf/ 350-350-25V.....
C-17	8K71909	Paper: .004 mf 400V .....
Fuse		
F-1	65K16248	Fuse: 9 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	24B502472	Antenna Coil Assembly .....
L-2	24B502473	RF Coil Assembly .....
L-3	24B502474	Oscillator Coil Assembly....
L-4	24K580706	Choke, RF .....
L-5	24A472535	Choke, hash .....

Speaker

LS-1	50K500415	Speaker, PM: 5-1/4"; 3.2 ohm voice coil .....

Resistors

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

R-1	6R6032	470,000 20% 1/2W .....
R-2	6R3992	150 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-6	6R490001	6800 10% 1W N.I. ...
R-7	6R6004	1 meg 20% 1/2W .....
R-8	18K501294	Volume control: .5 meg; includes on-off switch ...
R-9	6R5614	56 10% 1/2W .....
R-10	6R5614	56 10% 1/2W .....
R-11	6R2122	4.7 meg 20% 1/2W .....
R-12	6R6032	470,000 20% 1/2W .....
R-13	6R6414	270,000 10% 1/2W .....
R-14	6R6336	270 10% 1W .....
R-15	6R488312	2200 10% 1W N.I. .....

Spark Plug

SP-1	64A501797	Spark Plate, top ground.....
	14K501292	Insulator, spark plate:fibre
	64A501289	Spark Plate, "A" lead .....
	4K51142	Washer, insulating (spark plate) .....

Transformer

T-1	24B485553	IF, 455 Kc: complete ..
T-2	24K485554	Diode, 455 Kc: complete
T-3	25C501303	Power Transformer.....
T-4	25B70171	Output Transformer .....

CHASSIS PARTS - MECHANICAL

7B501415	Bracket, dial background.....
42A485548	Clip, coil can mtg (T-1 & T-2).
42A4215	Clip, vibrator grounding.....
11M8877	Cord, dial: 20 lb; black.....
58A501296	Coupling, tuning shaft.....
4S7666	Lockwasher, ext: #6; cad pl (power transformer mtg) .....
2S7005	Nut, hex: 6-32 x 1/4; stl; cad pl (power transformer mtg).....
2S7051	Nut, hex: 3/8-32 x 9/16; Palnut; stl; cad pl (volume control mtg) .....
1A501293	Pointer and Slider Assembly....
9A472148	Receptacle, antenna .....
5S7770	Rivet: .088 x 5/32; stl; nkl pl (min tube socket mtg).....
5S7706	Rivet: .122 x 1/8; stl; nkl pl (dial light mtg) .....
5S7707	Rivet: .122 x 5/32; stl; nkl pl (output transformer & vibrator socket mtg) .....
5S7701	Rivet: .122 x 3/16; stl; nkl pl (spark plate assembly mtg)...
5K501365	Rivet, shoulder (dial cord guide) .....
3S7247	Screw, machine: 6-32 x 3/16; slotted locking head; stl; cad pl (tuner mtg) .....
3S7506	Screw, sheet metal: #6 x 1/4 plain hex head; stl; cad pl (dial background bracket mtg) .....
47B501362	Shaft, tuning .....
9K592354	Socket, dial light: includes mtg bracket .....
9A472534	Socket, tube: miniature; 7-prong...
9K580218	Socket, tube: miniature; 7-prong; with dummy lug .....
9A70208	Socket, tube: 4-prong (vibrator)...
41A485380	Spring, insert (inside tuning shaft coupling) .....
4K501364	Washer, "C" (tuning shaft retainer) .....

HOUSING PARTS

43A501295	Bushing, mounting (on control shafts) .....
15D501312	Cover, housing: bottom; less spkr
15D501305	Cover, housing top .....
13D501197	Escutcheon, dial: chrome pl .....
36B501297	Knob, control: includes setscrew..
4S7657	Lockwasher, ext: #8; stl; cad pl (speaker mtg) .....
2S7003	Nut, hex: 8-32 x 5/16; stl; cad pl (speaker mtg) .....
64B501445	Plate, dial scale retaining: dark green .....
34B501360	Scale, dial: glass .....
3S8114	Screw, sheet metal: #8 x 1/4; slotted acorn head; antique copper finish (housing screws) .....
3S490733	Screw, sheet metal: #8 x 1/4; Phillips head; chrome pl (escutcheon mtg) .....
3S7118	Setscrew (control knobs) .....
2S7087	Speednut (dial scale mtg)

MOUNTING PARTS AND ACCESSORIES

7B501298	Bracket, receiver mtg (recvr to instrument panel) .....
7A72256	Bracket, receiver mtg (on housing).
7A484424	Bracket and Stud Assembly (receiver mtg) .....
8A4491	Capacitor, noise suppression (generator cap) .....
9K592648 or 9K580705	Lead Assembly, fuse: complete with fuse .....
4S7688	Lockwasher, int-ext: 1/4; cad pl (receiver mtg) .....
2S2878	Nut, hex: 1/4-20 x 7/16; stl; cad pl (receiver mtg) .....
3S7475	Screw, sheet metal: #8 x 1/4 slotted acorn head; cad pl (mtg brkt mtg-rear) .....
3S8109	Screw, sheet metal: #8 x 3/8; PKZ; slotted acorn head; cad pl (mtg brkt mtg -front) .....
3S7295	Screw, machine: 1/4-20 x 3/4; plain hex head; stl; cad pl (receiver mtg strap) .....
3S9694	Screw, machine: 1/4-20 x 1-1/2; plain hex head; stl; cad pl (receiver mtg to firewall) .....
42A485718	Strap, receiver mtg .....
6A4141	Suppressor, noise (distributor)..

TUNER - MODEL MT-87

Note: Electrical parts of the tuner are included in the Electrical Chassis Parts List.

51D502490	Tuner, Model MT-87: complete.....
43A502513	Bushing, stop (stop on manual drive shaft) .....
42A502507	Clip, spring (manual drive shaft retainer) .....
46A502505	Core, iron (L-1, 2 & 3 tuning-specify color coding on old core when ordering) .....
5A502510	Grommet (L-1 & L-2 mtg) .....
5K502516	Grommet (L-3 mtg) .....
5A501503	Grommet (L-1, 2 & 3 core mtg)...
2A502508	Nut, tension drive (on tuner carriage) .....
47A502509	Shaft, manual drive .....
46A502506	Sleeve, iron (inside L-1 & L-2 shields) .....
4K502518	Washer, fibre (on manual drive shaft) .....
4A502517	Washer, paper (inside L-1 & L-2 shields) .....

MODEL 451

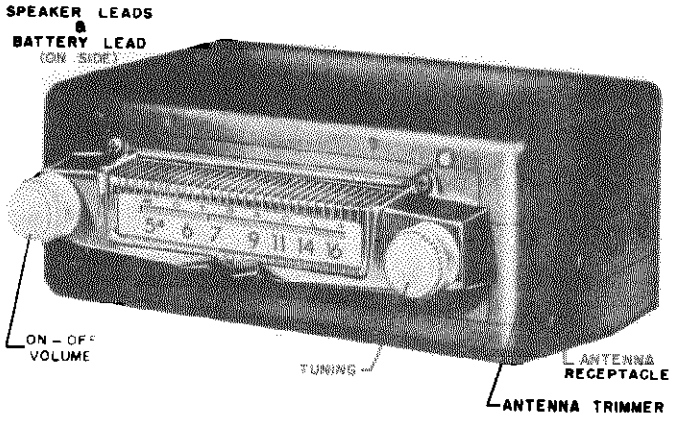
GENERAL INFORMATION

TYPE - Universal automotive type superheterodyne receiver. Designed for underdash mounting. Uses an external speaker. Receiver may be mounted behind instrument panel of some cars by using Trim Plate Kit AK-38.

TUNING RANGE - 535 to 1605 Kc IF - 455 Kc

TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Detector-AVC-AF Amp
6AQ5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 6.3 volts DC, 5 amperes



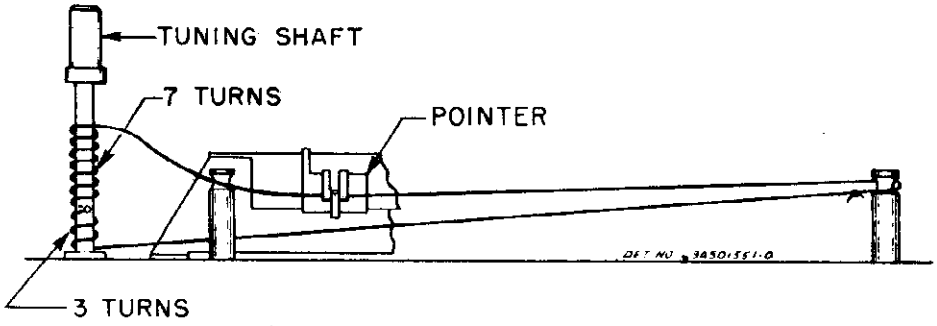


FIGURE 1. DIAL CORD RESTRINGING DETAIL

ALIGNMENT

Equipment Required:

1. A small fibre screwdriver for IF and RF adjustments.
2. An accurately calibrated AM signal generator.
3. A low range output meter.
4. A dummy antenna for RF and tuner alignment. (Construct dummy antenna as shown in Figure 3 .)

Procedure:

1. Remove top and bottom covers to expose alignment adjustments.
2. Connect output meter across voice coil of the speaker.
3. Connect a 6 volt DC source of power between "A" lead and receiver ground. Turn receiver on and permit it to warm up for a few minutes. Then proceed as per instructions in the alignment chart.

NOTE: 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.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7)	455 Kc	High frequency end of dial (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated.
RF ALIGNMENT						
2.	See Fig. 3	Antenna receptacle through dummy	1605 Kc	"	5	Peak for maximum.
3.	"	"	1400 Kc	Tune for max.	6 & 7	"
TUNER ALIGNMENT						
NOTE: The tuner cores have been correctly aligned at the factory. Field alignment of the tuner is not recommended unless components have been replaced or tampered with. Construct two core alignment tools as shown in Figure 4. Refer to Figure 4 for proper use of tools, and proceed to align as follows:						
4.	See Fig. 3	Antenna receptacle through dummy	1610 Kc	High frequency end of dial; cores should project 1-1/32" from end of coil form - screw out if necessary	5, 6 & 7	Peak for maximum in order indicated.
5.	"	"	1400 Kc	1400 Kc-per Figure 2	8, 9 & 10	"

6. With receiver installed in car, the antenna fully extended and dial set to approximately 1400 Kc, adjust the antenna trimmer (7) for maximum signal of a weak station or noise between stations.

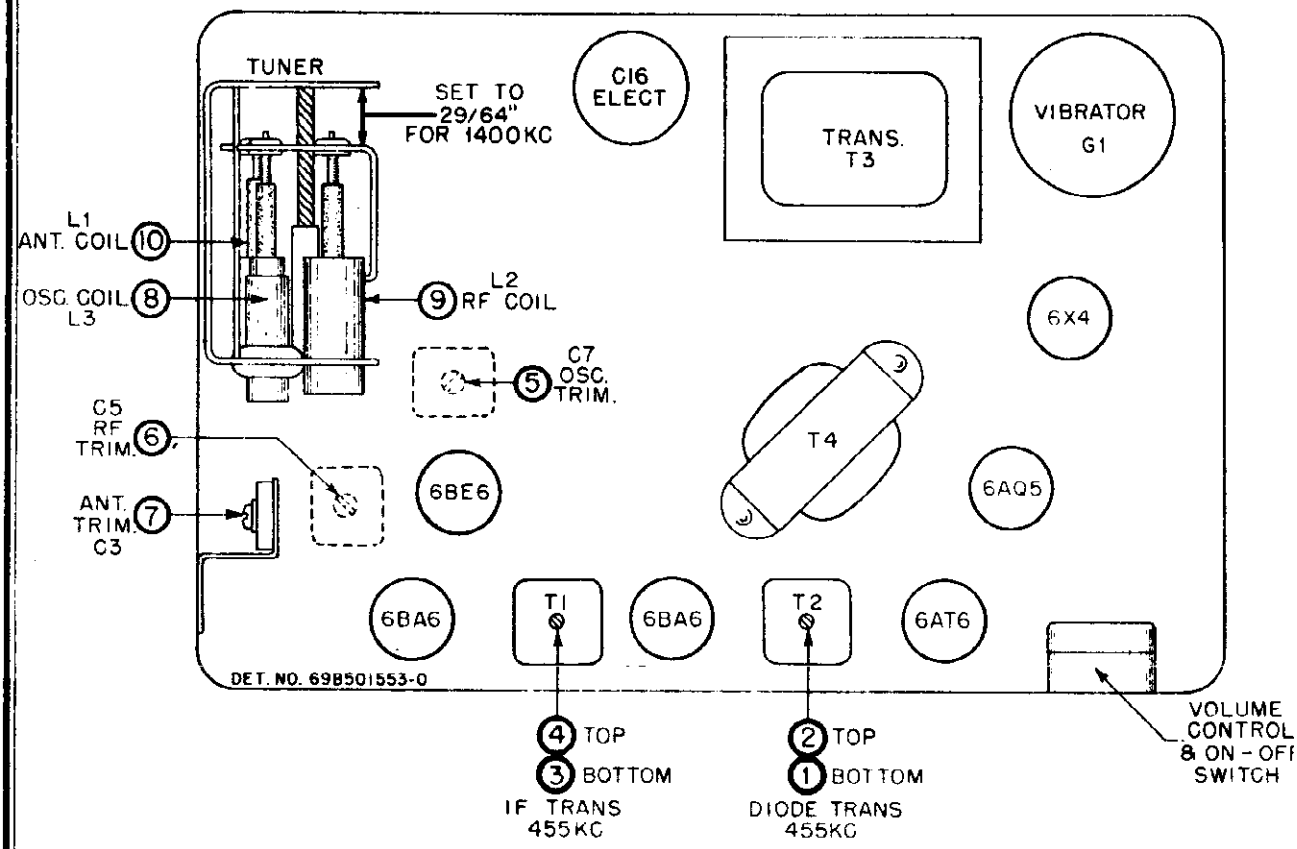


FIGURE 2. TUBE & TRIMMER LOCATIONS

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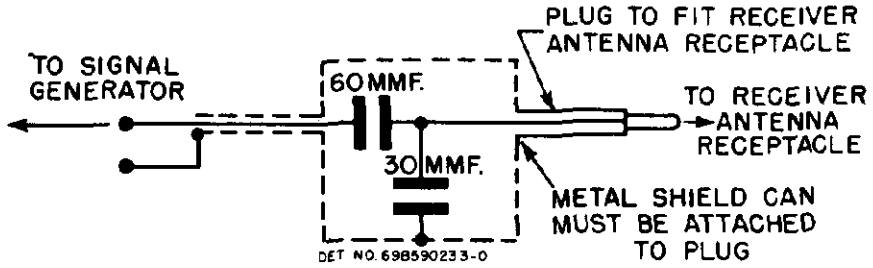


FIGURE 3. DUMMY ANTENNA

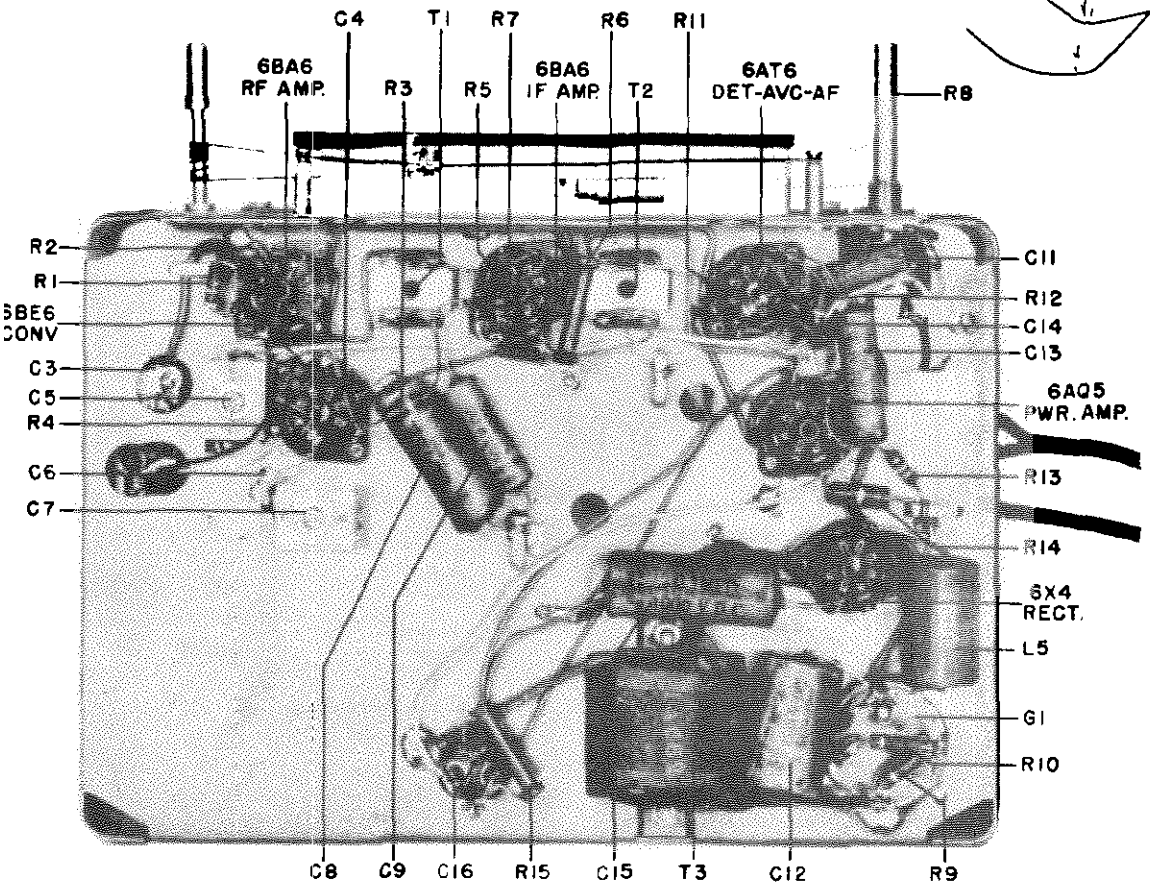


FIGURE 5. PARTS LOCATION

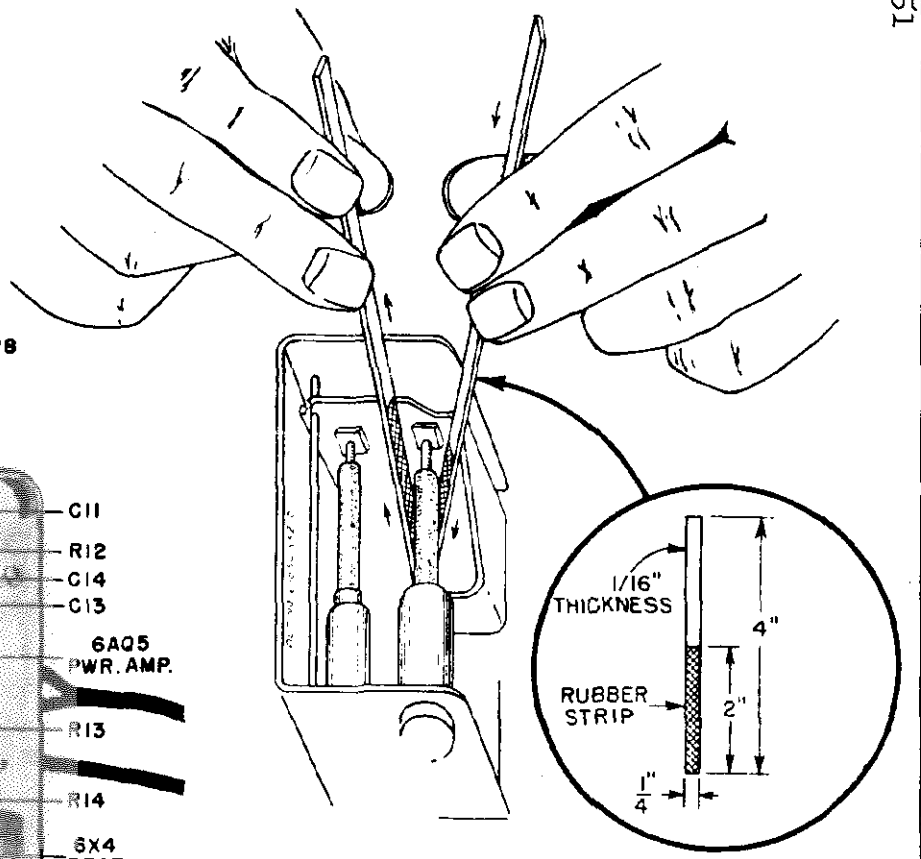


FIGURE 4. CORE ALIGNMENT DETAIL

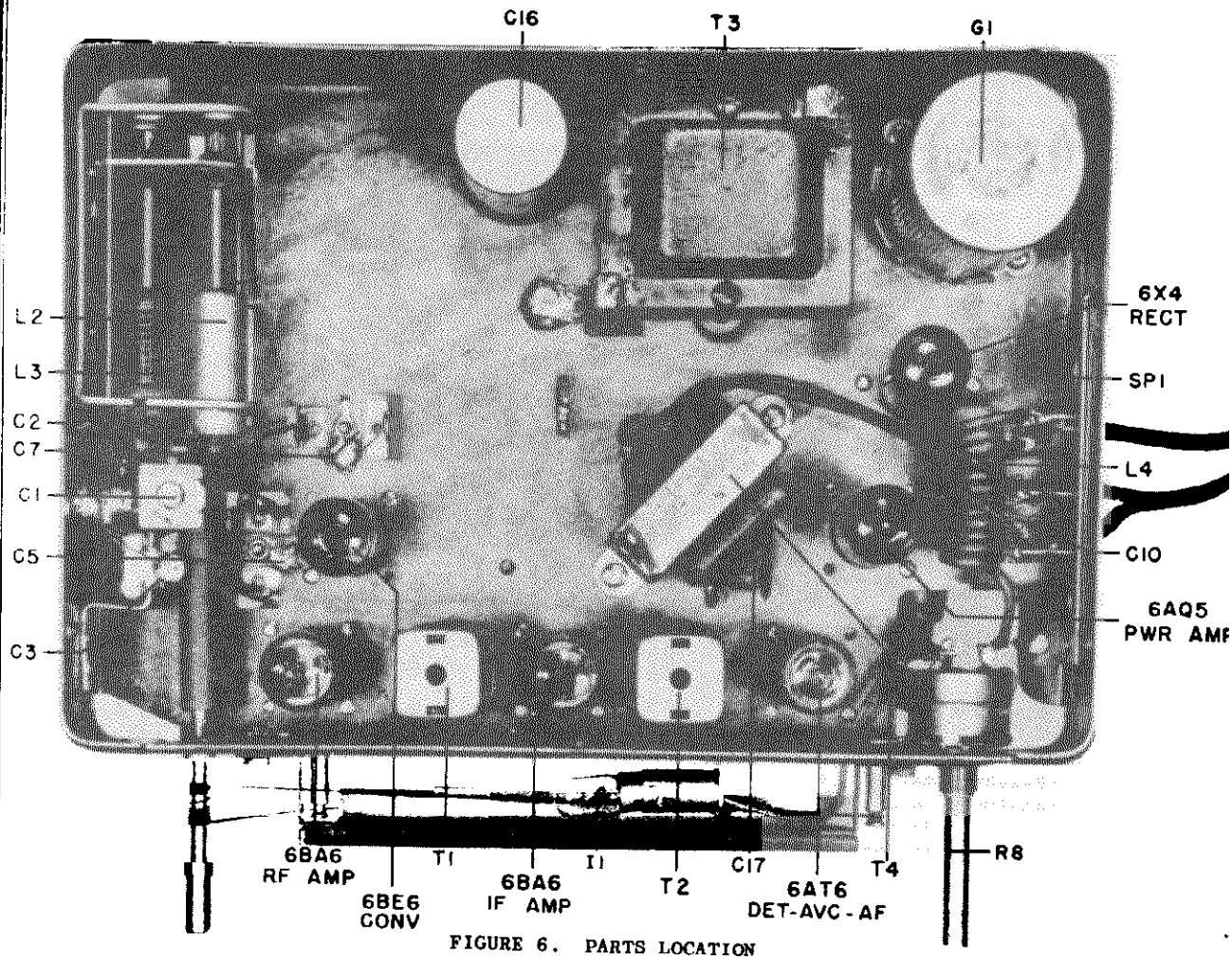


FIGURE 6. PARTS LOCATION

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21A591682	Ceramic: 90 mmf 500V.....
C-2	8A4529	Paper: .006 mf 100V .....
C-3	20A502338	Trimmer, mica: 20 to 180 mmf
C-4	21K70720	Molded: 5 mmf 500V.....
C-5	20A481526	Trimmer, mica: 20 to 80 mmf.
C-6	21K77373	Ceramic: 47 mmf .....
C-7	20A485708	Trimmer, mica: 395 to 470 mmf
C-8	8K14791	Paper: .05 mf 400V.....
C-9	8R13514	Paper: .05 mf 100V .....
C-10	8K17028	Paper: .5 mf 100V .....
C-11	8R472754	Paper: .01 mf 100V .....
C-12	8K17028	Paper: .5 mf 100V .....
C-13	8R23690	Paper: .01 mf 400V .....
C-14	21K481377	Ceramic: 500 mmf .....
C-15	8R9883	Paper: .03 mf 1000V .....
C-16	23A485677	Electrolytic: 15-10-20 mf/ 350-350-25V.....
C-17	8K71909	Paper: .004 mf 400V .....
Fuse		
F-1	65K16248	Fuse: 9 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	24B502472	Antenna Coil Assembly .....
L-2	24B502473	RF Coil Assembly .....
L-3	24B502474	Oscillator Coil Assembly ...
L-4	24K580706	Choke, RF .....
L-5	24A472535	Choke, hash .....
Speaker		
LS-1	50B501989	Speaker, PM: 5-1/4"; 3.2 ohm voice coil .....
Resistors		
	Note:	All resistors are insulated carbon type unless otherwise specified.
R-1	6R6032	470,000 20% 1/2W .....
R-2	6R3992	150 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-6	6R490001	6800 10% 1W N.I. ....

MODEL 451

Ref. No.	Part Number	Description
R-7	6R6004	1 meg 20% 1/2W .....
R-8	18K501294	Volume Control: .5 meg; includes on-off switch....
R-9	6R5614	56 10% 1/2W .....
R-10	6R5614	56 10% 1/2W .....
R-11	6R2122	4.7 meg 20% 1/2W .....
R-12	6R6032	470,000 20% 1/2W .....
R-13	6R6414	270,000 10% 1/2W .....
R-14	6R6336	270 10% 1W .....
R-15	6R488312	2200 10% 1W N.I. .....

Spark Plate

SP-1	1B501290	Spark Plate Assembly ....

Transformers

T-1	24B485553	IF, 455 Kc: complete ....
T-2	24K485554	Diode, 455 Kc: complete..
T-3	25C501303	Power Transformer .....
T-4	25B70171	Output Transformer .....

CHASSIS PARTS - MECHANICAL

7K501418	Bracket, dial background: ivory
1X76859	Cable Assembly, speaker .....
42A485548	Clip, coil can mtg (T-1 & T-2)..
42A4215	Clip, vibrator grounding .....
11M8877	Cord, dial: 20 lb; black .....
58A501296	Coupling, tuning shaft .....
4S7666	Lockwasher, ext: #6; cad pl (power transformer mtg) .....
2S7005	Nut, hex: 6-32 x 1/4; stl; cad pl (power transformer mtg) ....
2S7051	Nut, hex: 3/8-32 x 9/16; Palnut; stl; cad pl (volume control mtg) .....
1A501293	Pointer and Sliver Assembly ....
9A472148	Receptacle, antenna .....
5S7770	Rivet: .088 x 5/32; stl; nkl pl (tube socket mtg) .....
5S7706	Rivet: .122 x 1/8; stl; nkl pl (dial light mtg) .....
5S7707	Rivet: .122 x 5/32; stl; nkl pl (output transformer, vibrator socket, and trimmer mtg) ....
5S7703	Rivet: .122 x 7/32; stl; nkl pl (spark plate assembly mtg)...
5K501365	Rivet, shoulder (dial cord guide) .....
3S7247	Screw, machine: 6-32 x 3/16; slotted locking head; stl; cad pl (tuner mtg) .....
3S7506	Screw, sheet metal: #6 x 1/4; plain hex head; stl; cad pl (dial background bracket mtg) .....
47B501362	Shaft, tuning .....
9K592354	Socket, dial light: includes mtg bracket .....
9A472534	Socket, tube: miniature; 7-prong...
9K580218	Socket, tube: miniature; 7-prong; with dummy lug .....
9A70208	Socket, tube: 4-prong (vibrator)...
41A485380	Spring, insert (inside tuning shaft coupling) .....
29A76280	Terminal, pin and washer: black (speaker cable) .....
29K76282	Terminal, pin and washer: white (speaker cable) .....
4K501364	Washer, "C" (tuning shaft retainer) .....

Part Number	Description
HOUSING PARTS	
43A501295	Bushing, mounting (on control shafts) .....
15D501282	Cover, housing bottom .....
15K501310	Cover, housing top .....
13D501197	Escutcheon, dial: chrome pl .....
36B501297	Knob, control: includes setscrew...
64K501447	Plate, dial scale retaining: ivory.
34B501360	Scale, dial: glass .....
3S8114	Screw, sheet metal: #8 x 1/4; slotted acorn head; antique copper finish (housing screws) .....
3S490733	Screw, sheet metal: #8 x 1/4 Phillips head; chrome pl (escutcheon mtg) .....
3S7118	Setscrew (control knob) .....
2S7087	Speednut (dial scale mtg) ...
MOUNTING PARTS AND ACCESSORIES	
7B501298	Bracket, receiver mtg (recvr to instrument panel) .....
7A72256	Bracket, receiver mtg (on hsng)....
7A484424	Bracket and Stud Assembly (receiver mtg) .....
8A4491	Capacitor, noise suppression (generator cap) .....
9K592648 or 9K580705	Lead Assembly: complete with fuse..
4S7688	Lockwasher, int-ext: 1/4; cad pl (receiver mtg).....
2S2878	Nut, hex: 1/4-20 x 7/16; stl; cad pl (receiver mtg) .....
3S7475	Screw, sheet metal: #8 x 1/4 slotted acorn head; cad pl (mtg brkt mtg-rear) .....
3S8109	Screw, sheet metal: #8 x 3/8; PKZ; slotted acorn head; cad pl (mtg brkt mtg-front) .....
3S7295	Screw, machine: 1/4-20 x 3/4; plain hex head; stl; cad pl (receiver mtg strap) .....
3S9694	Screw, machine: 1/4-20 x 1-1/2; plain hex head; stl; cad pl (receiver mtg to firewall).....
42A485718	Strap, receiver mtg .....
6A4141	Suppressor, noise (distributor)..

TUNER - MODEL MT-87

Note: Electrical parts of the tuner are included in the Electrical Chassis Parts List

51D502490	Tuner, Model MT-87: complete.....
43A502513	Bushing, stop (stop on manual drive shaft) .....
42A502507	Clip, spring (manual drive shaft retainer) .....
46A502505	Core, iron (L-1, 2 & 3 tuning-specify color coding on old core when ordering) .....
5A502510	Grommet (L-1 & L-2 mtg) .....
5K502516	Grommet (L-3 mtg) .....
5A501503	Grommet (L-1, 2 & 3 core mtg)...
2A502508	Nut, tension drive (on tuner carriage) .....
47A502509	Shaft, manual drive .....
46A502506	Sleeve, iron (inside L-1 & L-2 shields) .....
4K502518	Washer, fibre (on manual drive shaft) .....
4A502517	Washer, paper (inside L-1 & L-2 shields) .....

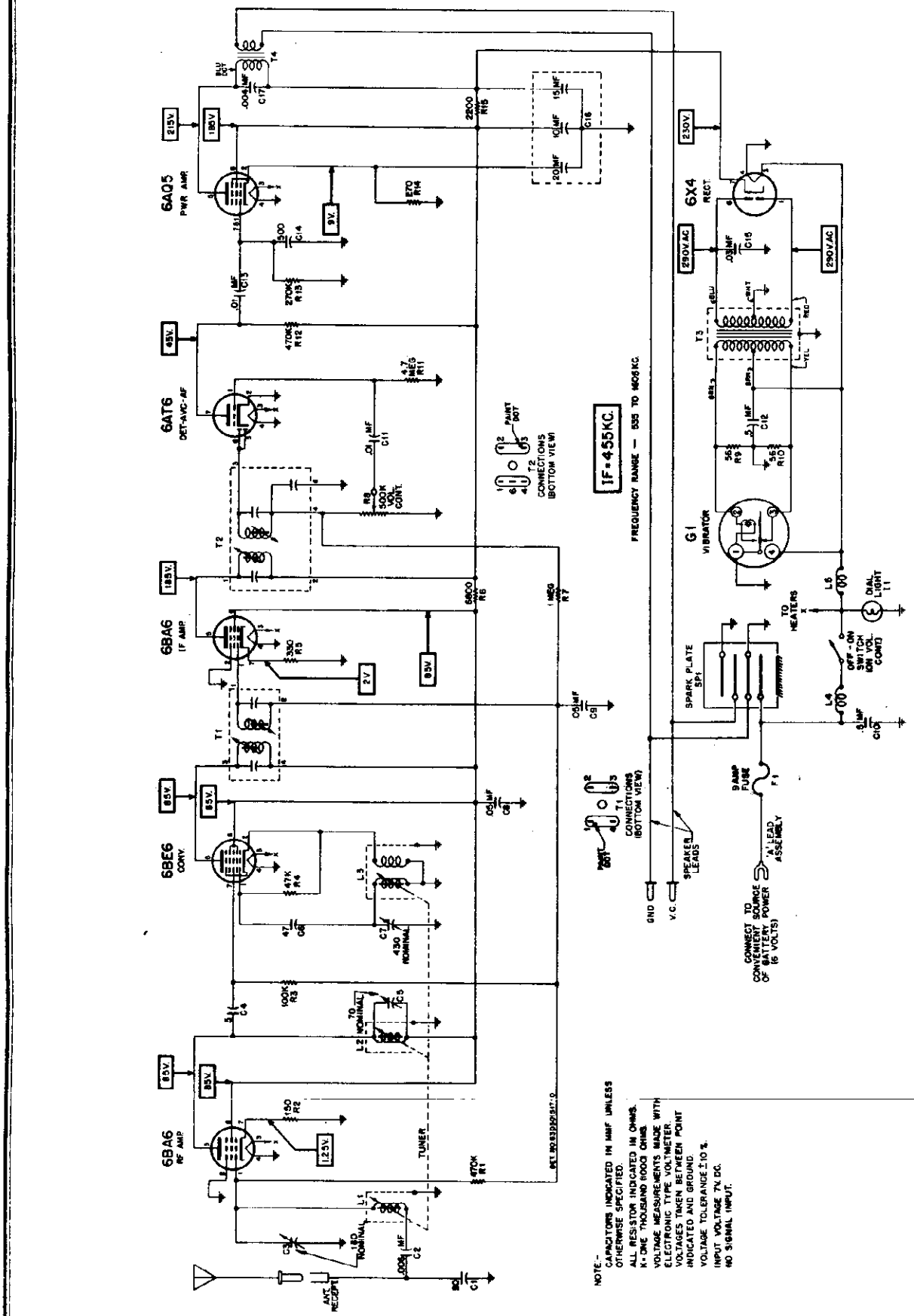


FIGURE 7. SCHEMATIC DIAGRAM

GENERAL INFORMATION

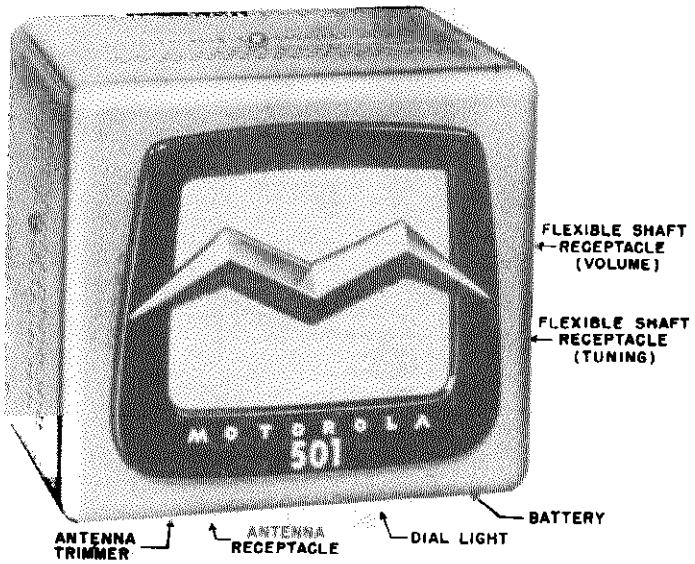
TYPE - Compact automotive type superheterodyne receiver with self-contained speaker. Receiver is designed for installation in any car when used with appropriate Motorola control head.

TUNING RANGE - 535 to 1600 Kc IF - 455 Kc

TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Det, AVC & AF Amp
6AQ5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 6.8 amps at 6.3 volts

POWER OUTPUT - 3.5 watts (max)



REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
		CHASSIS PARTS - ELECTRICAL
		Capacitors
C-1	21A591682	Ceramic: 90 mmf 500V .....
C-2	8C4529	Paper: .006 mf 100V .....
C-3	20K592078	Trimmer, variable: 50 to 280 mmf; on same bracket as C-5 and C-7,(sold only as assembly) .....
C-4	21K70720	Molded: 5 mmf 500V .....
C-5	20K592078	Trimmer, variable: 20 to 180 mmf; on same bracket as C-3 and C-7 (sold only as assembly) .....
C-6	8K17028	Paper: .5 mf 100V .....
C-7	20K592078	Trimmer, variable: 500 to 580 mmf; on same bracket as C-3 and C-5 (sold only as assembly) .....
C-8	21R6513	Mica: 50 mmf 10% 300V....
C-9	8R13166	Paper: .1 mf 400V .....
C-10	8R13514	Paper: .05 mf 100V .....
C-11	8R13514	Paper: .05 mf 100V .....
C-14	21K70720	Molded: 5 mmf 500V.....
C-15	8K17028	Paper: .5 mf 100V .....
C-16	8R490449	Paper: .02 mf 1000V.....
C-17	21K478410	Ceramic: 1000 mmf 500V.....
C-18	8R71911	Paper: .03 mf 400V .....
C-19	8R23690	Paper: .01 mf 400V.....
C-20	23A485677	Electrolytic: 15-10-20 mf/350-350-25V .....
		Fuse
F-1	65K16248	9 amp .....
		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	24B592153	Oscillator Coil (specify color of paint dots on old coil when ordering) .....
L-4	24K78026	Choke,("A" lead).....
L-5	24K78026	Choke (dial light) .....
L-6	24A472535	Choke, hash .....
		Resistors
		Note: All resistors are insulated carbon type 20% unless otherwise specified.
R-1	6R6032	470,000 1/2W .....

Ref. No.	Part Number	Description
R-2	6R6432	270 10% 1/2W .....
R-3	6R6075	100,000 1/2W .....
R-4	6R6056	47,000 1/2W .....
R-5	6R6090	470 10% 1/2W .....
R-6	6R6287	6800 1W N.I. .....
R-7	6R6004	1 meg 1/2W .....
R-8	1A472531	Volume Control: 500,000 ohms; includes SPST switch ..
R-9	6R6056	47,000 1/2W .....
R-10	6R6004	1 meg 1/2W .....
R-11	6R5614	56 10% 1/2W .....
R-12	6R5614	56 10% 1/2W .....
R-13	6R2118	3.3 meg 1/2W .....
R-14	6R6032	470,000 1/2W .....
R-15	6R6015	220,000 1/2W .....
R-16	6R6336	270 10% 1W .....
R-17	6R6184	1000 1W N.I. .....
R-18	6R5577	2700 10% 1/2W .....
Spark Plate		
SP-1	1X592328	Spark Plate Assembly: complete .....
Transformers		
T-1	24B485553	IF, 455 Kc: complete with tuning cores and padding capacitors .....
T-2	24B485555	Diode, 455 Kc: complete with tuning cores and padding capacitors .....
T-3	25B70171	Output Transformer .....
T-4	25B472533	Power Transformer .....

Part Number	Description
CHASSIS PARTS - MECHANICAL	
42A485548	Clip, coil can mtg .....
42A13177	Clip, center post grounding.....
42A4215	Clip, vibrator grounding .....
4S7695	Lockwasher, int: #5; stl; cad pl (terminal strip mtg).....
9A472148	Receptacle, antenna .....
5S7771	Rivet: .088 x 3/16 stl; nkl pl (tube socket mtg) .....
5S7706	Rivet: .122 x 1/8; stl; nkl pl (center post ground clip mtg)
5S7707	Rivet: .122 x 5/32; stl; nkl pl (terminal strip and output transformer mtg) .....
5S7701	Rivet: .122 x 3/16; steel; nkl (vibrator grounding clip mtg)
3S8140	Screw, sheet metal: #8 x 3/16 PKZ plain hex head; cad pl (tuner mtg) .....
3S7454	Screw, sheet metal: #8 x 1/4 plain hex head; stl; cad pl (capacitor bracket assembly and spark plate mtg) .....
3S3397	Screw, sheet metal: #8 x 5/16 PKZ plain hex head; cad pl (power transformer mtg) .....
9A70208	Socket, tube: 4-pin; with grounding lug (vibrator socket) .....
9A472534	Socket, tube: miniature; 7-prong...
9K580218	Socket, tube: miniature; 8-prong...
31C4079	Strip, terminal: 1 insulated lug, end mtg .....
31A472573	Strip, terminal: 2 ins lugs, #2 mtg .....

Part Number	Description
HOUSING PARTS	
42A472033	Clip, chassis retainer .....
13B501659	Cloth, speaker escutcheon .....
13D501358	Escutcheon, speaker .....
1X501347	Housing and Bushing Assembly, rear.
1X501349	Housing, front: includes escutcheon.
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 9 amp fuse .....
1X74340	Lead Assembly, dial light: complete with bulb .....
4S7653	Lockwasher, int-ext: 5/16; stl; cad pl (receiver mtg) .....
4S7657	Lockwasher, ext: #8; stl; cad pl (speaker mtg) .....
2S7003	Nut, hex: #8 x 5/16; stl; cad pl (speaker mtg) .....
2S2863	Nut, hex: 5/16-18 x 9/16; stl; cad pl (receiver mtg) .....
1K75148	Shaft, flexible: with housing 24" lg
50K500415	Speaker, PM: 5-1/4; 3.2 ohm VC.....
3A77542	Stud, receiver mtg .....
6X4141	Suppressor, distributor .....
TUNER PARTS - MECHANICAL	
Note:	Electrical parts of the tuner are included in the Electrical Chassis Part List.
1X592301	Manual Tuner MT-75 .....
1X592099	Base, Sleeve, Shields and Channels Assembly .....
1X78034	Carriage Plate, Slug Insulator and Center Guide Rod Assembly.....
42A70184	Clip, core adjustment .....
46K592080	Core, iron and screw.....
58K78012	Coupling, manual lead screw ...
14A70876	Insulator, coil sleeve .....
14B78007	Insulator, slug: bakelite.....
2A77596	Nut, floating: without ear (on manual lead screw).....
2A78005	Nut, floating: with ear (on manual lead screw) .....
64A77593	Plate, tuner front .....
5S7770	Rivet: .088 x 5/32; stl; nkl pl (slug insulator mtg) .....
47A78002	Rod, carriage guide.....
3S7352	Screw, machine: 8-32 x 2 slotted round head; stl; cad pl (front plate mtg) .....
43A70881	Sleeve, coil (iron) .....
41A77595	Spring, coil slug .....
41A77592	Spring, compression .....
42A21577	Washer, "C": spring (manual lead screw mtg) .....
4A70873	Washer, coil spacer .....
4A74571	Washer, fishpaper.....
4A70956	Washer, slug insulator .....
4K485653	Washer, spring (manual lead screw mtg) .....

MODEL 501

ALIGNMENT

Remove receiver front and rear housings to expose all adjustments.

Connect a 6 volt battery to BAT terminal and chassis.

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.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7) & chassis	455 Kc	High frequency end (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating step.
RF ALIGNMENT						
2.	See Fig. 1	Antenna receptacle through dummy	1610 Kc	High frequency end: cores should project 1-1/8" from cans (Screw out if necessary)	5, 6 & 7	Peak for maximum in order indicated.
3.	"	"	1425 Kc	1425 Kc -per Fig. 1	8, 9 & 10	Peak for maximum in order indicated.

4. When receiver is installed in car, extend antenna fully, set dial to approximately 1400 Kc and repeak antenna trimmer (7) for maximum volume of a weak station or noise between stations.

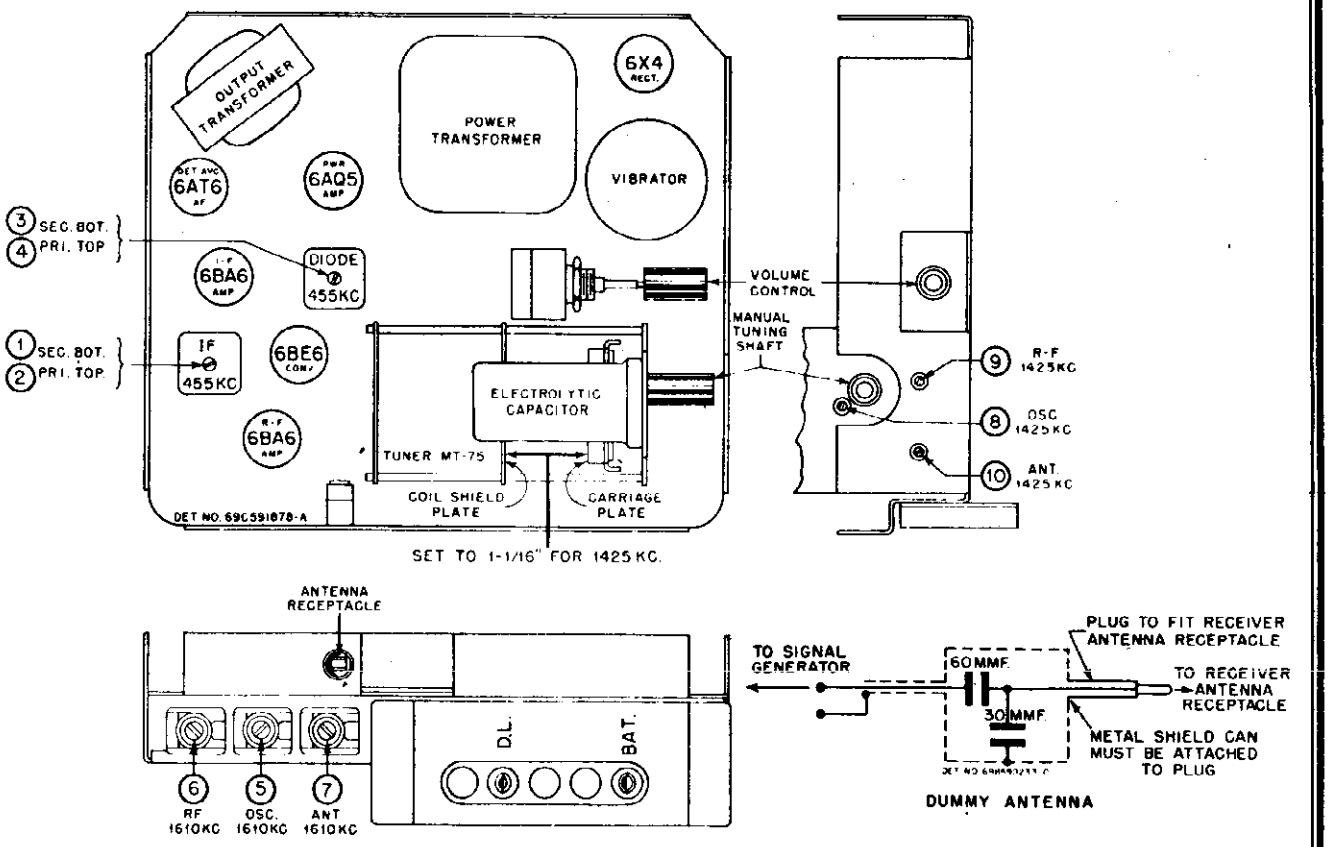


FIGURE 1. TUBE & TRIMMER LOCATIONS AND DUMMY ANTENNA

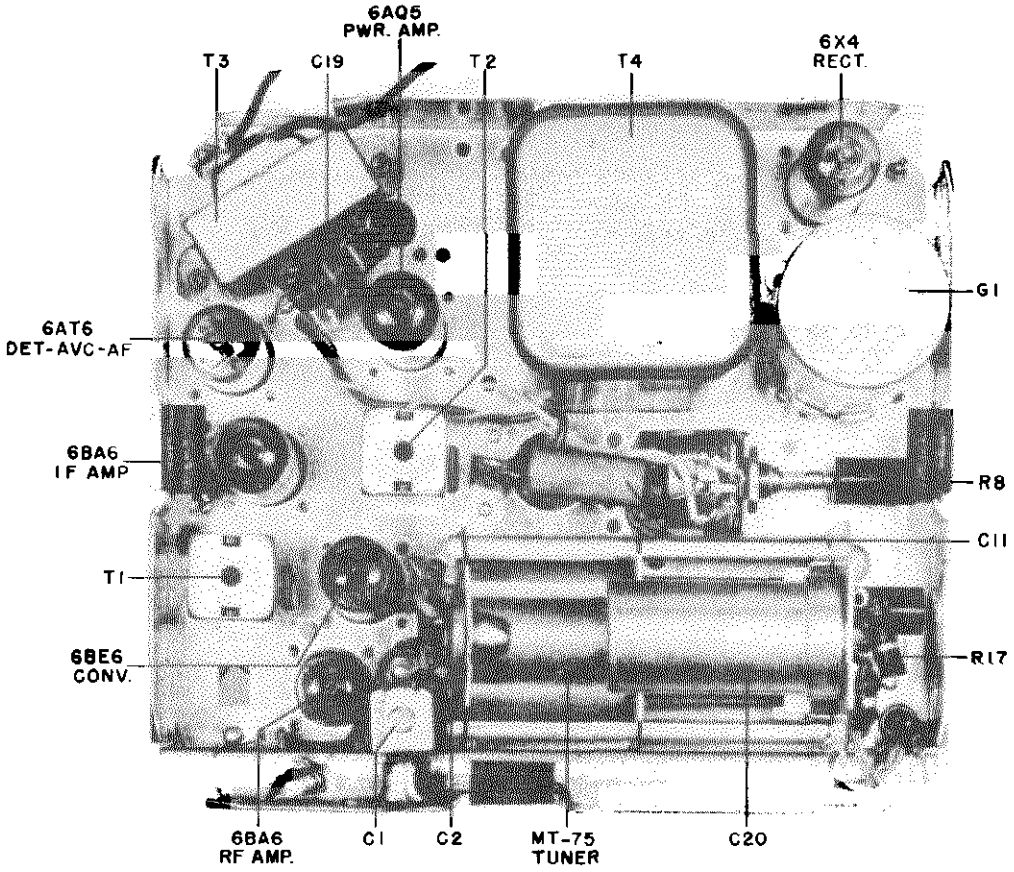


FIGURE 2. TOP VIEW OF CHASSIS

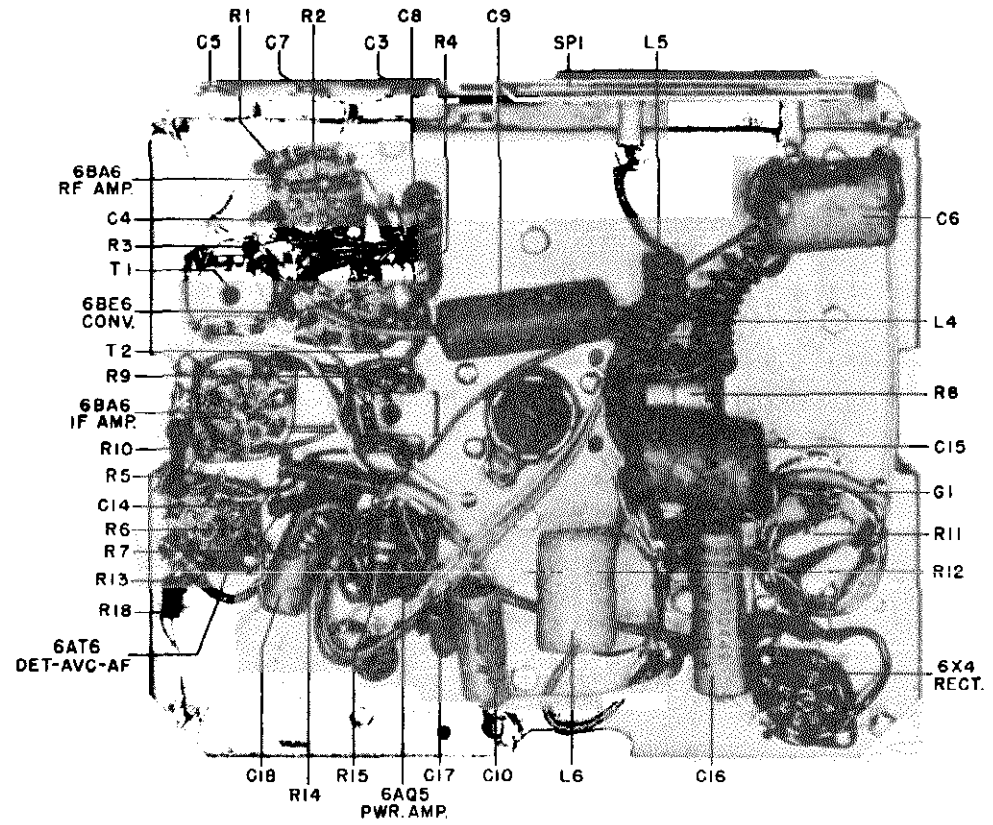


FIGURE 3. BOTTOM VIEW OF CHASSIS

MODEL 501

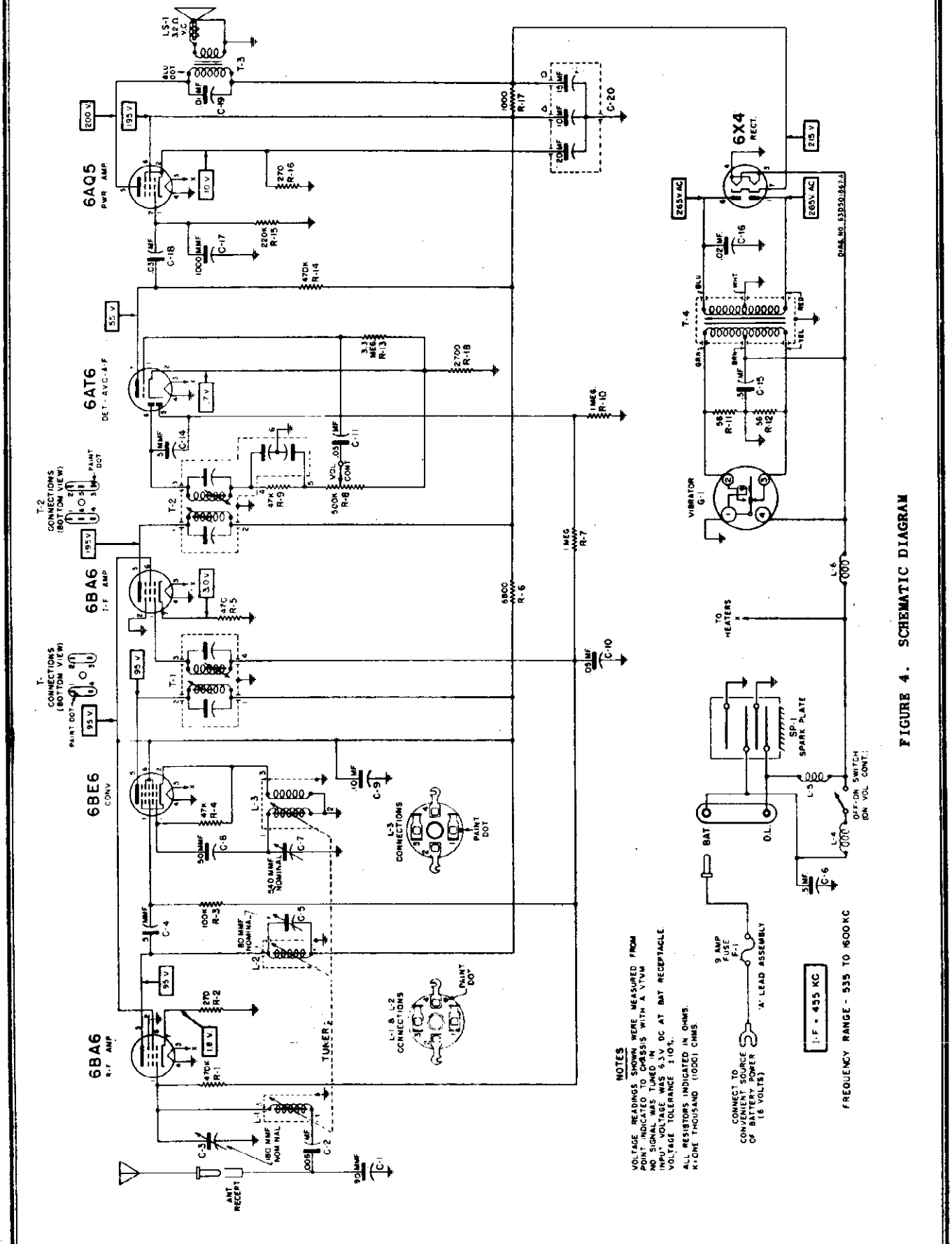


FIGURE 4. SCHEMATIC DIAGRAM

GENERAL INFORMATION

TYPE - Compact automotive type superheterodyne receiver with self-contained speaker. Receiver is designed for installation in any car when used with appropriate Motorola control head.

TUNING RANGE - 540 to 1600 Kc IF - 455 Kc

TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Det, AVC & AF Amp
6AQ5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 6.8 amps at 6.3 volts

POWER OUTPUT - 3.5 watts (max)

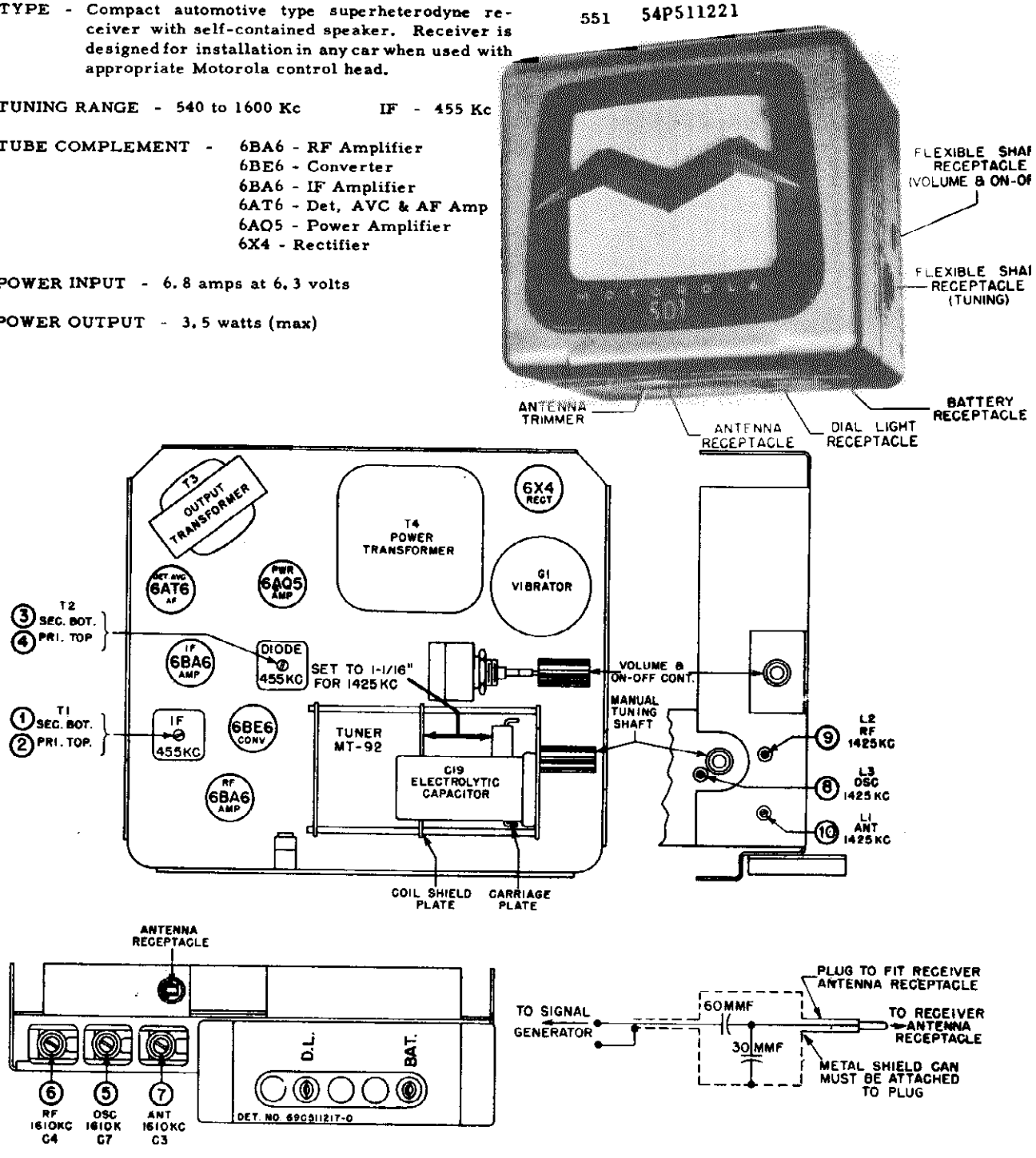


FIGURE 1. TUBE AND TRIMMER LOCATIONS AND DUMMY ANTENNA

ALIGNMENT

Remove receiver front and rear housings to expose all adjustments.

Connect a 6 volt battery to BAT terminal and chassis.

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 alignmer by reducing signal generator output as stages are brougl into alignment. Use a small fibre screwdriver when align ing IF and diode transformers. A special tool, Motorol Part No. 66A76278, is required for adjusting the tuner core IMPORTANT: Do not push in on the alignment tool whe adjusting the tuner cores; the slightest inward pressure ma move tuner carriage and result in inaccurate alignment.

MODEL 501A

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7) & chassis	455 Kc	High frequency end (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating step.
RF ALIGNMENT						
2.	See Fig. 1	Antenna receptacle through dummy	1610 Kc	High frequency end; cores should project 1-1/8" from cans (screw out if necessary)	5, 6 & 7	Peak for maximum in order indicated.
3.	"	"	1425Kc	1425 Kc -per Fig. 1	8, 9 & 10	Peak for maximum in order indicated.

4. When receiver is installed in car, extend antenna fully, set dial to approximately 1400 Kc and repeak antenna trimmer (7) for maximum volume of a weak station or noise between stations.

INSTALLATION INFORMATION

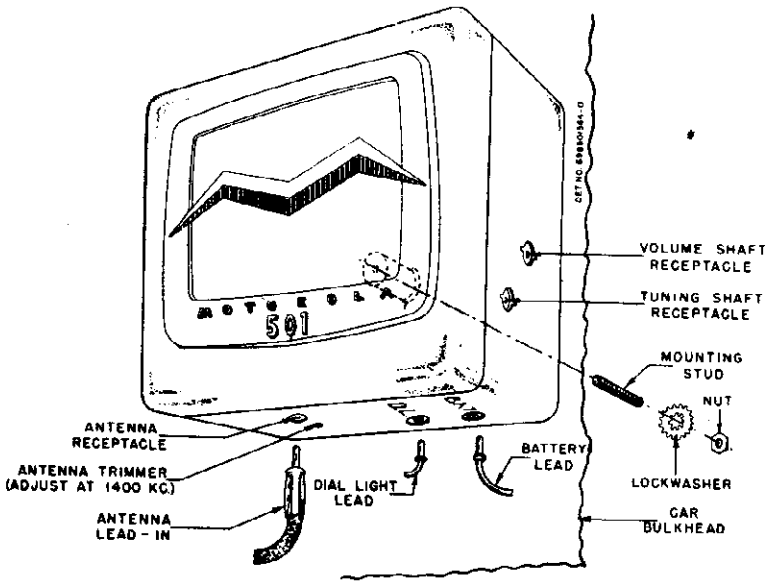


FIGURE 2. RECEIVER INSTALLATION DETAIL

INSTALL DISTRIBUTOR SUPPRESSOR

Cut the high tension lead, which runs from the center terminal of the car distributor to the ignition coil, approximately 1-1/2 inches from the distributor. See Figure 3. Screw the distributor suppressor in series with the two pieces of high tension wire, and plug the end terminal of the lead into the center receptacle of the distributor.

INSTALL CAPACITOR ON GENERATOR

Mount the noise suppression capacitor (Motorola Part Number 8A4491) on the generator frame, under the ground lead screw. See Figure 4. Connect the capacitor lead to the armature terminal of the generator. WARNING: DO NOT CONNECT THE CAPACITOR LEAD TO THE FIELD TERMINAL.

ADDITIONAL MOTOR NOISE HINTS

1. When checking the car for motor noise, clamp the hood down tight.
2. Hood Bonds (Motorola Part Number 39A4205) may be installed at the shoulders so that the hood makes a good ground to the cowl of the car.

TIRE STATIC

After completion of radio installation, road test car for tire static on dry concrete and blacktop pavements, under the following conditions:

1. At both low and high car speeds.
2. With antenna extended to operating position.
3. With radio at full volume and tuned off station.

If tire static noise is encountered, inject Tire Static Elimination Powder (available in kit form - Motorola Part Number 51B591494) into tires, following instructions given on the package.

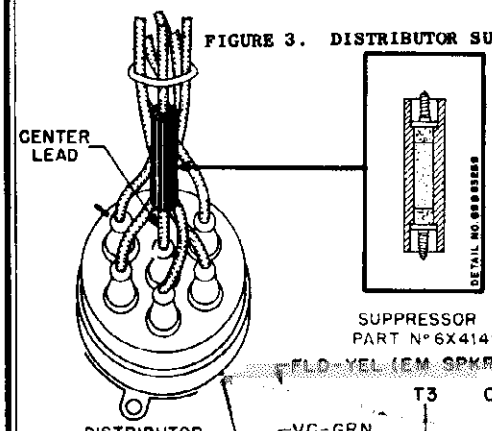


FIGURE 3. DISTRIBUTOR SUPPRESSOR INSTALLATION

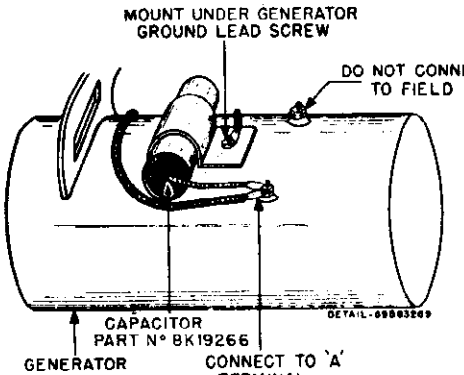


FIGURE 4. GENERATOR CAPACITOR INSTALLATION

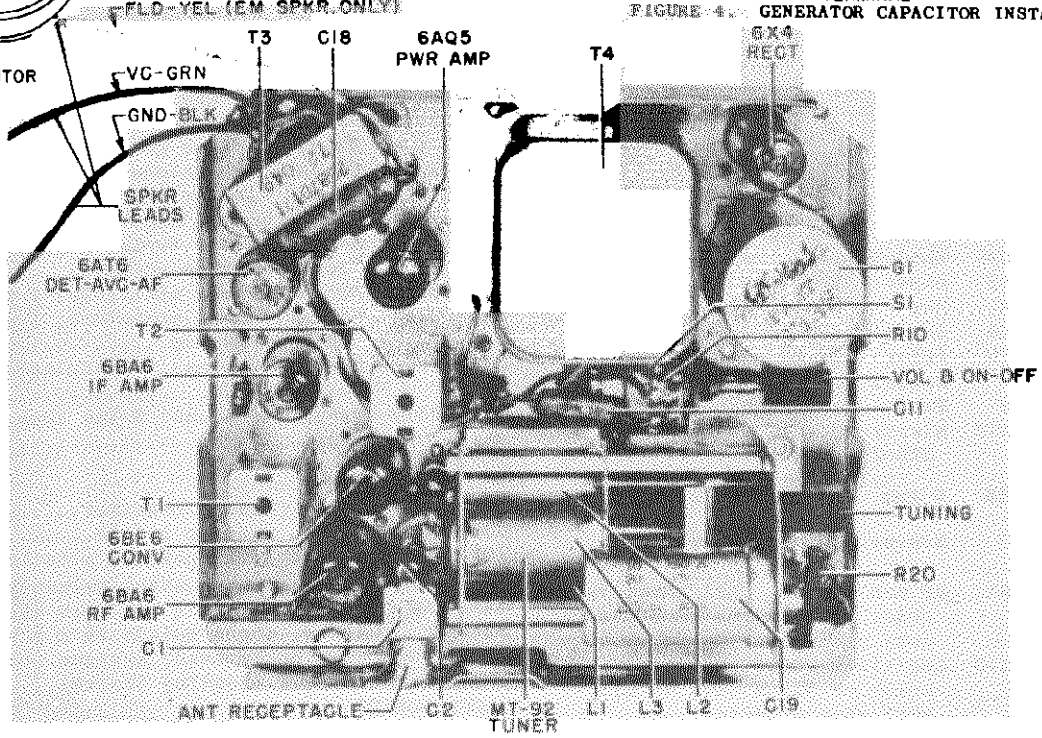


FIGURE 5. TOP VIEW OF CHASSIS

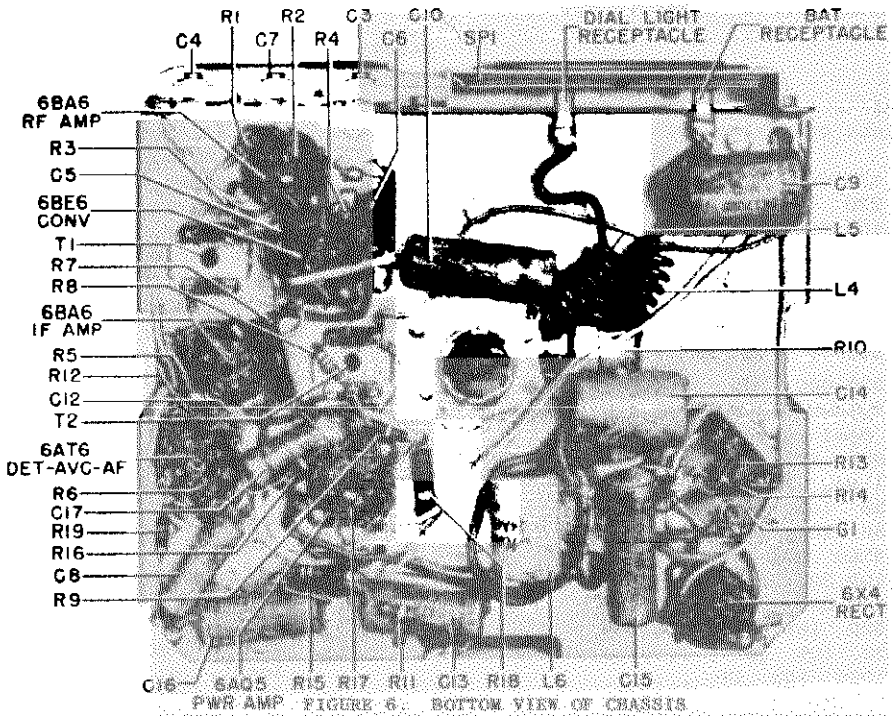


FIGURE 6. BOTTOM VIEW OF CHASSIS

MODEL 501A

REPLACEABLE PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

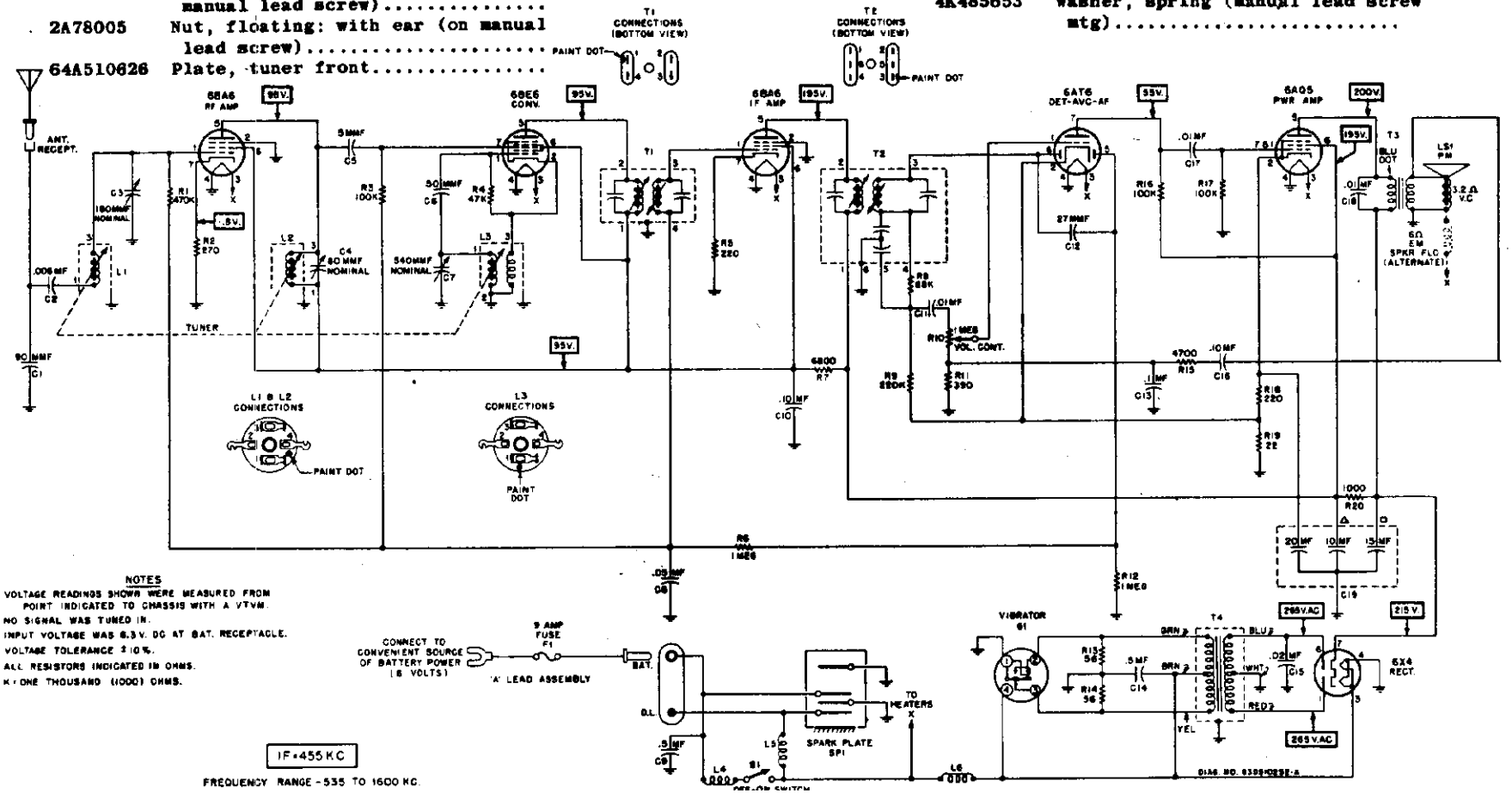
Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21A591682	Ceramic: 90 mmf 500V.....
C-2	8A4529	Paper: .006 mf 100V.....
C-3	20K592078	Trimmer, variable: 50 to 280 mmf on same brkt as C-4 and 7 (sold only as a assem)...
C-4	20K592078	Trimmer, variable: 20 to 180 mmf; on same brkt as C-3 and 7 (sold only as a assem)
C-5	21K70720	Molded: 5 mmf 500V.....
C-6	21R6513	Mica: 50 mmf 10% 300V....
C-7	20K592078	Trimmer, variable: 500 to 580 mmf; on same brkt as C-3 and 4 (sold only on as a assem).....
C-8	8R13514	Paper: .05 mf 100V.....
C-9	8K17028	Paper: .5 mf 100V.....
C-10	8R13166	Paper: .1 mf 400V.....
C-11	8R472754	Paper: .01 mf 100V.....
C-12	21R410089	Molded Disc: 27 mmf.....
C-13	8R472035	Paper: 1 mf 100V.....
C-14	8K17028	Paper: .5 mf 100V.....
C-15	8R490449	Paper: .02 mf 1000V.....
C-16	8R472035	Paper: .1 mf 100V.....
C-17	8R9809	Paper: .01 mf 400V.....
C-18	8R23690	Paper: .01 mf 400V.....
C-19	23A485677	Electrolytic: 15-10-20 mf/ 350-350-25V.....
Fuse		
F-1	65K16248	9 amp.....
Vibrator		
G-1	48B3333	Non-sync: 4-pin.....
Coils		
L-1,2	24B71881	RF and Antenna Coil (Specify color of paint dots on old coil when ordering).....
L-3	24B592153	Oscillator Coil (specify color of paint dots on old coil when ordering).....
L-4	24K78026	Choke, ("A" lead).....
L-5	24K78026	Choke (dial light).....
L-6	24A472535	Choke, hash.....
Resistors		
		Note: All resistors are insulated carbon type, 20%, unless otherwise specified.
R-1	6R6032	470,000 20% ½W.....
R-2	6R6432	270 10% ½W.....
R-3	6R6075	100,000 20% ½W.....
R-4	6R6056	47,000 20% ½W.....
R-5	6R3933	220 20% ½W.....
R-6	6R6004	1 meg 20% ½W.....
R-7	6R6287	6800 20% 1W.....
R-8	6R6074	68,000 10% ½W.....
R-9	6R6015	220,000 20% ½W.....
R-10	18A510819	Volume control: 1 meg; with Spst switch; incl mtg nut..
R-11	6R5554	390 10% ½W.....
R-12	6R6004	1 meg 20% ½W.....
R-13	6R5614	56 10% ½W.....
R-14	6R5614	56 10% ½W.....
R-15	6R6039	4700 20% ½W.....
R-16	6R6075	100,000 20% ½W.....
R-17	6R6075	100,000 20% ½W.....
R-18	6R6389	220 10% 1W.....
R-19	6R6406	22 10% ½W.....
R-20	6R6184	1000 20% 1W.....

Ref. No.	Part Number	Description
Spark Plate		
SP-1	1X592328	Spark Plate Assembly: complete.....
Transformers		
T-1	24B485553	IF, 455 Kc: complete with tuning cores and padding capacitors.....
T-2	24B485555	Diode, 455 Kc: complete with tuning cores and padding capacitors.....
T-3	25B70171	Output Transformer.....
T-4	25B472533	Power Transformer.....
CHASSIS PARTS - MECHANICAL		
	42A485548	Clip, coil can mtg.....
	42A13177	Clip, center post grounding.....
	42A4215	Clip, vibrator grounding.....
	9A472148	Receptacle, antenna.....
	5S7771	Rivet: .088 x 3/16 stl; nkl pl (tube socket mtg).....
	9A70208	Socket, tube: 4-pin; with grounding lug (vibrator socket).....
	9A472534	Socket, tube: miniature; 7-prong...
	9K580218	Socket, tube: miniature; 7-prong; with dummy lug.....
	31C4079	Strip, terminal: 1 insulated lug, end mtg.....
	31A472573	Strip, terminal: 2 ins lugs, #2 mtg.....
HOUSING PARTS		
	42A472033	Clip, chassis retainer.....
	13B510654	Cloth, speaker grille.....
	13D501358	Escutcheon, speaker: plastic.....
	1X510826	Housing and Bushing Assembly, rear.
	1X510828	Housing, front: includes escutcheon
	3S7456	Screw, sheet metal: #8 x ¼ PKA slotted acorn head; antique copper finish (housing screws).....
ACCESSORIES		
	65X4151	Bulb, pilot light: 6-8V; bayonet base; #51.....
	8A4491	Capacitor, generator.....
	9B473111	Lead Assembly, fuse: complete with 9 amp fuse.....
	1X74340	Lead Assembly, dial light: complete with bulb.....
	4S7653	Lockwasher, int-ext: 5/16; stl; cad pl (receiver mtg).....
	4S7657	Lockwasher, ext: #8; stl; cad pl (speaker mtg).....
	2S7003	Nut, hex: #8 x 5/16; stl; cad pl (speaker mtg).....
	2S2863	Nut, hex: 5/16-18 x 9/16; stl; cad pl (receiver mtg).....
	1K75148	Shaft, flexible: with housing; 24" lg.....
	50B510485 or 50B510878	Speaker, EM: 5¼; 3.2 ohm VC; 6V fld
	50K500415 or 50B510427	Speaker, PM: 5¼; 3.2 ohm VC.....
	3A77542	Stud, receiver mtg.....
	6A4141	Suppressor, distributor.....
	29K76284	Terminal, pin: red (fuse lead)....
	29K76287	Terminal, pin: gray (dial light lead).....

TUNER PARTS - MECHANICAL

Note: Electrical parts of the tuner are included in the Electrical Chassis Parts List

1X510840	Manual Tuner MT-92: complete.....
1X592099	Base, Sleeve, Shields and Channels Assembly.....
1X78034	Carriage Plate, Slug Insulator and Center Guide Rod Assembly.....
42A70184	Clip, core adjustment.....
46K592080	Core, iron and screw.....
58K78012	Coupling and Manual Lead Screw....
14A70876	Insulator, coil sleeve.....
14B78007	Insulator, slug: bakelite.....
2A77596	Nut,.floating: without ear (on manual lead screw).....
2A78005	Nut, floating: with ear (on manual lead screw).....
64A510626	Plate, tuner front.....
5S7770	Rivet: .088 x 5/32; stl; nkl pl (slug insulator mtg).....
47A78002	Rod, carriage guide.....
3S7352	Screw,machine: 8-32 x 2 slotted round head; stl; cad pl (front plate mtg).....
43A70881	Sleeve, coil (iron).....
41A77595	Spring, core.....
41A77592	Spring, compression (on manual tuning shaft).....
42A21577	Washer, "C": spring (manual lead screw mtg).....
4A70873	Washer, coil spacer.....
4A74571	Washer, fishpaper.....
4A70956	Washer, slug insulator.....
4K485653	Washer, spring (manual lead screw mtg).....



MODEL 601

GENERAL INFORMATION

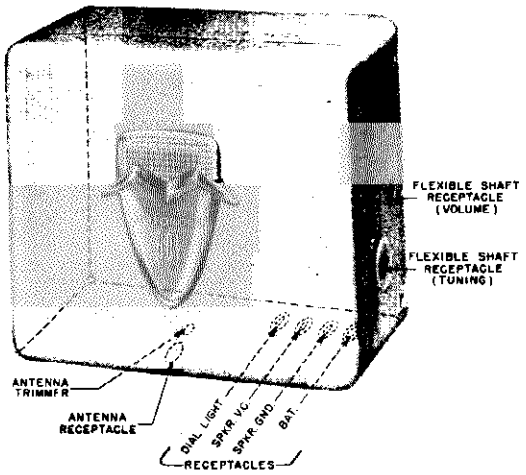
TYPE - Compact automotive type superheterodyne receiver designed for installation in any car when used with appropriate Motorola control head and speaker.

TUNING RANGE - 535 to 1600 Kc IF - 455 Kc

TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Det. AVC & AF Amp
6AQ5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 6.8 amps at 6.3 volts

POWER OUTPUT - 3.5 watts (max)



REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21A591682	Ceramic: 90 mmf 500V.....
C-2	8C4529	Paper: .006 mf 100V.....
C-3	20K592078	Trimmer, variable: 50 to 280 mmf; on same bracket as C-5 and C-8 (sold only as assembly) .....
C-4	8R13166	Paper: .1 mf 400V .....
C-5	20K592078	Trimmer, variable: 20 to 180 mmf; on same bracket as C-3 and C-8 (sold only as assembly) .....
C-6	21K70720	Molded: 5 mmf 500V.....
C-7	21R6513	Mica: 50 mmf 10% 300V....
C-8	20K592078	Trimmer, variable: 500 to 580 mmf; on same bracket as C-3 and C-5 (sold only as assembly) .....
C-9	8K17028	Paper: .5 mf 100V.....
C-10	8R13514	Paper: .05 mf 100V.....
C-11	8R13514	Paper: .05 mf 100V.....
C-14	21K70720	Molded: 5 mmf 500V.....
C-15	8K17028	Paper: .5 mf 100V.....
C-16	8R490449	Paper: .02 mf 1000V.....
C-17	21K478410	Ceramic: 1000 mmf 500V.....
C-18	8R71911	Paper: .03 mf 400V.....
C-19	8R23690	Paper: .01 mf 400V.....
C-20	23A485677	Electrolytic: 15-10-20 mf/ 350-350-25V .....
Fuse		
F-1	65K16248	9 amp .....
Vibrator		
G-1	48B3333	Non-sync: 4-pin .....
Coils		
L-1,2	24B71881	RF and Antenna Coil (specify color of paint dots on old coil when ordering) .....
L-3	24B592153	Oscillator Coil (specify color of paint dots on old coil when ordering) .....
L-4	24K78026	Choke ('A' lead) .....
L-5	24K78026	Choke (dial light) .....
L-6	24A472535	Choke, hash .....
Resistors		
		Note: All resistors are insulated carbon type, 20% unless otherwise specified.
R-1	6R6032	470,000 1/2W .....

Ref. No.	Part Number	Description
R-2	6R6432	270 10% 1/2W .....
R-3	6R6075	100,000 1/2W .....
R-4	6R6056	47,000 1/2W .....
R-5	6R6090	470 10% 1/2W .....
R-6	6R6287	6800 1W N.I. .....
R-7	6R6004	1 meg 1/2W .....
R-8	1A472531	Volume Control: 500,000 ohms; includes SPST switch....
R-9	6R6056	47,000 1/2W.....
R-10	6R6004	1 meg 1/2W .....
R-11	6R5614	56 10% 1/2W .....
R-12	6R5614	56 10% 1/2W .....
R-13	6R5577	2700 10% 1/2W .....
R-14	6R2118	3.3 meg 1/2W .....
R-15	6R6032	470,000 1/2W .....
R-16	6R6015	220,000 1/2W .....
R-17	6R6336	270 10% 1W .....
R-18	6R6184	1000 1W N.I. .....
Spark Plate		
SP-1	1X78041	Spark Plate Assembly: complete .....
Transformers		
T-1	24B485553	IF, 455 Kc: complete with tuning cores and padding capacitors .....
T-2	24B485555	Diode, 455 Kc: complete with tuning cores and padding capacitors .....
T-3	25B70171	Output Transformer .....
T-4	25B472533	Power Transformer .....

Part Number	Description
CHASSIS PARTS - MECHANICAL	
42A13177	Clip, center post grounding.....
42A485548	Clip, coil can mtg .....
42A4215	Clip, vibrator grounding .....
4S7695	Lockwasher, int: #5; stl; cad pl (terminal strip mtg) .....
9A472148	Receptacle, antenna .....
5S7771	Rivet: .088 x 3/16 stl; nkl pl (tube socket mtg) .....
5S7706	Rivet: .122 x 1/8; stl; nkl pl (center post ground clip mtg)
5S7707	Rivet: .122 x 5/32; stl; nkl pl (terminal strip and output trans mtg) .....
5S7701	Rivet: .122 x 3/16; stl; nkl pl (vibrator grounding clip mtg)
3S8140	Screw, sheet metal: #8 x 3/16 PKZ plain hex head; cad pl (tuner mtg) .....
3S7454	Screw, sheet metal: #8 x 1/4 plain hex head; stl; cad pl (capacitor bracket assembly and spark plate mtg) .....
3S3397	Screw, sheet metal: #8 x 5/16 PKZ plain hex head; cad pl (power transformer mtg) .....
9A70208	Socket, tube: 4-pin; with grounding lug (vibrator socket) .....
9A472534	Socket, tube: miniature; 7-prong...
9K580218	Socket, tube: miniature; 8-prong...
31C4079	Strip, terminal: 1 insulated lug, end mtg .....
31A472573	Strip, terminal: 2 insulated lugs,

Part Number	Description
HOUSING PARTS	
42A501270	Clip, escutcheon retainer.....
42A472033	Clip, chassis retainer .....
13D501271	Escutcheon, complete .....
1X501390	Housing and Bushing Assembly, rear.
1X501375	Housing, front; with escutcheon....
3S400356	Screw, sheet metal: #4 x 1/4 plain hex head; stl; cad pl (escutcheon mtg) .....
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 9 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, int-ext: 5/16; stl; cad pl (receiver mtg) .....
2S2863	Nut, hex: 5/16-18 x 9/16; cad pl (receiver mtg) .....
1K75148	Shaft, flexible: with housing: 24" long .....
50B500708 or 50B500684	Speaker: 6" PM; 3.2 ohm VC; less speaker lead .....
3A77542	Stud, receiver mtg .....
6X4141	Suppressor, distributor .....
TUNER PARTS - MECHANICAL	
Note:	Electrical parts of the tuner are include in the Electrical Chassis Parts List
1X592301	Manual Tuner MT-75 .....
1X592099	Base, Sleeve, Shields and Channels Assembly .....
1X78034	Carriage Plate, Slug Insulator and Center Guide Rod Assembly .....
42A70184	Clip, core adjustment .....
46K592080	Core, iron and screw .....
58K78012	Coupling, manual lead screw ....
14A70876	Insulator, coil sleeve .....
14B78007	Insulator, slug: bakelite .....
2A77596	Nut, floating: without ear (on manual lead screw).....
2A78005	Nut, floating: with ear (on manual lead screw) .....
64A77593	Plate, tuner front .....
5S7770	Rivet: .088 x 5/32; stl; nkl pl (slug insulator mtg) .....
47A78002	Rod, carriage guide .....
3S7352	Screw, machine: 8-32 x 2 slotted round head; stl; cad pl (front plate mtg) .....
43A70881	Sleeve, coil (iron) .....
41A77595	Spring, coil slug .....
41A77592	Spring, compression .....
42A21577	Washer, "C": spring (manual lead screw mtg) .....
4A70873	Washer, coil spacer .....
4A74571	Washer, fishpaper .....
4A70956	Washer, slug insulator .....
4K485653	Washer, spring (manual lead screw mtg)

MODEL 601

ALIGNMENT

Remove receiver front and rear housings to expose all adjustments.

Connect a 6 volt battery to BAT terminal and chassis.

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.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7) & chassis	455 Kc	High frequency end (cores out)	1, 2, 3, & 4	Peak for maximum in order indicated. Check by repeating step.
RF ALIGNMENT						
2.	See Fig. 1	Antenna receptacle through dummy	1610 Kc	High frequency end: cores should project 1-1/8" from cans (Screw out if necessary)	5, 6, & 7	Peak for maximum in order indicated.
3.	"	"	1425 Kc	1425 Kc -per Fig. 1	8, 9 & 10	Peak for maximum in order indicated.

4. When receiver is installed in car, extend antenna fully, set dial to approximately 1400 Kc and repeak antenna trimmer (7) for maximum volume of a weak station or noise between stations.

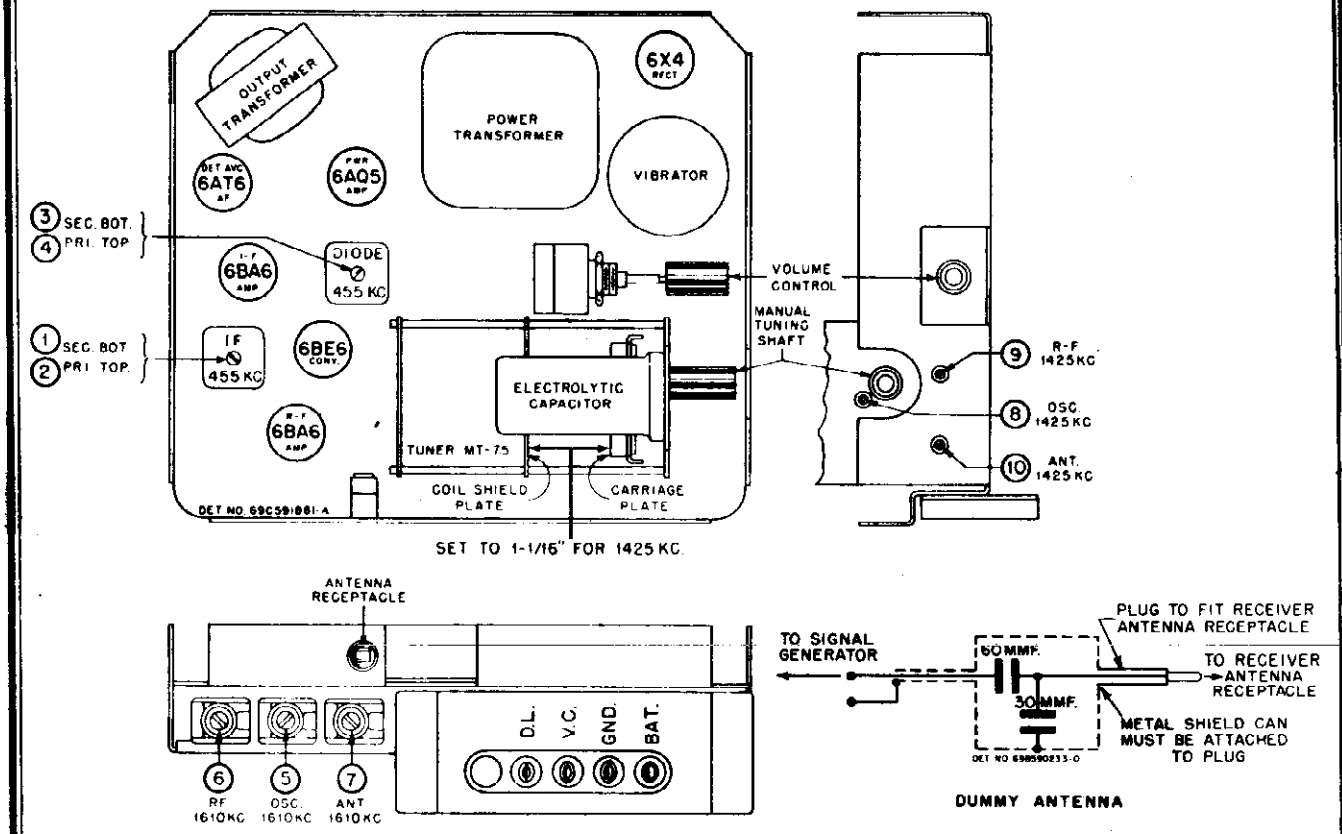


FIGURE 1. TUBE & TRIMMER LOCATIONS AND DUMMY ANTENNA

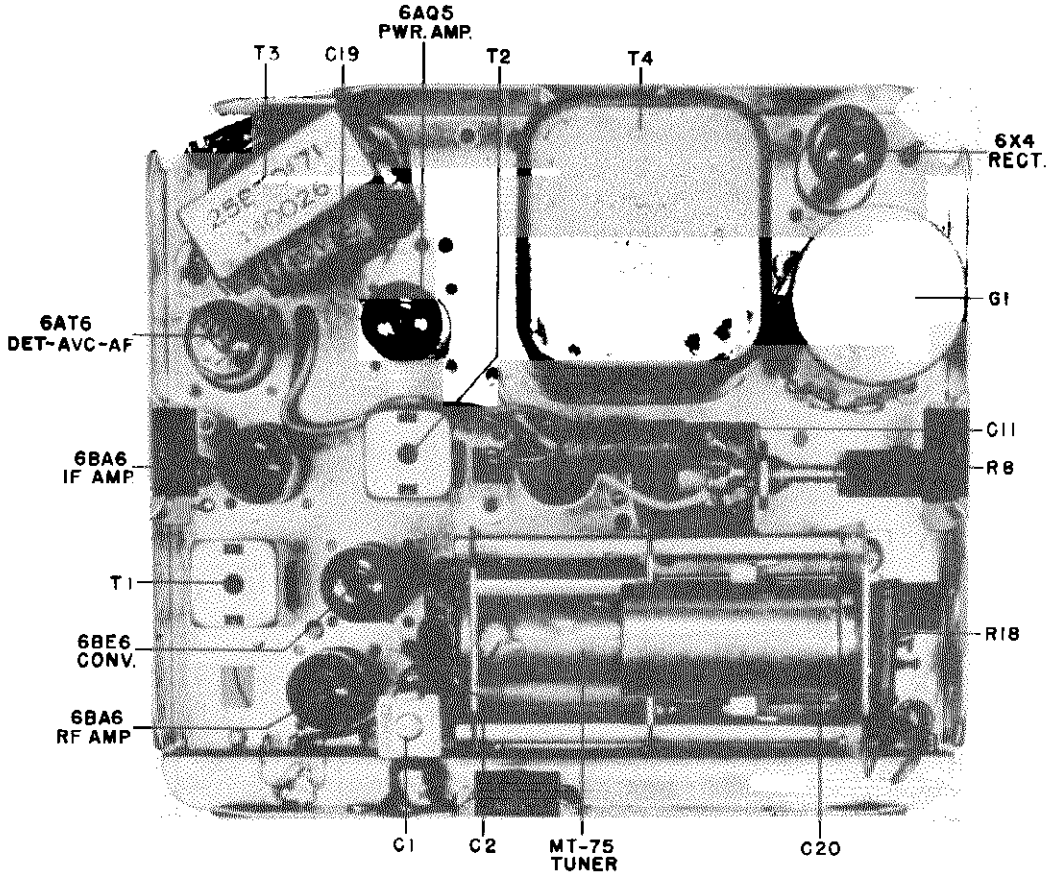


FIGURE 2. TOP VIEW OF CHASSIS

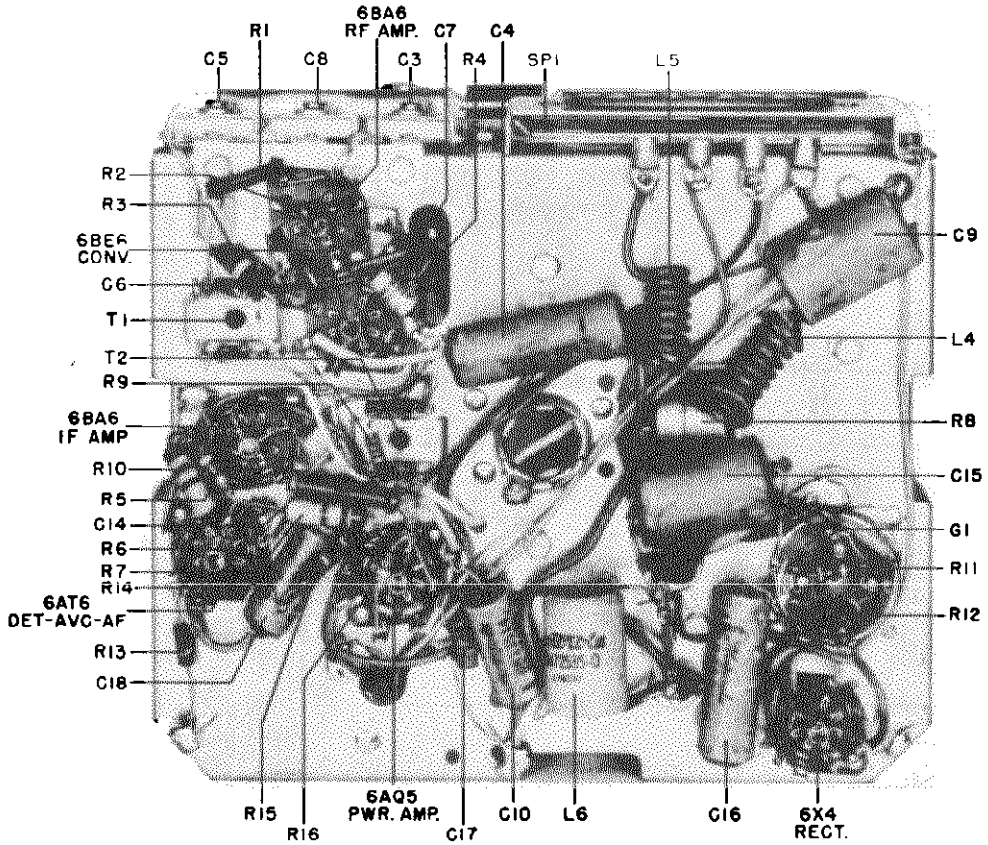


FIGURE 3. BOTTOM VIEW OF CHASSIS

MODEL 601

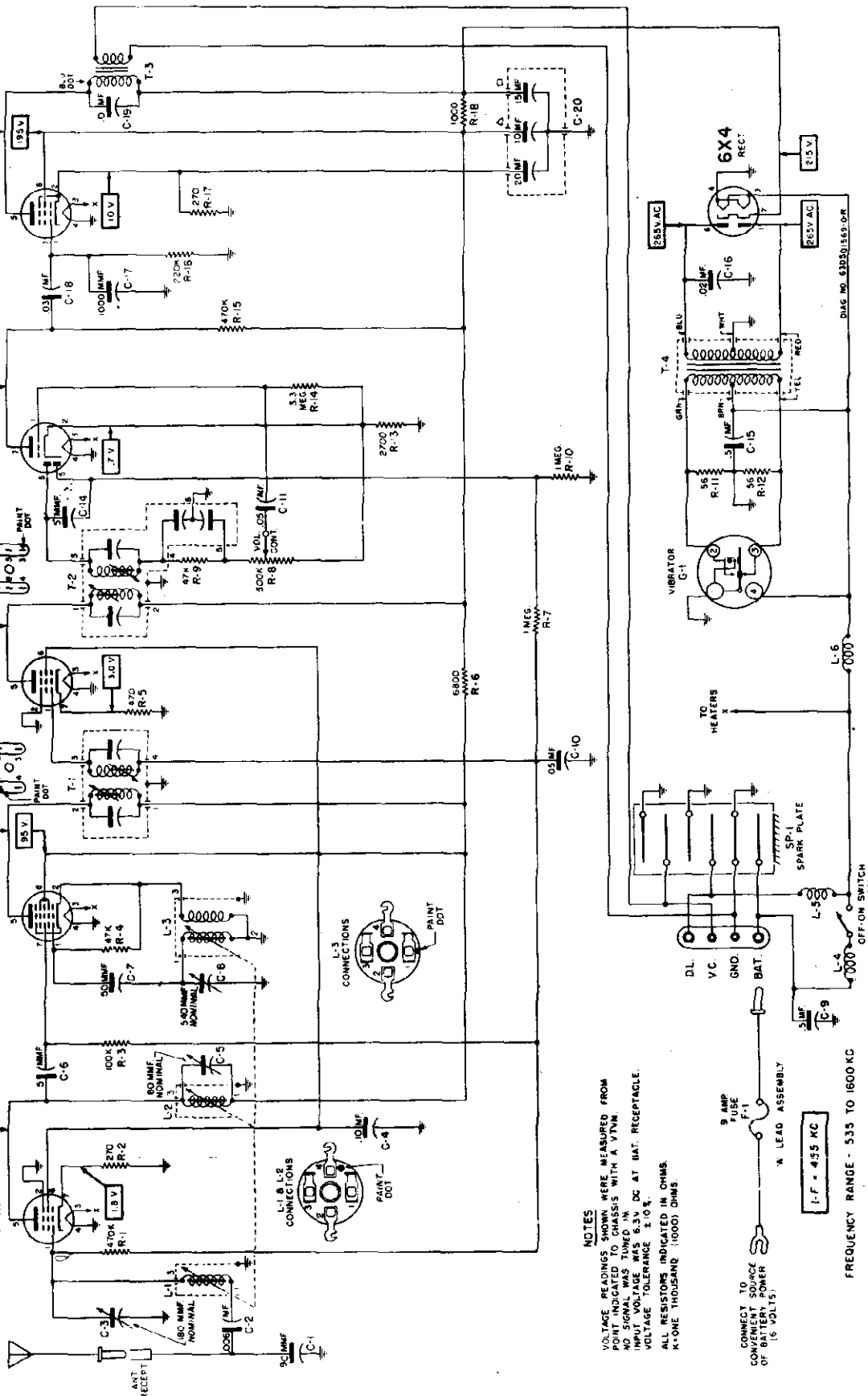


FIGURE 4. SCHEMATIC DIAGRAM

MODEL 601,
Dodge, Plymouth

GENERAL INFORMATION

TYPE - Automotive type superheterodyne receiver, designed to operate from a 6 volt storage battery. This receiver is specifically designed to fit Plymouth P-19, P-20 and Dodge D-33 and D-34 cars.

TUNING RANGE - 535 to 1605 Kc

IF FREQUENCY - 455 Kc

TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Oscillator-Modulator
6BA6 - IF Amplifier
6AT6 - Detector, AVC & 1st Amplifier
6V6GT - Power Amplifier
6X4 - Rectifier

POWER SUPPLY - Input is 6.3V DC at 7.1 amperes

INSTALLATION & OPERATING INSTRUCTIONS

Refer to Figure 1 for operating control locations.

TO TURN THE RADIO ON. Turn the left-hand knob (volume control) clockwise until a click is heard.

MANUAL TUNING. Tune stations with the right-hand knob.

PUSH BUTTON TUNING. After stations have been set up, it is only necessary to push in the button (1, 2, 3 or 4) that has been set to the desired station. Push the button all the way in, to make sure that the station will be tuned in correctly.

TONE CONTROL. The **TONE** push button operates a three-position tone control. Push the button until the most pleasing tone is obtained.

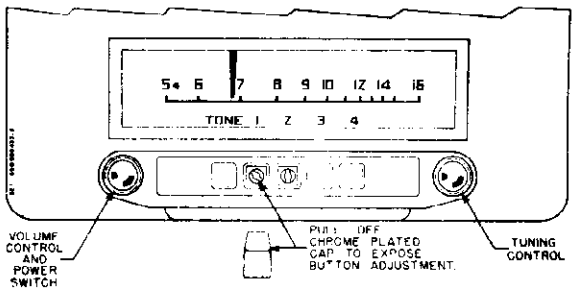


FIGURE 1. PUSH BUTTONS AND CONTROLS

TO SET THE PUSH BUTTONS

Push buttons should preferably be set up in daytime since weak station signals are stronger at night and the button may be set on a distant station carrying the same program as the desired station.

1. Turn radio **ON** (see Operating Instructions) and allow it to warm up for at least 15 minutes. Antenna should be fully extended and tone control in high position.

2. Pull off the chrome plated push button caps from buttons 1, 2, 3 and 4, exposing the knurled metal buttons. See Figure 1.

3. Unlock the four push button settings by turning each knurled button counterclockwise about one turn.

CAUTION: Never turn buttons more than two turns in a counterclockwise direction.

4. With the tuning knob, tune in the station to be set up on No. 1 button. Select only the best and most powerful local stations.

5. Push in the No. 1 button as far as it will go and tighten knurled button securely.

6. Perform steps 4 and 5 for the remaining three push buttons.

7. After all buttons have been set up, check if they can be tuned in more accurately with the tuning knob. If so, unlock button and reset it.

8. A push button may be reset at any time by unlocking the push button , tuning in a new station, and resetting as in step 5.

9. Replace push button caps with the notched side down.

ALIGNMENT

EQUIPMENT REQUIRED

1. A special tool for adjusting the tuner cores. Use Alignment Tool, Motorola Part No. 66A76278.

2. A small fibre screwdriver for IF & RF alignment.

3. An accurately calibrated AM modulated signal generator.

4. A low range output meter.

5. A dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 2.

PROCEDURE

1. Remove the housing and dial scale to expose all alignment adjustment screws.

2. Connect the output meter across speaker voice coil.

3. Connect a 6 volt storage battery to receiver battery receptacle and chassis. Turn receiver on and allow it to warm up for a few minutes. Set receiver volume control at maximum and tone control to treble (high) position.

4. 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.

5. **IF & RF ALIGNMENT.** See Alignment Chart & Figure 2.

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.

CAUTION: Do not press hard on the alignment screwdriver when aligning the IF & diode transformers as damage to the core or transformer may result.

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 car antenna after receiver is installed in car. This adjustment should be made with antenna fully extended and receiver set to approximately 1400 Kc. Peak the trimmer for maximum volume of a weak station or background noise between stations.

MODEL 604, Dodge, Plymouth

ALIGNMENT CHART

STEP	TUNER SET TO	DUMMY ANTENNA	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR FREQUENCY	ADJUST TRIMMER OR CORE	REMARKS
IF ALIGNMENT						
1.	High frequency end (cores out)	.1 mf	Hi side - 6HE6 grid (pin #7) Lo side-chassis	455 Kc	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating procedure.
RF ALIGNMENT						
2.	High frequency end, cores should project 1-1/8" from cans. (Screw out)	See Fig. 2	Ant receptacle through dummy	1605 Kc	5, 6 & 7	Peak for maximum in order indicated.
3.	Set spacing between treadle bar & tuner frame to 21/32". See Fig. 2	"	"	1300 Kc	8, 9 & 10	Peak for maximum in order indicated. Replace dial scale and set pointer to 1300 Kc by means of pointer adjustment eccentric. See Figure 2-

CHASSIS PARTS - ELECTRICAL

REF. NO.	PART NO.	DESCRIPTION
CAPACITORS		
C-1	21B77562	Ceramic: 100 mmf 500V
C-2	8C4529	Paper: .006 mf 100V
C-3	20A77536	Variable, mica: 50 mmf to 280 mmf 500V
C-4	8K13514	Paper: .05 mf 100V
C-5	21K70720	Molded: 5 mmf 500V
C-6	20A481526	Variable, mica: 20 mmf to 180 mmf 500V
C-7	8K13166	Paper: .1 mf 400V
C-8	8C580845	Paper: .5 mf 100V
C-9	8K13514	Paper: .05 mf 100V
C-10	20A77537	Variable, mica: 5 mmf to 88 mmf 500V
C-11	21K74661	Ceramic: 50 mmf 300V
C-12	21K580276	Ceramic: 220 mmf 5% 500V
C-13	8C580845	Paper: .5 mf 100V
C-14	8K13514	Paper: .05 mf 100V
C-15	21K74661	Ceramic: 50 mmf 300V
C-16	8K12840	Paper: .006 mf 1600V
C-17	21K481377	Ceramic: 500 mmf
C-18	8K71910	Paper: .006 mf 400V
C-19	8K71911	Paper: .03 mf 400V
C-20	8K71910	Paper: .006 mf 400V
C-21	23A473015	Electrolytic: 30-30-20 mf/ 350-300-25V
FUSE		
F-1	65X12894	Fuse, tubular: 14 amp
VIBRATOR		
G-1	48B3333	Vibrator, non-sync: 4-pin
PILOT LIGHT		
I-1	65X10867	Bulb: 6.3V .25A tubular; bayonet base; clear; #44
COILS		
L-1	24B580278	Antenna coil (specify color coding on old coil when ordering)
L-2	24K580557	RF coil (specify color coding on old coil when ordering)
L-3	24B580279	Oscillator coil (specify color coding on old coil when ordering)
L-4	24A472535	Choke, hash
SPEAKER		
LS-1	50B580175 or 50B580176 or 50B485788	Speaker: 5 x 7 oval type; PM; 3.2 ohm voice coil
RESISTORS		
		Note: All resistors are carbon insulated type unless otherwise specified.
R-1	6R6032	470,000 20% 1/2W
R-2	6R6075	100,000 20% 1/2W
R-3	6R6012	33,000 20% 1/2W
R-6	6R5554	390 10% 1/2W
R-7	6R6287	6800 20% 1W N.I.
R-8	6R6004	1 meg 20% 1/2W
R-9	6R5614	56 10% 1/2W
R-10	6R5614	56 10% 1/2W
R-11	18A485390	Volume Control: .5 meg; with sw.
R-12	6R6056	47,000 20% 1/2W
R-13	6R2118	3.3 meg 20% 1/2W
R-14	6R6428	6800 10% 1/2W
R-15	6R6054	10,000 20% 1/2W
R-16	6R6032	470,000 20% 1/2W
R-17	6R6032	470,000 20% 1/2W
R-18	6R6434	27,000 10% 1/2W
R-19	6R6004	1 meg 20% 1/2W
R-20	6R6389	220 10% 1W
R-21	6R476004	1000 20% 2W
R-22	6R6432	270 10% 1/2W
SWITCHES		
S-1		Power Switch (part of volume control R-11)
S-2		Tone Control (see Tuner AT-63A Parts List)
SPARK PLATE		
SP-1	1B485528	Spark Plate Assembly
TRANSFORMERS		
T-1	24B485553	IF, 455 Kc: complete
T-2	24K485554	Diode, 455 Kc: complete
T-3	25B70171	Output Transformer
T-4	25K580539	Power Transformer

CHASSIS PARTS - MECHANICAL

PART NUMBER	DESCRIPTION
43A489319	Bearing, pointer link mtg
43A580213	Bushing, receiver mounting
42A485548	Clip, can mounting (T-1 & T-2 mtg).
42A4215	Clip, vibrator grounding
29R5282	Lug, soldering: #10; plain long tab
52A580636	Pointer, dial
1X580507	Pointer Link Plate, Arm and Rivets Assembly: less pointer
9A472148	Receptacle, antenna input
5S7771	Rivet: .088 x 3/16; stl; nkl pl (min tube socket mtg)
5S7706	Rivet: .122 x 1/8; stl; nkl pl (ground strip and light shield mtg)
5S7701	Rivet: .122 x 3/16; stl; nkl pl (vibrator socket mtg)

MODEL 604,
Dodge, Plymouth

PART NUMBER	DESCRIPTION
5S7707	Rivet: .122 x 5/32; stl; nkl pl (octal tube socket and terminal strip mtg)
5S7700	Rivet: .122 x 1/4; stl; nkl pl (output trans mtg)
34C591923	Scale, dial
3S7506	Screw, sheet metal: #6 x 1/4 PKZ plain hex head; stl; cad pl (dial scale mtg)
3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; stl; cad pl (tuner, spkr plate and wiper mtg)
3S3397	Screw, sheet metal: #8 x 5/16 PKZ plain hex head; stl; cad pl (power trans mtg)
3S8176	Screw, sheet metal: #10 x 3/8 PKZ plain hex head; stl; cad pl (spkr mtg)
26A485262	Shield, light: end; (on spkr plate)
24B485268	Shield, light: painted (on spkr plate)
30B580838	Shield, spiral (lead shield)
26A592419	Shield, tube: spring type
9A485228	Socket, pilot light: includes bracket.
9A472534	Socket, tube: minfature; 7-prong
9K580218	Socket, tube: miniature; 7-prong (for 6BE6 tube)
9A6788	Socket, tube: octal
9A70208	Socket, vibrator: 4-prong
1X485536	Speaker Plate, Stud and Shield Assembly
41A590038	Spring, pointer arm backlash
42A580578	Strip, ground (grounds tuner to chassis)
31K86126	Strip, terminal: 2 insulated lugs, #2 mtg
31A472573	Strip, terminal: 2 insulated lugs, #2 mtg (choke mtg)
46A485229	Stud, speaker plate mtg
4S1719	Washer, flat: 3/8 x .140 x .030 thick; stl; cad pl (output trans mtg).
4A590466	Washer, spring (pointer bearing retainer)
39A591197	Wiper, ground
HOUSING PARTS	
42A580509	Clip, dial crystal retainer
39A28036	Clip, grounding (on rear cover)
39A580575	Clip, tension (on front hsng)
15K591954	Cover, housing bottom
61K580238	Crystal, dial; glass
13D590448	Escutcheon, push button: chrome plated
32B580722	Gasket, radio mounting: rubber
1X580506	Housing, front: includes receiver mtg gasket & crystal
1X590344	Housing, rear
2S2869	Nut, mounting: 7/16-28; round; knurled (PB escutcheon mtg)
32A580577	Pad, dial crystal cushion; 6-1/4" long
32K590510	Pad, dial crystal cushion; 1-5/8" long
5S7706	Rivet: .122 x 1/8; stl; nkl pl (front housing clip mtg)
3S7205	Screw, machine: 8-32 x 1/4; slotted hex head; locking type; stl; cad pl (front housing mtg)
3S7475	Screw, sheet metal: #8 x 1/4 PKZ slotted acorn head; stl; cad pl (housing screws)
2A580224	Thumbscrew (bottom cover retaining)
ACCESSORY PARTS	
7B580009	Bracket, radio mounting (Dodge)
7B580877	Bracket, radio mounting (Plymouth)
15A485225	Cap, push button: chrome plated
8A580014	Capacitor, radio interference
15A485342	Cover, receiver mounting nut: chrome pl
1X580809	Knob, control: chrome plated
9K591242	Lead Assembly, radio to ignition sw.
4S2641	Lockwasher, int-ext tooth: 3/4 x 1/4; stl; cad pl (for radio mtg brkt mtg screw)
2S7022	Nut, hex: 1/4-20 x 7/16; stl; cad pl (for radio mtg brkt mtg screw)
2S1393	Nut, hex: 5/16-18 x 1/2; stl; cad pl (radio mtg)
2A485540	Nut, hex: 7/16-28 x 9/16; cad pl (radio mtg)
3A591799	Screw, machine: special; with cup washer; 21/32" lg; stl; cad pl (radio mtg)
3K591900	Screw, machine: special; with cup washer; 15/16" lg; stl; cad pl (radio bracket mtg)
4A590795	Washer, cup: stl: cad pl (radio mtg)

AUTOMATIC TUNER AT-63A

Note: Tuner replacement electrical parts not listed here are listed under Chassis Parts - Electrical. When ordering replacement coils or tuning cores, specify color coding on old coil or core.

51D590440	AT-63A Automatic Tuner Assembly: comp
45A485508	Arm, push button cap support
42A70184	Clip, core adjustment (on tuning core screws)
42A472671	Clip, guide rod retainer: spring steel
1A580751	Core Bar Assembly: complete with bakelite core insulator, carriage guide brkt, pointer actuating arm with link drive pin, pointer adjustment eccentric & 2 bearing eyelets
46K580518	Core, Iron & Screw (ant, RF & osc tuning cores)(specify color coding on old core when ordering)
5S7862	Eyelet: .130 x .155; brass (coil shield mtg)
5S7819	Eyelet: .185 x .187; brass (core bar bearings)
51X591557	Gear Assembly, crown drive
5K580504	Grommet, insulating: rubber (ant & RF coil mtg)
5K580503	Grommet, insulating: rubber (osc coil mtg)
29A580756	Lug, carriage retainer
51A591149	Pinion Shaft & Drive Disc Assembly
51X590124	Ratchet & Contact Assembly (tone control)
5S8497	Rivet: .088 x 1/8; stl; nkl pl (ratchet stop spring mounting)
5S7771	Rivet: .088 x 3/16; stl; nkl pl (tone control assem mtg)
5S7707	Rivet: .122 x 5/32; stl; nkl pl (term strip mtg)
47K580230	Rod, guide (core bar guide)
1A580209	Screw, push button locking
3S8140	Screw, sheet metal: #8 x 3/16 PKZ; plain hex head; cad pl (trimmer mtg)
51A591148	Shaft Assembly, tuning (manual tuning shaft)
26A485610	Shield, coil
41A77595	Spring, coil core
41A580287	Spring, ratchet stop (tone control)
41A580220	Spring, treadle bar tension
41A580223	Spring, tuner locking screw (on push button locking screw)
31A71802	Strip, terminal: 1 insulated lug, #2 mtg
46A485513	Stud, tone switch push arm
51X590123	Tone Control Contact Assembly
4K24124	Washer, 'C' (tone ratchet retainer)
4A21577	Washer, 'C' (on core bar assembly)
4A70956	Washer, core insulator: bakelite
4A111189	Washer, fibre (on core bar assembly)
4A580644	Washer, spring (on core bar assembly)
4K580283	Washer, spring (tone control assembly)

MODEL 604,
Dodge, Plymouth

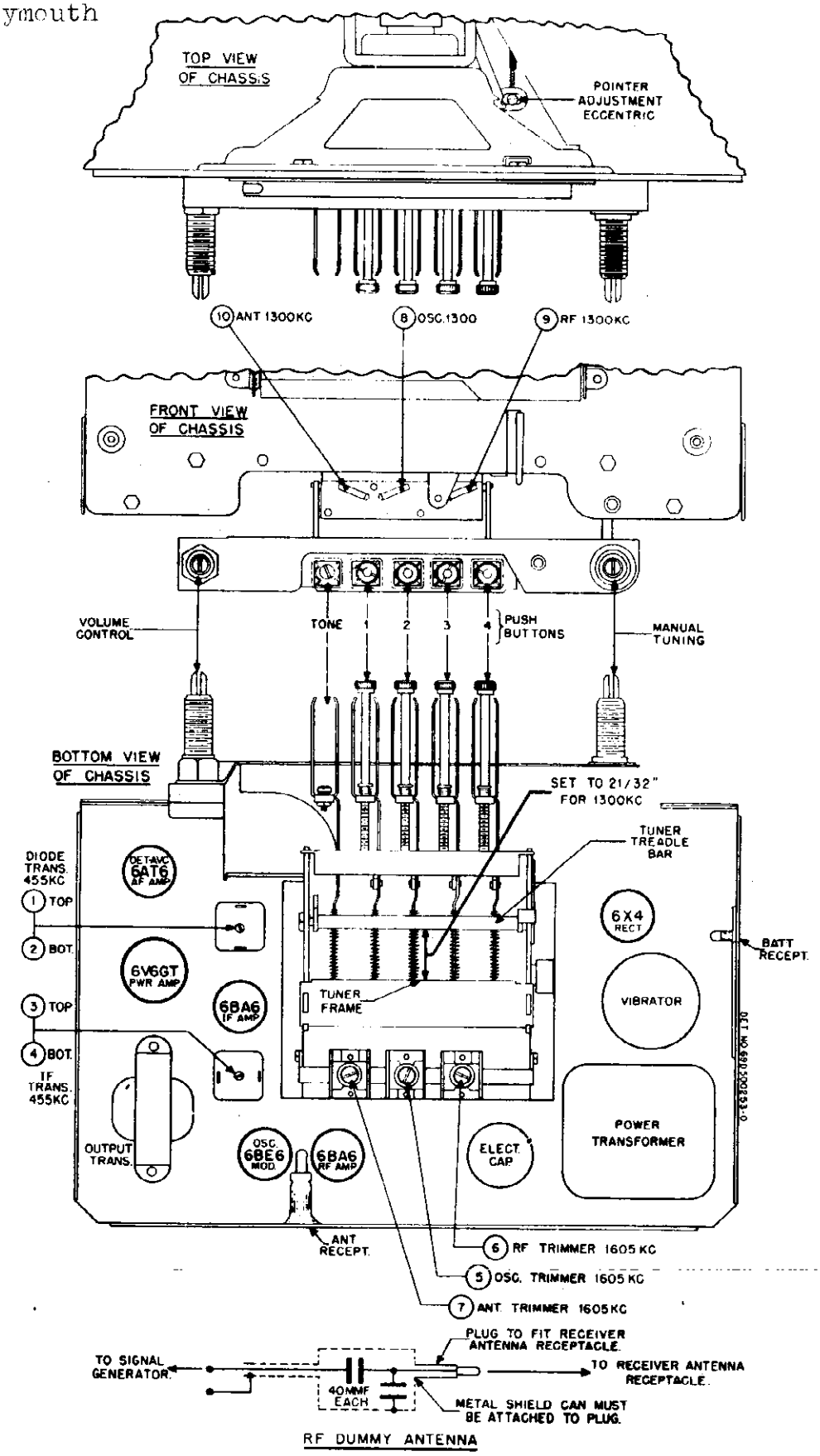


FIGURE 2. TUBE & TRIMMER LOCATION

MODEL 604,
Dodge, Plymouth

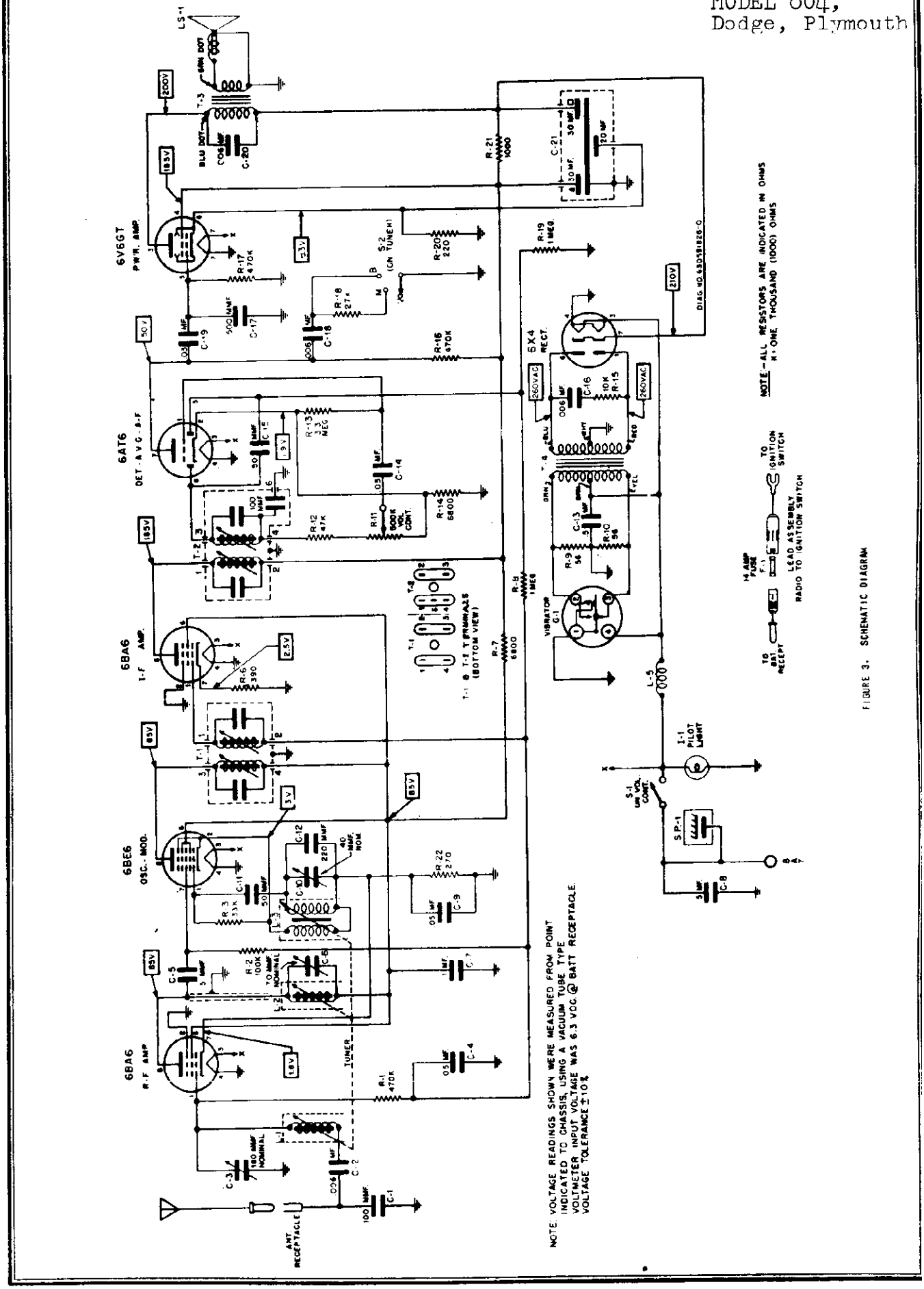
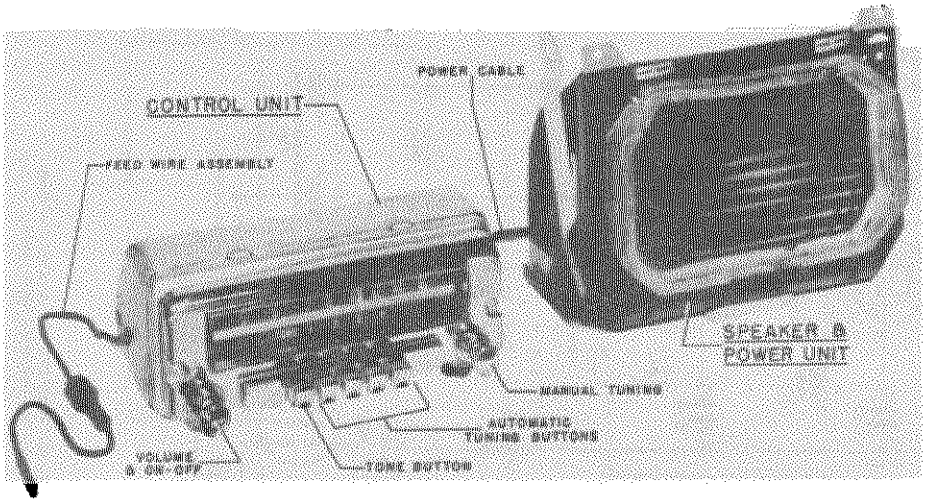


FIGURE 3. SCHEMATIC DIAGRAM

MODEL 606,
Plymouth



GENERAL INFORMATION

TYPE - Two-piece automotive type receiver, specifically designed for installation in Plymouth P-22 and P-23 cars.

TUNING RANGE - 540 to 1600 Kc. IF FREQUENCY - 455 Kc

POWER OUTPUT - 1.25 watts undistorted

TUNER - Model AT-84 or AT-89. See AT-84 and AT-89 Service Manuals for Replacement Parts.

TUBE COMPLEMENT - Control Unit
6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Det, AVC & AF Amplifier

Speaker & Power Unit
6AQ5 - Power Amplifier
6X4 - Rectifier

OPERATES FROM - 6.3 volts DC; 7.1 amperes

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.

PROCEDURE:

1. To expose the alignment adjustments, remove the rear housing, escutcheon and dial scale & bracket assembly.

2. Connect Control Unit & Speaker and Power Unit together by means of the power cable.

3. Connect an output meter across the speaker voice coil.

4. Connect 6.6 volts (measured at the "on-off" switch) to the receiver "BAT" terminal and chassis.

5. Turn the receiver on and allow it to warm up for a few minutes. Set receiver volume control at maximum and tone control to "high" position.

6. For greatest accuracy, keep the output of the receiver at 1 watt (1 watt = 1.79 volts on output meter) by reducing signal generator output (not receiver volume control) as stages are brought into alignment.

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.

7. 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 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.

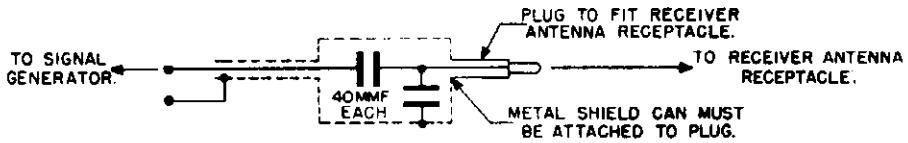


FIGURE 1. DUMMY ANTENNA

MODEL 606,
Plymouth

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Hi side-6BE6 grid (pin #7) Low side-chassis	455 Kc	Extreme high frequency end of travel	1, 2 3 & 4	Peak for maximum in order indicated. Check by repeating procedure.
RF ALIGNMENT						
Note: Back out tuner cores 8, 9 & 10 until 1-3/16" of core projects from end of coil, before performing step 2.						
2.	Dummy-see Figure 1.	Ant receptacle through dummy antenna	1610 Kc	Extreme high frequency end of travel	5, 6 & 7	Peak for maximum in order indicated.
3.	"	"	1400 Kc	With tuning knob, move carriage "in" until pointer is located 1-45/64" ±1/32" from tip of pointer to center of middle push button arm.	8, 9, & 10	Peak for maximum in order indicated.
4.	"	"	1610 Kc	With tuning knob, tune for maximum signal at high frequency end.	6 & 7	Peak for maximum in order indicated.
5.	"	"	1400 Kc	With tuning knob, tune to maximum signal	9 & 10	Peak for maximum in order indicated.
6.	-	-	-	-	-	Repeat step 4.

7. With set installed in car, peak ant trim (7) for maximum signal at approximately 1400 Kc. Car antenna should be fully extended.

OPERATING INSTRUCTIONS

ON-OFF SWITCH AND VOLUME CONTROL. To turn the receiver on, turn the left-hand control knob to the right until it "clicks" and the dial is illuminated. Allow the receiver to reach operating temperature (approximately 20 seconds). To increase the volume, continue to turn this control to the right. To turn the receiver off, turn this control knob to the left until it "clicks".

TUNING. Tuning is accomplished manually or automatically. Any one of four stations may be selected automatically by means of pushbutton control. To receive stations that are not set for automatic selection, use Manual tuning.

MANUAL TUNING. Select the desired station or program by turning the manual tuning knob (right-hand knob). Tune to the exact frequency position for clearest reception. The pointer indicates the frequency to which the receiver is tuned.

AUTOMATIC TUNING. The four pushbuttons, located beneath the dial scale, may be set to four favorite local stations. Firmly pressing one of the pushbuttons automatically selects the station for which the pushbutton was set. The dial pointer will automatically indicate the frequency of the selected station.

TONE CONTROL. The TONE pushbutton operates a three-position tone control. Push the button until the most pleasing tone is obtained. You will find that static and other types of electrical interference will be minimized in the "Bass" position.

TO SET THE PUSHBUTTONS

The receiver has 4 buttons for automatic station selection.

To set the pushbuttons for automatic tuning, proceed as follows:

1. Turn volume up until stations can be heard.

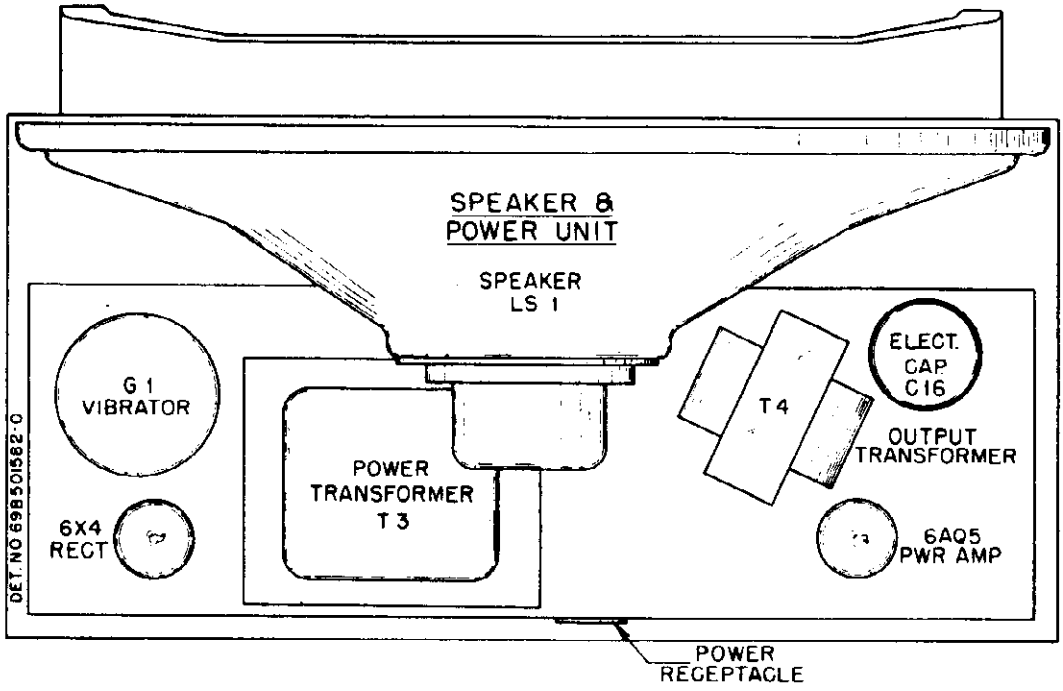
2. Pull out button and with the manual tuning knob tune to the station desired.

3. Push button in. This station is now set for automatic tuning.

4. Follow the same procedure for the remaining three buttons.

NOTE: The numbers on the dial scale indicate the frequency range of the receiver. Before setting the pushbutton, tune carefully until you are exactly on the station; tuning to either side of it will result in poor tone quality and excessive noise. When setting automatic tuning, it is preferred that the left-hand buttons tune in the lower KC stations and the right-hand buttons tune in the higher KC stations.

MODEL 606,
Plymouth



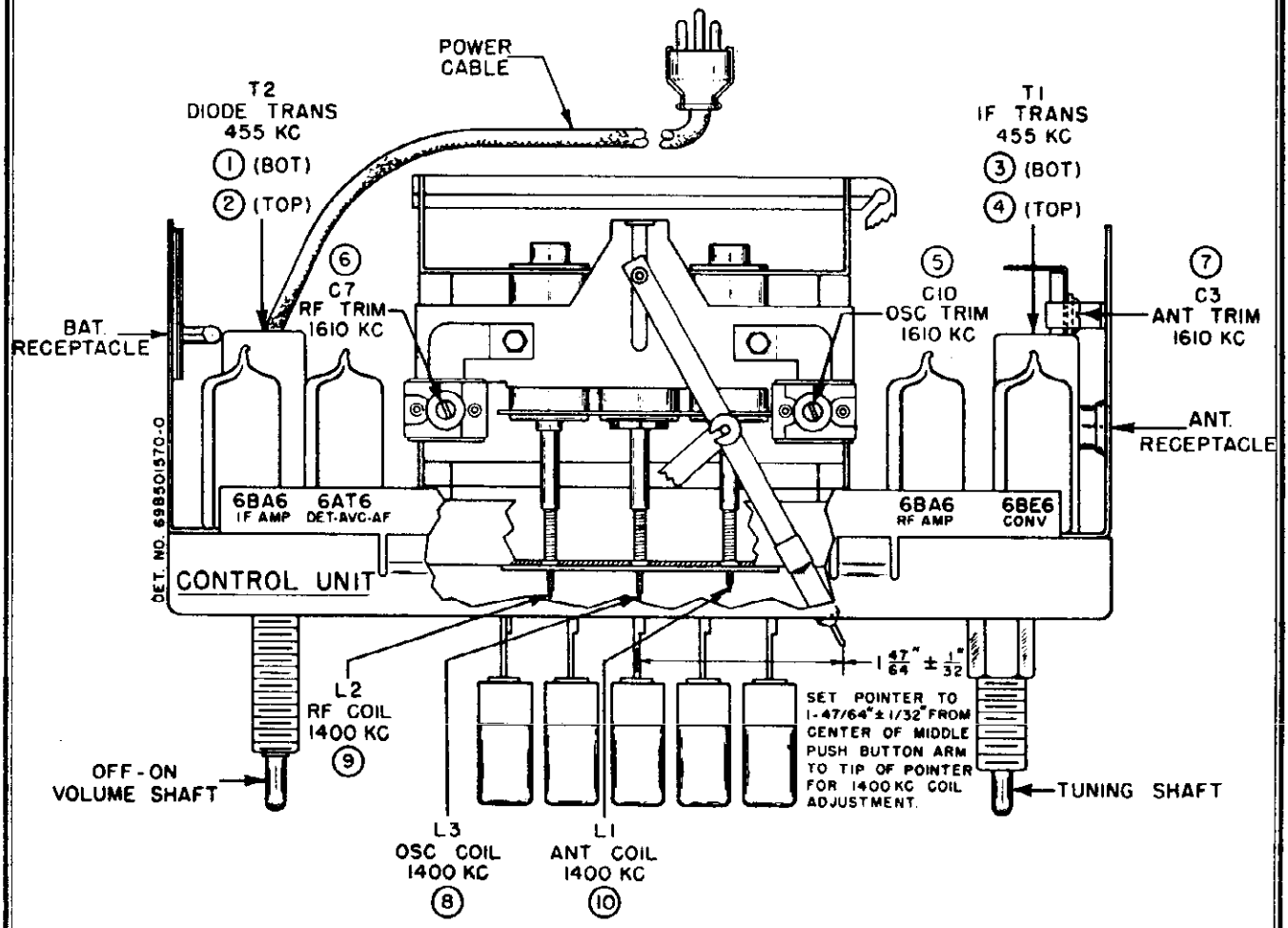


FIGURE 2. TUBE & TRIMMER LOCATION

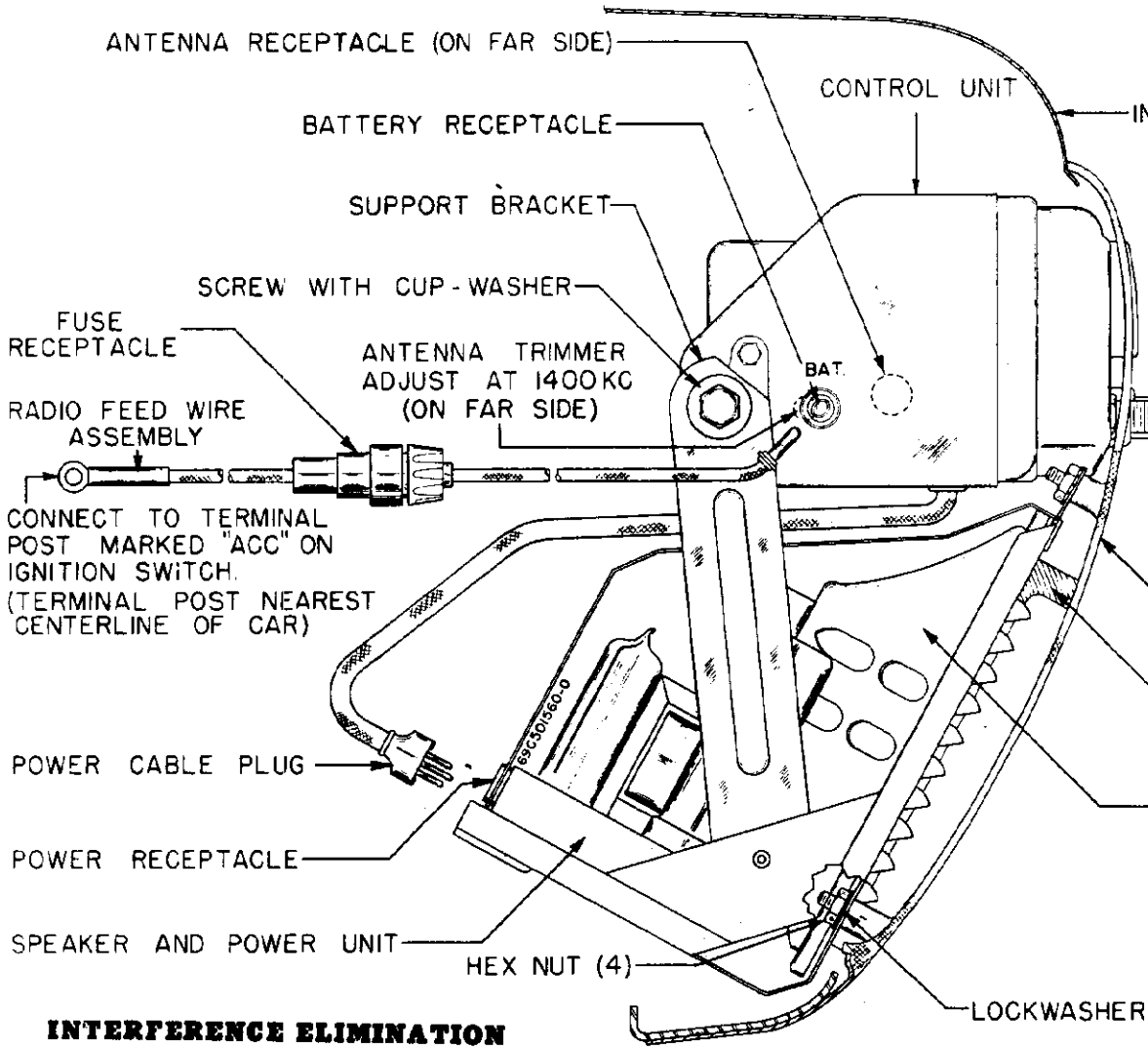


FIGURE 4. RADIO INSTALLATION

TIRE STATIC

After completion of Radio installation, road test car for tire static on dry concrete and blacktop pavements, under the following conditions:

1. At both low and high car speeds.
2. With antenna extended to operating position.
3. With radio at full volume and tuned off station.

If tire static noise is encountered, inject Tire Static Suppression Powder (Chrysler Package Part No. 1233 883) into tires with Injector (Chrysler Part No. 1233 884), following instructions given on package.

INTERFERENCE ELIMINATION

GENERATOR INTERFERENCE

Install radio interference filter capacitor on generator as shown in Figure 3. Mount the capacitor on the generator frame under the ground lead screw. Connect the eyelet terminal on the capacitor lead to the armature terminal of the generator.

WARNING: Do not connect to field terminal; to do so will result in damage to voltage regulator.

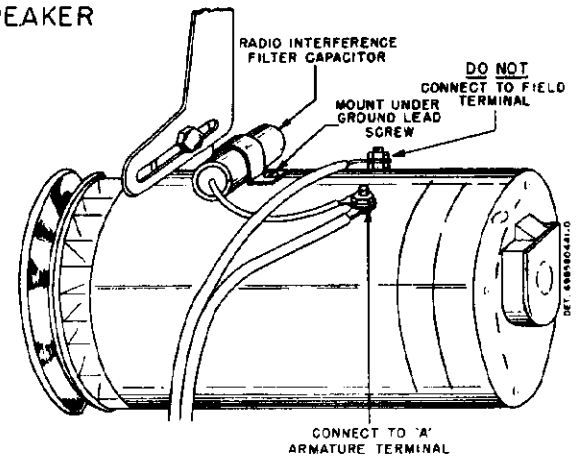


FIGURE 3. GENERATOR CAPACITOR INSTALLATION

MODEL 606,
Plymouth

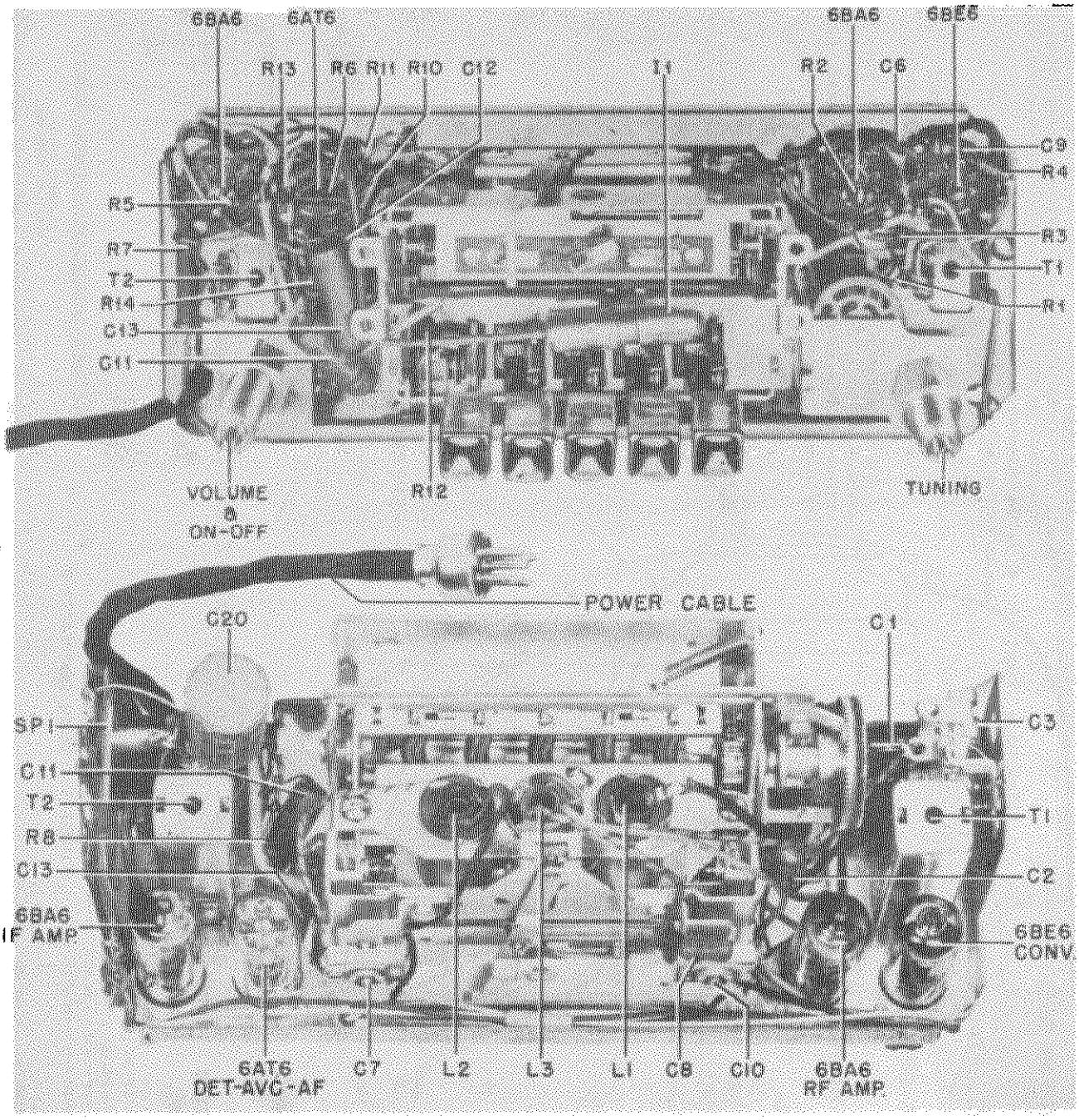


FIGURE 5. PARTS LOCATION - CONTROL UNIT

REPLACEMENT PARTS LIST

NOTE: When ordering parts specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CONTROL UNIT - CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21A591682	Mica, metal: 90 mmf .....
C-2	8A4529	Paper: .006 mf 100V .....
C-3	20A502338	Variable, mica: 50 to 280 mmf
C-4	8R13514	Paper: .05 mf 100V .....
C-5	8R14791	Paper: .05 mf 400V .....
C-6	21K70720	Molded: 5 mmf 500V .....
C-7,8	-	(Refer to AT-84 & AT-89 Tuner Service Manual) .....
C-9	21R6513	Mica: 50 mmf 10% 500V.....
C-10	-	(Refer to AT-84 & AT-89 Tuner Service Manual) .....
C-12	21K70720	Molded: 5 mmf 500V .....
C-13	8K71910	Paper: .006 mf 400V.....
C-20	8C580845	Paper: .5 mf 100V .....
Fuse		
F-1	65K12894	Fuse, tubular: 14 amp .....
Pilot Light		
I-1	65X10867	Bulb: 6.3V; .25A; tubular bayonet base; clear; #44...

MODEL 606
Plymouth

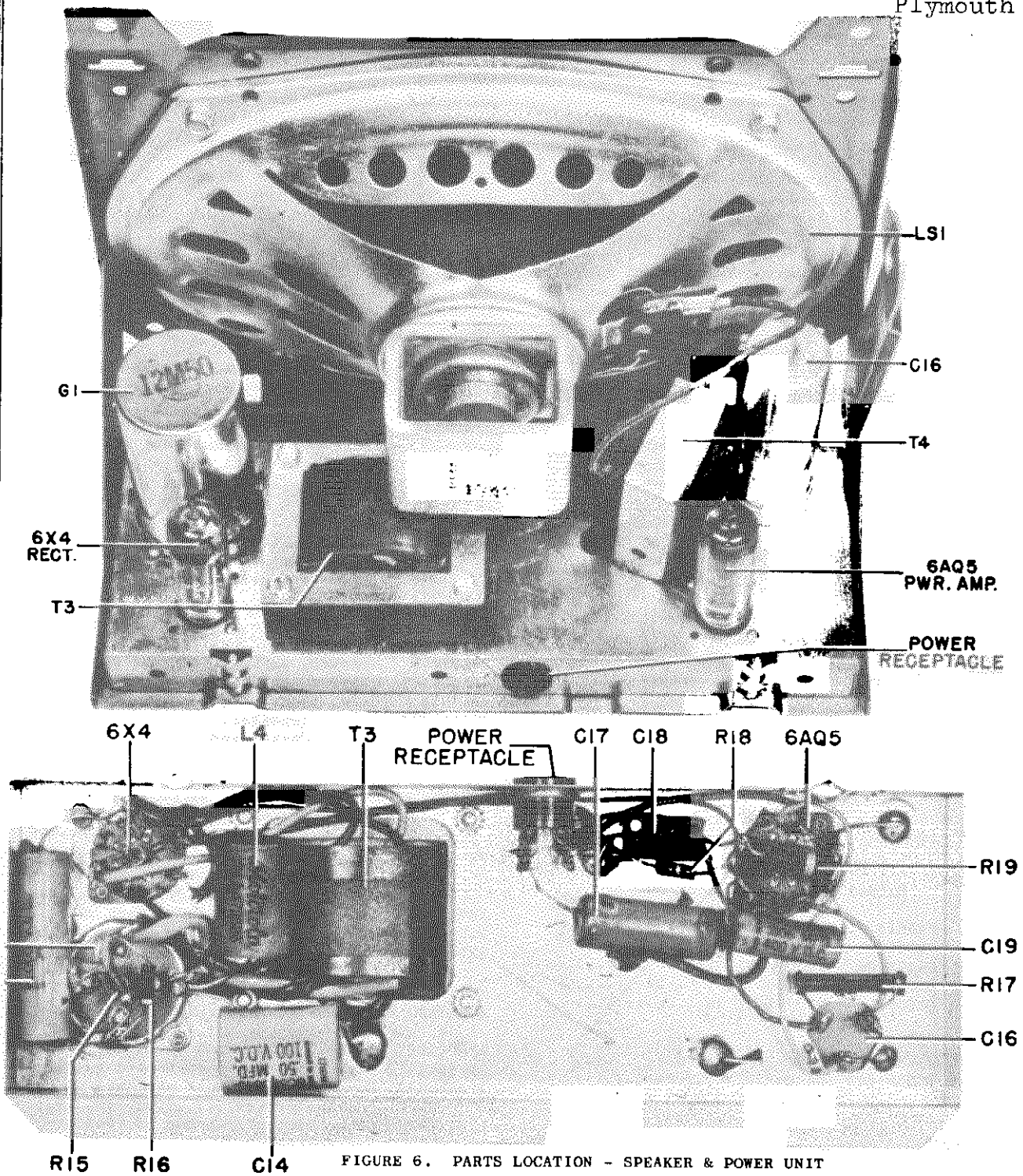


FIGURE 6. PARTS LOCATION - SPEAKER & POWER UNIT

Coils

L-1,2,3	-	(Refer to AT-84 & AT-89 Tuner Service Manual) .....

Resistors

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

R-1	6R6032	470,000 20% 1/2W .....
R-2	6R5554	390 10% 1/2W .....
R-3	6R6028	22,000 20% 1/2W .....
R-4	6R6012	33,000 20% 1/2W .....
R-5	6R5554	390 10% 1/2W .....
R-6	6R6004	1 meg 20% 1/2W .....
R-7	6R490349	6800 20% 2W .....
R-8	6R6056	47,000 20% 1/2W .....
R-9	18A501616	Volume control: 500,000; with switch .....
R-10	6R6004	1 meg 20% 1/2W .....
R-11	6R6428	6800 10% 1/2W .....
R-12	6R6434	27,000 10% 1/2W .....
R-13	6R2118	3.3 meg 20% 1/2W .....
R-14	6R6032	1 meg 20% 1/2W .....

Spark Plate

SP-1	1A501489	Spark Plate Assembly .....

MODEL 606,
Plymouth

Part Number		Description
Transformers		
T-1	24B485553	
or	24K502819	IF, 455 Kc: complete.....
T-2	24K485554	Diode, 455 Kc: complete.....
Tuners		
	51D501988	Automatic Tuner Model AT-84: complete (See AT-84 Tuner Service Manual for breakdown) .....
or	51D501875	Automatic Tuner Model AT-89: complete (See AT-89 Tuner Service Manual for breakdown) .....

SPEAKER AND POWER UNIT - CHASSIS PARTS - ELECTRICAL

Capacitors		
C-14	8C580845	Paper: .5 mf 100V .....
C-15	8R490449	Paper: .02 mf 1000V.....
C-16	23A473015	Electrolytic: 30-30-20 mf/ 350-300-25V .....
C-17	8R71911	Paper: .03 mf 400V .....
C-18	21R6590	Mica: 500 mmf 20% 500V...
C-19	8K71910	Paper: .006 mf 400V .....
Vibrator		
G-1	48B3333	Vibrator: non-sync; 4-pin...
Coil		
L-4	24K472535	Choke, hash .....
Speaker		
LS-1	50C502449	
or	50C501656	Speaker, PM: 6" x 9" oval; 3.2 ohm VC .....

Resistors

Note: All resistors are carbon insulated unless otherwise specified.

R-15	6R5614	56 10% 1/2W .....
R-16	6R5614	56 10% 1/2W .....
R-17	6R476004	1000 20% 2W .....
R-18	6R6032	470,000 20% 1/2W .....
R-19	6R6389	220 10% 1W .....
Transformers		
T-3	25C501644	Power Transformer .....
T-4	25B501684	Output Transformer.....

Part Number	Description

CONTROL UNIT - CHASSIS PARTS - MECHANICAL

30B501680	Cable and Plug Assembly, power.....
42A485548	Clip, coil can mtg .....
42A501477	Clip, pointer (pointer retainer)...
1X501683	Dial Scale and Background Assembly.
5A470399	Grommet, rubber (on power cable)
2A501405	Nut, hex: 7/16-28 x 3/4 (volume control mtg) .....
64D501492	Plate, front: painted white.....
28K38360	Plug, 5-pin (on power cable).....
52B501601	Pointer, dial .....
9A472148	Receptacle, antenna contact.....
34D501619	Scale, dial .....
15A22087	Shell, receptacle (on power cable).
26A470013	Shield, pilot light .....
9A501497	Socket, pilot light: includes brkt.
9K580218	Socket, tube: 7-prong; miniature; with dummy lug .....

CONTROL UNIT - HOUSING PARTS

1X501673	Bracket Assembly, dial crystal retaining .....
61A501603	Crystal, dial .....
1X501672	Escutcheon & Dial Crystal Assembly.
1X500377	Housing, rear: includes speed grip nut .....
2A485540	Nut, hex: special; 7/16-28 x 9/16; stl; cad pl (escutcheon mtg).....
2S7035	Nut, speed (dial crystal retainer mtg) .....doz
2K501944	Nut, speed grip retaining (on rear housing) .....
3S400458	Screw, machine: 10-32 x 7/8; Phillips round head; stl; cad pl (escutcheon mtg) .....doz

SPEAKER AND POWER UNIT - MECHANICAL PARTS

7B501620	Bracket, support (on spkr plate)...
42A501782	Clip, speed (rain shield mtg)...doz
42A4215	Clip, vibrator grounding.....
32C501637	Gasket, speaker: rubber .....
1X501667	Plate, Gasket and Bracket Assembly, speaker: less speaker .....
9A501887	Receptacle, 5-prong (for power cable)
3S7457	Screw, sheet metal: #8 x 7/8; plain hex head; stl; cad pl (spkr plate mtg) .....doz
3S8188	Screw, sheet metal: #10 x 1/2; plain hex head; stl; cad pl (spkr mtg) .....doz
1X502364	Shield, rain: includes pads .....
9A70208	Socket, tube: 4-prong (for vibrator)
9K580218	Socket, tube: 7-prong; miniature; with dummy lug .....

MOUNTING PARTS AND ACCESSORIES

1X500376	Button, push: with shell and clip.
8B580014	Capacitor, noise suppression .....
15A485342	Cover, control unit mtg nut: chrome pl .....
1X501984	Knob, control: chrome pl (volume or tuning) .....
9K502069 or 9K502083	Lead Assembly, radio to ignition switch: includes fuse .....
4S7652	Lockwasher, ext: #10; stl; cad pl (speaker & power unit mtg)..per/c
2S2883	Nut, hex: 10-32 x 3/8; stl; cad pl (spkr & power unit mtg).....doz
2A485540	Nut, hex: 7/16-28 x 9/16 (control unit mtg) .....
3A501943	Screw and Cup Washer: 1/4-20 x 1/2 (support bracket attaching).....

MODEL 606
Plymouth

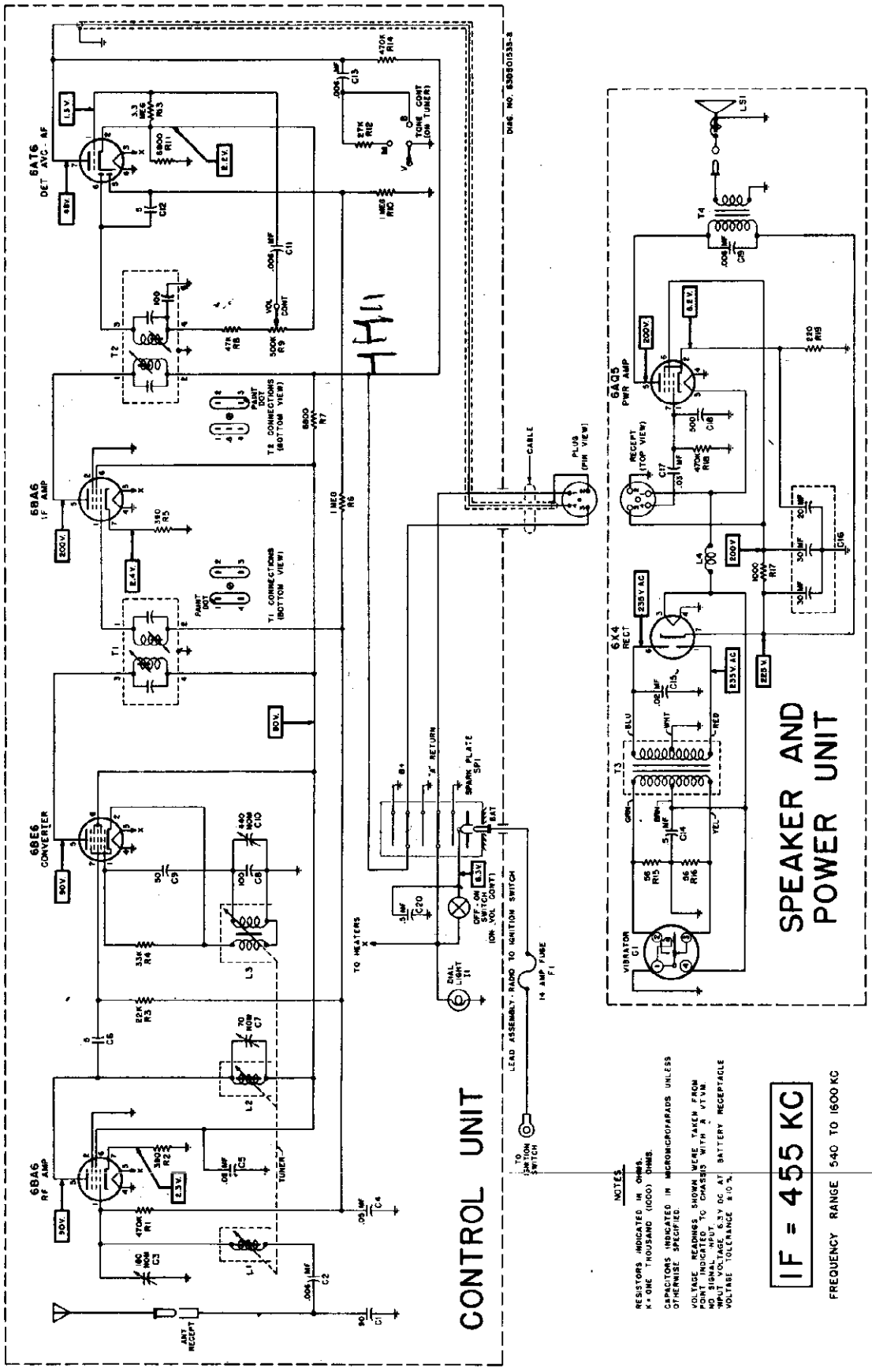
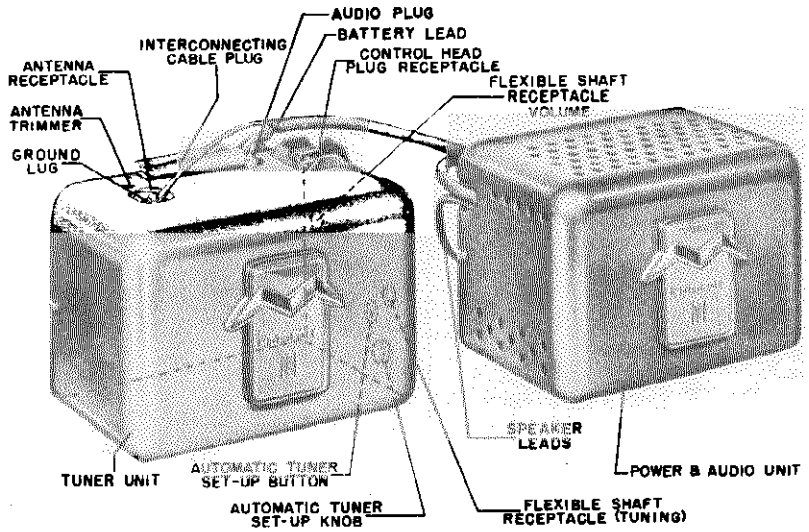


FIGURE 7. SCHEMATIC DIAGRAM

MODEL 701



GENERAL INFORMATION

TYPE - Compact two-piece automotive type superheterodyne receiver. Receiver consists of a tuning unit and audio & power unit which are connected together by means of an interconnecting cable. This receiver is designed for installation in any car by using with appropriate Motorola control head and speaker kit.

TUNING RANGE - 535 to 1600 Kc IF - 455 Kc

POWER INPUT - 7.0 amps at 6.3 volts

POWER OUTPUT - 3.5 watts (max)

TUBE COMPLEMENT - Tuner Unit
6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Det-AVC-AF Amp

Audio & Power Unit
6AQ5 - Power Amplifier
6X4 - Rectifier

TUNER - Solenoid Tuner ST-78. Refer to ST-78 Tuner Service Manual for complete service information.

TO SET UP AUTOMATIC TUNING

To set push buttons to the desired stations:

a. Turn receiver on and allow it to warm up for a few minutes.
b. Collapse antenna until signal is weak.
c. Press Manual "M" button on control head.
d. Turn tuning knob until desired station is tuned in. (Make a mental note of the program). For best results choose only local stations.
e. Press desired button and wait until tuning mechanism completes its operation.
f. Press automatic tuner set-up button until "click" is heard. (See detail above.)
g. Turn automatic tuner set-up knob until previously noted program is heard. NOTE: Check the setting of the automatic button just set up by pressing the "M" button and manually tune in the station. There should be no difference in volume or clarity when the station is tuned in either manually or automatically. If a difference is noted, reset the automatic tuner push button more accurately by repeating above procedure. Also make sure the push button is set to same station that was selected manually and not to a weak distant station carrying the same network program.
h. Repeat steps c, d, e, f & g for balance of buttons.

TONE CONTROL

This receiver has a three-position tone control which may be operated by pushing "in" volume knob. Do not hold the knob "in"; merely push in and release. Each push changes the tone one step.

To operate the tone control, push in on the volume control knob. Make certain the volume control knob is properly adjusted to operate the tone switch. Adjust the knob in or out on the shaft, to allow the minimum amount of travel to actuate the switch when the knob is depressed. Too much motion may cause the shaft to stick and prevent the tone switch from opening when the knob is released. CAUTION: Failure of the tone switch to release will cause the tone relay to overheat. If the tone control knob does not operate the tone control switch, with a reasonable amount of pressure, loosen the acorn nuts and adjust the outer housing of the flexible shaft until proper action is obtained.

ALIGNMENT

Remove tuner unit front housing and bottom cover to expose all alignment adjustments. Connect power and audio unit to tuner unit. Connect a 6 volt battery to "A" lead and power & audio unit chassis.

Connect a low range output meter across speaker voice coil and set volume control at maximum.

Place tuner in manual position, either by actuating carriage plate manually or by connecting a control head to receiver and pressing "M" button.

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 as stages are brought into alignment. Use a small fibre screwdriver when aligning IF and diode transformers. A special tool Motorola Part Number 66A76278, is required for adjusting the tuner cores.

IMPORTANT: Do not push in on the alignment tool when adjusting tuner cores; the slightest inward pressure may move tuner carriage and result in inaccurate alignment.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7) & chassis	455 Kc	High frequency end (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating step.
RF ALIGNMENT						
2.	See Fig. 1	Antenna receptacle through dummy	1610 Kc	High frequency end; cores should project 1-1/8" from cans (Screw out if necessary)	5, 6, & 7	Peak for maximum in order indicated.
3.	"	"	1425 Kc	1425 Kc -per Figure 1	8, 9 & 10	Peak for maximum in order indicated.

4. When receiver is installed in car, extend antenna fully, set dial to approximately 1400 Kc and repeak antenna trimmer (
for maximum volume of a weak station or noise between stations.

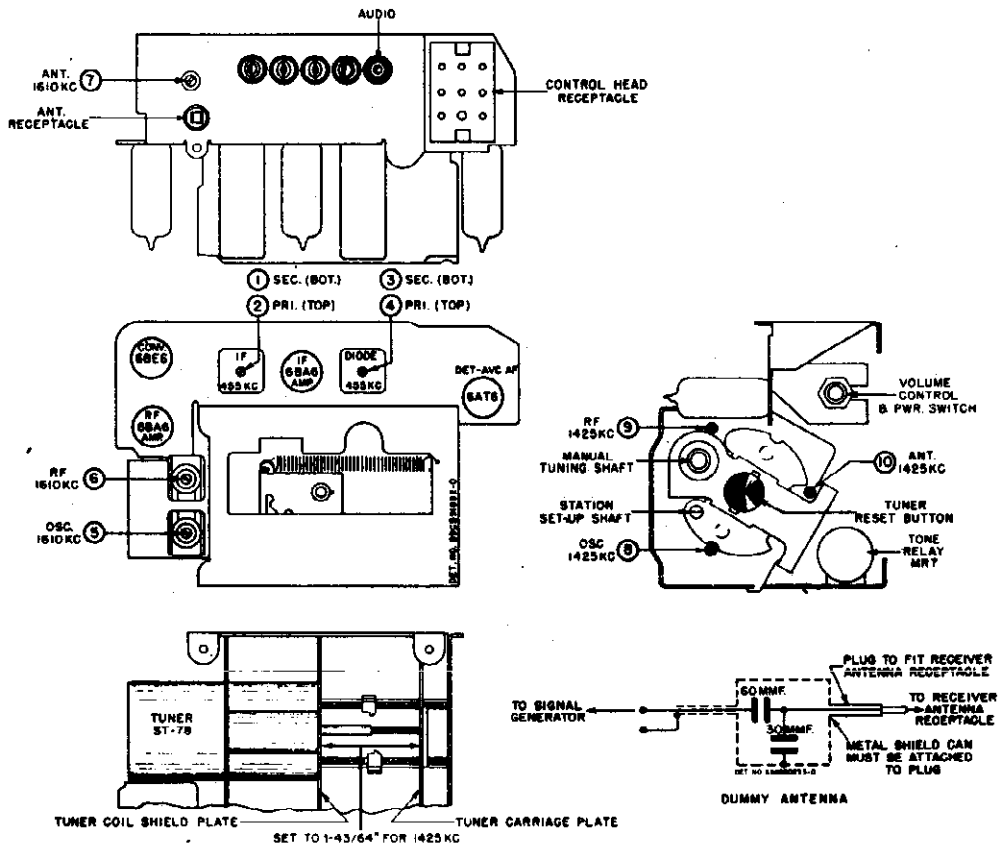
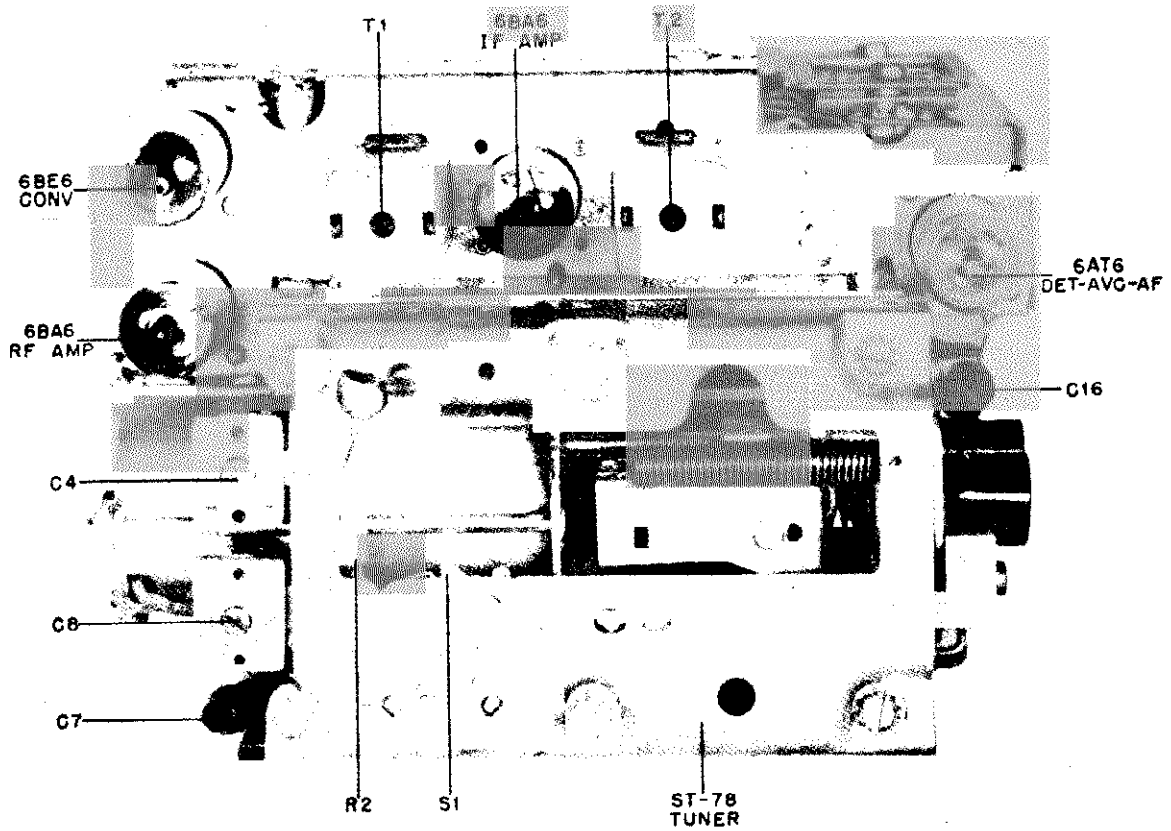


FIGURE 1. TUBE & TRIMMER LOCATIONS AND DUMMY ANTENNA DETAIL

MODEL 701



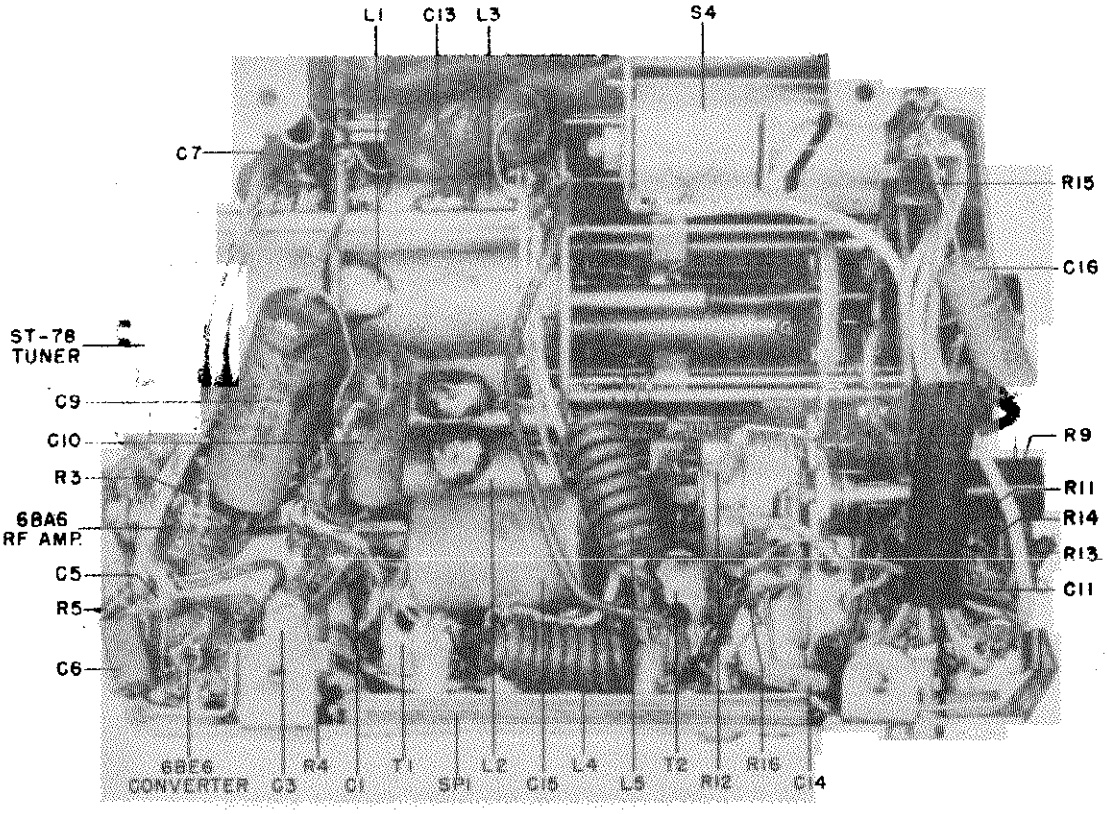


FIGURE 2. PARTS LOCATION - TUNING UNIT

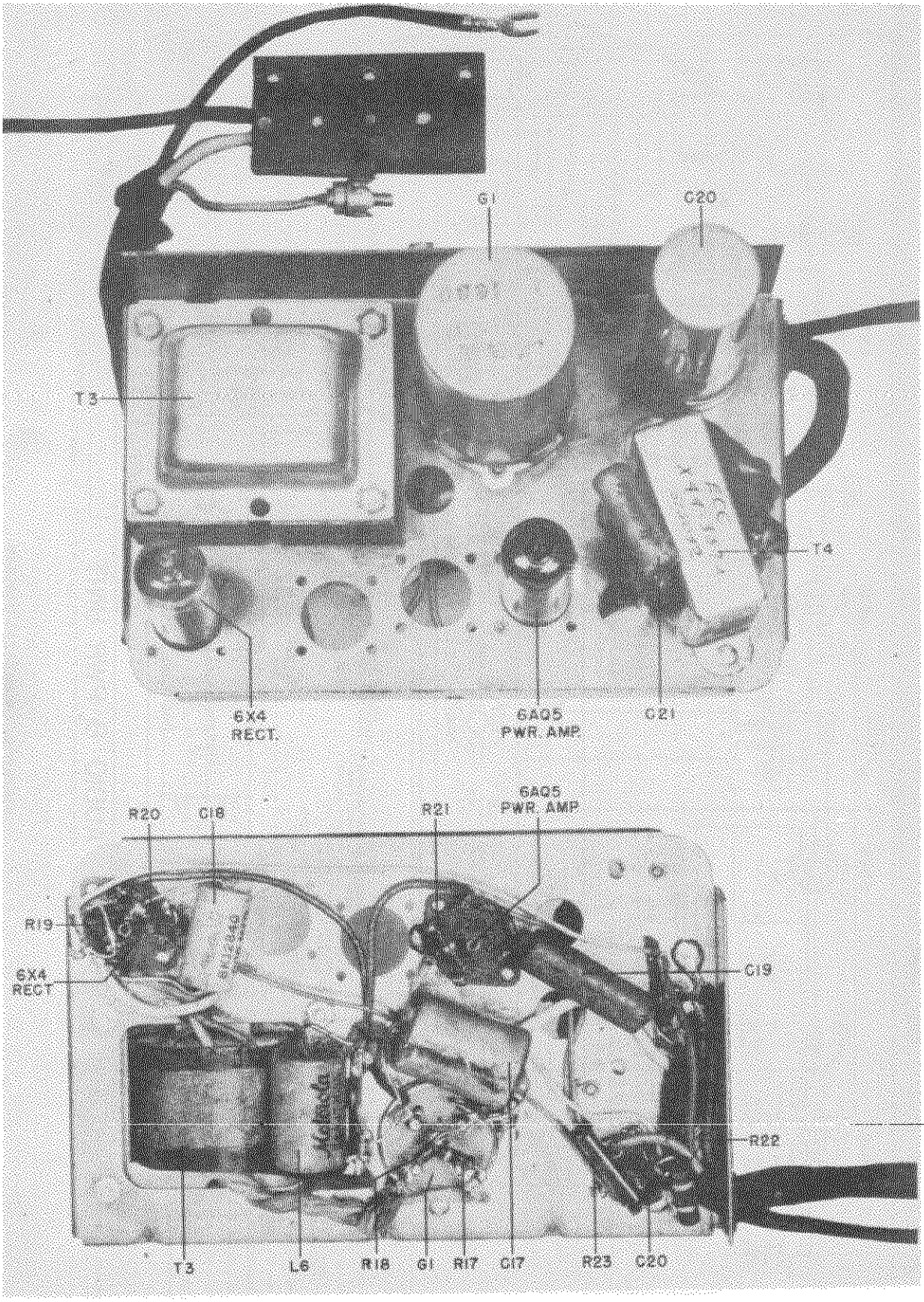


FIGURE 3. PARTS LOCATION - AUDIO & POWER UNIT

MODEL 701

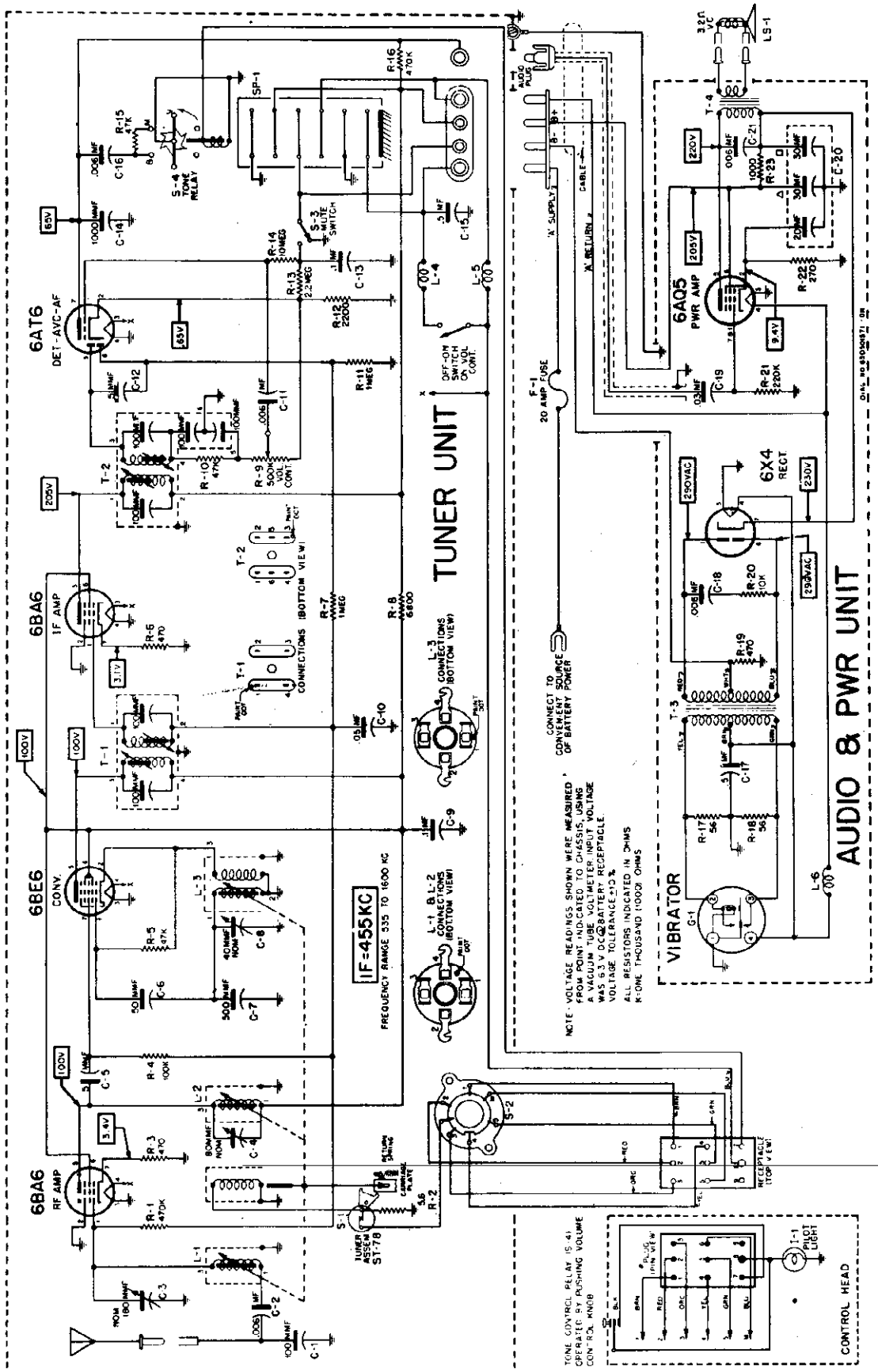


FIGURE 4. SCHEMATIC DIAGRAM

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
TUNER UNIT		
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21B77562	Ceramic: 100 mmf 500V.....
C-2	8A4529	Paper: .006 mf 100V.....
C-3*	20A592135	Variable, trimmer: 50 to 280 mmf; includes bracket.....
C-4*	20K481527	Variable, trimmer: 20 to 180 mmf; includes bracket.....
C-5	21K70720	Molded: 5 mmf 500V.....
C-6	21K74661	Ceramic: 50 mmf 300V.....
C-7	21K592327	Ceramic: 500 mmf 5% 500V...
C-8*	20K472612	Variable, trimmer: 5 to 80 mmf; includes bracket.....
C-9	8R13166	Paper: .1 mf 400V.....
C-10	8A13514	Paper: .05 mf 100V.....
C-11	8A4529	Paper: .006 mf 100V.....
C-12	21K70720	Molded: 5 mmf 500V.....
C-13	8R472035	Paper: .1 mf 100V.....
C-14	21R6638	Mica: 1000 mmf 500V.....
C-15	8K17028	Paper: .5 mf 100V.....
C-16	8K71910	Paper: .006 mf 400V.....
Pilot Light		
I-1	65X4151	Bulb: 6-8V; bayonet base; type #51 .....
Coils		
L-1,2*	24B71881	RF & Antenna Coil (specify color of paint dot on old coil when ordering).....
L-3*	24B592153	Oscillator Coil (specify color of paint dot on old coil when ordering) .....
L-4	24K592269	Choke ("A" lead).....
L-5	24K592269	Choke (dial light).....
Resistors		
		Note: All resistors are carbon insulated ty unless otherwise specified.
R-1	6R6032	470,000 20% 1/2W .....
R-2	17K484497	Wirewound: 5.6 .....
or	6R488139	5.6 10% 1W .....
R-3	6R6090	470 10% 1/2W .....
R-4	6R6075	100,000 20% 1/2W .....
R-5	6R6056	47,000 20% 1/2W .....
R-6	6R6090	470 10% 1/2W .....
R-7	6R6004	1 meg 20% 1/2W .....
R-8	6R6287	6800 20% 1W N.I. ....
R-9	1A472531	Volume Control and Shaft Assembly: .5 meg .....
R-10	6R6056	47,000 20% 1/2W.....
R-11	6R6004	1 meg 20% 1/2W .....
R-12	6R6290	2200 20% 1/2W .....
R-13	6R3927	2.2 meg 20% 1/2W .....
R-14	6R2109	10 meg 20% 1/2W .....
R-15	6R6056	47,000 20% 1/2W .....
R-16	6R6032	470,000 20% 1/2W .....

Ref. No.	Part Number	Description
Switches		
S-1*	1B70944	Solenoid Switch .....
S-2*	40B70952	Selector Switch .....
S-3*	40A472644	Mute Switch .....
S-4	1X592220	Tone Relay MR-7 .....
Spark Plate		
SP-1	1B592133	Spark Plate Assembly .....
Transformers		
T-1	24B485553	IF, 455 Kc: complete with tuning cores and padding capacitors .....
T-2	24K485555	Diode, 455 Kc: complete with tuning cores and padding capacitors .....
Tuner		
	1X592280	Solenoid Tuner ST-78 ...
POWER & AUDIO UNIT		
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-17	8K17028	Paper: .5 mf 100V .....
C-18	8K12840	Paper: .006 mf 1600V.....
C-19	8R71911	Paper: .03 mf 400V.....
C-20	23A473015	Electrolytic: 30-30-20 mf/ 350-300-25V .....
C-21	8K71910	Paper: .006 mf 400V.....
Fuse		
F-1	65K4637	Fuse: 20 amp .....
Vibrator		
G-1	48B3333	Vibrator, non-sync: 4-pin ..
Coils		
L-6	24A472535	Choke, hash .....
Resistors		
		Note: All resistors are carbon insulated type unless otherwise specified.
R-17	6R5614	56 10% 1/2W .....
R-18	6R5614	56 10% 1/2W .....
R-19	6R3949	470 20% 1/2W .....
R-20	6R6054	10,000 20% 1/2W .....
R-21	6R6015	220,000 20% 1/2W .....
R-22	6R6336	270 10% 1W .....
R-23	6R6184	1000 20% 1W N.I. ....

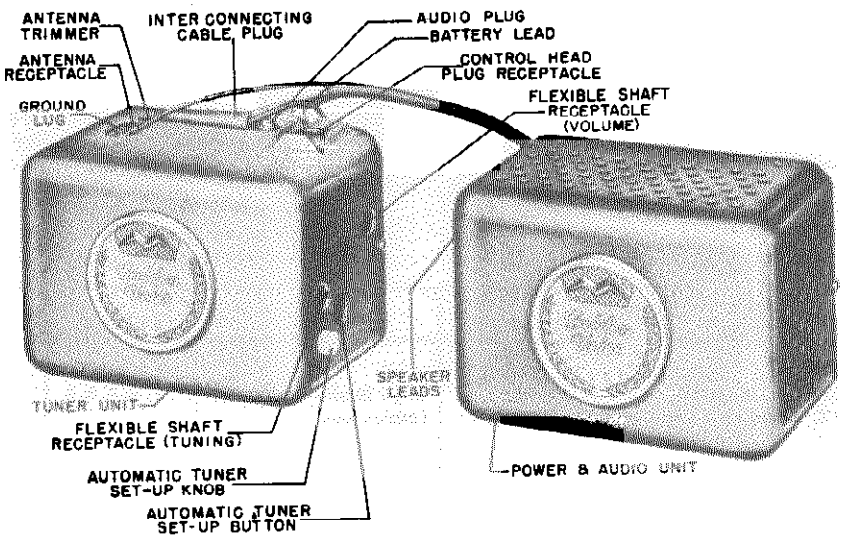
*Part of Solenoid Tuner ST-78

MODEL 701

Transformers

T-3	25K590650	Power Transformer .....
T-4	25B502330	Output Transformer .....

Part Number	Description
	TUNER UNIT
	CHASSIS PARTS - MECHANICAL
7A592127	Bracket, volume control mtg ...
42A485548	Clip, coil can mtg .....
4S7657	Lockwasher, ext: #8; stl; cad pl (tone relay mtg) .....
2S7000	Nut, hex: 8-32 x 5/16; stl; cad pl (tone relay mtg) .....
1X70646	Receptacle, antenna .....
5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg) .....
5S7719	Rivet: .088 x 5/32; stl; nkl pl (terminal strip mtg) .....
5S7728	Rivet: .122 x 5/16; stl; nkl pl (spark plate mtg) .....
3S7152	Screw, machine: 6-32 x 1/4 plain hex head; stl; cad pl (volume control bracket and capacitor bracket mtg) .....
3S8140	Screw, sheet metal: #8 x 3/16; plain hex head; stl; cad pl (tuner mtg) .....
3S7454	Screw, sheet metal: #8 x 1/4; PKZ plain hex head; stl; cad pl (tuner bracket mtg) .....
9A472534	Socket, tube: 7-prong; miniature.
9K580218	Socket, tube: 8-prong; miniature.
31A41318	Strip, terminal: 1 insulated lug, #2 mtg .....
	POWER & AUDIO UNIT
	CHASSIS PARTS - MECHANICAL
1X590362	Cable and Plug Assembly: includes fuse lead, power cable and plug.
42A4215	Clip, vibrator grounding.....
14A592132	Insulator, connector plug.....
9K592646	Lead Assembly, fuse: includes "A" lead and fuse receptacle.....
1X76859	Lead Assembly, speaker .....
4S7666	Lockwasher, ext: #6; stl; cad pl (power transformer mtg).....
2S7005	Nut, hex: 6-32 x 1/4; stl; cad pl (power transformer mtg) .....
28A592119	Plug, connector: 4-pin .....
28K71775	Plug, insulated .....
5S7771	Rivet: .088 x 3/16;stl; nkl pl (tube socket mtg) .....
5S7706	Rivet: .122 x 1/8; stl; nkl pl (terminal strip mtg) .....
5S7701	Rivet: .122 x 3/16; stl; nkl pl (vibrator clip mtg).....
5S7707	Rivet: .122 x 5/32; stl; nkl pl (output trans mtg) .....
9A472534	Socket, tube: miniature; 7-prong .
9A70208	Socket, tube: 4-pin (for vibrator).
31K490143	Strip, terminal: 2 insulated lugs, #2 mtg; 1-1/8" long .....
31A592258	Strip, terminal: 2 insulated lugs, #2 mtg; 1-3/8" long .....
29A76280	Terminal, insulated pin: black (on speaker leads) .....
29K76282	Terminal, insulated pin: white (on speaker leads) .....
	HOUSING PARTS
38A71874	Button, push: includes spring clamp
42A501255	Clip, escutcheon retainer .....
15K592124	Cover, bottom: with bushing.....
13C501269	Escutcheon .....
1X501273	Housing and Escutcheon Assembly (Tuner Unit) .....
1X501275	Housing and Escutcheon Assembly (Power & Audio Unit) .....
3S400356	Screw, sheet metal: #4 x 1/4; plain hex head; stl; cad pl (escutcheon mtg) .....
3S7454	Screw, sheet metal: #8 x 1/4 PKZ; plain hex head; stl; cad pl (bottom cover mtg) .....
3S8114	Screw, sheet metal: #8 x 1/4 PKZ slotted acorn head; antique copper finish (housing screws) .....
	ACCESSORIES
8A4491	Capacitor, generator .....
4S7653	Lockwasher, int-ext: 5/16; stl; cad pl (receiver mtg) .....
2S2863	Nut, hex: 5/16; stl; cad pl (receiver mtg) .....
1K75148	Shaft and Housing Assembly, flexible 24" long .....
50K502269 or 50B502802	Speaker, PM; 6"; 3.2 ohm VC....
3S77542	Stud, threaded (receiver mtg)..
6A4141	Suppressor, distributor .....



GENERAL INFORMATION

TYPE - Compact two-piece automotive type superheterodyne receiver. Receiver consists of a tuning unit and audio & power unit which are connected together by means of an interconnecting cable. This receiver is designed for installation in any car by using with appropriate Motorola control head and speaker kit.

TUNING RANGE - 535 to 1600 Kc IF - 455 Kc

POWER INPUT - 8.2 amps at 6.3 volts

POWER OUTPUT - 4.5 watts (max)

TUBE COMPLEMENT - Tuner Unit

6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Det-AVC-AF Amp

Audio & Power Unit

6AT6 - Audio Inverter
6AQ5 - Power Amplifier
6AQ5 - Power Amplifier
6X4 - Rectifier

TUNER - Solenoid Tuner ST-78. Refer to ST-78 Tun Service Manual for complete service informatio

TO SET UP AUTOMATIC TUNING

To set push buttons to the desired stations:

a. Turn receiver on and allow it to warm up for a few minutes.
b. Collapse antenna until signal is weak.
c. Press Manual "M" button on control head.
d. Turn tuning knob until desired station is tuned in. (Make a mental note of the program). For best results choose only local stations.
e. Press desired button and wait until tuning mechanism completes its operation.
f. Press automatic tuner set-up button until "click" is heard. (See detail above).
g. Turn automatic tuner set-up knob until previous noted program is heard. NOTE: Check the setting the automatic button just set up by pressing the "l button and manually tune in the station. There shou be no difference in volume or clarity when the stati is tuned in either manually or automatically. If a d ference is noted, reset the automatic tuner push butt more accurately by repeating above procedure. Al make sure the push button is set to same station th was selected manually and not to a weak distant st tion carrying the same network program.
h. Repeat steps c, d, e, f & g for balance of buttons.

TONE CONTROL

This receiver has a three-position tone control which may be operated by pushing "in" volume knob. Do not hold the knob "in"; merely push in and release. Each push changes the tone one step.

To operate the tone control, push in on the volume control knob. Make certain the volume control knob is properly adjusted to operate the tone switch. Adjust the knob in or out on the shaft, to allow the minimum amount of travel actuate the switch when the knob is depressed. Too mu motion may cause the shaft to stick and prevent the to switch from opening when the knob is released. CAUTIO Failure of the tone switch to release will cause the tone r lay to overheat. If the tone control knob does not oper the tone control switch, with a reasonable amount of pre sure, loosen the acorn nuts and adjust the outer housing the flexible shaft until proper action is obtained.

MODEL 801

ALIGNMENT

Remove tuner unit front housing and bottom cover to expose all alignment adjustments. Connect power and audio unit to tuner unit. Connect a 6 volt battery to "A" lead and power & audio unit chassis.

Connect a low range output meter across speaker voice coil and set volume control at maximum.

Place tuner in manual position, either by actuating carriage plate manually or by connecting a control head to receiver and pressing "M" button.

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 Number 66A76278, is required for adjusting the tuner cores.

IMPORTANT: Do not push in on the alignment tool when aligning the tuner cores; the slightest inward pressure may move tuner carriage and result in inaccurate alignment.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7) & chassis	455 Kc	High frequency end (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating step.
RF ALIGNMENT						
2.	See Fig. 1	Antenna receptacle through dummy	1610 Kc	High frequency end; cores should project 1-1/8" from cans (Screw out if necessary)	5, 6, & 7	Peak for maximum in order indicated.
3.	"	"	1425 Kc	1425 Kc per Figure 1	8, 9 & 10	Peak for maximum in order indicated

4. When receiver is installed in car, extend antenna fully, set dial to approximately 1400 Kc and repeak antenna trimmer (7) for maximum volume of a weak station or noise between stations.

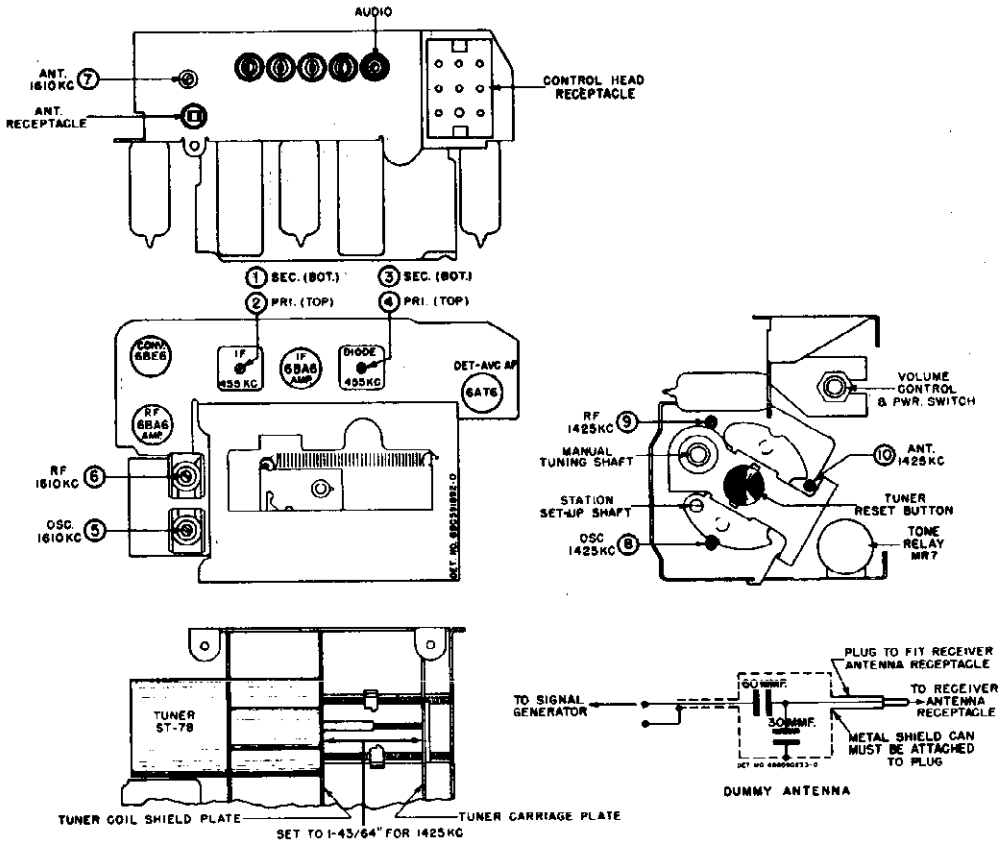
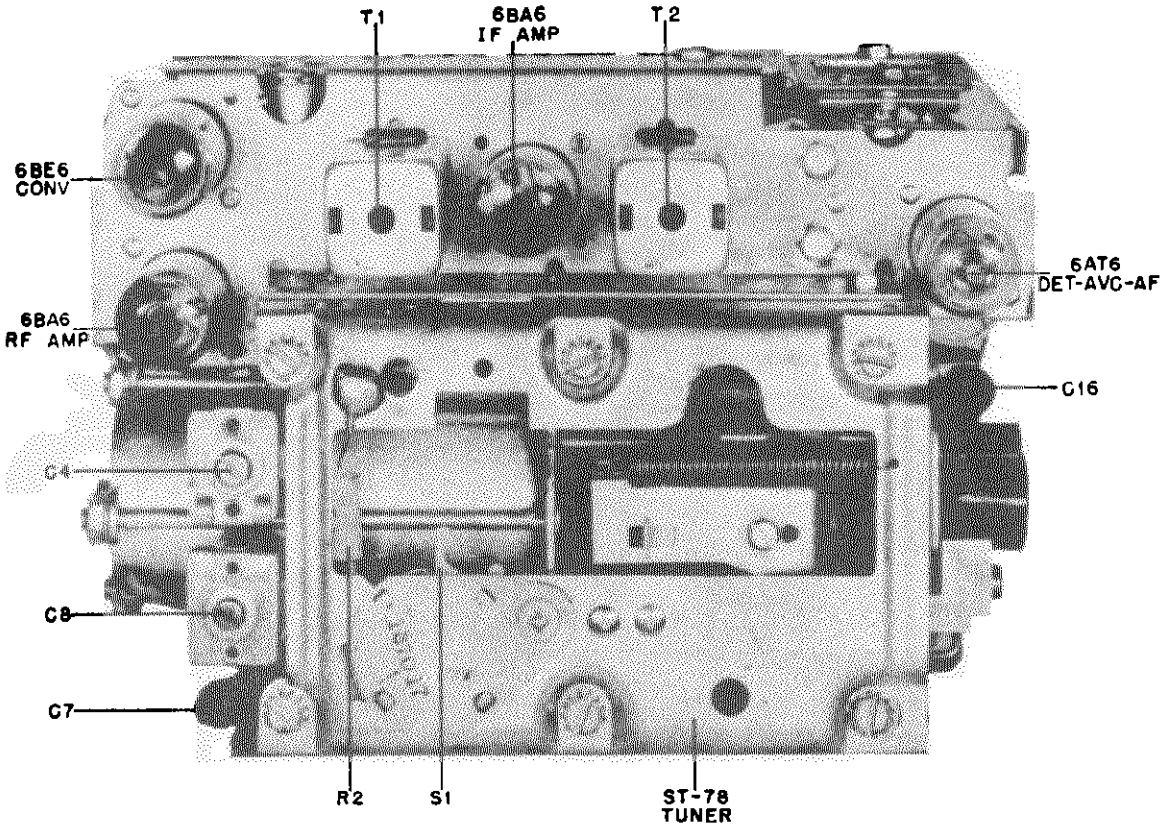


FIGURE 1. TUBE & TRIMMER LOCATIONS AND DUMMY ANTENNA DETAIL



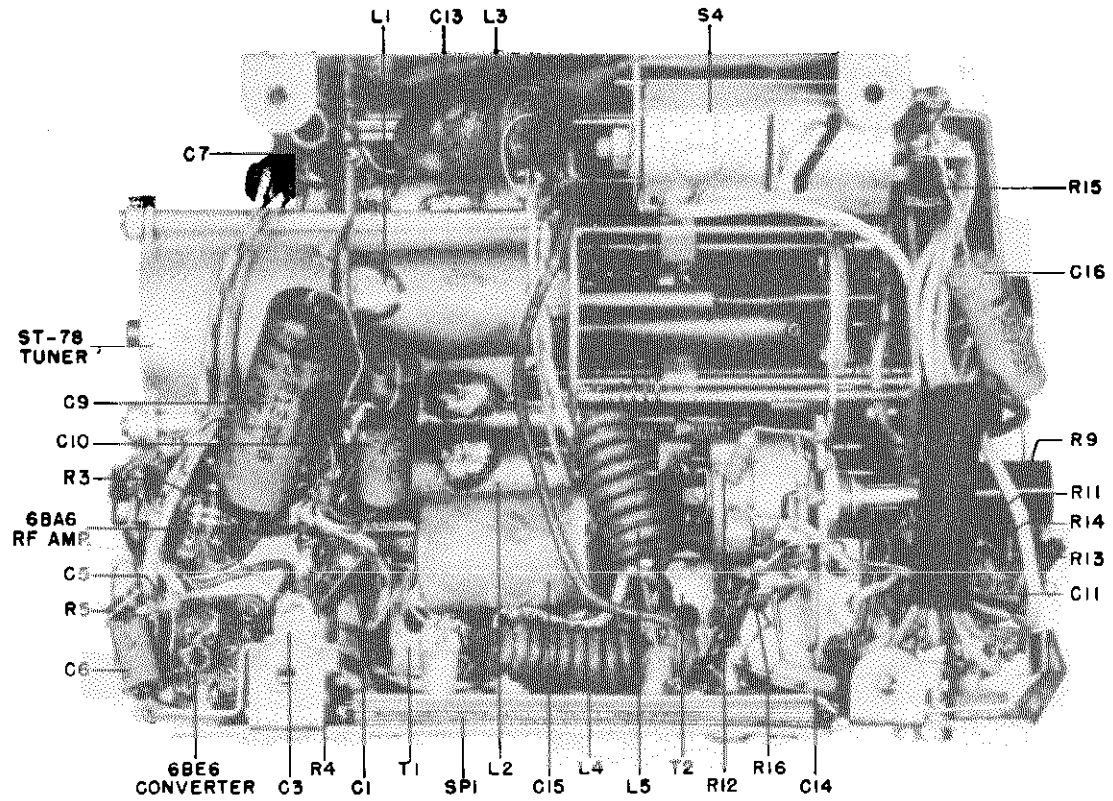
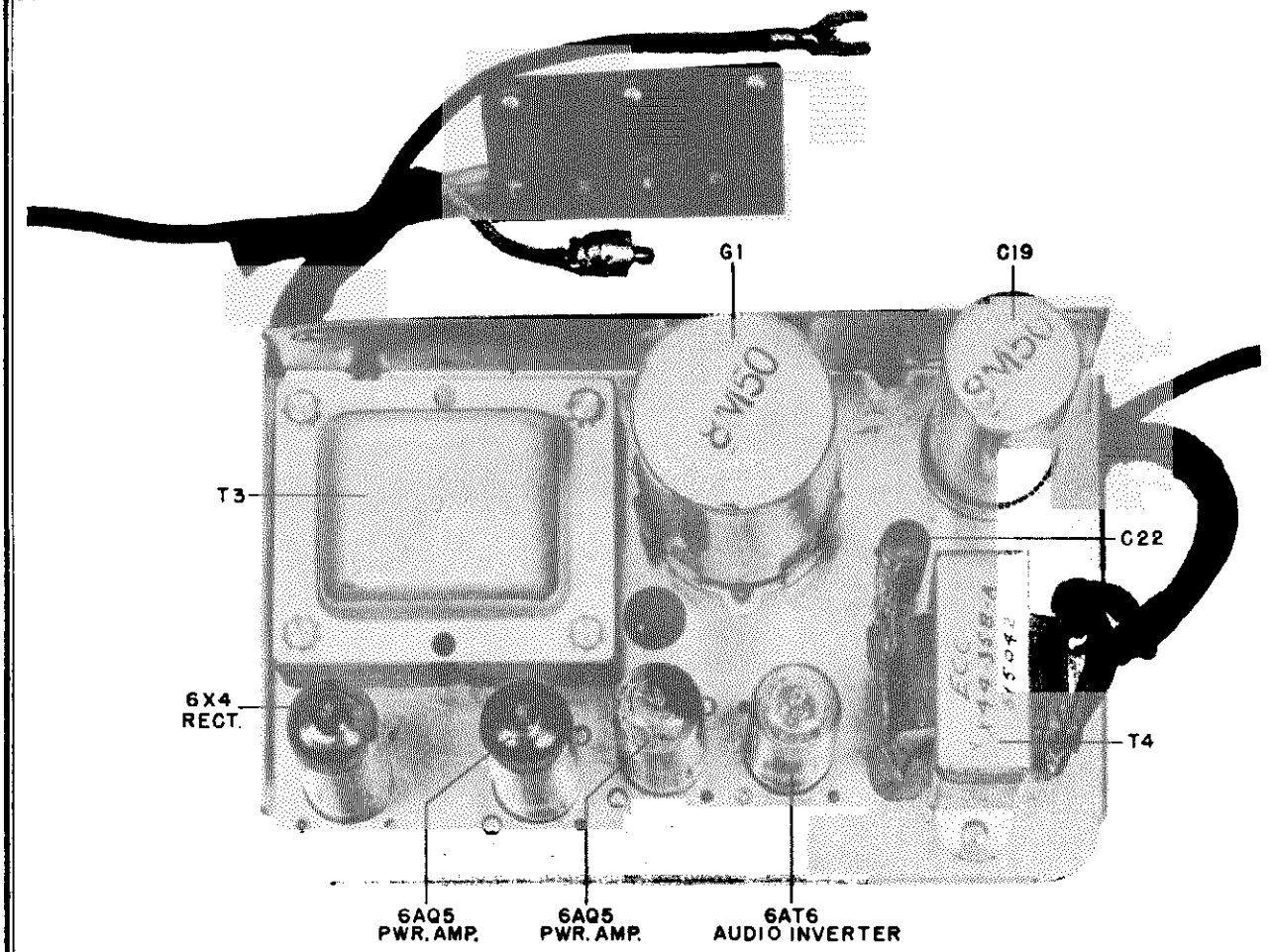


FIGURE 2. PARTS LOCATION - TUNING UNIT

MODEL 801



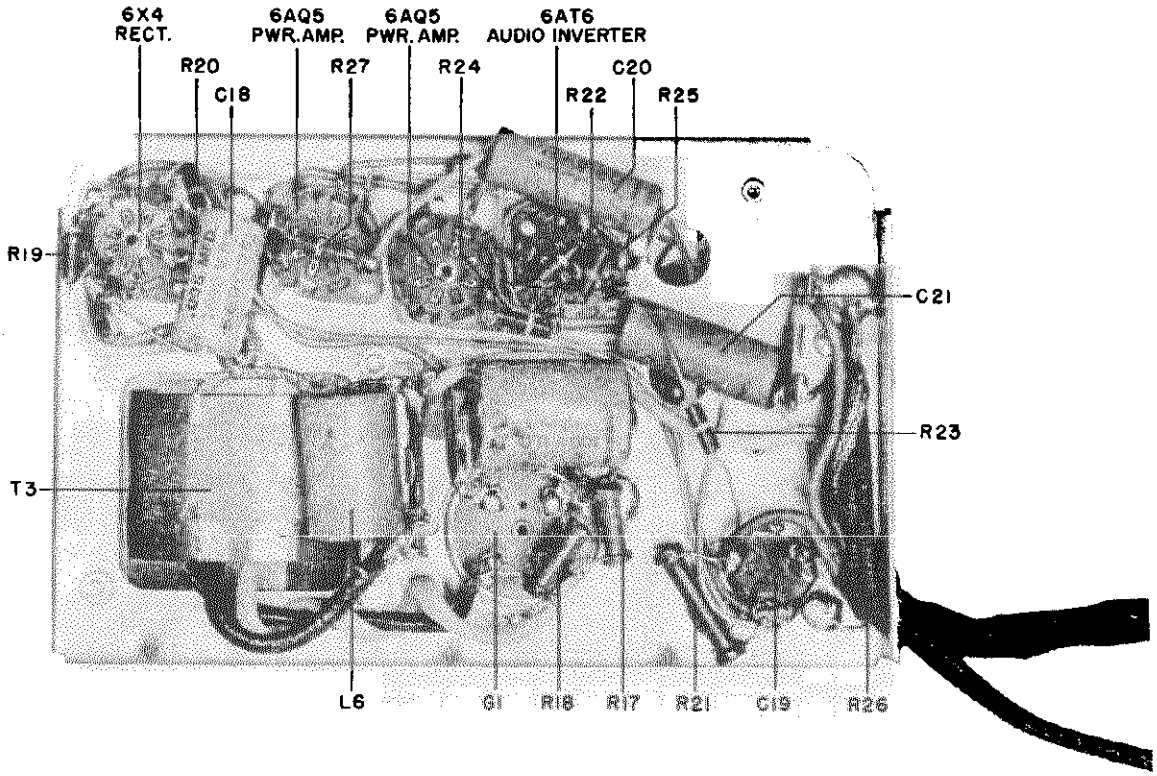


FIGURE 3. PARTS LOCATION - AUDIO & POWER UNIT

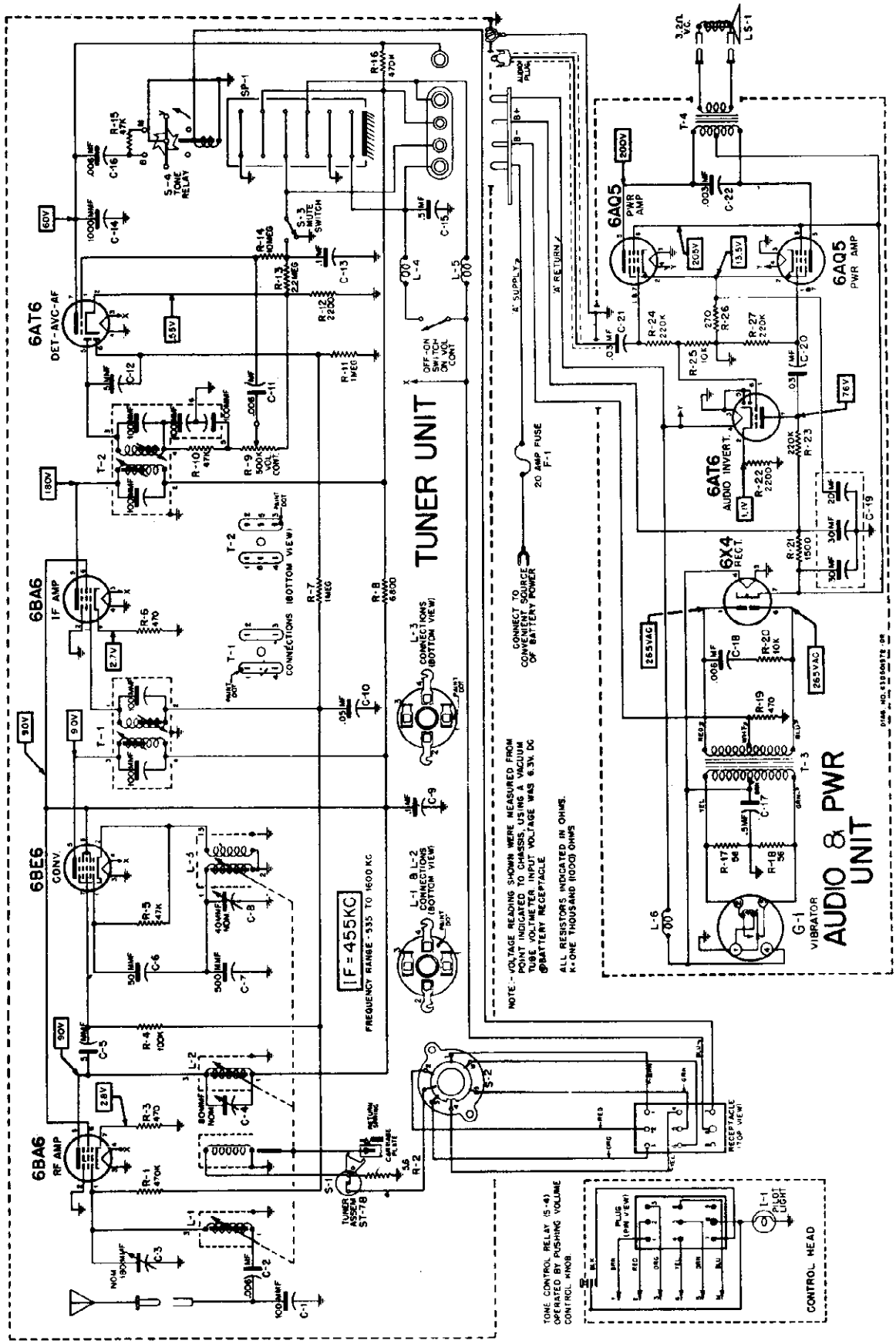


FIGURE 4. SCHEMATIC DIAGRAM

MODEL 801

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
TUNER UNIT		
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21B77562	Ceramic: 100 mmf 500V .....
C-2	8A4529	Paper: .006 mf 100V .....
C-3*	20A592135	Variable, trimmer: 50 to 280 mmf; includes bracket .....
C-4*	20K481527	Variable, trimmer: 20 to 180 mmf; includes bracket .....
C-5	21K70720	Molded: 5 mmf 500V .....
C-6	21K74661	Ceramic: 50 mmf 300V .....
C-7	21K592327	Ceramic: 500 mmf 5% 500V..
C-8*	20K472612	Variable, trimmer: 5 to 80 mmf; includes bracket .....
C-9	8R13166	Paper: .1 mf 400V .....
C-10	8A13514	Paper: .05 mf 100V .....
C-11	8A4529	Paper: .006 mf 100V .....
C-12	21K70720	Molded: 5 mmf 500V .....
C-13	8R472035	Paper: .1 mf 100V .....
C-14	21R6638	Mica: 1000 mmf 500V .....
C-15	8K17028	Paper: .5 mf 100V .....
C-16	8K71910	Paper: .006 mf 400V .....
Pilot Light		
I-1	65X4151	Bulb: 6-8V; bayonet base; type #51 .....
Coils		
L-1,2*	24B71881	RF & Antenna Coil (specify color of paint dot on old coil when ordering).....
L-3*	24B592153	Oscillator Coil (specify color of paint dot on old coil when ordering) .....
L-4	24K592269	Choke ("A" lead) .....
L-5	24K592269	Choke (dial light) .....
Resistors		
Note: All resistors are carbon insulated type unless otherwise specified.		
R-1	6R6032	470,000 20% 1/2W .....
R-2	17K484497	Wirewound: 5.6 .....
or	6R488139	5.6 10% 1W .....
R-3	6R6090	470 10% 1/2W .....
R-4	6R6075	100,000 20% 1/2W .....
R-5	6R6056	47,000 20% 1/2W .....
R-6	6R6090	470 10% 1/2W .....
R-7	6R6004	1 meg 20% 1/2W .....
R-8	6R6287	6800 20% 1W N.I. ....
R-9	1A472531	Volume Control and Shaft Assembly: .5 meg .....
R-10	6R6056	47,000 20% 1/2W .....
R-11	6R6004	1 meg 20% 1/2W .....
R-12	6R6290	2200 20% 1/2W .....
R-13	6R3927	2.2 meg 20% 1/2W .....
R-14	6R2109	10 meg 20% 1/2W .....
R-15	6R6056	47,000 20% 1/2W .....
R-16	6R6032	470,000 20% 1/2W .....
Switches		
S-1*	1B70944	Solenoid Switch .....
S-2*	40B70952	Selector Switch .....
S-3*	40A472644	Mute Switch .....
S-4	1X592220	Tone Relay MR-7 .....
Spark Plate		
SP-1	1B592133	Spark Plate Assembly .....
Transformers		
T-1	24B485553	IF, 455 Kc: complete with tuning cores and padding capacitors .....
T-2	24K485555	Diode, 455 Kc: complete with tuning cores and padding capacitors .....
Tuner		
	1X592280	Solenoid Tuner ST-78 .....
POWER & AUDIO UNIT		
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-17	8K17028	Paper: .5 mf 100V .....
C-18	8K12840	Paper: .006 mf 1600V.....
C-19	23A473015	Electrical: 30-30-20 mf/ 350-300-25V .....
C-20	8R71911	Paper: .03 mf 400V .....
C-21	8R71911	Paper: .03 mf 400V .....
C-22	8R13165	Paper: .003 mf 1000V .....
Fuse		
F-1	65K4637	Fuse, 20 amp .....
Vibrator		
G-1	48B3333	Vibrator, non-sync: 4-pin...
Coil		
L-6	24A472535	Choke, hash .....

*Part of Solenoid Tuner ST-78

Resistors

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

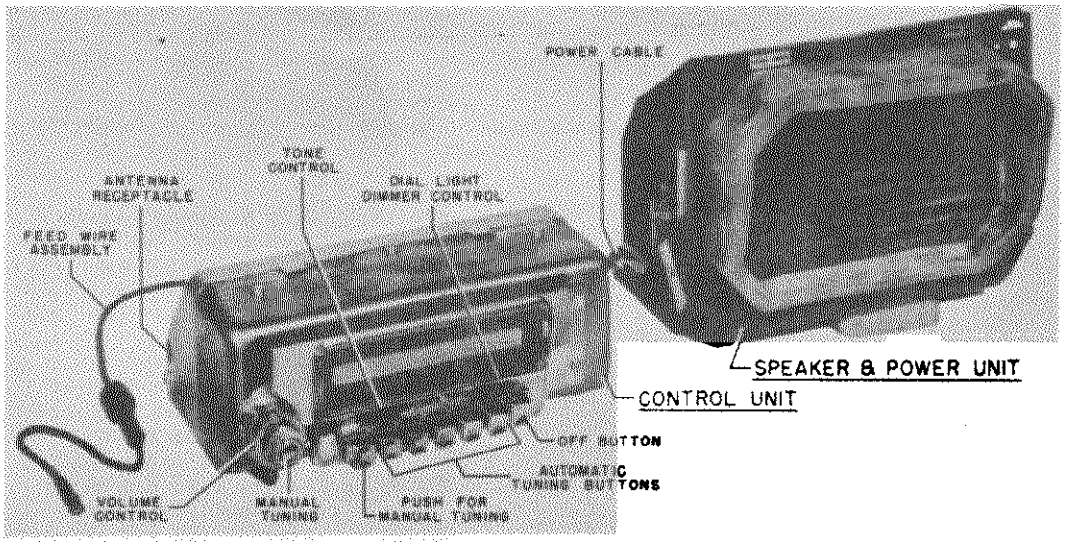
R-17	6R5614	56 10% 1/2W .....
R-18	6R5614	56 10% 1/2W .....
R-19	6R3949	470 20% 1/2W .....
R-20	6R6054	10,000 20% 1/2W .....
R-21	6R6286	1500 20% 1W N.I. ....
R-22	6R6069	2200 10% 1/2W .....
R-23	6R6015	220,000 20% 1/2W .....
R-24	6R6015	220,000 20% 1/2W .....
R-25	6R6054	10,000 20% 1/2W .....
R-26	6R6336	270 10% 1W .....
R-27	6R6015	220,000 20% 1/2W .....

Transformers

T-3	25K590650	Power Transformer .....
T-4	25B502331	Output Transformer .....

Part Number	Description
TUNER UNIT	
CHASSIS PARTS - MECHANICAL	
7A592127	Bracket, volume control mtg ....
42A485548	Clip, coil can mtg .....
4S7657	Lockwasher, ext: #8; stl; cad pl (tone relay mtg) .....
2S7000	Nut, hex: 8-32 x 5/16; stl; cad pl (tone relay mtg) .....
1X70646	Receptacle, antenna .....
5S7719	Rivet: .088 x 5/32; stl; nkl pl (terminal strip mtg) .....
5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg) .....
5S7728	Rivet: .122 x 5/16; stl; nkl pl (spark plate mtg) .....
3S7152	Screw, machine: 6-32 x 1/4 plain hex head; stl; cad pl (volume control brkt and capacitor brkt mtg) .....
3S8140	Screw, sheet metal: #8 x 3/16; plain hex head; stl; cad pl (tuner mtg) .....
3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; stl; cad pl (tuner bracket mtg) .....
9A472534	Socket, tube: 7-prong; miniature...
9K580218	Socket, tube: 8-prong; miniature...
31A41318	Strip, terminal: 1 insulated lug, #2 mtg .....
POWER & AUDIO UNIT	
CHASSIS PARTS - MECHANICAL	
1X592233	Cable and Plug Assembly: includes fuse lead, power cable and plug.
42A4215	Clip, vibrator grounding .....
14A592132	Insulator, connector plug .....
9K592237	Lead Assembly, fuse: includes "A" lead and fuse receptacle .....
1X76859	Lead Assembly, speaker .....
4S7666	Lockwasher, ext: #6; stl; cad pl (power transformer mtg) .....
2S7005	Nut, hex: 6-32 x 1/4; stl; cad pl (power transformer mtg) .....
28A592119	Plug, connector: 4-pin .....
28K71775	Plug, insulated .....
5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg) .....
5S7706	Rivet: .122 x 1/8; stl; nkl pl (terminal strip mtg) .....
5S7707	Rivet: .122 x 5/32; stl; nkl pl (output transformer mtg) ...
5S7701	Rivet: .122 x 3/16; stl; nkl pl (vibrator clip mtg) .....
9A472534	Socket, tube: miniature; 7-prong...
9A70208	Socket, tube: 4-pin (for vibrator).
31K490143	Strip, terminal: 2 insulated lugs, #2 mtg; 1-1/8" long .....
31A592258	Strip, terminal: 2 insulated lugs, #2 mtg; 1-3/8" long .....
29A76280	Terminal, insulated pin: black (on speaker leads) .....
29K76282	Terminal, insulated pin: white (on speaker leads) .....
HOUSING PARTS	
38A71874	Button, push .....
42A501255	Clip, escutcheon retainer .....
15K592124	Cover, bottom: with bushing .....
13C501302	Escutcheon (golden voice) .....
1X501276	Housing and Escutcheon Assembly (Power & Audio Unit) .....
1X501278	Housing and Escutcheon Assembly (Tuner Unit) .....
3S400356	Screw, sheet metal: #4 x 1/4; plain hex head; stl; cad pl (escutcheon mtg) .....
3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; stl;cad pl (bottom cover mtg) .....
3S8114	Screw, sheet metal: #8 x 1/4 PKZ slotted acorn head; antique copper finish (housing screws)....
ACCESSORIES	
8A4491	Capacitor, generator .....
4S7653	Lockwasher, int-ext: 5/16; stl;cad pl (receiver mtg) .....
2S2863	Nut, hex: 5/16; stl; cad pl (receiver mtg) .....
1K75148	Shaft and Housing Assembly, flexible 24" long .....
50B502802 or 50K502269	Speaker, PM: 6"; 3.2 ohm VC ..
3A77542	Stud, threaded (receiver mtg)
6A4141	Suppressor, distributor .....

MODEL 814,
De Soto



GENERAL INFORMATION

TYPE - Two-piece automotive type receiver, specifically designed for installation in DeSoto S-15 cars.

TUNING RANGE - 535 to 1605 Kc. IF FREQUENCY - 455 Kc

OPERATES FROM - 6.3 volts DC; 9 amperes

POWER OUTPUT - 4 watts undistorted

TUNER - Model AT-82. A breakdown of the tuner will be found in the Replacement Parts List.

TUBE COMPLEMENT - Control Unit
6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Det, AVC & AF Amplifier

Speaker & Power Unit
6AT6 - Audio Inverter
6AQ5 - Power Amplifier
6AQ5 - Power Amplifier
6X4 - Rectifier

ALIGNMENT

EQUIPMENT REQUIRED:

1. A special tool for adjusting the tuner cores. Use alignment Tool, Motorola Part No. 66A76278.

2. A small fibre screwdriver for IF & RF alignment.

3. An accurately calibrated AM modulated signal generator.

4. A low range output meter.

5. A dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 1.

PROCEDURE:

1. Remove the front and rear housings and dial scale to expose alignment adjustment screws.

2. Connect the Control Unit & Speaker and Power Unit together by means of the power cable.

3. Connect an output meter across speaker voice coil.

4. Connect 6.6 volts (measured at the "on-off" switch) to receiver feed wire assembly and chassis.

5. Turn receiver on and allow it to warm up for a few minutes. Set receiver volume control at maximum. Push DIAL button to place tuner in manual position. Turn tone control to VOICE position.

6. 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.

7. 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. CAUTION; Do not press hard on the alignment screwdriver when aligning IF & diode transformers as damage to the core or transformer may result.

8. ANTENNA TRIMMER ADJUSTMENTS. Once alignment has been satisfactorily performed, no further adjustment of any alignment screws should be made except to align the antenna trimmers (7 & 12) to car antenna after receiver is installed in car. These adjustments should be made with antenna fully extended. Trimmer (7) is adjusted with the DIAL button pushed in and dial set to approximately 1400 Kc; trimmer (12) is adjusted with #5 push button pushed in and tuned to approximately 1400 Kc. Peak these trimmers for maximum volume of a weak station or background noise between stations.

9. POINTER ADJUSTMENT. Pointer should be calibrated to dial scale by tuning in 1400 Kc signal and then adjusting pointer to 1400 Kc.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Hi side-6BE6 grid (pin #7) Lo side -chassis	455 Kc	High frequency end (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating procedure.
RF ALIGNMENT - MANUAL						
2.	See Fig. 1	Ant. receptacle through dummy	1605 Kc	High frequency end. Cores should project 1-1/8" from cans. (Screw out)	5, 6, & 7	Peak for maximum in order indicated.
3.	"	"	1400 Kc	Set spacing between carriage plate & coil shield plate to 3/8"	8, 9, & 10	Peak for maximum in order indicated.
4.	NOTE: The following oscillator padder coil adjustment has been correctly made at the factory. Unless components have been changed in the oscillator circuit, this adjustment should not be made in the field. Front cover must be attached to chassis for this adjustment.					
	See Fig. 1	Ant. receptacle through dummy	Turn generator power off	Set tuner to 600 Kc ("6" on dial scale)	11	Peak oscillator padder for maximum noise. 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.
5.	Repeat steps 2, 3, & 4 but eliminate preliminary step of moving cores to project 1-1/8" from cans.					
RF ALIGNMENT - PUSH BUTTON						
6.	PUSH BUTTON #5:					
	See Fig. 1.	Ant. receptacle through dummy	1400 Kc	Set PB #5 to 1400 Kc	12	Peak PB ant. trimmer for max.
NOTE:	The following push button tracking nut adjustments have been made at the factory. Unless components have been changed in the push button assembly circuit, these adjustments should not be made in the field.					
7.	PUSH BUTTON #5:					
a.	See Fig. 1	Ant. receptacle through dummy	1605 Kc	Set PB #5 to 1605 Kc	12	Peak PB ant. trimmer (12) for max.
b.	"	"	1400 Kc	Set PB #5 to 1400 Kc	13	Peak tracking nut (13) for max.
c.	Recheck pushbutton antenna trimmer (12) adjustment at 1605 Kc for max. response and repeat steps 7a & 7b if sensitivity rises with a change of push button antenna trimmer (12) setting.					
8.	PUSH BUTTONS #4, 3 & 2:					
	See Fig. 1	Ant. receptacle through dummy	1020 Kc	Set PB's #4, 3, 2 to 1020 Kc	14 for #4 15 for #3 16 for #2	Peak tracking nuts for max.
9.	PUSH BUTTON #1:					
	See Fig. 1	"	600 Kc	Set PB #1 to 600 Kc	17	Peak tracking nut for max.
IF TRAP ADJUSTMENT						
10.	See Fig. 1	"	455 Kc	Set PB #1 to 600 Kc	18	Tune wavetrap for minimum response.

MODEL 814,
De Soto

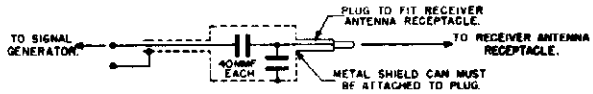


FIGURE 1. DUMMY ANTENNA

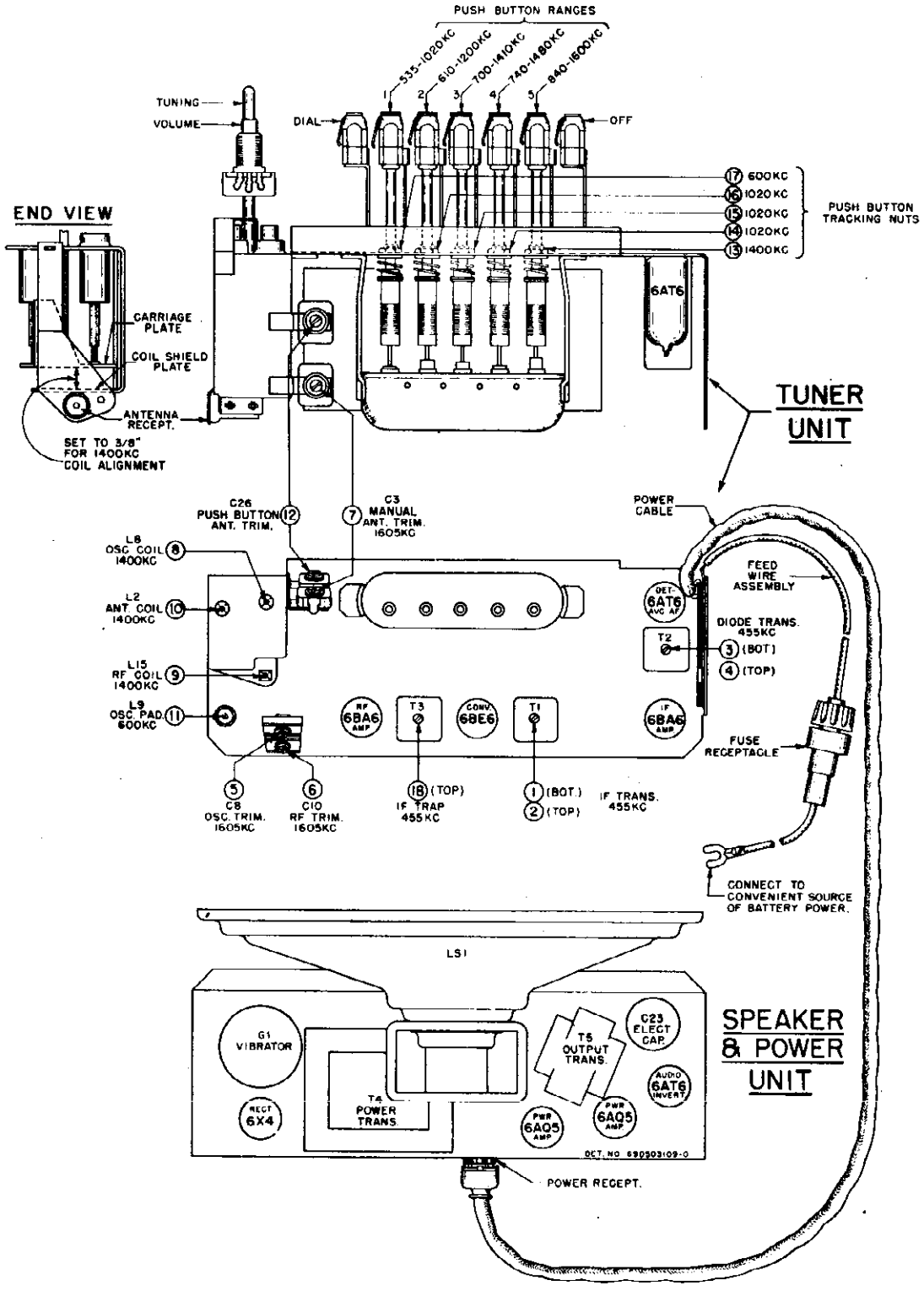


FIGURE 2. TUBE & TRIMMER LOCATION

MODEL 814,
De Soto

OPERATING INSTRUCTIONS

TO TURN THE RADIO ON. The on-off switch is combined with pushbutton operation. Pushing any button, other than the OFF button, will turn the radio on. Allow the receiver to reach operating temperature (approximately 20 seconds) before selecting a station.

TUNING. Tuning is accomplished manually or automatically. Any one of five stations may be selected automatically by means of pushbutton control. To receive stations that are not set for automatic selection, use Manual Tuning.

MANUAL TUNING. Push in the DIAL button (extreme left-hand button) then select the desired station or program by turning the manual tuning knob. Tune to the exact frequency or position for clearest reception. The pointer indicates the frequency to which the receiver is tuned.

AUTOMATIC TUNING. The five pushbuttons (1, 2, 3, 4 & 5) located beneath the dial scale, may be set for five favorite local stations. Firmly pressing one of the pushbuttons automatically selects the station for which the pushbutton was set.

VOLUME CONTROL. To increase the volume, turn the volume knob (located concentrically and behind the manual tuning knob) to the right.

TONE CONTROL. The knurled horizontal control at the left side of the dial escutcheon operates a variable tone control. Tuning this control to the right or to the left will change the tone of the receiver, as indicated on the dial escutcheon. With the control set at midway, the full tonal range is obtained. Static and other types of electrical interference will be minimized in the MELLO position.

DIMMER CONTROL. The knurled horizontal control at the right side of the dial escutcheon controls the intensity of the dial light. Turning this control to the left or right will vary the dial light intensity.

TO TURN THE RADIO OFF. Push in the OFF button (extreme right-hand button).

TO SET THE PUSHBUTTONS

The pushbuttons should preferably be set up during the day, since weak station signals are stronger at night and the button may be set to a distant station carrying the same program as the desired station.

1. Turn radio ON (see Operating Instructions) and allow it to warm up for at least 15 minutes. Antenna should be fully extended and tone control in VOICE position.

2. Pull off the chrome plated pushbutton caps from buttons 1, 2, 3, 4 and 5, exposing the knurled metal buttons.

3. Push in DIAL button and tune in station selected for No. 1 button, making sure it is within the 535 to 1020 kilocycle range as shown in Figure 2. Select only the most powerful local stations.

4. Push in No. 1 button. Turn No. 1 knurled button to right or left to tune in station already tuned in with manual control. Turning button counterclockwise will increase the frequency and turning clockwise will decrease the frequency. Check station by pushing in the DIAL button again to identify program. Tune carefully and do not force button beyond stop.

5. Perform steps 3 and 4 for the remaining four push buttons.

IMPORTANT: Check with Figure 2 for frequency range of each button.

6. Replace chrome plated pushbutton caps.

INTERFERENCE ELIMINATION

GENERATOR INTERFERENCE

Install radio interference filter capacitor on generator as shown in Figure 3. Mount the capacitor on the generator frame under the ground lead screw. Connect the eyelet terminal on the capacitor lead to the armature terminal of the generator.

WARNING: Do not connect to field terminal; to do so will result in damage to voltage regulator.

TIRE STATIC

After completion of Radio installation, road test car for tire static on dry concrete and blacktop pavements, under the following conditions:

1. At both low and high car speeds
2. With antenna extended to operating position
3. With radio at full volume and tuned off station.

If tire static noise is encountered, inject Tire Static Suppression Powder (Chrysler Package Part No. 1233 883) into tires with Injector (Chrysler Part No. 1233 884), following instructions given on package.

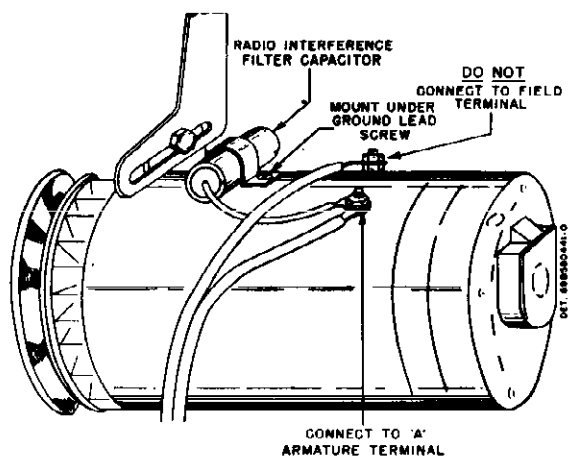


FIGURE 3. GENERATOR CAPACITOR INSTALLATION

MODEL 814,
De Soto

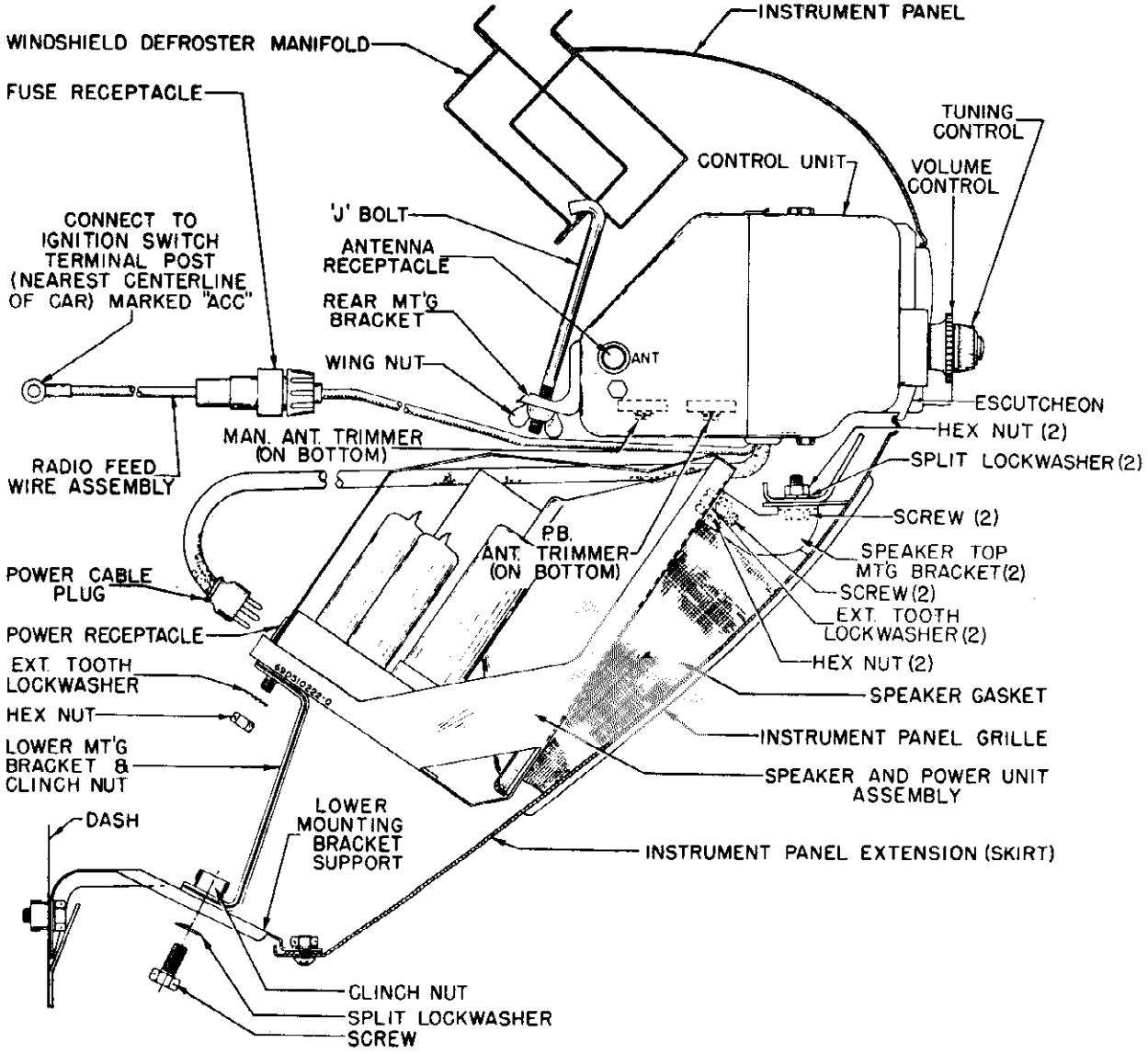


FIGURE 4. RADIO INSTALLATION

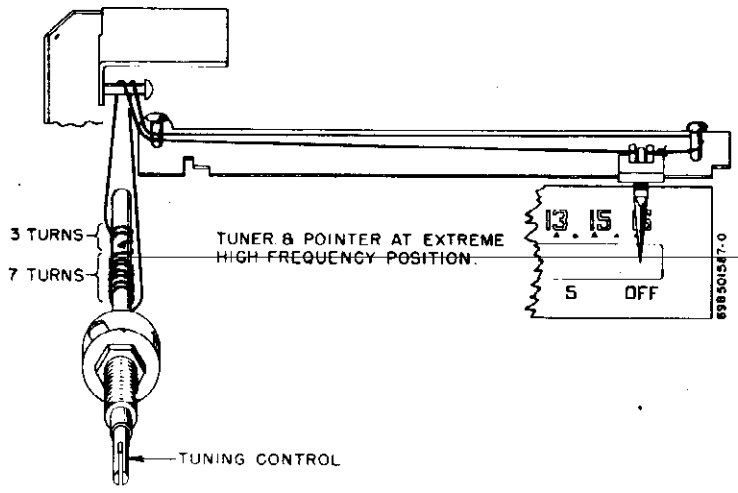


FIGURE 5. DIAL RESTRINGING

MODEL 814,
De Soto

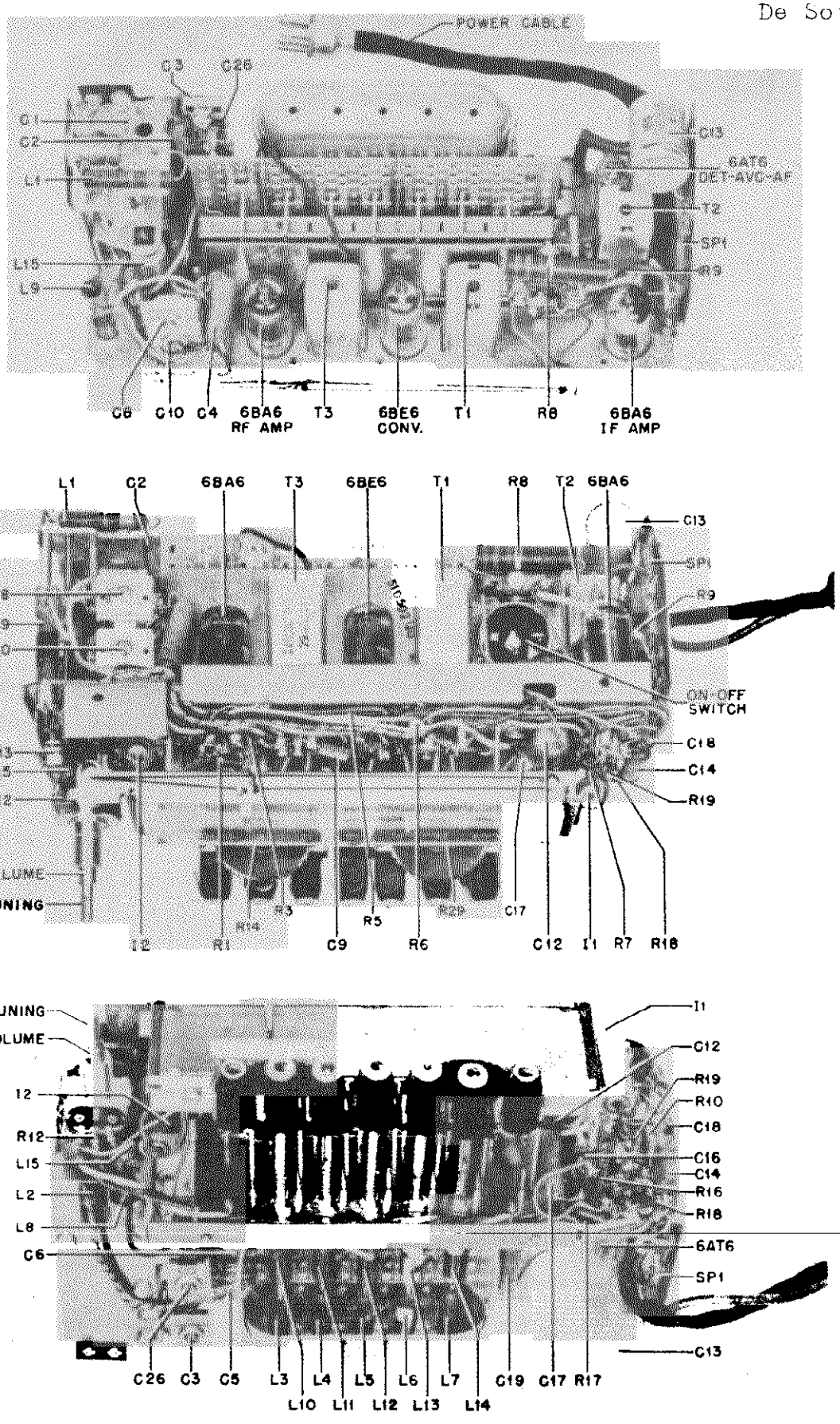


FIGURE 6. PARTS LOCATION - CONTROL UNIT

MODEL 814,
De Soto

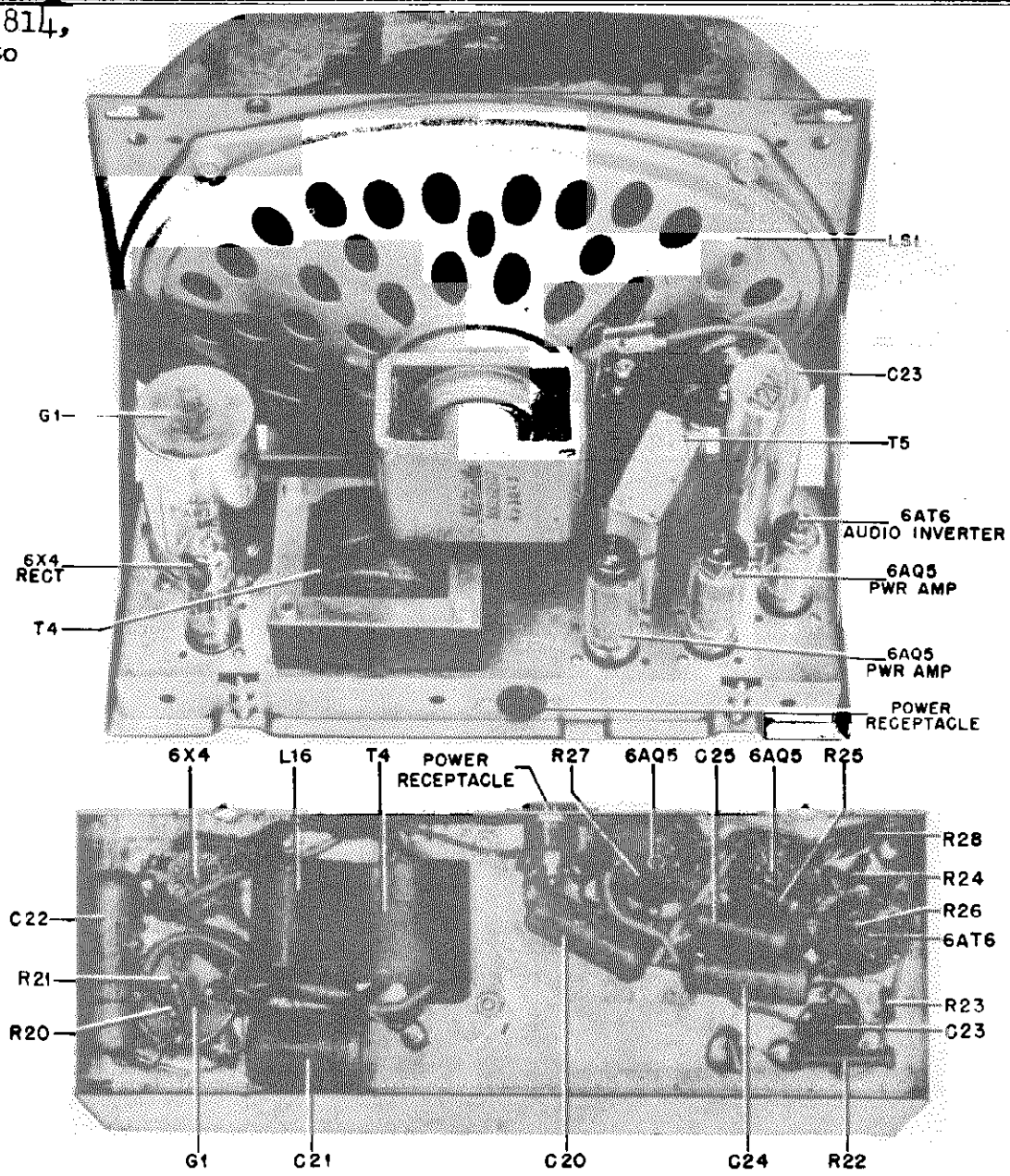


FIGURE 7. PARTS LOCATION - SPEAKER & POWER UNIT

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CONTROL UNIT - CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	-	Part of Tuner AT-82.....
C-2	-	Part of Tuner AT-82.....
C-3	-	Part of Tuner AT-82.....
C-4	8R13514	Paper: .05 mf 100V.....
C-5	-	Part of Tuner AT-82.....
C-6	-	Part of Tuner AT-82.....
C-7	21K70720	Molded: 5 mmf 500V.....
C-8	-	Part of Tuner AT-82.....
C-9	21R6513	Mica: 50 mmf 10% 500V.....
C-10	-	Part of Tuner AT-82.....
C-11	8R13166	Paper: .1 mf 400V.....
C-12	8R14791	Paper: .05 mf 400V.....
C-13	8C580845	Paper: .5 mf 100V.....
C-14	8R472754	Paper: .01 mf 100V.....
C-15	8R51209	Paper: .02 mf 100V.....
C-16	21K70720	Molded: 5 mmf 500V.....
C-17	8R13514	Paper: .05 mf 100V.....
C-18	21R6590	Mica: 500 mmf 20% 500V....
C-19	8R23690	Paper: .01 mf 400V.....
C-26	-	Part of Tuner AT-82.....
Fuse		
F-1	65K12894	Fuse, tubular: 14 amp.....
Pilot Light		
I-1,2	65X11854	Bulb: 6.3V; .15A; tubular; bayonet base.....
Coils		
L-1 thru L-15	-	Part of Tuner AT-82.....
Resistors		
Note: All resistors are insulated carbon type unless otherwise specified.		
R-1	6R6270	220 10% 1/2W.....
R-2	6R6032	470,000 20% 1/2W.....

R-3	6R6182	150,000 20% 1/2W.....
R-4	6R6075	100,000 20% 1/2W.....
R-5	6R6056	47,000 20% 1/2W.....
R-6	6R5656	12,000 10% 1W.....
R-7	6R5554	390 10% 1/2W.....
R-8	6R5732	15,000 10% 2W.....
R-9	6R6010	330 20% 1/2W.....
R-10	6R6001	68,000 20% 1/2W.....
R-11	6R6056	47,000 20% 1/2W.....
R-12	18A501857	Volume control: 500,000; tapped at 50,000.....
R-13	6R6054	10,000 20% 1/2W.....
R-14	18A501754	Tone control: 500,000...
R-15	6R6004	1 meg 20% 1/2W.....
R-16	6R6004	1 meg 20% 1/2W.....
R-17	6R6161	1500 20% 1/2W.....
R-18	6R2122	4.7 meg 20% 1/2W.....
R-19	6R6015	220,000 20% 1/2W.....
R-29	17A502225	Wirewound: 30 .....

Spark Plate

SP-1	1A501755	Spark Plate Assembly ...

Transformers

T-1	24B485553	
or	24K502819	IF, 455 Kc: complete....
T-2	24K485555	Diode, 455 Kc: complete.....
T-3	24B580274	IF trap, 455 Kc: complete...

SPEAKER AND POWER UNIT -CHASSIS PARTS -ELECTRICAL

Capacitors

C-20	8R71911	Paper: .03 mf 400V.....
C-21	8C580845	Paper: .5 mf 100V.....
C-22	8R490449	Paper: .02 mf 1000V.....
C-23	23A473015	Electrolytic: 30-30-20 mf/ 350-300-25V.....
C-24	8R71911	Paper: .03 mf 400V.....
C-25	8R490437	Paper: .003 mf 400V.....

Vibrator

G-1	48B3333	Vibrator, non-sync: 4-pin...

Coil

L-16	24A472535	Choke, hash.....

Speaker

LS-1	50C502337	
or	50C501778	
or	50C502190	Speaker, PM: 6" x 9" oval; 3.2 ohm VC .....

Resistors

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

R-20	6R5614	56 10% 1/2W.....
R-21	6R5614	56 10% 1/2W.....
R-22	6R476130	2200 20% 2W.....
R-23	6R6015	220,000 20% 1/2W.....
R-24	6R6069	2200 10% 1/2W.....
R-25	6R6407	220,000 10% 1/2W.....
R-26	6R6320	10,000 10% 1/2W.....
R-27	6R6015	220,000 20% 1/2W.....
R-28	6R6336	270 10% 1W.....

Transformers

T-4	25C501644	Power transformer.....
T-5	25B501722	Output transformer.....

CONTROL UNIT - CHASSIS PARTS - MECHANICAL

7B501750	Bracket, dimmer and tone control retainer.....
30K501917	Cable and Plug Assembly, power.....
42B485548	Clip, coil can mtg.....doz
42A501781	Clip, hair-pin (dial scale bracket retainer).....doz
11M8944	Cord, dial: #18; nylon; black....yd
1X502120	Dial Scale and Bracket Assembly....
1X502091	Dial Scale Support Bracket Assembly: includes dimmer control resistor and shoulder rivets.....
9K471264	Grommet, insulating (on power & battery leads).....
36B501748	Knob, dimmer control.....
36B501747	Knob, tone control.....
9K502087 or 9K502241	Lead Assembly, radio to ignition switch: includes fuse.....
1K501718	Pointer and Slider Assembly.....
1X502121	Pushbutton and Arm Assembly (for OFF and DIAL).....
1X502122	Pushbutton and Arm Assembly (for 1, 2, 3, 4 & 5).....
5K71246	Rivet, shoulder: stl; nkl pl (dial cord guide).....
34B501752	Scale, dial: plastic.....
43K501785	Sleeve, pushbutton coupling.....
9A502226	Socket, pilot light: includes bracket; R.H; 2-1/4" & 4-1/2" leads
9A502227	Socket, pilot light: includes bracket; L.H; 7" & 10" leads.....
9K580218	Socket, tube: 7-prong; miniature; with dummy lug.....
1A502228	Stud and Spring Wiper Assembly (dimmer control contact arm).....

CONTROL UNIT - HOUSING PARTS

61A501709	Crystal, dial: glass.....
1X502102	Escutcheon & Dial Crystal Assembly.
7B501715	Frame, dial crystal retainer.....
15D501724	Housing, front: painted white.....
15K501732	Housing, rear.....
2A485540	Nut, hex: special; 7/16-28 x 9/16; stl; cad pl (escutcheon mtg).....
2S7999	Speednut (dial crystal retainer)doz

SPEAKER AND POWER UNIT - MECHANICAL PARTS

42A501782	Clip, speed (rain shield mtg)...
42A4215	Clip, vibrator grounding.....
32B501634	Gasket, speaker: rubber.....
1X510121	Plate & Gasket Assembly, spkr mtg..
9A501887	Receptacle, 5-prong (for power cable).....
3S7457	Screw, sheet metal: #8 x 7/8 plain hex head; stl; cad pl (chassis mtg).....
3S8188	Screw, sheet metal: #10 x 1/2 plain hex head; stl; cad pl (spkr mtg).....
1X502364	Shield, rain: includes pads.....
9A70208	Socket, tube: 4-prong (for vibrator)
8A472534	Socket, tube: 7-prong; miniature...
8K580218	Socket, tube: 7-prong; miniature; with dummy lug.....

MODEL 814,
De Soto

MOUNTING HARDWARE AND ACCESSORIES

3A501915	Bolt, "J" (control unit assembly mtg).....
7B501623 or 7K501624	Bracket, spkr plate top mtg: right-hand.....

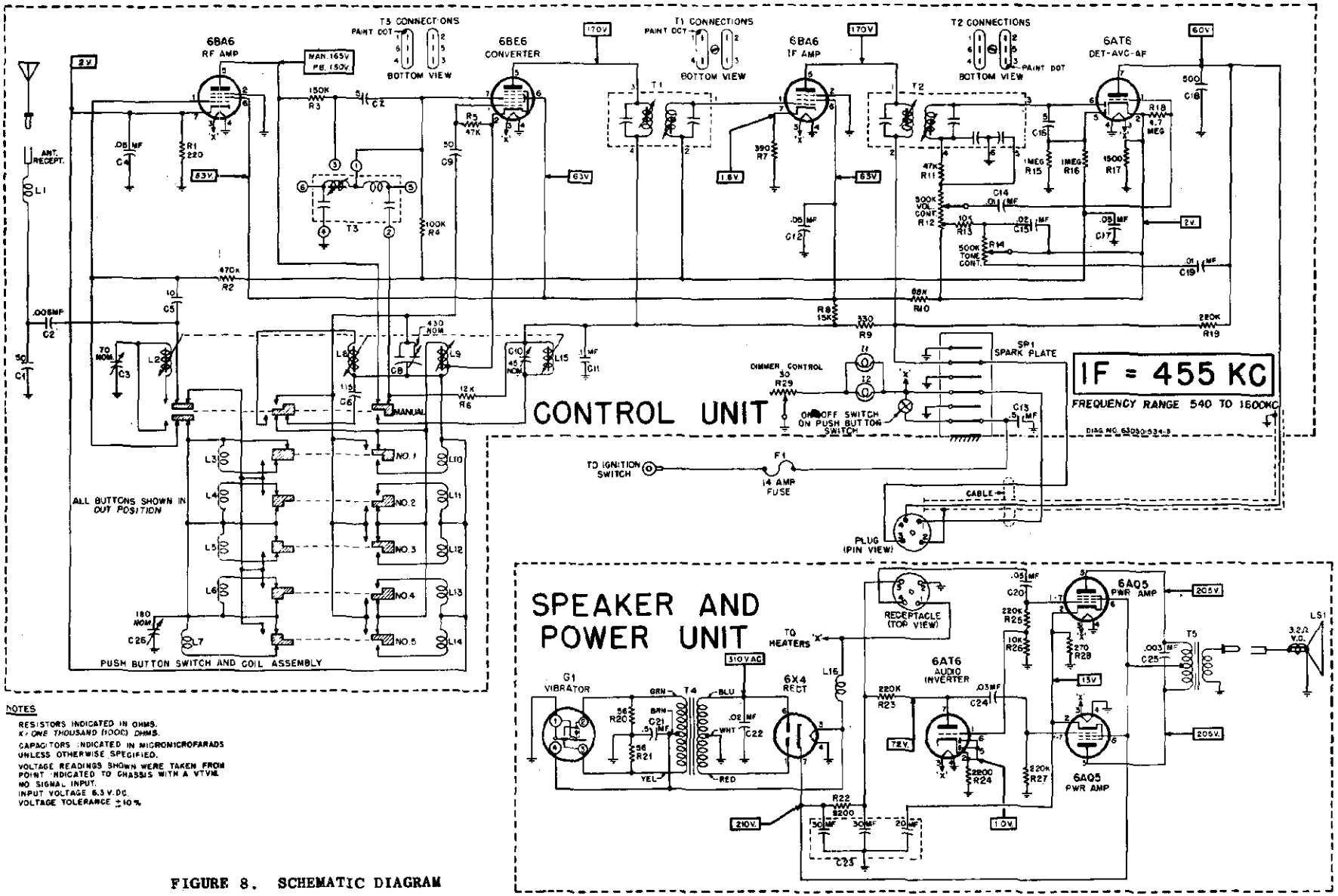
Part Number	Description
7K501626 or 7K501627	Bracket, spkr plate top mtg: left-hand.....
1X502104	Bracket and Clinch Nut Assembly (spkr & power unit mtg).....
15A485225	Cap, pushbutton: chrome pl.....
8B580014	Capacitor, radio interference.....
2K501944	Clinch Nut: 1/4-20 (lower mounting bracket support mtg).....
1X500387	Knob, tuning control: chrome pl....
36B501858	Knob, volume control: chrome pl....
4S7652	Lockwasher, ext: tooth; #10; stl; cad pl (spkr & power unit assembly mtg) .....
4S400449	Lockwasher, split: 1/4"; stl; cad pl (bracket and clinch nut assembly, lower mounting bracket support mtg & speaker plate top mounting bracket mtg).....
2S7009	Nut, hex: 10-32 x 3/8; stl; cad pl (speaker & power unit assembly mtg) .....
2S2890	Nut, hex: 1/4-20 x 7/16; stl; cad pl (speaker plate top mounting bracket mtg) .....
2K502076	Nut, wing: 10-24; stl; cad pl (control unit assembly mtg).....
3S400938	Screw, machine: 10-32 x 3/8; Phillips round head; stl; cad pl (lower mounting bracket support mtg).
4S400495	Screw, machine: 10-32 x 1/2; slotted hex head; stl; cad pl (speaker & power unit assembly mtg).....
3S7297	Screw, machine: 1/4-20 x 1/2; plain hex head; stl; cad pl (bracket & clinch nut assembly, speaker top mounting bracket and lower mounting bracket support mtg).....doz
7C502482	Support, lower mounting bracket....

Ref. No.	Part Number	Description
TUNER - MODEL AT-82		
	51D502140	Automatic Tuner Model AT-82, complete: includes 51K510170 & 51K510171.....
	51K510170	Manual Tuner Assembly only: complete; includes L-1,2,8, 15, C-1,2,3,26 & ant receptacle.....
	51K510171	Pushbutton Tuner Assembly, only: complete; includes L-3, 4,5,6,7,9,10,11,12,13,14, PB switch, C-5,6,8 & 10....

Ref. No.	Part Number	Description
Capacitors		
C-1	21K74661	Ceramic: 50 mmf 500V.....
C-2	8C4529	Paper: .006 mf 100V.....
C-3	20A501889	Variable, mica: 20-80 mmf; includes brkt.....
C-5	21K580178	Ceramic: 10 mmf 500V.....
C-6	21K502851	Ceramic: 115 mmf 500V.....
C-8	20A501888	Variable, mica: 395-470 mmf; on same bracket as C-10....
Coils		
L-1	24B580540	Choke, antenna.....
L-2	24A510162	Antenna coil, manual.....
L-3 thru L-7	-	Antenna coil, PB (part of 51K510171; not replaceable separately).....
L-8	24K510163	RF coil, manual.....
L-9	24K501921	Oscillator padder coil, manual.....
L-10 thru L-14	-	Oscillator coil, PB (part of 51K510171; not replaceable separately).....
L-15	24A510164	Oscillator coil, manual.....

Miscellaneous Tuner Parts

42A502507	Clip, spring (manual drive shaft retainer).....
46A510160	Core, powdered iron: with screw (L-2, 8 & 15 tuning)
5A501013	Grommet, rubber (L-2,8 & 15 tuning core mtg).....
2S9647	Nut, hex: 12-28 x 5/16 (PB osc coil mtg & tracking nut) .....
2A510167	Nut, floating: 1 ear (on manual drive shaft).....
2A510165	Nut, lock: 2 ears (on manual drive shaft).....
9A472148	Receptacle, antenna.....
5A470101	Rivet, shoulder (pointer cord guide).....
47B501910	Shaft, manual drive.....
46A510161	Sleeve, coil: powdered iron (inside L-2, 8 & 15 coil shield cans).....
41A510169	Spring, loading (on manual drive shaft).....
31A502144	Strip, terminal: 1 insulated lug, #2 mtg.....
31K590446	Strip, terminal: 2 insulated lugs, #2 mtg.....
31A502143	Strip, terminal: 2 insulated lugs, #3 mtg.....



NOTES

RESISTORS INDICATED IN OHMS.
K = ONE THOUSAND (1000) OHMS.
CAPACITORS INDICATED IN MICROMICROFARADS UNLESS OTHERWISE SPECIFIED.
VOLTAGE READINGS SHOWN WERE TAKEN FROM POINT INDICATED TO CHASSIS WITH A VTVM.
NO SIGNAL INPUT.
INPUT VOLTAGE 6.3 V. DC.
VOLTAGE TOLERANCE ±10%

FIGURE 8. SCHEMATIC DIAGRAM

MODEL 7XM21,
Ch. HS-218

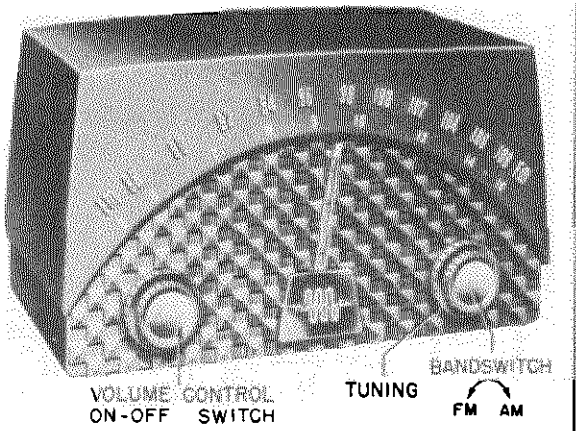
GENERAL INFORMATION

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 Amp
50C5 - Power Amplifier
Rectifier - Selenium type

POWER SUPPLY - 117V AC or DC, 40 watts



INSTALLATION & OPERATING INSTRUCTIONS

ANTENNA & GROUND

No outside antenna or ground is required for standard broadcast (AM) reception. A loop antenna for broadcast reception is located at the rear of the cabinet.

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. In 'fringe' or weak signal areas, improved FM reception can be obtained by using an FM antenna mounted as high as possible. The FM antenna should be connected through a 300 ohm twin transmission line to the two screws on the rear of the set. Refer to the instructions on the antenna panel for proper transmission line connections. Orient the antenna so that maximum volume of FM station or stations is obtained.

NOTE: When the built-in FM antenna is used, connect the green lead from the chassis to the **RIGHT-HAND** terminal on the loop. Since the FM antenna is incorporated in the power line cord, stretch the line cord to its full length to obtain strong FM reception.

CAUTION: Do not connect antenna or chassis to water pipe, radiator, or other ground.

CONTROLS

POWER SWITCH & VOLUME CONTROL. The power switch and volume control are combined and are operated by the left-hand knob.

BANDSWITCH. The small (inner) right-hand knob selects FM or AM reception. Rotate the knob clockwise for AM or counterclockwise for FM.

TUNING. Tuning of both FM and AM is accomplished with the large (outer) right-hand knob. The standard broadcast dial (AM) is read in kilocycles by adding two zeros to the figures. The frequency modulation (FM) dial scale is read in megacycles (88 to 108).

Tuning of FM stations should be done very carefully, for best sound reproduction, not necessarily for strongest volume received.

SERVICE NOTES

OPERATING 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 the power line and the receiver to reduce the possibility of electrical shock. If an isolation transformer is not available, check the AC voltage between the chassis and the bench ground. If there is any indication of voltage, reverse the line plug before handling the set.

When operating the receiver from an AC power line, reception can sometimes be improved by reversing the plug in the power outlet. If the receiver does not operate from a DC power line, after being turned on for a few minutes, reverse the plug in the power outlet.

TO CALIBRATE DIAL:

1. Turn the tuning knob counterclockwise until the end of its travel is reached.
2. Through the hole in the bottom of the cabinet, loosen the Allen head setscrew in the pointer sleeve.
3. Move the pointer until it coincides with the center of the "5" on the AM broadcast scale.
4. Tighten the setscrew.

NOTE: If the pointer is accidentally moved by hand, it will be released from a detent in the pointer collar assembly, and no damage to the tuning mechanism will result. To reset the pointer, merely move it back and forth until it again engages in the detent.

TO REMOVE POINTER:

1. Remove the two screws holding the medallion, from beneath the cabinet.
2. Turn the tuning knob until the pointer reaches the low frequency end of its range.
3. Through the hole in the bottom of the cabinet, insert an Allen head wrench into the setscrew in the pointer sleeve and hold the wrench. This keeps the sleeve from turning and breaking the dial string.
4. Remove the nut and washers from the front of the pointer.
5. Pull off the pointer.

TO REMOVE CHASSIS FROM CABINET:

1. Remove the pointer, as described above.
2. Pull off the control knobs.
3. From the rear of the cabinet, remove the two screws holding the chassis to the cabinet.
4. Remove the two split plugs at the top of the loop, which hold the loop to the cabinet.
5. Slide the chassis from the cabinet.

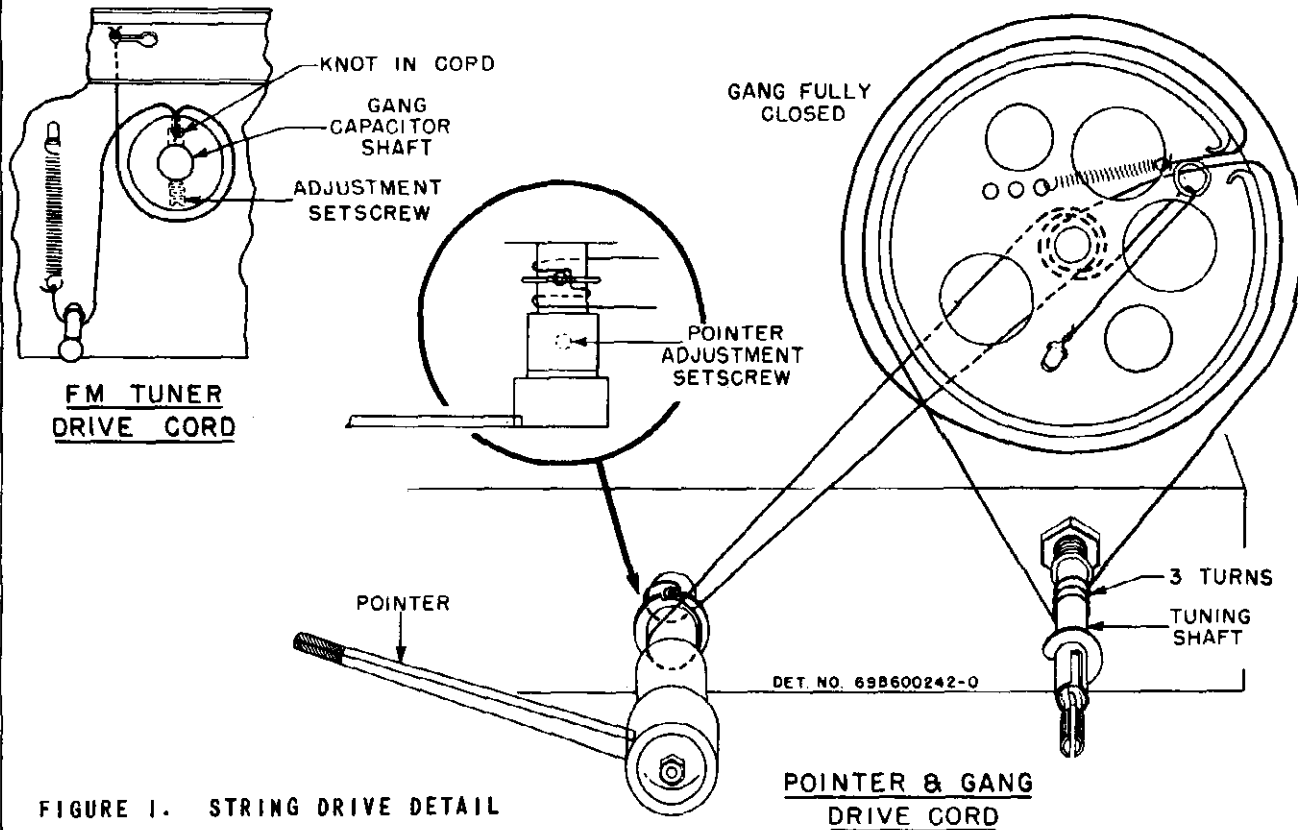


FIGURE 1. STRING DRIVE DETAIL

ALIGNMENT

GENERAL INFORMATION

1. Maximum performance can be obtained only if extreme care is exercised during alignment.

2. If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver during alignment to avoid hum and electrical shocks. If an isolation transformer is not available, connect the low side of the signal generator to the receiver chassis through a .1 mf capacitor.

3. Use a small fibre screwdriver for aligning the IF transformers.

4. Refer to Figure 2 for the location of all alignment trimmers and cores.

5. As the stages are brought into alignment, reduce the signal generator output to a low value to avoid overloading the receiver.

ORDER OF ALIGNMENT AND EQUIPMENT REQUIRED

1. Broadcast Band IF & RF Alignment
   a. 455 to 1620 Kc AM signal generator
   b. Low range output meter

2 (A) FM Band IF & RF Alignment (Preferred Method)
   a. 10.7 to 108 Mc FM signal generator
   b. Oscilloscope

(B) FM Band IF & RF Alignment (Alternate Method)
   a. 10.7 to 108 Mc signal generator (unmod.)
   b. Low range DC electronic voltmeter.

BROADCAST BAND - IF & RF ALIGNMENT

1. Connect the AM signal generator as in chart below, with 400 cycle, 30% modulation.

2. Connect the output meter across the speaker voice coil. Throughout alignment reduce the generator output to a level which produces less than .40 volts across the voice coil, to avoid overloading the receiver.

3. Set the bandswitch to the AM position.

4. Turn the receiver volume control to maximum

5. Proceed as shown in the following chart.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. V-2 (pin 7, 12BA7)	455 Kc	Fully opened	1, 2, 3 & 4 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	.1 mf	Grid of conv. V-2 (pin 7, 12BA7)	1620 Kc	Fully opened	5 (BC osc)	Adjust for maximum.*
3.	-	Across radiation loop**	1400 Kc	Tune in signal	8 (BC ant)	Adjust for maximum.

MODEL 7XM21,
Ch. HS-218

4. If, after the receiver has been aligned as above, it is found to be badly off calibration, it will be necessary to adjust oscillator core (7) as follows: connect the generator to the grid of the converter tube and, with the gang fully closed, adjust core (7) at 535 Kc. It is advisable to repeat the oscillator adjustments at 1620 Kc and 535 Kc several times until the tuning range is correct. Core (7) has been pre-set at the factory and normally should require no retuning.

* If difficulty is encountered in tuning trimmer (5), adjust trimmer (6) to ½ turn from tight.

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

FM BAND - IF & RF ALIGNMENT (PREFERRED METHOD)

1. The following FM alignment procedure, using an FM signal generator and an oscilloscope, is to be preferred because the actual response pattern may be observed on the scope and adjusted for best symmetry and maximum amplitude.

2. Connect the vertical input terminals of the oscilloscope between the chassis and the junction of resistor R-24 (33K) and capacitor C-29 (1000 mmf).

3. Connect the FM signal generator sync voltage output terminals, through a phase shifting network, to the horizontal input terminals of the scope, as in Figure 3. (Other values of resistance and capacitance may be required, depending upon the scope). The phasing control should be adjusted to give only one trace on the scope. **NOTE:** If the FM generator has a built-in phase control, the phase shifting network is not necessary.

4. Set the bandswitch to the FM position.

5. Throughout alignment, reduce the generator output to keep the signal just above the noise level, to avoid overloading the receiver.

6. Proceed as shown in the following chart.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	1000 mmf	Grid of 2nd IF Amp V-4 (pin 1, 12BA6)	10.7 Mc ±100 Kc dev.	Fully opened	9 (ratio det pri)	Adjust for maximum amplitude of pattern.*
2.	1000 mmf	Grid of 2nd IF Amp V-4 (pin 1, 12BA6)	10.7 Mc ±100 Kc dev.	Fully opened	10 (ratio det sec)	Adjust for symmetrical curve, as shown in Figure 4.
3.	-	-	-	-	-	Repeat steps 1 & 2 for maximum amplitude and best symmetry.
4.	1000 mmf	Grid of 1st IF Amp V-3 (pin 1, 12BA6)	10.7 Mc ±100 Kc dev	Fully opened	11 & 12 (2nd IF sec & pri)	Adjust for maximum amplitude of pattern.*
5.	1000 mmf	Grid of conv. V-2 (pin 7, 12BA7)	10.7 Mc ±100 Kc dev	Fully opened	13 & 14 (1st IF sec & pri)	Adjust for maximum amplitude of pattern.*
6.	1000 mmf	Grid of conv. V-2 (pin 7, 12BA7)	10.7 Mc ±100 Kc dev	Fully opened	11, 12, 13 & 14	Readjust for maximum amplitude and best symmetry.
RF ALIGNMENT						
7.	270 ohms	FM terminals on loop	87.5 Mc ± 22½ Kc dev	Fully closed	15 (osc adj nut)	Adjust for maximum amplitude of pattern.*
8.	-	-	-	Fully closed	16 (RF adj nut)	Turn counterclockwise until core is at bottom of pipe, then turn four turns clockwise.
9.	270 ohms	FM terminals on loop	90 Mc ± 22½ Kc dev	Tune in signal	17 (RF tuning plug)	Adjust for maximum amplitude of pattern.*
10.	270 ohms	FM terminals on loop	105 Mc ± 22½ Kc dev	Tune in signal	16 (RF adj nut)	Adjust for maximum amplitude of pattern.*
11.	-	-	-	-	-	Repeat steps 9 & 10 until no further adjustment is necessary.

*An output meter across the speaker voice coil will also indicate maximum amplitude. It should not be used

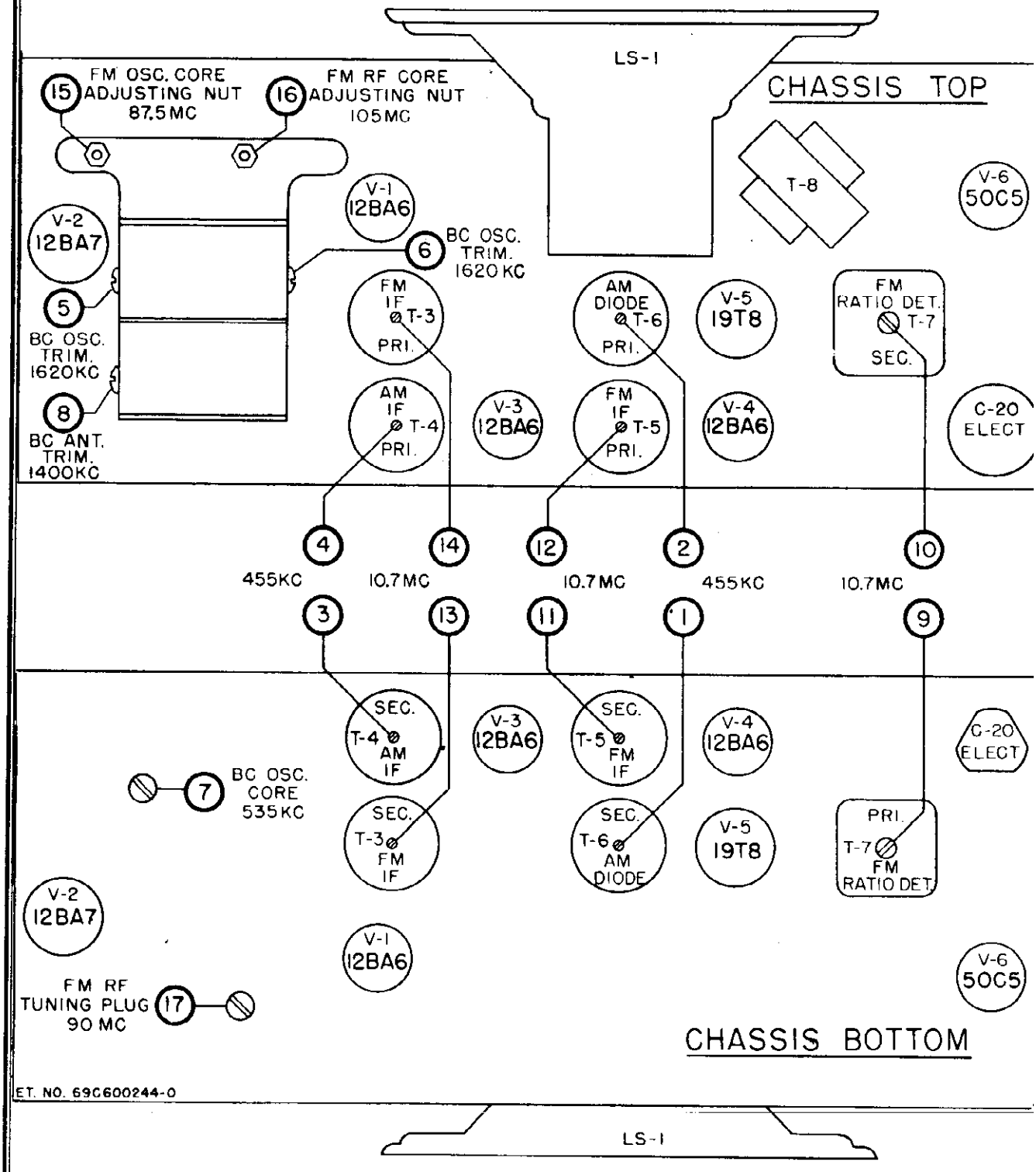


FIGURE 2. TUBE & TRIMMER LOCATIONS

MODEL 7XM21,
Ch. HS-218

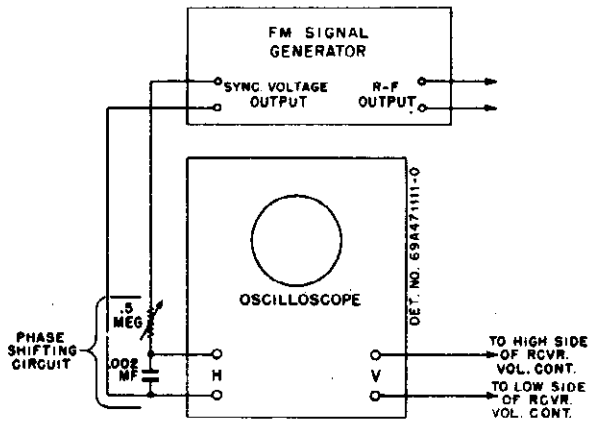


FIGURE 3.
FM SIGNAL GENERATOR & OSCILLOSCOPE HOOK-UP

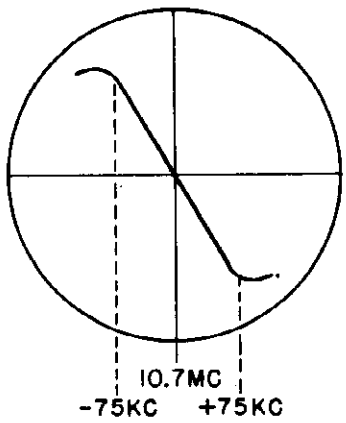


FIGURE 4.
RATIO DETECTOR WAVEFORM

FM BAND - IF & RF ALIGNMENT (ALTERNATE METHOD)

1. The following procedure for FM alignment, with an unmodulated carrier generator and a DC electronic voltmeter, is not as desirable as the preceding method; but it may be used if no FM generator is available.

2. Connect the signal generator as in chart below, with no modulation.

3. Set the bandswitch to the FM position.

4. Except in step 2 below, connect the electronic voltmeter across resistor R-23 (15K) in the ratio detector stage.

5. Throughout alignment reduce the signal generator output to a value which produces no more than a 5 volt rise above no signal voltage, to avoid overloading the receiver.

6. In step 2 below, connect two 100K ohm resistors in series across R-23. Connect the electronic voltmeter between the volume control side of resistor R-24 (33K) and the junction of the two 100K resistors, with the low side of the meter at the 100K resistors.

7. Proceed as shown in the following chart.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	1000 mmf	Grid of conv. V-2 (pin 7, 12BA7)	10.7 Mc	Fully opened	9, 11, 12, 13 & 14 (IF cores)	Adjust for maximum.
2.	1000 mmf	Grid of conv. V-2 (pin 7, 12BA7)	10.7 Mc	Fully opened	10 (ratio det sec)	Adjust for zero. (Connect meter as in step 6 above).
RF ALIGNMENT						
3.	270 ohms	FM terminals on loop	87.5 Mc	Fully closed	15 (osc adj nut)	Adjust for maximum.
4.	-	-	-	Fully closed	16 (RF adj nut)	Turn counterclockwise until core is at bottom of pipe, then turn four turns clockwise.
5.	270 ohms	FM terminals on loop	90 Mc	Tune in signal	17 (RF tuning plug)	Adjust for maximum.
6.	270 ohms	FM terminals on loop	105 Mc	Tune in signal	16 (RF adj nut)	Adjust for maximum.
7.	-	-	-	-	-	Repeat steps 5 & 6 until no further adjustment is necessary.

MODEL 7XM21,
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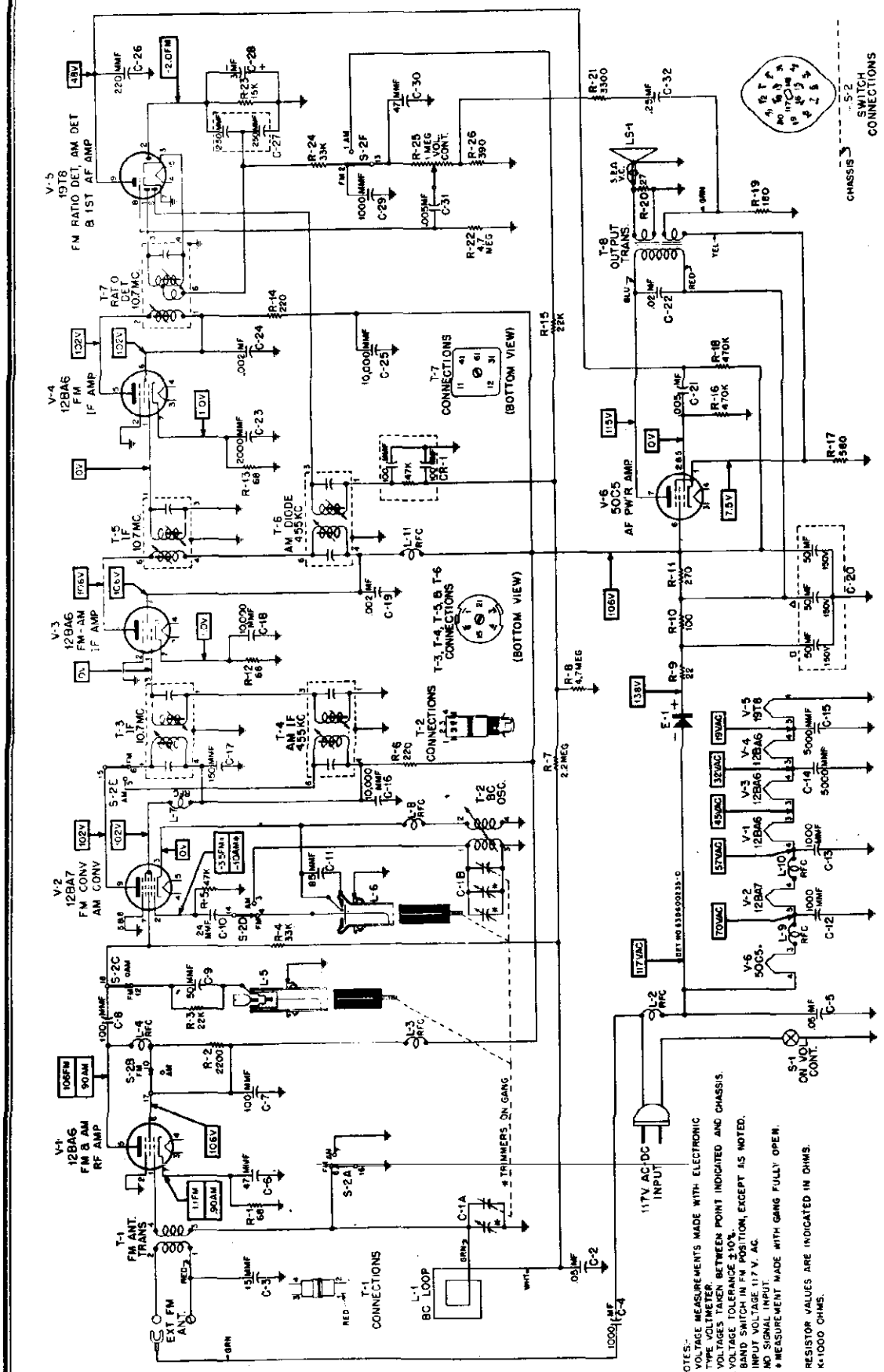


FIGURE 5. SCHEMATIC DIAGRAM

MODEL 7XM21,
Ch. HS-218

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
		CHASSIS PARTS - ELECTRICAL
		CAPACITORS
C-1A,B	19B691877	Variable: 2-gang .....
C-2	8R9821	Paper: .05 mf 200V .....
C-3	21K470323	Ceramic: 15 mmf 500V .....
C-4	21K478410	Ceramic: 1000 mmf 500V .....
C-5	8K470606	Paper: .05 mf 400V .....
C-6	21K77373	Ceramic: 47 mmf 500V .....
C-7	21B77286	Ceramic: 100 mmf 500V .....
C-8	21B77286	Ceramic: 100 mmf 500V .....
C-9	21R2743	Mica: 50 mmf 5% 300V .....
C-10	21K28816	Ceramic: 24 mmf 500V .....
C-11	21A690688	Ceramic: 85 mmf 500V .....
C-12	21K478410	Ceramic: 1000 mmf 500V .....
C-13	21K478410	Ceramic: 1000 mmf 500V .....
C-14	21A470789	Ceramic, disc type: 5000 mmf 450V
C-15	21A470789	Ceramic, disc type: 5000 mmf 450V
C-16	21K482726	Ceramic, disc type: 10,000 mmf 450V
C-17	21K691948	Ceramic: 150 mmf 500V .....
C-18	21K482726	Ceramic, disc type: 10,000 mmf 450V
C-19	8K9824	Paper: .002 mf 400V .....
C-20	23B690539	Electrolytic: 50-50-50 mf/150V..
C-21	8R9813	Paper: .005 mf 600V .....
C-22	8R9802	Paper: .02 mf 400V .....
C-23	21K790912	Ceramic: 2000 mmf 500V .....
C-24	8K9824	Paper: .002 mf 400V .....
C-25	21K482726	Ceramic, disc type: 10,000 mmf 450V .....
C-26	21K77375	Ceramic: 220 mmf 500V .....
C-27	21B484337	Ceramic, dual: 250 mmf, 250 mmf.
C-28	23K690543	Electrolytic: 3 mf 50V .....
C-29	21K478410	Ceramic: 1000 mmf 500V.....
C-30	21K77373	Ceramic: 47 mmf 500V .....
C-31	8R9813	Paper: .005 mf 600V .....
C-32	8R9810	Paper: .25 mf 100V .....
		CAPACITOR-RESISTOR
CR-1	21A473040	Capacitor-Resistor: 100-100 mmf & 47,000 ohms .....
		RECTIFIER
E-1	48B482807	Rectifier, selenium: half-wave; 150 ma .....
		COILS
L-1	24C692186	Antenna Loop & Panel Assembly: complete.....
L-2	24A692148	RF Choke .....
L-3	24A692148	RF Choke .....
L-4	24A484025	RF Choke .....
L-5	24C690584	Inductor & Capacitor Assembly: FM RF; less tuning core.....
L-6	24K600519	Inductor & Capacitor Assembly: FM osc; less tuning core.....
L-7	24A691847	RF Choke .....
L-8	24A791081	RF Choke .....
L-9	24A692148	RF Choke .....
L-10	24K780128	RF Choke .....
L-11	24A692148	RF Choke .....

REF. NO.	PART NO.	DESCRIPTION
		SPEAKER
LS-1	50C600135	Speaker: 5-1/4" PM; 3.2 ohm VC exch
		RESISTORS
		Note: All resistors are insulated carbon type unless otherwise specified.
R-1	6R2039	68 10% ½W .....
R-2	6R6069	2200 10% ½W .....
R-3	6R6028	22,000 20% ½W .....
R-4	6R6012	33,000 20% ½W .....
R-5	6R6056	47,000 20% ½W .....
R-6	6R3933	220 20% ½W .....
R-7	6R3927	2.2 meg 20% ½W .....
R-8	6R2122	4.7 meg 20% ½W .....
R-9	17A690578	Wire wound: 22 10% 1.5W....
R-10	6R3963	100 10% 2W .....
R-11	6R476116	270 10% 2W .....
R-12	6R2039	68 10% ½W .....
R-13	6R2039	68 10% ½W .....
R-14	6R3933	220 20% ½W .....
R-15	6R6028	22,000 20% ½W .....
R-16	6R6032	470,000 20% ½W .....
R-17	6R6291	560 10% ½W .....
R-18	6R6032	470,000 20% ½W .....
R-19	6R5660	180 10% ½W .....
R-20	6R5683	27 10% ½W .....
R-21	6R6036	3300 20% ½W .....
R-22	6R2122	4.7 meg 20% ½W .....
R-23	6R6477	15,000 10% ½W .....
R-24	6R6012	33,000 20% ½W .....
R-25	18A690549	Volume Control: 1 meg; with on-off switch .....
R-26	6R5554	390 10% ½W .....
		SWITCHES
S-1		On-Off Switch (on vol control)..
S-2	40B690538	Bandswitch, AM-FM .....
		TRANSFORMERS
T-1	24A690544	FM Antenna Input Transformer....
T-2	24K691878	BC Oscillator Coil .....
T-3	24B690540	1st FM IF Transformer (orange dot): 10.7 mc; complete with capacitors and cores, less shield .....
T-4	24B692193	AM IF Transformer (blue dot): 455 Kc; complete with capacitors and cores; less shield....
T-5	24B690541	2nd FM IF Transformer (yellow dot): 10.7 mc; complete with capacitors and cores; less shield .....
T-6	24B692193	AM Diode Transformer (blue dot): 455 Kc; complete with capacitors and cores; less shield....
T-7	24B690542	Ratio Detector Transformer: 10.7 mc; complete with capacitors, cores, and shield.....
T-8	25B690536	Audio Output Transformer.....

PART NUMBER	DESCRIPTION
CHASSIS PARTS - MECHANICAL	
43A4326	Ball, steel: 1/8" dia (pointer detent)
1X690717	Bracket Assembly, tuning core mtg: includes shoulder rivet & anti-backlash clip
7K692144	Bracket, loop mtg
7K692146	Bracket, rectifier mtg
7C690567	Bracket, tuner mtg (gang mtg)
43A692172	Bushing, pointer shaft: brass
42K690561	Clip, anti-backlash: single (on core mtg bracket)
42A690560	Clip, anti-backlash: double (on tuner mtg bracket)
42B482867	Clip, spring: blued finish (holds IF transformers)
1X692227	Collar Assembly, pointer detent: with pin
11M488137	Cord, dial: core drive
11M8944	Cord, dial: pointer drive
30K21859	Cord, line: with plug; 9 ft long
46K692165	Core, iron and screw (RF tuning core)
46B692164	Core, iron and screw: green dot (osc tuning core)
5S7866	Eyelet: .125 x .091 brass; nkl pl (core drive cord retainer)
5A19658	Eyelet, speaker mtg
37A12691	Grommet, rubber (spkr cushion)
14A690548	Insulator, bakelite (vol control & bandswitch mtg)
14A482844	Insulator, line cord: fibre; without lugs
14K692187	Insulator, line cord: fibre; with lugs
4S9751	Lockwasher, int-ext: #8; cad pl (pointer drive pulley mtg)
29R3036	Lug, soldering: #8 (on spkr mtg screw)
29R5285	Lug, soldering: #8 (on FM ant lead)
2S70019	Nut, hex: 4-40 x 1/4; cad pl (tuning core mtg)
2S7051	Nut, hex palnut: 3/8-32 x 9/16; cad pl (vol control & bandswitch mtg)
35K691846	Pad, rubber: 1 hole (gang mtg)
35A691845	Pad, rubber: 2 hole (gang mtg)
1X692216	Pulley Assembly, pointer drive: 3½" dia
49A690562	Pulley, core drive: brass
5S8497	Rivet: .088 x 1/8 stl; nkl pl (anti-backlash clip mtg)
5S7771	Rivet: .088 x 3/16 stl; nkl pl (min socket mtg)
5S7774	Rivet: .088 x 1/4 stl; nkl pl (noval socket mtg)
5S7707	Rivet: .122 x 5/32 stl; nkl pl (term strip mtg)
5K13896	Rivet, shoulder (on core mtg brkt)
3S7477	Screw, machine: 8-32 x 1/4 plain hex head; thread cutting type; cad pl (loop mtg)
3S7205	Screw, machine: 8-32 x 1/4 slotted locking head; cad pl (gang mtg)
3S7163	Screw, machine: 8-32 x 1/4 plain hex head; cad pl (pointer drive pulley mtg)
3S488011	Screw, machine: 8-32 x 5/8 slotted locking hex head; cad pl (spkr mtg)
3S2695	Screw, sheet metal: #6 x 3/16 PKZ plain hex head; cad pl (tuner bracket mtg)
3S490851	Screw, sheet metal: #6 x 1/2 PKA plain hex head; cad pl (loop mtg brkt)
3S490325	Screw, sheet metal: #6 x 1-1/8 PKZ plain hex head; cad pl (selenium rectifier mtg)
3S7103	Setscrew: 8-32 x 1/8 Allen head; cad pl (core drive pulley mtg)
3S9705	Setscrew: 8-32 x 1/4 Allen head; cad pl (pointer adj sleeve mtg)
1X692225	Shaft & Pulley Assembly, pointer: complete, but less pointer
47K690573	Shaft, tuning: brass (fits over bandswitch shaft)
9K485936	Shield, coil (for IF transformers)
26A481521	Shield, tube: spring type
43K692185	Sleeve, pointer: die cast; less pointer adj setscrew
9K484167	Socket, tube: miniature; 7-prong
9B692196	Socket, tube: noval; 9-prong (for V-5)
9K692197	Socket, tube: noval; 9-prong (for V-2)
41A690598	Spring, coil: 7 turns; cosmoline dipped (FM-RF core mtg)
41K691840	Spring, coil: 8 turns; copper plated (FM osc core mtg)
41A690732	Spring, compression (in pointer sleeve)
41A14244	Spring, tension (core & pointer drive cord)
31K85348	Strip, terminal: 1 insulated lug; #2 mtg; 3/8" spacing
31K86126	Strip, terminal: 2 insulated lugs; #2 mtg; 3/8" spacing
31K37493	Strip, terminal: 2 insulated lugs; #2 mtg; 1/2" spacing
31K14655	Strip, terminal: 3 insulated lugs; #3 mtg; 3/8" spacing
31K22174	Strip, terminal: 4 insulated lugs; #4 mtg; 3/8" spacing
31K470747	Strip, terminal: 5 insulated lugs; #3 mtg; 3/8" spacing
29A70422	Terminal, screw (antenna terminal on loop back)
4A73639	Washer, 'C' (holds tuning shaft)
4K692188	Washer, 'C' (pointer shaft mtg)
4A70873	Washer, fibre (pointer drive pulley mtg)
4S7582	Washer, flat: ⅛ x .195 x .033; cad pl (pointer drive pulley mtg)
4S7614	Washer, flat: 11/16 x 11/64 x .036 stl; cad pl (loop mtg)
4K690571	Washer, shoulder: fibre (vol control & bandswitch mtg)
4K482859	Washer, shoulder: fibre (loop mtg brkt)
4B600149	Washer, spring (under pointer shaft pulley)
CABINET PARTS	
16E691951	Cabinet, table model: plastic; brown
36B692149	Knob, control: brown plastic (tuning knob)
36B692150	Knob, control: brown plastic (AM-FM selector)
36B692181	Knob, control: brown plastic (volume control)
4S7650	Lockwasher, internal: #6; cad pl (pointer mtg)
2S7005	Nut, hex: 6-32 x 1/4 stl; cad pl (pointer mtg)
13B692039	Medallion: brass plated
38A25507	Plug, split (mounts loop to cabinet)
52B692173	Pointer, dial
3S2999	Screw, machine: 6-32 x 5/8 slotted locking hex head; cad pl (medallion mtg)
3S3371	Screw, thread cutting: #8 x 3/8 plain hex head; cad pl (chassis mtg)
4S1720	Washer, flat: 3/8 x .156 x .030 stl; cad pl (medallion mtg)
4S1765	Washer, flat: ¼ x .147 x .015 stl; cad pl (pointer mtg)
4K485672	Washer, spring (pointer mtg)

MODEL 9MF, Ford
#8A-18805-A3

GENERAL INFORMATION

TYPE - Automotive superheterodyne receiver with external speaker.

TUNING RANGE - 540 to 1610 Kc IF - 265 Kc

TUBE COMPLEMENT - 6SK7GT - RF Amplifier
6SA7GT - Converter
6SK7GT - IF Amplifier
6SQ7GT - Detector, AVC & AF Amplifier
6V6GT - AF Output Amplifier
6X5GT - Rectifier

OPERATES FROM - 6 volt storage battery

TO SET THE PUSH BUTTONS

Automatic push button tuning is provided for selection of five favorite local stations. The five push buttons may be adjusted to any of the desired stations. In order to simplify the identification of these stations, it is advisable to set the push buttons in sequence according to their frequencies, beginning with the station broadcasting on the lowest frequency and progressing to the station broadcasting on the highest frequency. The push buttons should be set up during the daytime because at night, distant stations will be heard with the same intensity as local stations, making it difficult to select local stations. To set the push buttons proceed as follows:

1. Collapse the antenna.

2. Turn the receiver on and allow it to operate for at least fifteen minutes in order for each part to reach normal operating temperature.

3. Loosen the first push button on the left by turning it (with your fingers)counterclockwise one turn.

4. Select the station desired and with low volume tune it in by turning the manual tuning knob. Tune very carefully for clearest reception.

5. Press the first push button in firmly, then release and tighten (with your fingers) by turning clockwise.

The first push button is now set for this station selection. Follow the above procedure for setting each of the other four buttons.

When the five push buttons have been set to the desired stations, return the antenna to the lowest position necessary for good reception. It is only necessary to press a push button to receive the station for which the adjustment was made. The dial pointer will automatically indicate the frequency of the selected station.

IF TRANSFORMER CHANGES

The Detrola 1st IF transformer T-1, Detrola Part No. D71193-1 and the Detrola 2nd IF transformer T-2, Detrola Part No. D71192-1 have been replaced by transformer of another make, Motorola Part Nos. 24B580193 and 24K580194 respectively. The above mentioned Motorola Transformers are mechanically and electrically not interchangeable with the Detrola Transformers. A 33,000 ohm resistor, which was mounted internally on the Detrola 2nd IF transformer, will be mounted externally to the transformer where the Motorola transformer Part No. 24K580194 is used.

MODEL 9MF, Ford
#8A-18805-A3

ALIGNMENT

Connect the receiver 'A' lead and receiver chassis to a 6 volt storage battery. Rotate volume and tone controls to maximum clockwise position. Connect an output meter across the speaker voice coil. Use an insulated screwdriver for making all adjustments. 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. Remove receiver escutcheon and top & bottom covers to expose all alignment adjustments. See Figure 1.

Pointer is calibrated by tuning in a 1300 Kc signal and then set pointer to 1300 Kc after loosening its adjusting screw. See Figure 1.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Converter grid (6SA7GT pin 8)	265 Kc	HF end stop	1,2,3 & 4	Adjust for maximum. Repeat for greater accuracy.
RF ALIGNMENT						
2.	See Fig. 1	Ant. recept	1610 Kc	HF end stop*	C-14,C-11 C-1	Adjust for maximum.
3.	See Fig. 1	Ant. recept	1400 Kc	Move carriage 'in' 5/16" from HF end stop position. See Figure 1.	L-6, L-5, L-2	Adjust for maximum.
4.	See Fig. 1	Ant. recept	1610 Kc	HF end stop	C-14 C-11 C-1	Adjust for maximum.
5.	Repeat steps 3 & 4 until no further increase is obtainable. After final adjustment is made, stake core adjustments in place with speaker cement.					
SENSITIVITY CONTROL						
6.	See Fig. 1	Ant. recept	Set to 600 Kc & 4 microvolts output	Tune for maximum	Sensitivity control	Set sensitivity control for 1 watt output (1.79 volts on output meter)
ANTENNA TRIMMER ADJUSTMENT						
7.	-	-	-	Weak station at approx. 1400 Kc	C-1	With receiver installed in car, peak antenna trimmer for maximum volume. Ant. should be fully extended.

* Tuner cores should be backed out to project 1-3/8" from end of coil forms so they will have no effect on trimmer adj.

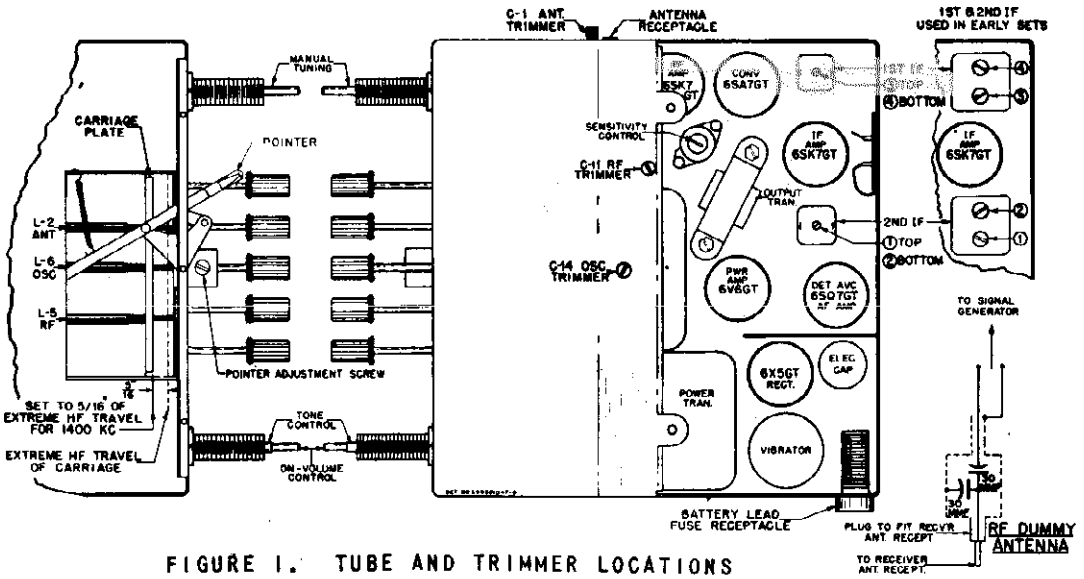
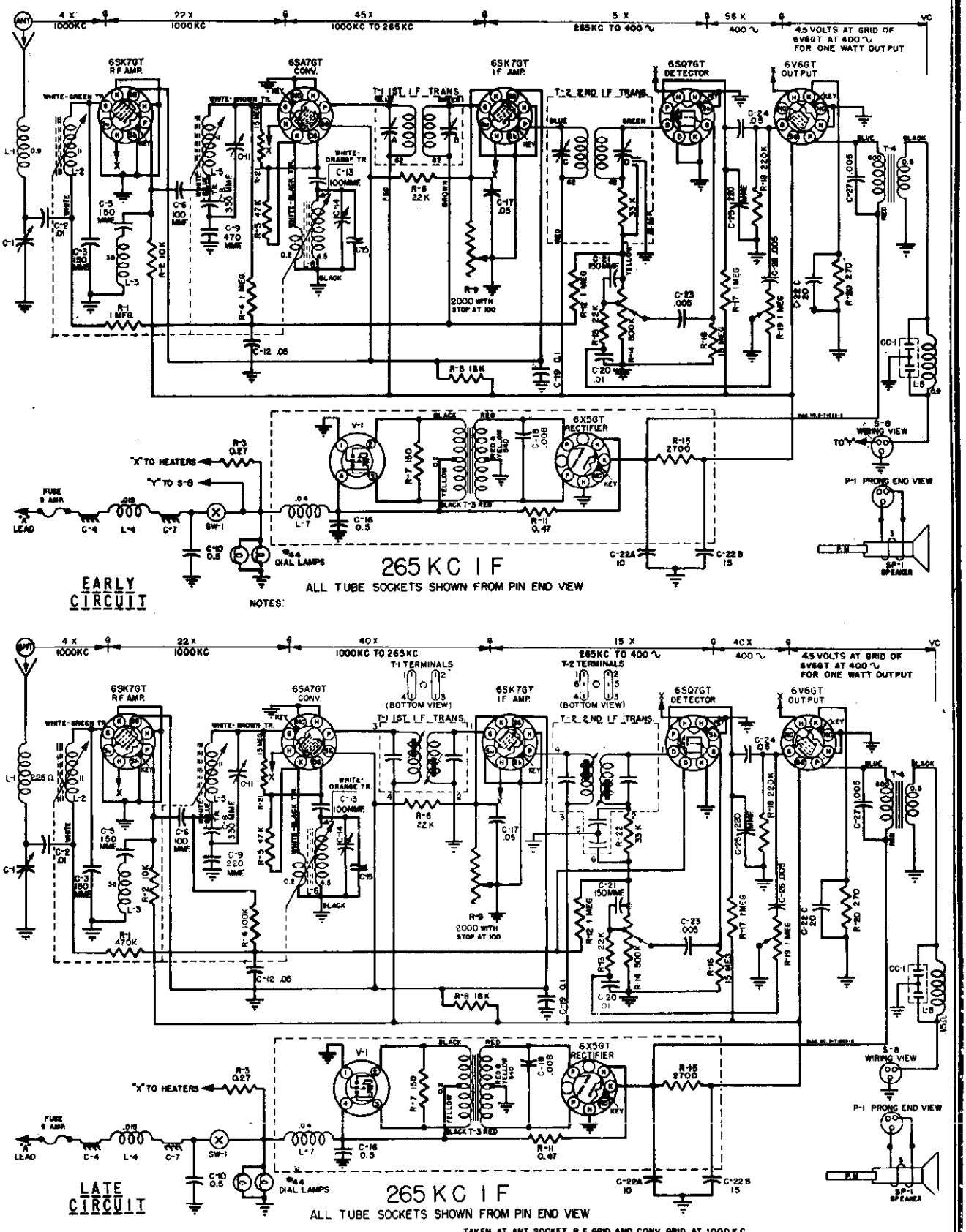


FIGURE 1. TUBE AND TRIMMER LOCATIONS

MODEL 9MF, Ford
#3A-18805-A3



NOTES:
RESISTANCE VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.
"K" EQUALS 1000 OHMS, "MEG" EQUALS 1,000,000 OHMS.
CAPACITY VALUES ARE IN MICROFARADS UNLESS OTHERWISE NOTED.
STAGE GAINS
TAKEN AT ANT. SOCKET, R.F. GRID AND CONV. GRID AT 1000 K.C.
TAKEN AT I.F. GRID AT 265 K.C. AUDIO MEASUREMENTS TAKEN AT 400 ~
DUMMY ANTENNA
30 MMFD. SERIES & 330 MMFD. SHUNT AT ANT. SOCKET & 0.1 MFD. SERIES AT TUBE GRIDS.
BATTERY CONDITIONS
7.2 VOLTS MEASURED BETWEEN END OF "A" LEAD AND CHASSIS

FIGURE 2. SCHEMATIC DIAGRAM

REPLACEMENT PARTS LIST

REF. NO.	FORD PART NO.	DETROLA PART NO.	MOTOROLA PART NO.	DESCRIPTION
CAPACITORS				
C-1		B-55481	B-912124	Mica, variable; includes bracket
C-2		BD430103	X910013	Paper: .01 mf 400V; tubular
C-3		BM64A151	21R6649	Mica: 150 mmf 10% 500V
C-4				Spark Plate Assembly consists of:
				One A-70255 plate, capacitor
				One A-70282 disc, mica: silvered
				One A-71048 washer, shoulder
				Two BF12HJ02 washer
				One BV321HC2 rivet
C-5		B-58906	B-912152	Mica: 150 mmf 5% 300V
C-6		BM64A101	21R6554	Mica: 100 mmf 10% 500V
C-7				Same as C-4
C-8		BM74A331	21R2744	Mica: 330 mmf 20% 500V
C-9		BM74A221	21R2745	Mica: 220 mmf 20% 500V
C-10		A-55528	A-912100	Paper: .5 mf 100V; tubular
C-11		B-55525	B-912125	Mica: variable; includes bracket
C-12		BD230503	X910008	Paper: .05 mf 200V; tubular
C-13		BM64A101	21R6554	Mica: 100 mmf 10% 500V
C-14		B-55523-4	B-912126	Trimmer: 100 mmf-160 mmf (Part of Tuner Assembly)
C-15		A-55495	A-912101	Compensating: 180 mmf 5% 500V (Part of Tuner Assembly).
C-16		A-55528	A-912100	Paper: .5 mf 100V; tubular same as C-10
C-17		BD230503	X910008	Paper: .05 mf 200V; tubular
C-18		A-55383	A-912102	Paper: .008 mf 1600V; tubular
C-19		BDB30104	X910009	Paper: .1 mf 200V; tubular
C-20		BD430103	X910013	Paper: .01 mf 400V; tubular
C-21		B-58816-2	B-912127	Ceramic: 150 mmf
C-22 A,B,C		B-71011	B-912128	Electrolytic: 10-15-20 mf; 350-350-25V
C-23		BD630502	X910010	Paper: .005 mf 600V; tubular
C-24		BD430503	X910011	Paper: .05 mf 400V; tubular
C-25		BM74A221	21R2745	Mica: 220 mmf 20% 500V
C-26		BD630502	X910010	Paper: .005 mf 600V; tubular
C-27		BD630502	X910010	Paper: .005 mf 600V; tubular
CC-1		A-55526	A-912103	Dual Filter
COILS				
L-1			24B580540	Choke, antenna spark
L-2		X-71258	A-912153	Ant. coil (Part of Tuner Assembly)
L-3		A-71097	A-912104	Choke, IF trap
L-4		A-71046	A-912105	Choke, "A" spark
L-5		X-71257	A-912154	RF coil (Part of Tuner Assembly)
L-6		X-71259	A-912155	Osc. coil (Part of Tuner Assembly)
L-7		A-70242	A-912106	Choke, hash
L-8		A-71047	A-912107	Choke, antenna spark
DIAL LIGHT				
	8A-18828	A-9285	65X10867	Bulb, pilot: 6.3V; .25A tubular, bayonet base: #44
FUSE				
	8M15608	B-55541-1	B-912129	Fuse, 9 amp

RESISTORS
Note: All resistors are insulated carbon type, 20% unless otherwise specified.

R-1	BR17B474	6R6032	470,000 1/2W
R-2	BR17E103	6R5570	10,000 1W
R-3	BR46E27B	17K488267	Wire wound: .27 10% 1W (molded)
R-4	BR17B104	6R6075	100,000 1/2W
R-5	BR17B473	6R6056	47,000 1/2W
R-6	BR17B223	6R6028	22,000 1/2W
R-7	BR17E151	6R488265	150 1W
R-8	B-55511-4	6R476014	18,000 10% 2W
R-9	A-71069	A-912108	Control, sensitivity: 2000 ohms
R-11	BR46C47B	17K488266	Wire wound: .47 10% 1/2W (molded)
R-12	BR17B105	6R6004	1 meg 1/2W
R-13	BR17B223	6R6028	22,000 1/2W
R-14	B-71013-1	B-912130	Control, volume tone & switch: tapped at 500K
R-15	B-55511-3	6R5764	2,700 10% 2W
R-16	BR17B156	6R488264	15 meg 1/2W
R-17	BR17B105	6R6004	1 meg 1/2W
R-18	BR17B224	6R6015	220,000 1/2W
R-19			See R-14 (tone control)
R-20	BR16E271	6R6336	270 10% 1W
R-21	BR17B156	6R488264	15 meg 1/2W
R-22		6R6012	33,000 1/2W

SPEAKER

SP-1	D-71060-1	50C580855	Speaker, PM: 6 x 9"

SWITCH

SW-1			Part of R-14, ON-OFF switch: SPDT

TRANSFORMERS

T-1		24B580193	1st IF Transformer: iron core tuning
	D71193-1		1st IF Transformer: trimmer tuning
T-2		24K580194	2nd IF Transformer: iron core tuning
	D71192-1		2nd IF Transformer: trimmer tuning
T-3	C-71014	C-912144	Transformer, power
T-4	C-71012	C-912143	Transformer, output

MODEL 9MF, Ford
#8A-18805-A3

REF. NO.	FORD PART NO.	DETROLA PART NO.	MOTOROLA PART NO.	DESCRIPTION
TUBES				
		A-54514-2		Tube, vacuum: 6SA7GT (Converter)
		A-54517-2		Tube, vacuum: 6SK7GT (RF Amplifier)
		A-54517-2		Tube, vacuum: 6SK7GT (IF Amplifier)
		A-54518-2		Tube, vacuum: 6SQ7GT (Detector)
		A-54519-3		Tube, vacuum: 6V6GT (Output)
		A-54577-2		Tube, vacuum: 6X5GT (Rectifier)
VIBRATOR				
V-1	51A18885	B-70347	B-912131	Vibrator, 4-prong
CHASSIS PARTS - MECHANICAL				
		A-71086-1	A-912109	Bracket, front cover mounting
		B-71088	B-912132	Bracket, dial scale
		A-71191	A-912110	Clip, pointer retaining
		A-55261	A-912111	Clip, vibrator ground
		C-71062-1	C-912145	Cover, bottom front
		B-71035	1X580306	Cover, power supply
		B-71039	B-912133	Crystal, dial
		X-71230	1X580303	Escutcheon Assembly: includes bracket & grounding spring.
		A-71076	30K580711	Housing, fuse
		A-55247	A-912112	Insulator, armite (volume control mounting)
	8A-18824-A2	B-71090-1	1X580525	Knob, manual: includes spring; chrome plated
	8A-18830-A2	B-71057-1	B-912134	Knob, tone control: chrome plated
	8A-18817-A2	X-71235	1X580521	Knob, volume control: includes spring; chrome plated
		BK122E02	4S7666	Lockwasher, external: #6; steel; cad pl (filter capacitor mounting)
		A-54901	29R3025	Lug, soldering: hot tin
		BN141T02	2A590913	Nut, hex: 1/2-28 x 11/16-1/8 thick; stl; cad pl (vol. cont mtg)
		BN111T02	2S2876	Nut, hex: 1/2-28 x 3/4; steel; cad pl
		BH1A120A	2S488296	Nut, speed
		B-71189	B-912135	Pointer, dial
		BR393C03	5S8497	Rivet: .088 x 1/8 steel; nkl plated (dial scale brkt mtg
		BV321C05	X910007	Rivet: .122 x 1/8 steel; black dip (spring grounding mtg)
		BV321C02	X910022	Rivet: .122 x 1/8 steel; cad pl (power supply cover spring mounting)
		BV321D02	X910002	Rivet: .122 x 5/32 steel; cad pl (tube socket mtg, dial light socket mtg, filter capacitor mtg, sensitivity control mtg, terminal strip mtg and antenna socket mtg)
			5S7703	Rivet: .122 x 7/32 steel; pol nkl (vib. clip mtg., soldering lug mounting)
		BV321H02	X910006	Rivet: .122 x 9/32 steel; cad pl (spark plate mtg)
		D-71045	D-912146	Scale, dial
		BSF14C02	3S7205	Screw, machine: 8-32 x 1/4 slotted hex head; steel; cad pl (power transformer mounting and variable capacitor bracket mounting)
		BP928C02	3S488298	Screw, sheet metal: #8 x 1/4 PKZ slotted hex head; steel; cad pl (output transformer mounting, shield mounting, etc.)
		B-71089	B-912136	Shield, dial
		B-71044	B-912137	Shield, interference
		A-70302	A-912113	Socket, antenna connector
		B-71074-1	B-912138	Socket, dial light & lead (4")
		B-71074-2	B-912139	Socket, dial light & lead (12")
		A-71079	A-912114	Socket, speaker: 3-prong
		A-55366	9A590099	Socket, tube: octal; molded
		A-70301	A-912116	Socket, tube: 4-prong, wafer
		A-71096	A-912150	Spring, grounding (used on escutcheon)
	51A18847	A-70300	41A485380	Spring, knob retaining (used on manual and volume cont).
		A-70277	A-912115	Spring, shield (used on power supply cover)

MODEL 9MF, For
#8A-18805-A3

	BY510101	X910003	Strip, terminal: 1 insulated lug, #1 mtg, 3/8" spacing...
	BY520102	X910004	Strip, terminal: 2 insulated lugs, #2 gnd; 3/8" spacing..
	BY550104	X910005	Strip, terminal: 4 insulated lugs, #2 mtg, 3/8" spacing..
	A-54901	29R3025	Terminal, ground .....
	BF12HJ02	4S1719	Washer, flat: 3/8-9/64-1/32; steel; cad pl (spark plate mounting) .....
	A-70311	A-912149	Washer, flat: armite (fuse housing) .....
	A-71048	A-912117	Washer, shoulder: nylon (spark plate mounting) .....

HOUSING, MOUNTING PARTS & ACCESSORIES

		51A580607	Bracket, replacement rear mounting (to be used when welded stud on back of housing breaks off) .....
		30K580703	Cable, fuse .....
8C18801	B-71078	B-912140	Capacitor, distributor: .5 mfd .....
51AF-18827	B-70323	B-912141	Capacitor, generator: .1 mfd .....
	D-71063-1	D-912147	Cover, bottom: rear .....
	D-71061-1	D-912148	Cover, top .....
	A-71211	A-912118	Folder, operating instructions .....
	BK202K02	4S7693	Lockwasher, split: 1/4" steel; cad pl (rear mtg) .....
	HN121R02	2S7022	Nut, hex: 1/4-20 x 7/16 steel; cad pl (rear brkt mtg)...
	HN141202	2S8397	Nut, hex: 1/2-28 x 5/8 steel; cad pl (rear mtg).....
	HN141T02	2A590913	Nut, hex: 1/2-28 x 11/16-1/8 thick; steel; cad pl (volume control mtg, escutcheon mtg) .....
	A-55243-1	A-912119	Nut, wing: 8-32 steel; cad pl (speaker mounting) .....
	C-71059	32C580584	Screen and Gasket Assembly, speaker .....
	B-55207-1	B-912151	Screw, machine: 10-32; hex head special (bottom cover mounting) .....
	BP928C02	3S488298	Screw, sheet metal: #8 x 1/4 PkZ slotted hex head; steel; cad pl (top cover mounting) .....
	BP238G02	3S7463	Screw, sheet metal: #8 x 1/2 PkZ slotted round head; steel; cad pl (hood bonding strap mtg) .....
8A-18888	B-71040	A-912142	Bracket, rear support .....
8A-18870	A-71091	A-912120	Strap, hood bonding .....
1GA18811-A	A-70259	A-912121	Suppressor, distributor .....
	A-71083	1X580308	Suppression kit .....
	A-71082	1X580307	Installation kit .....

G. I. TUNER UNIT & PARTS - MECHANICAL - 8072

X-71280	B-912080	Bracket - Shaft Supported .....
X-71276	B-912043	Bushing & Disc Assembly Clutch .....
X-71275	B-912037	Clutch Disc Assembly (Crown Gear) .....
X-71277		Clutch Pressure Spring .....
X-71256		Grommet - Coil Mtg - Osc .....
B-51427-12		Grommet - Coil Mtg RF & Ant .....
B-71240	B-912065	Push Button & Screw Assembly 8-32 thd .....
X-71278	B-912013	Shaft & Bush. Assembly - Manual Drive .....
X-71279	B-912044	Spring - Tension Drive Shaft .....
A-71198	41A912090	Spring - Pointer .....
X-71285	B-912084	Spring - Pointer Link .....
X-71281	B-912033	Pinion & Shaft Assembly .....

SANTAY TUNER UNIT & PARTS - MECHANICAL - 8072

B-71160		Bushing & Disc Assembly Clutch .....
B-71150		Clutch Disc Assembly (Crown Gear) .....
A-71137		Clutch Pressure Spring .....
B-51427-12		Grommet - Coil Mounting Osc. .....
B-51427-8		Grommet - Coil Mtg. RF & Ant .....
A-71198	41A912090	Pointer Spring .....
B-71145	B-912160	Push Button & Screw Assembly 8-40 thd .....
B-71195		Shaft & Bushing Assembly, Man. Drive .....
A-71251	A-912123	Spring Tension Drive Shaft .....
B-71168		Spring Tension .....
B-71155		Pinion & Shaft Assembly .....

G. I. OR SANTAY TUNER UNIT & PARTS - ELECTRICAL - 8072

A-55495	A-912101	Capacitor - Compensating 180 mmfd .....
B-55523-4	A-912158	Capacitor - Trimmer .....
X-71258	A-912153	Coil - Antenna .....
X-71259	A-912155	Coil - Osc. .....
X-71257	A-912154	Coil - RF .....
X-71262	A-912156	Cores .....
X-71286	X-912159	(Cores Kit - Hardware .....
		(T-nut
		(Core Spring
		(Flat Washer

THE HRO-50-1 RADIO RECEIVER

SECTION 1. DESCRIPTION

1-1. GENERAL

The HRO-50-1 is a deluxe radio receiver featuring performance and versatility. Sixteen tubes, including a rectifier and a voltage regulator tube, are utilized in a superheterodyne circuit for the reception of code and phone signals throughout its frequency range of 50 to 430 kilocycles and 480 to 35,000 kilocycles. The HRO type receivers have long been outstanding and proven performers in Communication and Amateur services. This new series of HRO-50-1 receivers feature many desirable innovations emanating from the latest advances in receiver circuitry and mechanical design. It is housed in a new and enlarged cabinet styled in an attractive gray finish with a self-contained power supply adequately isolated from the R.F. circuits. A calibrated, illuminated slide-rule dial provides direct reading in megacycles for each of the General Coverage coil sets as well as an additional bandspread scale for those coil sets incorporating this feature. A front-panel mounted oscillator trimmer control is provided to assure precise calibration. Of course, the dial-driving mechanism still features the micrometer dial. Temperature compensation and voltage regulation of the high-frequency oscillator as well as utilization of ceramic insulation in the coil sets and associated connecting brush blocks provide stable operation and freedom from drift. A single front-panel mounted Control switch selects any one of the four modes of operation, C.W., Phone, Narrow-Band F.M. or Phono. Sockets are mounted on the receiver chassis to accommodate the National Type NFM-83-50 FM adaptor and the National Type XCU-50-2 Crystal Calibrator Unit. These accessories may be permanently installed and switched On and Off by means of the front-panel switches. At the rear of the receiver sockets are available for external use of the National Type SOJ-3 Select-O-Ject and National Type 650S Vibrator Power Supply or battery power supply. The S-Meter circuit is designed so that the operator may adjust the sensitivity of the S-Meter. A push-pull audio system delivers the utmost in audio frequency response and undistorted power output from the built-in output transformer. Other highlights include a six-position crystal filter, maximum bandspreading of the amateur bands, a quick-acting bandspread switch and a dimmer control for the slide-rule dial and S-Meter lamps.

A standard equipment consists of a receiver, loudspeaker and coil sets A, B, C and D. Coil sets Type E, F, G, H, J, AA, AB and AC may be obtained as desired. Accessories available include the National types NFM-83-50 Narrow-Band F.M. adaptor, XCU-50-2 Crystal Calibrator, SOJ-3 Select-O-Ject and 650S Vibrator Power Supply.

1-2. CIRCUIT

For all frequency ranges the circuit utilizes two tuned stages of radio frequency amplification, a tuned mixer stage, a high-frequency oscillator employing a tube separate from the mixer tube, a first intermediate frequency amplifier stage employing a variable-selectivity crystal filter and two additional I.F. amplifier stages all operating at 455 kilocycles, a combined second detector-automatic volume control stage, an S-Meter amplifier, a double-action adjustable threshold double-diode noise limiter, a first audio amplifier, a phase inverter, a push-pull audio amplifier and a beat frequency oscillator coupled to the second detector to provide for C.W. reception.

All voltages required by the receiver are supplied by a built-in power supply. A voltage regulator tube is used to regulate the plate supply to the high-frequency oscillator and the S-Meter amplifier stages.

1-3. ANTENNA INPUT

Antenna input terminals are provided at the rear of the receiver. The input circuit is suitable for operation with a single-wire antenna, a balanced feed line or a low impedance 72-ohm unbalanced concentric transmission cable. The actual antenna input impedance is between 300 and 600 ohms depending on the frequency of the input signal.

1-4. TUBE COMPLEMENT

The HRO-50-1 receiver is supplied complete with tubes which are tested in the receiver at the time of alignment.

The tubes employed are as follows:

First R.F. Amplifier	6BA6
Second R.F. Amplifier	6BA6
Mixer	6BE6
High-Frequency Oscillator	6C4
First I.F. Amplifier	6K7
Second I.F. Amplifier	6SG7
Third I.F. Amplifier	6SG7
Second Detector - A.V.C.	6H6
Noise Limiter	6H6
S-Meter Amplifier - Phase Inverter	6SN7GT
First A.F. Amplifier	6SJ7
Audio Output (2)	6V6GT
Beat Frequency Oscillator	6J7
Voltage Regulator	OB2
Rectifier	5V4G

1-5. TUNING SYSTEM

The frequency coverage of the HRO-50-1 is covered in twelve bands as follows:

COIL SET	GENERAL COVERAGE	BANDSPREAD
A	14.0 - 30.0 Mc.	27.0 - 30.0 Mc.
B	7.0 - 14.4 Mc.	14.0 - 14.4 Mc.
C	3.5 - 7.3 Mc.	7.0 - 7.3 Mc.
D	1.7 - 4.0 Mc.	3.5 - 4.0 Mc.
E	900 - 2050 Kc.	
F	480 - 960 Kc.	
G	180 - 430 Kc.	
H	100 - 200 Kc.	
J	50 - 100 Kc.	
AA		27.5 - 30 Mc.
AB	25 - 35 Mc.	
AC		21.0 - 21.5 Mc.

As shown above plug-in coil set types AA, AC, A, B, C and D provide bandspread coverage of the 10-11, 15, 20, 40 and 80 meter amateur bands. The AA, AC, B, C, and D bands are spread out so as to cover 400 dial divisions while the A band is spread 430 divisions on the 500-division main tuning dial. This is accomplished by switching a small variable capacitor in series with each section of the main tuning capacitor, thus reducing its effective capacity range. All of the coil sets are factory aligned in the receiver using accurate crystal-controlled test oscillators thus assuring precise alignment.

The micrometer type dial drives the main tuning capacitor through a worm drive having a reduction ratio of approximately 20 to 1. Backlash is eliminated by the use of a spring-loaded split worm wheel which assures positive drive in either direction at all times. This dial has an effective scale length of approximately twelve feet and is calibrated from zero to 500.

A slide-rule type dial is synchronized with the micrometer dial by means of an anti-backlash gear and an efficient string drive arrangement to the main tuning dial. A dial drum provides a

means of mounting eight scales. Each of these scales is calibrated in megacycles for the general coverage and/or bandspread frequencies depending on the coil set. Mounted on the front panel is a band selector switch for ease in rotating the dial drum to select the proper band scale to correspor to the coil set in use. Each scale is clearly marked with the band designation. Two pilot lamps are used, one at each end of the dial scale drum, for illumination. The degree of illumination is controlled by the front-panel mounted Dimmer control.

1-6. CRYSTAL FILTER

The selectivity characteristics of the HRO-50-1 are made adjustable by means of a crystal filter. Located in the first intermediate frequency amplifier this crystal filter is designed for extreme flexibility and efficiency of operation. A six-position Selectivity switch and a crystal Phasing control are front-panel mounted for adjustment of the filter. Figure Number 1 shows the selectivity characteristics of the rec-iver for each of the six degrees of selectivity.

The crystal filter may be used for either C.W. or phone reception; any degree of selectivity from true single-signal to wide band A.M. broadcast reception being available. Operation of the Phasing control provides for efficient suppression of interfering C.W. signals or M.C.W. signals which may produce objectionable heterodynes.

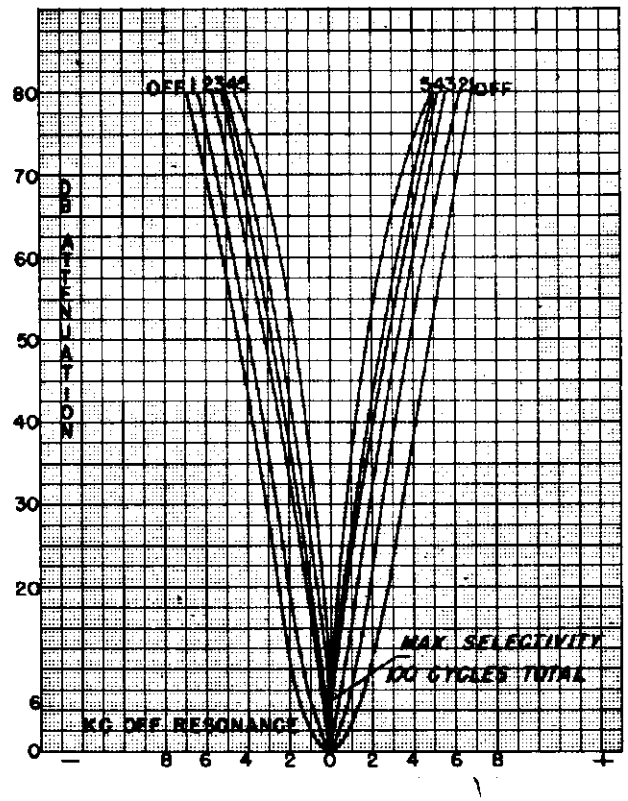


Figure No. 1. Crystal Filter Selectivity Curves

1-7. NOISE LIMITER

The noise limiter in the HRO-50-1 receiver uses an automatic type double-action circuit resulting in the limiting of noise pulses on both the positive and negative peaks. It is equally effectiv on both C.W. and phone reception. The usefulness of this limiter will be most appreciated on the higher frequency bands of the receiver where automobile ignition noise and other high frequency disturbances are effectively suppressed. A threshold control on the front panel permits adjustment of the level at which limiting action starts.

1-8. TONE CONTROL

The Tone control circuit has been especially designed to provide a versatile variance of the frequency characteristics of the audio amplifier output. In the extreme counter-clockwise position the greatest degree of high audio frequency response is obtained. Rotating the control clockwise until the switch mounted on the control just closes provides a comparatively flat response over the entire usable audio frequency range. Further clockwise rotation will result in the high audio frequencies being attenuated as illustrated in Figure Number 2. This control is particularly helpful when receiving weak signals through interference. If a signal is weak and partially obscured by background noise or static, an improvement in signal-to-noise ratio will be obtained by rotating the Tone control in a clockwise direction thereby attenuating the higher audio frequencies.

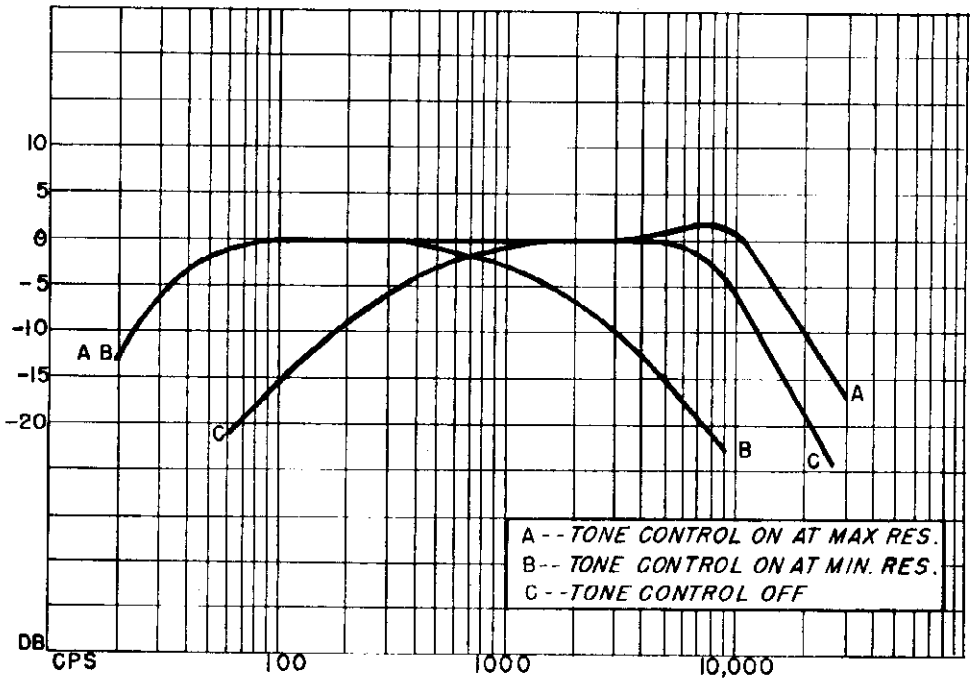


Figure No. 2. Audio Amplifier Response

1-9. TEMPERATURE COMPENSATION

The HRO-50-1 is compensated for frequency drift due to temperature changes which may detune the receiver from the desired signal over long or short periods of reception. The most objectionable cause of frequency drift is the change of inductance of the high-frequency oscillator coil as heat from the tubes causes the interior of the receiver to increase in temperature. This undesirable heating effect in the R.F. coils is minimized by the position of the plug-in coil sets in that they are placed at the bottom of the receiver underneath the chassis in a separately shielded compartment. A further safeguard against frequency drift is provided for on bandspread operation. The heat which is dissipated in the high-frequency oscillator may change the inter-electrode capacity of the tube and thus cause frequency drift. To offset this effect a small negative temperature coefficient capacitor is placed adjacent to the high-frequency oscillator tube to compensate for any change caused by the internal heating of the tube.

The coil set terminal connecting boards of each shielded coil can as well as their mating brush blocks have been made of ceramic type material. As a result freedom from any possible leakage due to poor insulation assures a low degree of drift. This will be found especially true of the coils operating at the higher frequencies.

1-10. SIGNAL STRENGTH METER

Signal input readings are indicated in S-units from 1 to 9 and in decibels above S-9 from zero to 40 db. on the panel-mounted signal strength meter. A reading of S-9 is obtained with an input signal of approximately 25 microvolts. The meter employs a zero to 1 milliampere movement with its mechanical zero at 40 db. on the dial scale. The S-Meter is connected in series with the plate input of the S-Meter Amplifier tube V-8A and measures the plate current of this tube. With the A.C. supply switch On and the A.V.C. switch set at A.V.C. the S-Meter will read zero in the absence of signal input. A variable resistor is shunted across the meter and with no antenna connected this resistor allows correct adjustment of the pointer to its electrical zero. Any increase in A.V.C. voltage caused by signal input will give a corresponding increase in the meter reading. At the 40 db. meter reading the A.V.C. grid voltage applied reaches the cut-off point of the amplifier tube. Therefore the pointer cannot be harmed by violent contact with the full-scale meter pin. For the purpose of comparing strong signals (which cause the meter to contact the full-scale meter pin) with other stronger and/or weaker signals the sensitivity of the S-Meter may be lowered by retarding the R.F. Gain control. The meter dial lamp illumination is regulated by a Dimmer control mounted on the front panel of the receiver.

1-11. NARROW-BAND F.M. SOCKET

A standard octal socket, X-1, is mounted inside the receiver on the center portion of the power supply compartment chassis. It is designed to mount the National Type NFM-83-50 Narrow-Band F.M. adaptor. A control switch is front-panel mounted to provide a means of switching the adaptor into the output of the intermediate amplifier circuit. With the Control switch set at the N.F.M. position the receiver is adjusted for the reception of narrow-band F.M. signals. With the A.V.C. switch set at A.V.C. the S-Meter is operative in the N.F.M. position and the receiver should be tuned for maximum meter reading to assure efficient operation. Further information concerning the NFM-50 unit is contained in a separate data sheet at the rear of this manual.

1-12. CRYSTAL CALIBRATOR SOCKET

The Crystal Calibrator socket, X-2, is of the standard octal type mounted on top of the power supply compartment chassis inside the receiver. It is designed to accommodate a National Model XCU-50-2 Crystal Calibrator. The Model XCU-50-2 is compactly constructed and furnished with a drive screw clamping arrangement to hold it firmly in place. A double-pole, three-position toggle type front-panel mounted Calibrate switch marked 100-Off-1000 provides a means of connecting B-plus to the unit for instantaneous use. At the same time by using this toggle switch a resonant crystal-controlled frequency of either 100 or 1000 kcs. may be selected. The output of this unit is loosely coupled to the first R.F. amplifier stage through the socket wiring. Further information concerning the Model XCU-50-2 unit is covered by a separate data sheet included at the rear of this manual.

1-13. SELECT-O-JECT SOCKET

The Select-O-Ject socket, X-3, is a standard octal type socket accessible at the rear of the receiver. It is primarily designed to accommodate a National Model SOJ-3 Select-O-Ject unit. The mating plug attached to the SOJ-3 permits a direct connection into this socket in place of the audio jumper plug originally plugged into the Select-O-Ject socket. By proper adjustment of the controls any single audio frequency selected in the range of approximately 80 to 10,000 cycles may be boosted or rejected. Detailed instructions for proper operation of the Select-O-Ject are contained with the unit.

For convenience a source of 6.3 V.A.C. filament voltage, a 240 V.D.C. high voltage as well as the 105 V.D.C. regulated voltage is available for operation of external apparatus. The Schematic diagram, Figure Number 13, shows a pin view of the Select-O-Ject socket thus providing the information necessary for making the proper connections. External equipment MUST NOT be utilized if the Narrow-Band F.M. adaptor, Crystal Calibrator and Select-O-Ject units are all operated at the same time Consideration must also be given to the fact that the 105-volt regulated power supply cannot

be switched off by the B+ On-Off switch.

1-14. PHONO INPUT JACK

A Phono jack is mounted at the rear of the Receiver and can be used for connecting auxiliary apparatus, such as a record player pick-up or microphone into the audio system of the receiver. This input circuit is of high-impedance providing a suitable match for such external equipment into the high-gain first audio amplifier stage. The front-panel mounted Control switch must be set at the Phono position when using the Phono jack. Both the A.F. Gain and Tone controls are operative with this type of operation.

The majority of record player pick-ups are terminated in a single shielded wire. The Phono jack on the HRO-50-1 is the type that accommodates a standard phono tip plug and if the record player to be used is not fitted with such a plug one can easily be attached. If the output circuit of the record player is of low impedance (less than 100,000 ohms) improved efficiency will be obtained if a suitable resistor, with a value as specified for the particular record player, is connected across the phono tip plug or its mating jack to properly load the record player output circuit.

1-15. AUDIO OUTPUT

The HRO-50-1 features a push pull output amplifier using inverse feed-back. See Figure No. 2 for the audio system response characteristic. The matching transformer located inside the receiver provides two audio output circuits as follows:

(1) The transformer secondary leads are brought to a three-terminal Output board located at the rear of the receiver, having both 8 and 500-ohm terminals and a common ground terminal. The eight-ohm terminal provides output for the speaker voice coil. The 500-ohm terminal is available for connection to a 500-ohm line. Approximately 8 watts of undistorted audio output power is available at the output terminal board and a maximum power of 10 watts is obtainable.

(2) A headphones jack is front-panel mounted and is wired so as to silence the Loudspeaker upon insertion of the headphones plug. The headphones output load impedance is not critical and varying types of headphones may be used including crystal types, as no direct current flows through the headphones.

1-16. POWER SUPPLY

The power supply is built in a separate compartment inside the receiver cabinet incorporating a heat-resistant shielded barrier isolating it from the R.F. chassis portion. It is designed for operation from a 110/120 or 220/240-volt, 50/60 cycle A.C. supply source. A toggle switch is mounted on top of the chassis for selection of either 110/120 or 220/240-volt operation. Normal power consumption is approximately 115 watts. The built-in power unit supplies all of the voltages required by the heater and B supply circuits, 5.1 amperes at 6.3 volts and 145 milliamperes at 240 volts respectively. In addition this supply is also capable of furnishing all voltages required by the accessories such as the NFM-83-50, XCU-50-2 and SOJ-3. A 2-ampere fuse is connected in one side of the A.C. input supply to protect the receiver circuits against possible voltage surges in the power line or short circuits in the receiver. It is located at the rear of the receiver and is easily removed for examination or replacement.

A Power Socket, X-4, is provided at the rear of the receiver so that either a battery or vibrator power supply may be utilized for portable or emergency service. The National Type 650S Vibrator Power Supply is designed to provide efficient operation of the receiver with the use of a 6-volt storage battery input. Further information concerning the 650S is contained at the rear of this manual on a separate data sheet.

1-17. LOUDSPEAKER

The HRO-50TS of HRO-50RS loudspeakers in table or rack mounting styles respectively are designed for use with the receiver. These are both permanent-magnet type loudspeakers furnished with a shielded connecting cable from the 8-ohm voice coil for connection to the output terminal board located at the rear of the receiver. If desirable a 500-ohm shielded line may be used from the receiver output terminals to the speaker and/or externally operated equipment. In the event a dynamic type loudspeaker is used external means for supplying field excitation voltage will be necessary.

A cabinet finished to match the receiver design houses the HRO-50TS loudspeaker for table mounting. The cabinet is lined with sound absorbent material to avoid mechanical resonance.

SECTION 2. INSTALLATION

2-1. GENERAL

All HRO-50-1 receivers are supplied with the following eight scales mounted on the slide-rule dial drum, irrespective of the type of coil sets ordered, A, B, C, D, E-F, AA, AB and AC. If a coil set or coil sets are ordered with the receiver and the corresponding scale does not appear on the dial drum it will be found packed with the coil set. The new scale is installed in place of any one of the unused scales previously mounted on the dial drum. A Phillips head type screw at one end and a spring clip at the other end of the scale hold it properly in place. The drum scales for the A, B, C and D coil sets are frequency calibrated in megacycles for both of the available ranges i.e., General Coverage and Bandspread. The E and F coil set ranges are on the same scale, while the remaining scales carry just the one frequency range calibrated in megacycles. Each scale is clearly marked with the band designation.

2-2. LOCATION

The receiver should not be installed in small, unventilated or warm spaces. Wherever practicable placement should be made to allow freedom of air circulation on all four sides. The loudspeaker may be located in any desirable position although it is not recommended that it be placed on top of the receiver as undesirable microphonics may result. The loudspeaker should not be placed near the antenna terminals.

2-3. ANTENNA RECOMMENDATIONS

The radio frequency input of the receiver is designed for operation from either a single-wire antenna or other types employing transmission lines having impedances of 70 ohms or more. There is an antenna terminal panel at the rear of the receiver with three screw-type terminals marked A, A and G respectively. A link is provided on the antenna terminal panel to allow connection of two-wire or single-wire type antennae to the receiver.

For best impedance matching to the receiver input circuit an antenna with a 300 to 600 ohm transmission line is recommended. The antenna should be cut to the proper length for the most used frequency. The antenna transmission line feeders should be connected to the two antenna terminals marked A; the grounding link is not used. It must be remembered, however, that an antenna installation of this type will have maximum efficiency over a band of frequencies near that frequency for which it is designed and will be most useful in installations where the receiver is tuned to one frequency or band of frequencies. For other frequencies, it would be desirable to connect the two transmission line leads together at the antenna terminal at the left of the antenna terminal panel, grounding the other terminal by means of the link. The antenna is thus utilized as a single wire type.

The most practicable antenna for use in installations where the receiver is to be used over a wide range of frequencies is the single-wire type. An antenna length of from 50 to 100 feet is recommended. The antenna lead-in should be connected to the antenna terminal marked A at the left of the antenna terminal panel; the other terminal marked A should be grounded by means of the link.

When a doublet is used, the antenna feeders or balanced transmission line are connected to the two terminals marked A. The grounding link is not used.

The inner conductor of a concentric transmission line should be connected to the terminal marked A at the left of the antenna terminal panel. The outer conductor should be connected to the other terminal marked A and grounded by means of the link to G.

In some cases where a doublet antenna is used with a low impedance concentric or other type transmission line it may be necessary to re-trim the first R.F. amplifier stage at the high end of each band to provide a better impedance match between antenna and receiver input circuit. Paragraph 4-6 describes this procedure.

In an installation where the receiver is to be used as the receiving unit in a transmitting station the most efficient operation will result from use of the transmitting antenna as receiving antenna also. This is especially true if the transmitting antenna is of the multi-element, directional type since the same antenna gain is available for both receiving and transmitting - a very desirable condition. For switching the antenna from the receiver to transmitter, an antenna change-over relay should be used. A double-pole, double-throw relay possessing good high-frequency insulation is suitable. A second relay and a three position switch may be used to control the transmitter plate supply and the receiver B+ circuits. This second relay should be a single-pole, single-throw type having one normally open pair of contacts. The schematic diagram of this type of control circuit is shown in Figure 3. With S-1 in the receive position the antenna transmission line is connected to the receiver by contacts 2, 3, 5 and 6 on relay RY-1; the B+ circuit of the receiver is completed by the switch. (The B+ switch on the receiver should be at B+ Off). With the switch in the transmit position RY-1 contacts 1, 3, 4 and 6 are closed transferring the antenna transmission line to the transmitter; contacts 7 and 8 of relay RY-2 close to complete the plate supply circuit to the transmitter. Contacts 7 and 8 of relay RY-2 should be in series with the primary of the transmitter plate supply transformer. Thus, the station is in the receiving condition with switch S-1 in the receive position and in the transmitting condition with S-1 in the transmit position. With S-1 in the mid-position the receiver B+ circuit and transmitter plate supply circuit are both open thus permitting coil set changing in the receiver and transmitter. In the mid-position the receiver B+ circuit is controlled by the B+ switch on the front panel of the receiver.

NOTE

The high-frequency oscillator, C.W. oscillator, S-Meter amplifier and the push-pull audio output amplifier are not affected by the external relay connection to the B.S.W. terminal block. Unless the A.C. On-Off switch is set at Off these circuits will obtain an uninterrupted B-plus supply.

2-4. A.C. OPERATION

After unpacking the HRO-50-1 receiver and associated equipment proceed as follows:

(1) Make sure that all tubes are firmly seated in their sockets, tube clamps are properly in place and all grid clips securely fastened.

(2) Make sure the plug-in coil set used in the receiver is firmly in position by pressing down the lever type handles on the front panel to their maximum vertical position.

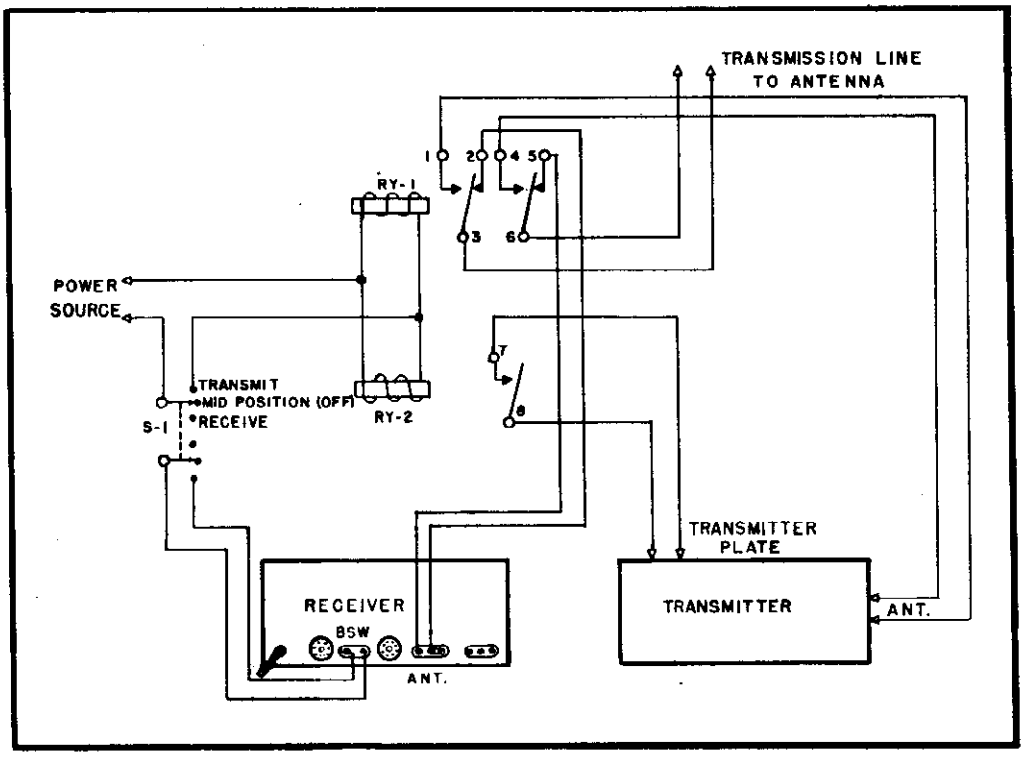


Figure No. 3. Typical Antenna Switching System

(3) Connect the antenna as recommended in Section 2-2.

(4) Connect the loudspeaker cable to the Output terminal board at the rear of the receiver This is accomplished by connecting the outer shield lead to the common terminal and the other to the 8-ohm terminal. A 500-ohm terminal is also available on the Output terminal board in cases where a 500-ohm line is utilized for loudspeaker connection.

(5) Connect the receiver A.C. line cord to the proper source of voltage. The Primary switch, S-10, must be set at the position corresponding to the line voltage to be used i.e., 110/120 or 220/240 volts, 50/60 cps.

(6) Set the controls as recommended in Section 3 for reception of signals.

NOTE

Where the receiver is located in the R.F. field of a relatively powerful transmitter, it is advisable to provide some means of preventing damage to the receiver R.F. coil. If a separate receiving antenna is used a means of disconnecting or grounding it during transmission periods should be provided.

2-5. BATTERY OPERATION

The HRO-50-1 is readily adaptable for emergency, portable operation or operation in localities where a 115 or 230-volt A.C. power source is not available. It may be operated directly from batteries or a National Type 650S Vibrator Power Supply designed for operation from a 6-volt storage battery. The Type 650S power unit draws 9.5 amperes at 6-volts when furnishing power to the receiver if the Narrow-Band F.M. Adaptor, Crystal Calibrator and Select-O-Ject units are not used. If these plug-in units are utilized typical operating conditions and power consumption data will be found in Section 6.

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The Schematic Diagram Figure Number 13 illustrates pin connections of the receiver Power Socket X-4. This provides the information necessary for wiring the octal type battery plug which is used to place of the regular A.C. jumper plug. To conserve battery power the battery plug must be disconnected when the receiver is not being used. For stand-by operation in all cases it is recommended that a switch be placed in the battery B-plus lead as the B-plus switch in the receiver does not open the B-plus circuit supplying the high-frequency oscillator, C.W. oscillator, S-Meter Amplifier or the push-pull audio output tubes. A suggested refinement is to include a switch in the A-plus input lead so that the tube heaters may be turned off when the receiver is not in use without the necessity of removing the battery plug from the Power socket.

2-6. ACCESSORY SOCKETS

Three octal type sockets are available for additional accessories as follows:

(1) A N.B. F.M. socket, X-1, is mounted on top of the chassis inside the power supply compartment. A National Type NFM-83-50 Narrow-Band F.M. adaptor is designed to fit into this socket and is supplied with a mounting bracket and drive screws to hold it firmly in place. The front-panel mounted Control switch, S-7, provides a means of switching the NFM-50 unit into instant service, as required.

(2) A Crystal Calibrator socket, X-2, is top chassis mounted in the power supply compartment. This socket is wired to accommodate a National plug-in Type XCU-50-2 Crystal Calibrator unit. A slotted head screw arrangement bolts the unit firmly in place. The front panel Calibrate switch provides a means of applying B-plus to the unit as well as the selection of either a 100 or 1000 kc. marker signal.

(3) A Select-O-Ject socket, X-3, of the standard octal type is mounted so as to be accessible from the rear of the receiver. This socket is designed primarily for the use of a National Model SOJ-3 Select-O-Ject unit. The SOJ-3 is fitted with an interconnecting cable and plug for direct connection to the Select-O-Ject socket.

Reference to the Schematic Diagram will show the various connections made to the socket if it is desired to use the voltages available for accessories other than the Select-O-Ject. It will be noted that B+ (240 V.D.C. and 105 V.D.C. regulated) and filament voltages are available. There is a definite limitation on the drain permissible at this socket. The total permissible drain (if the NFM-83-50, XCU-50-2 and SOJ-3 are not used) is 1.8 amps at 6.3 V.A.C., 10 milliamperes at 240 V.D.C. and 5 milliamperes at 105 V.D.C. If the 105-volt supply is used it must be remembered that it cannot be switched Off by the B+ On-Off switch or external switching devices connected to the B.S.W. panel unless an additional relay is used.

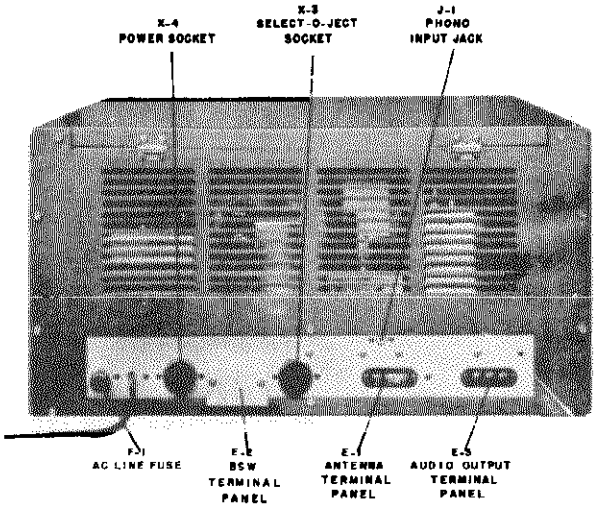

Figure No. 4. Rear View of Receiver

SECTION 3. OPERATION

3-1. CONTROLS

All controls are identified by front-panel markings for ease of identification. The controls are located in a symmetrical manner and are arranged for ease of operation.

The main tuning HRO type micrometer dial is arranged so that the frequency to which the receiver tunes increases as the dial reading increases. The slide-rule dial pointer mechanism is synchronized with the main tuning dial using an anti-backlash gear plus an efficient string-drive arrangement to provide an accurate relationship between the main tuning dial and the direct frequency calibrated scales on the slide-rule drum assembly. Front-panel mounted is a Band selector switch for switching the proper scale in place for the coil set to be used.

The R.F. Gain control serves to adjust the amplification of the second R.F., first, and second and third I.F. amplifier stages. Maximum sensitivity is obtained by rotating the control knob to the extreme clockwise position (10 on its circular scale). At the extreme clockwise position all tubes are operating at maximum gain with minimum bias. As the control is rotated counter-clockwise, increasing bias is applied to the cathodes of the second R.F., first, second and third I.F. tubes, thus reducing their amplification.

The A.C. On-Off switch is associated with the A.F. Gain control and A.C. power is turned on as the A.F. Gain control is advanced from A.C. Off to zero on its scale.

The B+ On-Off switch is connected in the positive lead of the power supply circuit and its purpose is to disconnect the B-plus during periods of transmission or WHEN CHANGING COIL SETS. This last function is important. The B+ circuits are completed when the switch is set at On. However, the B-plus circuits of the high-frequency oscillator, S-Meter amplifier, C.W. oscillator and push-pull audio output tubes remain On at all times regardless of the position of the B+ On-Off switch providing the A.C. On-Off switch is set at On.

Connected in parallel with the B+ switch and mounted at the rear of the chassis is a pair of contacts marked B.S.W. intended for use with relay control of the receiver. The B.S.W. panel is covered by a metal shield to prevent accidental contact with the terminals by the operator. Two slots are provided in this shield to bring out wires to connect to an external switch or relay. Care should be taken that these wires for external connection do not short to the B.S.W. shield.

The Phasing control and Selectivity switch are part of the crystal filter. When the Selectivity switch is set at Off the crystal is switched out of the circuit. With the crystal switched out the Phasing control has no influence on receiver performance. With the Selectivity switch set at any point between 1 and 5, inclusive, the crystal filter is in operation, selectivity increasing as the switch is progressively advanced to position 5. The Phasing control is then used to balance the crystal bridge circuit and eliminate interfering signals or heterodynes. It is recommended that the Tone control be rotated counter-clockwise until the switch is turned Off. This will provide optimum reception of the high audio frequencies when using the crystal filter for A.M. reception. The resultant boost of the higher frequencies tends to compensate for the side-band cutting action of the crystal filter.

The C.W. oscillator is turned on by setting the front-panel mounted Control switch at the C.W. position. The C.W.O. control provides a vernier tuning adjustment for the C.W. oscillator transformer. This oscillator is used to produce an audible beat note when receiving C.W. signals or to locate the carrier of a weak phone station. With the Control switch set at the C.W. position, B-plus is applied to the C.W. oscillator tube providing a constant B-plus supply regardless of the B+ On-Off switch setting or the B.S.W. external control devices. Normally the C.W.O. control is set at zero, however by rotating it either to the right or left of zero the operator can select an audio tone suitable to the ear, or he may set the control for best reception. The C.W. code characters are made audible through the heterodyning action of the C.W. oscillator with that of the incoming signal. Care

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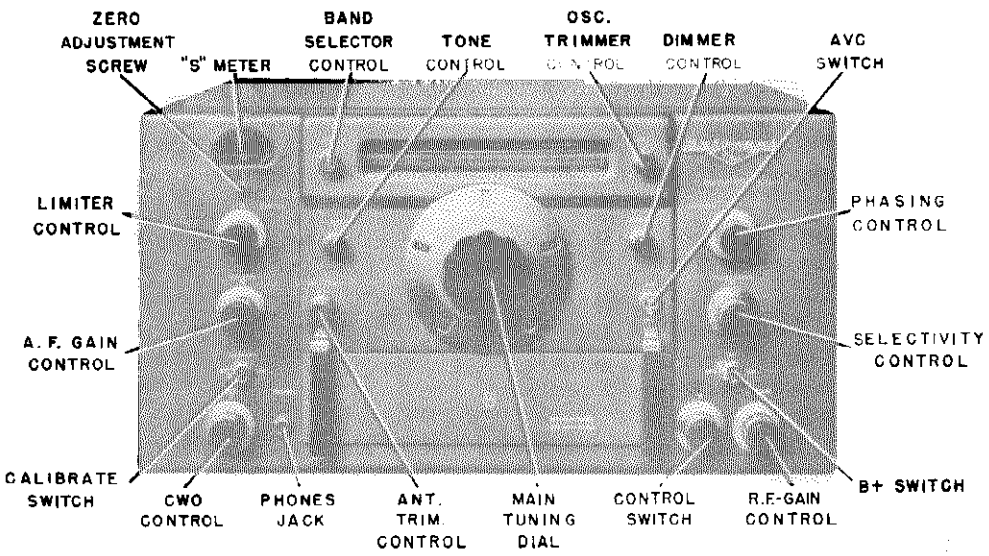

Figure No. 5. Front View of Receiver

should be taken to retard the R.F. Gain control to a point where the receiver does not overload.

The Limiter control serves to switch on the limiter and following this, to adjust the threshold at which limiting action starts. With the Limiter control turned on (at position 0 on the dial scale) limiting action automatically takes place at a relatively high percentage modulation. Rotating the control clockwise progressively lowers the threshold, or percentage modulation, at which limiting action starts until maximum clipping is achieved at 10. This limiter is double-acting in that limiting is accomplished by clipping of both positive and negative peaks. Limiting action is equally effective for both phone or C.W. reception.

The Tone control is used to vary the audio frequency characteristic of the audio system. In the extreme counter-clockwise position the greatest degree of high audio frequency response is obtained. Rotating the control clockwise until the switch mounted on the control just closes provides a comparatively flat response over the entire usable audio frequency range. Rotating the control further in a clockwise direction will attenuate the high audio frequencies as shown in Figure Number 2. If a signal is weak and partially obscured by background noise or static an improvement in signal-to-noise ratio is possible by the attenuation of the higher audio frequencies. Excessive attenuation of these frequencies, however, may result in an impairment of A.M. speech intelligibility. When receiving C.W. signals it will be possible to advance the Tone control considerably further than is possible in A.M. reception since audio distortion is relatively unimportant.

The A.V.C. switch is a two-position toggle marked A.V.C.-Off. The automatic volume control circuits are operative with the toggle switch in the A.V.C. or upper position.

The A.F. Gain control adjusts the volume level of the signal at both the Phones jack and loudspeaker terminals. Clockwise rotation of this control increases the signal applied to the grid of the first audio amplifier tube. The A.F. Gain control is operative when an audio signal is applied to the Phono input jack with the Control switch set at the Phono position.

A Bandspread switch is mounted on the A, B, C and D coil sets. Inspection of the coil set ceramic terminal panel will show a silver-plated spring metal strip with a slotted center screw. Four silver-plated contacts are provided on the terminal panels; two for each type of reception i.e., General Coverage or Bandspread. The metal strip may be turned either to the right or left thereby selecting the type of reception required. A spring tension detent arrangement provides for proper placement and a firm trouble-free electrical contact in each position. It is only necessary to switch this from the right to the left hand side to change from General Coverage to Bandspread. The

lower calibrated scale on the slide rule dial is used when operating in the Bandspread position. A typical coil set showing adjustment locations is illustrated in Figure Number 7 contained in Section 4.

The Ant. Trim. control operates a tuning capacitor which is connected across the first R.F. amplifier section of the main tuning capacitor. This trimmer control is used to tune the first R.F. amplifier stage properly under a wide variety of antenna loading conditions over the entire frequency range of the receiver.

The Dimmer control is a variable resistor actuated by a front-panel mounted dial. It is connected in series with one of the filament supply wires to the S-Meter and slide-rule dial pilot lamps and furnishes a means of varying the degree of illumination as desired by the operator.

The front-panel mounted Osc. trimmer control drives a variable air capacitor connected in parallel with the oscillator main tuning capacitor. Assuming that the receiver is properly aligned this compensating trimmer may be used for minor calibration adjustments. Calibration can be checked by the use of accurate crystal-controlled test oscillators or by using the National Model XCU-50-2 Crystal Calibrator. Use of the Osc. trimmer should not be attempted until the receiver has had a warm-up period of at least five minutes.

A four position Control switch is mounted on the front panel of the receiver. In the C.W. position the C.W. oscillator is placed in operation. The A.M. position provides normal reception of phone or broadcast signals. In the N.F.M. position the reception of narrow-band F.M. signals is possible provided a National Type NFM-83-50 adaptor is plugged into the N.B.F.M. socket. With the Control switch in this position the adaptor is connected between the output of the intermediate amplifier and the input of the audio system. When the Control switch is set in the Phono position the Phono jack is connected to the input of the audio amplifier. In the Phono position all of the receiver circuits except the audio system are rendered inoperative. The A.F. Gain and Tone controls remain operative. If it is so desired the record player may remain connected to the receiver and normal receiving operation resumed by setting the Control switch to any of the other positions.

3-2. PHONE RECEPTION

After the HRO-50-1 is properly installed as outlined in Section 2, it is placed in operation by the following adjustments:

1. Set the Control switch at A.M.
2. Set the A.V.C. switch at A.V.C.
3. Set the Selectivity switch at Off.
4. Set the Phasing control at zero.
5. Set the Limiter control at Off.
6. Set the R.F. Gain control at 10.
7. Check the position of the Osc. trimmer control pointer. It is aligned at the factory so that proper calibration is obtained with the pointer in a vertical position with the arrow head pointed to the "S" in the Osc. panel engraving.
8. Turn the A.C.-On-Off switch mounted on the A.F. Gain control to On i.e., zero on the dial scale.
9. Set the receiver B+ switch at On.
10. Adjust the Band control to select the scale corresponding to the plug-in coil set in use.
11. Turn the A.F. Gain control to the position giving the desired audio volume.
12. Adjust the Ant. Trim. control for a maximum S-Meter reading after the desired station has been selected. Alternately in the absence of a signal the Ant. Trim. control may be set for maximum receiver background noise.
13. Turn the Tone control to a position giving the desired audio output response.

The receiver is now adjusted for the reception of phone signals and will tune to the frequency

corresponding to the plug-in coil set in use and the setting of the main tuning dial. If a dual-coverage plug-in coil set is used the position of the Bandspread switch,, as previously described in paragraph 1 of this section, will determine the frequency coverage i.e., General Coverage or Bandspread.

The settings given above are for the reception of signals of average strength. Exceptionally strong or weak signals may require modification of the above settings. Very strong signals may cause overload or distortion in the receiver with the R.F. Gain control at 10. In this case retarding this control slightly until the overload or distortion disappears is recommended. However, the operator must remember that automatic volume control action will be restricted unless the R.F. Gain control is fully advanced. Audio output should be adjusted entirely by means of the A.F. Gain control.

The A.V.C. - Off switch may be set at the Off position to provide increased sensitivity in some cases. With such a setting the operator must be careful not to advance the R.F. Gain control to a point where I.F. or audio amplifier overload occurs. Such overload is indicated by distortion.

Various types of interference which may be encountered due to adverse receiving conditions can be minimized by utilization of the following controls in the manner described.

Noise Limiter -- When a signal is accompanied by static peaks or noise pulses of high intensity and short duration, the best signal-to-noise ratio will be obtained by turning On the Limiter control. In general, it will be found that turning the Limiter control On to 0 on the dial scale will effectively minimize interference caused by external noise pulses. In cases where the noise pulses are extremely pronounced a higher degree of noise suppression will be realized by advancing the Limiter control to a higher dial setting.

Tone control -- An improvement in signal-to-noise ratio can be realized by setting the Tone control to attenuate the high audio frequencies. When receiving weak signals which are partially obscured by background noise or static an improvement in reception will be noticed by rotating the Tone control in a clockwise manner. However, too much attenuation of the high audio frequencies may impair the intelligibility of speech.

Selectivity and Phasing -- The selectivity of the receiver is adjusted by means of the crystal filter Selectivity switch. The normal setting of the Selectivity switch in phone or broadcast reception is at one of the positions affording broad selectivity. Positions marked Off, 1 or 2 are recommended. Selectivity may be progressively increased by turning the Selectivity switch to position 3 4 or 5. Increasing selectivity will result in the attenuation of the higher audio frequency tones of the signal as well as sharper tuning. If the selectivity is increased too much these higher frequency audio tones will be attenuated to such an extent that phone or broadcast signals may become unintelligible due to excessive side-band cutting. The Phasing control is part of the crystal filter and is used to eliminate or attenuate interfering heterodynes. The Phasing control is inoperative with the Selectivity switch set in the Off position but is operative in all other settings. The normal setting of the Phasing control with the crystal filter On (i.e., the Selectivity switch set at 1, 2, 3, 4 or 5) in phone reception is at zero on its scale. If, after a desired signal has been tuned in, an interfering signal causes a heterodyne or whistle the Phasing control should be adjusted until this interference is reduced to a minimum. The setting of the Phasing control should be that which provides a maximum attenuation of the objectionable heterodyne. If the heterodyne is below 1,000 cycles the optimum Phasing control setting will be near either one or the other end of the dial scale, depending upon whether the interfering signal has a higher or lower frequency than the desired signal.

3-3. C.W. RECEPTION

The initial adjustment of the receiver controls for C.W. reception is the same as given in Section 3-2 except that the Control switch must be set at C.W.

For the reception of C.W. signals the action of the crystal filter is similar to that for phone reception except that full use of the sharp selectivity position may be used without the loss of intelligibility experienced in phone reception. When maximum selectivity is used, (Selectivity switch at position 5) care must be exercised since tuning is very critical. When the receiver is slowly tuned across the carrier at the received signal the beat-note produced will be very sharply peaked in output at a particular audio pitch. This peak in response indicates the correct receiver dial setting. The setting of the C.W.O. control must be such that the beat-note peak is well within the audible range so that the receiver peak response may be readily observed. A C.W.O. dial setting near zero is recommended. After the receiver has been correctly tuned, the pitch of the beat-note peak may be adjusted by means of the C.W.O. control to provide an audio tone which is pleasing to copy or coincides with any response peaks in the speaker or headphones. Under these conditions the receiver will exhibit pronounced single-signal properties which may be demonstrated by tuning the receiver to the other side of "zero-beat" so that the pitch is the same as before and observe the marked reduction in output. This dial setting is not recommended for use other than to demonstrate the single-signal properties of the receiver. With the receiver tuned to "crystal peak", an interfering signal may be attenuated by proper setting of the Phasing control since this control has little effect on the desired signal.

Similar to phone reception the Limiter control can be used to great advantage in C.W. reception for the reduction of interference due to external noise pulses. For C.W. reception, however, the Limiter control may be set at a well advanced position on the dial scale as excessive clipping of the modulation peaks will not be experienced as might be the case in phone reception. Also the Tone control may be advanced considerably further for C.W. reception since audio distortion is relatively unimportant.

3-4. N.B.F.M. OPERATION

The HRO-50-1 receiver is adaptable for Narrow-Band F.M. reception by utilizing a National Type NFM-83-50 Narrow-Band F.M. adaptor. Operating instructions as given in paragraph 3-2 of this section are applicable for the reception of narrow-band F.M. signals except that the Control switch must be set at N.F.M. It is recommended when the operator is scanning a band for signals that the Control switch is set at A.M. An F.M. signal is indicated by the presence of an audio null in the center of the signal carrier. When an F.M. signal is encountered the Control switch should then be set at N.F.M. and with the A.V.C. switch set at A.V.C. the signal tuned for maximum S-Meter reading.

3-5. MEASUREMENT OF SIGNAL STRENGTH

To measure the strength or intensity of a signal the R.F. Gain control must be advanced to 10, the Control switch set at A.M. and the A.V.C.-Off switch at A.V.C. The crystal filter should be turned Off by means of the Selectivity switch and the Phasing control set at zero. The Ant. Trim. control should be adjusted for a maximum S-Meter reading after a signal has been tuned in. The Limiter, Tone and A.F. Gain controls do not affect the S-Meter reading.

Tuning the receiver to a signal will cause the S-Meter to read, indicating the signal input in S-units from 1 to 9 and in decibels above the S-9 level from zero to 40 db. With no R.F. input to the receiver, or with the antenna disconnected, the S-Meter should read zero plus or minus one-half an S-unit. If it does not the S-Meter circuit compensator requires adjustment. See Section 4-7 for adjustment procedure.

Design of the S-Meter actuating circuit is such that a signal stronger than 40 db. above S-9 cannot cause the meter pointer to come in violent contact with the full-scale meter stop pin thus preventing the possible bending of the meter pointer.

For the purpose of comparing strong signals, which cause the meter pointer to read full scale, with other stronger and/or weaker signals the sensitivity of the S-Meter may be lowered by retarding the R.F. Gain control.

Measurements of the signal strength of C.W. signals cannot be made with the C.W. oscillator in operation.

With the receiver A.C.-On-Off switch set at Off the meter pointer will return to its mechanical zero located on the right hand or 40 db. end of the meter.

SECTION 4. ALIGNMENT DATA

4-1. GENERAL

All circuits in the HRO-50-1 receiver are carefully aligned before shipment using precision test equipment insuring accurate conformability to the alignment frequency. No realignment of the various adjustments will be required unless the receiver is tampered with or component parts or tube replacements have been necessary.

A definite need for realignment can be determined by checking the performance of the receiver against its normal operation as outlined in Section 3. A simple check to assure the need of realignment of the I.F. Amplifier is provided in paragraph 4-2 of this section. In no case should realignment be attempted unless tests indicate that such realignment is necessary. Even then it must be remembered that the HRO-50-1 is a communications receiver and should not be serviced or realigned by by any individual who does not have a complete understanding of the functioning of the equipment and who has not had previous experience adjusting receivers of this type.

Complete alignment of the receiver can be divided into three steps as follows:

(a) Intermediate Frequency Amplifier alignment including crystal filter adjustments.
(b) General Coverage Alignment
(c) Bandspread Alignment

All circuits must be tuned in the above order when complete alignment is required. All alignment adjustments and controls are shown on Figure Numbers 6, 7 and 10.

4-2. I.F. AMPLIFIER CHECK

The making of any adjustment indiscriminately is cautioned against and no circuit should be realigned unless tests definitely indicate that realignment is necessary.

The alignment of the intermediate frequency amplifier may be easily checked in the following manner:

1. Adjust the receiver for normal operation with the antenna disconnected.
2. Connect a pair of headphones to the Phones jack.
3. Set the A.V.C. switch at Off.
4. Set the Control switch at C.W.
5. Set the Phasing control at zero.
6. Set the Selectivity switch at 5.
7. Set the R.F. Gain control at 10.

The setting of the A.F. Gain control does not affect the measurement and may be adjusted to provide sufficient headphone output to make the required observations. Adjust the C.W.O. control

until a point is found where the predominant pitch of the background noise is lowest and a distinct crystal ring is heard. Note this setting of the C.W.O. control. Disconnect the crystal filter from the circuit by turning the Selectivity switch to the Off position Once more adjust the C.W.O. control for the lowest predominant pitch of background noise and note the setting. If the I.F. amplifier is correctly aligned to the crystal filter frequency the setting of the C.W.O. control will be the same for both tests outlined above. If the two settings differ perform the complete I.F. amplifier alignment procedures in the following paragraph 4-3.

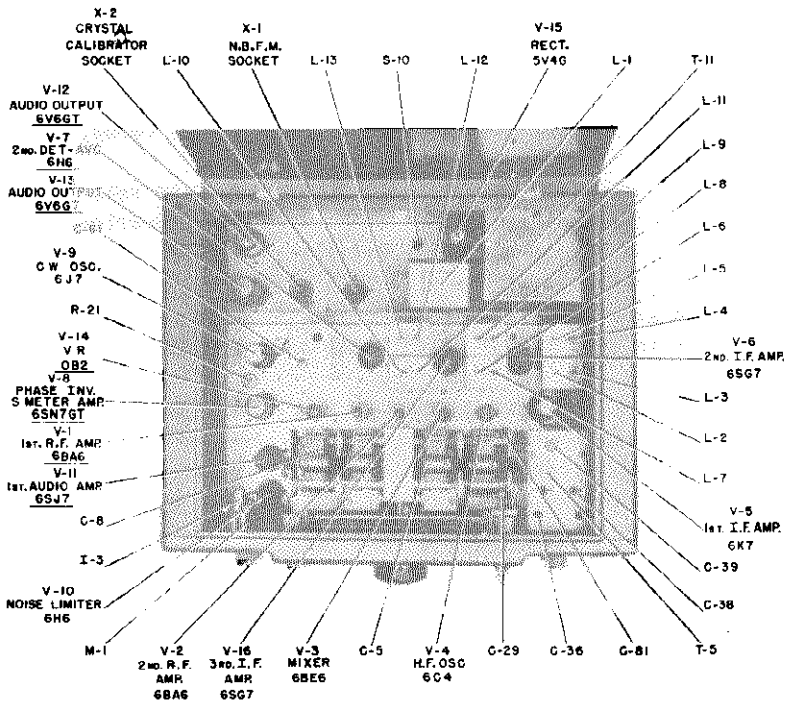

Figure No. 6. Top View of Receiver

4-3. I.F. AMPLIFIER ALIGNMENT

The intermediate frequency of the HRO-50-1 is 455 kilocycles plus or minus 2 kilocycles. The exact frequency is determined by the quartz crystal resonator, Y-1, used in the crystal filter.

The crystal filter and C.W. oscillator transformer are fitted with air-type variable trimmer capacitors for alignment purposes. The I.F. transformers are aligned by means of variable iron cores. These adjustments are located on Figure Numbers 6 and 10.

The preliminary alignment procedure is as follows:

(1) Connect the high output lead of an accurately calibrated signal generator to the stator portion of the mixer section of the main tuning capacitor, C-5C, and the grounded lead to any convenient point on the chassis. This is a direct connection.

(2) Connect an output meter having an 8 or 500 ohm resistive load to the matching output terminals on the receiver. As an alternative a high-impedance A.C. voltmeter may be connected to the phones jack.

(3) Set the Control switch at C.W.

(4) Set the A.V.C. switch at Off.

(5) Set the Phasing control at zero.

(6) Set the Selectivity switch at 5.

(7) Set the A.F. Gain control at 10.

(8) Set the R.F. Gain control at 9.

(9) Turn the modulation of the signal generator off to provide a steady C.W. test signal

tuned to approximately 455 kilocycles.

Adjust the output attenuator of the signal generator to provide a signal of approximately 100 microvolts. The C.W.O. control must be set to provide an audio beat-note at some frequency between 400 and 1000 cycles per second. The presence of this beat note can readily be determined by temporarily connecting headphones or a loudspeaker to the receiver. If difficulty is encountered in obtaining such a beat-note an adjustment of the C.W.O. transformer trimmer capacitor, C-61, must be made.

Vary the tuning control of the signal generator very slowly between the frequencies of 453 and 457 kilocycles. At one frequency between these limits the I.F. amplifier of the receiver will show a very definite sharply peaked response, as indicated on the output meter. This frequency is that of the crystal filter crystal, Y-1, and I.F. alignment, as outlined below, is made at this frequency.

While making I.F. amplifier adjustments it will be necessary to retard the attenuator of the signal generator if I.F. amplifier gain increases to a point where overload occurs. Without altering the frequency setting of the signal generator set the Selectivity switch at Off, the Control switch at A.M. and turn the modulation of the signal generator On. Capacitors C-33, C-39 and inductors L-2 through L-13 should at this point each be carefully adjusted to give a maximum reading on the output meter. The order in which these adjustments are performed is not important.

Upon completion of the above adjustments set the Selectivity switch at 1. Set the frequency of the signal generator 2 kilocycles higher and adjust the crystal filter trimmer capacitor C-39 for a maximum output meter indication. After making this adjustment set the Selectivity control at Off and return the signal generator to the exact crystal frequency (2 kilocycles lower). Tune the Selectivity compensating trimmer capacitor C-38 for a maximum reading on the output meter.

The Phasing control as set at the factory should need no further attention. When correctly set a predominant decrease in background level will be found with the Selectivity switch at position 5 and the Phasing control set at zero. This same null point should be found by rotating the Phasing control exactly 180 degrees. If not, a slight adjustment of the phase balancing capacitor C-36 will provide the proper setting.

Turn the modulation of the signal generator Off and set the Control switch at C.W. Rotate the C.W.O. control to its full clockwise position. If in this position the dial control does not coincide with 5 on its scale loosen the dial knob and reset it at 5. Set the C.W.O. control to zero beat with the signal generator signal. If zero beat does not occur at 0 on the control dial carefully readjust the air trimmer capacitor C-61 of the C.W. oscillator transformer T-8.

4-4. GENERAL COVERAGE ALIGNMENT

The data given in this section applies to the General Coverage alignment of the H.F. oscillator and R.F. amplifier stages of all coil sets. The original alignment at the National Laboratories is accomplished by the use of precision, crystal-controlled test oscillators. No realignment should be attempted unless a reliable test signal source is available. In the case of General Coverage H.F. oscillator alignment, a test signal source with an accuracy of 1% or better is required. For Bandspread alignment the calibration accuracy demands that the test signal source have the accuracy of precision-calibrated crystals. The entire range of test frequencies required may be obtained by the use of nine crystals operating at their fundamental and harmonic frequencies. The frequency of these crystals is as follows: 0.05, 0.1, 1.0, 2.0, 3.5, 5.0, 6.8, 7.0, 7.3, 14.4 and 15 megacycles.

The need for realignment of the H.F. oscillator of any band is indicated when the frequency calibration of the receiver dial is in error by more than 1% at the high frequency end of the band in question. If it is determined that realignment is necessary proceed as follows:

(1) Connect an output meter to the receiver as described in paragraph 4-3 of this Section and disconnect the antenna.

coil set. It may be desirable to align the R.F. Amplifier trimmers C-2 and C-15 and the mixer trimmer C-21 using receiver background noise as an indication of maximum gain, rather than the signal source. If this alternate method of alignment is used the point of maximum gain is that setting of the trimmers which provides the loudest receiver background noise. However, it is possible to align the R.F. amplifier and mixer stages to the image frequency using background noise as an indicator. A check of this possibility is to tune in the image signal — if the image is weaker than the fundamental signal the R.F. amplifier and mixer stages are correctly aligned.

Correction of tracking errors of the R.F. amplifier and mixer stages at the low frequency limit of each coil set is accomplished by the adjustments listed on the Alignment Chart. The actual tracking of these stages may be checked by pressing the outside rotor plates of the main tuning capacitor section toward or away from the stator in a manner assuring that the rotor plates will spring back to their original position. Any change in capacity should decrease the receiver gain if the stage is tracking properly.

The locations of the adjustments referred to on the General Coverage Chart are shown on Figure Number 7. Each variable on the chart is followed by a number in parenthesis to identify its position on the respective coil set. Schematic diagrams of each of the plug-in coil sets are furnished on Figure Numbers 11 and 12.

GENERAL COVERAGE CHART

Step	Coil Set	Adjust Signal Source and Receiver To:	Adjust to Receive Test Signal	Adjust for Maximum Output
1	A	30.0 Mc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4).
2	A	14.4 Mc.	Inductance at Pos. No. 16.	Inductance at Pos. Nos. 13, 11, 9.
3	A	30.0 Mc.		Check step 1. Repeat steps 1 and 2 if necessary.
1	B	14.4 Mc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6) C-15 (Pos. 4), C-2 (Pos. 2).
2	B	7.0 Mc.	Inductance at Pos. No. 16.	Inductance at Pos. Nos. 13, 11, 9.
3	B	14.4 Mc.		Check step 1. Repeat steps 1 and 2 if necessary.
1	C	7.3 Mc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4), C-2 (Pos. 2).
2	C	3.5 Mc.	Inductance at Pos. No. 16.	Inductance at Pos. Nos. 13, 11, 9.
3	C	7.3 Mc.		Check step 1. Repeat steps 1 and 2 if necessary.
1	D	4.0 Mc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4), C-2 (Pos. 2).
2	D	1.8 Mc.	Inductance at Pos. No. 16.	Inductance at Pos. Nos. 13, 11 9.
3	D	4.0 Mc.		Check step 1. Repeat steps 1 and 2 if necessary.

GENERAL COVERAGE CHART (CONT'D)

Step	Coil Set	Adjust Signal Source and Receiver to:	Adjust to Receive Test Signal	Adjust for Maximum Output
1	E	2.0 Mc	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6) C-15 (Pos. 4).
2	E	1.0 Mc.	Padder capacitor C-100 (Pos. 7).	
3	E	1.4 Mc.	Inductance at Pos. No. 16.	
4	E	2.0 Mc.		Check step 1. Repeat steps 1, 2 and 3 if necessary.
1	F	0.9 Mc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4), C-2 (Pos. 2).
2	F	0.5 Mc.	Padder capacitor C-100 (Pos. 7).	
3	F	0.7 Mc.	Inductance at Pos. No. 16.	
4	F	0.9 Mc.		Check step 1. Repeat steps 1, 2 and 3 if necessary.
1	G	400 Kc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4).
2	G	200 Kc.	Padder capacitor C-100 (Pos. 7).	
3	G	300 Kc.	Inductance at Pos. No. 16.	
4	G	400 Kc.		Check step 1. Repeat steps 1, 2 and 3 if necessary.
1	H	200 Kc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4), C-2 (Pos. 2).
2	H	100 Kc.	Padder capacitor C-100 (Pos. 7).	
3	H	150 Kc.	Inductance at Pos. No. 16.	
4	H	200 Kc.		Check step 1. Repeat steps 1, 2 and 3 if necessary.
1	J	100 Kc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6). C-15 (Pos. 4), C-2 (Pos. 2).
2	J	50 Kc.	Padder capacitor C-100 (Pos. 7).	
3	J	75 Kc.	Inductance at Pos. No. 16.	
4	J	100 Kc.		Check step 1. Repeat steps 1, 2 and 3 if necessary.

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GENERAL COVERAGE CHART (CONT'D)

Step	Coil Set	Adjust Signal Source and Receiver to:	Adjust to Receive Test Signal	Adjust for Maximum Output
1	AA	30 Mc.	Trimmer capacitor C-26 (Pos. 7).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4), C-2 (Pos. 2).
2	AA	27.2 Mc.	Padder capacitor C-100 (Pos. 8).	Padder capacitors C-99 (Pos. 5), C-98 (Pos. 3), C-97 (Pos. 1).
3	AA	28 Mc.	Inductance at Pos. No. 16.	Inductance at Pos. Nos. 13, 11, 9.
4	AA	30 Mc.		Check step 1. Repeat steps 1, 2 and 3 if necessary.
1	AB	35 Mc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4), C-2 (Pos. 2).
2	AB	25 Mc.	Padder capacitor C-100 (Pos. 7).	Padder capacitors C-99 (Pos. 5), C-98 (Pos. 3), C-97 (Pos. 1).
3	AB	30 Mc.	Inductance at Pos.No. 16.	Inductance at Pos. Nos. 13, 11, 9.
4	AB	35 Mc.		Check step 1. Repeat steps 1, 2 and 3 if necessary. Check step 1.
1	AC	21.5 Mc.	Trimmer capacitor C-26 (Pos. 7).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4), C-2 (Pos. 2).
2	AC	21 Mc.	Padder capacitor C-100 (Pos. 8).	Padder capacitors C-99 (Pos. 5), C-98 (Pos. 3), C-97 (Pos. 1).
3	AC	21.3 Mc.	Inductance at Pos. No. 16.	Inductance at Pos. Nos. 13, 11, 9.
4	AC	21.5 Mc.		Check step 1. Repeat steps 1, 2 and 3 if necessary. Check step 1.

4-5. BANDSPREAD ALIGNMENT

The data given in this section applies to the Bandspread Alignment of the high-frequency oscillator, R.F. amplifier and mixer stages of coil sets A, B, C and D. It is important that no Bandspread adjustments are made until after completion of General Coverage alignment as General Coverage adjustments affect Bandspread alignment.

The need for realignment of the H.F. oscillator of any band is indicated when the frequency calibration of the main tuning dial is in error by more than ±5 divisions. To effect alignment the receiver controls are adjusted the same as outlined in Section 4-4, except that the Bandspread switch on each of the plug-in coils must be in the right-hand or Bandspread position.

The procedure in effecting Bandspread alignment is accomplished by adhering to the instructions given in the Bandspread Alignment Chart. The procedure is similar to that for General Coverage except for the method followed in checking tracking errors of the R.F. amplifier and mixer stages at the low-frequency limit of each coil set. To secure an indication of proper tracking, check the setting of the Bandspread trimmer capacitors C-3, C-16 and C-22 for the position of maximum receiver gain. Any change in capacity should decrease the receiver gain indicating proper tracking. The use of the trimmer capacitors C-3, C-16 and C-22 for a tracking check may destroy their proper settings therefore they must be carefully rechecked at the high-frequency limit of the coil set. The location

BANDSPREAD ALIGNMENT CHART

NOTE: Do not effect Bandspread Alignment until after completion of General Coverage.

Step	Coil Set	Adjust Signal Source and Receiver to:	Adjust to Receive Test Signal	Adjust for Maximum Output
1	A	30.0 Mc.	Trimmer capacitor C-27 (Pos. 7).	Trimmer capacitors C-22 (Pos. 5) C-16 (Pos. 3), C-3 (Pos. 1).
2	A	27.2 Mc.	Padder capacitor C-25 (Pos. 15).	Padder capacitors C-20 (Pos. 14) C-14 (Pos. 12), C-1 (Pos. 10).
3	A	30.0 Mc.		Check step 1. Repeat steps 1 and 2 if necessary. Check step 1.
1	B	14.4 Mc.	Trimmer capacitor C-27 (Pos. 7).	Trimmer capacitors C-22 (Pos. 5) C-16 (Pos. 3), C-3 (Pos. 1).
2	B	14.0 Mc.	Padder capacitor C-25 (Pos. 15).	Padder capacitors C-20 (Pos. 14), C-14 (Pos. 12), C-1 (Pos. 10).
3	B	14.4 Mc.		Check step 1. Repeat steps 1 and 2 if necessary. Check step 1
1	C	7.3 Mc.	Trimmer capacitor C-27 (Pos. 7).	Trimmer capacitors C-22 (Pos. 5) C-16 (Pos. 3), C-3 (Pos. 1).
2	C	7.0 Mc.	Padder capacitor C-25 (Pos. 15).	Padder capacitors C-20 (Pos. 14) C-14 (Pos. 12), C-1 (Pos. 10).
3	C	7.3 Mc.		Check step 1. Repeat steps 1 and 2 if necessary. Check step 1.
1	D	4.0 Mc.	Trimmer capacitor C-27 (Pos. 7).	Trimmer capacitors C-22 (Pos. 5) C-16 (Pos. 3), C-3 (Pos. 1).
2	D	3.5 Mc.	Padder capacitor C-25 (Pos. 15).	Padder capacitors C-20 (Pos. 14) C-14 (Pos. 12), C-1 (Pos. 10).
3	D	4.0 Mc.		Check step 1. Repeat steps 1 and 2 if necessary. Check step 1.

of the adjustments referred to in this section are shown on Figure Number 7. Each variable on the chart is followed by a number in parenthesis to identify its position on the respective coil set. Schematic diagrams of each of the four combination Bandspread and General Coverage coil sets A, B, C and D are furnished on Figure Number 11.

4-6. FIRST R.F. STAGE ALIGNMENT WITH LOW IMPEDANCE TRANSMISSION LINE

If a low impedance transmission line is to be used with the receiver, it may be necessary to realign the first R.F. amplifier at the high-frequency end of each band. The tracking of the first R.F amplifier stage on each of the coil ranges may be checked by rotating the Ant. Trim. control. If two definite peaks in output are observed while rotating the Ant. Trim. control, the first R.F. amplifier stage is tracking correctly and the setting at either peak is correct. The lack of a peak in output or the presence of only one peak indicates the stage is not tracking properly and correction should be made. The General Coverage adjustments affect the Bandspread adjustments and must therefore be performed first. The following procedure should be adhered to:

(a) GENERAL COVERAGE

(1) Set the Bandspread switch on each coil to the left-hand side or General Coverage position. Adjust the receiver for normal operation as follows: Control switch at A.M., Selectivity switch at Off, Ant. Trim. control pointer set in a vertical position with the arrow head towards the top of the receiver, A.F. Gain control set at 10 and the R.F. Gain control set to provide a suitable signal level.

(2) Connect the antenna feeders to the receiver antenna terminals and tune the receiver to the signal shown in step 1 on the General Coverage Alignment Chart for the coil set to be aligned. Adjust the trimmer capacitor C-2 for maximum signal output. Coil sets A and D do not use a first R.F. amplifier General Coverage trimmer but are peak-tuned by the Ant. Trim. control over the full frequency range of each coil set.

(b) BANDSPREAD

(1) With the receiver adjusted in the same manner as for General Coverage shift the Bandspread switch on each coil terminal panel to the right-hand side or Bandspread position.

(2) Connect the Antenna feeders to the receiver antenna terminal and tune the receiver to the signal shown in Step 1 on the Bandspread Alignment Chart for the coil set being aligned. Adjust the Bandspread trimmer capacitor C-3 for maximum signal output. If no signal can be received the trimmer may be adjusted for maximum background noise.

4-7. S-METER ADJUSTMENT

The S-Meter balancing resistor R-21 is used to obtain a zero meter reading in the absence of signal input to the receiver. To make this adjustment set the controls as follows: set the R.F. Gain control at 0, A.V.C. switch at A.V.C., Control switch at A.M. and the A.C. switch at On. Adjust the S-Meter balancing resistor R-21 for a zero reading on the S-Meter. This is a screwdriver type adjustment located on the top of the chassis.

SECTION 5. MAINTENANCE

5-1. GENERAL MAINTENANCE DATA

Any repairs in the HRO-50-1 receiver which necessitates resoldering of joints must be made with care. A good mechanical connection must be made before the solder is applied.

Failure of a vacuum tube in the receiver may reduce the sensitivity, produce intermittent operation or cause the equipment to be completely inoperative. In such cases, all tubes should be checked either in an analyzer or similar tube testing equipment or by replacement with tubes of proven quality. When any tube is tested, it should be tapped or jarred to make sure that it has no internal loose connection or intermittent short circuit.

Tubes of the same type will vary slightly in their individual characteristics and this fact should be borne in mind when replacements become necessary. The C.W. oscillator, high-frequency oscillator and I.F. tubes should be chosen with care to select a replacement which most nearly approaches the characteristic of the original tube. A replacement high frequency oscillator tube can be readily checked by noting any change in dial calibration, particularly on the amateur bandspread bands. Substitution of new I.F. amplifier tubes may possibly alter overall gain and selectivity characteristics. The necessity for realignment as well as alignment procedures is discussed in Section 4.

In case of breakdown or failure of the receiver, the fault must first be localized. This can

often be accomplished by observation of some peculiar action of one of the controls Reference to the circuit diagram will aid in checking voltages at the various tube elements. Measurement of voltages in accordance with Section 5-4. will most likely indicate where failure has occurred.

5-2. CIRCUIT FAILURES

All components parts in the HRO-50-1 receiver have been selected to assure an ample factor of safety. Failure may occur in individual cases and the most common cause of failure, excluding tubes, will probably be due to breakdown of a capacitor or resistor.

Bypass or filter capacitors which develop poor connections internally, or which become open-circuited, will cause decreased sensitivity, oscillation or poor stability. The defective unit can be located by temporarily connecting a good capacitor in parallel with each capacitor that is under suspicion.

Failure of any bypass or filter capacitor may seriously overload resistors in associated circuits. Overload of sufficient magnitude to permanently damage a resistor will cause the surface of the resistor to be scorched, making the defective unit easy to locate by visual inspection.

Open or short-circuited resistors can be definitely located by measuring the resistance of each individual resistor. The schematic diagram should be consulted to make sure that any particular resistor under test is not connected in parallel with some other circuit element which might produce a false measurement

Loose connections which cause intermittent or noisy operation can often be found by tapping or shaking any component under suspicion with the receiver adjusted for normal operation.

5-3. STAGE GAIN MEASUREMENTS

The sensitivity measurements listed herein are made with the receiver set up as specified in Section 3-2 except that the A.F. Gain control is set at 10. Connect an output meter with an impedance to match the receiver output circuit i.e., 8 or 500 ohms to the output terminal panel in place of the loudspeaker. It is important that the proper output impedance match be observed.

Connect the high output lead of the signal generator through a 0.1 mf coupling capacitor to the grid of each tube as specified in the following table. The ground lead of the generator is connected to any convenient chassis point.

The signal generator, using modulation, is varied between 453 and 457 kilocycles until a pronounced peak reading is obtained on the output meter.

With the generator attenuated to provide a one watt reading on the output meter the signal generator attenuator should read within the limits specified on the following table:

TERMINAL	TEST SIGNAL
Mixer Grid	60 ± 20 Microvolts
First I.F. Grid	530 ± 50 Microvolts
Second I.F. Grid	2800 ± 250 Microvolts
Third I.F. Grid	48,000 ± 5000 Microvolts

5-4. VOLTAGE TABULATION

All voltage measurements should be made using a high-impedance vacuum tube voltmeter. Readings taken with any other type of instrument will differ somewhat depending upon the input resistance of the meter. Voltmeter resistance should be ten times larger than the resistance of the circuit across which the voltage is measured otherwise the voltmeter will indicate a voltage lower than the

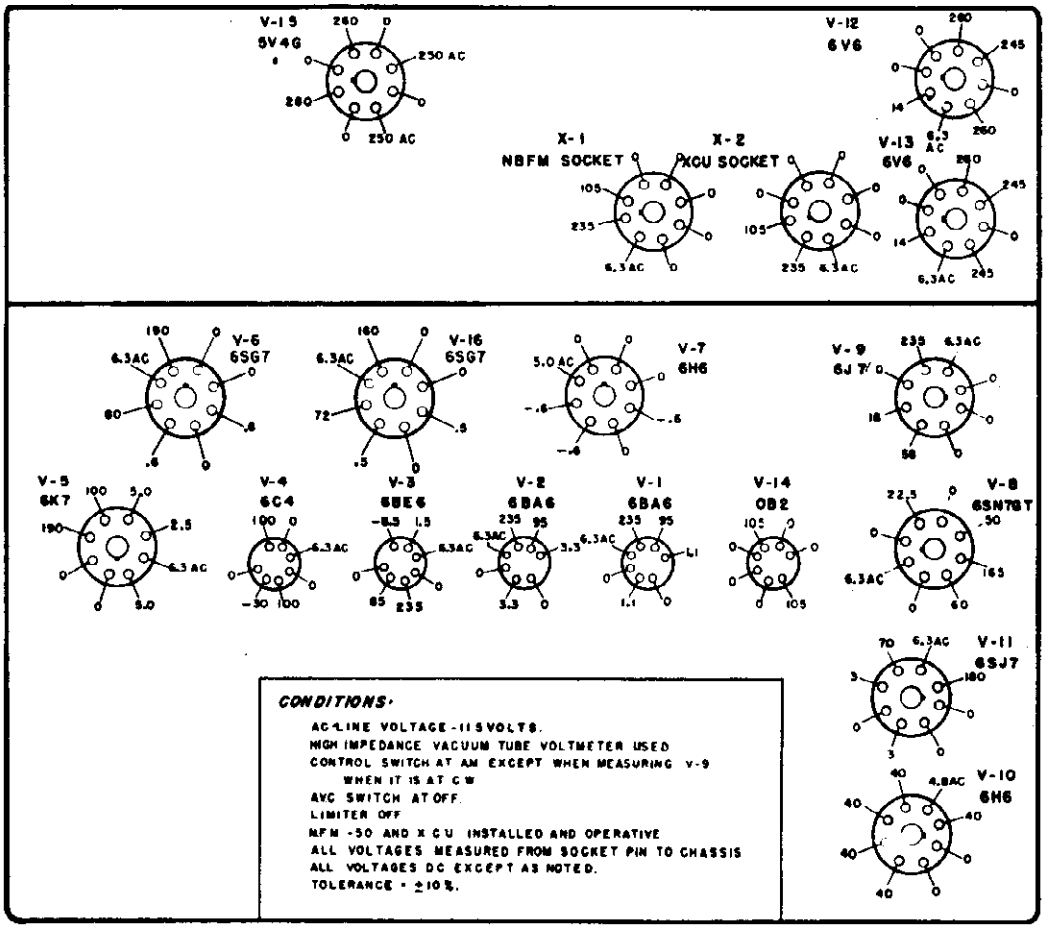

Figure No. 8. Tube Socket Voltages

actual voltage present. The tube socket voltage tabulations contained in Figure Number 8 were taken using a vacuum tube voltmeter with an input resistance of 11 megohms. All voltages are measured between specified socket terminals and chassis. The control settings to be observed are shown on Figure Number 8.

5-5. MAIN TUNING DIAL

The main tuning dial should normally give no trouble. If, however, the dial should become removed from the receiver it must NOT be operated until mounted on the capacitor shaft WITH SET-SCREWS TIGHT. This is because the dial is only designed to rotate for ten revolutions (0 to 500) and if turned farther than this the mechanism will be damaged. When mounted on the capacitor, limit stops protect the dial provided the assembly is made properly. The procedure for re-mounting the dial is as follows:

(a) Place the dial on the capacitor shaft, tighten set-screws and turn the dial counter-clockwise to fully mesh capacitor rotor plates so that the tips of the rotor plates are flush with the edge of the stator plates.

(b) Loosen set-screws and rotate dial slowly until the dial reading has decreased to zero.

(c) Tighten the set-screws.

(d) Check position of rotor plates at zero. The tips of the rotor plates must be flush with the edge of the stator plates. A slight adjustment may be necessary and this is done by loosening the set-screws, adjusting the position of the dial and tightening the set-screws again.

If it is necessary to remove the dial at any future time, turn to 250 before removing the dial

and do not disturb the setting of either the dial or capacitor until reassembled. If in doubt about the correct position, inspect the springs on the back of the dial. When the dial reads 250 these springs should be straight-up-and-down, they must not be tipped to one side.

It is important that the backplate and dial do not become separated. The backplate is held in place by two springs so that its gear teeth mesh with the dial gear teeth in correct relationship for proper dial operation. If this backplate should be sprung out of place, it may return to an in correct position and the proper dial numbers will not appear in the windows when the dial is used. To ascertain that the two parts are in correct position proceed as follows:

(a) Locate small window near outer periphery of dial backplate and also locate dial number window on face of dial which is 180° removed from the small backplate window.

(b) Hold dial so backplate lies flat in palm of left-hand and with right hand rotate dial knob until 250 appears in previously located dial window.

(c) If dial is properly adjusted it will be noted that the pointer at the outer edge of the small window lines up with a marked tooth on the dial itself. It will be found that the dial and backplate can be moved so that the backplate pointer will mesh between teeth at points equidistant from marked tooth in either direction.

(d) If by checking as in paragraph (c) the dial is found not properly adjusted, it will be necessary to separate the backplate from the dial far enough to bring the two gears out of mesh and then re-mesh the two parts until the proper setting is found. A number of trial settings may be required before the correct mesh is found.

5-6. SLIDE-RULE TUNING DIAL

The slide-rule tuning dial assembly has been adjusted at the factory for accurate synchronization with the micrometer dial. If not tampered with this mechanism will provide complete freedom of mechanical trouble over a long period of continuous use. It is driven by an anti-backlash tuning gear ganged with the main tuning dial. The slide-rule dial pointer is controlled by a string-drive assembly.

If replacement of the string-drive cord is required it will be necessary to remove the receiver chassis from its cabinet or wraparound. Before removing the micrometer dial reference should be made to Paragraph 5 of this section for proper method of removal. Figure Number 9 illustrates the proper method of replacing the cord. After the cord has been replaced and before the receiver is returned to its cabinet the micrometer dial should temporarily be replaced (See Paragraph 5-5) and the slide-rule pointer correctly set in the following manner:

NOTE

This procedure may also be used if a check is desired to assure that the slide-rule dial pointer is properly synchronized with that of the main tuning dial.

(a) Check the main tuning dial at zero on its dial scale. The tips of the rotor plates should be flush with the edge of the stator plates.

(b) Set the Band Selector control so that the D coil set scale appears.

(c) Set the main tuning dial at 490 on its dial scale. Correct setting of the slide-rule dial pointer is 4 megacycles on the dial scale. Draw the slide-rule pointer along the cord to its proper position being careful not to disturb the setting of the micrometer dial. After the correct setting has been obtained use a small amount of glyptol or household cement to fasten the dial pointer securely in place on the cord.

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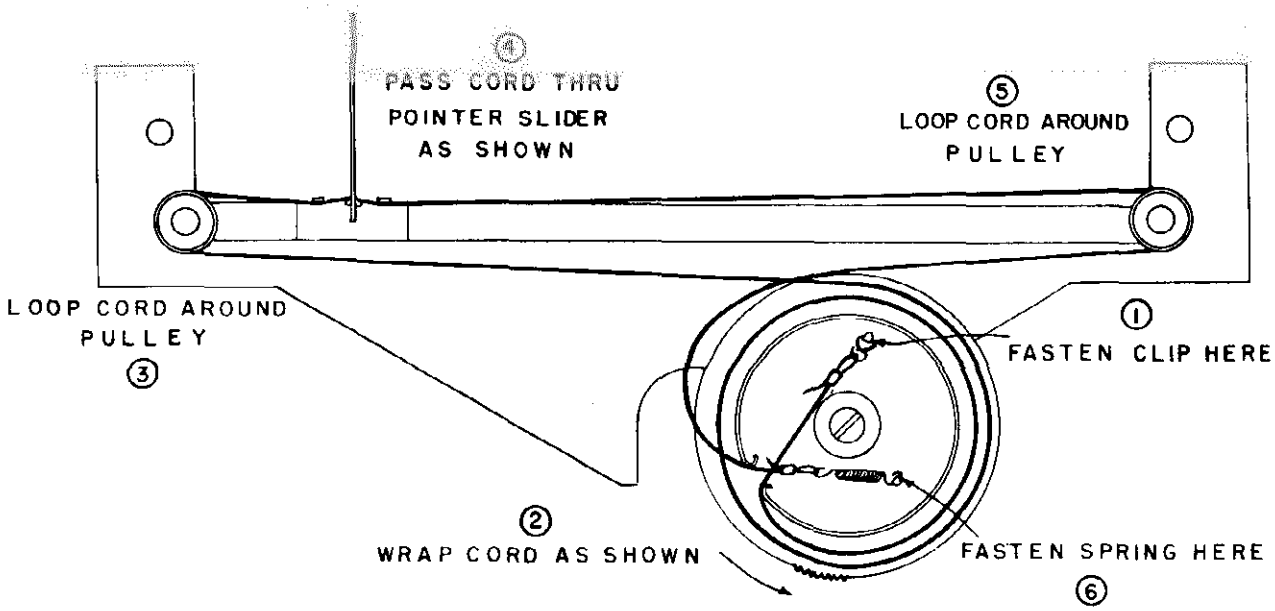

NOTE: *CORD SHOWN EXPOSED FOR CLARITY*
CORD LENGTH 33 7/8" INCLUDING
SPRING AND CLIP

Figure No. 9. Instructions for Dial Cord Replacement

PARTS LIST

SYMBOL	FUNCTION	DESCRIPTION	DRAWING NO.
		CAPACITORS	
C-1	T-1 Bandspread Padder used on A, B, C, D coil sets	Mica, variable, 3.5 – 35 mmf	D832-2
C-2	T-1 General Coverage Trimmer used on B, C, F, H, J, AA, AB, AC coil sets	Variable, air dielectric	
C-3	T-1 Bandspread Trimmer used on A, B, C, D coil sets	Variable, air dielectric	
C-4	Antenna Trimmer,	Variable, air dielectric	SA:6577
C-5	Main Tuning	*Four section ganged*	*SA:6592*
C-5A	V-1 Tuning	Air dielectric, 225 mmf. max.	
C-5B	V-2 Tuning	Air dielectric, 225 mmf. max.	
C-5C	V-3 Tuning	Air dielectric, 225 mmf. max.	
C-5D	V-4 Tuning	Air dielectric, 225 mmf. max.	
C-6	V-1 Gric Filter	Ceramic, .01 mfd. 450 vdcw	K946-2
C-7	Not Used		
C-8	V-1 Grid Filter	Mica, .01 mfd. 300 vdcw	J666-56
C-9	V-1 Cathode Bypass	Paper, .1 mfd. 400 vdcw	D827-12
C-10	V-1 Screen Bypass	Ceramic, .005 mfd. 450 vdcw	K946-1
C-11	V-1 Screen Bypass	Paper, .1 mfd. 400 vdcw	*D827-12*
C-12	V-1 Plate Filter	Paper, .1 mfd. 600 vdcw	D827-13
C-13	V-2 Grid Return Bypass	Ceramic, .005 mfd. 450 vdcw	K946-1

PARTS LIST (CONT'D)

SYMBOL	FUNCTION	DESCRIPTION	DRAWING NO.
		CAPACITORS (CONT'D)	
C-14	T-2 Bandspread Padder used on A, B, C, D coil sets	Mica, variable, 3.5 - 35 mmf.	D832-2
C-15	T-2 General Coverage Trimmer used on all coil sets	Variable, air dielectric	
C-16	T-2 Bandspread Trimmer used on A, B, C, D coil sets	Variable, air dielectric	
C-17	V-2 Cathode Bypass	Paper, .1 mfd. 400 vdcw	D827-12
C-18	V-2 Screen Bypass	Ceramic, .005 mfd. 450 vdcw	K946-1
C-19	V-2 Plate Filter	Paper, .1 mfd. 600 vdcw	D827-13
C-20	T-3 Bandspread Padder used on A, B, C, D coil sets	Mica, variable, 3.5 - 35 mmf.	D832-2
C-21	T-3 General Coverage Trimmer used on all coil sets	Variable, air dielectric	
C-22	T-3 Bandspread Trimmer used on A, B, C, D coil sets	Variable, air dielectric	
C-23	V-3 Cathode Bypass	Ceramic, .01 mfd. 450 vdcw	K946-2
C-24	V-3 Screen Bypass	Paper, .1 mfd. 400 vdcw	D827-12
C-25	T-4 Bandspread Padder used on A, B, C, D coil sets	Variable, air dielectric	
C-26	T-4 General Coverage Trimmer used on all coil sets	Variable, air dielectric	
C-27	T-4 Bandspread Trimmer used on A, B, C, D coil sets	Variable, air dielectric	
C-28	T-4 General Coverage Padder:		
	A coil set	Mica, .0012 mfd. 300 vdcw	J666-63
	B coil set	Mica, .003 mfd. 500 vdcw	J666-30
	C coil set	Mica, .0016 mfd. 500 vdcw	J666-21
	D coil set	Mica, .0009 mfd. 500 vdcw	J666-62
	E coil set	Mica, 470 mmf. 500 vdcw	H500-18
	F coil set	Mica, 330 mmf. 500 vdcw	H500-22
	G coil set	Ceramic, 100 mmf. 500 vdcw	D825C-304
	J coil set	Ceramic, 50 mmf. 500 vdcw	D825D-417
	AA coil set	Ceramic, 10 mmf. 500 vdcw	D825D-402
	AB coil set	Ceramic, 120 mmf. 500 vdcw	D825C-340
C-29	Osc. Trimmer	Variable, air dielectric	
C-30	V-4 Grid	Ceramic, 100 mmf. 500 vdcw	D825D-421
C-31	V-4 Plate	Paper, .1 mfd. 400 vdcw	D827-12
C-32	V-4 to V-3 coupling	Mica, .01 mfd. 300 vdcw	J666-56
C-33	T-5 Primary Trimmer	Variable, air dielectric	
C-34	Bridge Balancing	Ceramic, 62 mmf. 500 vdcw	J695-3
C-35	Bridge Balancing	Ceramic, 47 mmf. 500 vdcw	J695-1
C-36	Phasing Balance Adjustment	Mica, variable, 3.5 - 35 mmf.	D832-2
C-37	Phasing Control	Variable, air dielectric	SA:3655
C-38	Selectivity Compensator	Mica, variable, 3.5 - 35 mmf.	D832-2
C-39	T-5 Output adjustment	Variable, air dielectric	SA:1841
C-40	Selectivity Adjusting	Ceramic, 5 mmf. 500 vdcw	D825D-401
C-41	Selectivity Adjusting	Ceramic, 10 mmf. 500 vdcw	D825D-426
C-42	Selectivity Adjusting	Ceramic, 10 mmf. 500 vdcw	D825D-426
C-43	V-5 A.V.C. Filter	Ceramic, .01 mfd. 450 vdcw	K946-2
C-44	V-5 Cathode Bypass	Ceramic, .01 mfd. 450 vdcw	K946-2

PARTS LIST (CONT'D)

SYMBOL	FUNCTION	DESCRIPTION	DRAWING NO.
		CAPACITORS (CONT'D)	
C-45	L-2 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-46	L-3 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-47	L-4 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-48	L-5 Tuning	Mica. 510 mmf. 500 vdcw	H500-5
C-49	V-6 A.V.C. Filter	Ceramic, .01 mfd. 450 vdcw	K946-2
C-50	V-6 Cathode Bypass	Ceramic, .01 mfd. 450 vdcw	K946-2
C-51	V-6 Screen Bypass	Ceramic, .01 mfd. 450 vdcw	K946-2
C-52	V-6 Plate Filter	Ceramic, .01 mfd. 450 vdcx	K946-2
C-53	V-7 Load	Ceramic, 270 mmf. 500 vdcw	J633-2
C-54	V-7 Coupling	Ceramic, 100 mmf. 500 vdcw	D825D-421
C-55	A.V.C. Filter	Paper, .01 mfd. 600 vdcw	D827-7
C-56	V-9 to V-7 Coupling	Ceramic, 3 mmf. 500 vdcw	J695-4
C-57	V-9 Screen Bypass	Mica, .01 mfd. 300 vdcw	J666-56
C-58	C.W. Osc. Control	Variable, air dielectric	SA:6580
C-59	V-9 Grid	Mica, .001 mfd. 500 vdcw	J666-14
C-60	T-9 Fixed Tuning	Ceramic, 100 mmf. 500 vdcw	D825C-304
C-61	T-9 Tuning	Variable, air dielectric	
C-62	D.C. Bypass	Paper, .01 mfd. 600 vdcw	D827-7
C-63	A.C. Line Bypass	Mica, .01 mfd. 300 vdcw	J666-56
C-64	A.C. Line Bypass	Mica, .01 mfd. 300 vdcw	J666-56
C-65	Power Supply Filter	Electrolytic, 40 + 40 mfd. 475 vdcw	K945-3
C-65A	Power Supply Input Filter	Part of C-65	
C-65B	Power Supply Output Filter	Part of C-65	
C-66	V-7 to V-10 Coupling	Paper, .01 mfd. 600 vdcw	D827-7
C-67	V-10 Threshold Filter	Paper, .1 mfd. 400 vdcw	D827-12
C-68	V-10 Plate Filter	Paper, .1 mfd. 400 vdcw	D827-12
C-69	V-10 to X-3 Coupling	Paper, .01 mfd. 600 vdcw	D827-7
C-70	Tone Compensator	Electrolytic, 25 mfd. 50 vdcw	E338-4
C-71	V-11 Cathode Bypass	Paper, .5 mfd. 100 vdcw	D827-49
C-72	V-11 Screen Bypass	Paper, .1 mfd. 400 vdcw	D827-12
C-73	V-11 Plate Filter	Paper, .1 mfd. 400 vdcw	D827-12
C-74	Tone	Paper, .01 mfd. 600 vdcw	D827-7
C-75	V-8B to V-11 Coupling	Paper, .01 mfd. 600 vdcw	D827-7
C-76	V-8B Grid	Ceramic, 100 mmf. 500 vdcw	D825D-421
C-77	V-8B to V-12 Coupling	Paper, .01 mfd. 600 vdcw	D827-7
C-78	V-8B to V-13 Coupling	Paper, .01 mfd. 600 vdcw	D827-7
C-79	V-12 and V-13 Cathode Bypass	Electrolytic, 25 mfd. 50 vdcw	E338-4
C-80	Tone Compensator	Mica, .0024 mfd. 1000 vdcw	J667-68
C-81	Temperature Drift Compensator	Ceramic, 5 mmf. 500 vdcw	H872-3
C-82	T-1 Fixed Bandspread Padder:	Ceramic	
	A coil set	12 mmf. 500 vdcw	D825D-404
	B coil set	5 mmf. 500 vdcw	D825D-401
	C coil set	12 mmf. 500 vdcw	D825D-404
	D coil set	25.7 mmf. 500 vdcw	D825D-412
C-83	T-2 Fixed Bandspread Padder:	Ceramic	
	A coil set	21 mmf. 500 vdcw	D825D-410
	B coil set	5 mmf. 500 vdcw	D825D-401
	C coil set	12 mmf. 500 vdcw	D825D-404
	D coil set	25.7 mmf. 500 vdcw	D825D-412

PARTS LIST (CONT'D)

SYMBOL	FUNCTION	DESCRIPTION	DRAWING NO.
C-84	T-3 Fixed Bandspread Padder:	Ceramic	
	A coil set	21 mmf. 500 vdcw	D825D-410
	B coil set	5 mmf. 500 vdcw	D825D-401
	C coil set	12 mmf. 500 vdcw	D825D-404
	D coil set	25.7 mmf. 500 vdcw	D825D-412
C-85	T-4 Bandspread Padder used on A coil set	Ceramic, 10 mmf. 500 vdcw	D825D-437
C-86	T-4 Fixed Divider used on D coil set	Ceramic, 21 mmf. 500 vdcw	D825D-410
C-87	T-4 Fixed General Coverage Trimmer:	Ceramic	
	A coil set	20 mmf. 500 vdcw	D825D-446
	B coil set	5 mmf. 500 vdcw	D825D-440
	AA coil set	10 mmf. 500 vdcw	D825D-402
	AB coil set	35 mmf. 500 vdcw	D825D-413
	AC coil set	68 mmf. 500 vdcw	D825D-439
C-88	T-1 Fixed General Coverage Padder:		
	A coil set	Mica, 1200 mmf. 500 vdcw	J666-16
	AB coil set	Ceramic, 120 mmf. 500 vdcw	D825C-305
C-89	T-4 Fixed Temperature Compensator:	Ceramic	
	B coil set	5 mmf. 500 vdcw	D825D-440
	A coil set	5 mmf. 500 vdcw	D825D-440
C-90	T-2 Primary Trimmer used on H coil set	Ceramic, 21 mmf. 500 vdcw	D825D-410
C-91	T-1 General Coverage Trimmer:	Ceramic	
	AA coil set	5 mmf. 500 vdcw	D825D-401
	AB coil set	21 mmf. 500 vdcw	D825D-410
	AC coil set	50 mmf. 500 vdcw	D825D-417
C-92	T-2 coupling used on AB coil set	Mica, 470 mmf. 500 vdcw	J665-56
C-93	T-2 General Coverage Padder used on AB coil set	Ceramic, 100 mmf. 500 vdcw	D825C-304
C-94	T-3 Coupling used on AB coil set	Mica, 470 mmf. 500 vdcw	J665-56
C-95	T-3 General Coverage Trimmer:		
	AB coil set	Ceramic, 10 mmf. 500 vdcw	D825D-402
	AC coil set	Ceramic, 68 mmf. 500 vdcw	D825D-429
C-96	V-2 Cathode Bypass	Ceramic, .005 mfd. 450 vdcw	K946-1
C-97	T-1 General Coverage Padder used on AA, AB and AC coil sets	Variable, air dielectric	
C-98	T-2 General Coverage Padder used on AA and AB coil sets	Variable, air dielectric	
C-99	T-3 General Coverage Padder used on AA, AB and AC coil sets	Variable, air dielectric	
C-100	T-4 General Coverage Padder used on E, F, G, H, J and AA, AB, AC coil sets	Variable, air dielectric	
C-101	T-3 General Coverage Padder used on AB coil set	Ceramic, 100 mmf. 500 vdcw	D825C-304
C-102	T-2 General Coverage Trimmer:	Ceramic	
	AC coil sets	68 mmf. 500 vdcw	D825D-439
	AB coil sets	10 mmf. 500 vdcw	D825D-402
C-103	I.F. coupling to X-1	Ceramic, 100 mmf. 500 vdcw	D825D-402

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PARTS LIST (CONT'D)

SYMBOL	FUNCTION	DESCRIPTION	DRAWING NO.
		CAPACITORS (CONT'D)	
C-104	T-4 General Coverage Padder used on A coil set	Ceramic, 20 mmf. 500 vdcw	D825D-446
C-105	V-5 Plate Filter	Paper, .25 mfd. 600 vdcw	D827-19
C-106	L-8 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-107	L-9 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-108	V-16 AVC Filter	Ceramic, .01 mfd. 450 vdcw	K946-2
C-109	V-16 Cathode Bypass	Ceramic, .01 mfd. 450 vdcw	K946-2
C-110	R.F. Filter	Paper, .25 mfd. 200 vdcw	D827-15
C-111	V-16 Screen	Ceramic, .01 mfd. 450 vdcw	K946-2
C-112	V-16 Plate Filter	Ceramic, .01 mfd. 450 vdcw	K946-2
C-113	L-10 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-114	L-11 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-115	L-12 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-116	L-13 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-117	V-2 Plate Filter	Ceramic, .005 mfd. 450 vdcw	K946-1
C-118	V-15 Plate Filter	Paper, .1 mfd. 600 vdcw	D827-13
C-119	Osc. Padder	Ceramic, 10 mmf. 500 vdcw	D825D-437
C-120	L-6 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-121	L-7 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-122	V-5 Screen Bypass	Ceramic, .01 mfd. 450 vdcw	K946-2
C-123	V-3 Plate Filter	Ceramic, .01 mfd. 450 vdcw	K946-2
C-124	V-5 Screen Bypass	Paper, .1 mfd. 400 vdcw	D827-12
		RESISTORS	
R-1	V-1 Grid Filter	Fixed, 470,000 ohms, 1/2 W	J569-57
R-2	V-1 Cathode	Fixed, 100 ohms, 1/2 W	J569-13
R-3	V-1 and V-2 Screen	Fixed, 2,200 ohms, 1/2 W	J569-29
R-4	V-2 Grid	Fixed, 470,000 ohms, 1/2 W	J569-57
R-5	V-2 Cathode	Fixed, 560 ohms, 1/2 W	J569-22
R-6	RF Gain Control	Variable, W.W. 10,000 ohms	K349-3
R-7	V-3 Injector Grid	Fixed, 22,000 ohms, 1/2 W	J569-41
R-8	V-3 Cathode	Fixed, 220 ohms, 1/2 W	J569-17
R-9	V-3 Screen	Fixed, 33,000 ohms, 1 W	J571-43
R-10	V-4 Grid	Fixed, 22,000 ohms, 1/2 W	J569-41
R-11	V-4 Plate	Fixed, 22 ohms, 1/2 W	J569-5
R-12	V-5 Grid Filter	Fixed, 470,000 ohms, 1/2 W	J569-57
R-13	V-1, V-2, V-5 Screen Bleeder	Fixed, 27,000 ohms, 2 W	J572-42
R-14	V-5 Cathode	Fixed, 220 ohms, 1/2 W	J569-17
R-15	V-5 Cathode	Fixed, 330/1000 ohms, 1/2 W	
R-16	V-1, V-2, V-5 Screen Dropping	Fixed, 15,000 ohms, 2 W	J572-39
R-17	V-5 Plate Filter	Fixed, 2,200 ohms, 1/2 W	J569-29
R-18	V-6 Grid Filter	Fixed, 470,000 ohms, 1/2 W	J569-57
R-19	V-6 Cathode	Fixed, 68 ohms, 1/2 W	J569-11
R-20	V-8A Plate Load	Fixed, 47,000 ohms, 1/2 W	J569-45
R-21	"S" Meter Zero Adjustment	Variable, W.W. 1000 ohms, 1 W	D831-2
R-22	V-7 Plate Load	Fixed, 1.5 meg. 1/2 W	J569-63
R-23	AVC Filter	Fixed, 1.5 meg. 1/2 W	J569-63
R-24	V-9 Plate	Fixed, 220,000 ohms, 1/2 W	J569-53
R-25	V-9 Screen Filter	Fixed, 100,000 ohms, 1/2 W	J569-49
R-26	V-9 Screen Bleeder	Fixed, 100,000 ohms, 1/2 W	J569-49
R-27	V-9 Grid	Fixed, 47,000 ohms, 1/2 W	J569-45
R-28	Dimmer Control	Variable, W.W. 25 ohms	K915-13

PARTS LIST (CONT'D)

SYMBOL	FUNCTION	DESCRIPTION	DRAWING NO.
		RESISTORS (CONT'D)	
R-29	V-7 Filament Dropping	Fixed, 4.3 ohms, 1 W	K098-48
R-30	V-10 Filament Dropping	Fixed, 4.3 ohms, 1 W	K098-48
R-31	V-14 Dropping	Fixed, 5,000 ohms, 10 W	E959-10
R-32	V-7 Load	Fixed, 22,000 ohms, 1/2 W	J569-41
R-33	V-7 Load	Fixed, 470,000 ohms, 1/2 W	J569-57
R-34	V-10 Plate	Fixed, 220,000 ohms, 1/2 W	J569-53
R-35	V-10 Cathode	Fixed, 220,000 ohms, 1/2 W	J569-53
R-36	Limiter Threshold control	Variable, 500,000 ohms	J681-2
R-37	Limiter Threshold Filter	Fixed, 220,000 ohms, 1/2 W	J569-53
R-38	Limiter Plate Filter	Fixed, 820,000 ohms, 1/2 W	J569-60
R-39	V-10 Plate Load	Fixed, 470,000 ohms, 1/2 W	J569-57
R-40	Audio Gain Control	Variable, 500,000 ohms	K347-1
R-41	Limiter Output Divider	Fixed, 220,000 ohms, 1/2 W	J569-53
R-42	V-11 Cathode	Fixed, 2200 ohms, 1/2 W	J569-29
R-43	V-11 Cathode Divider	Fixed, 150 ohms, 1/2 W	J569-15
R-44	Degeneration Feedback	Fixed, 6800 ohms, 1/2 W	J569-35
R-45	V-11 Screen Filter	Fixed, 470,000 ohms, 1/2 W	J569-57
R-46	V-11 Plate Load	Fixed, 100,000 ohms, 1/2 W	J569-49
R-47	V-11 Plate Filter	Fixed, 47,000 ohms, 1/2 W	J569-45
R-48	Tone control	Variable, 500,000 ohms	K347-1
R-49	V-8B Grid	Fixed, 220,000 ohms, 1/2 W	J569-53
R-50	V-8B Cathode Bias	Fixed, 4700 ohms, 1/2 W	J569-33
R-51	V-8B Cathode Load	Fixed, 47,000 ohms, 1/2 W	J569-45
R-52	V-8B Plate Load	Fixed, 47,000 ohms, 1/2 W	J569-45
R-53	V-13 Grid	Fixed, 220,000 ohms, 1/2 W	J569-53
R-54	V-12 Grid	Fixed, 220,000 ohms, 1/2 W	J569-53
R-55	V-12 and V-13 Cathode Bias	Fixed, 220 ohms, 2 W	J572-17
R-56	Output Load	Fixed, 470 ohms, 2 W	J572-21
R-57	T-1 Ant. Load used on A coil set	Fixed, 22 ohms, 1/2 W	J569-5
R-58	V-6 Screen Dropping	Fixed, 47,000 ohms, 1/2 W	J569-45
R-59	V-16 AVC Filter	Fixed, 470,000 ohms, 1/2 W	J569-57
R-60	V-16 Cathode	Fixed 68 ohms, 1/2 W	J569-11
R-61	V-16 Screen Dropping	Fixed, 47,000 ohms, 1/2 W	J569-45
R-62	V-16 Plate Filter	Fixed, 2200 ohms, 1/2 W	J569-29
		MISCELLANEOUS	
E-1	Antenna Input Terminal	Screw type, three terminals	E261-3
E-2	B+ Switch Terminal	Screw type, two terminals	E265-19
E-3	Audio Output Terminal	Screw type, three terminals	E259-2
F-1	Fuse 3AG	2 Amps at 250 V	F135-4
I-1	Dial Lamp	#47	F136-6
I-2	Dial Lamp	#47	F136-6
I-3	"S" Meter Lamp	#47	F136-6
J-1	Phono Jack	Single Circuit	J993-1
J-2	Phone Jack	Multi-Circuit	F316-1

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PARTS LIST (CONT'D)

SYMBOL	FUNCTION	DESCRIPTION	BRAWING NO.
		MISCELLANEOUS (CONT'D)	
L-1	Filter Choke	17 Henries	SA:1694
L-2	T-6 Tuning	Variable iron-core inductor	SA:3905
L-3	T-6 Tuning	Variable iron-core inductor	SA:3366
L-4	T-6 Tuning	Variable iron-core inductor	SA:3905
L-5	T-6 Tuning	Variable iron-core inductor	SA:3366
L-6	T-7 Tuning	Variable iron-core inductor	SA:3905
L-7	T-7 Tuning	Variable iron-core inductor	SA:3366
L-8	T-7 Tuning	Variable iron-core inductor	SA:3905
L-9	T-7 Tuning	Variable iron-core inductor	SA:3366
L-10	T-8 Tuning	Variable iron-core inductor	SA:3905
L-11	T-8 Tuning	Variable iron-core inductor	SA:8951
L-12	T-8 Tuning	Variable iron-core inductor	SA:3905
L-13	T-8 Tuning	Variable iron-core inductor	SA:8951
L-14	T-6 Coupling	R.F. choke, 1.1 uh.	SA:6072
L-15	T-7 Coupling	R.F. choke, 1.1 uh.	SA:6072
L-16	T-8 Coupling	R.F. choke, 1.1 uh.	SA:8952
M-1	"S" Meter	0-1 ma. W/S scale	J984-5
P-1	Select-O-Ject Plug	Octal	SA:6569
P-2	A.C. Jumper Plug	Octal	SA:3731
S-1	T-1 B.S. - G.C. Switch	Twist Type, Two position	SA:6748
S-2	T-2 B.S. - G.C. Switch	Twist Type, Two position	SA:6749
S-3	T-3 B.S. - G.C. Switch	Twist Type, Two position	SA:6749
S-4	T-4 B.S. - G.C. Switch	Twist Type, Two position	SA:6749
S-5	Selectivity Switch	Six Position, Double Pole	E195-3
S-6	A.V.C. ON-OFF switch	SPST Bat Handle, Toggle	E230-2
S-7	Control Switch	Double-Wafer, four-position	SA:6564
S-8	Calibrator Switch	DPDT Bat Handle, Toggle center position open	P738-1
S-9	A.C. Line Switch	Part of R-40	
S-10	T-10 Primary Selector Switch	DPDT, Toggle	H340-4
S-11	B+ Switch	SPST, Bat Handle, Toggle	E230-2
T-1	First R.F. Amplifier Transformer		
	A Band	14.0 - 30 Mc.	SA:6654
	B Band	7.0 - 14.4 Mc.	SA:6755
	C Band	3.5 - 7.3 Mc.	SA:6759
	D Band	1.7 - 4.0 Mc.	SA:6635
	E Band	900 - 2050 Kc.	SA:6513
	F Band	480 - 960 Kc.	SA:6660
	G Band	180 - 430 Kc.	SA:6665
	H Band	100 - 200 Kc.	SA:6803
	J Band	50 - 100 Kc.	SA:6806
	AA Band	27 - 30 Mc.	SA:6814
	AB Band	25 - 35 Mc.	SA:6675
	AC Band	21 - 21.5 Mc.	SA:8073
T-2	Second R.F. Amplifier Transformer		
	A Band	14.0 - 30 Mc.	SA:6751
	B Band	7.0 - 14.4 Mc.	SA:6650
	C Band	3.5 - 7.3 Mc.	SA:6641
	D Band	1.7 - 4.0 Mc.	SA:6637

PARTS LIST (CONT'D)

SYMBOL	FUNCTION	DESCRIPTION	DRAWING NO.
		MISCELLANEOUS (CONT'D)	
T-2	Cont'd		
	E Band	900 - 2050 Kc.	SA:6540
	F Band	480 - 960 Kc.	SA:6662
	G Band	180 - 430 Kc.	SA:6667
	H Band	100 - 200 Kc.	SA:6669
	J Band	50 - 100 Kc.	SA:6809
	AA Band	27 - 30 Mc.	SA:6673
	AB Band	25 - 35 Mc.	SA:6818
	AC Band	21 - 21.5 Mc.	SA:8074
T-3	Mixer Transformer		
	A Band	14.0 - 30 Mc.	SA:6752
	B Band	7.0 - 14.4 Mc.	SA:6756
	C Band	3.5 - 7.3 Mc.	SA:6642
	D Band	1.7 - 4.0 Mc.	SA:6638
	E Band	900 - 2050 Kc.	SA:6789
	F Band	480 - 960 Kc.	SA:6794
	G Band	180 - 430 Kc.	SA:6800
	H Band	100 - 200 Kc.	SA:6804
	J Band	50 - 100 Kc.	SA:6810
	AA Band	27 - 30 Mc.	SA:6815
	AB Band	25 - 35 Mc.	SA:6676
	AC Band	21 - 21.5 Mc.	SA:8075
T-4	H.F. Oscillator Transformer		
	A Band	14.0 - 30 Mc.	SA:6656
	B Band	7.0 - 14.4 Mc.	SA:6678
	C Band	3.5 - 7.3 Mc.	SA:6760
	D Band	1.7 - 4.0 Mc.	SA:6776
	E Band	900 - 2050 Kc.	SA:6631
	F Band	480 - 960 Kc.	SA:6795
	G Band	180 - 430 Kc.	SA:6785
	H Band	100 - 200 Kc.	SA:6805
	J Band	50 - 100 Kc.	SA:6811
	AA Band	27 - 30 Mc.	SA:6816
	AB Band	25 - 35 Mc.	SA:6819
	AC Band	21 - 21.5 Mc.	SA:8076
T-5	Crystal Filter	455 kc.	SA:3654
T-6	2nd. I.F. Amp. Transformer	455 kc.	SA:8448
T-7	3rd. I.F. Transformer	455 kc.	SA:8448
T-8	Det. Input Transformer	455 kc.	SA:8948
T-9	C.W. Osc. Transformer	455 kc.	SA:3361
T-10	Audio Output Transformer	Pri. 10,000 ohms Sec. 8/600 ohms 10 watts	P187-1
T-11	Power Transformer	Primary: #4 and #5, 115 volts #4 and #7, 230 volts Secondary: #1 and #3, 6.3 V at 6.5 A. Secondary: #8, #9 and #10, 275-0-275 V. Secondary: #11 and #12, 5 V. at 2 A. #2 electrostatic shield	SA:6566
V-1	First R.F. Amplifier	6BA6	
V 2	Second R.F. Amplifier	6BA6	

MODEL HRO-50-1 PARTS LIST (CONT'D)

SYMBOL	FUNCTION	DESCRIPTION	DRAWING NO.
		MISCELLANEOUS (CONT'D)	
V-3	Mixer	6BE6	
V-4	H.F. Oscillator	6C4	
V-5	First I.F. Amplifier	6K7	
V-6	Second I.F. Amplifier	6SG7	
V-7	Second Detector and A.V.C.	6H6	
V-8A	"S" Meter Amplifier	1/2 6SN7GT	
V-8B	Phase Inverter	1/2 6SN7GT	
V-9	C.W. Oscillator	6J7	
V-10	Noise Limiter	6H6	
V-11	Audio Amplifier	6SJ7	
V-12	Audio Output	6V6GT	
V-13	Audio Output	6V6GT	
V-14	Voltage Regulator	0B2	
V-15	Rectifier	5V4G	
V-16	Third I.F. Amplifier	6SG7	
X-1	Accessory Connector Socket	Octal	J625-2
X-2	Crystal Calibrator Socket	Octal	J625-2
X-3	Select-O-Ject Socket	Octal	J625-2
Y-1	Crystal Resonator	Quartz, 455 kc.	E979-1

DESCRIPTION	NAT. CO. TYPE
MECHANICAL PARTS	
Flexible coupling on Control switch shaft	SA:22
Flexible coupling on C.W.O. control shaft	SA:22
Knurled nut to mount Calibrate Switch	Q163-2
Knurled nut to mount B+ and AVC switches (2)	J703-2
Knurled nut to mount phones jack	J704-2
Knob for Tone control, Ant. trimmer and Dimmer controls	SA:7021
Main Tuning dial control knob	SA:6586
Spring washer to ground main tuning knob	L087-1
Shaft extension for Selectivity switch	SA:3664
Coupling on phasing control shaft	D694-2
Set screws for mounting above coupling (4)	G879-2
Shaft extension for Phasing control	C696-4
Cast aluminum hub on main tuning capacitor shaft	SA:8800
Window for dial scales	P211-1
Bracket for dial scale window	P539-1
Base plate for mounting tuning capacitor	SA:6581
Spacer plate between base plate and tuning capacitor	P106-1
Triangular bracket for main tuning capacitor shaft	SA:6582
Dial drum supporting assembly (includes pointer, pointer rail, pulleys and drum positioning spring)	SA:6594

DESCRIPTION	NAT. CO. TYPE
MECHANICAL PARTS (CONT'D)	
Drum positioning spring	P131-1
Gear assembly for driving dial pointer (includes pulley and gears)	SA:6595
Loading spring for above gears (2)	P216-1
Bearing for pulley	P226-1
Washer to mount pulley and bearing to dial drum supporting assembly	M953-2
Spring washer to position pulley and gears	J728-7
Shaft, for rotating dial scale drum	P221-2
Rubber "O" ring on above shaft	L792-3
Retaining washer on above shaft	E229-3
Snap ring on above shaft	L936-1
Dial cord	SA:6596
Spring to maintain tension on dial cord	P223-1
Dial scale drum stop, mounted on Osc. control shaft	P472-1
Tension spring for above stop	P471-1
Dial light socket (2)	SA:6600
Dial scale drum assembly (no scales included)	SA:7922
Dial scale for Band A	P136-1
Dial scale for Band B	P136-2
Dial scale for Band C	P136-3
Dial scale for Band D	P136-4
Dial scale for Band A (bandspread calibration only)	P136-5
Dial scale for Band B (bandspread calibration only)	P136-6
Dial scale for Band C (bandspread calibration only)	P136-7

PARTS LIST (CONT'D)

DESCRIPTION	NAT. CO. TYPE
MECHANICAL PARTS (CONT'D)	
Dial scale for Band D (bandspread calibration only)	P136-8
Dial scale for Band E-F	P136-9
Dial scale for Band G-H	P136-10
Dial scale for Band J	P136-11
Dial scale for Band AA	P136-12
Dial scale for Band AB	P136-13
Dial scale for Band AC	P136-14
End bearing for main tuning capacitor rotor shaft	SA:2127
Ceramic brush insulators on main tuning capacitor (4)	D679-1
Ceramic brush insulator with cutaway surface (5)	D680-1
Rotor brush (5)	SA:8675
Worm for driving main tuning capacitor	M939-2
Worm loading spring	Q544-1
Ball bearing used with worm loading spring	F150-2
Spring thrust collar used with worm loading spring	P112-1
Coil set levers	SA:7001
Nut to mount coil set levers (2)	P207-2
Coil set brush board (4)	SA:6575
Fibre washer for mounting brush-board (16)	E181-3
Bakelite slide for coil sets (2)	D393-1
Shield cap for type 6K7 and 6J7 tubes (2)	E726-1
Shield for miniature tubes (3)	SA:3387
Shield base for miniature tubes (3)	SA:3847
Socket for miniature tubes (5)	SA:4916
Fibre washer for mounting miniature sockets (10)	H285-2
Octal tube sockets (15)	J625-2
Spring clamp for type 6C4 tube	L532-3
Spring clamp for type 0B2 tube	L532-2
Nut for mounting miniature sockets	B111-2
Ceramic standoff insulated terminals (2) (one top of chassis one on bottom of chassis)	B425-1
Insulation between chassis and heat shield	P942-1 (short) P942-2 (long)
Heat shield (with grommets and lugs)	SA:6563
Plate, heat shield	P202-1
R.F. Gain control knob	SA:6867
Phasing and C.W.O. control knob (2)	SA:6868

DESCRIPTION	NAT. CO. TYPE
MECHANICAL PARTS USED ON TABLE MODEL ONLY	
Selectivity control knob	SA:686
Limiter control knob	SA:687
CW - AM - NFM - Phono switch knob	SA:658
A.F. Gain control knob	SA:687
End bearing for main tuning capacitor	SA:866
Cover, gear housing	C898-1
1/4" length of rubber tubing on capacitor stop	F234-2
Stop washer (10)	P149-3
Stop	Q543-1
Spacer, stop	Q541-1
Spring washer in stop	J728-1
Stop washer	P149-1
Collar in stop with set screws	Q542-2
Set screws in above	G879-4 G879-2
Balls in capacitor bearing (6)	H613-3
C.W.O. shaft	Q534-
Washer on above	D802-
Retaining ring on above	Q102-
Bracket from chassis to dial support plate	Q538-1
Chassis mounting angle bracket (left)	P244-1
Chassis mounting angle bracket (right)	P244-
National Co. insignia	J791-1
Rubber mounting foot (4)	K499-1
S-Meter bracket	J970-2
Band or Osc. control knob (2)	SA:70
Cover hinge (2)	J825-1
Cover stop angle (2)	K788-
Socket assembly for S-Meter lamp	K377-1
Cabinet wraparound	SA:866
Cabinet back	SA:866
Cabinet cover	J701-1
Cabinet bottom	SA:658
MECHANICAL PARTS USED ON RACK MODEL ONL	
Front panel	SA:87
Blister for front panel	SA:670
Side plate (left)	P302-
Side plate (right)	P302-3
National Co. insignia	J791-3
Band control knob	SA:74
Osc. control knob	SA:746
Dust cover	SA:87
Thumb screw for dust cover (2)	L309-2

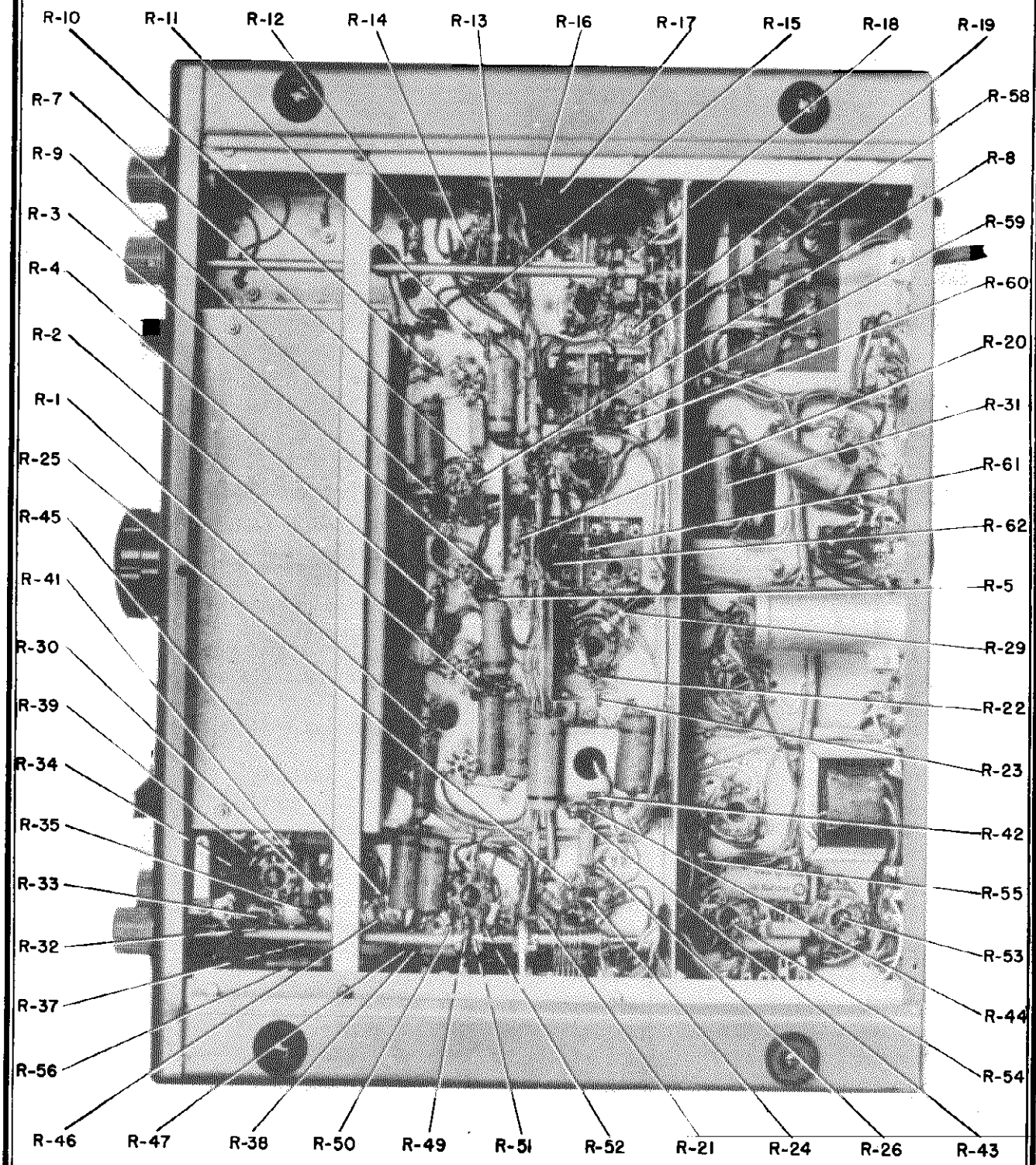


Figure No. 10A. Resistor Locations, Bottom View of Receiver

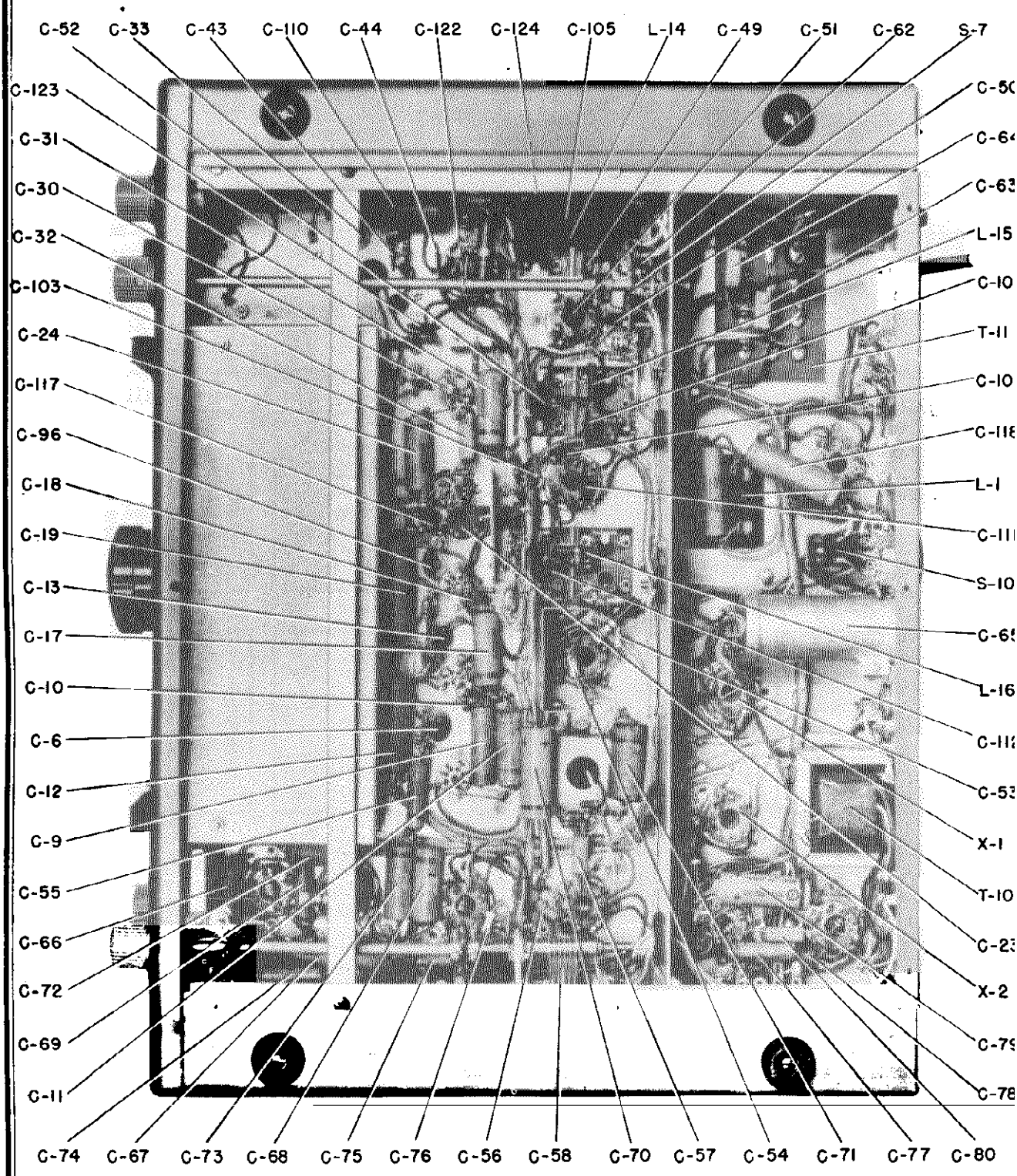


Figure No. 10B. Capacitor and Miscellaneous Component Locations, Bottom View of Receiver

MODEL HRO-50-1

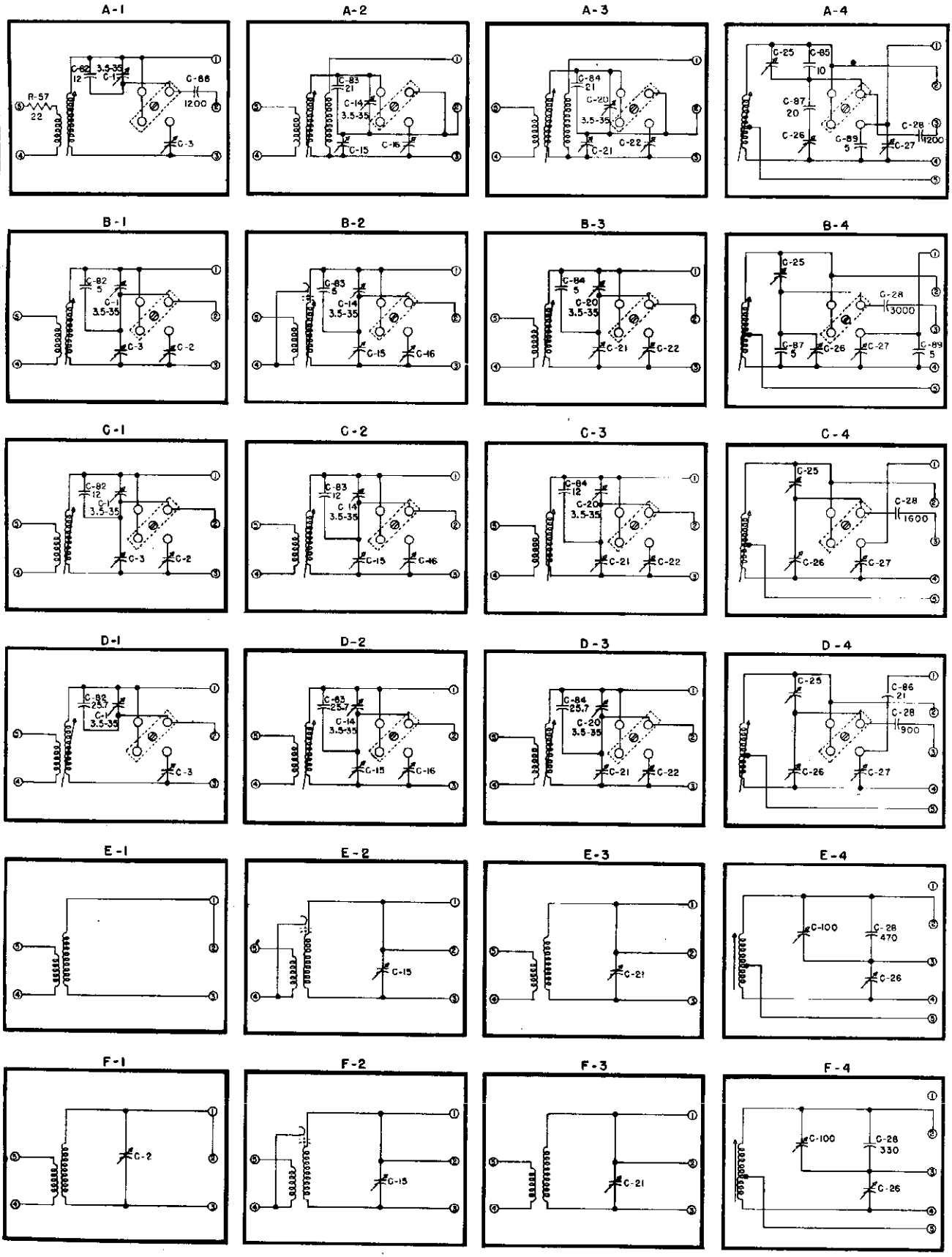
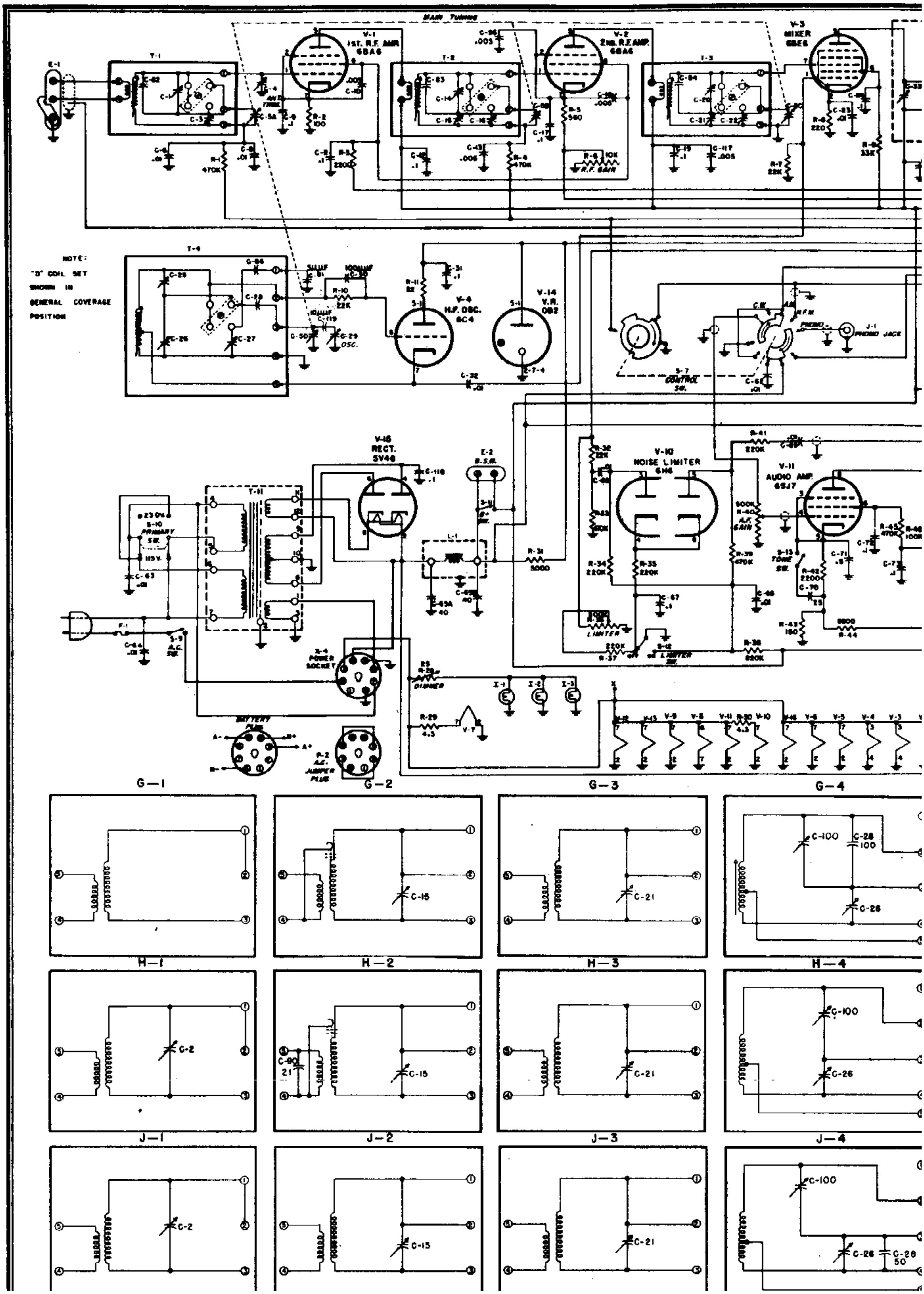


Figure No. 11. Schematic Diagrams, Coil Sets A, B, C, D, E and F



MAIN TUNING
V-1
1st. R.F. AMP.
6BA6
V-2
2nd. R.F. AMP.
6BA6
V-3
MIXER
6BE6
T-1
T-2
T-3
T-4
NOTE:
"D" COIL SET
SHOWN IN
GENERAL COVERAGE
POSITION
V-4
H.F. OSC.
6C4
V-14
V.R.
OB2
S-7
CONTROL
SW.
J-1
PHONO JACK
V-16
RECT.
5V4G
T-11
E-2
B.S.R.
L-1
V-10
NOISE LIMITER
6H6
V-11
AUDIO AMP.
6SJ7
S-10
PRIMARY
SW.
S-9
A.C.
SW.
X-4
POWER
SOCKET
DIMMER
LIMITER
S-12
LIMITER
SW.
S-13
TONE
SW.
BATTERY
PLUG
P-2
A.C.
JUMPER
PLUG
G—1
G—2
G—3
G—4
H—1
H—2
H—3
H—4
J—1
J—2
J—3
J—4

MODEL HRO-50-1

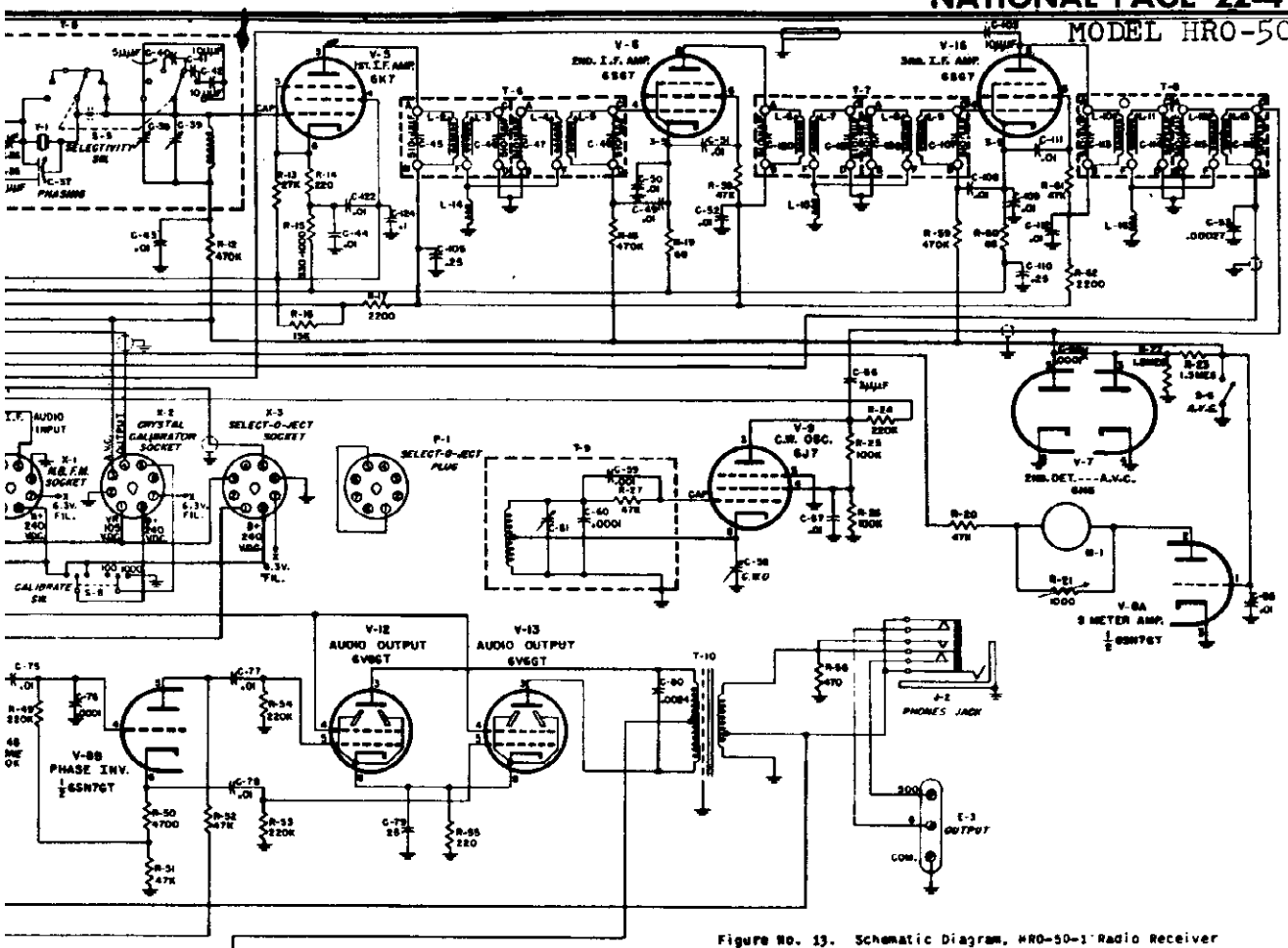
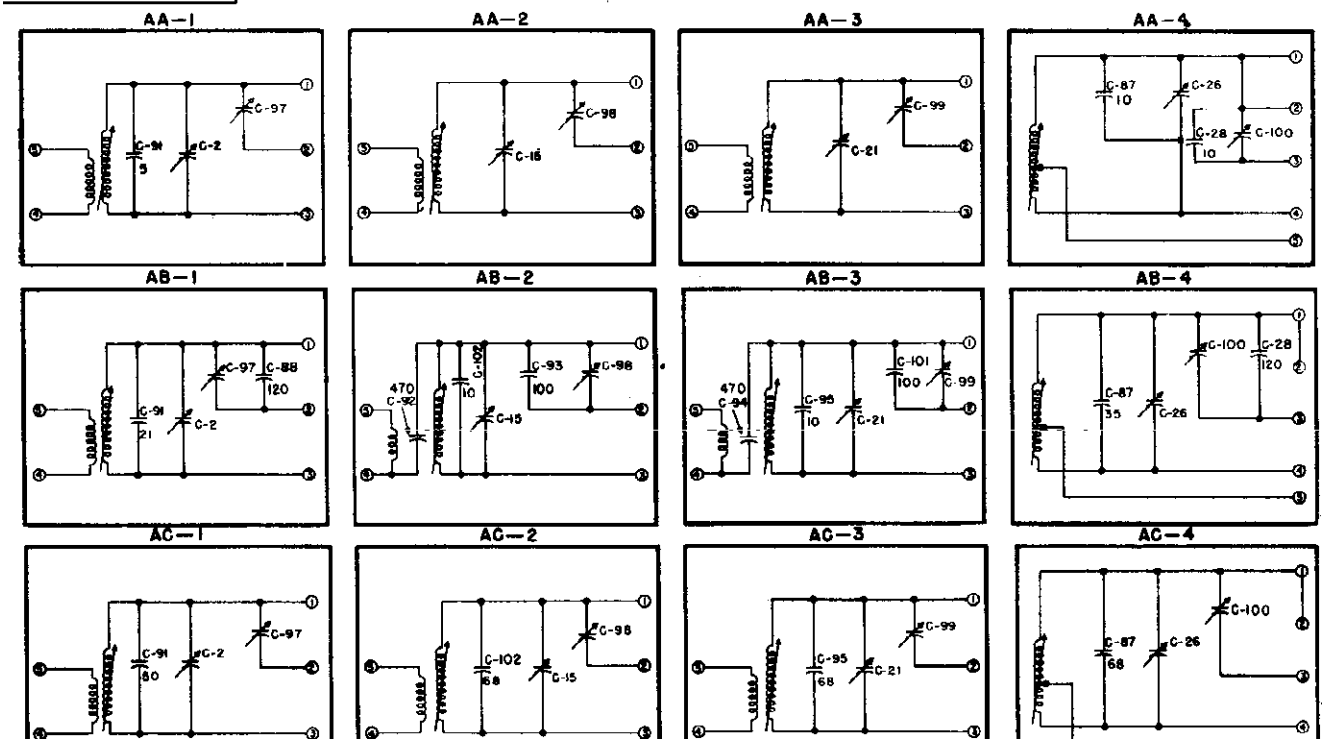


Figure No. 13. Schematic Diagram, HRO-50-1 Radio Receiver

NOTE:
CAPACITOR VALUES = MICROFARADS EXCEPT AS NOTED
RESISTOR VALUES = OHMS
K = 1000

Figure No. 12. Schematic Diagram, Coil Sets AA, AB, AC, G, H and J



MODEL HRO-50-1

INSTRUCTIONS FOR THE NATIONAL XCU-50-2 CRYSTAL CALIBRATOR UNIT

GENERAL

The type XCU-50-2 Crystal Calibrator Unit is designed expressly for use within the HRO-50 receiver. It utilizes an electron-coupled oscillator circuit controlled by a dual crystal (Valpey type DFS). This type of crystal provides two crystal-controlled marker frequencies of 100 kilocycles and 1 megacycle. When plugged into the Crystal Calibrator Socket, X-2, the XCU output is loosely coupled to the first R.F. amplifier input circuit. Selection of either the 100 kilocycle or 1000 kilocycle crystal-controlled signal is made possible by the front-panel mounted Calibrate switch on the receiver.

INSTALLATION

The XCU-50-2 calibrator is installed in the HRO-50-1 receiver by plugging the unit into the Crystal Calibrator Socket, X-2, on top of the chassis. A slotted-head screw mounted through the top of the unit is provided to bolt the unit to the chassis.

A trimmer capacitor, C-1, is connected across the crystal to permit adjustment of the frequency of the 100 kilocycle output marker when the unit is operated at locations where the temperature is vastly removed from that of normal room temperature. This capacitor should never require adjustment unless such abnormal temperatures are experienced. To make the adjustment proceed as follows:

(1) Plug in a coil set suitable for the reception of WWV on one of the various frequencies utilized by this standard frequency station.
(2) Adjust the receiver for normal A.M. operation as explained in Section 3-3.
(3) Set the front-panel mounted Calibrate switch at the 100 kilocycle position.
(4) Tune in the signal from WWV at a time when the signal is unmodulated.
(5) Adjust the trimmer capacitor, C-1, located at the top of the calibrator unit so that the 100 kilocycle marker signal harmonic is zero beat with the signal received from WWV.

OPERATION

The XCU-50-2 Crystal Calibrator provides a means of checking the accuracy of the frequency calibration of the receiver. The front-panel mounted Calibrate switch marked 100-Off-1000 connects B-plus to the Calibrator for instantaneous service. At the same time this switch selects either the 100 or 1000 kilocycle marker signal. To check calibration accuracy tune in the desired marker signal with the Control switch set at C.W. and zero beat the receiver with the harmonic marker. If the micrometer dial and the slide-rule dial do not read accurately correction should be made by adjusting the front-panel mounted Osc. trimmer control. Only a slight adjustment of the Osc. trimmer control should be necessary. If calibration is way off the plug-in coil set probably requires realignment and reference should be made to Section 4.

PARTS LIST

SYMBOL	FUNCTION	DESCRIPTION	NAT. CO. TYPE
C-1	100 Kc. Tuning	Ceramic, variable, 6 -20 mmf.	E311-2
C-2	E+ Filter	Paper, .1 mfd. 400 vdcw	D827-12
C-3	Cathode by-pass	Paper, .1 mfd. 400 vdcw	D827-12
C-4	Output Coupling	Ceramic, 10 mmf. 500 vdcw	H872-1
C-5	Feedback	Ceramic, 3 mmf. 500 vdcw	J695-4
L-1	100 Kc. inductor	5 mh. type R-100	SA:2608
L-2	1000 Kc. inductor	.5 mh. type R-50	SA:2514
P-1	Plug	Octal	K783-1
R-1	Grid	Fixed, 4.7 megohms, 1/2 W.	J569-69
R-2	Not Used		
R-3	Screen dropping	Fixed, 22,000 ohms, 1 W.	J571-41
R-4	Plate	Fixed, 470,000 ohms, 1 W.	J571-57
V-1	Oscillator tube	6AK6	
Y-1	Crystal Resonator	Quartz, 100 - 1000 Kc.	Q560-1

MODEL HRO-50-1

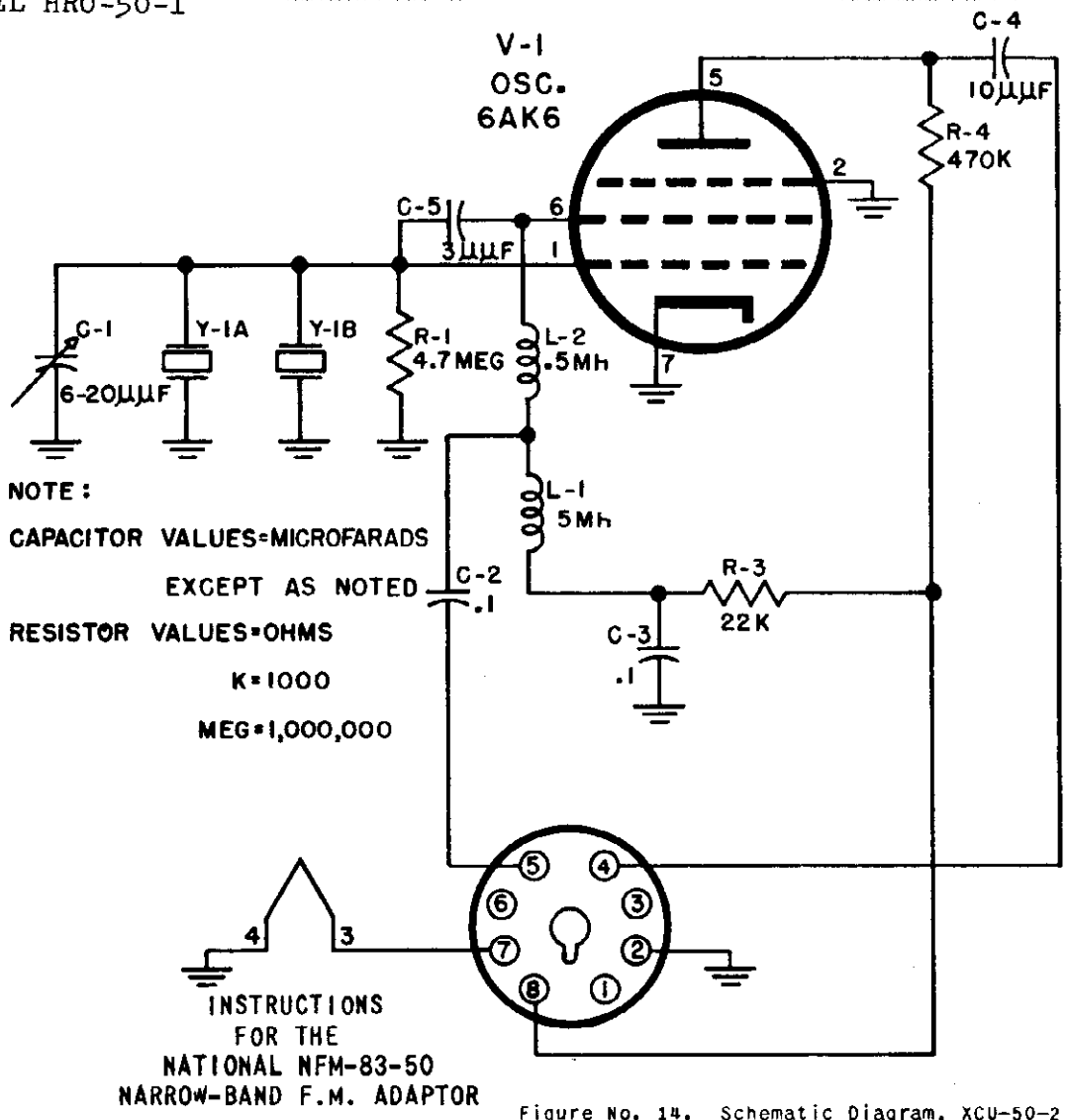


Figure No. 14. Schematic Diagram, XCU-50-2 Calibrator

INSTALLATION

The NFM-83-50 is installed in the HRO-50-1 receiver by plugging the adaptor unit into the N.B.F.M. Socket X-1 on the top of the chassis. A mounting bracket is furnished to hold the adaptor unit securely in position. The adaptor unit is aligned at National Company laboratories and realignment is not necessary.

ALIGNMENT

The NFM-83-50 is carefully aligned before shipment and no realignment is required unless the adaptor is accidently misaligned. The necessity of realignment can be determined by the A.M. rejection capabilities of the adaptor unit. Proper alignment will be indicated when the maximum A.M. rejection occurs at the center of the A.M. carrier. Maximum S-meter reading will indicate the center of the carrier.

The equipment required for alignment is a high-impedance vacuum tube voltmeter and an A.M. signal generator. The signal generator used should have an output reasonably free of any frequency modulation. The use of a broadcast station as a signal source, in place of a signal generator, would provide a test signal meeting the above requirement. In any case, the signal strength of the test signal should be of the order to provide an S-meter reading of from 2 to 5 S-units when the HRO-50-1 is correctly tuned to the test signal.

The preliminary alignment procedure is as follows:

1. Connect the high-impedance voltmeter between the test point jack, J-1, and chassis. The polarity of the voltage will depend on the alignment of the adaptor, connect the voltmeter to obtain an [illegible]-scale reading.

2. Connect a signal source to the antenna terminals, A and A, at the rear of the HRO-50-1. If a signal generator is used make the connection through a 300 ohm dummy load and select a frequency in the standard broadcast band.

3. Set the Control switch at N.F.M.

4. Set the Selectivity switch at Off.

5. Set the Limiter control at Off.

6. Plug in the E coil set, 900 to 2,050 Kc. If this coil set is not available use the D coil set, 1.7 to 4.0 Mc.

7. Set the B plus switch at On.

8. Set the A.V.C.-Off switch at A.V.C.

9. Turn the R.F. Gain control to 10.

10. Adjust the A.F. Gain control for the desired volume.

11. Tune the test signal by adjustment of the Main Tuning knob. The correct tuning point is the setting that produces maximum S-meter reading.

Alignment is effected as follows:

1. Detune both primary, L-1, and secondary L-2, I.F. trimmers by rotating the screw adjustments until they are withdrawn from the shield can as far as possible. The adjustment with the dot of red paint opposite it is the primary trimmer L-1.

2. Tune the primary trimmer, L-1, for maximum reading on the voltmeter. If two peaks in output are observed, the correct peak will be the first one encountered when rotating the screw adjustment into the shield can.

3. Tune the secondary trimmer, L-2, for a zero reading on the voltmeter. It will be noted that there is a crossover in the polarity of the test voltage at this point.

4. Adjust the capacitor, C-9, for a null in the audio output. This capacitor is accessible after removal of the button plug on the side of the adaptor unit.

5. Adjustment of capacitor, C-9, may affect the zero voltage reading obtained by adjustment of the secondary trimmer, L-2. Retrim L-2 and C-9, as necessary, until both a zero voltage reading on the voltmeter and a null in the audio output are obtained.

PARTS LIST

SYMBOL NO.	FUNCTION	DESCRIPTION	NAT. CO. TYPE
C-1	I.F. Amp. Coupling	Ceramic, 10 Mmf, 500 vdcw	D825D-402
C-2	Input Divider	Ceramic, 38.5 Mmf, 500 vdcw	D825D-414
C-3	I.F. Amp. Cathode Bypass	Mica, 0.01 Mfd, 300 vdcw	J666-56
C-4	I.F. Amp. Screen Bypass	Mica, 0.001 Mfd, 300 vdcw	J665-71
C-5	T-1 Primary Tuning	Mica, 100 Mmf, 500 vdcw	H500-7
C-6	T-1 Secondary Tuning	Mica, 180 Mmf, 500 vdcw	H500-3
C-7	T-1 Secondary Tuning	Mica, 180 Mmf, 500 vdcw	H500-3
C-8	T-1 Secondary Tuning	Ceramic, 38 Mmf, 500 vdcw	D825D-424
C-9	T-1 Sec. Balance Adjustment	Ceramic, Variable, 7-35 Mmf.	E311-4
C-10	Disc. Cathode Filter	Elect. 1 Mfd, 450 vdcw	E338-10
C-11	B Supply Bypass	Mica, 0.01 Mfd, 300 vdcw	J666-56
C-12	R.F. Filter	Mica, 470 Mmf, 500 vdcw	J665-56
C-13	Audio Coupling	Mica, 0.01 Mfd, 300 vdcw	J666-56
R-1	I.F. Amp. Grid Leak	Fixed, 1 Megohm, 1/2 W.	K379-61
R-2	I.F. Amp. Cathode Bias	Fixed, 1,000 Ohms, 1/2 W.	K379-25
R-3	I.F. Amp. Screen Dropping	Fixed, 47,000 Ohms, 1/2 W.	K379-45
R-4	R.F. Filter	Fixed, 47,000 Ohms, 1/2 W.	K379-45
R-5	Diode Load	Fixed, 15,000 Ohms, 1/2 W.	K379-39
R-6	Diode Load	Fixed, 15,000 Ohms, 1/2 W.	K379-39
R-7	Decoupling	Fixed, 4,700 Ohms, 1/2 W.	J569-33
J-1	Test Point	Tip Jack, Bakelite	K421-1
L-1	T-1 Primary Inductor	Adjustable Iron-Core	SA:4892
L-2	T-1 Secondary Inductor	Adjustable Iron-Core	SA:4891
P-1	Adaptor Unit Plug	8 Prong Octal	K783-1
T-1	Discriminator Transformer	Ratio Type 455 Kc.	SA:4890
V-1	I.F. Amplifier	6SK7	
V-2	Discriminator	6H6	

MODEL HRO-50-1

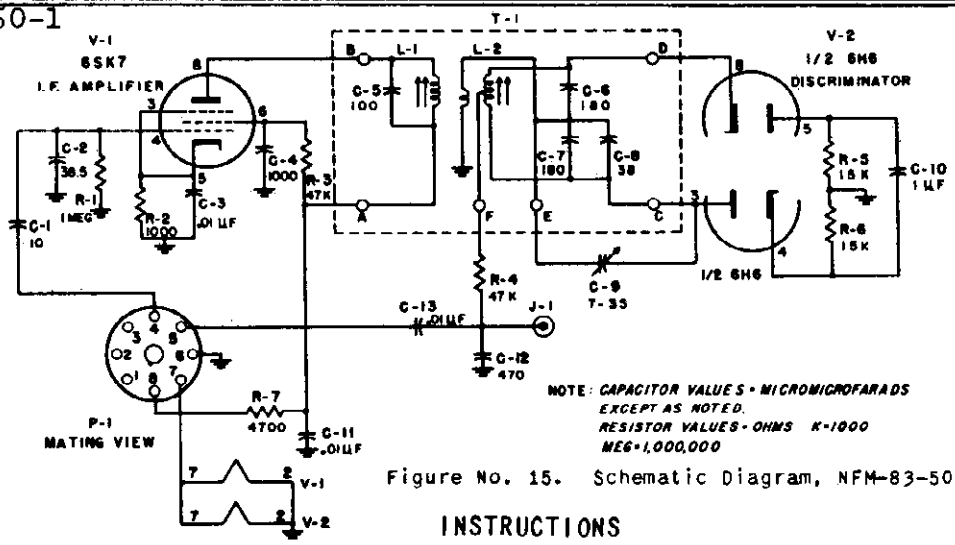


Figure No. 15. Schematic Diagram, NFM-83-50 Adaptor

INSTRUCTIONS FOR THE NATIONAL TYPE 650S VIBRATOR POWER SUPPLY

GENERAL

The National Type 650S Table Model Vibrator Power Unit has been designed to furnish complete operating voltages for the HRO-50-1 receiver. The unit operates from a 6-volt D.C. supply and provides approximately 150 volts D.C. at 70 milliamperes in normal operation. Output voltages for both A and B supply are available at a four prong socket for convenient connection to the Receiver.

The 650S consists of a vibrator unit utilizing an 0Z4A type rectifier tube and a vibrator in a circuit employing efficient R.F. filtering of vibrator hash. Further filtering of the low frequency or audio hum component in the output is accomplished by using the regular filter system in the receiver.

INSTALLATION

The 650S unit is supplied with a battery connecting cable as well as an interconnecting cable to facilitate connection to the receiver.

Battery clips are provided on the battery connecting cable W-1 for convenient connection to a 6-volt storage battery or similar source of power. The interconnecting cable W-2 is terminated at one end in a four-prong plug to mate with the socket X-1 of the 650S. The other end utilizes an octal plug to mate with the power socket X-1 at the rear of the HRO-50-1 receiver. The receiver A.C. jumper plug P-1 used for A.C. operation must be removed from the power socket. Figure Number 16 shows the Schematic Wiring Diagram.

The 650S Vibrapack Unit has been completely tested and adjusted at the factory to provide efficient and economical service when used with the HRO-50-1 receiver. An adjustment control switch has been furnished for increasing the B-plus output. This is a screw driver control available through an entry hole provided at the rear of the 650S. The control switch has four steps from approximately 150 volts of filtered D.C. at 70 milliamperes in the extreme counterclockwise position (step 1) to approximately 210 volts at 90 milliamperes in the fully clockwise position (step 4). It is recommended that the receiver be operated at the lower B voltage of step 1. The total battery drain is approximately 11 amperes when furnishing power to the receiver if the NFM-83-50, XCU-50-2 and SOJ-3 units are used. If the receiver is used without these accessories the total drain is approximately 9.5 amperes. The V.R. tube does not light under these conditions but the receiver will operate normally and operation from a storage battery becomes practical. In step 4 the V.R. tube will light and full receiver output will be obtained but the drain on the storage battery will be approximately 15.5 amperes when all accessories are utilized. Without these accessories the total receiver drain from the battery will be approximately 13.8 amperes.

The two intermediate control switch steps 2 and 3 should not be used as the voltage obtained is approximately the value required to fire the V.R. tube in the receiver. Under this condition the V.R. tube may fire on and off sporadically resulting in erratic operation of the receiver.

PARTS LIST

SYMBOL	FUNCTION	DESCRIPTION	NAT. CO. TYPE
C-1	Filter Capacitor	Elec. 500 mfd. 15 vdcw	E338-7
E-1	Vibrapack Unit	6 V.D.C. Mallory Type VP554	Q371-1
F-1	Fuse	20 Amperes 25 volts type 3 AG	F135-18
L-1	6-volt Line Filter	16 microhenries, iron core	SA:869
S-1	6-volt Line Switch	Toggle S.P.S.T.	E230-2
V-1	Rectifier Tube	Type 0Z4A	
W-1	6-volt Line Connector	Two-Contact	SA:1999
W-2	Interconnecting Cable	One end terminated in four prong plug; other in an octal plug	
Y-1	Vibrator	6 V.D.C. Mallory Type 825C	
X-1	Output Socket	Four Prong Female	E319-9

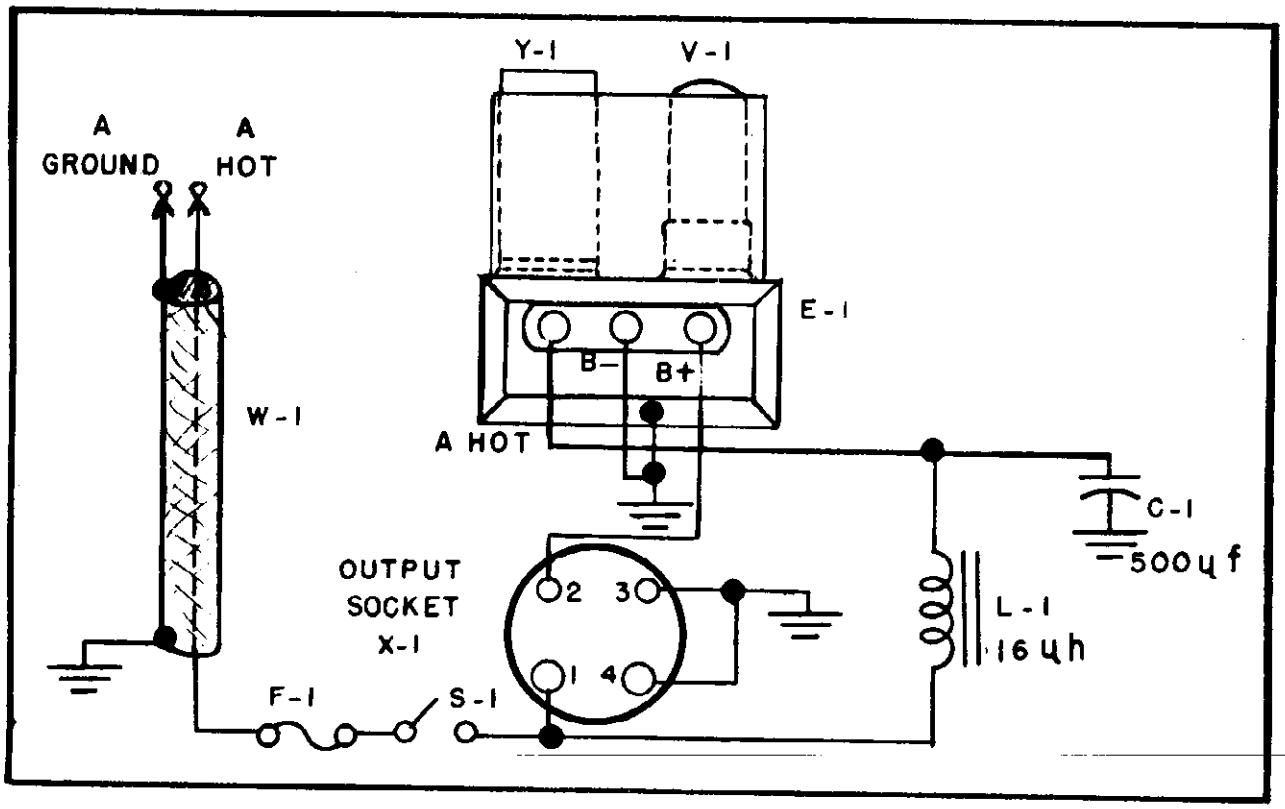


Figure No. 16. Schematic Diagram, 650S Vibrator Power Supply

SECTION 1. INSTALLATION

1-1. INSTALLATION PROCEDURE

The SW-54 Receiver is designed to operate from a 105/130 volt, 50/60 cycle, A.C. source of supply or a 105/130 volt, D.C. source of supply. Normal power consumption is approximately 25 watts at 115 volts.

Installation of the SW-54 is accomplished as follows:

1. Connect the antenna as recommended in Section 1-2.
2. Connect a good external ground (radiator or water pipe) to the cabinet. A screw-type terminal is provided at the top center of the cabinet back to facilitate this connection. This connection, if used, serves two purposes:
   a. Achieves a considerable reduction in noise interference in certain localities.
   b. Eliminates the possibility of shock occurring if the operator makes bodily contact between the Receiver and ground.
3. Connect the power cable and plug to the proper source of supply i.e., 105/130 volts, 50/60 cycles, A.C. or 105/130 volts D.C. Proper polarity of the plug should be observed when connection is made to a power source although no damage to the Receiver will occur if the polarity is reversed. Reversed polarity will be evidenced as follows and is corrected by simply reversing the plug prongs in the power outlet.
   a. D.C. Power Source — The Receiver will be inoperative, although the tubes and pilot lamp will light.
   b. A.C. Power Source — A hum may be heard in the output of the Receiver.

   Proper polarization of the plug will eliminate the possibility of shock occurring in installations where one side of the power line is grounded, if the operator should make bodily contact between the Receiver and ground.
4. Adjust controls as recommended in Section 2 for the reception of signals.

1-2. ANTENNA RECOMMENDATIONS

The antenna input circuit of the SW-54 is arranged for operation from either a single-wire type, doublet type or other types of antennas having impedances of 70 ohms or more. The input impedance of the antenna circuit is approximately 300 ohms.

The most practical antenna for use in installations where the Receiver is to be used over a wide range of frequencies is the single-wire type. An antenna length of from 50 to 75 feet is recommended although the length is not critical and any length from 25 to 75 feet may be used. If the Receiver is to be operated on one frequency or a narrow band of frequencies, best results will be obtained by the use of a tuned antenna, such as the folded doublet or half-wave dipole type, designed for the operating frequency.

The methods of connecting the various types of antennas to the antenna terminal strip at the rear of the Receiver are as follows:

1. Single-wire type — Connect the antenna to terminal A at the left of the strip and connect the metal link to the unused A terminal.
2. Doublet-type — Connect the antenna feeders to the two terminals marked A; the metal link is not used.
3. Concentric transmission line type — Connect the inner conductor to terminal A at the left of the strip and the outer conductor to the other A terminal. Connect the metal link to the center A terminal.

2-1. GENERAL DESCRIPTION

The SW-54 is an A.C./D.C. superheterodyne Receiver having a complement of four tubes plus a rectifier with a continuous frequency range of from 540 kilocycles to 30 megacycles. The Receiver is designed to provide reception of amplitude modulated voice or music and code telegraphy signals throughout its entire frequency range.

A stage outline of the circuit employed in the Receiver is given below together with the tube type associated with each stage.

Converter	12BE6
C.W. Osc. -- I.F. Amplifier (455 Kc.)	12BA6
Second Det. - A.V.C. - First Audio	12AV6
Audio Output	50C5
Rectifier	35Z5

Two audio output circuits are provided in the SW-54:

1. The built-in loudspeaker is a permanent magnet type.
2. Phone tip jacks are mounted at the rear of the receiver to accommodate headphones. The headphones load impedance is not critical, permitting the use of various types of headphones including crystal types.

2-2. TUNING SYSTEM

The two-gang main tuning capacitor and four set of coils are used to cover the frequency range of the SW-54 in four tuning bands as shown on the following table. A bandspread tuning dial scale calibrated from 0 to 100 is provided to permit bandspread tuning of any portion of the frequency range of the receiver.

BAND	FREQUENCY COVERAGE
A	.54 to 1.6 mc.
B	1.6 to 4.7 mc.
C	4.6 to 14.5 mc.
D	12 to 30 mc.

The main dial has four scales accurately calibrated directly in megacycles. The respective scales are marked with heavy black scorings to clearly locate for the operator such short-wave features as the Amateur, Police, Foreign Broadcast and Ship bands. These locating markers are identified by letters AM, P, F and S respectively.

2-3. OPERATING INSTRUCTIONS

After the SW-54 has been installed as outlined in Section 1, it is placed in operation for voice

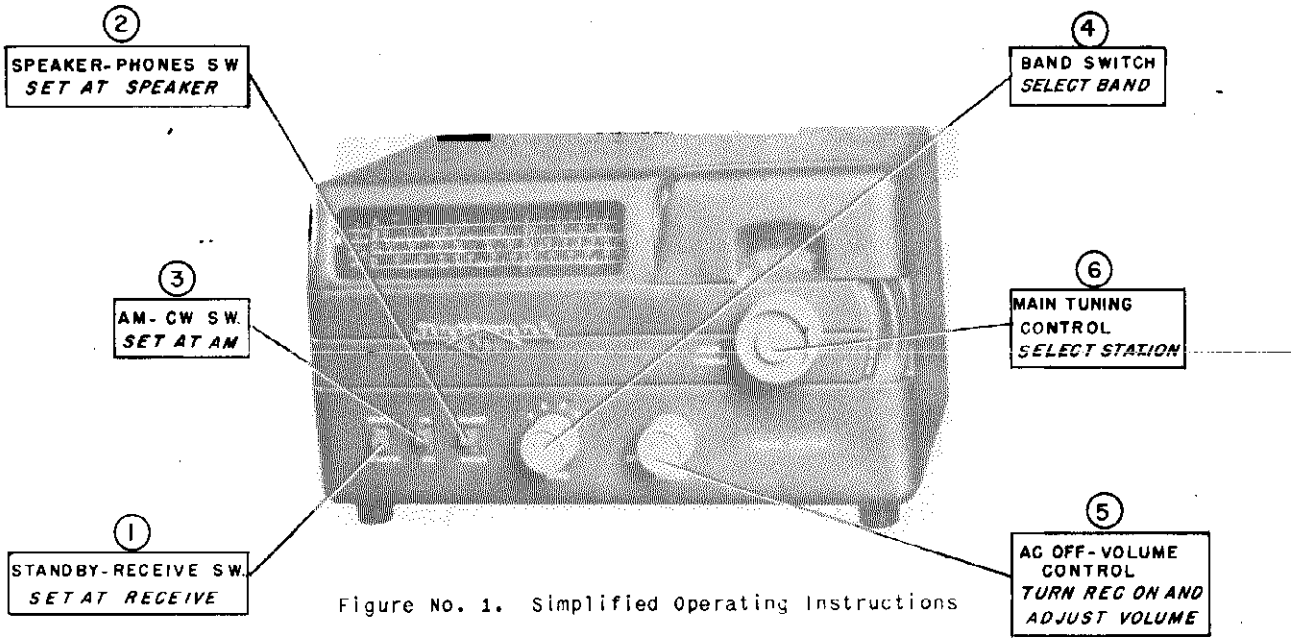


Figure No. 1. Simplified Operating Instructions

or music reception by adjustment of the receiver controls. Figure No. 1 gives the step-by-step procedure to follow for the reception of signals. The same procedure is outlined below with a brief description of the function of each control.

1. Set the Standby-Receive switch at Receive. This switch, in the Standby position is used to quiet the Receiver for a period of time such as during a transmitting period, when it is desirable to resume reception immediately without waiting for the tubes to warm up.

2. Set the Speaker-Phones switch at Speaker. Should headphone operation be desired set the switch at Phones and connect headphones to the Phones jack located at the rear of the receiver.

3. Set the AM-CW switch at AM.

4. Set the Band switch at the band of frequencies to be tuned. The four positions of the Band switch select the proper set of coils to cover the frequency range of the four tuning bands of the SW-54. Each position is marked with a band letter designation which corresponds to the markings appearing on the main dial.

5. Turn the Volume control from the A.C. off position to the point providing the desired audio volume. In the A.C. Off position the SW-54 is turned off: advancing the control knob in a clockwise direction turns on the Receiver and increases the audio output volume to a maximum at the extreme clockwise position.

6. Set the main tuning dial pointer at the desired frequency. The main tuning control knob and dial scale are used to tune the entire frequency range of the Receiver and tunes at any one time the band of frequencies selected by the Band switch.

7. To utilize the advantages of bandspread (fine) tuning and logging provided by the SW-54 proceed as follows:

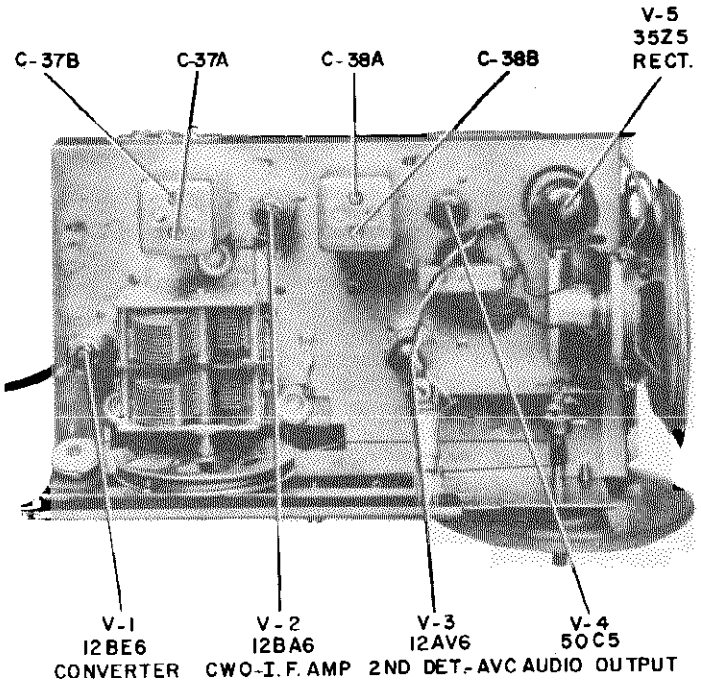
(a) Set the main tuning dial pointer at the Low frequency limit of the band of frequencies to be tuned.

(b) Hold the main tuning control knob (or the outer edge of the Bandspread dial) firmly enough to prevent the main tuning dial pointer from moving and set the bandspread dial at Zero by rotating the inner segment of the Bandspread dial.

(c) Bandspread tuning can now be accomplished by rotation of the entire Bandspread dial in a clockwise direction. Logging of stations is accomplished by noting the frequency setting of the main dial pointer and the numerical setting of the bandspread dial.

2-4. CODE TELEGRAPHY RECEPTION

The adjustment of the receiver controls for code reception is the same as that for voice and music except that the AM-CW switch must be set at CW.



NOTE: *ALTERNATE IF TRANS. HAVE L-9 & L-11 AT BOTTOM OF CAN, L-10 & L-12 AT THE TOP.*

Figure No. 2. Tube and Alignment Adjustment Locations

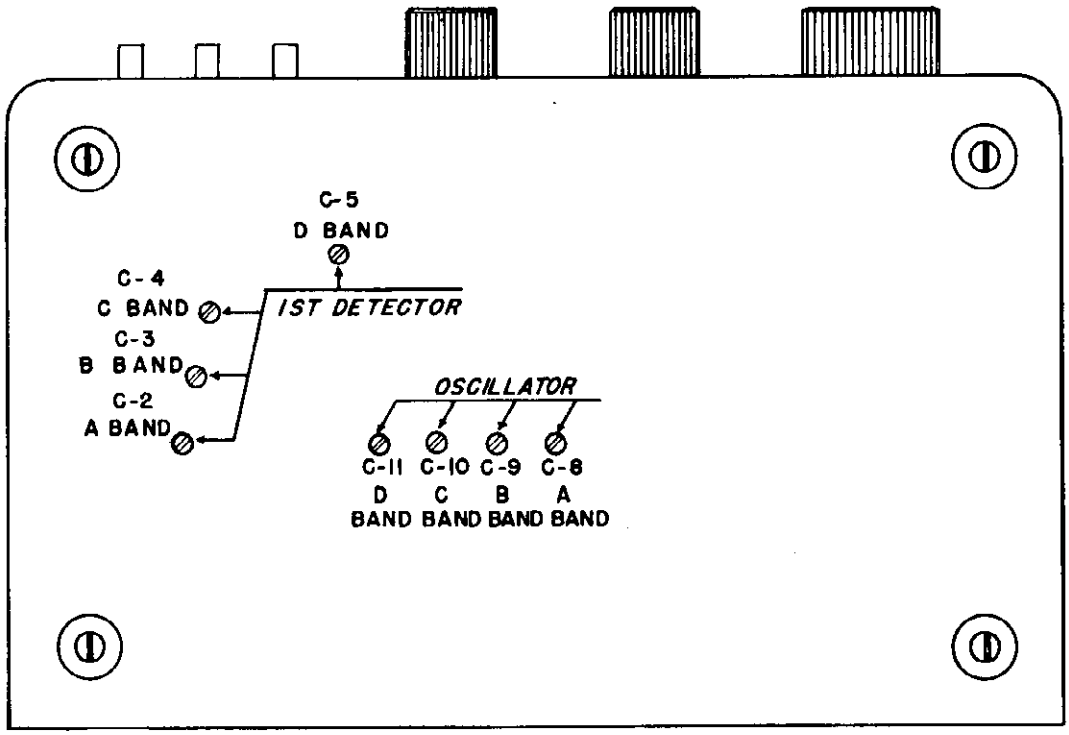
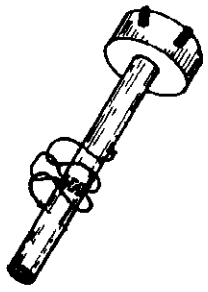


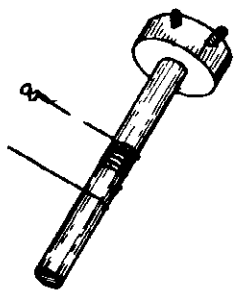
Figure No. 3. R.F. Alignment Trimmer Locations

1 LENGTH OF CORD = 38" INCLUDING CLIP AT ONE END AND LOOP IN OTHER.
MEASURE 16 3/4" FROM CLIP END AND MARK THIS POINT. LOOP CORD AT MARK AND PUSH THRU HOLE IN SHAFT. BRING ENDS OF CORD THRU LOOP AS SHOWN AND PULL TAUT KEEPING MARKED POINT OVER HOLE.



2a WIND CLIP END OF CORD 6 1/2 TURNS AROUND SHAFT AND WITH TUNING CAPACITOR AT MAXIMUM HOOK CLIP TO LARGE PULLEY.

b TURN CAPACITOR TO MINIMUM ALLOWING OTHER END OF CORD TO WIND ITSELF AROUND SHAFT.



3 SET PULLEY AT POSITION SHOWN AND PASS CORD AROUND SMALL PULLEY. FASTEN SPRING TO END OF CORD AND CLIP TO HOLE IN PULLEY PROVIDING CORRECT TENSION.

4. ATTACH POINTER TO CORD AND BY ELECTRICAL CALIBRATION TEST SET POINTER AT CORRECT POSITION

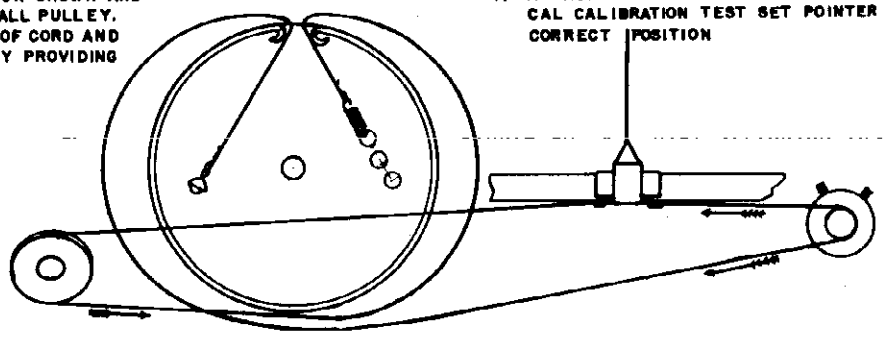


Figure No. 4 Dial Stringing Instructions

MODEL SW-54

SW-54

ALIGNMENT AND TEST INSTRUCTIONS

Note: 1. An isolation transformer should be used wherever possible: If the transformer is not available, the set may be handled with safety if the following precautions are observed:

a. Find out with an AC volt meter which side of power socket is at ground potential.
b. With receiver plug out of power socket, turn on power switch and with an ohmmeter find which tab of power cord is connected directly to the chassis through the volume control switch.
Insert the cord into the power socket so that both grounds come together. When these precautions have been taken one may connect other grounds to receiver chassis without danger.
If the power source is DC, the set will not operate unless proper polarity of the plug is observed.

2. A dummy antenna of 300 ohms is also needed.
Alignment should not be made without this resistor.
3. A blocking condenser .01 to .1 mfd. should be used. This condenser should be used in series with the hot lead of the signal source at all times. Having observed polarity of plug as under Note #1, the ground lead of the signal source may be connected directly to the chassis.

I Check tuning condenser and dial pointer setting--

a. Rotate tuning dial fully counter-clockwise against stop.
b. Look at tuning condenser. The rotor should be fully meshed. This is very, very important. This is your reference, and will avoid tracking and calibration troubles. When we say fully meshed, we do not mean 1/2 of a degree or one degree, but that the plates be flush.
c. To set the condenser rotate dial fully counter-clockwise. Loosen the two set screws on dial shaft. Hold the collar, which has the two set screws, against the stop. Turn dial until tuning condenser hits its stop. Tighten set screws.
d. Set the pointer over the first calibration mark on band "B".

II Connect the power to the receiver.
III Connect headphones and output meter to output jack.
IV Connect the 300 ohm dummy to hot antenna terminal.
V Put band change switch in the "A" position.
VI Set dial to 1000 kc.
VII Set signal to 455 kc ±1 kc.
Caution: Do not depend on the accuracy of your signal generator, unless you know it is good.
VIII Connect the signal source to the top contact on the front switch wafer (flue lead). This is the mixer grid connection with the band change switch at "A".

IX Adjust L9, 10, 11 and 12 or C-37A C37B, C38A and C38B for maximum output. The maximum input required for 50 mw output should not be over 75 micro-volts. The minimum may run as low as 10 micro-volts. If the set is stable-10 micro-volts will be all right. A normal set will require 25 micro-volts. Use approximately 100 micro-volts input when making IF adjustments. The IF alignment is now complete.

X Set the frequency at the high end of band "A" with condenser C-8 (osc.) Adjust det. trimmer C-2 for maximum gain. Check calibration at the low end of band. 600 kc should fall within ±10 kc.
Note: A chart is being supplied which will show calibration and alignment points for each band. This chart will also show tolerances on calibration.

XI Set the band change switch at "B". Set the frequency at the high end of the band. Peak mixer trimmer while rocking the dial for maximum output. Check the calibration at the low end of the band.

XII Repeat Operation XI for band "C" (Band switch at "C".)

XIII Set band switch at "D". Set the frequency at the high end of the band. Peak the mixer trimmer on signal for maximum output while rocking the dial. Check the frequency at the low end of band. On Band "D", adjust loop in det. coil at 14 mc for maximum gain.

Check chart below for calibration and alignment points.

Band	Set	Peak Det. Trimmer at	Check Cal. at Tol.	Check Tracking at
"A"	1.5 mc.	1.5 mc.	.6 mc±10kc.	.6 mc.
"B"	4.0 mc.	3.8 mc.	2.0 mc 20kc.	1.8 mc.
"C"	14.0 mc.	13.5 mc.	5.0 mc±60kc.	5.5 mc.
"D"	28.0 mc.	29.0 mc.	14.0 mc±150kc.	13.5 mc.

The above tolerances apply to the whole band.

SELECTIVITY Input: 100 micro-volts
Output: level 10 milliwatts

6 db 3.4 kc.
20 db 14.0 kc.
40 db 28.2 kc.
60 db 49.5 kc.

AVC at 2 MC 300 ohm dummy-

Measurement taken here to avoid noise pick-up.
10 micro-volts = 0 db = 1 mw.
100 - " - + 15
1000 - " - + 20
10000 - " - + 24
100000 - " - + 28.0

Overall distortion at 1 MC

30% mod. 1000 CPS

100 mw.	2 %
200	2.2
300	2.6
500	2.8
.7	3.5
.8	4.2
1.0	6.5
1.5 watts	10+

Maximum power 1.8 watts

Overall fidelity at 2 mc.

100	-11.0
200	- 5.0
400 cp.s	0 db
1000	+ 2.0
2000	- 2.0
3000	- 6.5
4000	-12.5
5000	-18.0

GAIN Dial set at 1000 kc.

Location	Frequency	Input	Output
Mixer Grid	455 kc.	26 uv	50 mw
IF Grid	455 kc.	3000 uv	50 mw
First Audio	400 cps	.5 volts	50 mw
Last Audio	400 cps	1.8 volts	50 mw

Audio response from first audio grid.
Input constant at .4 volts.

100	-12.0
200	- 5.5
400	0
1000	+ 1.8
2000	+ 1.0
3000	- .75
4000	- 3.5
5000	- 6.5
10000	-19.0

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HUM

As measured on 4 ohms with Ballantine volt meter

IF grid grounded
Audio gain off 1.8 micro-watts
Audio gain full 1.8 micro-watts
Line cord reversed 1.8 micro-watts

OVERALL GAIN, S/N RATIO, AND IMAGE RATIO

FREQ. MC.	GAIN FOR 50 MW	10 DB SIG/NOISE 300 OHMS	10 DB SIG/NOISE NO. DUMMY	IMAGE DB	50 MW DIRECT	OSC. VOLTS
BAND "A"						
.6	21.5 uv	18 uv	18 uv	43	22	6.6
1.0	11	10	10	42	16.5	9.0
1.5	15	10	10	35	19	9.6
BAND "B"						
1.7	11	11	3.1	30	5.5	4.2
2.5	6	6	2.8	32	2.8	6.2
4.0	7.2	7.7	4.5	20	4.0	7.2
BAND "C"						
5.0	14.0	13	4.5	22	5.5	2.6
8.0	9.4	7.0	2.4	16.0	4.5	3.6
14.0	4.0	4.0	3.8	18.0	3.0	2.2
BAND "D"						
15	28.0	28.0	8.5	8.0	13.5	2.4
20	10	10	8.5	12.0	6.5	2.6
29	4.5	4.5	4.0	6.0	6.0	1.6

SOCKET VOLTAGES

Meter - High impedance D.C. 100 ohms per volt A.C.

All measurements to ground
Bandswitch at "A"
No signal
Dial at 1000 kc.
Audio gain turned down.

Tube	Pin #1	Pin #2	Pin #3	Pin #4	Pin #5	Pin #6	Pin #7
12BE6	9 DC	.6AC	11AC	22 AC	98 DC	98 DC	.3 DC
12BA6	.3DC	0 AC	22AC	35 AC	35 AC	105 DC	1.1 DC
12AV6	.9DC	0	11AC	0	.45DC	.45DC	72 DC
50C5	7.0DC	0	80AC	35 AC	0	100 DC	120 DC
35Z5	100 DC	115 AC	110AC	0	110 AC	125 DC	80 AC

RESISTANCE MEASUREMENTS TAKEN TO CHASSIS (POWER REMOVED).

Bandswitch at "A"

Tube	Pin #1	Pin #2	Pin #3	Pin #4	Pin #5	Pin #6	Pin #7	Pin #8
12BE6	22K	.2	11	22	20K	20K	3 meg	
12BA6	2.5 meg.	0	20	30	20K	20K	100	
12VA6	10 meg.	0	11	0	.5 meg	.5 meg	260K	
50C5	150	.5 meg	100	40	.5 meg	.5 meg	20K	
35Z5	22K	120	120	Open Cir.	120	120	85	20K

Primary-output trans. 100 ohms
Secondary .2 ohms

RESISTANCE OF RF COILS

A Det. Coil Sec.	3.5 ohms	A Det. Coil Prim	29.5 ohms
B Det. Coil Sec.	.83 "	B Det. Coil Prim.	.93 "
C Det. Coil Sec.	.05 "	C Det. Coil Prim	.93 "

A Osc. Coil Total	2.34 ohms
cold end to trap	.35 ohms
B Osc. Coil Total	1.01 ohms
C Osc. Coil Total	.06 ohms
D Osc. Coil Total	.04 ohms

Caution: Be sure that no part of the metal frame of the speaker touches the chassis.

Never substitute 10% condensers for the 5% as called for on the parts list. These 5% condensers are used as padders and are C-12, C-13 and 4...470 mmfd ...1000 mmfd and 3000 mmfd.

Length of wires on tuning condenser should not be changed.

SOME TROUBLES AND FAULTY PARTS WHICH COULD BE THE CAUSE

Mushy audio and loud hum.
Defective condenser C-29C or C-29D.

Off signal, audio not mushy on signal.
Be sure the shield on the 12AV6 tube V-3 is properly seated.

Hum modulation in broadcast band.
Try replacing C-33.

Hum modulation in the higher frequency bands-check C-32.
C-39 may be defective.

Oscillation in the IF stage.
C-36 defective
C-35 defective
CW switch does not ground the feed back wire with the CW off.
Plate and grid leads should be down near the chassis.
Pin #2 and center shield on the socket not grounded.
Shorted cathode resistor.

Poor sensitivity at low end of band "B" with almost normal gain at the high end of the band.
C-1 may be open.

Poor sensitivity on all bands and trimmers C-2, 3 and 4 do not peak properly.
C-6 open.
High frequency oscillator does not work at some spot in one of the bands.
Poor contact on shorting rotor on band change switch.

PARTS LIST

Symbol No.	Description	Nat. Co. Type
	CAPACITORS	
C-1	Paper .01 mfd 400 vdcw	D827-5
C-2	Variable mica 2.2-40 mmf 500 vdcw	D832-5
C-3	Variable mica 2.2-40 mmf	D832-5
C-4	Variable mica 2.2-40 mmf	D832-5
C-5	Variable mica 2.2-40 mmf	D832-5
C-6	Paper .02 mfd 200 vdcw	D827-51
C-7	Ceramic 10 mmf 500 vdcw	D8270-426
C-8	Variable mica 2.2-40 mmf	D832-5
C-9	Variable mica 2.2-40 mmf	D832-5
C-10	Variable mica 2.2-40 mmf	D832-5
C-11	Variable mica 2.2-40 mmf	D832-5
C-12	Mica 470 mmf 500 vdcw	J665-55
C-13	Mica 1000 mmf 300 vdcw	J665-70
C-14	Mica 3000 mmf 500 vdcw	J666-30
C-15	Ceramic 21 mmf 500 vdcw	D825D-410
C-16	2 section variable	K577-2
C-16A	12 to 441.7 mmf	Part of C-16

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C-16B	12 to 441.7 mmf	Part of C-16
C-17	Ceramic 3 mmf	J695-4
C-18	Ceramic 100 mmf	J695-6
C-19	87 mmf	Part of T-1
C-20	87 mmf	Part of T-1
C-21	Paper .01 mfd 400 vdcw	D827-5
C-22	110 mmf	Part of T-2
C-23	110 mmf	Part of T-2
C-24	110 mmf	Part of T-2
C-25	110 mmf	Part of T-2
C-26	Paper .005 mmf 200 vdcw	D827-50
C-27	Paper .005 mmf 200 vdcw	D827-50
C-28	Mica 4700 mmf 500 vdcw	J665-56
C-29	4 section dry electrolytic	Q252-1
C-29A	5 mfd	Part of C-29
C-29B	40 mfd	Part of C-29
C-29C	40 mfd	Part of C-29
C-29D	60 mfd	Part of C-29
C-30	Paper .02 mfd 600 vdcw	D827-44
C-31	Paper .02 mfd 200 vdcw	D827-51
C-32	Mica 470 mmf 500 vdcw	J665-56
C-33	Paper .1 mfd 400 vdcw	D827-12
C-34	Paper .02 mfd 600 vdcw	D827-44
C-35	Paper .02 mfd 200 vdcw	D827-51
C-36	Paper .25 mfd 200 vdcw	D827-15
C-37	Variable ceramic 2 section	Part of T-1*
C-37A	35-150 mmf	Part of C-37
C-37B	35-150 mmf	Part of C-37
C-38	Variable ceramic 2 section	Part of T-2*
C-38A	35-150 mmf	Part of C-38
C-38B	35-150 mmf	Part of C-38

RESISTORS

R-1	Fixed 470,000 ohms 1/2 watt	J569-57
R-2	Fixed 47 ohms 1/2 watt	J569-9
R-3	Fixed 47 ohms 1/2 watt	J569-9
R-4	Fixed 100 ohms 1/2 watt	J569-13
R-5	Fixed 47,000 ohms 1/2 watt	J569-45
R-6	Variable 500,000 ohms w/switch	K347-6
R-7	Fixed 2,200,000 ohms 1/2 watt	J569-65
R-8	Fixed 10,000,000 ohms 1/2 watt	J569-73
R-9	Fixed 220,000 ohms 1/2 watt	J569-53
R-10	Fixed 470,000 ohms 1/2 watt	J569-57
R-11	Fixed 150 ohms 1/2 watt	J569-15
R-12	Fixed 15,000 ohms 1 watt	J571-39
R-13	Fixed 220 ohms 1/2 watt	J569-5
R-14	Fixed 22 ohms 1/2 watt	J569-22
R-15	Fixed 1000 ohms 1 watt	J571-25
R-16	Fixed 330 ohms 1/2 watt	J569-19
R-17	Fixed 22,000 ohms 1/2 watt	J569-41

*Alternate IF Trans.

MISCELLANEOUS

E-1	Antenna terminal board 3 terminal	E261-3
E-2	Terminal board, speaker output, 2 terminal	E264-1
I-1	Lamp, #47 bayonet type 6-8 v 15 amps	F136-11
L-1	Inductor, detector "A" coil air core	SA:7971
L-2	Inductor, detector "B", "C" and "D" coils air core	SA:7973
L-2A		Part of L-2
L-2B		Part of L-2
L-2C		Part of L-2
L-3	Inductor, oscillator "A", "B", "C" and "D" coils air core	SA:7981
L-3A		Part of L-3
L-3B		Part of L-3
L-3C		Part of L-3
L-3D		Part of L-3
L-4	Inductor, variable, iron core tuning	Part of T-1
L-5	Inductor, variable, iron core tuning	Part of T-1
L-6	Inductor, variable iron core	Part of T-2
L-7	Inductor, variable iron core	Part of T-2
LS-1	Loudspeaker, 4" PM	Q374-1
S-1	Switch, band selector, 2 pole 4 pos	SA:7972
S-1A		Part of S-1
S-1B		Part of S-1
S-2	Switch, CW-AM, 2 pole 3 pos	SA:7977
S-3	Switch, standby, 2 pole 3 pos	SA:7978
S-4	Switch, phone, 2 pole 3 pos	SA:7976
S-5	Switch, on off, spst	Part of R-6
T-1	Transformer, IF, 455 Kc., shielded	Q242-1
T-1*	Transformer, IF, 455 Kc., shielded	Q243-1
T-2	Transformer, IF, 455 Kc., shielded	Q242-2
T-2*	Transformer, IF, 455 Kc., shielded	Q243-2
T-3	Transformer: speaker matching, primary 2500 ohms secondary 3.2 ohms, iron core	K588-2
V-1	Tube, converter, 12BE6	
V-2	Tube, pentode, 12BA6	
V-3	Tube, duo diode triode, 12AV6	
V-4	Tube, beam power amplifier, 50C5	
V-5	Tube, full wave rectifier, 35Z5	
Z-1	Filter, one 47,000 ohm resistor and two 100 mmf. capacitors *Alternate IF Trans.	Q262-1

MECHANICAL PARTS

Bracket, main support	Q228-1
Bracket, to mount coil (2)	Q249-1
Bracket, pulley suppott	SA:7969
Bumper, rubber: chassis insulator	Q258-1
Cabinet	SA:7979
Channel, rubber	Q255-1
Chassis, metal wraparound less all components	Q227-1
Clip for miniature tube	K925-1
Collar for dial shaft	D637-4
Cord, AC Line	Q241-1
Cord, dial	SA:7975
Cover, bottom of cabinet	Q224-1
Cover, rear of cabinet	Q223-1
Foot (4)	Q237-1
Knob, large	SA:5692-2
Knob, small (2)	SA:7984
Pad, rubber	Q254-1
Plate, for switch	Q235-1
Pointer, dial scale	Q240-1
Rail, for pointer	Q234-1
Ring, retaining (dial shaft)	P491-3
Scale, slide rule type	Q233-1
Shaft, dial	SA:7974
Shield, for miniature tube	K924-1
Socket, for dial light	J721-2
Socket, miniature 7 pin (4)	K926-2
Socket, octal type	Q236-1
Strap, for speaker mounting	Q235-1
Washer, stop, for dial shaft	P149-2
Washer, stop, for dial shaft (6)	P149-1
Window for the slide rule scale	Q225-1