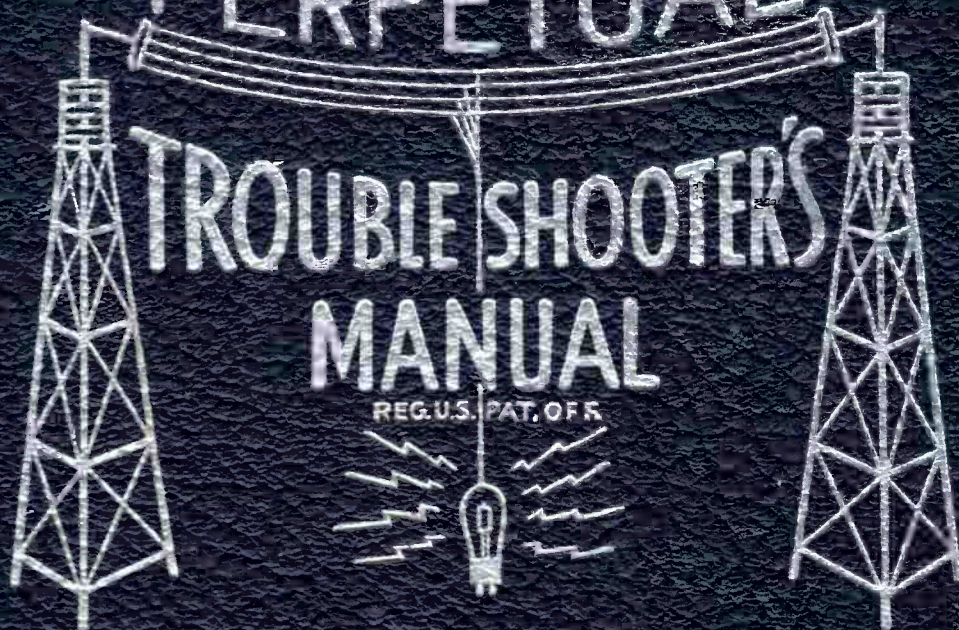
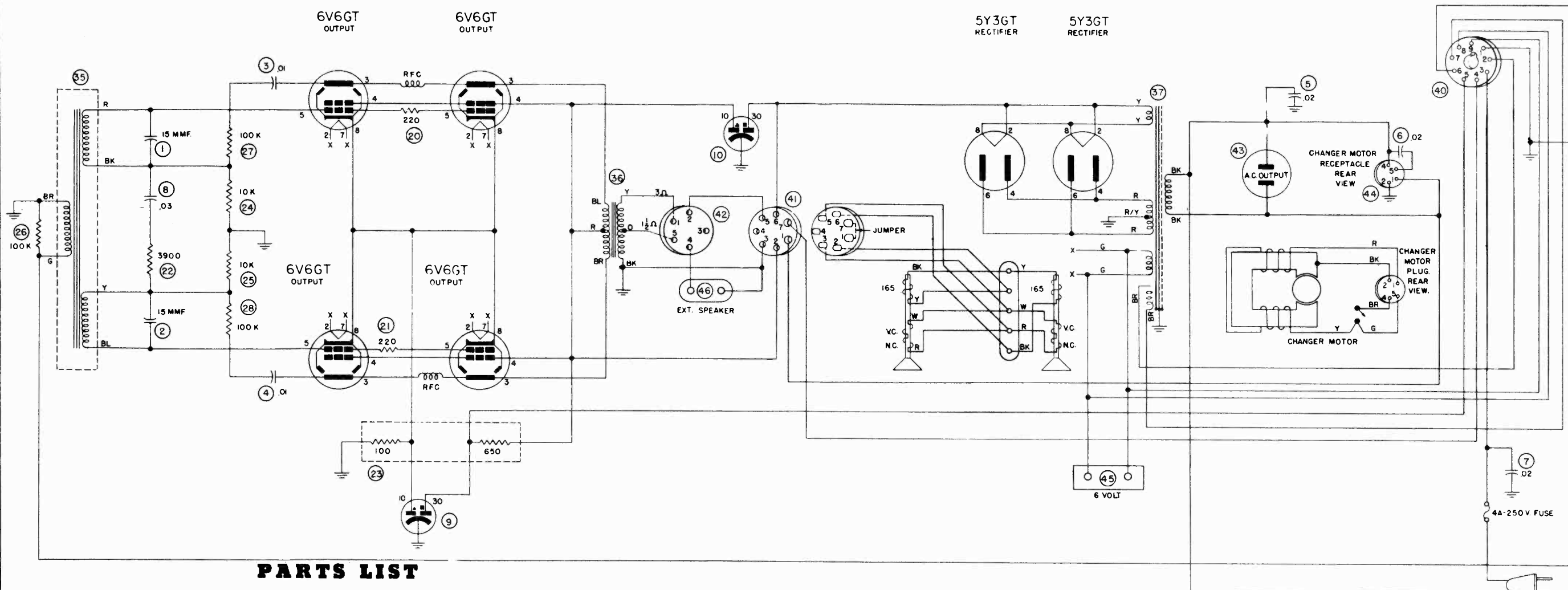


VOLUME XVIII

PERPETUAL



JOHN F. RIDER



**PARTS LIST**

REFERENCE NO	DESCRIPTION	MAGNAVOX PART NO.
1	Capacitor, molded mica, 15 mmf.	250159G93
2	Capacitor, molded mica, 15 mmf.	250159G93
3	Capacitor, paper, .01 mfd. 600 V.	250129G2
4	Capacitor, paper, .01 mfd. 600 V.	250129G2
5	Capacitor, paper, .02 mfd. 600 V.	250129G3
6	Capacitor, paper, .02 mfd. 600 V.	250129G3
7	Capacitor, paper, .02 mfd. 600 V.	250129G3
8	Capacitor, tubular, .03 mfd. 400 V.	250152G25
9	Capacitor, electrolytic, 30-10 mfd. 475 V.	270023G2
10	Capacitor, electrolytic, 30-10 mfd. 475 V.	270023G2
20	Resistor, composition, 220 ohms 1/2 W.	230084G9
21	Resistor, composition, 220 ohms 1/2 W.	230084G9
22	Resistor, composition, 3900 ohms ± 10% 1/2 W.	230084G69
23	Resistor, wire wound, 100-650 ohms 7 W.	240040G1
24	Resistor, composition, 10,000 ohms 1/2 W.	230084G19
25	Resistor, composition, 10,000 ohms 1/2 W.	230084G19
26	Resistor, composition, 100,000 ohms ± 10% 1/2 W.	230084G86
27	Resistor, composition, 100,000 ohms 1 W.	230085G25
28	Resistor, composition, 100,000 ohms 1 W.	230085G25
35	Transformer, input.	320021G2
36	Transformer, output.	330024G1
37	Transformer, power, 117 V., 50-60 cycle.	300037G1

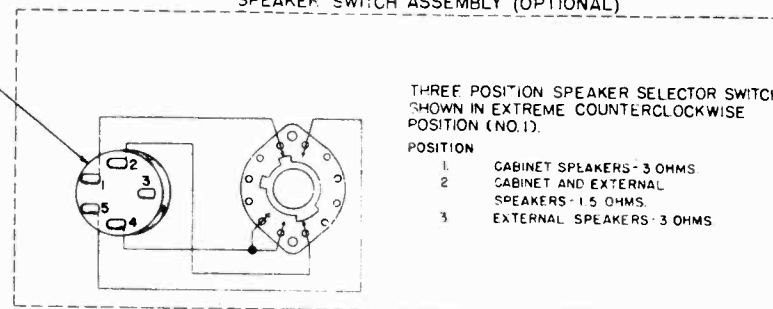
40	Cable and plug assembly	460634G1
41	Socket, speaker connection	180504G16
42	Socket, speaker switch	180504G6
43	Socket, AC power connection	180428G1
44	Socket, phonograph motor connection	180501G5
45	Socket, 6-volt outlet	189788G2
46	Terminal board—external speaker connection	209601G2

THIS SHORTING PLUG MUST BE INSERTED IN SOCKET ABOVE FOR NORMAL OPERATION WHEN SPEAKER SELECTOR SWITCH IS USED. REMOVE SHORTING PLUG AND REPLACE IT WITH PLUG SUPPLIED AS PART OF SWITCH ASSEMBLY.



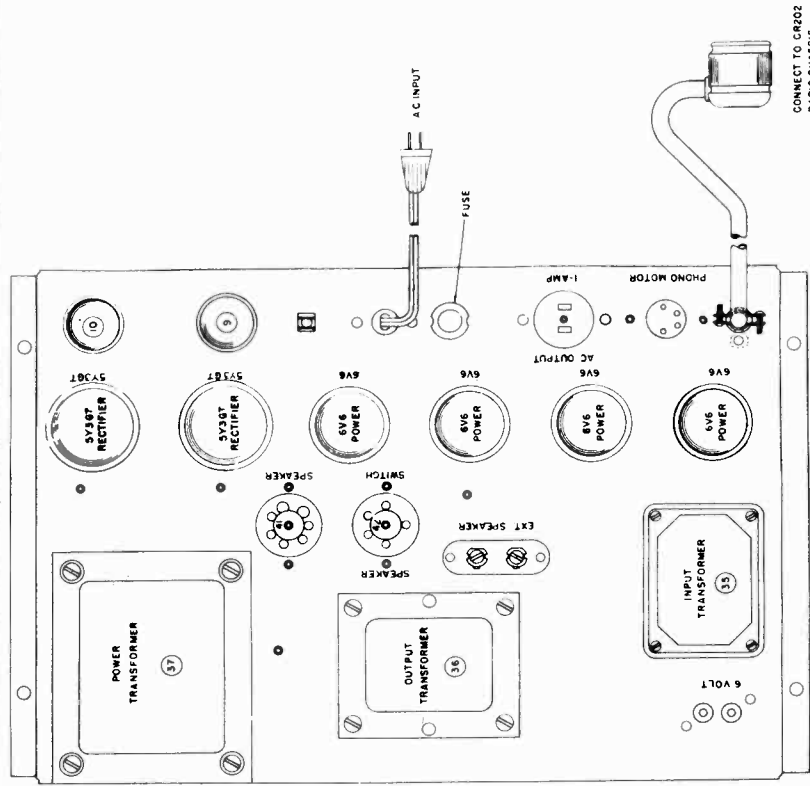
**SPEAKER SWITCH ASSEMBLY (OPTIONAL)**

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



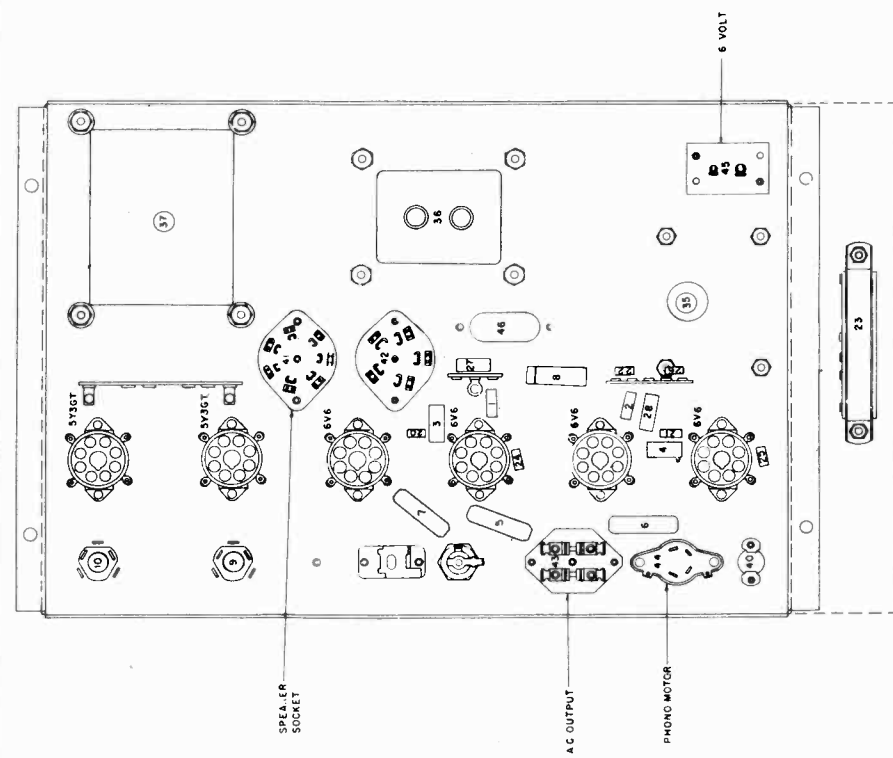
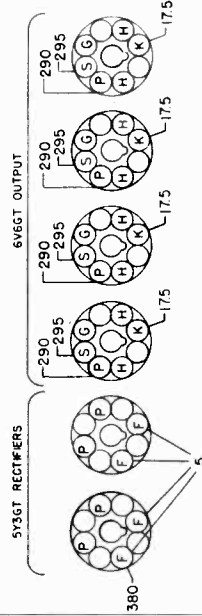
THREE POSITION SPEAKER SELECTOR SWITCH SHOWN IN EXTREME COUNTERCLOCKWISE POSITION (NO. 1).

- POSITION 1 CABINET SPEAKERS - 3 OHMS
- POSITION 2 CABINET AND EXTERNAL SPEAKERS - 1.5 OHMS
- POSITION 3 EXTERNAL SPEAKERS - 3 OHMS



VOLTAGE TABLE  
BOTTOM VIEW OF CHASSIS

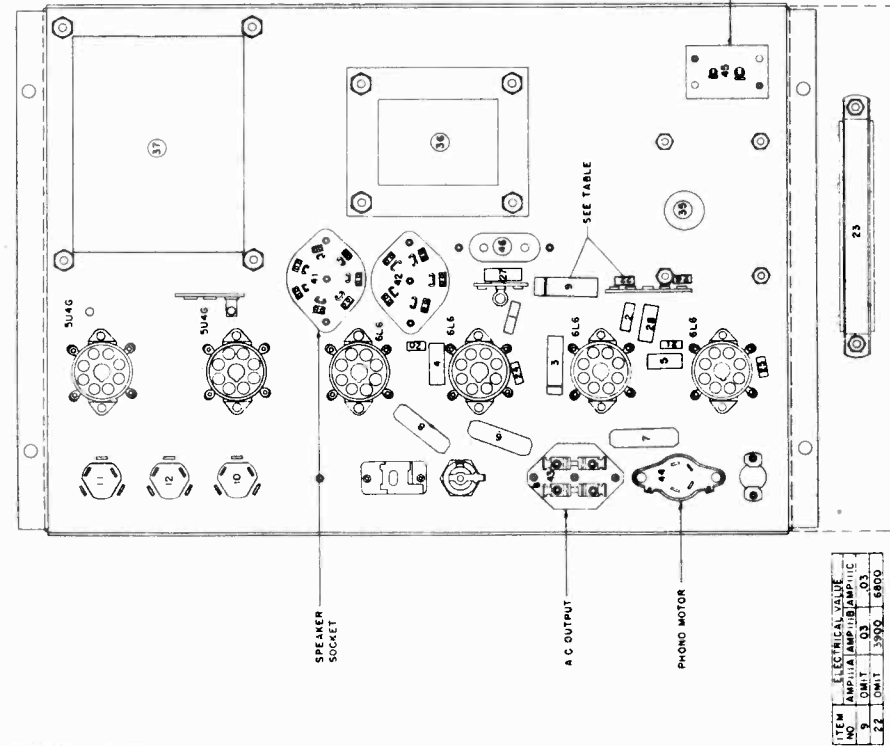
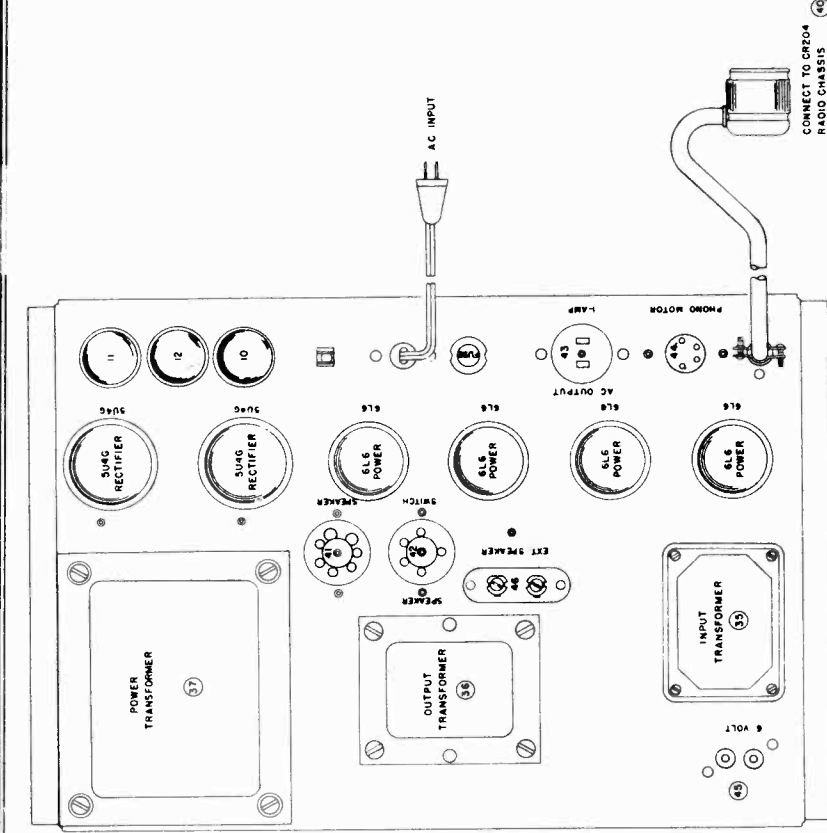
MEASURE HEATER AND FILAMENT VOLTAGES DIRECTLY ACROSS SOCKET TERMINALS  
ALL OTHER VOLTAGES MEASURED FROM SOCKET TERMINAL TO GROUND WITH A 20,000 OHMS/VOLT METER BAND SWITCH ON CR202 CHASSIS IN SHORT WAVE POSITION  
HEATERS (H) 6.3 V.A.C.  
TOTAL POWER CONSUMPTION (CR202 & AMP109) 200 WATTS  
LINE VOLTAGE 117V. A.C.



Power supply.....117 volts 50/60 cycles AC  
Power consumption.....\*200 watts  
Power output.....20 watts  
Output impedance.....2.5/1.7 ohms

Tubes:  
Power output (push-pull parallel stage).....(4) 6V6GT  
Rectifiers.....(2) 5Y3GT

Speakers:  
No. 583108 No. 583109  
Field coil resistance.....165 ohms 165 ohms  
Voice coil impedance (400 cycles).....5.0 ohms 5.0 ohms



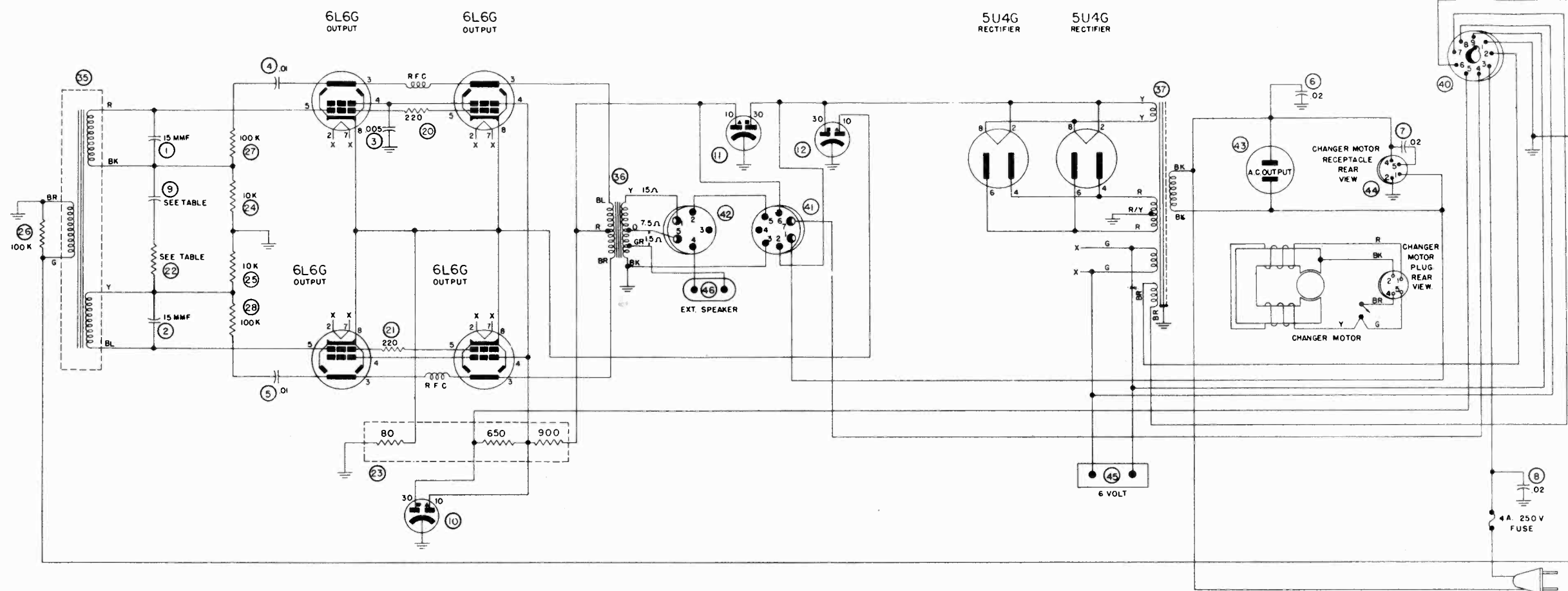
ITEM NO.	ELECTRICAL VALUE
1	AMP/111 AMP/111 AMP/111
2	OHM 100 20 20
3	OHM 100 20 20
4	OHM 100 20 20

AMP-111 Speakers:  
No. 583002 (Bass) 150 ohms  
Voice coil resistance.....12 ohms  
or:  
No. 582999 (Bass) 150 ohms  
Voice coil resistance.....12 ohms  
No. 580005 (Tweeter) PM 11 ohms  
No. 580006 (Tweeter) PM 150 ohms  
Voice coil resistance.....11 ohms

**SPECIFICATIONS**

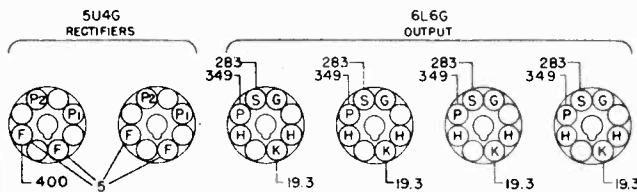
Power supply.....117 volts 50/60 cycles AC  
Power consumption.....\*250 watts  
Power output.....45 watts  
Output impedance.....15/7.5/1.5 ohms  
Tubes:  
Power output (push-pull parallel stage).....(4) 6L6G  
Rectifiers.....(2) 5U4G

\*Power consumption is for amplifier and CR-204 radio chassis.



**VOLTAGE TABLE**  
BOTTOM VIEW OF CHASSIS

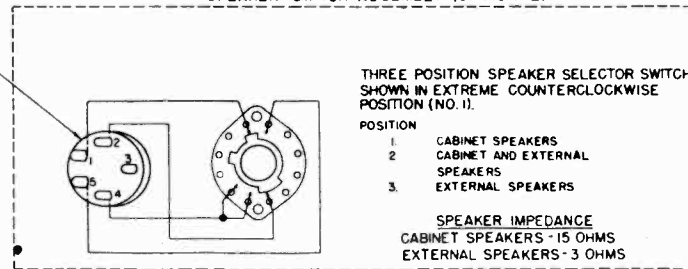
MEASURE HEATER AND FILAMENT VOLTAGES DIRECTLY ACROSS SOCKET TERMINALS  
ALL OTHER VOLTAGES MEASURED FROM SOCKET TERMINAL TO GROUND WITH A 20,000 OHMS/VOLT  
VOLTMETER. BAND SWITCH ON CR204 CHASSIS IN SHORT WAVE POSITION.  
HEATERS (H) 6.3 V. A.C.  
TOTAL POWER CONSUMPTION (CR204 & AMP III) 260 WATTS.  
LINE VOLTAGE 117 V. A.C.



THIS SHORTING PLUG MUST BE INSERTED  
IN SOCKET ABOVE FOR NORMAL OPERATION  
WHEN SPEAKER SELECTOR SWITCH IS USED,  
REMOVE SHORTING PLUG AND REPLACE IT  
WITH PLUG SUPPLIED AS PART OF SWITCH  
ASSEMBLY.

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

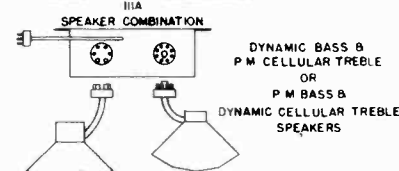
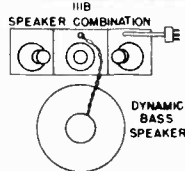
**SPEAKER SWITCH ASSEMBLY (OPTIONAL)**



THREE POSITION SPEAKER SELECTOR SWITCH  
SHOWN IN EXTREME COUNTERCLOCKWISE  
POSITION (NO. 1).

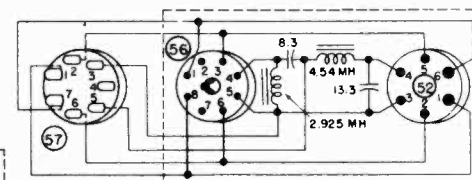
- POSITION
- 1. CABINET SPEAKERS
  - 2. CABINET AND EXTERNAL SPEAKERS
  - 3. EXTERNAL SPEAKERS

SPEAKER IMPEDANCE  
CABINET SPEAKERS - 15 OHMS  
EXTERNAL SPEAKERS - 3 OHMS

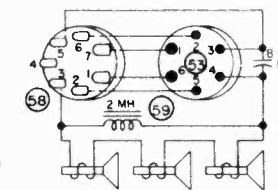


DYNAMIC BASS &  
P M CELLULAR TREBLE  
OR  
P M BASS &  
DYNAMIC CELLULAR TREBLE  
SPEAKERS

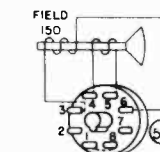
III C	03	6800
III B	03	3300
III A	04	OMIT
MODEL	ITEM	ITEM
	9	22



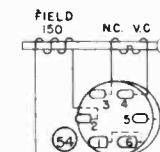
USED IN AMP III A



USED IN AMP III B



CELLULAR TREBLE SPEAKER  
USED IN AMP III A



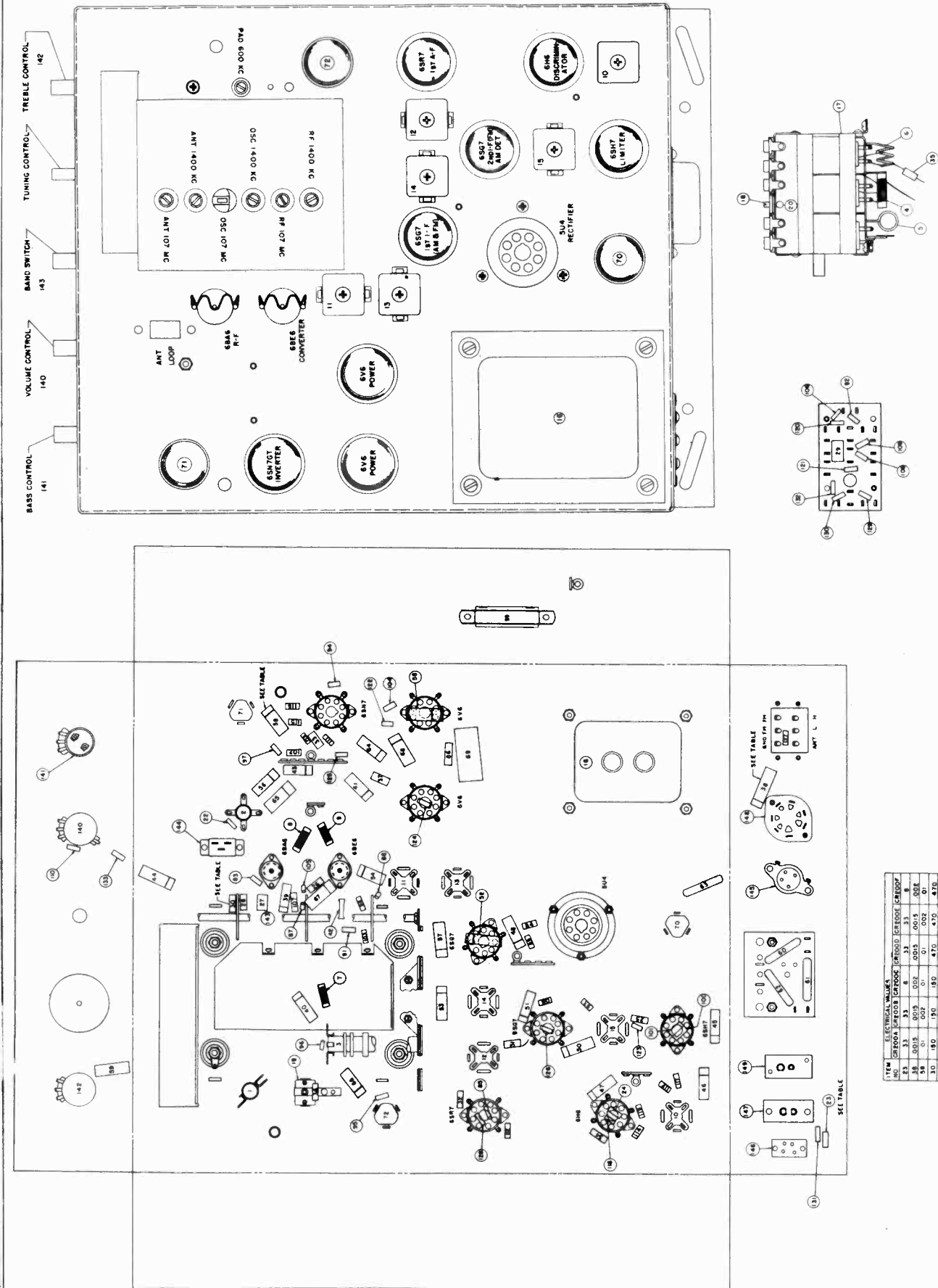
DYNAMIC BASS SPEAKER  
USED IN AMP III A & III B

NOTE - VOICE COIL CONNECTIONS TO SPEAKER PLUGS  
ARE THE SAME FOR PM OR DYNAMIC SPEAKERS  
JUMPER BETWEEN 1B & AND 1B6 OMITTED  
WITH PM SPEAKERS.

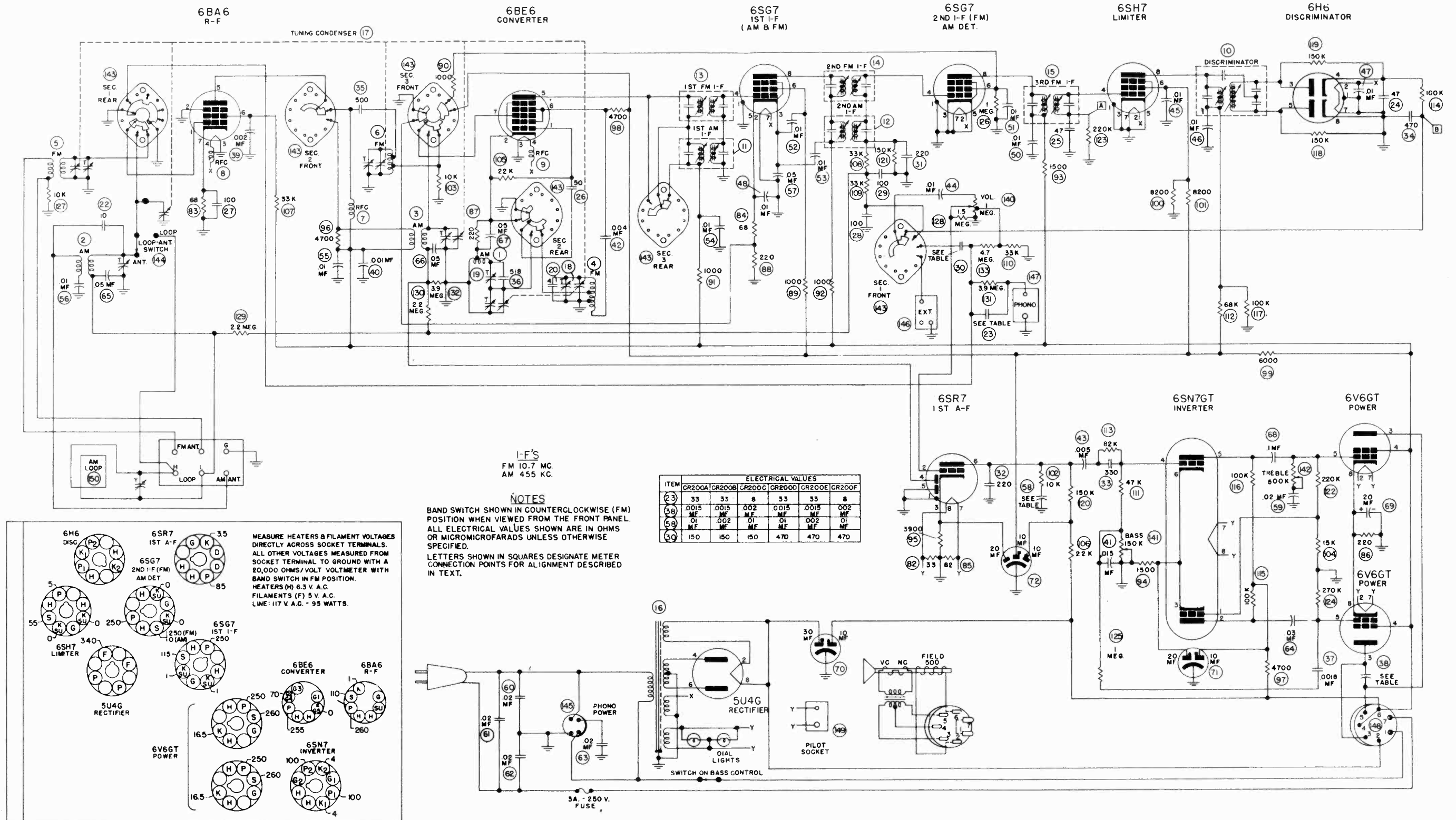
**PARTS LIST**

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Capacitor, molded mica, 15 mmf.	250159G93
2	Capacitor, molded mica, 15 mmf.	250159G93
3	Capacitor, paper, .005 mfd, 600 V.	250152G41
4	Capacitor, paper, .01 mfd, 600 V.	250129G2
5	Capacitor, paper, .01 mfd, 600 V.	250129G2
6	Capacitor, paper, .02 mfd, 600 V.	250129G3
7	Capacitor, paper, .02 mfd, 600 V.	250129G3
8	Capacitor, paper, .02 mfd, 600 V.	250129G3
9	Capacitor, paper, .03 mfd, 400 V, (AMP-111B and C only)	250152G25
10	Capacitor, electrolytic, 30-10 mfd, 475 V.	270023G2
11	Capacitor, electrolytic, 30-10 mfd, 475 V.	270023G2
12	Capacitor, electrolytic, 30-10 mfd, 475 V.	270023G2
20	Resistor, composition, 220 ohms, 1/2 W.	230084G9
21	Resistor, composition, 220 ohms, 1/2 W.	230084G9
22	Resistor, composition, 3900 ohms ± 10%, 1/2 W, (AMP-111B only)	230084G69
	Resistor, composition, 6800 ohms ± 10%, 1/2 W, (AMP-111C only)	230084G72
23	Resistor, wire wound, 80-650-900 ohms, 10 W.	240039G1
24	Resistor, composition, 10,000 ohms, 1/2 W.	230084G19
25	Resistor, composition, 10,000 ohms, 1/2 W.	230084G19
26	Resistor, composition, 100,000 ohms ± 10%, 1/2 W.	230084G86
27	Resistor, composition, 100,000 ohms, 1 W.	230085G25
28	Resistor, composition, 100,000 ohms, 1 W.	230085G25
35	Transformer, input.	320021G1
36	Transformer, output.	330028G1
37	Transformer, power, 117 V, 50-60 cycle.	300042G1
40	Cable and plug assembly.	460634G1
41	Socket, speaker connection.	180504G16
42	Socket, speaker switch.	180504G6
43	Socket, AC power connection.	180428G1
44	Socket, phonograph motor connection.	180501G5
45	Socket, 6-volt outlet.	189788G2
46	Terminal board—external speaker connection.	209601G2
51	Filter assembly, (AMP-111A only).	350041G1
52	Socket, 15" speaker connection to filter, (AMP-111A only).	180504G2
53	Socket, 15" speaker to tweeters, (AMP-111B only).	180504G2
54	Plug, 15" speaker.	180503G3
55	Plug, tweeter, (AMP-111A only).	180503G5
56	Socket, octal, (AMP-111A only).	180194G4
57	Plug, filter to amplifier connection, (AMP-111A only).	180503G4
58	Plug, tweeter to amplifier connection, (AMP-111B only).	180503G4
59	Coil, choke, A. F., (AMP-111B only).	350042G1
60	Capacitor, paper, 8 mfd, 100 V. (AMP-111B only).	250167G1

**EXTENSION SPEAKER**—Two screw terminals are provided on the rear of the amplifier chassis for the connection of an extension speaker line. No. 582888 12-inch permanent-magnet extension speakers are available through all authorized Magnavox dealers.



THE MAGNAVOX CO.



Models CR-200A, CR-200B and CR-200C are alike except for circuit variations to provide correct response in each of three different cabinets. In later production of the CR-200 series chassis, CR-200A, B and C were replaced by CR-200D, E and F respectively that incorporate a circuit change to provide increased bass response at low volume settings in

phonograph position. These circuit variations are all shown in the table on the schematic diagram, Figure 2.

CR-200A/D chassis is incorporated in the Model 240 Traditional, CR-200B/E in the Model 235 Chairside and CR-200C/F in the Model 239 Mayfair.

**ALIGNMENT PROCEDURE**

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

**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 40 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. Connect signal generator through .00025 mfd. capacitor to antenna and ground terminals on antenna terminal strip on rear of chassis. Be sure "Ant-loop" switch on top of the chassis is in the ANT. position. Connect output meter as for AM i-f alignment.
2. Tune signal generator to 1400 kc.
3. Set dial to 1400 kc. and adjust oscillator, r-f and antenna trimmers to maximum output on meter.
4. Set signal generator to 600 kc. and tune radio to signal. Adjust the 600 kc. padder to maximum output while simultaneously rocking the dial.
5. 1400 kc. calibration should then be checked and re-adjusted if necessary with the 1400 kc. oscillator trimmer.

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.

**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 serviceman who has a vacuum tube voltmeter or a similar measuring instrument available.

**STAGE GAINS\***

Antenna Post to R-F Grid at:	
600 kc. ....	6.60
98 mc. ....	1.15
R-F Grid to Converter Grid at:	
600 kc. ....	17.8
98 mc. ....	9.4
R-F on Converter Grid to 455 kc. or I-F Grid at:	
600 kc. ....	6.9
98 mc. ....	3.2
I-F on Converter Grid to 1st I-F Grid at:	
455 kc. (gang closed).....	8.8
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 1.25V. as measured by a high resistance AC voltmeter across the voice coil of the speaker.  
\*\*Detector Plate on AM.  
\*\*\*0.1 watt speaker output at 400 cycles is equivalent to a reading of 0.55 volts as measured by a high resistance AC voltmeter across the voice coil of speaker.

**SPECIFICATIONS**

Power supply .....	117 volts 50/60 cycles AC
Power consumption.....	95 watts
Power output .....	10 watts
Intermediate frequency .....	455 kc./10.7 mc.
Tuning frequency range:	
Broadcast Band .....	540-1620 kc.
FM Band .....	88-108 mc.
Tubes:	
R-F Amplifier .....	6BA6
Converter .....	6BE6
1st I-F Amplifier (AM-FM).....	6SG7
2nd I-F (FM), Detector and AVC (AM).....	6SG7
Limiter .....	6SH7
Discriminator .....	6H6
First Audio .....	6SR7
Inverter .....	6SN7GT
Power output (push-pull stage).....	(2) 6V6GT
Rectifier .....	5U4G
Dial Lamps .....	Mazda No. 44
Speaker:	
Field coil resistance.....	500 ohms
Voice coil impedance (400 cycles).....	3.0 ohms
Output transformer .....	8,000/3 ohms

## DIAL CORD REPLACEMENT

Two separate drive cables are used in the CR-200 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 19½ inches end to end excluding spring.

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

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

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

## PARTS LIST

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil assembly, oscillator (AM) .....	360318G1
2	Coil assembly, antenna (AM) .....	360320G1
3	Coil assembly, r-f (AM) .....	360319G1
4	Coil assembly, oscillator (FM) .....	360323G1
5	Coil assembly, antenna (FM) .....	360321G2
6	Coil assembly, r-f (FM) .....	360322G2
7	Coil, choke .....	360284G1
8	Coil, choke .....	360264G1
9	Coil, choke .....	360264G1
10	Transformer, discriminator .....	360317G1
11	Transformer, first i-f .....	360315G1
12	Transformer, i-f (2nd AM) .....	360315G2
13	Transformer, i-f (FM) .....	360316G1
14	Transformer, i-f (FM) .....	360316G1
15	Transformer, i-f (FM) .....	360316G1
16	Transformer, power .....	300041G1
17	Capacitor, variable, three-gang tuning .....	260089G1
18	Capacitor, variable trimmer .....	260067G1
19	Capacitor, variable trimmer .....	250046G1
20	Capacitor, ceramic, 4 mmf .....	250088G28
22	Capacitor, composition, 10 mmf .....	250164G3
23	Capacitor, composition, 33 mmf—CR-200A, B, D & E .....	250164G4
	Capacitor, composition, 8 mmf—CR-200C & F .....	250164G1
24	Capacitor, mica, 47 mmf .....	250159G96
25	Capacitor, mica, 47 mmf .....	250159G96
26	Capacitor, ceramic, 50 mmf, ± 10% .....	250088G39



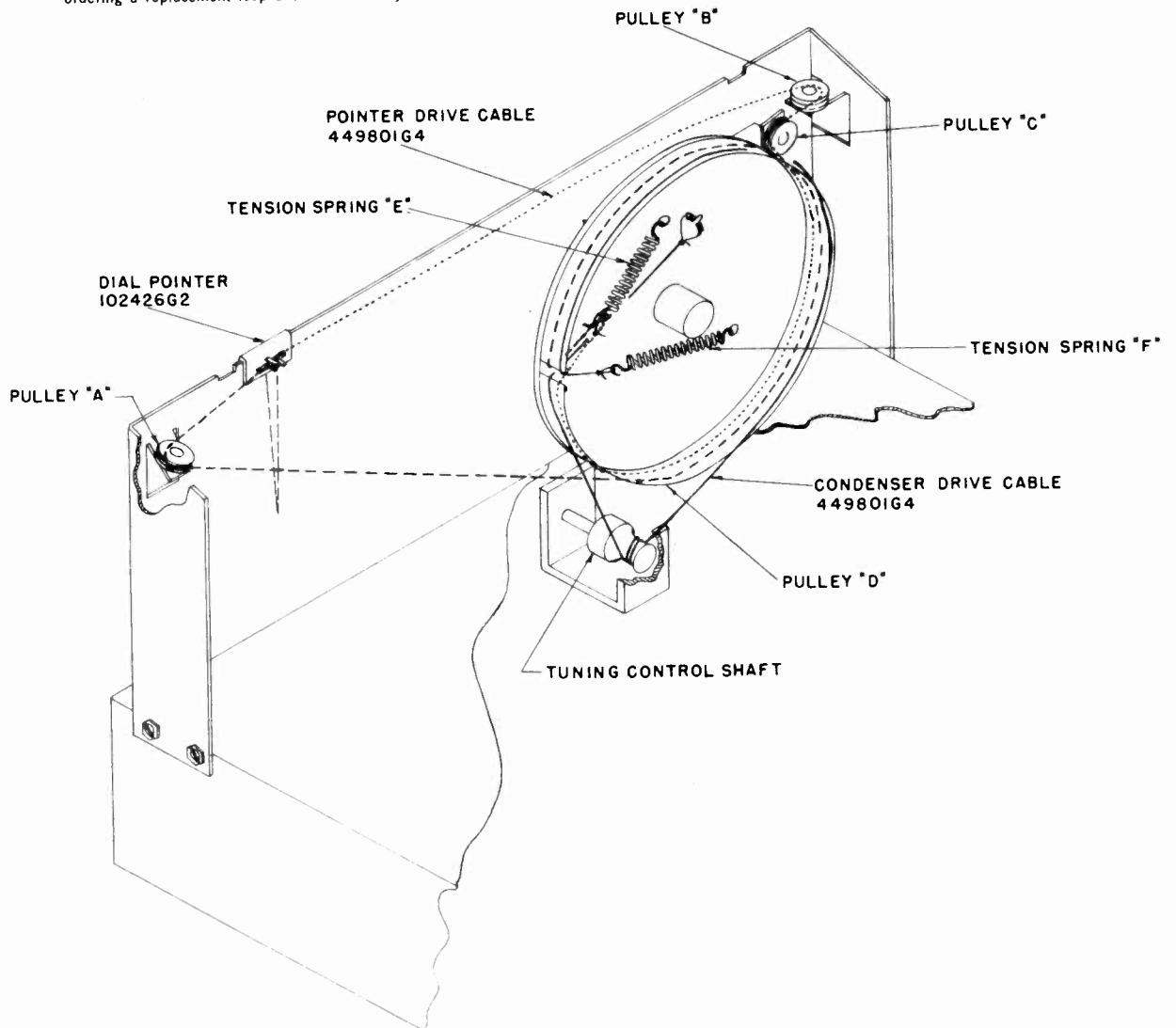
REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.			
27	Capacitor, mica, 100 mmf.	250159G98	Capacitor, paper, .1 mfd. 400 V.	250152G22	230084G22
28	Capacitor, mica, 100 mmf.	250159G98	Capacitor, electrolytic, 20 mfd. 25 V.	270027G2	270027G2
29	Capacitor, mica, 100 mmf.	250159G98	Capacitor, electrolytic, 10 mfd. 475 V. — 30 mfd. 475 V.	270023G2	270023G2
30	Capacitor, mica, 150 mmf. ± 10%—CR-200A, B & C	250159G84	Capacitor, electrolytic, 10 mfd. 450 V. — 20 mfd. 20 V.	270023G6	270023G6
31	Capacitor, mica, 470 mmf. ± 10%—CR-200A, B & C	250159G90	Capacitor, electrolytic, 10 mfd. 450 V. — 10 mfd. 450 V. — 20 mfd. 25 V	270023G7	270023G7
32	Capacitor, mica, 220 mmf.	250159G100	Resistor, composition, 33 ohms, ½ W.	230084G4	230084G4
33	Capacitor, mica, 330 mmf. ± 10%	250159G88	Resistor, composition, 68 ohms, ½ W.	230084G6	230084G6
34	Capacitor, mica, 470 mmf.	250159G102	Resistor, composition, 68 ohms, ½ W.	230084G6	230084G6
35	Capacitor, ceramic, 500 mmf.	250088G31	Resistor, composition, 82 ohms, ± 10%, ½ W.	230084G9	230084G9
36	Capacitor, silver mica, 518 mmf. ± 1%.	250085G35	Resistor, composition, 220 ohms, 2 W.	230084G9	230084G9
37	Capacitor, mica, 1800 mmf. ± 5%.	250160G44	Resistor, composition, 220 ohms, ½ W.	230084G9	230084G9
38	Capacitor, paper, .0015 mfd. ± 10%, 600 V — CR-200A, B, D & E	250169G1	Resistor, composition, 1000 ohms, ½ W.	230084G13	230084G13
39	Capacitor, paper, .002 mfd. ± 10%, 600 V — CR-200C & F	250169G2	Resistor, composition, 1000 ohms, ½ W.	230084G13	230084G13
40	Capacitor, paper, .001 mfd. 600 V.	250152G44	Resistor, composition, 1000 ohms, ½ W.	230084G13	230084G13
41	Capacitor, paper, .015 mfd. ± 10%, 200 V.	250169G5	Resistor, composition, 1500 ohms, ½ W.	230084G14	230084G14
42	Capacitor, ceramic, .004 mfd.	250088G34	Resistor, composition, 1500 ohms, ½ W.	230084G14	230084G14
43	Capacitor, paper, .005 mfd. 600 V.	250152G41	Resistor, composition, 1500 ohms, ½ W.	230084G14	230084G14
44	Capacitor, paper, .01 mfd. 200 V.	250152G18	Resistor, composition, 1500 ohms, ½ W.	230084G14	230084G14
45	Capacitor, paper, .01 mfd. 200 V.	250152G18	Resistor, composition, 1500 ohms, ½ W.	230084G14	230084G14
46	Capacitor, paper, .01 mfd. 200 V.	250152G18	Resistor, composition, 1500 ohms, ½ W.	230084G14	230084G14
47	Capacitor, paper, .01 mfd. 200 V.	250152G18	Resistor, composition, 1500 ohms, ½ W.	230084G14	230084G14
48	Capacitor, paper, .01 mfd. 200 V.	250152G18	Resistor, composition, 1500 ohms, ½ W.	230084G14	230084G14
49	Capacitor, paper, .01 mfd. 400 V.	250152G27	Resistor, composition, 3900 ohms, ± 10%, ½ W.	230084G69	230084G69
50	Capacitor, paper, .01 mfd. 400 V.	250152G27	Resistor, composition, 4700 ohms, ½ W.	230084G17	230084G17
51	Capacitor, paper, .01 mfd. 400 V.	250152G27	Resistor, composition, 4700 ohms, ½ W.	230084G17	230084G17
52	Capacitor, paper, .01 mfd. 400 V.	250152G27	Resistor, composition, 4700 ohms, ½ W.	230084G17	230084G17
53	Capacitor, paper, .01 mfd. 400 V.	250152G27	Resistor, composition, 4700 ohms, ½ W.	230084G17	230084G17
54	Capacitor, paper, .01 mfd. 400 V.	250152G27	Resistor, composition, 4700 ohms, ½ W.	230084G17	230084G17
55	Capacitor, paper, .01 mfd. 400 V.	250152G27	Resistor, wire wound, 6000 ohms, ± 10%, 7.5 W.	240035G6	240035G6
56	Capacitor, paper, .01 mfd. 400 V.	250152G27	Resistor, composition, 8200 ohms, ± 10%, 1 W.	230085G73	230085G73
57	Capacitor, paper, .05 mfd. 200 V.	250152G15	Resistor, composition, 8200 ohms, ± 10%, 1 W.	230085G73	230085G73
58	Capacitor, paper, .002 mfd. ± 10%, 600 V. — CR-200A, C, D & F	250169G2	Resistor, composition, 8200 ohms, ± 10%, 1 W.	230085G73	230085G73
59	Capacitor, paper, .02 mfd. 200 V.	250152G17	Resistor, composition, 10,000 ohms, 1 W.	230085G19	230085G19
60	Capacitor, paper, .02 mfd. 600 V.	250129G3	Resistor, composition, 10,000 ohms, ½ W.	230084G19	230084G19
61	Capacitor, paper, .02 mfd. 600 V.	250129G3	Resistor, composition, 10,000 ohms, ± 5%, ½ W.	230084G18	230084G18
62	Capacitor, paper, .02 mfd. 600 V.	250129G3	Resistor, composition, 22,000 ohms, ½ W.	230084G21	230084G21
63	Capacitor, paper, .02 mfd. 600 V.	250129G3	Resistor, composition, 22,000 ohms, ½ W.	230084G21	230084G21
64	Capacitor, paper, .03 mfd. 400 V.	250152G25	Resistor, composition, 33,000 ohms, ½ W.	230085G22	230085G22
65	Capacitor, paper, .05 mfd. 200 V.	250152G15	Resistor, composition, 33,000 ohms, ½ W.	230084G22	230084G22
66	Capacitor, paper, .05 mfd. 200 V.	250152G15	Resistor, composition, 33,000 ohms, ½ W.	230084G22	230084G22
67	Capacitor, paper, .05 mfd. 200 V.	250152G15	Resistor, composition, 33,000 ohms, ½ W.	230084G22	230084G22
			Resistor, composition, 33,000 ohms, ½ W.	230084G22	230084G22
			Resistor, composition, 47,000 ohms, ½ W.	230084G23	230084G23
			Resistor, composition, 68,000 ohms, ± 10%, ½ W.	230084G84	230084G84
			Resistor, composition, 82,000 ohms, ± 10%, ½ W.	230084G85	230084G85
			Resistor, composition, 100,000 ohms, ± 10%, ½ W.	230084G86	230084G86
			Resistor, composition, 100,000 ohms, ½ W.	230084G25	230084G25
			Resistor, composition, 100,000 ohms, ½ W.	230084G25	230084G25
			Resistor, composition, 100,000 ohms, ½ W.	230084G25	230084G25
			Resistor, composition, 150,000 ohms, ± 10%, ½ W.	230084G88	230084G88
			Resistor, composition, 150,000 ohms, ± 10%, ½ W.	230084G88	230084G88
			Resistor, composition, 150,000 ohms, ½ W.	230084G26	230084G26
			Resistor, composition, 150,000 ohms, ½ W.	230084G26	230084G26

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122	Resistor, composition, 220,000 ohms, ± 5%, ½ W.	230084G215
123	Resistor, composition, 220,000 ohms, ½ W.	230084G27
124	Resistor, composition, 270,000 ohms, ± 10%, ½ W.	230084G91
125	Resistor, composition, 1 megohm, ± 5%, ½ W.	230084G231
126	Resistor, composition, 1 megohm, ½ W.	230084G31
127	Resistor, composition, 10,000 ohms, ½ W.	230084G19
128	Resistor, composition, 1.5 megohm, ½ W.	230084G32
129	Resistor, composition, 2.2 megohm, ½ W.	230084G33
130	Resistor, composition, 2.2 megohm, ½ W.	230084G33
131	Resistor, composition, 3.9 megohm, ± 10%, ½ W.	230084G105
132	Resistor, composition, 3.9 megohm, ± 10%, ½ W.	230084G105
133	Resistor, composition, 4.7 megohm, ± 10%, ½ W.	230084G106
140	Potentiometer, volume control	220074G1
141	Potentiometer, bass control, with switch	220073G5
142	Potentiometer, treble control	220072G8
143	Switch, band selector	160182G1
144	Switch, loop-ant	160176G1
145	Socket, motor	180501G5
146	Socket, input, FM	180060G1
147	Socket, phonograph input	189741G1
148	Socket, speaker	180504G16
149	Socket, 6-volt	189788G2
150	Antenna loop assembly	*

\*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.



## ALIGNMENT PROCEDURE

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

### AM ALIGNMENT

#### I-F ALIGNMENT

1. Set treble control to SHARP TUNE position. Set volume and bass controls to maximum, the Band Switch to Broadcast position, and dial pointer to 1000 kc.
2. Tune the signal generator to EXACTLY 455 kc.
3. Connect output of modulated signal generator to the signal grid of the 6SB7Y (pin 8) through a .01 mfd. capacitor and signal generator ground to radio chassis.
4. All i-f transformers on this chassis are slug-tuned. Both slug adjustments for 455 kc. are located on top of the transformers; the 10.7 mc. adjustments are accessible on the bottom.
5. Connect output meter across voice coil of 12-inch speaker and peak in order the third, second and first i-f transformers.

### ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Connect 455 kc. sweep generator having approximately 40 kc. sweep to signal grid of 6SB7Y (pin 8) through a .01 mfd. capacitor. Connect an oscilloscope through a 1 megohm isolating resistor across the 220,000 ohm diode load resistor. Align for best possible peak in sharp tune position and symmetry in full range position.

### BROADCAST BAND R-F ALIGNMENT

1. Connect signal generator through .00025 mfd. capacitor to antenna and ground terminals on antenna terminal strip on rear of chassis. Be sure "Ant-loop" switch on top of the chassis is in the ANT. position. Connect output meter as for AM i-f alignment.
2. Tune signal generator to 1400 kc.
3. Set dial to 1400 kc. and adjust oscillator, r-f and antenna trimmers for maximum indication on meter.
4. Set signal generator to 600 kc. and tune radio to signal. Adjust the 600 kc. padder to maximum output while simultaneously rocking the gang.
5. 1400 kc. calibration should then be checked and re-adjusted if necessary with the 1400 kc. oscillator trimmer.

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

### SHORT WAVE BAND R-F ALIGNMENT

1. Set the Band Switch to Short Wave and replace the .00025 mfd. capacitor in series with the signal generator lead to the antenna terminal, with a 400-ohm resistor.
2. Set the signal generator and the receiver to 15 mc. and adjust the oscillator, r-f and antenna trimmers for maximum indication on the meter. While adjusting the 15 mc. oscillator trimmer, two peaks may be observed; only one is the correct peak for 15 mc. alignment. To obtain the correct peak, screw trimmer in to maximum capacitance, then decrease until the first peak is observed. This is the correct one.

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

### FM ALIGNMENT

#### DISCRIMINATOR ALIGNMENT

1. Tune signal generator to EXACTLY 10.775 mc. and connect to pin 4 of the 6SH7 limiter tube socket through a .01 mfd. capacitor.
2. Connect a DC vacuum tube voltmeter from Pin 4 on 6H6 tube socket to ground through a 1 megohm isolating resistor.
3. Peak both discriminator slugs at 10.775 mc.
4. Retune signal generator to exactly 10.7 mc. and adjust bottom slug for zero volts.
5. The DC voltage at 10.625 mc. should be within 10% of the voltage at 10.775 mc. and of opposite polarity.

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

### I-F ALIGNMENT

1. Connect high side of signal generator, through a

## THE MAGNAVOX CO.

MODELS CR-202 SERIES

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

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

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

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

### ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

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

### R-F ALIGNMENT

1. Connect vacuum tube voltmeter across limiter grid resistor as in FM I-F alignment. Adjust signal generator output until a reading of at least 3 volts is obtained.
2. Ground one side of the FM Antenna by placing a wire jumper from one FM connection on the antenna terminal strip to the ground connection.
3. Connect unmodulated signal generator through a 300 ohm resistor to ungrounded antenna post and chassis, and tune signal generator to 107 mc.
4. Set radio dial to 107 mc. and tune oscillator trimmer to peak output on vacuum tube voltmeter.
5. Tune 107 mc. r-f and antenna trimmers for maximum indication on voltmeter—it may be necessary to rock the gang while adjusting the r-f trimmer.

#### STAGE GAINS\*

Antenna Post to R-F Grid at:	
600 kc. ....	5.8
6.5 mc. ....	2.9
98 mc. ....	1.0
R-F Grid to Converter Grid at:	
600 kc. ....	11.6
6.5 mc. ....	9.5
98 mc. ....	6.8

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

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

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

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

#### AUDIO GAIN

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

.015 volt with Amplifier AMP 109  
with Band Selector Switch in BDCST setting.

#### OSCILLATOR OUTPUT VOLTAGE

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

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

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

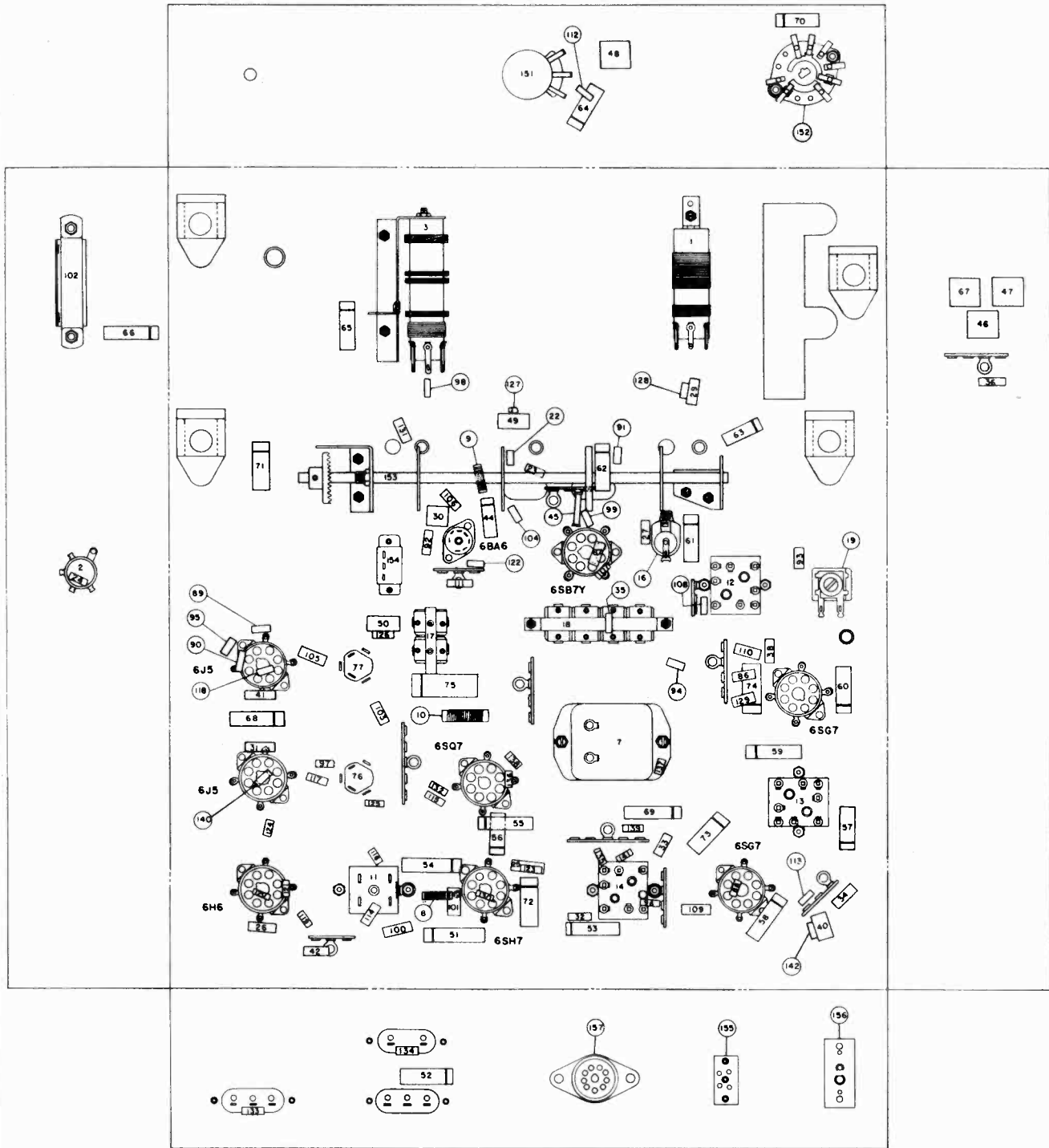
\*Variations of ±20% are permissible. All AM readings made with sufficient input signal to provide 0.5 watt speaker output. 0.5 watt speaker output at 400 cycles is equivalent to a reading of 1.22V. as measured by a high resistance AC voltmeter across the voice coil.

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

### 10 KC. FILTER ADJUSTMENT

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

1. Adjust the treble control switch to the No. 4 setting.
2. Connect the output of an audio oscillator to the phonograph pickup socket on the radio chassis and adjust the oscillator to exactly 10,000 cycles.
3. Set the band selector to PHONO and adjust the 10 kc. trimmer for *minimum* output.
4. If an audio oscillator is not available for making this adjustment set the band selector to BDCST, set the treble control to position 4, connect the antenna to the receiver and set the gang condenser to a point between two stations on adjacent channels having approximately the same power. If the 10 kc. trimmer is out of adjustment, a whistle will be heard. Adjust the trimmer until the whistle is eliminated.



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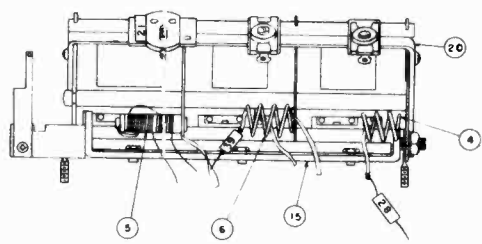
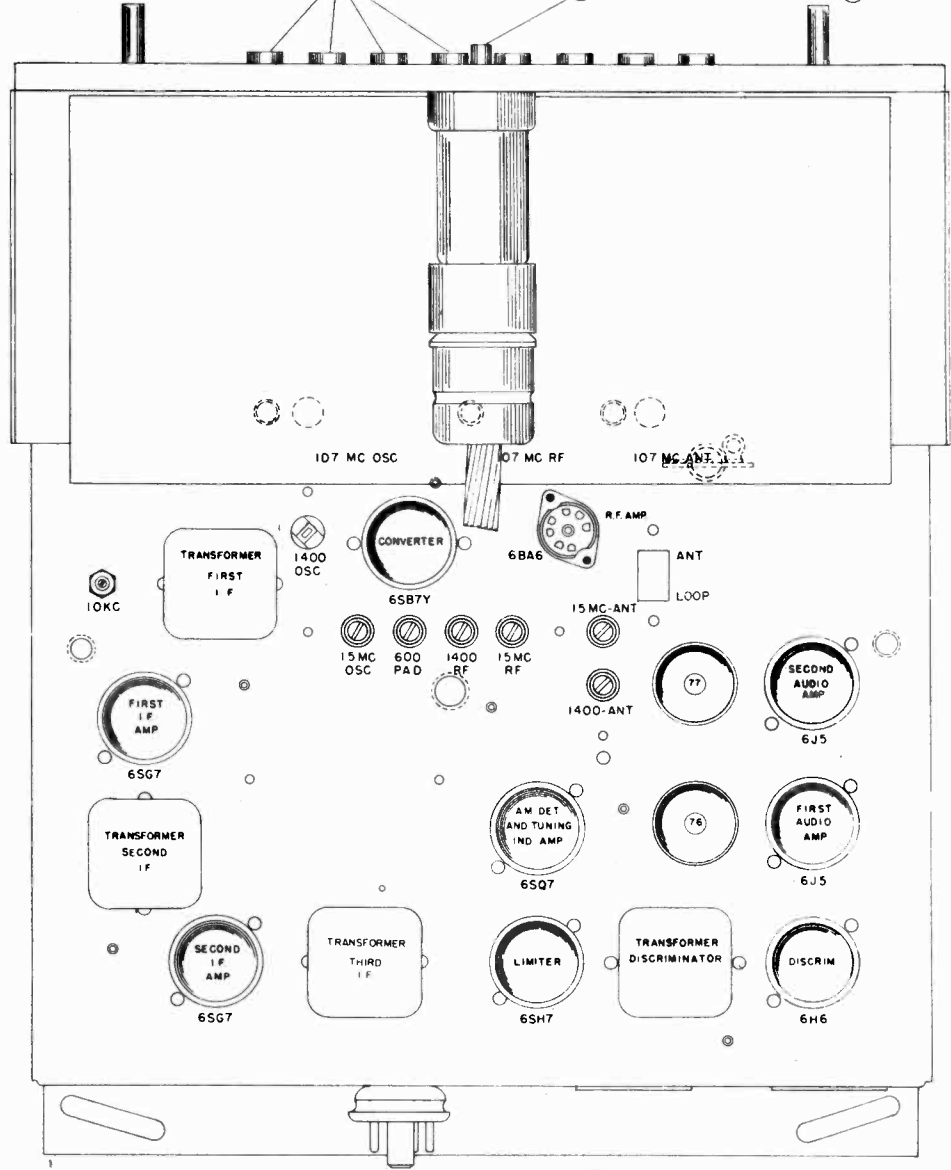
MODELS CR-202 SERIES

(152) UPPER, TUNING CONTROL  
 LOWER, TREBLE CONTROL

AUTOMATIC PUSH BUTTON TUNING

BASS CONTROL (151)

UPPER, VOLUME CONTROL (150)  
 LOWER, BAND SWITCH (153)



ITEM NOS.	ELECT VALUES
GR202A	GR202B
15Z	OMIT 3.3 MEG

## DIAL CORD REPLACEMENT

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

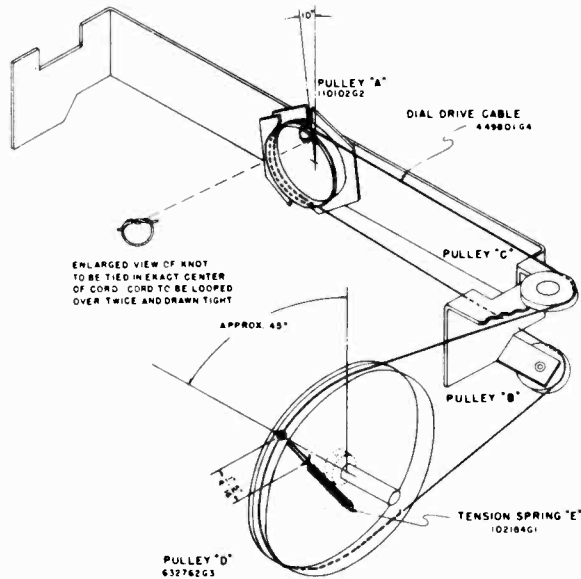


FIGURE 1

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

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

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

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

### Tubes:

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

## CONDENSER GANG DRIVE ADJUSTMENTS

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

hub. Insert a .010" gauge between the Flywheel and the Pin, and while holding the gauge in this position, loosen the set screw in the Flywheel hub that was previously tightened. The Compression Spring should force the Flywheel back against the gauge—when this occurs, tighten both set screws in the Flywheel hub.

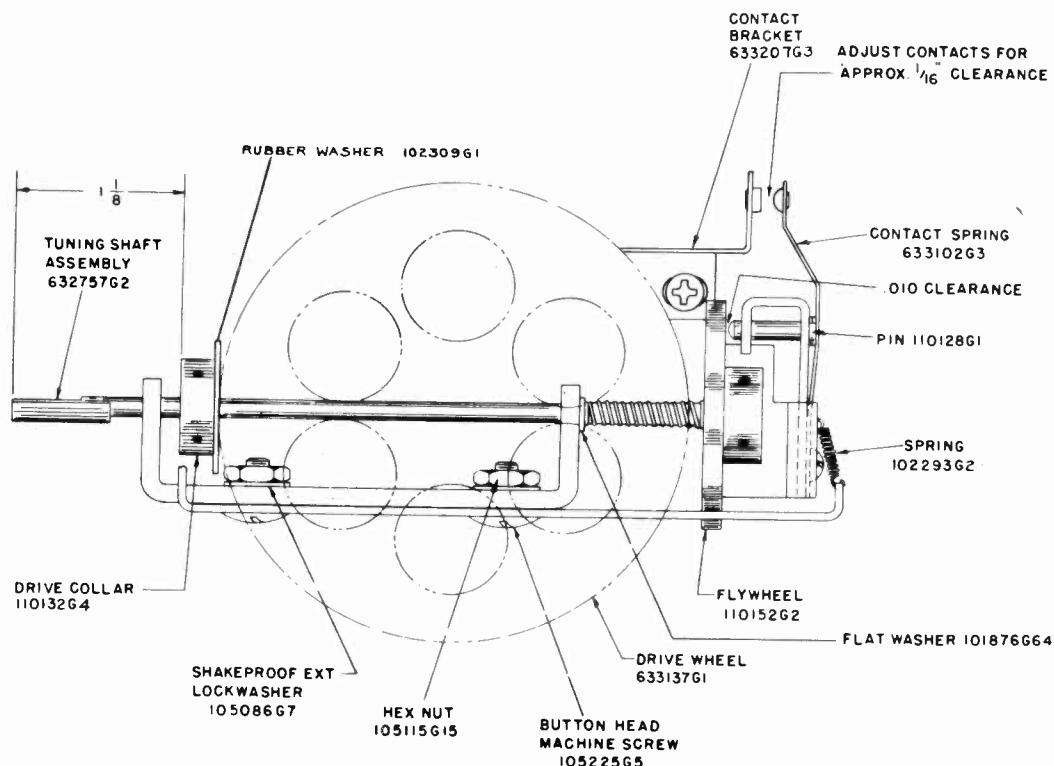


FIGURE 2

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

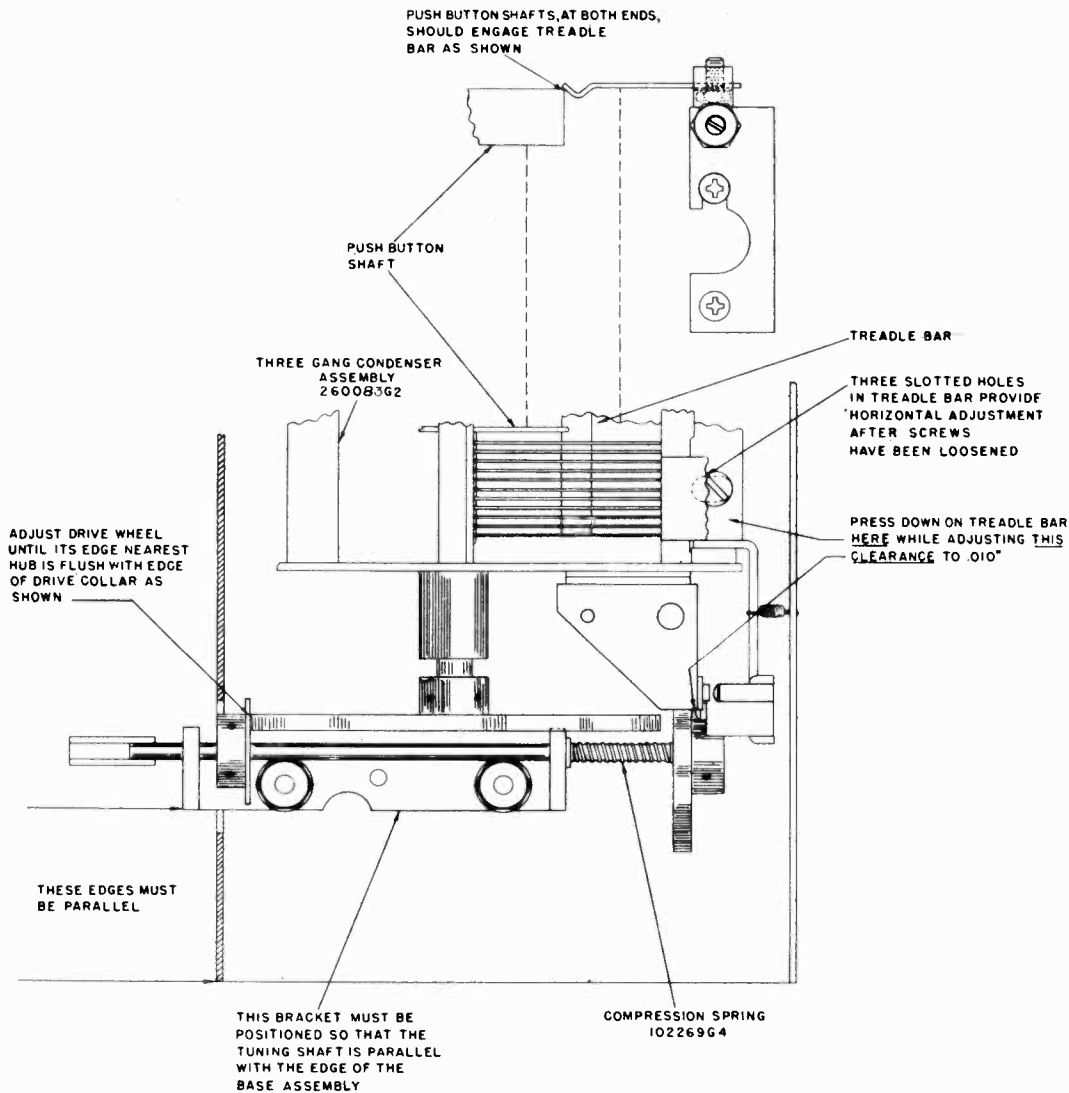
1. Assemble the Tuning Shaft, Drive Collar, Compression Spring and Flywheel in the order shown on Figure 3. The distance between the front of the Drive Collar and the front of the Tuning Shaft must be  $1\frac{1}{8}$  inches as specified on Figure 2. Install the Flywheel on the rear of the Tuning Shaft and slide it forward until it nearly touches the edge of the Drive Wheel; then tighten one of the set screws in the Flywheel.
2. Adjust the Muting Switch contact clearance by loosening the two screws in the Contact Bracket and sliding the bracket in the required direction until a  $1/16$ " clearance is obtained. If this adjustment cannot be obtained in the manner prescribed, bend the Contact Bracket until proper clearance is realized.
3. The Drive Wheel is properly located on its shaft when its edge nearest the hub is in line with the outside edge of the Drive Collar as shown on Fig-

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

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

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





**FIGURE 3**  
**PARTS LIST**

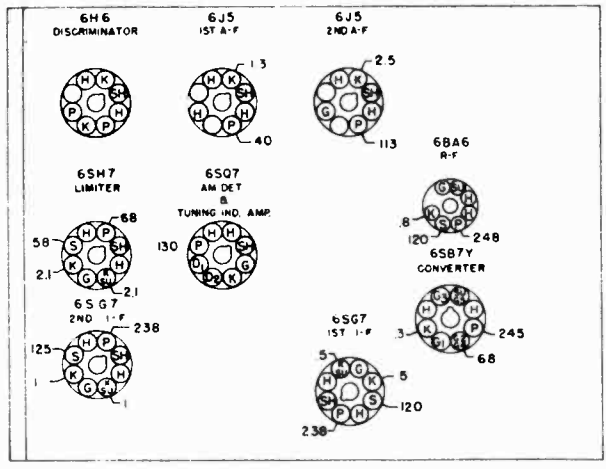
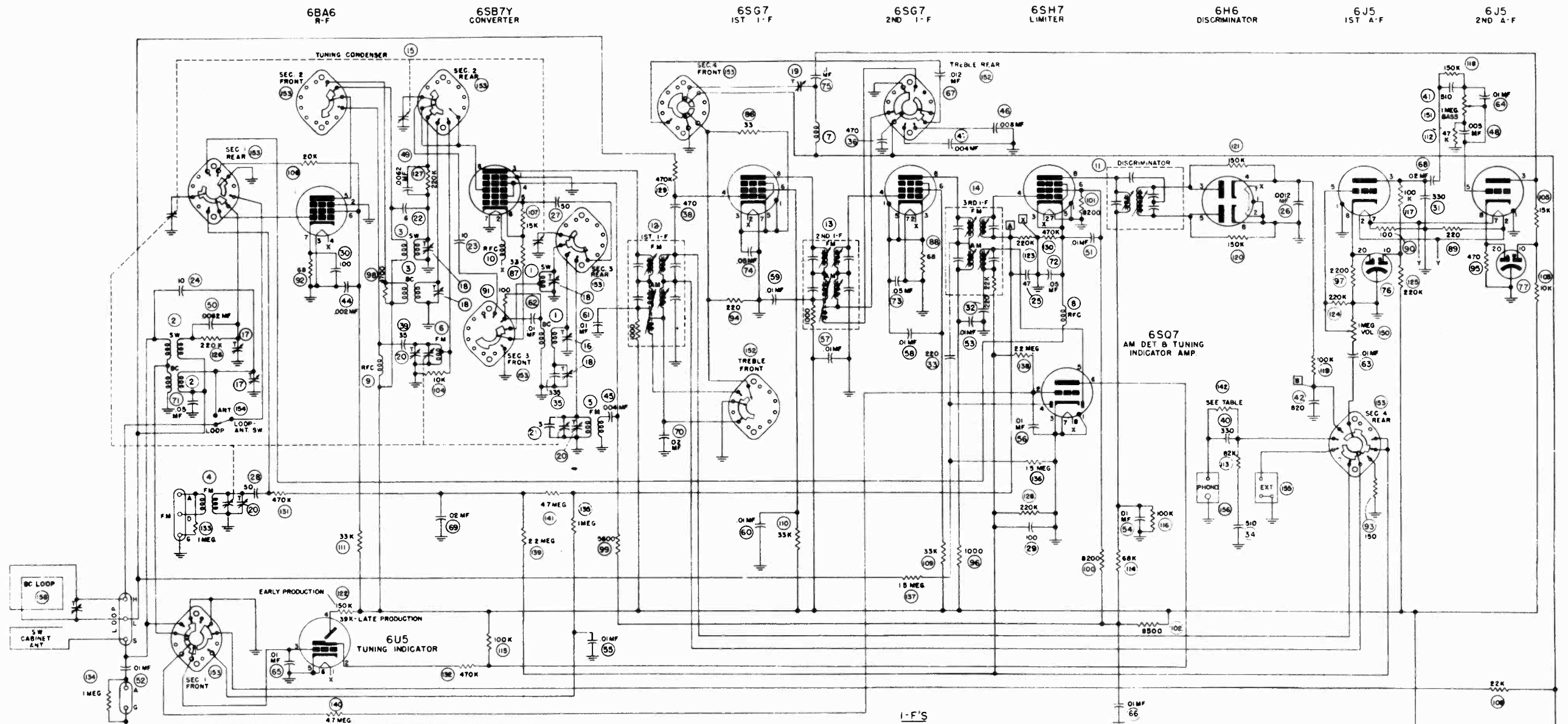
REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil Assembly, oscillator, AM	360298G1
2	Coil Assembly, antenna, AM	360299G1
3	Coil Assembly, r-f, AM	360300G1
4	Coil Assembly, antenna, FM	360296G2
5	Coil Assembly, oscillator, FM	360295G1
6	Coil Assembly, r-f, FM	360297G2
7	Coil Assembly, 10 kc.	360244G1
8	Coil, choke	360284G1
9	Coil, choke	360284G1
10	Coil, filament choke	360264G1
11	Transformer, discriminator	360305G1
12	Transformer, i-f	360285G1
13	Transformer, i-f	360285G1
14	Transformer, limiter	360286G1
15	Capacitor, variable, three-gang tuning	260083G1
16	Capacitor, variable, oscillator trimmer, broadcast	260067G4
17	Capacitor, variable, two-gang trimmer	260080G1
18	Capacitor, variable, four-gang trimmer and oscillator padder	260082G1
19	Capacitor, variable, 10 kc. trimmer	259610G2
20	Capacitor, trimmer assembly	260084G1

## THE MAGNAVOX CO.

MODELS CR-202 SERIES

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
21	Capacitor, ceramic, 3 mmf.	250088G38
22	Capacitor, ceramic and composition, 6 mmf.	250164G2
23	Capacitor, ceramic and composition, 10 mmf.	250164G3
24	Capacitor, ceramic and composition, 10 mmf.	250164G3
25	Capacitor, mica, 47 mmf.	250159G96
26	Capacitor, mica, .0012 mfd, $\pm 10\%$ , 600 V	250169G12
27	Capacitor, ceramic, 50 mmf.	250088G39
28	Capacitor, ceramic, 50 mmf.	250088G39
29	Capacitor, mica, 100 mmf.	250159G98
30	Capacitor, mica, 100 mmf.	250159G98
31	Capacitor, mica, 330 mmf.	250159G101
32	Capacitor, mica, 220 mmf.	250159G100
33	Capacitor, mica, 220 mmf.	250159G100
34	Capacitor, mica, 510 mmf., $\pm 5\%$	250159G64
35	Capacitor, silver mica, 335 mmf., $\pm 1\%$	250085G38
36	Capacitor, mica, 470 mmf.	250159G102
38	Capacitor, mica, 470 mmf.	250159G102
39	Capacitor, ceramic, 35 mmf.	250088G40
40	Capacitor, mica, 330 mmf $\pm 10\%$	250159G88
41	Capacitor, mica, 510 mmf., $\pm 5\%$	250159G64
42	Capacitor, mica, 820 mmf., $\pm 10\%$	250159G132
44	Capacitor, paper, .002 mfd., 600 V.	250152G44
45	Capacitor, ceramic, .004 mfd.	250088G34
46	Capacitor, molded paper, .008 mfd., 600 V.	250129G11
47	Capacitor, molded paper, .004 mfd., 600 V.	250129G7
48	Capacitor, molded paper, .004 mfd., 400 V.	250129G10
49	Capacitor, mica, .0062 mfd., $\pm 5\%$	250161G27
50	Capacitor, mica, .0062 mfd., $\pm 5\%$	250161G27
51	Capacitor, paper, .01 mfd., 400 V.	250152G27
52	Capacitor, paper, .01 mfd., 400 V.	250152G27
53	Capacitor, paper, .01 mfd., 400 V.	250152G27
54	Capacitor, paper, .01 mfd., 400 V.	250152G27
55	Capacitor, paper, .01 mfd., 400 V.	250152G27
56	Capacitor, paper, .01 mfd., 400 V.	250152G27
57	Capacitor, paper, .01 mfd, 400 V.	250152G27
58	Capacitor, paper, .01 mfd., 400 V.	250152G27
59	Capacitor, paper, .01 mfd., 400 V.	250152G27
60	Capacitor, paper, .01 mfd., 400 V.	250152G27
61	Capacitor, paper, .01 mfd., 400 V.	250152G27
62	Capacitor, paper, .01 mfd., 400 V.	250152G27
63	Capacitor, paper, .01 mfd., 400 V.	250152G27
64	Capacitor, paper, .01 mfd., 400 V.	250152G27
65	Capacitor, paper, .01 mfd., 400 V.	250152G27
66	Capacitor, paper, .01 mfd., 400 V.	250152G27
67	Capacitor, molded paper, .012 mfd., 200 V.	250129G13
68	Capacitor, paper, .02 mfd., 400 V.	250152G26
69	Capacitor, paper, .02 mfd., 400 V.	250152G26
70	Capacitor, paper, .02 mfd., 400 V.	250152G26
71	Capacitor, paper, .05 mfd., 200 V.	250152G15
72	Capacitor, paper, .05 mfd., 200 V.	250152G15
73	Capacitor, paper, .05 mfd., 200 V.	250152G15
74	Capacitor, paper, .05 mfd., 200 V.	250152G15
75	Capacitor, paper, .1 mfd., 400 V.	250152G22
76	Capacitor, electrolytic, 10 mfd., 450 V. - 20 mfd., 25 V.	270023G6
77	Capacitor, electrolytic, 10 mfd., 450 V. - 20 mfd., 25 V.	270023G6
86	Resistor, composition, 33 ohms, $\frac{1}{2}$ W.	230084G4
87	Resistor, composition, 33 ohms, $\frac{1}{2}$ W.	230084G4
88	Resistor, composition, 68 ohms, $\frac{1}{2}$ W.	230084G6
89	Resistor, composition, 220 ohms, $\pm 10\%$ , $\frac{1}{2}$ W.	230084G54
90	Resistor, composition, 100 ohms, $\pm 10\%$ , $\frac{1}{2}$ W.	230084G50
91	Resistor, composition, 100 ohms, $\frac{1}{2}$ W.	230084G7
92	Resistor, composition, 68 ohms, $\frac{1}{2}$ W.	230084G6

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
93	Resistor, composition, 150 ohms, $\frac{1}{2}$ W.	230084G8
94	Resistor, composition, 220 ohms, $\frac{1}{2}$ W.	230084G9
95	Resistor, composition, 470 ohms, $\frac{1}{2}$ W.	230084G11
96	Resistor, composition, 1000 ohms, $\frac{1}{2}$ W.	230084G13
97	Resistor, composition, 2200 ohms, $\frac{1}{2}$ W.	230084G15
98	Resistor, composition, 4700 ohms, $\frac{1}{2}$ W.	230084G17
99	Resistor, composition, 5600 ohms, $\pm 10\%$ , $\frac{1}{2}$ W.	230084G71
100	Resistor, composition, 8200 ohms, $\pm 10\%$ , 1 W.	230085G73
101	Resistor, composition, 8200 ohms, $\pm 10\%$ , 1 W.	230085G73
102	Resistor, strip, 8500 ohms	240035G5
103	Resistor, composition, 10,000 ohms, 1 W.	230085G19
104	Resistor, composition, 10,000 ohms, $\frac{1}{2}$ W.	230084G19
105	Resistor, composition, 15,000 ohms, 1 W.	230085G20
106	Resistor, composition, 20,000 ohms, $\pm 5\%$ , 1 W.	230085G190
107	Resistor, composition, 15,000 ohms, $\frac{1}{2}$ W.	230084G20
108	Resistor, composition, 22,000 ohms, $\frac{1}{2}$ W.	230084G21
109	Resistor, composition, 33,000 ohms, 1 W.	230085G22
110	Resistor, composition, 33,000 ohms, 1 W.	230085G22
111	Resistor, composition, 33,000 ohms, $\pm 10\%$ , 2 W.	230086G80
112	Resistor, composition, 47,000 ohms, $\frac{1}{2}$ W.	230084G23
113	Resistor, composition, 82,000 ohm, $\pm \frac{1}{2}$ W.	230084G85
114	Resistor, composition, 68,000 ohms, $\pm 10\%$ , $\frac{1}{2}$ W.	230084G84
115	Resistor, composition, 100,000 ohms, $\frac{1}{2}$ W.	230084G25
116	Resistor, composition, 100,000 ohms, $\frac{1}{2}$ W.	230084G25
117	Resistor, composition, 100,000 ohms, $\frac{1}{2}$ W.	230084G25
118	Resistor, composition, 150,000 ohm, $\frac{1}{2}$ W.	230084G26
119	Resistor, composition, 100,000 ohms, $\pm 10\%$ , $\frac{1}{2}$ W.	230084G86
120	Resistor, composition, 150,000 ohms, $\frac{1}{2}$ W., $\pm 10\%$	230084G88
121	Resistor, composition, 150,000 ohms, $\frac{1}{2}$ W., $\pm 10\%$	230084G88
122	Resistor, composition, 150,000 ohms, $\frac{1}{2}$ W. (EARLY PRODUCTION)	230084G26
	Resistor, composition, 39,000 ohms, $\frac{1}{2}$ W. (LATE PRODUCTION)	230084G81
123	Resistor, composition, 220,000 ohms, $\frac{1}{2}$ W.	230084G27
124	Resistor, composition, 220,000 ohms, $\frac{1}{2}$ W.	230084G27
125	Resistor, composition, 220,000 ohms, $\frac{1}{2}$ W.	230084G27
126	Resistor, composition, 220,000 ohms, $\frac{1}{2}$ W.	230084G27
127	Resistor, composition, 220,000 ohms, $\frac{1}{2}$ W.	230084G27
128	Resistor, composition, 220,000 ohms, $\frac{1}{2}$ W.	230084G27
129	Resistor, composition, 470,000 ohms, $\frac{1}{2}$ W.	230084G29
130	Resistor, composition, 470,000 ohms, $\frac{1}{2}$ W.	230084G29
131	Resistor, composition, 470,000 ohms, $\frac{1}{2}$ W.	230084G29
132	Resistor, composition, 470,000 ohms, $\frac{1}{2}$ W.	230084G29
133	Resistor, composition, 1 megohm, $\frac{1}{2}$ W.	230084G31
134	Resistor, composition, 1 megohm, $\frac{1}{2}$ W.	230084G31
135	Resistor, composition, 1 megohm, $\frac{1}{2}$ W.	230084G31
136	Resistor, composition, 1.5 megohm, $\frac{1}{2}$ W.	230084G32
137	Resistor, composition, 1.5 megohm, $\frac{1}{2}$ W.	230084G32
138	Resistor, composition, 2.2 megohm, $\frac{1}{2}$ W.	230084G33
139	Resistor, composition, 2.2 megohm, $\frac{1}{2}$ W.	230084G33
140	Resistor, composition, 4.7 megohm, $\frac{1}{2}$ W.	230084G35
141	Resistor, composition, 4.7 megohm, $\frac{1}{2}$ W.	230084G35
142	Resistor, composition, 3.9 megohm, $\pm 10\%$ , $\frac{1}{2}$ W. (CR-202 B only)	230084G34
150	Control, volume, 1 megohm	220044G24
151	Control, bass, 1 megohm with switch	220073G6
152	Switch, treble control	160178G1
153	Switch, rotary, band switch	160179G1
154	Switch, slide SPDT	160176G1
155	Socket, external input	180060G1
156	Socket, phonograph input	189741G1
157	Socket, amplifier	180427G2
158	Antenna Loop Assembly	460637G1
	Dial Glass Assembly	150303G1
	Push Button Assembly for Gang	260093G1



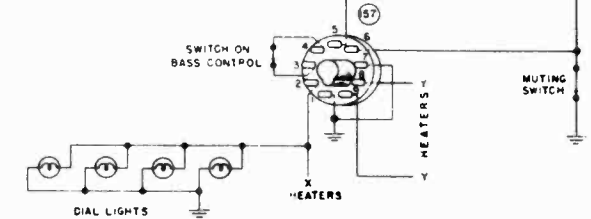
MEASURE HEATER AND FILAMENT VOLTAGES DIRECTLY ACROSS SOCKET TERMINALS. ALL OTHER VOLTAGES MEASURED FROM SOCKET TERMINAL TO GROUND WITH A 20,000 OHMS/VOLT VOLTMETER WITH BAND SWITCH IN SW POSITION. HEATERS (H) 6.3 V. A.C. LINE VOLTAGE 117 V. A.C.

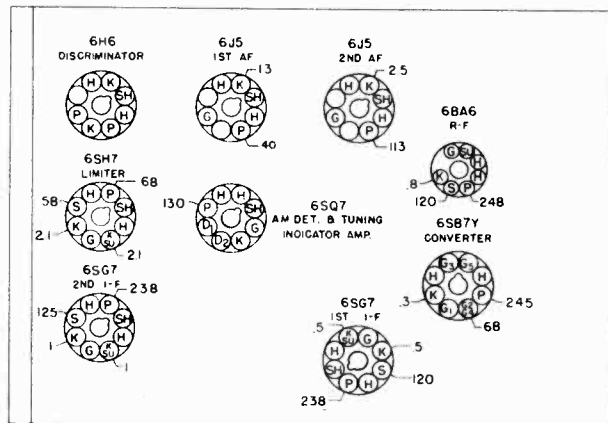
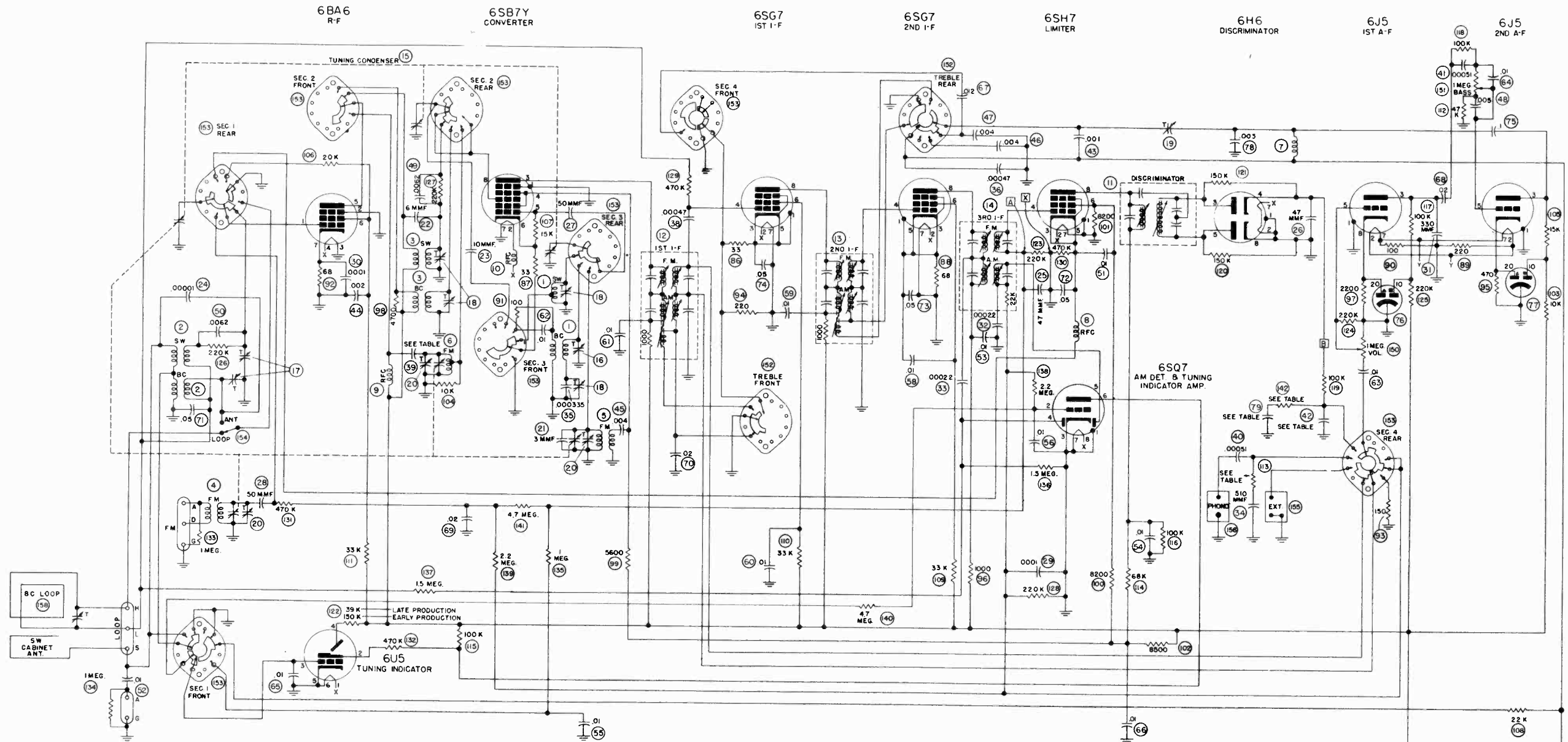
I-F'S  
AM — 455 KC  
FM — 10.7 MC

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

142	0M.T.	33 MEG
17EW	CR202A	CR202B

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



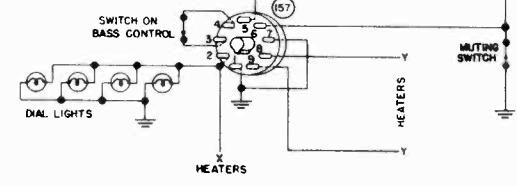


**VOLTAGE TABLE**  
 MEASURE HEATER AND FILAMENT VOLTAGES DIRECTLY ACROSS SOCKET TERMINALS. ALL OTHER VOLTAGES MEASURED FROM SOCKET TERMINAL TO GROUND WITH A 20,000 OHMS/VOLT VOLTMETER WITH BANDSWITCH IN SHORT WAVE POSITION. HEATERS (H) 6.3 VOLTS A.C. LINE VOLTAGE 117 V. A.C.

I-F'S  
 AM 455KC  
 FM 10.7MC

- NOTES**
- BANDSWITCH, ITEM 153, SHOWN IN CLOCKWISE POSITION (BANDSWITCH KNOB IN COUNTERCLOCKWISE POSITION) VIEWED FROM THE FRONT PANEL.
  - ALL ELECTRICAL VALUES SHOWN ARE IN MICROFARADS OR OHMS UNLESS OTHERWISE SPECIFIED.
  - LETTERS SHOWN IN SQUARES DESIGNATE METER CONNECTION POINTS FOR ALIGNMENT AS DESCRIBED IN TEXT.
  - TREBLE SWITCH, ITEM 152, SHOWN IN COUNTERCLOCKWISE POSITION VIEWED FROM THE FRONT PANEL.

CR204C	OMIT	35	0018	002	330K
CR204B	OMIT	500	00082	OMIT	OMIT
CR204A	47K	35	00082	OMIT	OMIT
MODEL	ITEM	ITEM	ITEM	ITEM	ITEM
	113	33	42	79	142



## DIAL CORD REPLACEMENT

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

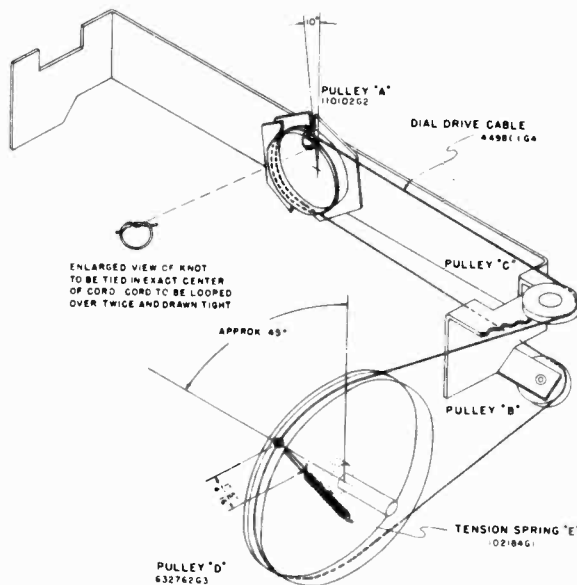


FIGURE 1

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

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

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

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

### Tubes:

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

## ALIGNMENT PROCEDURE

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

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

### AM ALIGNMENT

#### I-F ALIGNMENT

1. Set treble control to SHARP TUNE position. Set volume and bass controls to maximum, the Band Switch to Broadcast position, and dial pointer to 1000 kc.
2. Tune the signal generator to EXACTLY 455 kc.
3. Connect output of modulated signal generator to the signal grid of the 6SB7Y (pin 8) through a .01 mfd. capacitor and signal generator ground to radio chassis.
4. All i-f transformers on this chassis are slug-tuned. Both slug adjustments for 455 kc. are located on top of the transformers; the 10.7 mc. adjustments are accessible on the bottom.
5. Connect output meter across voice coil of 15-inch speaker and peak in order the third, second and first i-f transformers.

#### ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Connect 455 kc. sweep generator having approximately 40 kc. sweep to signal grid of 6SB7Y (pin 8) through a .01 mfd. capacitor. Connect an oscilloscope through a 1 megohm isolating resistor across the 220,000 ohm diode load resistor. Align for best possible peak in sharp tune position and symmetry in full range position.

### BROADCAST BAND

#### R-F ALIGNMENT

1. Connect signal generator through .00025 mfd. capacitor to antenna and ground terminals on antenna terminal strip on rear of chassis. Be sure "Ant-loop" switch on top of the chassis is in the ANT. position. Connect output meter as for AM i-f alignment.
2. Tune signal generator to 1400 kc.
3. Set dial to 1400 kc. and adjust oscillator, r-f and antenna trimmers for maximum indication on meter.
4. Set signal generator to 600 kc. and tune radio to signal. Adjust the 600 kc. padder to maximum output while simultaneously rocking the gang.
5. 1400 kc. calibration should then be checked and re-adjusted if necessary with the 1400 kc. oscillator trimmer.

### SHORT WAVE BAND

#### R-F ALIGNMENT

1. Set the Band Switch to Short Wave and replace the .00025 mfd. capacitor in series with the signal generator lead to the antenna terminal, with a 400-ohm resistor.
2. Set the signal generator and the receiver to 15 mc. and adjust the oscillator, r-f and antenna trimmers for maximum indication on the meter. While adjusting the 15 mc. oscillator trimmer, two peaks may be observed; only one is the correct peak for 15 mc. alignment. To obtain the correct peak, screw trimmer in to maximum capacitance, then decrease until the first peak is observed. This is the correct one.

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

#### FM ALIGNMENT DISCRIMINATOR ALIGNMENT

1. Tune signal generator to EXACTLY 10.775 mc. and connect to pin 4 of the 6SH7 limiter tube socket through a .01 mfd. capacitor.
2. Connect a DC vacuum tube voltmeter from Pin 4 on 6H6 tube socket to ground through a 1 megohm isolating resistor.
3. Peak both discriminator slugs at 10.775 mc.
4. Retune signal generator to exactly 10.7 mc. and adjust bottom slug for zero volts.
5. The DC voltage at 10.625 mc. should be within 10% of the voltage at 10.775 mc. and of opposite polarity.

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

#### I-F ALIGNMENT

1. Connect high side of signal generator, through a .01 mfd. capacitor and a 1000 ohm resistor in series,

to pin 4 of the 6SG7 2nd i-f tube. Connect low side of generator to chassis.

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

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

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

### ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

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

### R-F ALIGNMENT

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

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

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

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

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

### STAGE GAINS\*

Antenna Post to R-F Grid at:

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

R-F Grid to Converter Grid at:

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

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

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

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

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

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

455 kc. ....	20.5
10.7 mc. ....	37

2nd I-F Grid to Limiter Grid at:

10.7 mc. ....	34.5
---------------	------

### AUDIO GAIN

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

.013 volt with Amplifier AMP-111A

.008 volt with Amplifier AMP-111B or C

with Band Switch in BDCST setting.

### OSCILLATOR OUTPUT VOLTAGE

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

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

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

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

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

### 10 KC. FILTER ADJUSTMENT

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

1. Adjust the treble control switch to the No. 4 setting.

2. Connect the output of an audio oscillator to the phonograph pickup socket on the radio chassis and adjust the oscillator to exactly 10,000 cycles.

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

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



## CONDENSER GANG DRIVE ADJUSTMENTS

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

hub. Insert a .010" gauge between the Flywheel and the Pin, and while holding the gauge in this position, loosen the set screw in the Flywheel hub that was previously tightened. The Compression Spring should force the Flywheel back against the gauge—when this occurs, tighten both set screws in the Flywheel hub.

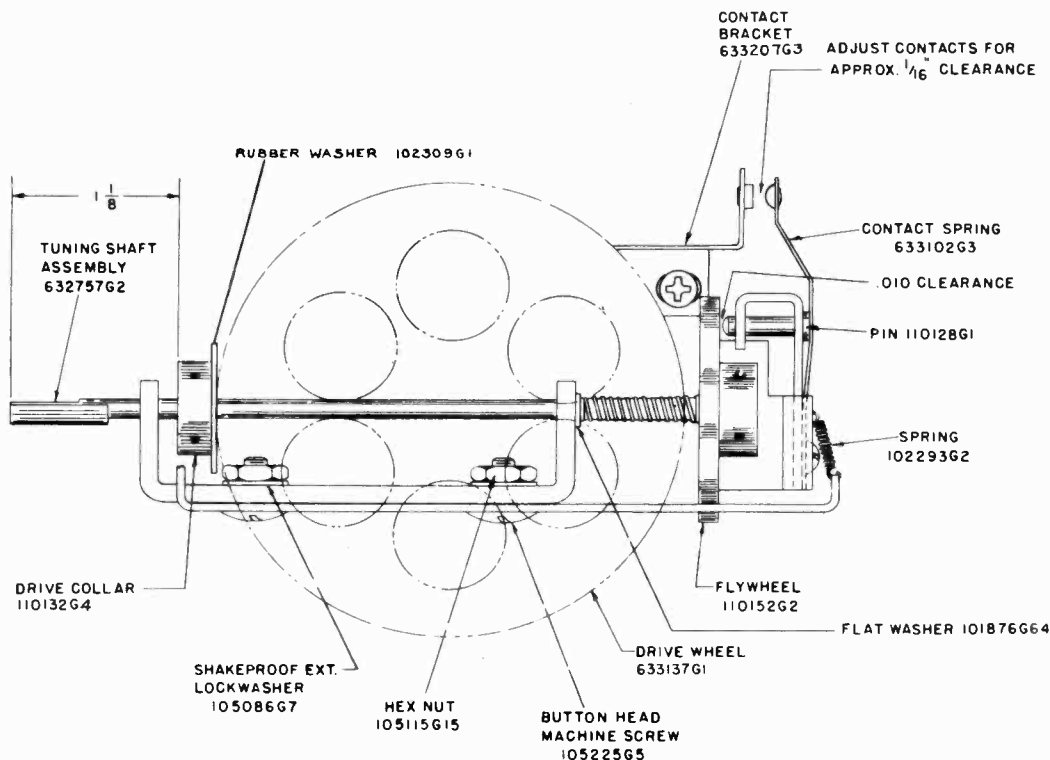


FIGURE 2

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

1. Assemble the Tuning Shaft, Drive Collar, Compression Spring and Flywheel in the order shown on Figure 3. The distance between the front of the Drive Collar and the front of the Tuning Shaft must be  $1\frac{1}{8}$  inches as specified on Figure 2. Install the Flywheel on the rear of the Tuning Shaft and slide it forward until it nearly touches the edge of the Drive Wheel; then tighten one of the set screws in the Flywheel.
2. Adjust the Muting Switch contact clearance by loosening the two screws in the Contact Bracket and sliding the bracket in the required direction until a  $1/16$ " clearance is obtained. If this adjustment cannot be obtained in the manner prescribed, bend the Contact Bracket until proper clearance is realized.
3. The Drive Wheel is properly located on its shaft when its edge nearest the hub is in line with the outside edge of the Drive Collar as shown on Fig-

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

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

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

THE MAGNAVOX CO.

MODELS CR-204 SERIES

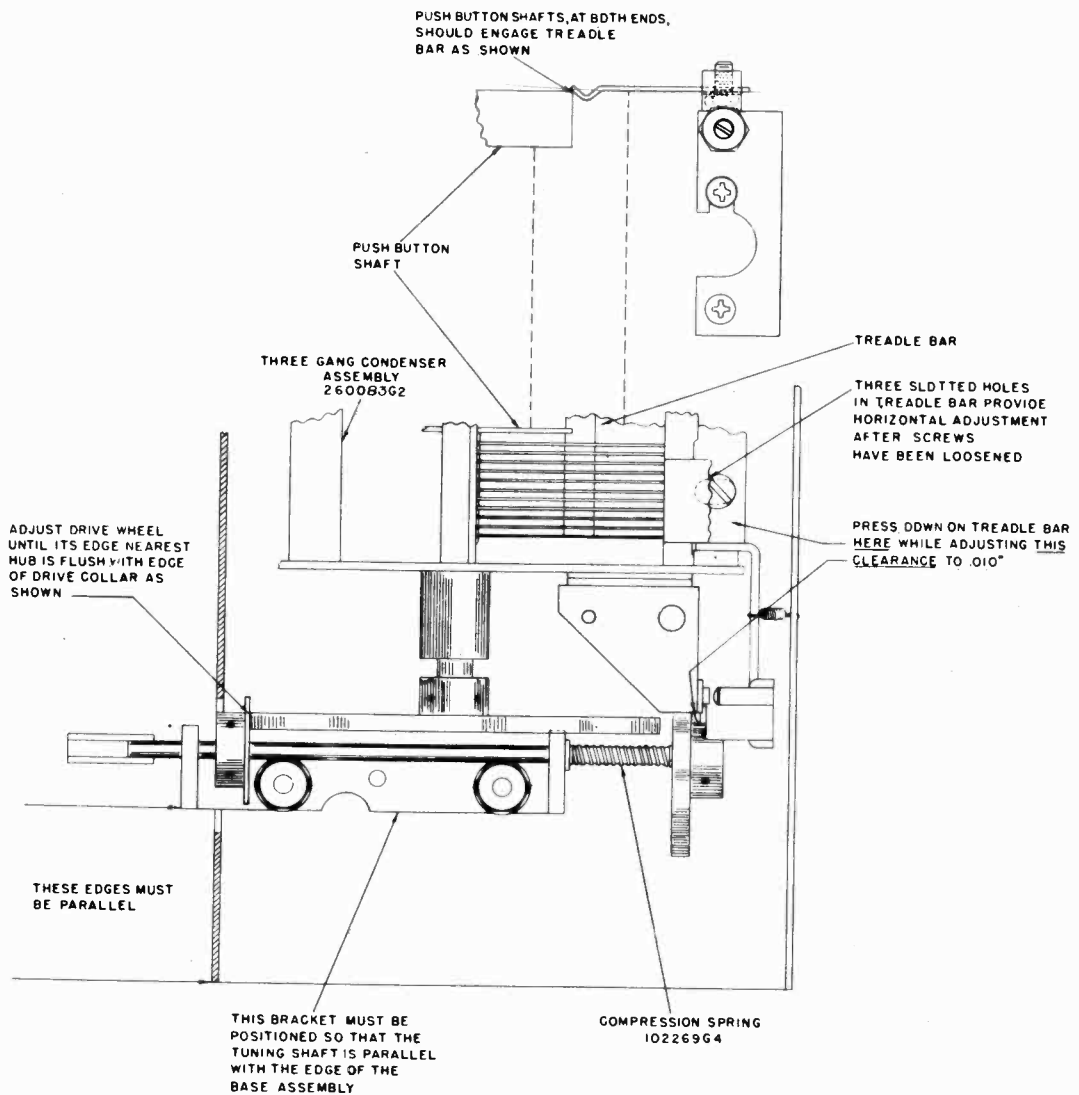


FIGURE 3  
PARTS LIST

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil Assembly, oscillator, AM	360298G1
2	Coil Assembly, antenna, AM	360299G1
3	Coil Assembly, r-f, AM	360300G1
4	Coil Assembly, antenna, FM (CR-204B only)	360296G2
	Coil Assembly, antenna, FM (CR-204A and C only)	360296G3
5	Coil Assembly, oscillator, FM	360295G1
6	Coil Assembly, r-f, FM (CR-204B only)	360297G2
	Coil Assembly, r-f, FM (CR-204A and C only)	360297G3
7	Coil Assembly, 10 kc.	360244G1
8	Coil, choke	360284G1
9	Coil, choke	360284G1
10	Coil, filament choke	360264G1
11	Transformer, discriminator	360305G1
12	Transformer, i-f	360285G1
13	Transformer, i-f	360285G1
14	Transformer, limiter	360286G1
15	Capacitor, variable, three-gang tuning	260083G1
16	Capacitor, variable, oscillator trimmer, broadcast	260067G4
17	Capacitor, variable, two-gang trimmer	260080G1

## MODELS CR-204 SERIES

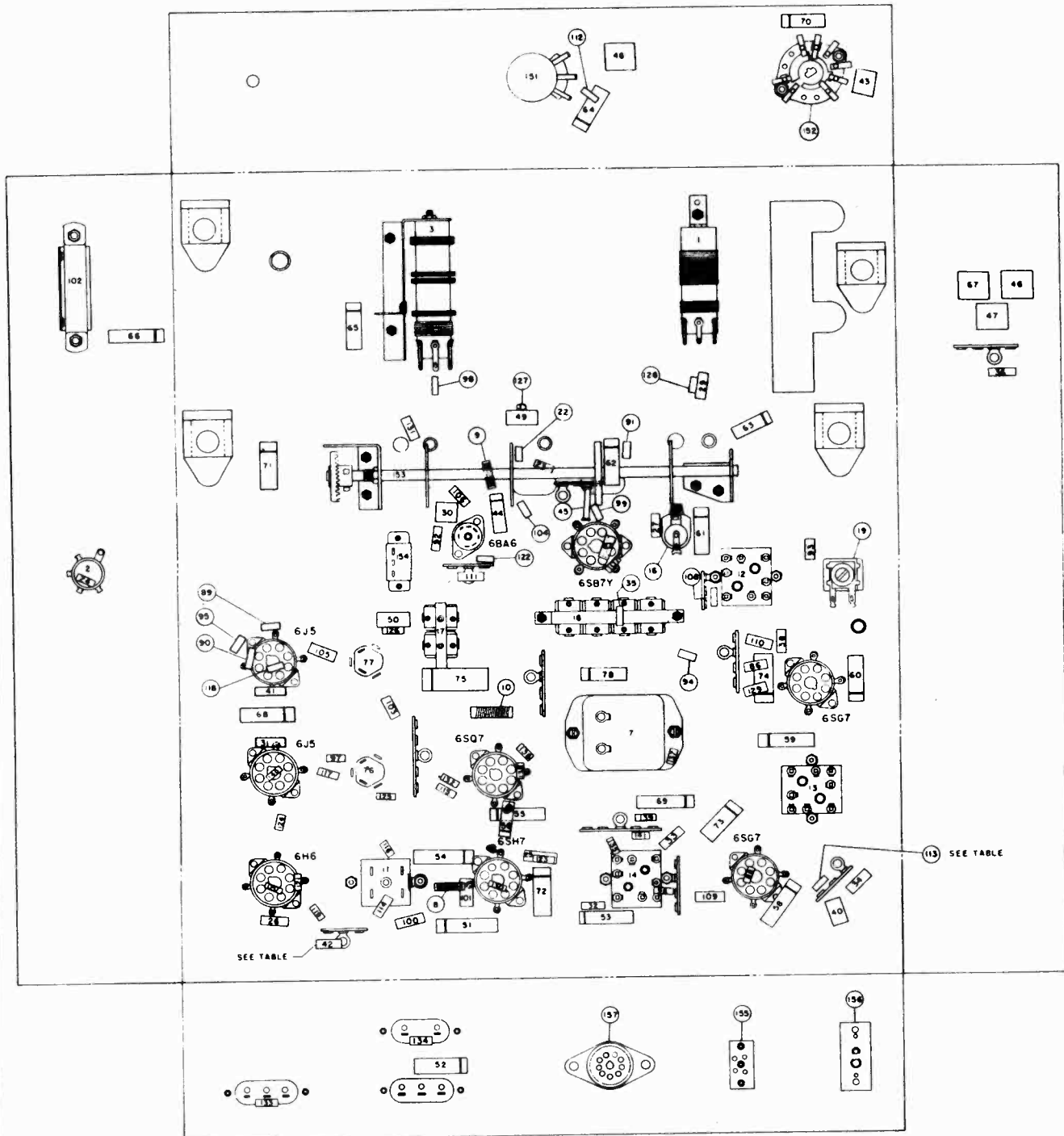
REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
18	Capacitor, variable, four-gang trimmer and oscillator padder	260082G1
19	Capacitor, variable, 10 kc. trimmer	259610G2
20	Capacitor, trimmer assembly	260084G1
21	Capacitor, ceramic, 3 mmf.	250088G38
22	Capacitor, ceramic and composition, 6 mmf.	250164G2
23	Capacitor, ceramic and composition, 10 mmf.	250164G3
24	Capacitor, ceramic and composition, 10 mmf.	250164G3
25	Capacitor, mica, 47 mmf.	250159G96
26	Capacitor, mica, 47 mmf.	250159G96
27	Capacitor, ceramic, 50 mmf.	250088G39
28	Capacitor, ceramic, 50 mmf.	250088G39
29	Capacitor, mica, 100 mmf.	250159G98
30	Capacitor, mica, 100 mmf.	250159G98
31	Capacitor, mica, 330 mmf.	250159G101
32	Capacitor, mica, 220 mmf.	250159G100
33	Capacitor, mica, 220 mmf.	250159G100
34	Capacitor, mica, 510 mmf., $\pm 5\%$	250159G64
35	Capacitor, silver mica, 335 mmf., $\pm 1\%$	250085G38
36	Capacitor, mica, 470 mmf.	250159G102
38	Capacitor, mica, 470 mmf.	250159G102
39	Capacitor, ceramic, 500 mmf. (CR-204B only)	250088G31
	Capacitor, ceramic, 35 mmf. (CR-204A and C only)	250088G40
40	Capacitor, mica, 510 mmf., $\pm 5\%$	250159G64
41	Capacitor, mica, 510 mmf., $\pm 5\%$	250159G64
42	Capacitor, mica, 820 mmf., $\pm 10\%$ (CR-204A and B only)	250159G132
	Capacitor, mica, 1800 mmf., $\pm 10\%$ (CR-204C only)	250160G67
43	Capacitor, mica, 1000 mmf., $\pm 20\%$	250160G82
44	Capacitor, paper, .002 mfd., 600 V.	250152G44
45	Capacitor, ceramic, .004 mfd.	250088G34
46	Capacitor, molded paper, .004 mfd., 600 V.	250129G7
47	Capacitor, molded paper, .004 mfd., 600 V.	250129G7
48	Capacitor, molded paper, .004 mfd., 400 V.	250129G10
49	Capacitor, mica, .0062 mfd., $\pm 5\%$	250161G27
50	Capacitor, mica, .0062 mfd., $\pm 5\%$	250161G27
51	Capacitor, paper, .01 mfd., 400 V.	250152G27
52	Capacitor, paper, .01 mfd., 400 V.	250152G27
53	Capacitor, paper, .01 mfd., 400 V.	250152G27
54	Capacitor, paper, .01 mfd., 400 V.	250152G27
55	Capacitor, paper, .01 mfd., 400 V.	250152G27
56	Capacitor, paper, .01 mfd., 400 V.	250152G27
58	Capacitor, paper, .01 mfd., 400 V.	250152G27
59	Capacitor, paper, .01 mfd., 400 V.	250152G27
60	Capacitor, paper, .01 mfd., 400 V.	250152G27
61	Capacitor, paper, .01 mfd., 400 V.	250152G27
62	Capacitor, paper, .01 mfd., 400 V.	250152G27
63	Capacitor, paper, .01 mfd., 400 V.	250152G27
64	Capacitor, paper, .01 mfd., 400 V.	250152G27
65	Capacitor, paper, .01 mfd., 400 V.	250152G27
66	Capacitor, paper, .01 mfd., 400 V.	250152G27
67	Capacitor, molded paper, .012 mfd., 200 V.	250129G13
68	Capacitor, paper, .02 mfd., 400 V.	250152G26
69	Capacitor, paper, .02 mfd., 400 V.	250152G26
70	Capacitor, paper, .02 mfd., 400 V.	250152G26
71	Capacitor, paper, .05 mfd., 200 V.	250152G15
72	Capacitor, paper, .05 mfd., 200 V.	250152G15
73	Capacitor, paper, .05 mfd., 200 V.	250152G15
74	Capacitor, paper, .05 mfd., 200 V.	250152G15
75	Capacitor, paper, .1 mfd., 400 V.	250152G22
76	Capacitor, electrolytic, 10 mfd., 450 V.—20 mfd., 25 V.	270023G6
77	Capacitor, electrolytic, 10 mfd., 450 V.—20 mfd., 25 V.	270023G6
78	Capacitor, paper, .003 mfd., $\pm 10\%$ , 600 V.	250169G6

## THE MAGNAVOX CO.

## MODELS CR-204 SERIES

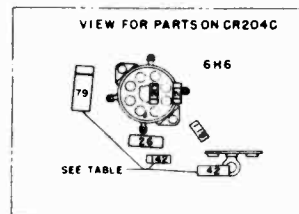
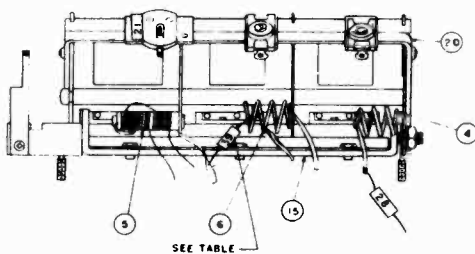
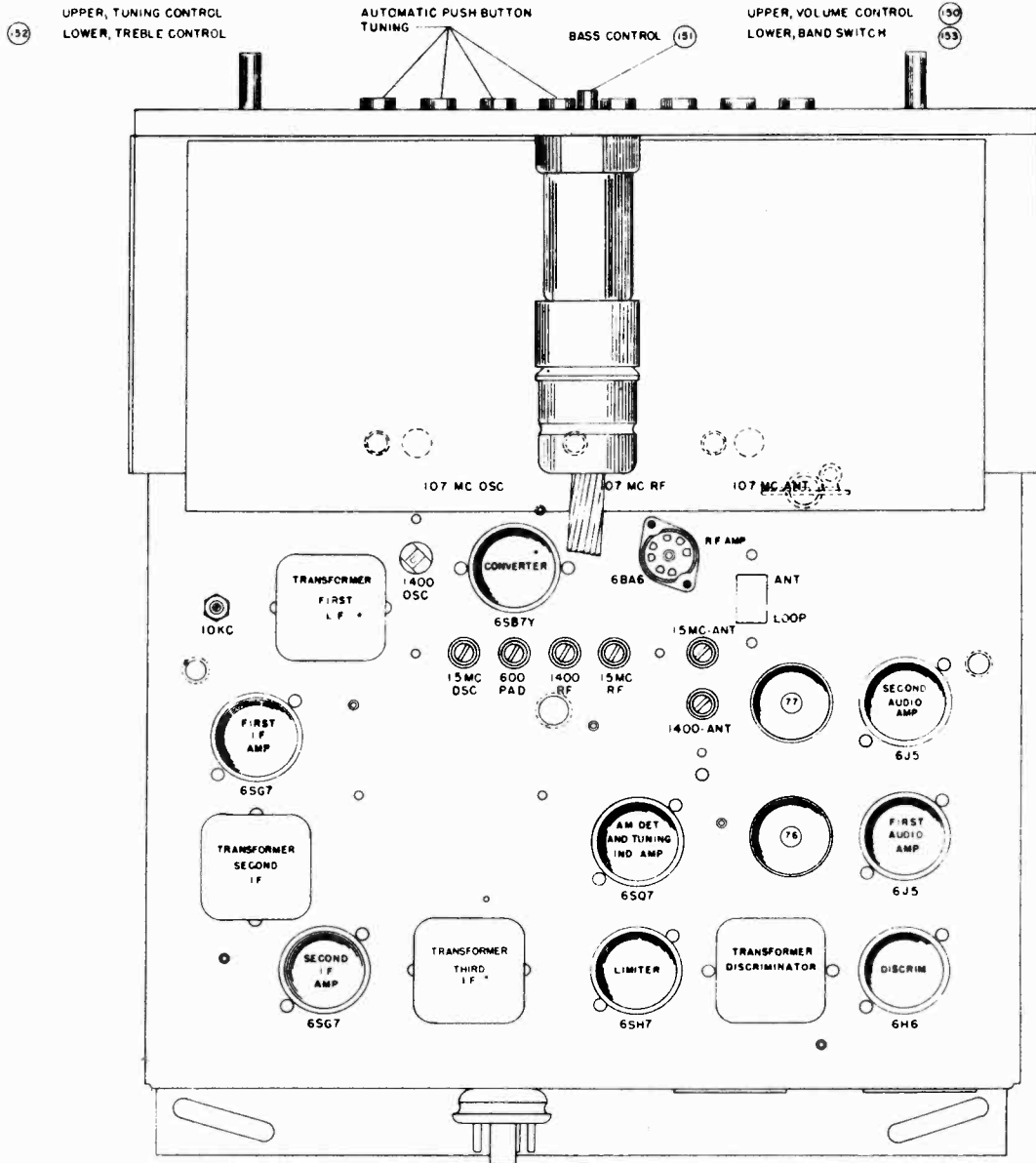
REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
79	Capacitor, paper, .002 mfd., 600 V., $\pm 10\%$ (CR-204C only)	250169G2
86	Resistor, composition, 33 ohms, $\frac{1}{2}$ W.	230084G4
87	Resistor, composition, 33 ohms, $\frac{1}{2}$ W.	230084G4
88	Resistor, composition, 68 ohms, $\frac{1}{2}$ W.	230084G6
89	Resistor, composition, 220 ohms, $\pm 10\%$ , $\frac{1}{2}$ W.	230084G54
90	Resistor, composition, 100 ohms, $\pm 10\%$ , $\frac{1}{2}$ W.	230084G50
91	Resistor, composition, 100 ohms, $\frac{1}{2}$ W.	230084G7
92	Resistor, composition, 68 ohms, $\frac{1}{2}$ W.	230084G6
93	Resistor, composition, 150 ohms, $\frac{1}{2}$ W.	230084G8
94	Resistor, composition, 220 ohms, $\frac{1}{2}$ W.	230084G9
95	Resistor, composition, 470 ohms, $\frac{1}{2}$ W.	230084G11
96	Resistor, composition, 1000 ohms, $\frac{1}{2}$ W.	230084G13
97	Resistor, composition, 2200 ohms, $\frac{1}{2}$ W.	230084G15
98	Resistor, composition, 4700 ohms, $\frac{1}{2}$ W.	230084G17
99	Resistor, composition, 5600 ohms, $\pm 10\%$ , $\frac{1}{2}$ W.	230084G71
100	Resistor, composition, 8200 ohms, $\pm 10\%$ , 1 W.	230085G73
101	Resistor, composition, 8200 ohms, $\pm 10\%$ , 1 W.	230085G73
102	Resistor, strip, 8500 ohms	240035G5
103	Resistor, composition, 10,000 ohms, 1 W.	230085G19
104	Resistor, composition, 10,000 ohms, $\frac{1}{2}$ W.	230084G19
105	Resistor, composition, 15,000 ohms, 1 W.	230085G20
106	Resistor, composition, 20,000 ohms, $\pm 5\%$ , 1 W.	230085G190
107	Resistor, composition, 15,000 ohms, $\frac{1}{2}$ W.	230084G20
108	Resistor, composition, 22,000 ohms, $\frac{1}{2}$ W.	230084G21
109	Resistor, composition, 33,000 ohms, 1 W.	230085G22
110	Resistor, composition, 33,000 ohms, 1 W.	230085G22
111	Resistor, composition, 33,000 ohms, $\pm 10\%$ , 2 W.	230086G80
112	Resistor, composition, 47,000 ohms, $\frac{1}{2}$ W.	230084G23
113	Resistor, composition, 47,000 ohms, $\frac{1}{2}$ W. (CR-204A only)	230084G23
114	Resistor, composition, 68,000 ohms, $\pm 10\%$ , $\frac{1}{2}$ W.	230084G84
115	Resistor, composition, 100,000 ohms, $\frac{1}{2}$ W.	230084G25
116	Resistor, composition, 100,000 ohms, $\frac{1}{2}$ W.	230084G25
117	Resistor, composition, 100,000 ohms, $\frac{1}{2}$ W.	230084G25
118	Resistor, composition, 100,000 ohms, $\frac{1}{2}$ W.	230084G25
119	Resistor, composition, 100,000 ohms, $\pm 10\%$ , $\frac{1}{2}$ W.	230084G86
120	Resistor, composition, 150,000 ohms, $\frac{1}{2}$ W., $\pm 10\%$	230084G88
121	Resistor, composition, 150,000 ohms, $\frac{1}{2}$ W., $\pm 10\%$	230084G88
122	Resistor, composition, 150,000 ohms, $\frac{1}{2}$ W. (EARLY PRODUCTION)	230084G26
	Resistor, composition, 39,000 ohms, $\frac{1}{2}$ W. (LATE PRODUCTION)	230084G81
123	Resistor, composition, 220,000 ohms, $\frac{1}{2}$ W.	230084G27
124	Resistor, composition, 220,000 ohms, $\frac{1}{2}$ W.	230084G27
125	Resistor, composition, 220,000 ohms, $\frac{1}{2}$ W.	230084G27
126	Resistor, composition, 220,000 ohms, $\frac{1}{2}$ W.	230084G27
127	Resistor, composition, 220,000 ohms, $\frac{1}{2}$ W.	230084G27
128	Resistor, composition, 220,000 ohms, $\frac{1}{2}$ W.	230084G27
129	Resistor, composition, 470,000 ohms, $\frac{1}{2}$ W.	230084G29
130	Resistor, composition, 470,000 ohms, $\frac{1}{2}$ W.	230084G29
131	Resistor, composition, 470,000 ohms, $\frac{1}{2}$ W.	230084G29
132	Resistor, composition, 470,000 ohms, $\frac{1}{2}$ W.	230084G29
133	Resistor, composition, 1 megohm, $\frac{1}{2}$ W.	230084G31
134	Resistor, composition, 1 megohm, $\frac{1}{2}$ W.	230084G31
135	Resistor, composition, 1 megohm, $\frac{1}{2}$ W.	230084G31
136	Resistor, composition, 1.5 megohm, $\frac{1}{2}$ W.	230084G32
137	Resistor, composition, 1.5 megohm, $\frac{1}{2}$ W.	230084G32
138	Resistor, composition, 2.2 megohm, $\frac{1}{2}$ W.	230084G33
139	Resistor, composition, 2.2 megohm, $\frac{1}{2}$ W.	230084G33
140	Resistor, composition, 4.7 megohm, $\frac{1}{2}$ W.	230084G35
141	Resistor, composition, 4.7 megohm, $\frac{1}{2}$ W.	230084G35
142	Resistor, composition, 330,000 ohms, $\pm 10\%$ , $\frac{1}{2}$ W. (CR-204C only)	230084G92
150	Control, volume, 1 megohm	220044G24
151	Control, bass, 1 megohm with switch	220073G6
152	Switch, treble control	160178G1

153	Switch, rotary, band switch .....	160179G1
154	Switch, slide SPDT .....	160176G1
155	Socket, external input .....	180060G1
156	Socket, phonograph input .....	189741G1
157	Socket, amplifier .....	180427G2
158	Antenna Loop Assembly .....	460637G1
	Dial Glass Assembly .....	150303G1
	Push Button Assembly for Gang .....	260093G1



THE MAGNAVOX CO.

MODELS CR-204 SERIES



ITEM NO.	ELECTRICAL VALUES		
	CR204A	CR204B	CR204C
113	47K	OMIT	OMIT
39	35	500	35
42	820	820	1800
79	OMIT	OMIT	002
142	OMIT	OMIT	33K

Intermediate frequency ..... 455 kc. 10.7 mc.

Tuning frequency range:

Broadcast Band ..... 540--1620 kc.

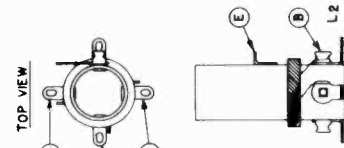
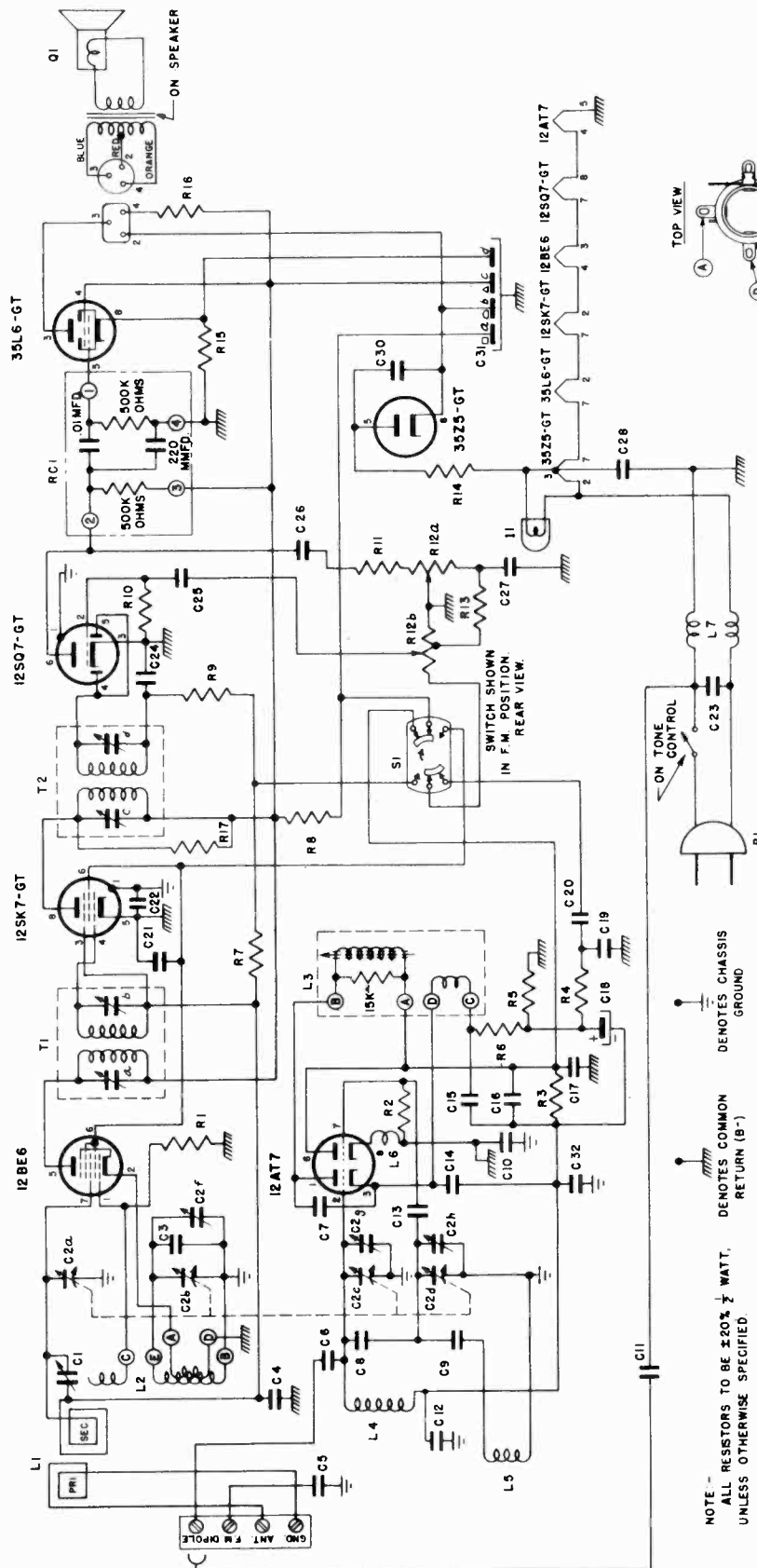
Short Wave Band ..... 5.9--17.3 mc.

FM Band ..... 88--108 mc.



MAJESTIC RADIO & TELEV. CORP.

MODEL 6FM714,  
CHASSIS 6B02D



NOTE --  
 ALL RESISTORS TO BE  $\pm 20\%$   $\frac{1}{2}$  WATT,  
 UNLESS OTHERWISE SPECIFIED.

DENOTES COMMON RETURN (B-)  
 DENOTES CHASSIS GROUND



MODEL 6FM714,  
CHASSIS 6B02D

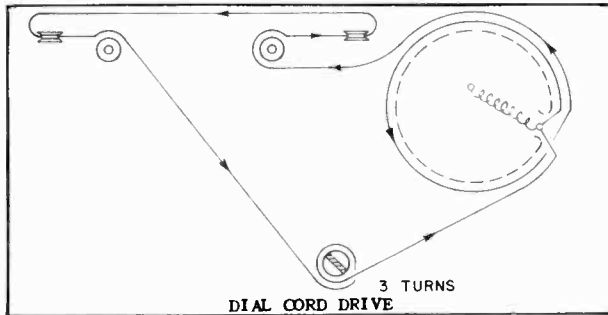
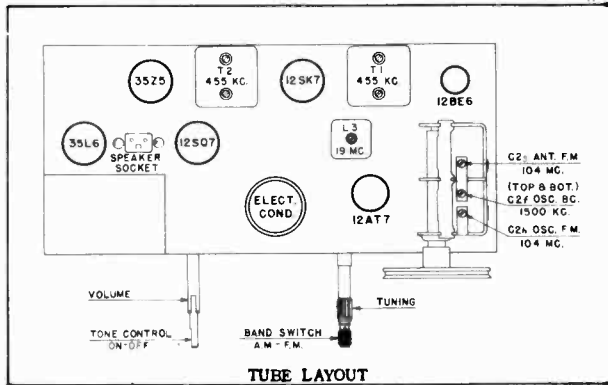
MAJESTIC RADIO & TELEV. CORP.

ALIGNMENT

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

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

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



VOLTAGE TABLE  
D. C. VOLTAGES MEASURED TO COMMON GROUND

TUBE	ELEMENT	PIN	VOLTS
12BE6 Converter	Plate	5	87
	Cathode	2	0
	Screen Grid	6	78
	Control Grid	1&7	.8
12SK7 I.F. Amplifier	Plate	8	87
	Cathode	5	0
	Screen Grid	6	78
	Control Grid	4	.8
12S07 Det-AVC 1st AF	Plate	6	56
	Cathode	3	0
	Control Grid	2	.9
	Diodes	4&5	.6 - .8
35L6 Output	Plate	3	105
	Cathode	8	5.3
	Screen	4	87
	Control Grid	5	0
3525 Rectifier	Cathode	8	112
	Plate	1	99
FM 12AT7 Osc. Section	Cathode	3	0
	Grid	2	.4
	Plate	6	99
12AT7 Det. Section	Plate	6	99
	Cathode	8	37
	Grid	7	34

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

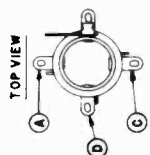
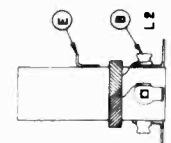
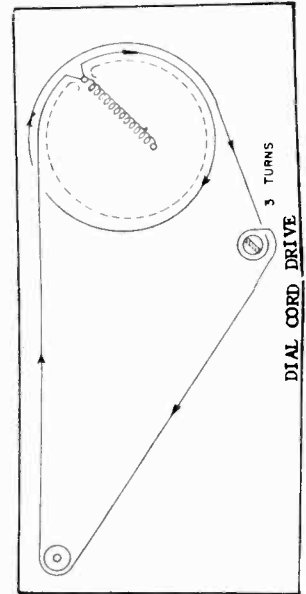
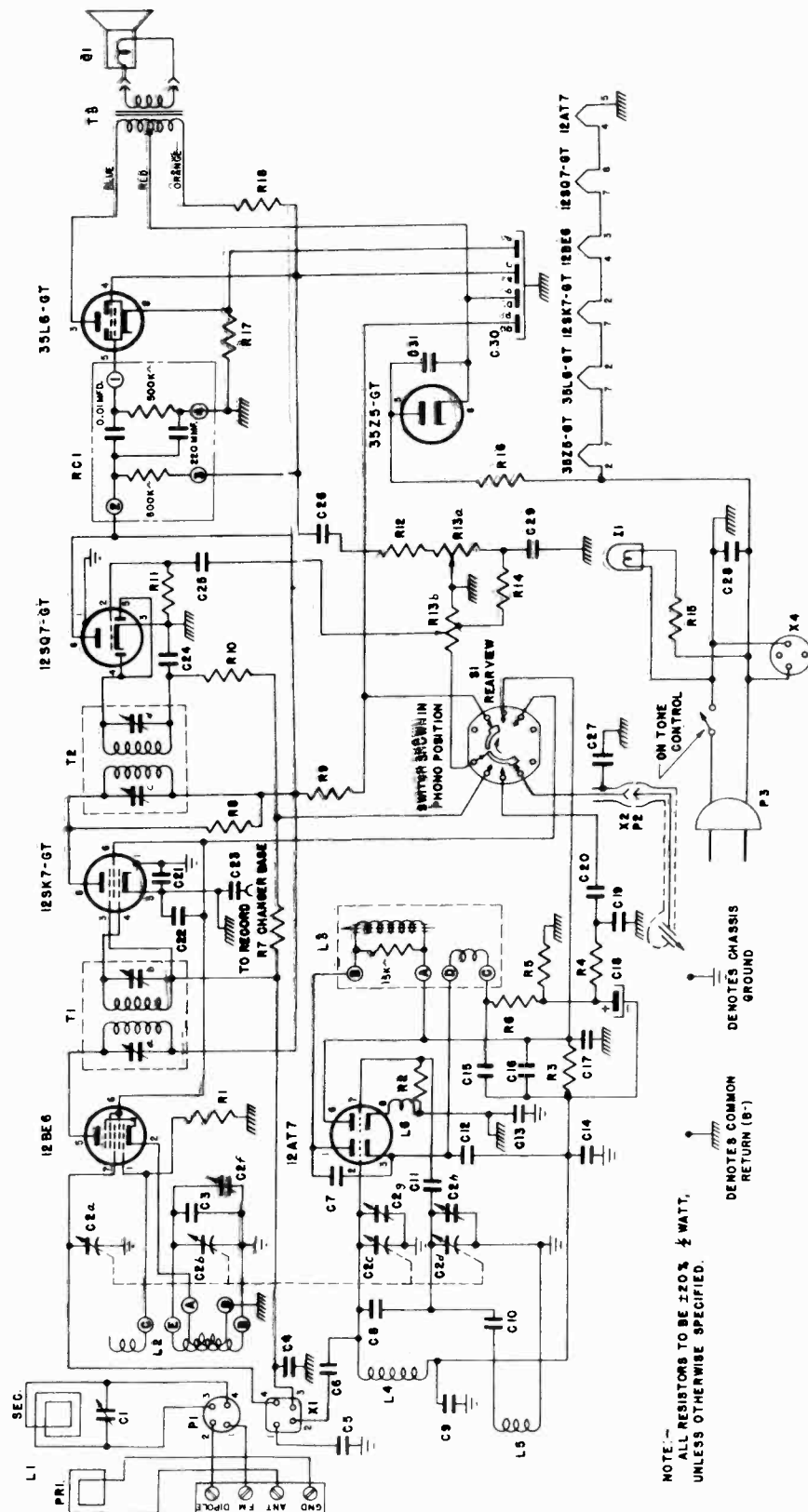
PARTS LIST

SYMBOL DESIG.	PART NO.	DESCRIPTION
C1	8-59	2-30 uuf. Trimmer
C2a,b,c,d, f,g,h	A.M. & F.M. Variable Condenser (2 gang)	
C3	7-33	15 uuf. 500 V. Ceramic
C4	6-88	.05 uf. 200 V. Paper
C5,11,19, 21,30,32	4-6	1000 uuf. Ceramic
C6&8	6-134	2.2 uuf. Molded Bakelite
C7,13&14	4-5	30 uuf. Ceramic
C9	4-8	68 uuf. Ceramic
C10,12	020-67	470 uuf. 500 V. Mica
C15	021-38	3300 uuf. 500 V. Mica
C16	4-4	5000 uuf. Ceramic
C17	6-228	700 uuf. 500 V. Mica
C18	19-58	10 uf. 25 V. Electrolytic
C20	015-6	.02 uf. 200 V. Paper
C22	5-51	.2 uf. 200 V. Paper
C23	4-7	100 uuf. Ceramic
C24	020-53	220 uuf. 500 V. Mica
C25	016-5	.01 uf. 400 V. Paper
C26	017-4	.005:uf. 600 V. Paper
C27	015-5	.01 uf. 200 V. Paper
C28	016-8	.05 uf. 400 V. Paper
C29	6-229	820 uuf. Mica
C31a,b,c,d	19-59	40 uf. 150 V. 100 uf. 10 V. electrolytic
R1,5,9	02-143**	22 K Ohms Resistor
R2	02-150**	33 K Ohms Resistor
R3	02-178**	150 K Ohms Resistor
R4&17	02-171**	100 K Ohms Resistor
R6	02-94**	1500 Ohms Resistor
R7	02-234**	3.3 Meg. Resistor
R8&16	03-90	1200 Ohms ± 10% 1 W. Resistor
R10	02-255**	10 Meg. Resistor
R11	02-118	5600 Ohms 1/2 W. 10% Resistor
R12a&b	13-30**	Tone Control 2 Meg. Volume Control 500 K Ohm
R13	02-132	12K Ohms ± 10% 1W. Resistor
R14	02-17**	22 Ohms Resistor
R15	02-52**	150 Ohms Resistor
T1	3-116	1st. I.F. Transformer
T2	3-117	2nd. I.F. Transformer
RC1	37-1	Printed Circuit Plaque (Audio Coupling)
L2	S-1684	Oscillator Coil Assembly
L3	S-1678	S. R. Coil Assembly
L4	3-209	F.M. Antenna Coil
L5	3-208	F.M. Oscillator Coil
L6	S-1928	R. F. Choke
L7	S-1681	Line Choke Coil Assem.
S1	11-78	Band Switch
I1	26-2	Pilot Light (Mazda #47, Br. Bead)
Q1	22-39	Speaker 4" P.M.
P1	27-202	Plug & Line Cord-8'
	116-12	Cabinet Plastic (State Color)
	117-96	Dial Scale
	135-23	Dial Pointer
	S1686	Loop Ant. Assem.
	123-35	Cabinet Back
	128-62	Knob Band Switch
	128-63	Knob Tuning
	128-68	Knob On-Off-Tone
	128-69	Knob Volume

\* Plus Excise Tax.  
\*\* Resistors to be ± 20% 1/2 watt.

MAJESTIC RADIO & TELEV. CORP.

MODEL 6FM773,  
CHASSIS 6B11D



NOTE: -  
ALL RESISTORS TO BE 1/2 WATT,  
UNLESS OTHERWISE SPECIFIED.

DENOTES CHASSIS  
GROUND

DENOTES COMMON  
RETURN (B-)

MODEL 6FM773,  
CHASSIS 6B11D

MAJESTIC RADIO & TELEV. CORP.

ALIGNMENT

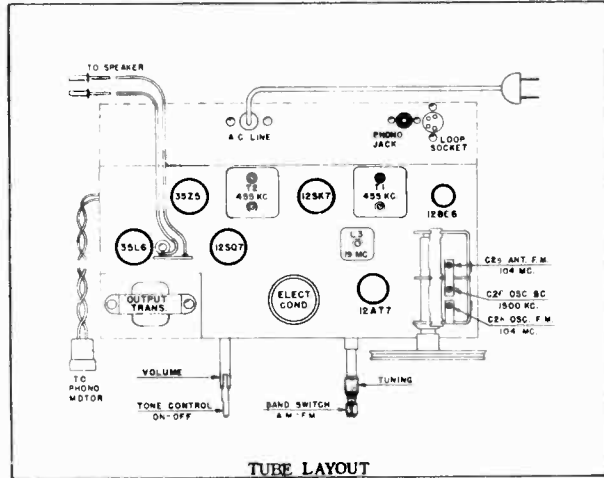
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PARTS LIST

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C3	6-88	15 uuf 500v Ceramic
C4,23,27	015-8	.05 uf 200v Paper
C5,14,19, 22,30	4-6	1000 uuf Ceramic
C6,8	6-134	2.2 uuf Molded Bakelite
C7,11,12	4-5	30 uuf Ceramic
C9,13	020-67	470 uuf 500v Mica
C10	4-8	68 uuf Ceramic
C15	021-38	3300 uuf 500v Mica
C16	4-4	5000 uuf Ceramic
C17	6-228	700 uuf 500v Mica
C18	19-58	10 uf 25v Electrolytic
C20	015-6	.02 uf 200v Paper
C21	5-51	.2 uf 200v Paper
C24	020-53	220 uuf 500v Mica
C25	016-5	.01 uf 400v Paper
C26	017-4	.005 uf 600v Paper
C28	016-8	.05 uf 400v Paper
C29	015-5	.01 uf 200v Paper
C30a,b,c, d	19-61	40-100-40 uf 1500 40 uf 10v Electrolytic
C32	6-229	820 uuf Mica
R1,5,10	02-143**	22K ohm Resistor
R2	02-150**	33K ohm Resistor
R3	02-178**	150K ohm Resistor
R4,8	02-171**	100K ohm Resistor
R6	02-94**	1500 ohm Resistor
R7	02-234**	3.3 Meg. Resistor
R9,18	03-90	1200 ohm ± 10% 1W Resistor
R11	02-255**	10 Meg Resistor
R12	02-118	5600 ohm 1/2 W Resistor
R13a,b	13-30	Tone Control 2 Meg Volume Control 500K ohm
R14	02-132	12K ohm 1/4 W ± 10% Resistor
R15	04-69	390 ohm 2W ± 10% Resistor
R16	02-17**	22 ohm Resistor
R17	02-52**	150 ohm Resistor
T1	3-116	1st I.F. Transformer
T2	3-117	2nd I.F. Transformer
T3	2-40	Output Transformer
L1	S1922	Loop Antenna & back Assem.
L2	S1684	Oscillator Coil Assem.
L3	S1678	S.R. Coil Assem.
L4	3-209	F.M. Antenna Coil
L5	3-208	F.M. Oscillator Coil
L6	S1928	Choke Coil
RC-1	37-1	Printed Circuit Plaque (Audio Coupling)
S1	11-81	Band Switch
I1	26-21	Pilot Light, 115-125v G.E. #10C7DC
Q1	22-30	Speaker 8" P.M.
P1	18-32	4 Prong Plug
P2	140-6	Phono Pick-up Connector Plug
P3	27-201	8' Plug & Line Cord
X1	15-96	Socket
X2	15-87	Phono Pick-up Connector Socket
X4	15-118	Phono Motor Connector Socket
	135-33	Dial Pointer
	115-50-1	Cabinet (Aero Cut-Out)
	115-50-2	Cabinet (milw.cut-out)
	122-50	Escutcheon & Dial Scale Ass'y
	128-63	Knob (Tuning)
	128-68	Knob (Tone-on-off)
	128-69	Knob (Volume)
	128-80	Knob (Band Switch)
	21-34	Aero Record Changer
	21-35	Milwaukee "



VOLTAGE TABLE

D. C. VOLTAGES MEASURED TO COMMON GROUND

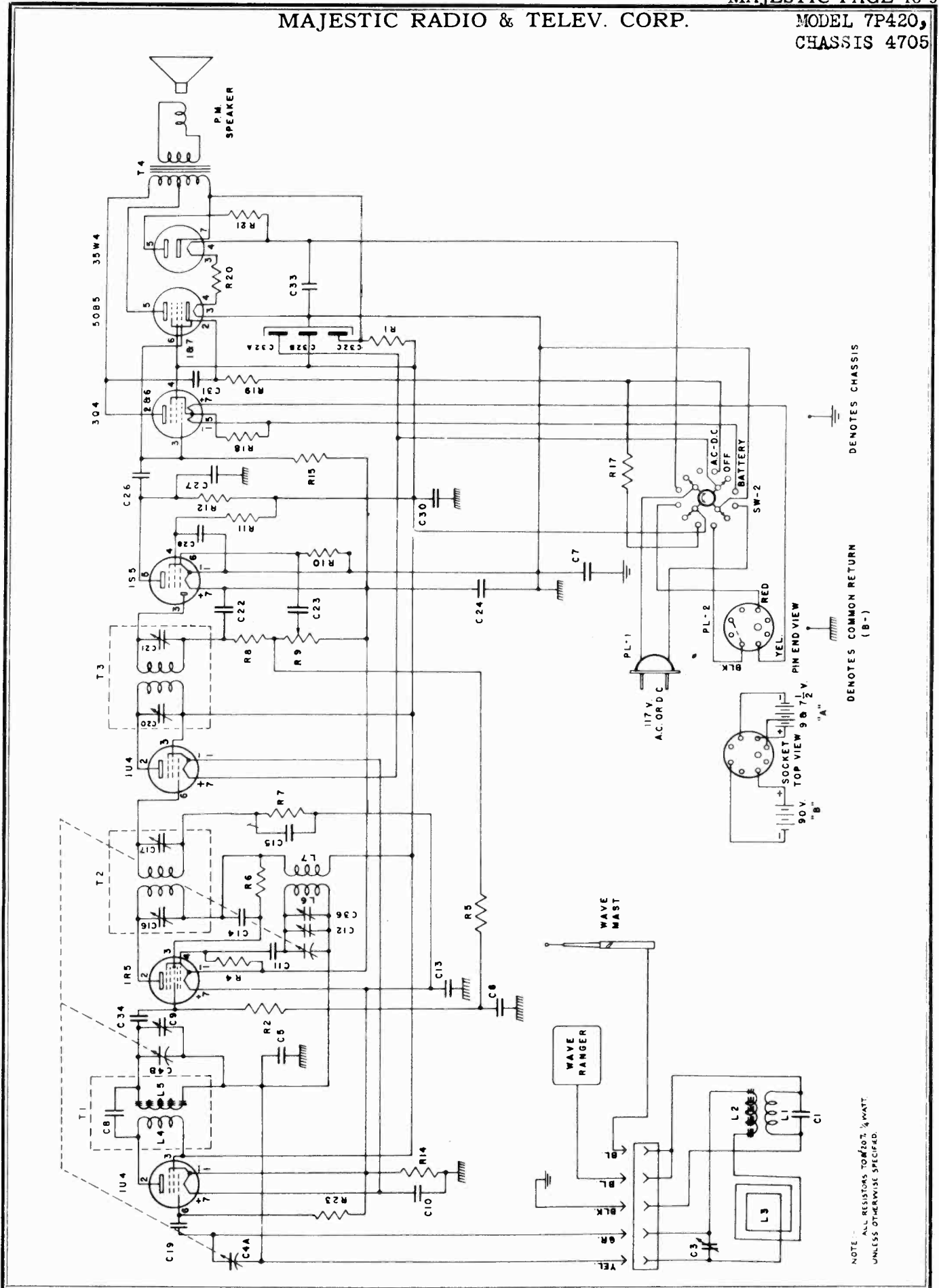
TUBE	ELEMENT	PIN	VOLTS
12BE6 Converter	Plate	5	87
	Cathode	2	0
	Screen Grid	6	78
	Control Grid	1&7	.8
12SK7 I.F. Amplifier	Plate	8	87
	Cathode	5	0
	Screen Grid	6	78
	Control Grid	4	.8
12SQ7 Det-AVC 1st AF	Plate	6	56
	Cathode	3	0
	Control Grid	2	.9
	Diodes	4&5	.6 - .8
35L6 Output	Plate	3	105
	Cathode	8	5.3
	Screen	4	87
	Control Grid	5	0
3525 Rectifier	Cathode	8	112
	Plate	1	99
FM 12AT7 Osc. Section	Cathode	3	0
	Grid	2	.4
	Plate	6	99
12AT7 Det. Section	Cathode	8	37
	Grid	7	34

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

\* Plus Excise Tax  
\*\* Resistors to be ± 20% 1/2 watt.

MAJESTIC RADIO & TELEV. CORP.

MODEL 7P420,  
CHASSIS 4705



DENOTES COMMON RETURN (B-)

NOTE: ALL RESISTORS TO 207, 1/4 WATT, UNLESS OTHERWISE SPECIFIED.

MODEL 7P420,  
CHASSIS 4705

MAJESTIC RADIO & TELEV. CORP.

ALIGNMENT PROCEDURE

STEP	DUMMY ANTENNA	TEST OSCILLATOR CONNECTION	TEST OSCILLATOR FREQUENCY	RECEIVER DIAL	ADJUST FOR MAXIMUM	NOTES
1	.01 MFD.	1R5 GRID	455 KC	ANY QUIET SPOT	C16, C17 C20, C21	
2	LOOP		1500 KC	150	C12, C9, C3	NOTE #1

SERVICE NOTES:

1. Before adjusting the loop trimmer, have complete set and loop assembled in the cabinet.

NOTE #1 ADJUST C12 FIRST FOR DIAL CALIBRATION. THEN ADJUST C9.  
C3 FOR RESONANCE. (MAX: OUTPUT)

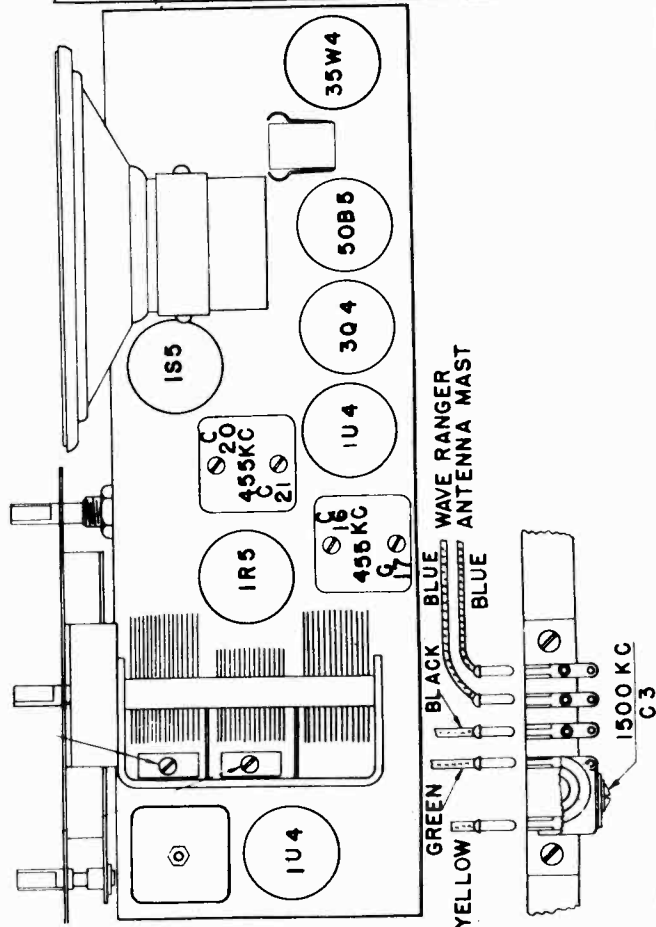
1500 KC  
C12

1500 KC  
C9

VOLTAGE TABLE

TUBE	FILAMENT	PLATE	SCREEN	CATHODE	GRID
		$E_s$	$E_k$	$E_g$	$E_g$
(R. F. AMP.) 1U4	1.47	86	86	-	.05
(CONVERTER) 1R5	1.28	87	55	-	.85
(I. F.) 1U4	1.5	84	84	-	1.5
(DET. A.V.C. - A.F.) 1S5	1.3	12.7	19.6	-	0.3
(OUTPUT - (A.C.)) 50B5	47	108	88	7.4	1.4
(OUTPUT - (BATT.)) 3Q4	2.4	69	78	-	4.6
(RECTIFIER) 35W4	29	100AC		117	

ALL VOLTAGES MEASURED WITH A 20,000 OHM PER VOLT METER.



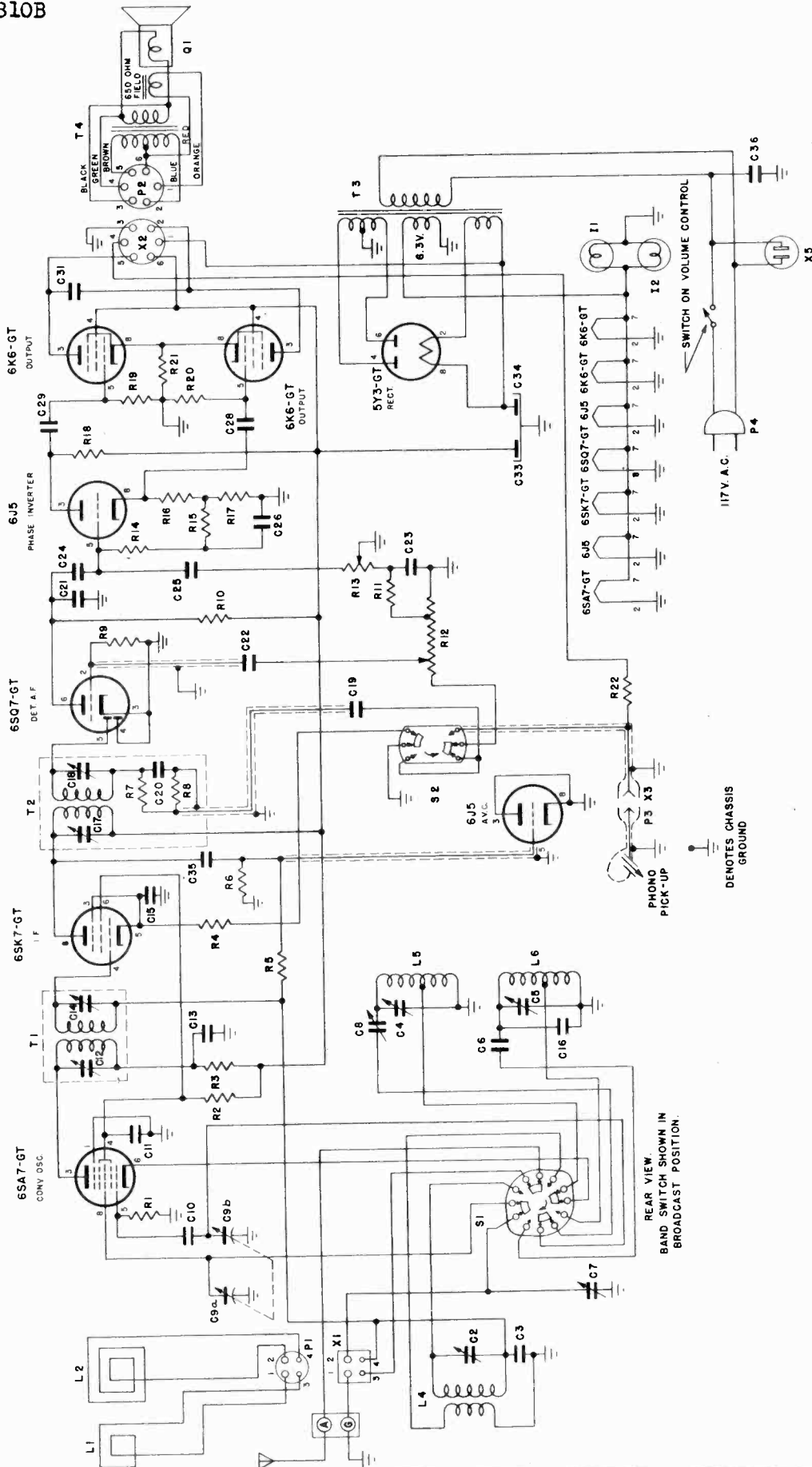
## MAJESTIC RADIO &amp; TELEV. CORP.

MODEL 7P420,  
CHASSIS 4705

ITEM	DESCRIPTION	PART NO.
L6, L7	Oscillator coil	3-125
L4, L5	R. F. coil	3-126
T1, (incl. C16, C17)	1st I. F. transformer	3-127
T2, (incl. C20, C21)	2nd I. F. transformer	3-128
C5, C6, C10	0.1 mfd. + 40% - 10% 200v paper	5-39
C28, C30	.002 mfd. + 80% - 25% 400v paper	6-184
C26	.001 mfd. + 20% - 10% 200v paper	5-50
C14	.05 mfd. ± 20% 400v paper	5-64
C33	.05 mfd. + 40% - 10% 200v paper	5-40
C7, C13, C24	.002 mfd. + 40% - 10% 200v paper	5-52
C15, C26		
C22, C25,		
C27, C34	220 mmfd. ± 20% 500v mica	6-86
C11	100 mmfd. ± 20% 500v mica	6-232
C4A, C4B, C4C incl. (C9, C12, C36	Tuning condenser	7-13
R10	10 megohms ± 20% 1/4 w.	9-213
R1	1200 ohms ± 10% 1 w.	9-216
R2, R11	3.3 megohms ± 20% 1/4 w.	9-221
R7, R15	470,000 ohms + 20% 1/4 w.	9-223
R5, R12	1 megohm ± 20% 1/4 w.	9-255
R4	100,000 ohms ± 20% 1/4 w.	9-304
R6	12,000 ohms ± 10% 1/4 w.	9-305
R8	47,000 ohms ± 20% 1/4 w.	9-306
R23	2.2 megohms ± 20% 1/4 w.	9-114
R21	27 ohms ± 10% 1/3 w.	9-204
R18	270 ohms ± 10% 1/4 w.	9-310
R14	390 ohms ± 10% 1/4 w.	9-315
R17	5000 ohms ± 5% 2 w.	9-317
R19	56 ohms ± 10% 1/2 w.	9-314
S2	Power switch	11-62 or 11-49
R9	Volume control	13-17
C32A, C32B, C32C	70 mfd. 150v, 20 mfd. 150v, 200 mfd. 10v	19-37
	Speaker	22-9
	Battery plug & cable	27-269
	Power cord & plug	27-202
	Dial scale	117-45
	Drive cord spring	129-34
	Drive cord	134-7
	Dial pointer	135-15
	Loop assembly	20-12
	Wave Ranger assembly	20-13
	Antenna mast	20-25
	Cabinet	116-13
	Escutcheon	122-32
	Knob (power switch)	128-59
	Knob (tuning-volume)	128-58

MODEL 8JL885,  
CHASSIS 4810B

MAJESTIC RADIO & TELEV. CORP.



DENOTES CHASSIS  
GROUND

REAR VIEW.  
BAND SWITCH SHOWN IN  
BROADCAST POSITION.

### VOLTAGE TABLE

TUBE	PLATE	SCREEN	GRID
6SA7 (Conv.)	240-265	105	0
6SK7 (I.F.)	282-296	106-122	2.1 - 2.5
6SQ7 (A.F.)	72-84	---	0
6J5 (Ph. Inv.)	208-220	---	6.0 - 7.5
6K6 (Out)	270-280	280-285	22.5 - 24
6J5 (AVC)	---	---	*0.6
5Y3	320 A.C. 340 D.C.	---	---

NOTE: All voltages measured to ground with 20,000 ohm per voltmeter, or \*vacuum tube voltmeter.

### ALIGNMENT

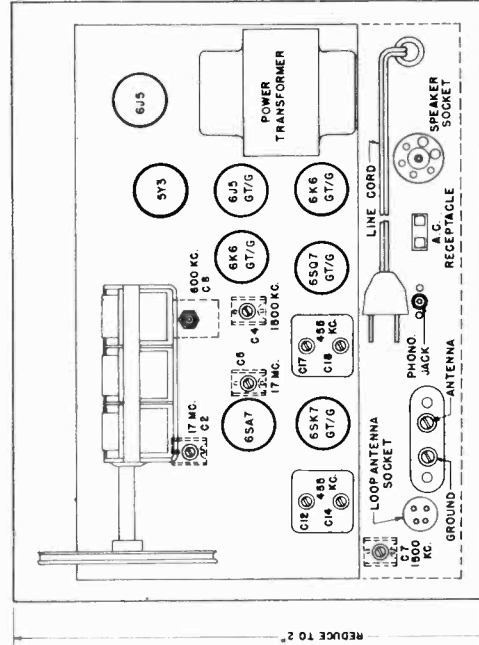
Before aligning, close tuning condenser (plates fully meshed). Set pointer to center of extreme left hand mark on the dial.

When aligning broadcast band, connect to output of the signal generator a loop, about 12 inches in diameter, consisting of two or three turns of wire. Place this loop in a plane parallel to that of the receiver loop antenna and about a foot away from it. The receiver loop antenna should be in about the same portion relative to the chassis as it is when installed in the cabinet.

While aligning, turn the volume control full on and keep the generator output as low as possible.

STEP	DUMMY ANTENNA	TEST OSCILLATOR CONNECTION	TEST OSCILLATOR FREQUENCY	RECEIVER BAND-SWITCH	RE-CEIVER DIAL	ADJUST FOR MAXIMUM	NOTES
1	.01 mfd	6SA7 grid	455 KC	BC	Any quiet spot	C18, C17 C14, C12	-----
2	Loop	-----	1500 KC	BC	150	C4, C7	-----
3	Loop	-----	600 KC	BC	60	C8	Note #1
4	400 ohms	Receiver antenna post	17 MC	SW	17	C2, C5	-----

Note #1 - Rock gang while making this adjustment. Then recheck step 2.



### TUBE LAYOUT



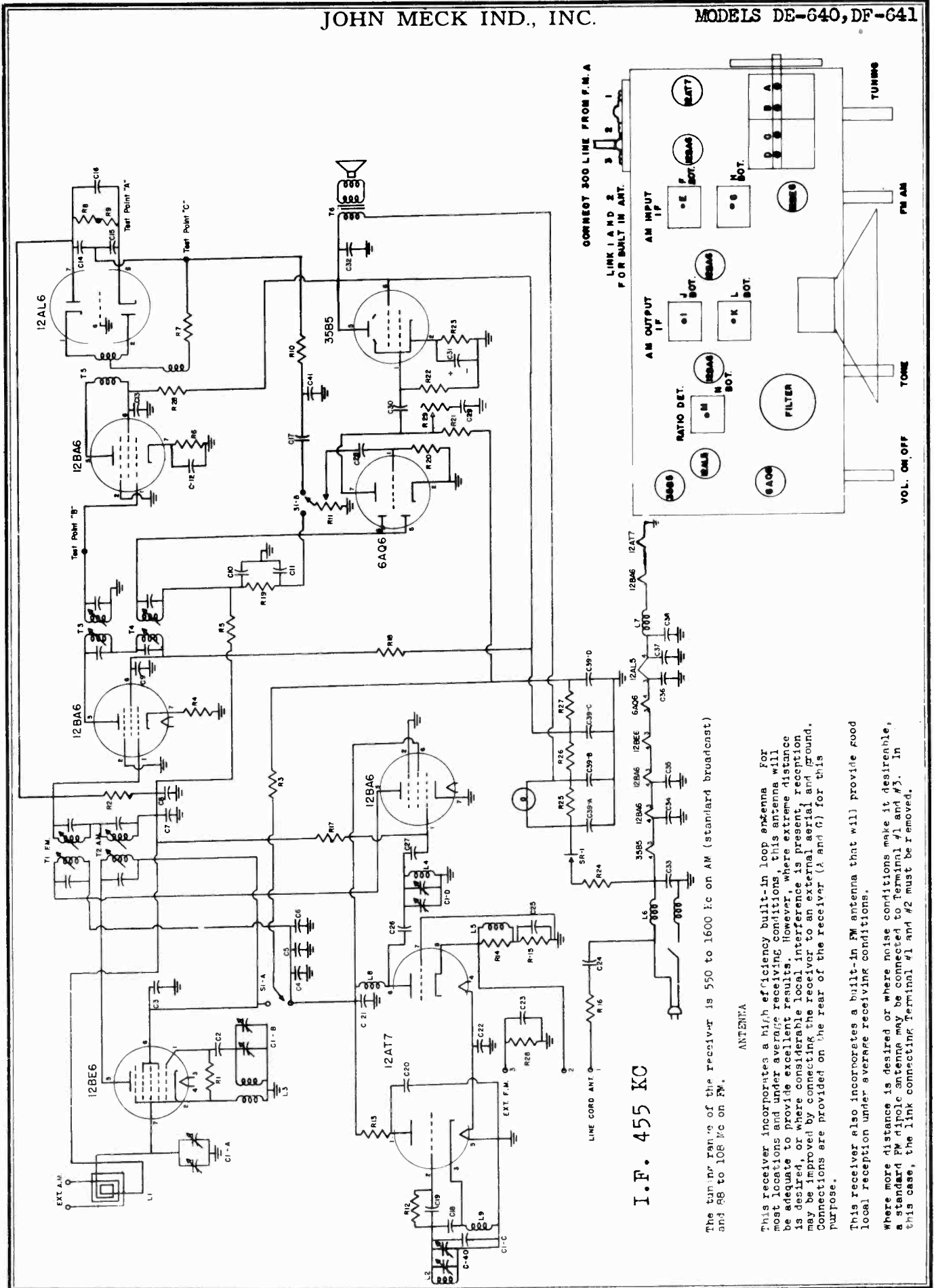
MODEL 8JL885,  
CHASSIS 4810B

MAJESTIC RADIO & TELEV. CORP.

PARTS LIST

SYMBOL NO.	PART NO.	DESCRIPTION
C2, C4, C5	8-35	Trimmer, 24-30 mmf
C3, C15	015-9	Condenser, .1 mfd, 200 volt paper.
C6	6-177	Condenser, 6900 mmf, 500 volt mica
C7	8-36	Trimmer, 14-15 mmf
C8	8-33	Padder, 330-960 mmf
C9a, b, c	7-30	Tuning Condenser (3 Section)
C10	6-159	Condenser, 47 mmf, 500 volt Ceramic.
C11	017-5	Condenser, .01 mfd, 600 volt paper
C12, C14,		Part of T1 Transformer
C13	017-8	Condenser, .05 mfd, 600 volt paper
C16	6-264	Part of L5 & L6 (5 mmf ceramic)
C17, C18		Part of T2 Transformer
C19, C24, C28, C29, C36	016-5	Condenser, .01 mfd, 400 volt paper
C20		Part of T2 Transformer
C21	020-53	Condenser, 220 mmf, 500 volt mica.
C22, C25	6-133	Condenser, .006 mfd, 600 volt paper.
C23	015-5	Condenser, .01 mfd, 200 volt paper
C26	015-8	Condenser, .05 mfd, 200 volt paper
C31	017-1	Condenser, .001 mfd, 600 volt paper.
C33, C34	18-16	Condenser, 16-16 mfd, 450 volt Electrolytic.
C35	020-39	Condenser, 100 mmf, 500 volt mica.
R1	01-143	Resistor, 22,000 ohms 1/2 watt 20%
R2	04-136	Resistor, 15,000 ohms 2 watts 10%.
R3	02-128	Resistor, 10,000 ohms 1/2 watt 10%
R4	02-55	Resistor, 180 ohms 1/2 watt 10%.
R5, R23	01-213	Resistor, 1 megohm 1/2 watt 20%.
R6	02-213	Resistor, 1 megohm 1/2 watt 10%.
R7	01-156	Part of T2 (47,000 ohms)
R8	01-198	Part of T2 (470,000 ohms)
R9	01-255	Resistor, 10 megohms 1/2 watt 20%.
R10, R14, R19, R20	02-198	Resistor, 470,000 ohms 1/2 watt 10%.
R11	01-139	Resistor, 18,000 ohms 1/2 watt 10%.
R12	13-15	Volume control, 2 megohm with SPST switch.
R13	14-4	Tone control, 2 megohms
R15	01-185	Resistor, 220,000 ohm 1/2 watt 20%
R16	02-100	Resistor, 2200 ohms 1/2 watt 10%
R17	02-139	Resistor, 18,000 ohms 1/2 watt 10%
R18	02-142	Resistor, 22,000 ohms 1/2 watt 10%
R21	04-69	Resistor, 390 ohms 2 watt 10%.
R22	01-227	Resistor, 2.2 megohms 1/2 watt 20%
L1, L2	20-8 or	20-8 or
L4	20-20R	Loop (pri-sec) (Revised winding of 20-8 & 20-20)
L5, L6	S-1938	S.W. Antenna coil.
	S-1937	S.W. P. B.C. Oscillator coil.
I1, I2	26-2	Dial lite, .15 A 6.3 volt (brown bead)
Q1	22-46	Speaker, with output transformer & plug.

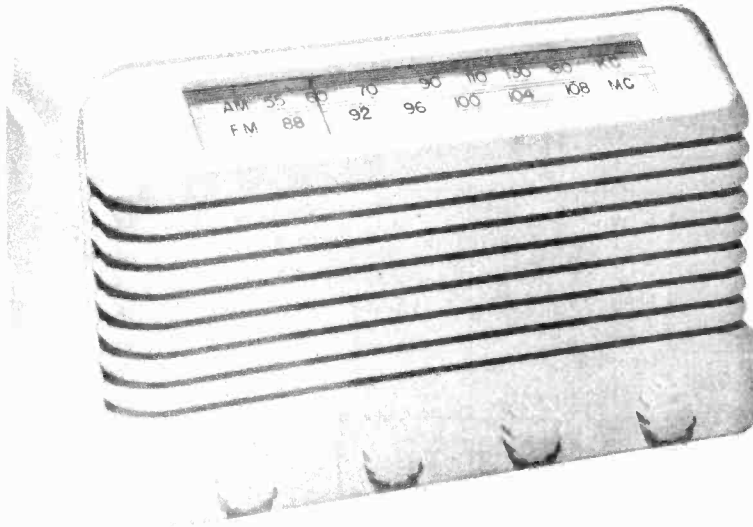
SYMBOL NO.	PART NO.	DESCRIPTION
P1	18-32	Loop plug
P2	18-43	Speaker plug.
P3	18-47	Phono plug.
P4	27-201	A.C. lead & plug.
S1	11-46 or	Band switch
S2	11-64	Phono-Radio switch.
T1	3-165	1st I.F. Transformer.
T2	3-166	2nd I.F. Transformer.
T3	2-12	Power transformer
T4	52-46	Output transformer (part of speaker ass'y).
X1	15-80	Loop socket
X2	15-103	Speaker socket.
X3	15-87	Phono socket.
X4	15-135	Phono A.C. socket
	15-69	Octal tube sockets.
	135-29	Dial pointer.
	129-29	Dial cord spring.
	S-1263	Dial cord assembly.
	117-92	Dial glass scale.
	115-51-1	Cabinet, combination (walnut)
	128-45	Knob, phono-radio
	128-46	Knob, off-volume.
	128-47	Knob, B.C.-S.W.
	128-48	Knob, bass-treble
	128-49	Knob, tuning.
	21-29	Record changer, Aero.
	122-42	Escutcheon, including glass (plain)



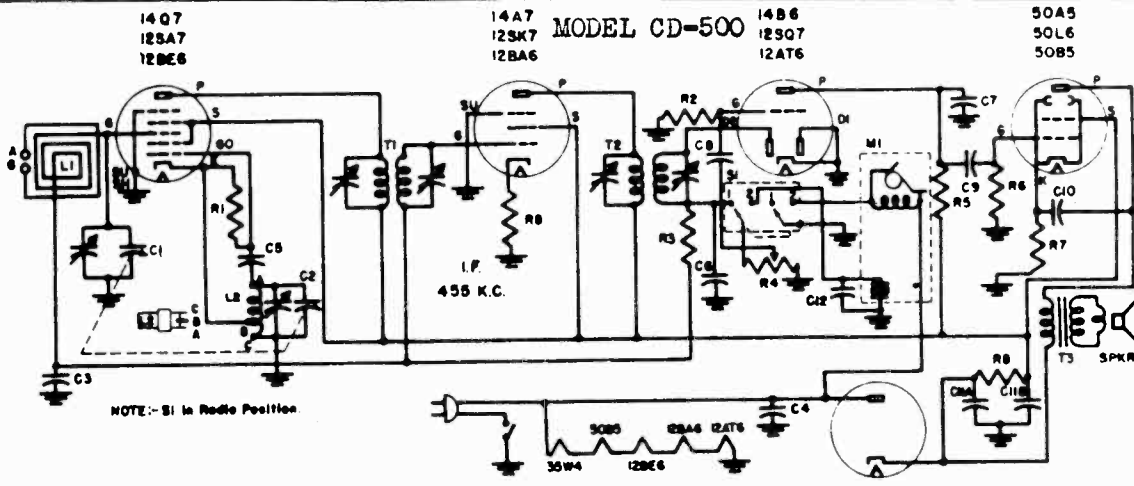
MODELS DE-640,DF-641  
MODEL CD-500

JOHN MECK IND., INC.

MODELS DE-640,DF-641



CIRCUIT SYMBOL	PART NO.	DESCRIPTION	CIRCUIT SYMBOL	PART NO.	DESCRIPTION
CL-A-B-C-D	CV-10002-E	CONDENSER VARIABLE 250 P.F.E.	M1	RC-12200	RESISTOR CARBON 27,000 OHMS 1/4 WATT
C3	CP-12503	CERAMIC 50 MMFD .	R2-17-22	RC-14703	" " 470,000 OHMS 1/4 WATT
C4	CMX-10002	" .005 MFD 200 V.	R3	RC-34700	" " 470 OHMS 1/2 WATT
C5	CMX-10004	" .01 MFD 200 V.	R4-6	RC-10680	" " 58 OHMS 1/4 WATT
C6	CP-15201	CERAMIC 500 MMFD .	R5	RC-12204	" " 2.2 MEG OHMS 1/4 WATT
C7	CP-22003	PAPER 25 MMFD 200 V.	R7	RC-10330	" " 33 OHMS 1/4 WATT
C8	CP-15201	" 500 MMFD .	R8-9	RC-16301	" " 6800 OHMS 1/4 WATT
C9	CP-15201	CERAMIC 500 MMFD .	RC-1019	RC-47000	" " 47,000 OHMS 1/4 WATT
C10	CMX-10003	" ELECT 2 MFD 50 V.	VC-11002-C	VC-11002-C	VOLUME CONTROL WITH SWITCH
C11	CL-10227	CERAMIC 20 MMFD .	R10	RC-11001	RESISTOR CARBON 1000 OHMS 1/4 WATT
C12	CP-15203	" CERAMIC 20 MMFD .	R11	RC-11501	" " 1500 OHMS 3/4 WATT
C13	CL-10228	" ELECT 25 MFD 25 V.	R12	RC-12200	" " 220 OHMS 1/4 WATT
C14	CP-14523	" PAPER 25 MFD 400 V.	R13	RC-11000	" " 100 OHMS 1/4 WATT
C15	CL-10228	" ELECT 40-40-30 MFD 150 V.	R14	RC-31001	" " 1000 OHMS 1/2 WATT
C16	CMX-10005	" .002 MFD .	R15	RC-11003	" " 10 MEG OHMS 1/4 WATT
C17	CMX-10005	" .002 MFD .	R16	RC-12500	" " 220,000 OHMS 1/4 WATT
L1	AL-10007	ANTENNA LOOP	R17-27-28	RC-11500	" " 150 OHMS 1/4 WATT
L2	TRC-10000-B	FM OSCILLATOR COIL	R20	RC-43500	" " 43,500 OHMS 1/2 WATT
L3	TRC-10018	AM OSCILLATOR COIL	R21	RC-43500	" " 43,500 OHMS 1/2 WATT
L4	TRF-10021	FM RF COIL	R22	RC-43500	" " 43,500 OHMS 1/2 WATT
L5	LC-10006	CATHODE CHOKE	R23	RC-43500	" " 43,500 OHMS 1/2 WATT
L6	LC-10004	POWER LINE ANTENNA CHOKE	R24	RC-43500	" " 43,500 OHMS 1/2 WATT
L7	LC-10003	10.7 MC CHOKE	R25	RC-43500	" " 43,500 OHMS 1/2 WATT
L8-9	LC-10003	FM SIGNAL FREQUENCY CHOKE	R26	RC-43500	" " 43,500 OHMS 1/2 WATT
SR-1	VS-10000	SELENIUM RECTIFIER 100 MA	R27-28	RC-43500	" " 43,500 OHMS 1/2 WATT
SI-A-B	VS-10000	SELECTOR SWITCH	VC-11015-B	VC-11015-B	TONE CONTROL



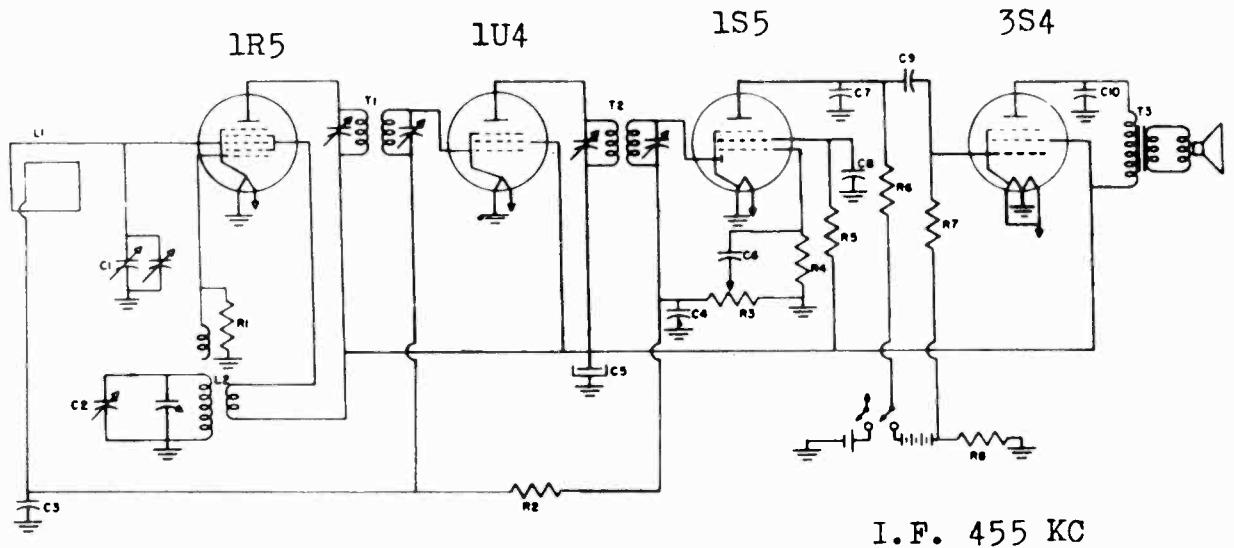
I.F. 455 KC

Circuit Symbol	Part Number	Description	Circuit Symbol	Part Number	Description
C1,C2	CV-10002-E	Condenser-Variable, with pulley	R6	RC-35003	Resistor-Carbon, 500,000 ohms ; watt
C3	CP-12503	Condenser-Paper, 0.05 mfd., 200 volt	R7	RC-31500	Resistor-Carbon, 150 ohms ; watt
C4,C10	CP-14503	Condenser-Paper, 0.05 mfd., 400 volt	R8	RC-32000	Resistor-Carbon, 200 ohms ; watt
C5	CM-15500	Condenser-Mica, 0.00005 mfd., 500 volt	R9	RC-30680	Resistor-Carbon, 68 ohms ; watt
C6,C7	CM-15251	Condenser-Mica, 0.00025 mfd., 500 volt	M1	PRA-10000	Changer Automatic
C8	CP-12103	Condenser-Paper, 0.01 mfd., 200 volt	L1	AL-10003	Loop-Antenna
C9	CP-14103	Condenser-Paper, 0.01 mfd., 400 volt	L2	TRC-10000-D	Coil-Oscillator
C11,C11B	CL-10001	Condenser-Electrolytic 20/20/20 mfd., 150 volt	T1	TS-10000	Transformer-1st I.F.
R1	RC-32002	Resistor-Carbon, 20,000 ohms ; watt	T2	TS-10001	Transformer-2nd I.F.
R2	RC-31005	Resistor-Carbon, 10 Megohms ; watt	T3	TO-10000	Transformer-Output
R3	RC-32004	Resistor-Carbon, 2 Megohms ; watt	SPKR	S0-10000	Speaker-P.M. 4" round less T3
R4	VC-10105	Control-Volume, with switch, 1 Megohms	SI	VS-10000	Switch-Radio Phono. d.s. three position
R5	RC-32503	Resistor-Carbon, 250,000 ohms ; watt			

JOHN MECK IND., INC.

MODEL 4D8  
MODEL 4H8

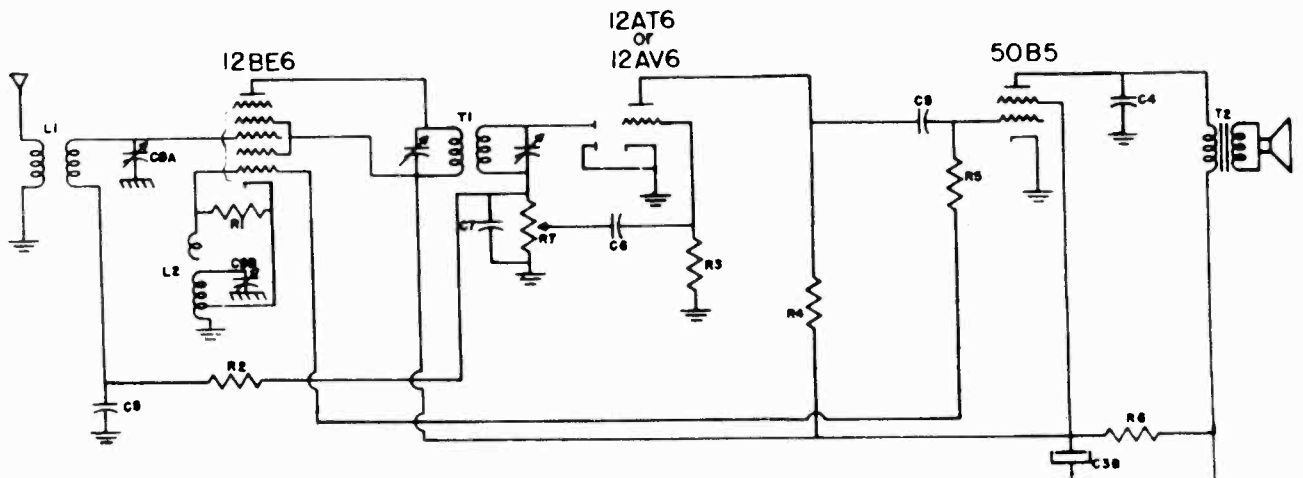
MODEL 4D8



I.F. 455 KC

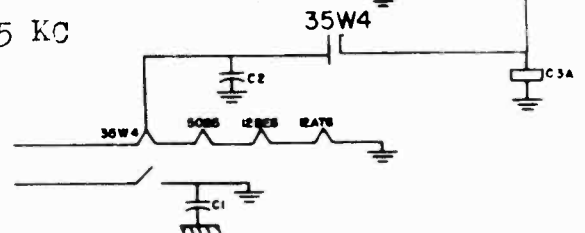
CIR	SYM	PART	NO	DESCRIPTION	CIR	SYM	PART	NO	DESCRIPTION
C1-C2	CV	10008		CONDENSER VARIABLE	R1	RC	38002		RESISTOR CARBON 50,000 OHMS
R3-C6	CP	12103		PAPER .01 MFD 200 V	R2-R5	RC	33304		RESISTOR CARBON 33 MEG
C4-C7	CL	15101		MICA 100 MMF	VC	21103		VOLUME CONTROL 1 MEG DPT SWITCH	
R8-C9	CL	10022		ELECTROLYTIC 10 MFD 75 V	RC	31003		RESISTOR CARBON 10 MEG	
R6-C9	CP	12202		PAPER .005 MFD 200 V	RC	31004		RESISTOR CARBON 1 MEG	
L1	AL	10023		ANTENNA LOOP	RC	32204		RESISTOR CARBON 220 OHMS	
L2	TRC	10001		OSCILLATOR COIL	TR	10011		TRANSFORMER 1ST LF	
					TR	10012		TRANSFORMER 2ND LF	
					TR	10013		TRANSFORMER 3RD LF	

MODEL 4H8



I.F. 455 KC

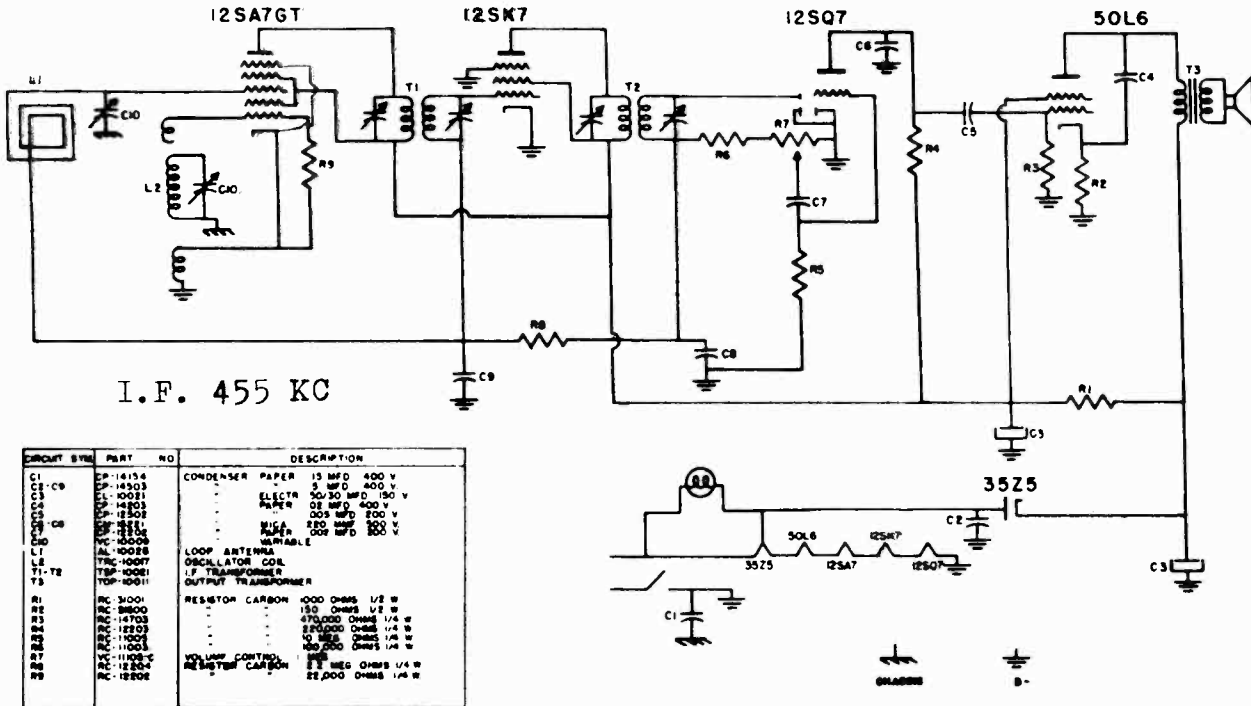
CIR	SYM	PART	NO	DESCRIPTION
R1	RC	11002		RESISTOR CARBON 10,000 Ohm 1/4 W.
R2	RC	12004		RESISTOR CARBON 2 Meg Ohm 1/4 W.
R3	RC	11005		RESISTOR CARBON 10 Meg Ohm 1/4 W.
R4, R5	RC	14703		RESISTOR CARBON 470,000 Ohm 1/4 W.
R6	RC	11001		RESISTOR CARBON 1000 Ohm 1/4 W.
R7	VC	12106-E		VOLUME CONTROL 1 Meg WVA Switch
C1	CP	12503		CONDENSER PAPER .05 MFD 200 V.
C2	CP	14203		CONDENSER PAPER .02 MFD 400 V.
C3A-B	CL	10017		ELECTR. 30/20 MFD 150 V.
C4	CP	14103		CONDENSER PAPER .01 MFD 400 V.
C5	CP	12802		CONDENSER PAPER .005 MFD 200 V.
C6	CP	12202		CONDENSER PAPER .002 MFD 200 V.
C7	CM	25251		MICA 250 MMF
C8	CP	12103		CONDENSER PAPER .01 MFD 200 V.
C9	CV	10010		CONDENSER VARIABLE
L1	TRF	10008		ANTENNA COIL
L2	TRC	10014		OSCILLATOR COIL
T1	TRF	10017X		LF TRANSFORMER
T2	TO	10000		TRANSFORMER



MODEL 5H8  
MODEL 5G8

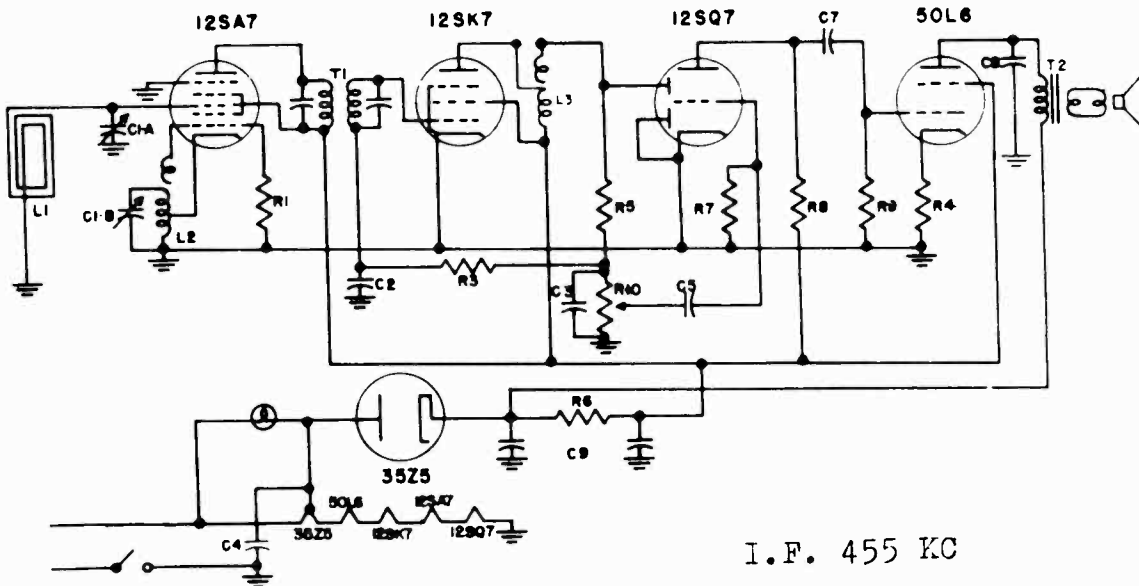
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### MODEL 5H8



CIRCUIT SYM	PART NO	DESCRIPTION
C1	CP-14154	CONDENSER PAPER 15 MFD 400 V
C1-C9	CP-14303	" " 5 MFD 400 V
C2	CL-10081	ELECTR 50/30 MFD 150 V
C3	CP-14803	PAPER .05 MFD 400 V
C4	CP-14803	" " .05 MFD 400 V
C5	CP-14803	" " .05 MFD 400 V
C6	CP-14803	" " .05 MFD 400 V
C7	CP-14803	" " .05 MFD 400 V
C8	CP-14803	" " .05 MFD 400 V
C9	CP-14803	" " .05 MFD 400 V
L1	AL-10008	LOOP ANTENNA
L2	TRC-10007	OSCILLATOR COIL
L3	TSP-10001	IF TRANSFORMER
T1	TSP-10001	IF TRANSFORMER
T2	TSP-10001	IF TRANSFORMER
T3	TSP-10001	IF TRANSFORMER
R1	RC-18001	RESISTOR CARBON 400 OHMS 1/2 W
R2	RC-18000	" " 150 OHMS 1/2 W
R3	RC-14703	" " 470,000 OHMS 1/4 W
R4	RC-12203	" " 220,000 OHMS 1/4 W
R5	RC-11003	" " 110,000 OHMS 1/4 W
R6	RC-11003	" " 110,000 OHMS 1/4 W
R7	RC-11003	" " 110,000 OHMS 1/4 W
R8	RC-12204	VOLUME CONTROL 22 MEG OHMS 1/4 W
R9	RC-12204	" " 22 MEG OHMS 1/4 W
R10	RC-12202	RESISTOR CARBON 22,000 OHMS 1/4 W

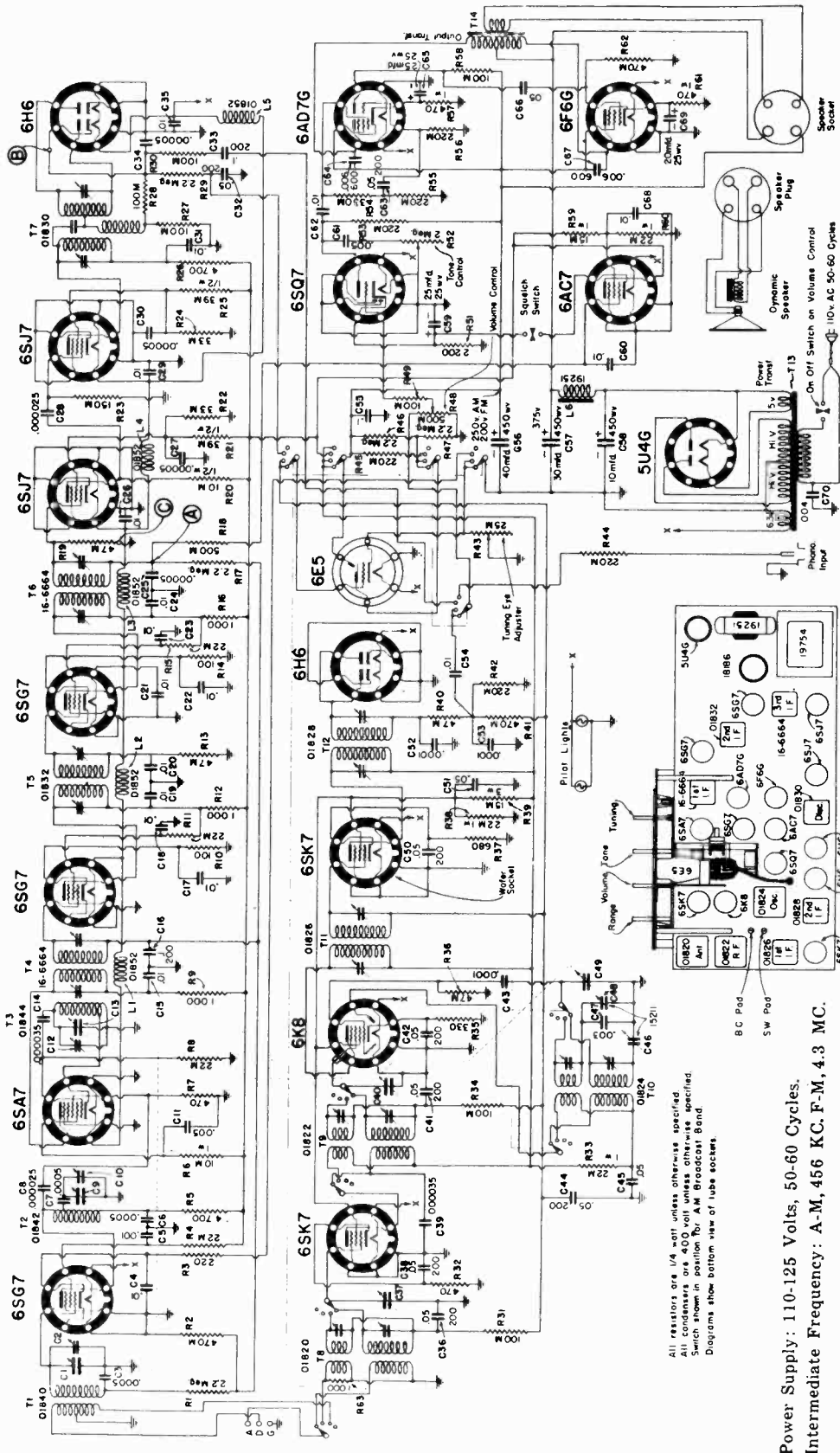
### MODEL 5G8



CIR SYM	PART NO	DESCRIPTION	CIR SYM	PART NO	DESCRIPTION
C1-A-B	CV-10010	CONDENSER VARIABLE	R1	RC-18002	RESISTOR CARBON 20,000 OHM 1/4 WATT
C2	CP-12103	PAPER .01 MFD 200 V	R3	RC-12204	" " 22 MEG OHMS 1/4 WATT
C3	CP-12203	" " .05 MFD 400 V	R4	RC-11203	" " 110,000 OHMS 1/4 WATT
C4	CP-14803	PAPER .05 MFD 400 V	R5	RC-11803	" " 118,000 OHMS 1/4 WATT
C5	CP-12203	" " .05 MFD 400 V	R6	RC-11003	" " 110,000 OHMS 1/4 WATT
C6	CP-12203	" " .05 MFD 400 V	R7	RC-11003	" " 110,000 OHMS 1/4 WATT
C7	CP-14803	" " .05 MFD 400 V	R8	RC-11003	" " 110,000 OHMS 1/4 WATT
C8	CP-14803	" " .05 MFD 400 V	R9	RC-11003	" " 110,000 OHMS 1/4 WATT
C9	CP-14803	" " .05 MFD 400 V	R10	RC-11003	" " 110,000 OHMS 1/4 WATT
L1	AL-10004-A	ANTENNA LOOP	T1	TS-10011-A	VOLUME CONTROL WITH SWITCH
L2	TRC-10007	OSCILLATOR COIL	T2	TSP-10000	IF TRANSFORMER
L3	TSP-10001	INTERSTAGE IF COIL			

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MODELS 9-1053, 9-1054



Power Supply: 110-125 Volts, 50-60 Cycles.  
Intermediate Frequency: A-M, 456 KC.F-M, 4.3 MC.

**NORMAL OPERATING VOLTAGES**  
On Tube Socket Terminals Designated by RMA Number  
Voltages shown below are measured with Range Switch turned to F-M Position.

**NOTES ON VOLTAGE CHART**  
\* These voltages are AC and should not be measured with a DC Voltmeter.  
a These points show a slight voltage indication due to the thermal noise of the receiver unless one of the limiter tubes is removed from its socket.  
b This voltage must be measured with the Interstation Noise Silencer Switch in the "on" position.  
N A varying negative voltage of 15 to 20 volts may be measured at this point, depending upon the setting of the tuning condenser.  
All voltages indicated above are measured with a 1000-ohms-per-volt meter with a line voltage of 117 volts.

Tube	Use	1	2	3	4	5	6	7	8
6SK7	AM RF Ampl.	0	6.3*	0	0	3.5	90	0	250
6K8	AM Converter	0	0	250	90	150	6.3*	2.7	
6SK7	AM I-F Ampl.	0	0	0	0	3.5	90	6.3*	2.7
6H6	AM Detector	0	0	0	0	0	0	6.3*	0
6SQ7	Audio Ampl.	0	0	1.0	0	0	90	6.3*	0
6AD7G	Audio Ampl.	0	6.3*	350	250	0	85	0	16.5
6F6G	Power Ampl.	0	0	350	250	0	0	6.3*	16.5
5U4G	Rectifier	0	400	0	380*	0	0	0	400
6E5	Tuning Ind.	—	—	—	—	—	—	—	—

Tube	Use	1	2	3	4	5	6	7	8
6SG7	FM RF Amp.	0	0	2.1	0	2.1	0	120	6.3* 145
6SA7	FM Converter	0	6.3*	185	95	0	0	0	0
6SG7	FM 1st I-F	0	0	1.3	0	1.3	105	6.3* 175	
6SG7	FM 2nd I-F	0	0	1.2	0	1.2	105	6.3* 175	
6SJ7	FM 1st Lim.	0	6.3*	0	0	0	65	0	135
6SJ7	FM 2nd Lim.	0	6.3*	0	0	0	65	0	165
6H6	FM Discrim.	0	6.3*	0a	0a	0	0	0	0
6AC7	Silencer	0	0	0	0	3b	110	6.3* 185	

**ALIGNMENT PROCEDURE**

The minimum of equipment required for correctly aligning this receiver is listed below.

A modulated service oscillator or signal generator capable of generating the frequencies 456 KC, 600 KC, 1400 KC, 6.0 MC, 16.0 MC and 46.0 MC.

An output meter.

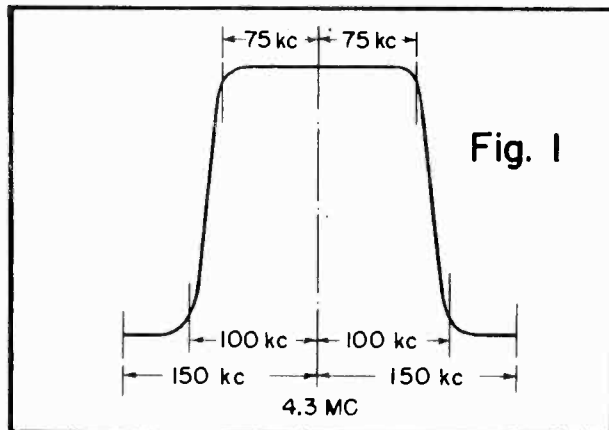
A 0-200 or a 0-100 microampere meter.

An oscilloscope with vertical and horizontal amplifiers.

A wide-band frequency-modulated generator or "wobulator" covering the intermediate frequency of 4.3 MC and with either 400-cycle or 60-cycle modulation. It must be capable of producing a deviation frequency of 150 KC. (Total frequency swing of 300 KC.)

While this instruction sheet describes the use of a generator for F-M alignment which has 400-cycle modulation and which has provision for bringing out the 400-cycle voltage for application to the horizontal plates of the oscilloscope, it is also possible to use a generator with 60-cycle modulation, and to use the 60-cycle sweep which is built into the oscilloscope, instead of obtaining the synchronizing voltage from the generator. If the service man has been using such a generator for A-M visual alignment he will be familiar with his instrument and will be able to adapt it to this alignment procedure.

Although it is possible to align this receiver with a generator or wobulator not having quite as great a total frequency swing as 300 KC, it will be difficult to get satisfactory results. Note that the I-F response curve in Figure 1 is flat over a region about 150 KC wide. An unsymmetrical response curve in an F-M receiver quite seriously affects its performance at low signal levels. It is therefore essential to have proper equipment for alignment in order to get the best results.

**A-M ALIGNMENT**

The alignment of the A-M portion of this receiver is conventional and should be carried out as follows:

Connect the output meter to the receiver by any of the usual methods.

Connect the A-M signal generator between the chassis and the grid of the 6K8 tube, using a .0005-mfd. to .25-mfd. condenser between the grid and the high side of the generator output. Do not remove the grid clip for this operation. The range switch should be turned to the Broadcast band and the dial pointer set near 600 KC. Tune the signal generator to 456 KC and proceed to align the four I-F trimmers for maximum output. On this and on all following adjustments turn the audio control on full and use as weak a signal from the generator as will give a satisfactory indication on the output meter.

The generator should now be connected to the antenna-and-ground terminal strip. Leave "D" unconnected. Use a proper dummy antenna in series with the high side of the generator output (200-mmfd. for Broadcast; 400-ohms for Short-Wave).

**SHORT-WAVE BAND**

Turn the range switch to the Short-Wave position and set the tuning dial and the signal generator to 16.0 MC. Adjust the oscillator trimmer (top trimmer in oscillator coil) to maximum response. If two responses of nearly equal intensity are found, adjust for the one with the trimmer farthest open. Now adjust the top trimmers in the Antenna and R-F coils for maximum response. Since, at this frequency, the R-F tuning slightly affects the oscillator frequency, it will be necessary to rock the tuning condenser slightly while adjusting the R-F trimmer in order to keep the signal tuned in.

Set the signal generator to 6.0 MC and tune in this signal with the receiver dial. Now, while rocking the tuning condenser back and forth, adjust the S-W oscillator padding condenser. (The rear section of the dual padder located in the top of the chassis over the range switch) for maximum output. This adjustment is not critical and the tuning of the S-W padder will be found to be quite broad.

**BROADCAST BAND**

Turn the range switch to the Broadcast position and substitute the 200-mmfd. dummy antenna for the 400 ohms. Set the dial and the generator to 1400 KC and adjust the oscillator trimmer (bottom trimmer on oscillator coil) to maximum response. Next adjust the bottom trimmers of the Antenna and R-F coils for maximum response.

Now set the generator to 600 KC and tune in the signal with the dial. Rocking the gang condenser slightly, adjust the oscillator padder (front section of the dual padder) for maximum response. This adjustment will be much sharper than the padding adjustment on the short-wave band.

This completes the alignment of the A.M. portion of the receiver.

**F-M ALIGNMENT**

The F-M alignment is made in three major steps: namely, I-F alignment, discriminator alignment and R-F alignment.

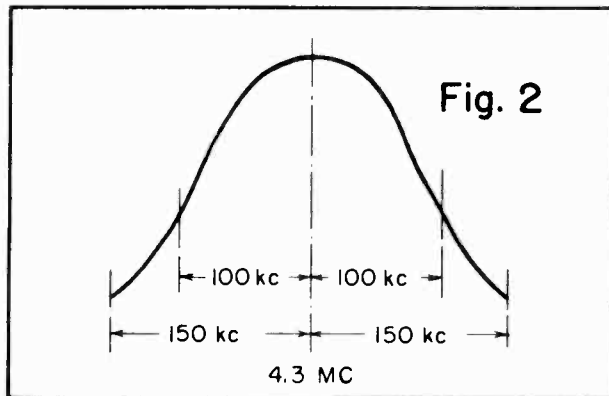
For the first operation, I-F alignment, connect the output of the frequency-modulated generator between the grid of the 6SG7 2nd IF stage and chassis, using a .05-mfd. condenser in series with the high side of the generator output and connecting this condenser to the 6SG7 grid. Leave the grid lead of the 6SG7 tube connected. Now connect the synchronizing voltage output from the generator to the input of the horizontal amplifier of the oscilloscope. Note: The ground lead from the generator should always be connected to the chassis near the tube to whose grid the generator is connected to avoid spurious regeneration phenomena which change the shape of the IF curve.

Now connect the input to the oscilloscope vertical amplifier between chassis and the low potential end of the last I-F transformer (point "A" in circuit diagram) using a 100,000-ohm resistor in series with the high side. This resistor should be located at the receiver end of the connecting wires and should be connected with a short lead to the Point "A".

Having made the set-up, turn on the oscilloscope and the frequency-modulated generator. Turn down the receiver volume control. Set the generator to 4.3 MC and the deviation frequency (if calibrated on the generator) to 150 KC. Turn the vertical gain control of the oscilloscope well up and the horizontal gain control just high enough to give almost full-screen deflection of the horizontal pattern. Using just enough output from the generator to give good deflection on the screen adjust the trimmers of the last I-F transformer for the greatest gain and to give a pattern that is centered in the screen and that is symmetrical. This pattern should be similar to the one shown in Figure 2

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Now without changing the generator frequency, remove the generator connection from the grid of the 6SG7 2nd I.F. amplifier and place it on the grid of the 6SG7 1st I.F. amplifier, using the .05-mfd. condenser as before, and changing the position of the ground lead as described above. Again use only enough output from the generator to give good vertical deflection on the screen, and adjust the trimmers of the second I-F transformer in the same manner as before. The curve shape should remain practically the same as it was before.

Now remove the generator connections (ground as well as "hot") from the 6SG7 first I-F amplifier and place them on the signal grid and ground of the 6SA7, again using the .05-mfd. condenser. Proceed as before, turning down the output from the generator until there is just enough for good vertical deflection on the oscilloscope screen. Adjust the trimmers of the first I-F transformer for the greatest gain and to give a pattern similar to the one shown in Figure 2.

In all of the foregoing adjustments note that the oscilloscope vertical amplifier gain control has been turned well toward maximum gain, and that a low input from the generator has been used. The reason for this is that, as higher signal-input levels are used, the response curve of the I-F amplifier stages will change shape. If the symmetry of the response curve is kept good at low input levels, then any dissymmetry occurring at high input levels will be unimportant, since at high input levels the limiter tube will level out the response before the signal reaches the discriminator.

Should the I-F circuits for any reason be badly misaligned, the first 6SG7 I-F stage may oscillate when the input from the generator is placed on the grid of the 6SG7 second I-F tube, making it difficult to get a readable pattern on the oscilloscope screen. Should this condition occur, the remedy is to remove the 6SG7 first I-F tube from its socket until the last I-F stage has been aligned.

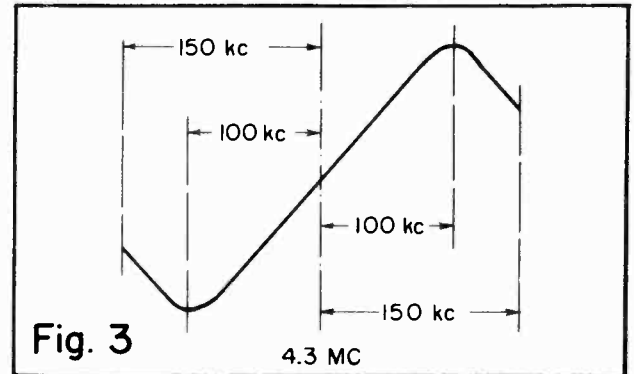
This completes the alignment of the I-F stages and the alignment of the discriminator comes next. Before proceeding with the discriminator alignment, however, it will be necessary to balance the tuning-eye circuit. With the 6SJ7 second-limiter tube removed from its socket, adjust the eye balance control, which is the short shaft with the screw driver slot on the back of the chassis, until the eye just closes but does not overlap. Now replace the 6SJ7 second-limiter tube.

**DISCRIMINATOR ALIGNMENT**

Leaving the set up as it was when the I-F alignment was completed, adjust the generator frequency until the I-F response pattern on the oscilloscope screen is centered and is symmetrical.

Now remove the connection to the low-potential side of the 1st I-F coil, which is the lead containing the 100,000-ohm resistor, and move this connection to the 6H6 discriminator cathode marked "B" in the circuit diagram. The pattern on the oscilloscope screen will go off scale and the input from the generator will have to be decreased. If the generator leakage is bad and its output cannot be turned down to a sufficiently low level, the oscilloscope vertical amplifier gain control may be turned down. With the set-up made as described and with the generator deviation-

frequency still set at 150 KC, adjust the trimmer on the primary side of the discriminator coil (The red Trimmer Screw) for greatest vertical deflection on the oscilloscope screen.



Next adjust the trimmer on the secondary side of this coil until a pattern similar to the one shown in Figure 3 is obtained. This adjustment is quite critical and should be made so that the pattern is as near symmetrical as possible. If the portion of the pattern in Figure 3 which appears straight, is not quite straight on the oscilloscope screen it may be made so by a slight readjustment of the trimmer on the primary side of the coil. Before leaving the adjustment of the discriminator coil a further refinement in the adjustment of the secondary trimmer should be made as follows: Decrease the frequency deviation of the generator from 150 KC to about 100 KC, or until the pattern on the oscilloscope screen just takes in the straight portion of the curve. Now, watching the action of the tuning eye, make a very slight readjustment of the secondary trimmer of the discriminator coil until the eye just closes but does not overlap. This completes two steps in the I-F alignment and the connections to the frequency-modulated generator and the oscilloscope may now be removed.

**ANTENNA, R-F AND OSCILLATOR**

In order to align the R-F Antenna and Oscillator circuits, an amplitude-modulated signal generator covering the range of 42-50 MC and a 0-200 microampere meter may be used. The signal generator need not be modulated.

Connect the meter in series with the ground end of the grid resistor of the 6SJ7 first-limiter tube, with the positive side of the meter to ground. This point is marked "C" in the circuit diagram. Now apply the output of the signal generator to the antenna and ground posts of the terminal strip on the back of the chassis which are marked "A" and "G". Leave "D" unconnected. Set the receiver dial and the signal generator to 46 MC and adjust the oscillator trimmer, which is the air trimmer mounted on top of the middle section of the tuning condenser, for maximum deflection on the 0-200 microampere meter. If two positions of the oscillator trimmer give almost equal deflection on the meter, select the point with the trimmer farthest in mesh, since the oscillator on this band operates below the signal frequency. Keep the generator output adjusted to such a value that about one quarter of full scale deflection is obtained on the meter. Next adjust the R-F trimmer, mounted on the front section of the tuning condenser, for maximum deflection of the meter; then perform the same operation for the antenna trimmer, which is mounted on the back section of the tuning condenser. The adjustment of the R-F trimmer affects the oscillator frequency slightly and the tuning condenser should be rocked back and forth when making this adjustment in order to keep the oscillator tuned to the signal frequency. If two points of response are found on the R-F or antenna trimmers, the point which requires the least amount of capacity in these trimmers should be selected.

As a final check of antenna, R-F and oscillator adjustment, signals from the generator should be tuned in at various points on the band to see that the sensitivity is equal over the band.



## REPLACEMENT PARTS LIST

### MISCELLANEOUS

Part No.	Description	Part No.	Code	Value
19746	Tuning Indicator Socket Assembly	15132	C14,C39	35 mmfd.
19759	Multiple Section Range Switch	14101	C43,C52,C53	100 mmfd.
17280	Interstation Silencer Switch	14139	C3,C6,C7	500 mmfd.
19698	Molded Bakelite Knob	14108	C5,	.001 mfd.
	8" Dynamic Speaker, 2700-ohm Field, with cable and plug	17120	C11,C61	.005 mfd.
		18154	C70	.004 mfd.
		16138	C47	.003 mfd.

#### TRIMMER

9583	C2,C10	1 1/2 -plate	Ceramic
21-5175	C12	14 -plate	Ceramic
15211	C46,C48	6 -plate	Ceramic

### TRANSFORMERS AND COILS

Part No.	Code	Description	Part No.	Code	Value	Special
01840	T1	F-M Antenna Coil	18185	C1,C9,C13	5-plate	F-M Tuning
01842	T2	F-M RF Mixer Coil		C37,C40,C49	19-plate	A-M Tuning
01844	T3	F-M Oscillator Coil				
16-6664	T4	F-M 1st I-F Transformer				
01832	T5	F-M 2nd I-F Transformer				
16-6664	T6	F-M 3rd I-F Transformer				
01830	T7	F-M Discriminator Transformer				
01820	T8	Two-band Antenna Coil				
01822	T9	Two-band RF Mixer Coil				
01824	T10	Two-band Oscillator Coil				
01826	T11	A-M Input I-F Transformer				
01828	T12	A-M Output I-F Transformer				
19754	T13	Power Transformer, 110-volt, 60-cycle				
19753	T14	Output Transformer				
01852	L1 to L5	Filament Choke				
19251	L6	Filter Choke				

#### SPECIAL

## RESISTORS

#### CARBON

Part No.	Code	Resistance	Wattage
15102	R10,R14	100-ohm	0.25..
15136	R3	220-ohm	0.25..
14175	R35	330-ohm	0.25..
15145	R7	470-ohm	0.25..
18104	R57,R61	470-ohm	1.00..
16126	R37	680-ohm	0.25..
14191	R9,R12		
	R16,R63	1,000-ohm	0.25..
16117	R51	2,200-ohm	0.25..
14179	R5,R26	4,700-ohm	0.25..
15153	R20	10,000-ohm	0.50..
14193	R6	10,000-ohm	1.00..
15156	R59	15,000-ohm	1.00..
17121	R39	15,000-ohm	3.00..
14190	R33,R38,R60	22,000-ohm	1.00..
14169	R4,R8		
	R11,R15	22,000-ohm	0.25..
17111	R22,R24	33,000-ohm	0.25..
15155	R21,R25	39,000-ohm	0.50..
14151	R13,R19		
	R36,R40	47,000-ohm	0.25..
17184	R27,R28	100,000-ohm	0.25..
14144	R30,R31,R34		
	R49,R58	100,000-ohm	0.25..
16193	R23	150,000-ohm	0.25..
14170	R42,R44,R45		
	R53,R55,R56	220,000-ohm	0.25..
14145	R54	330,000-ohm	0.25..
14155	R2,R18,R32		
	R41,R62	470,000-ohm	0.25..
17109	R1,R17,R29		
	R46,R47	2.2-megohm	0.25..

#### VARIABLE

19752	R43	25,000-ohm	Tuning Indicator Adjustment
19748	R48	500,000-ohm	Volume Control, With Switch
19747	R52	2.0-megohm	Tone Control

### CONDENSERS

#### TUBULAR

Part No.	Code	Capacity	Voltage
15187	C64,C67	.006 mfd.	600....
14110	C4,C15,C17		
	C18,C19,C20		
	C21,C22,C23		
	C24,C26,C29		
	C31,C35,C54		
	C60,C62,C68	.01 mfd.	400....
14181	C45,C51,C66	.05 mfd.	400....
15142	C16,C33	0.1 mfd.	200....
14160	C32,C36,C38		
	C41,C42,C44		
	C50,C63	.05 mfd.	200....
15143	C55	0.1 mfd.	400....

#### ELECTROLYTIC

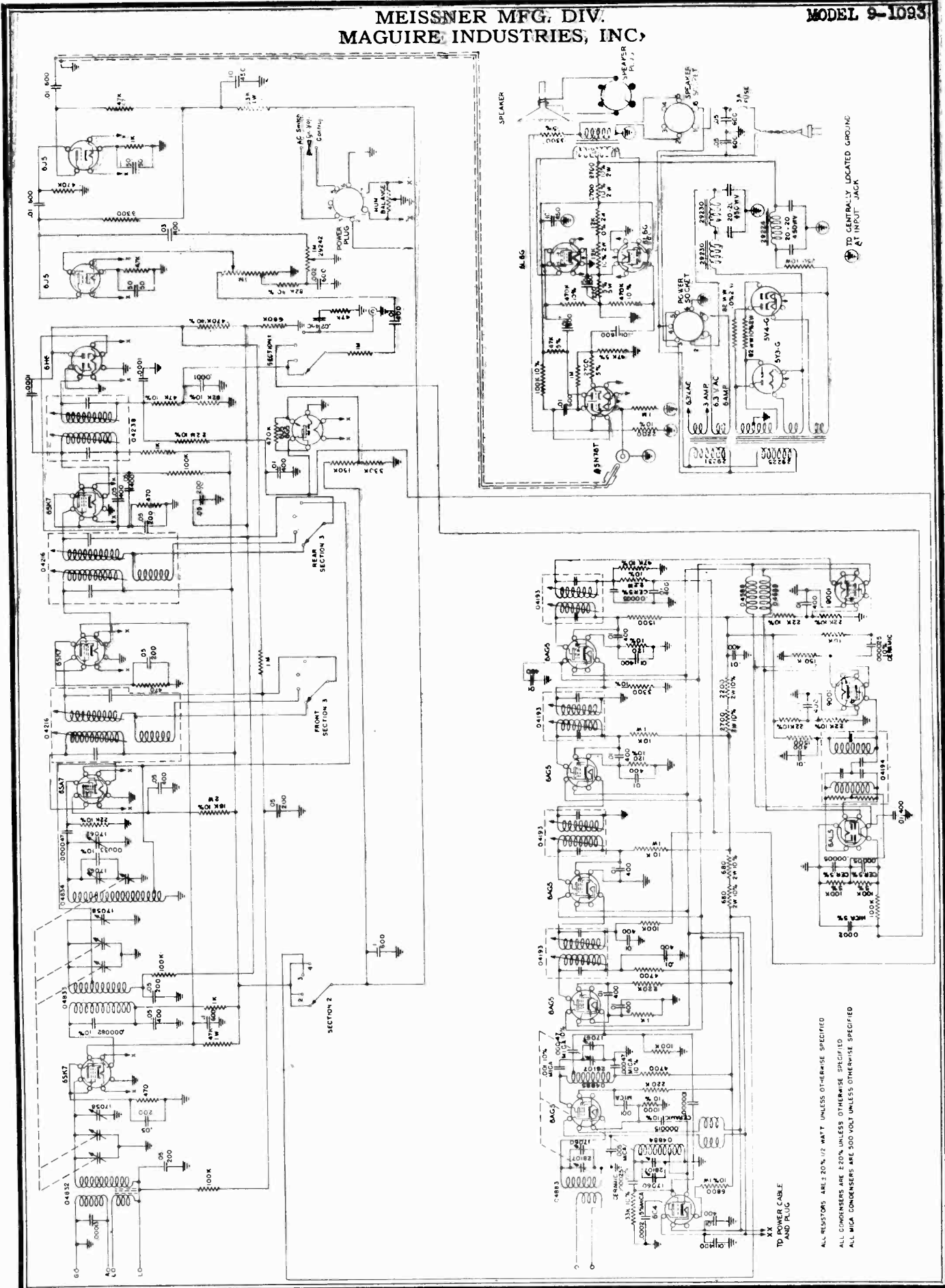
18186	C56	40 mfd.	450
	C57	30 mfd.	450
	C58	10 mfd.	450
	C69	20 mfd.	25....
16184	C59,C65	25 mfd.	25....

#### MOLDED

15101	C25,C27		
	C30,C34	50 mmfd.	
14180	C8,C28	25 mmfd.	

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MODEL 9-1093



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MODEL 9-1093

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## Broadcast Band Alignment Data -

Intermediate Frequency	455	Kilocycles
Adjust Trimmers at	1550	Kilocycles
Adjust Oscillator Padder at	580	Kilocycles

signal 10.7 mc. to 1st limiter grid through .005 mica capacitor. Connect vacuum tube voltmeter (with high impedance input) from the junction of two .000050 ceramic condensers in discriminator output circuit to chassis and adjust top slug of discriminator transformer for maximum voltmeter reading. Then connect VT meter from discriminator audio output lead to chassis and balance bottom slug for zero reading.

## Frequency Modulation Band Alignment -

Equipment required for alignment: unmodulated R.F. signal generator that will cover 10.7 Megacycles and a range of 88 to 108 Megacycles, a D.C. vacuum tube voltmeter, and a microammeter capable of reading 50 microamperes. A more satisfactory discriminator alignment may be obtained if the following additional equipment is available. An F.M. generator capable of 200 kilocycles deviation at 10.7 megacycles and a cathode-ray oscilloscope.

## Discriminator Alignment - (With F.M. signal and oscilloscope)

Remove 2nd I.F. tube.

Apply 1 V. modulated, 200 kc. deviation, 10.7 mc. signal to 1st limiter grid through .005 mica capacitor. Adjust bottom slug of discriminator transformer so that peaks of curve are symmetrical about the vertical axis. Adjust top slug to give maximum amplitude of peaks.

## Discriminator Alignment - (With unmodulated signal and vacuum tube voltmeter)

Remove 2nd I.F. tube.

Apply 1 V. unmodulated

## I.F. Alignment -

Remove second 9001 limiter from socket. Insert microammeter in series with 47K 1st limiter grid resistor to ground. With 10.7 mc. signal input to antenna, adjust each I.F. transformer for maximum limiter grid current.

## R.F. Alignment -

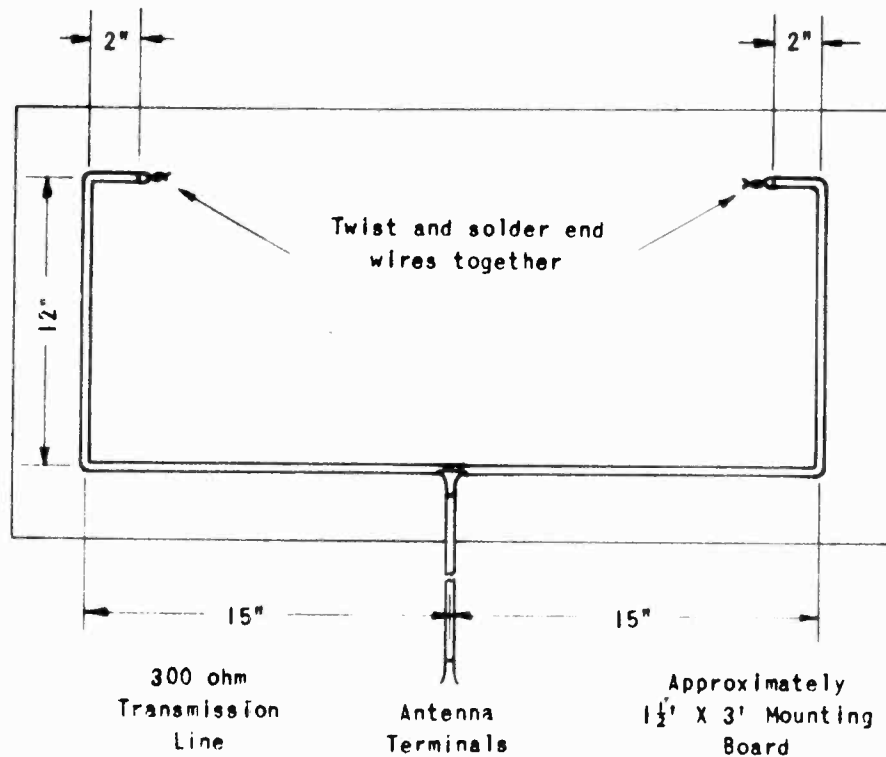
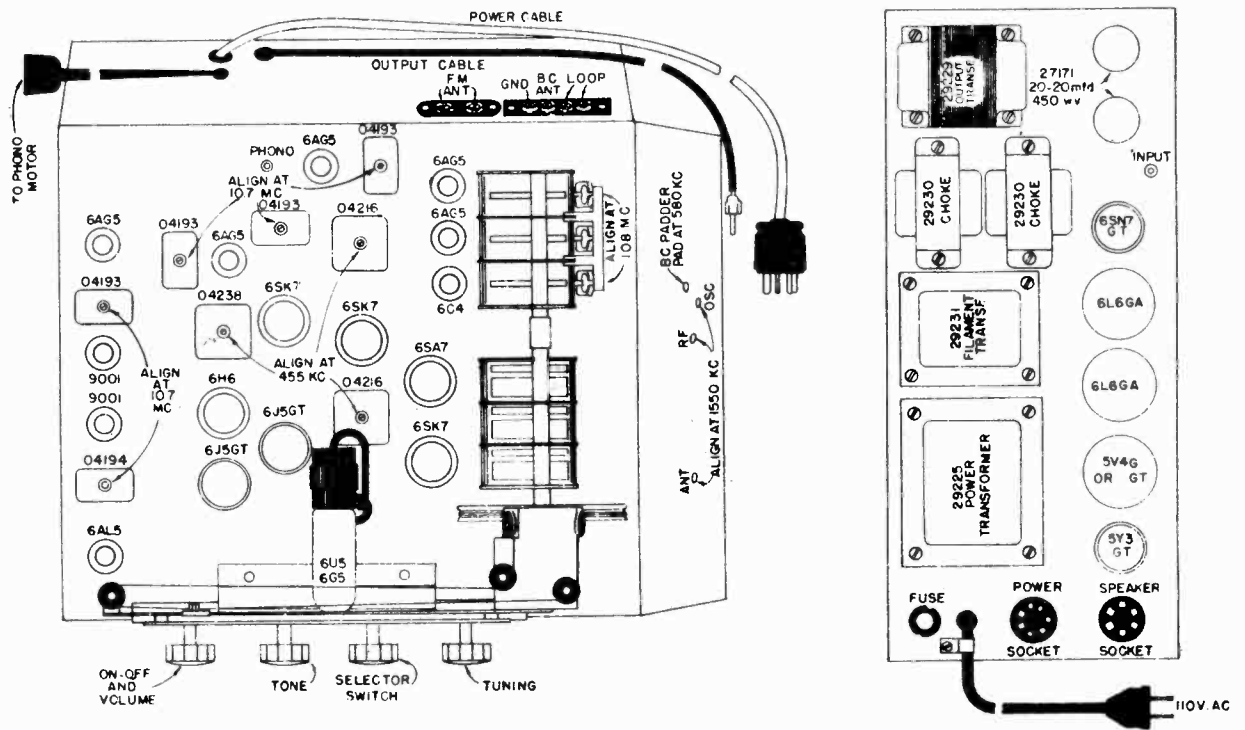
The R.F. section contains a double converter system in which the oscillator operates at one half signal frequency, minus 5.35 mcs. The image frequency is so far away from the signal frequency that it is normally not necessary to locate or pay any particular attention to the image during the alignment procedure.

Trimmers should be adjusted for maximum output at limiter stage with generator set to 108 mcs.

Standard Broadcast	535-1620	Kilocycles
Frequency Modulation	88-108	Megacycles

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MAGUIRE INDUSTRIES, INC.

MODEL 9-1093



MEISSNER MFG. DIV.  
MAGUIRE INDUSTRIES, INC.D.C. VOLTAGE TABLE

<u>Tube</u>	<u>Function</u>	<u>Plate</u>	<u>Screen</u>	<u>Cathode</u>
6SK7	R.F.	280	107	4.4
6SA7	Converter	285	108	-
6SK7	1st I.F.	285	107	4.7
6SK7	2nd I.F.	280	111	5
6H6	Detector	-	-	(Pin 4) 5 (Pin 8) 0
6J5	1st Audio	150	-	6.7
6J5	2nd Audio	67.5	-	1.7
6E5	Tuning Eye	125	-	-
6AG5	1st Conv.	260	107	2.7
6AG5	2nd Conv.	270	133	2.9
6C4	Osc.	180	-	-
6AG5	1st. I.F.	100	100	0
6AG5	2nd I.F.	125	125	1.1
6AG5	3rd I.F.	102	102	1
9001	1st Limiter	98	46.5	-
9001	2nd Limiter	117	45	-
6AL5	Discriminator	-	-	(Pin 5) 3.4
6SN7G	Driver	(Pin 2) 76 (Pin 5) 197.5	-	(Pin 3) 2.6 (Pin 6) 83
6L6G	Output	365	270	22.2
5Y3G	Rectifier	-	-	310
5V4G	Rectifier	-	-	405

Power Supply

This receiver is designed to operate from a power supply main of 105-125 volts, 50-60 cycle alternating current (A.C.). NEVER PLUG INTO ANY OTHER SUPPLY !!

Speaker

The power amplifier is designed to operate a permanent magnet type of speaker with a voice coil impedance of 12 ohms.

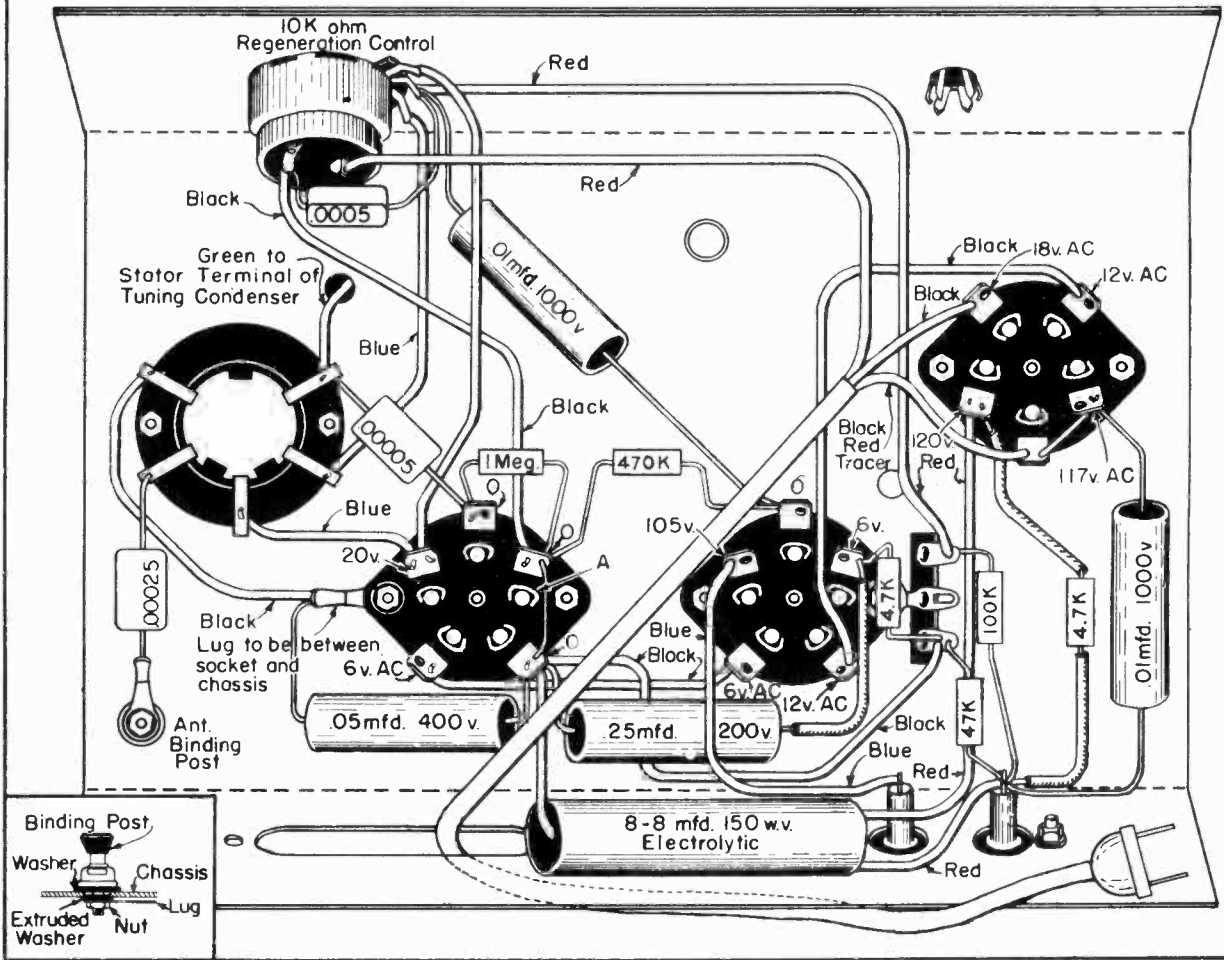
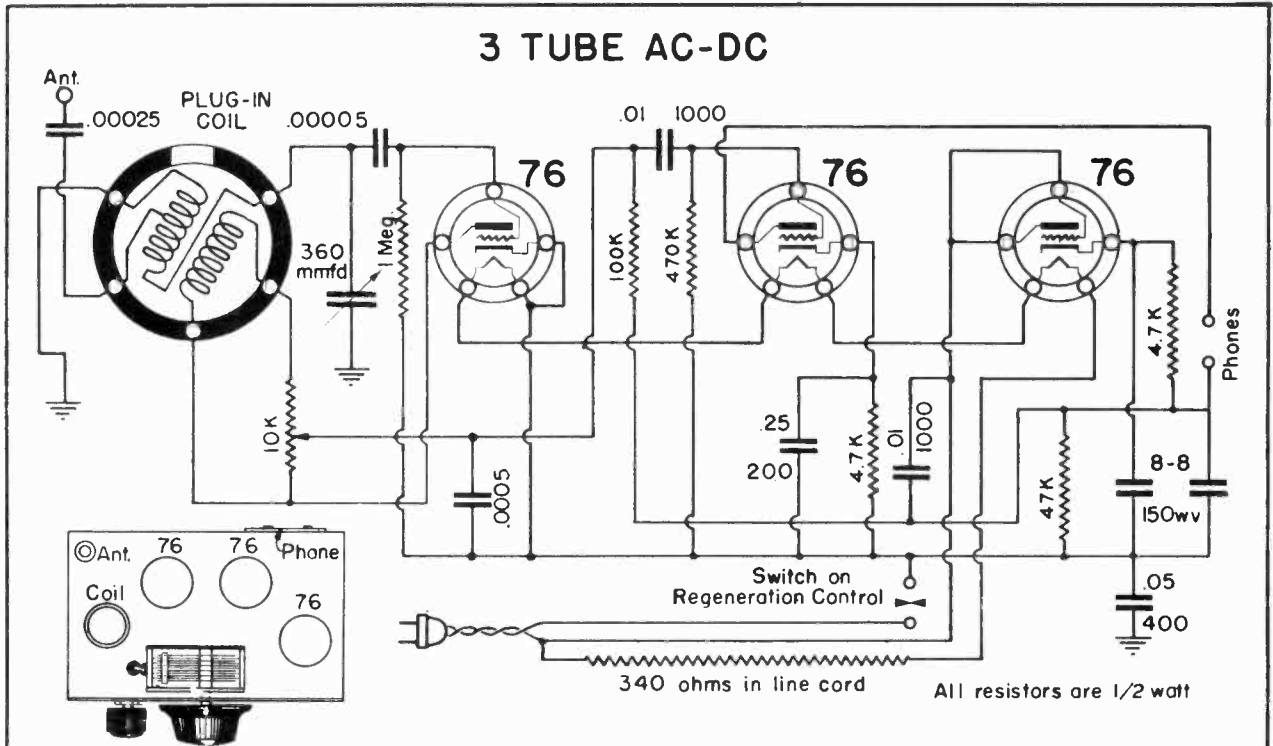
D.C. Voltage Table -

The voltages in the table above are the correct voltages which should be measured between the socket terminal and chassis with nominal line voltage and no signal. All voltages measured with a high impedance voltmeter (20,000 ohms/volt). Allowance should be made for loading if a low impedance voltmeter is used.

MEISSNER MFG. DIV.  
MAGUIRE INDUSTRIES, INC.

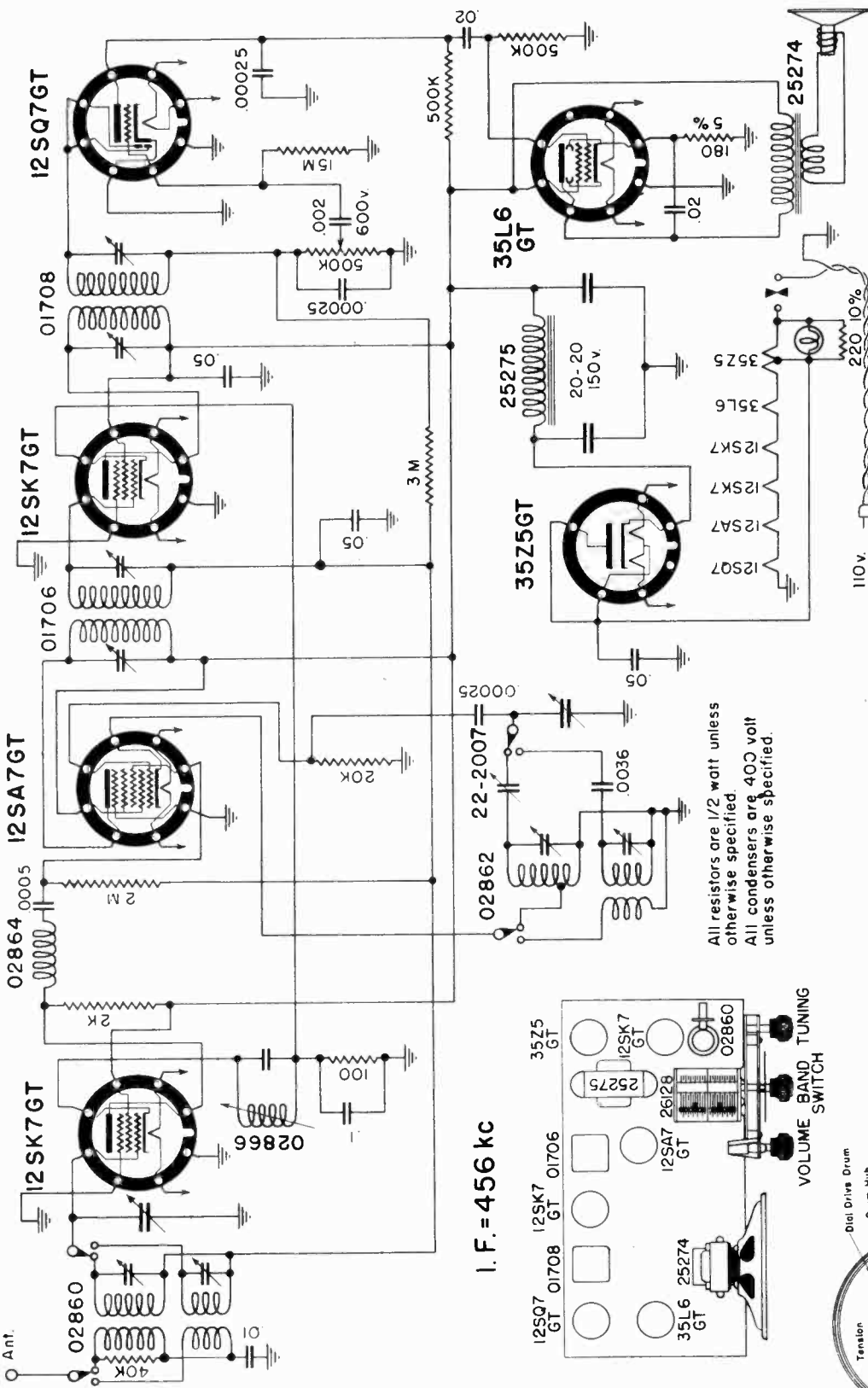
MODEL 10-1193

### 3 TUBE AC-DC

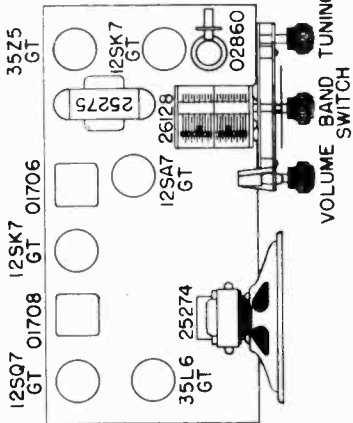


MEISSNER MFG. DIV.  
MAGUIRE INDUSTRIES, INC.

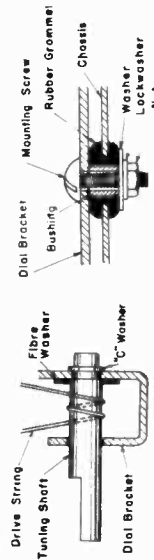
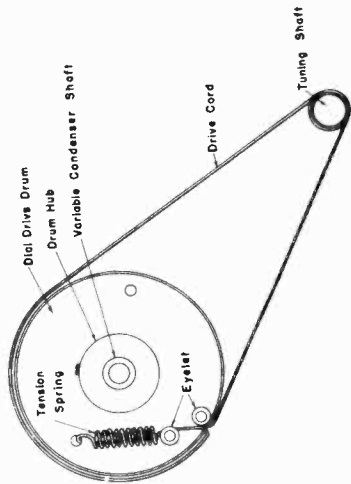
MODEL 10-1199



I. F. = 456 kc



Double the dial string and thread the doubled portion through the hole in the rim of the pulley from the inside out.  
Hook the free end of the spring into one of the holes in the flat part of the pulley.  
Close the gang condenser and rotate the pulley until the hole in the rim occupies the same position as the figure of the hour 7 on a clock face—then tighten the set screw.  
Mount the tuning shaft, looping the string around it 2½ turns, in such a direction that the string leaves the tuning shaft without crossing. Detail of shaft mounting—



Stretch the string over the rim of the pulley. Figure (2) shows the position of the string in the completely strung up drive.

All resistors are 1/2 watt unless otherwise specified.  
All condensers are 40V volt unless otherwise specified.

MEISSNER MFG. DIV.  
MAGUIRE INDUSTRIES, INC.

MODEL 10-1199

The signal generator should be connected to the signal grid or pin No. 8 of the 6SA7 mixer tube. This connection should be made through a .0005 to .25 mfd. condenser, the condenser being between the high side of the signal generator and the connection to the mixer grid. The signal generator should be set to 456 KC, which is the IF frequency, and the volume control of the receiver should be set at maximum or extreme clockwise. The output of the signal generator should then be turned up until a signal is heard and then the trimmers on the IF transformers adjusted (with insulated shaft screwdriver) for maximum output, reducing the output of the generator as the receiver becomes progressively more sensitive, always using as weak a signal as possible.

After the IF transformers have been properly adjusted, remove the connection from the generator to the mixer grid, reconnecting the generator to the antenna binding post. Leaving the frequency of the signal generator at 456 KC, adjust the wave trap by turning the adjusting screw which protrudes through the chassis. This adjustment should be made for the minimum of signal output. The generator output should be increased as the adjustment proceeds to insure maximum IF rejection.

When the IF transformers are adjusted for a maximum sensitivity, the antenna and oscillator trimmers should be adjusted in the following manner:

- (1) Check the dial pointer position to see that it is horizontal when the gang condenser is closed.
- (2) Set the band switch in the broadcast position or counter clockwise.
- (3) Rotate the gang condenser until the pointer indicates 1400 KC.
- (4) Adjust the signal generator to 1400 KC and connect the output of the signal generator to the antenna lead, using a .0002 mfd. condenser between the antenna and the high side of the oscillator. Increase the generator output to a medium level and adjust the oscillator trimmer, which is located through a hole on the top of the chassis just to the right of the speaker. The next step is to adjust the antenna coil by adjusting the trimmer which is closest to the chassis. Both of these trimmer adjustments should be made for maximum output, decreasing the generator signal strength as the set progressively becomes aligned. Leaving connections as they are, turn the dial pointer to approximately 600 KC and reset the signal generator for 600 KC, increasing the generator output until a signal can be heard. Adjust the padder screw, which is located near the center of the chassis, to maximum output. The best adjustment is obtained by simultaneously adjusting the padder screw and rocking the tuning control around 600 KC. Variation in wiring in circuit capacities may give the maximum output for 600 KC very slightly in error of 600 KC on the receiver dial.
- (5) In the aligning of the short wave band, the band switch must be turned clockwise. Replacing

the .0002 mfd. condenser with a 400 ohm resistor between the antenna post of the receiver and the output of the generator, set the generator to 16 megacycles and also the receiver dial pointer to 16 megacycles. Then adjust the oscillator trimmer, which is located through a hole on top of the chassis just to the right of the broadcast trimmer, for maximum output. When adjusting the oscillator trimmer on the short wave band, the trimmer should be tightened and then loosened to the second peak. The second peak will be the correct peak for this adjustment. Next adjust the short wave antenna coil, which is a trimmer located near the top of the coil. As before, the adjustments of these trimmers should be made with as low a signal level from the generator as possible, as the alignment proceeds. The padding of the short wave band is fixed.

CAUTION

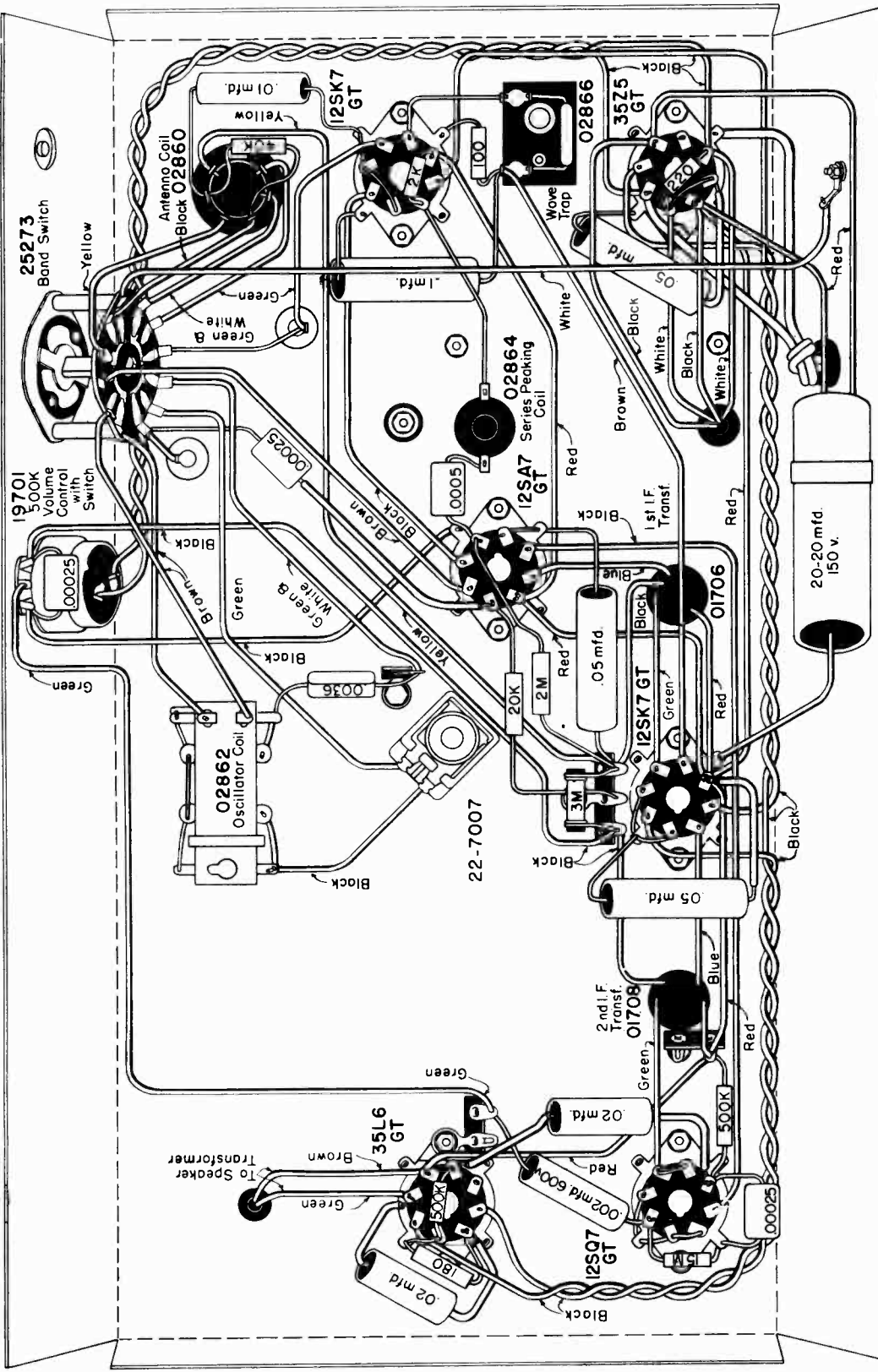
The power line is connected directly to this chassis. The receiver must be suitably protected by a non-metallic cabinet and non-metallic knobs so that no one can make contact with any metal part of this radio when in operation. A cabinet back must be used to prevent accidental contact with the chassis. This back should have small holes or slots to permit ventilation yet prevent contact. Mounting screws used to hold the set in a cabinet should also be covered to prevent contact.

COMPLETE PARTS LIST

- |  |   |
|--|---|
| 1 Chassis No. 02859                                  | 1 Binding post assembly   |
| 1 Input IF Transformer No. 01706                     | 2 Black rubber grommets for $\frac{3}{16}$ " hole                   |
| 1 Output IF Transformer No. 01708                    | 2 Black rubber grommets for $\frac{1}{4}$ " hole                    |
| 1 Broadcast and short wave antenna coil No. 02860    | 3 Gum rubber grommets $\frac{3}{16}$ I. D. for $\frac{1}{4}$ " hole |
| 1 Broadcast and short wave oscillator coil No. 02862 | 1 Condenser mounting bracket  |
| 1 Series peaking coil No. 02864                      | 4 Chassis mounting brackets   |
| 1 IF wave trap No. 02866                             | 2 Solder lugs   |
| 1 PM speaker with output transformer No. 25274       | 1 180 ohm resistor $5\frac{1}{2}\%$ $\frac{1}{2}$ W. carbon         |
| 1 Filter choke No. 25275                             | 2 500,000 ohm resistor $20\frac{1}{2}\%$ $\frac{1}{2}$ W. carbon    |
| 3 Tie lugs   | 1 3 megohm resistor $20\frac{1}{2}\%$ $\frac{1}{2}$ W. carbon       |
| 1 Padder 22-7007                                     | 1 20,000 ohm resistor $10\frac{1}{2}\%$ $\frac{1}{2}$ W. carbon     |
| 1 Band switch  | 2 megohm resistor $20\frac{1}{2}\%$ $\frac{1}{2}$ W. carbon         |
| 1 Dial mechanism plate                               | 1 220 ohm resistor $10\frac{1}{2}\%$ $\frac{1}{2}$ W. carbon        |
| 1 Trimmer base assembly                              | 1 100 ohm resistor $10\frac{1}{2}\%$ $\frac{1}{2}$ W. carbon        |
| 1 Dial drum  | 1 2,000 ohm resistor $20\frac{1}{2}\%$ $\frac{1}{2}$ W. carbon      |
| 1 Dial cord and spring assembly                      | 2 .02 mfd. 400 volt paper condenser                                 |
| 1 Dial shaft   | 1 .05 mfd 400 volt paper condenser                                  |
| 1 "C" washer for dial shaft                          | 1 .01 mfd. 400 volt paper condenser                                 |
| 1 Bakelite washer for dial shaft                     | 1 1 mfd. 400 volt paper condenser                                   |
| 1 Dial scale   | 1 20-20 mfd. 160 volt electrolytic condenser                        |
| 1 Pilot socket and 6-8 volt pilot light              | 3 .00025 mfd. 20% mica condenser                                    |
| 1 Dial pointer                                       | 1 .0036 mfd. 27% silver mica condenser                              |
| 3 Knobs  | 1 .0005 mfd. mica condenser   |
| 1 Line cord  |   |

It has a high impedance primary antenna coil which permits the use of almost any length of antenna available. It also has one stage of untuned R. F. and an I. F. wave trap. This receiver covers a frequency range of 530 KC to 1650 KC and from 5.7 MC to 18 MC, and will operate satisfactorily on voltages from 105 to 125, either D. C. or 50-60 cycles A. C. Extra filtering is required if it is desired to operate on A. C. below 50 cycles.





VOLTAGE ON SOCKET PIN NUMBERS

TUBE	1	2	3	4	5	6	7	8
12SK7GT RF	0	24VAC	0	grid	1.2DC	95VDC	37VAC	76VDC
35L6GT	NC	110VAC	110VAC	NC	110VAC	NC	76VAC	112VDC
12SA7GT	0	12VAC	95VDC	95VDC	grid	0	24VAC	grid
12SK7GT IF	0	37VAC	0	grid	1.2DC	95VDC	50VAC	95VDC
12SQ7GT	0	grid	0	diode	diode	10VDC	12VAC	0
35L6GT	0	76VAC	95VDC	95VDC	grid	NC	50VAC	6VDC

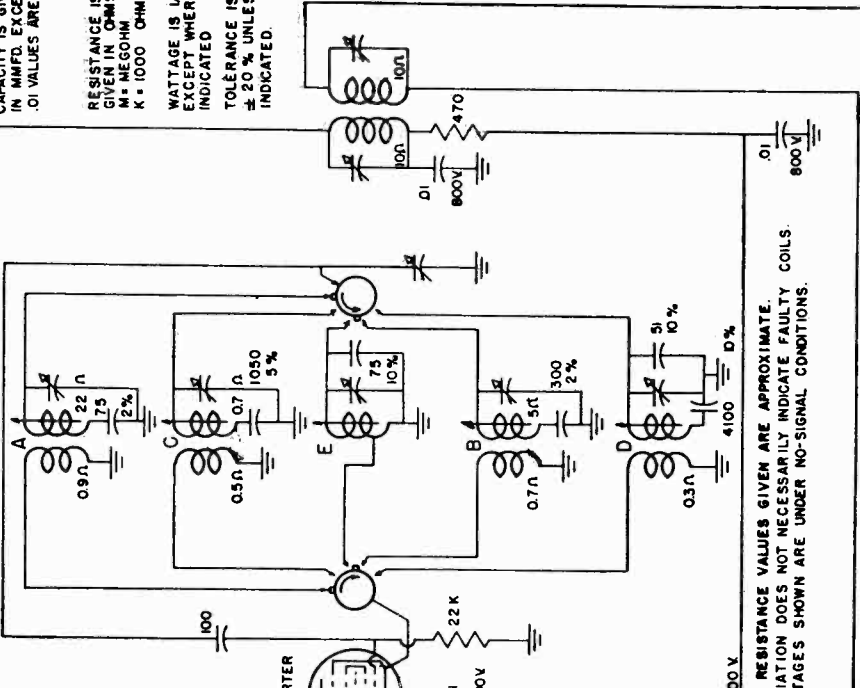
Measurements taken with 1,000 ohms per volt meter. 116 volts AC line. NC indicates "No Connection"; all voltages indicated are positive with respect to chassis unless otherwise marked.

CAPACITY IS GIVEN  
 IN MMFD EXCEPT  
 .01 VALUES ARE MFD

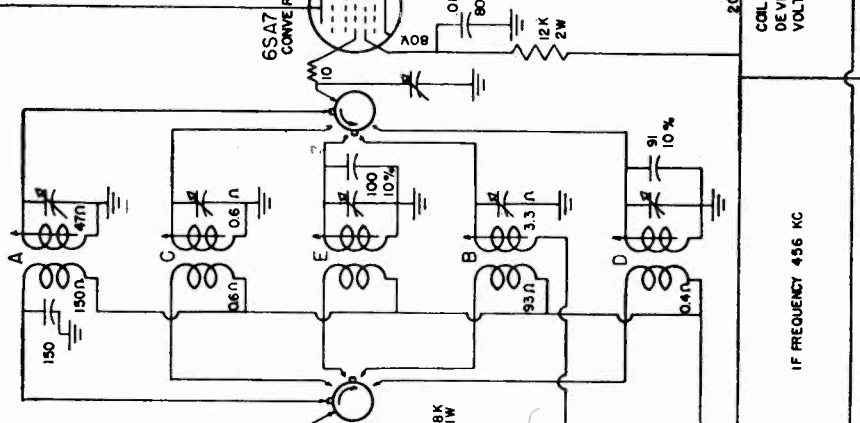
RESISTANCE IS  
 GIVEN IN OHMS  
 M = MEGOHM  
 K = 1000 OHMS

WATTAGE IS 1/2  
 EXCEPT WHERE  
 INDICATED  
 TOLERANCE IS  
 ± 20 % UNLESS  
 INDICATED.

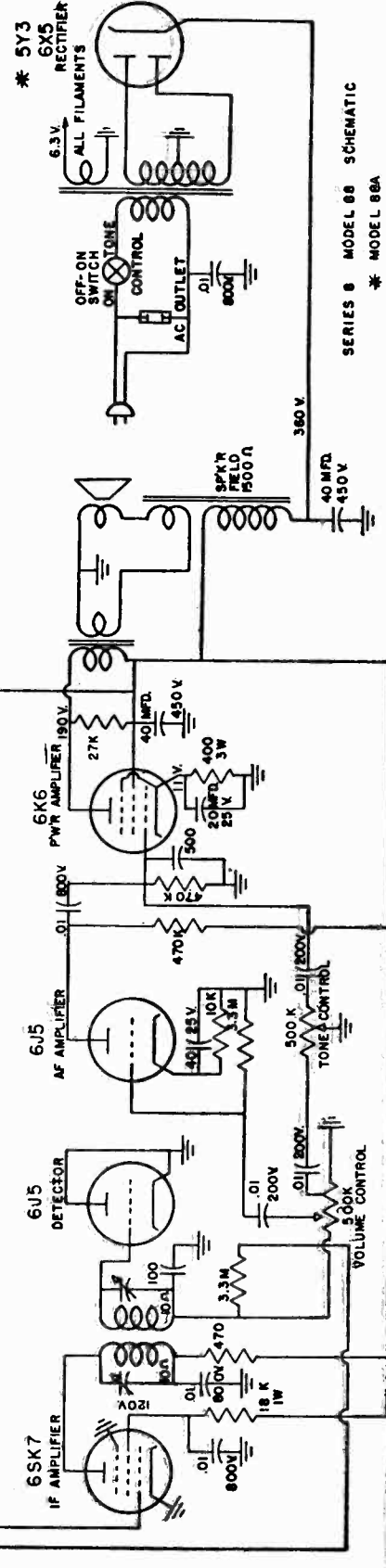
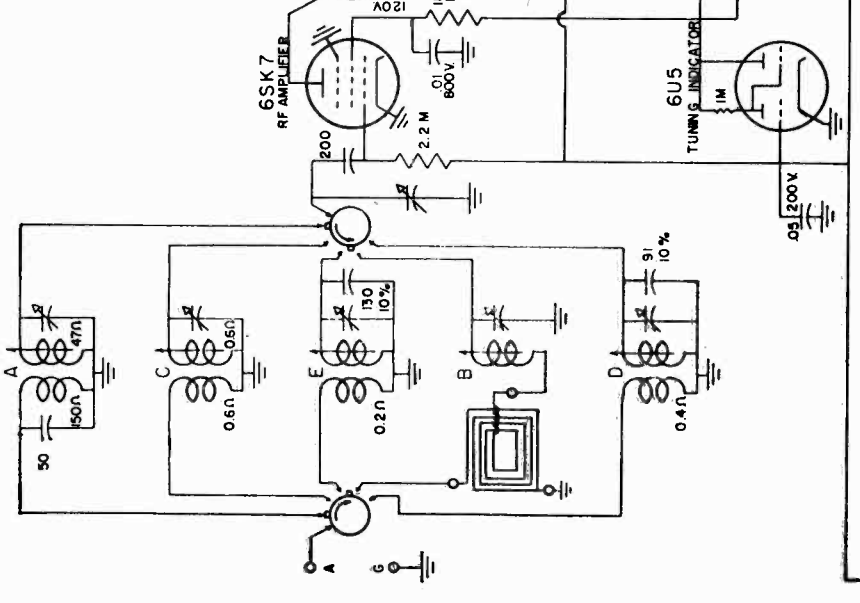
OSCILLATOR PLATE



MIXER PLATE



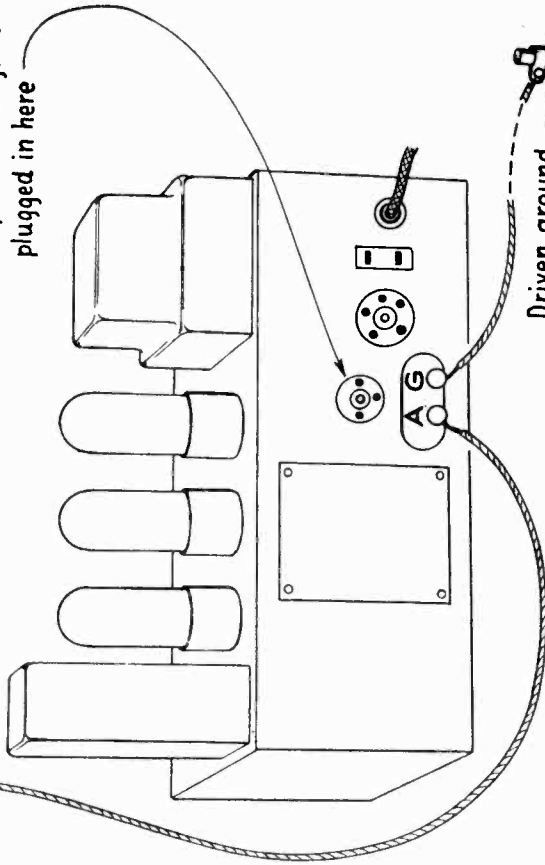
RF PLATE



SERIES 8 MODEL 88 SCHEMATIC  
 \* MODEL 88A

From conventional antenna. -  
If doublet is used, the two ends  
should be twisted together and  
connected to "A".

Loop must always be  
plugged in here



Driven ground  
Cold water pipe may be used.

Figure 1. Series 8 Antenna Connections

In locations which have too high an interference level, reception can be greatly improved by the use of an external antenna and ground.

In areas far removed from radio stations you may need an external antenna and ground system for best reception. The Antenna System illustrated in our catalog is highly recommended.

Simply plug the power cord into a nominal 115 volt 60 cycles receptacle. If you are not sure that your power is 115 volt 60 cycles, call your power company because extensive damage can result if the receiver is connected to direct current or alternating current other than 60 cycles, or voltage other than 105 to 125.

Special receivers can be supplied for some non-standard power sources. When ordering for non-standard power sources check with your power company for the exact voltage and frequency.

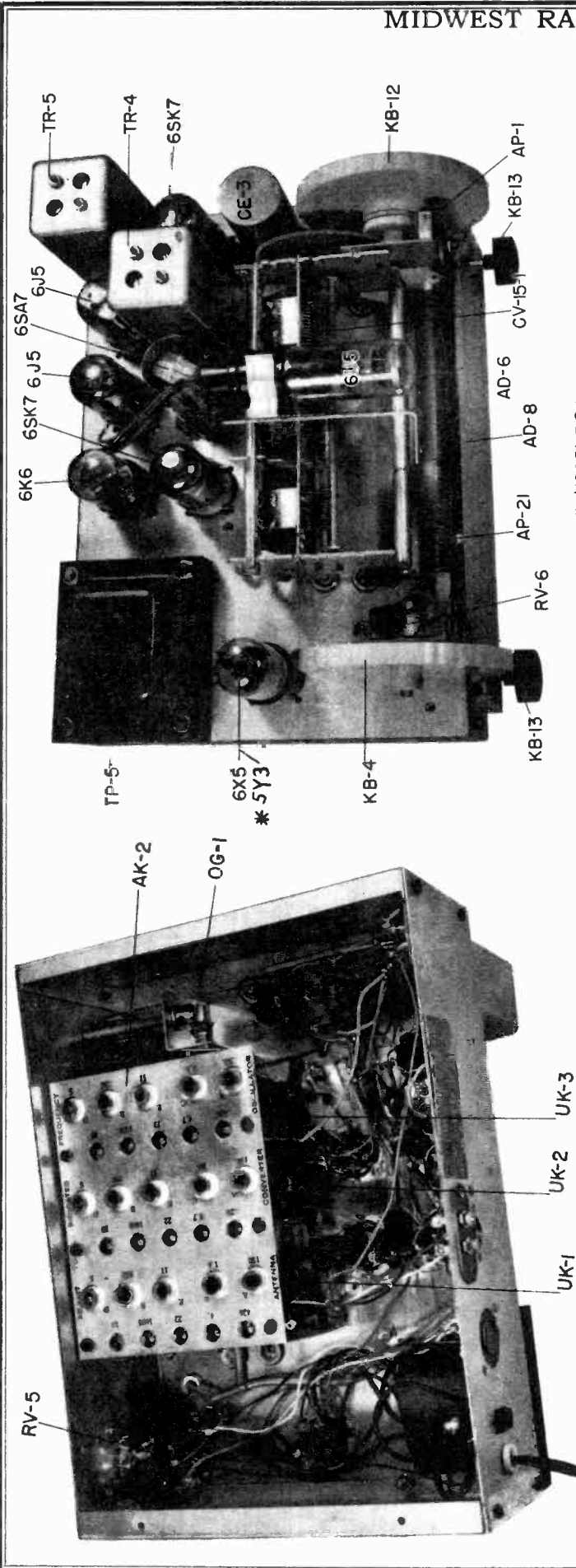
**ALIGNMENT** — The output indicator may be an audio frequency meter across the voice coil or a vacuum tube voltmeter at the avc. For 0.5 watt the voltage at the voice coil is 1.2 volts or 2.5 to 3.5 volts avc. if a 30% modulated signal is used. I.F. alignment should be made with band switch on "B", pointer turned to 1000 kc. and signal to mixer grid through a .05 mfd. condenser. Trim both I.F. transformers for maximum reading.

R. F. alignment should be made in the usual manner. There is no interaction between bands. The only precaution is that a dummy antenna be used between the generator and the antenna post on the receiver. This may be simply a 200 micro micro farad condenser in series with a 400 ohm resistor. The B band RF paddler, 550 KC. is very broad and should not be adjusted. The loop must be plugged in when adjusting the B band RF trimmer, 1600 kc.

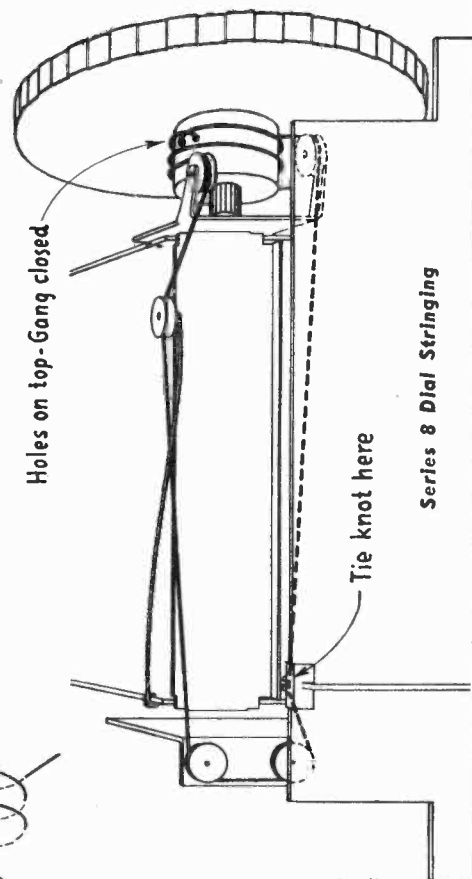
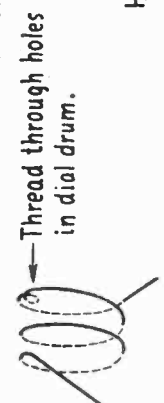
**ALIGNMENT CHART**

Coupling	Signal	Band Switch	Dial	Adjustment
To converter grid thru .05 mfd capacitor	456 KC	B	1000 KC	Peak 1st and 2nd IF trimmers.
To "A" on antenna-ground terminal strip through 200 mmfd. and 400 ohms in series.	400 KC	A	400 KC	Peak RF, converter and oscillator trimmers marked "A".
	150 KC	A	150 KC	Peak RF, converter and oscillator cores marked "A".
	1600 KC	B	1600 KC	Peak "B" trimmers. Loop must be plugged in.
	550 KC	B	550 KC	Peak "B" cores except PF. Loop must be plugged in.
	4.7 MC	C	4.7 MC	Peak "C" trimmers.
	1.6 MC	C	1.6 MC	Peak "C" cores.
	10 MC	D	10 MC	Peak "D" trimmers.
	5 MC	D	5 MC	Peak "D" cores.
	22 MC	E	22 MC	Peak "E" trimmers.
	11.5 MC	E	11.5 MC	Peak "E" cores.

Note: Modulate the signal with 400 cycles 30%. The output indicator may be an audio meter at the voice coil or a VTVM on the avc. The voltage at the voice coil is 1.2 and the avc. voltage is between 2.5 and 3.5 for 1/2 watt output. Do not use signals for alignment which will give output in excess of 1/2 watt.



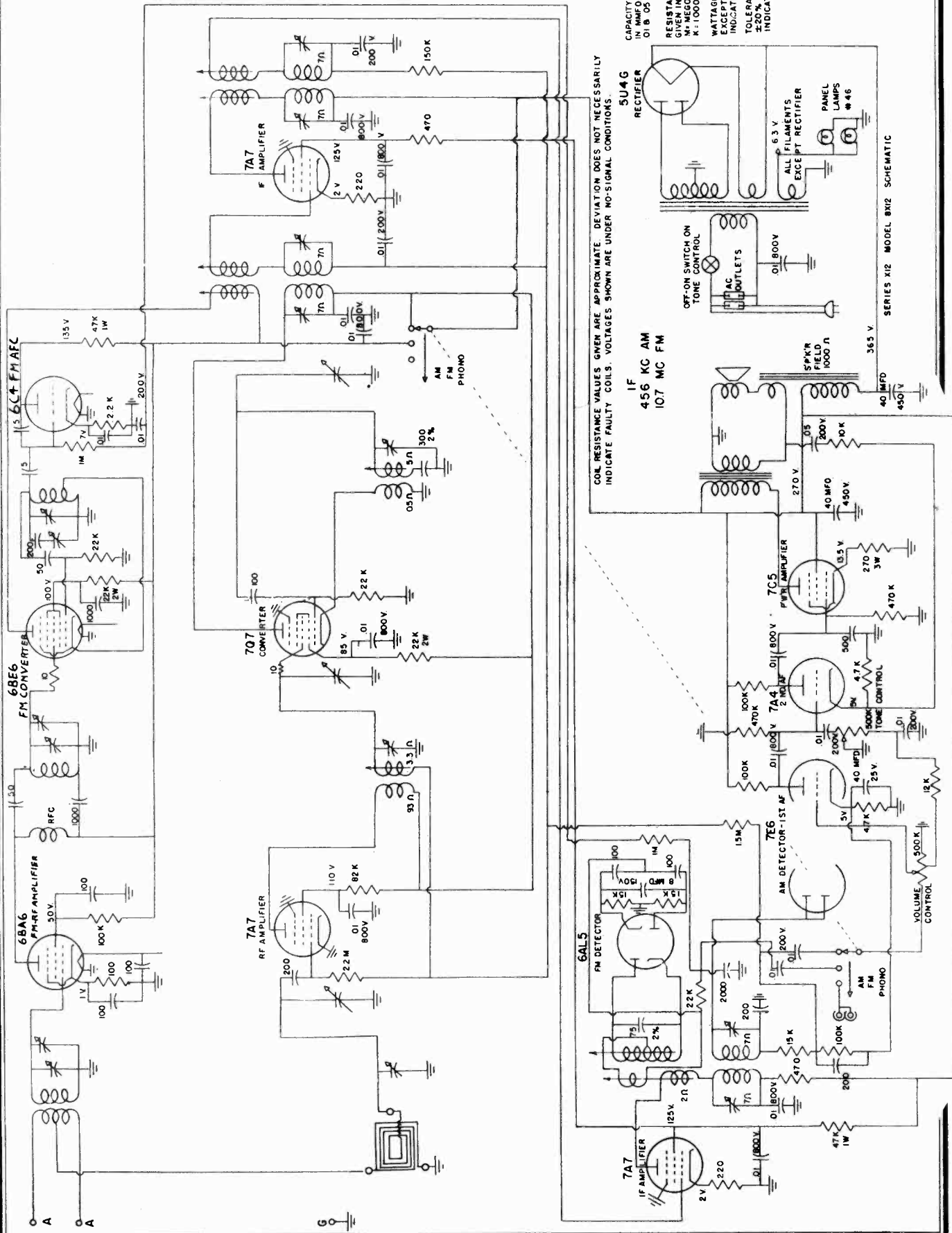
**\* MODEL 88A**  
**DIAL STRINGING** — Use a light weight flexible dial cord when replacing worn or broken cord such as Beven-Wilcox FSN-25-12.



**PARTS LIST**

Part	Description	Part	Description
AD-6	Dial, C, D, E	KB-12	Tuning knob
AD-8	Dial, glass	KB-4	Volume control knob
AE-6	Escutcheon	KB-13	Tone or Band knob
AK-2	Coil plate cover	OG-1	Miter gear, pair
AP-1	Wood pulley	OS-3	Dial string spring
AP-3	Pointer	PC-3	Loop plug
AS-1	Wood pulley mtg. stud	RV-5	Tone control
CE-3	Fiber condenser 40-40-20	RV-3	Volume control
CE-4	Cathode by pass 40 mfd. 25 v	*SP-1	Speaker, oval 6 x 9
*CV-15-1	Tuning gang	TP-5	Power transformer
EG-2	Speaker mtg. grommet	*TR-4	1st I.F. transformer
ES-13	Tube shield	*TR-5	2nd I.F. transformer
HE-1	Speaker mtg. eyelet	*UK-1	R. F. coil plate
IL-1	Panel Lamp, 6-8 volts	*UK-2	Mixer coil plate
		*UK-3	Oscillator coil plate

Note: Order resistors and condensers by value, tolerance and wattage or voltage.  
 Note: When ordering include serial number of chassis, since Midwest records of changes in parts specifications are kept by that number.



CAPACITY IS GIVEN IN MMFD EXCEPT 0.1 & 0.05 ARE MFD.  
RESISTANCE IS GIVEN IN OHMS M = MEGOHM K = 1000 OHMS  
WATTAGE IS 1/2 EXCEPT WHERE INDICATED  
TOLERANCE IS ±20% UNLESS INDICATED

COIL RESISTANCE VALUES GIVEN ARE APPROXIMATE. DEVIATION DOES NOT NECESSARILY INDICATE FAULTY COILS. VOLTAGES SHOWN ARE UNDER NO-SIGNAL CONDITIONS.

SERIES #12 MODEL BN12 SCHEMATIC

MIDWEST RADIO CORP.

MODELS R-12, RT-12, RG-12, 8X12, CHASSIS RGT-12

**ALIGNMENT** — Refer to the alignment chart for step by step procedure. It is preferable to align the FM IF stages with an AM or CW Signal. It should be noted that all adjustments are made for peak avc reading except the secondary of the third transformer. At this point, if you use an AM signal, it may be tuned for minimum audio signal; or the discriminator voltage may be used, reading it with a VTVM, and the secondary may be adjusted to the zero voltage. There may be some discrepancy between these methods, and if it is not excessive, is of no importance.

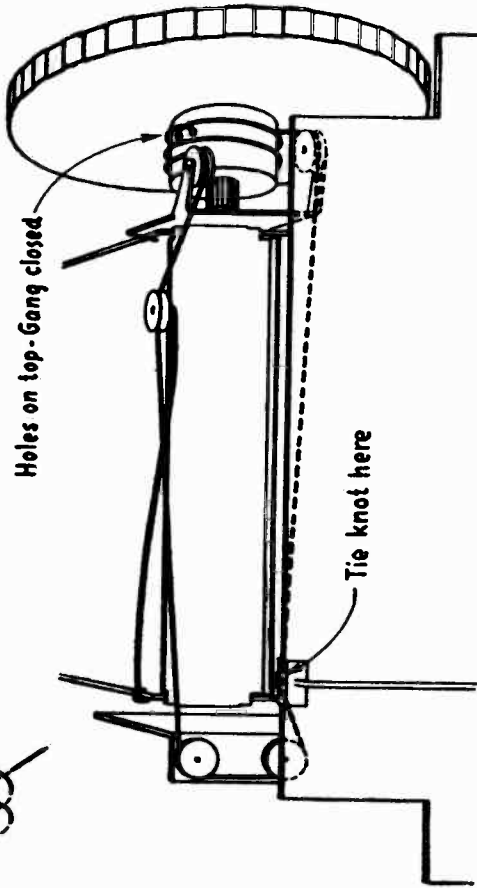
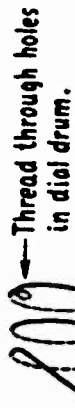
The FM RF alignment should be made using an FM signal and either avc or audio for peaking. In doing this alignment, or when feeding the IF signal into the FM mixer grid, care must be taken not to move the wiring. If the wiring is displaced so as to affect the inductance of the RF circuits it is difficult to re-establish the RF-Oscillator tracking.

The AM, RF and IF alignment should be done with a VTVM across the avc. The recommended signal value is one which will generate 10 volts of avc. When aligning the "AM" band the loop must be plugged in and you need not adjust the RF padder core. The RF padder is very broad and can be aligned only if the converter grid lead is connected to an RF type VTVM as indicator; this will usually involve a signal level greater than is normally available.

**ALIGNMENT CHART**

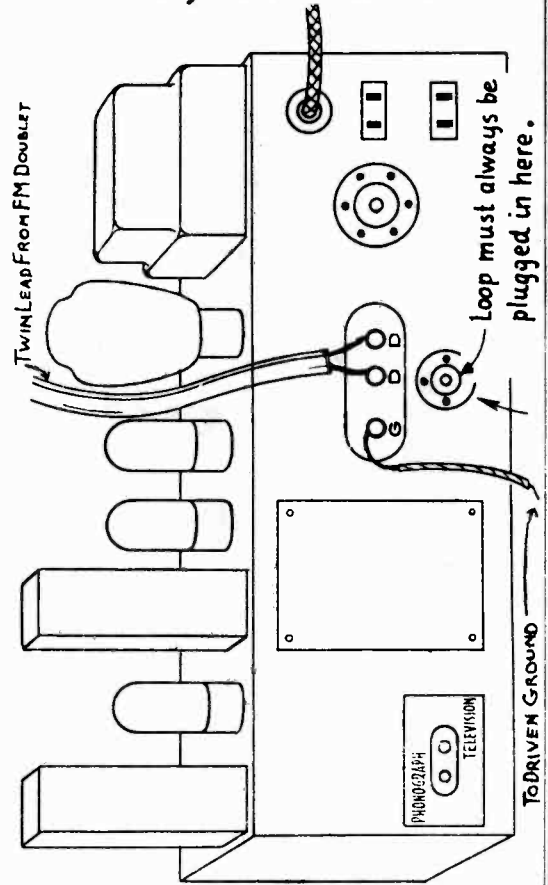
Coupling	Signal	Band Switch	Dial	Adjustment
To 7Q7 converter grid through .05 mfd. capacitor.	456 KC AM	AM	1000 KC	Peak 1st, 2nd and 3rd IF trimmers on top of IF cans.
To "A" on antenna ground terminal strip through 200 mfd. and 400 ohms in series.	1600 KC AM	AM	1600 KC	Peak RF, converter and oscillator trimmers marked "B".
To 6BE6 mixer grid direct.	550 KC AM	AM	550 KC	Peak converter and oscillator padder cores marked "B". Loop must be plugged in. Do not adjust RF.
	10.7 MC AM or CW	FM	100 MC	Peak core adjustments for avc (around 3 volts) at 1st, 2nd and primary of 3rd IF. Adjust secondary of 3rd IF for audio null from 30% amplitude modulated 10.7 MC IF signal.
To "A" and "A" on doublet terminal strip through a pair 150 ohm resistors.	105 MC FM	FM	105 MC	Peak RF mixer and oscillator trimmers for avc or audio.

\*Read text for use of CW for FM-IF alignment.



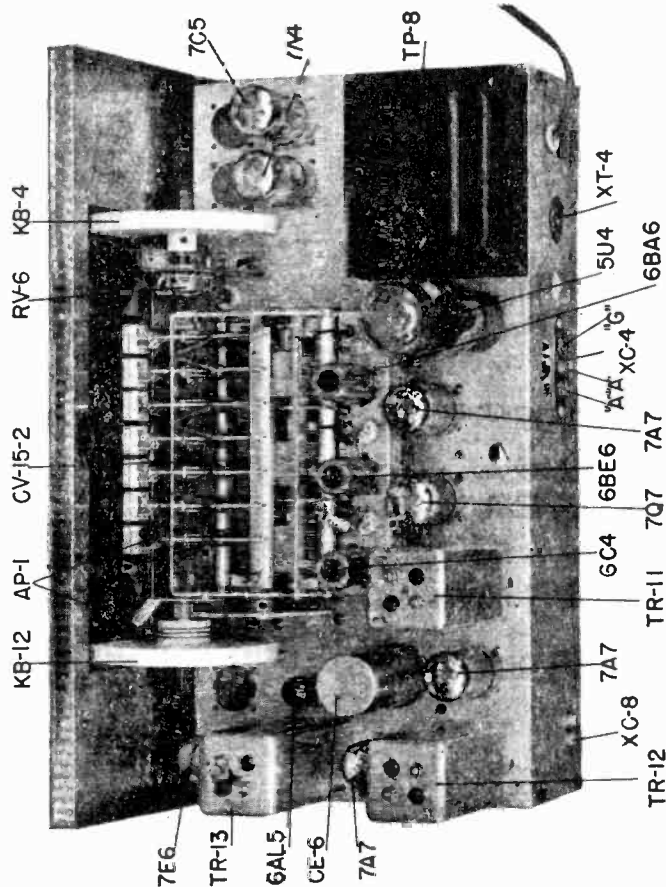
**Series 12 Dial Stringing**

**DIAL STRINGING** — Use a light weight flexible dial cord when replacing worn or broken cord such as Beven-Wilcox FSN-25-12.



MODELS R-12, RT-12, RG-12, MIDWEST RADIO CORP.  
8X12, CHASSIS RGT-12

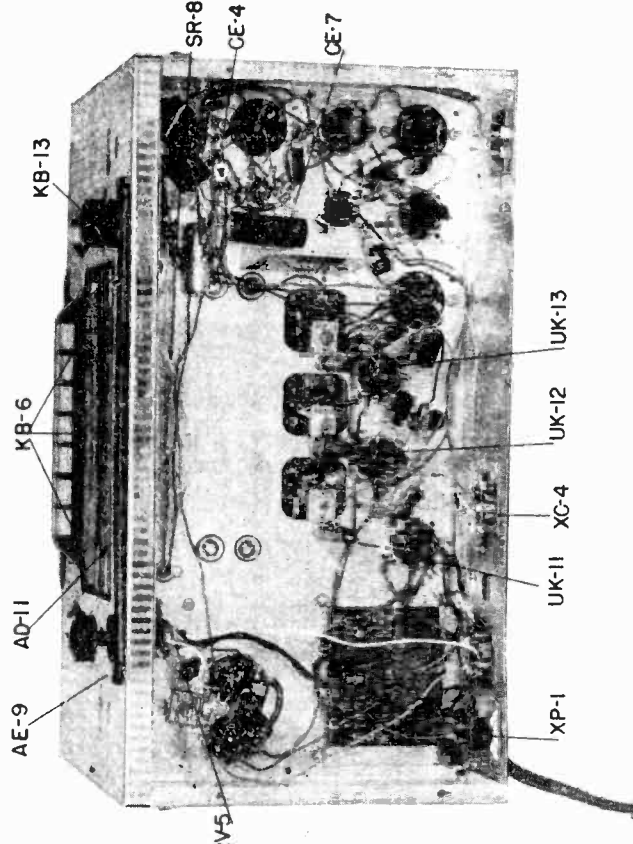
Note: Order resistors and condensers by value, tolerance and wattage or voltage.  
Note: When ordering include serial number of chassis, since Midwest records of changes in parts specifications are kept by that number.



Top View of Series 12 Chassis

PARTS LIST

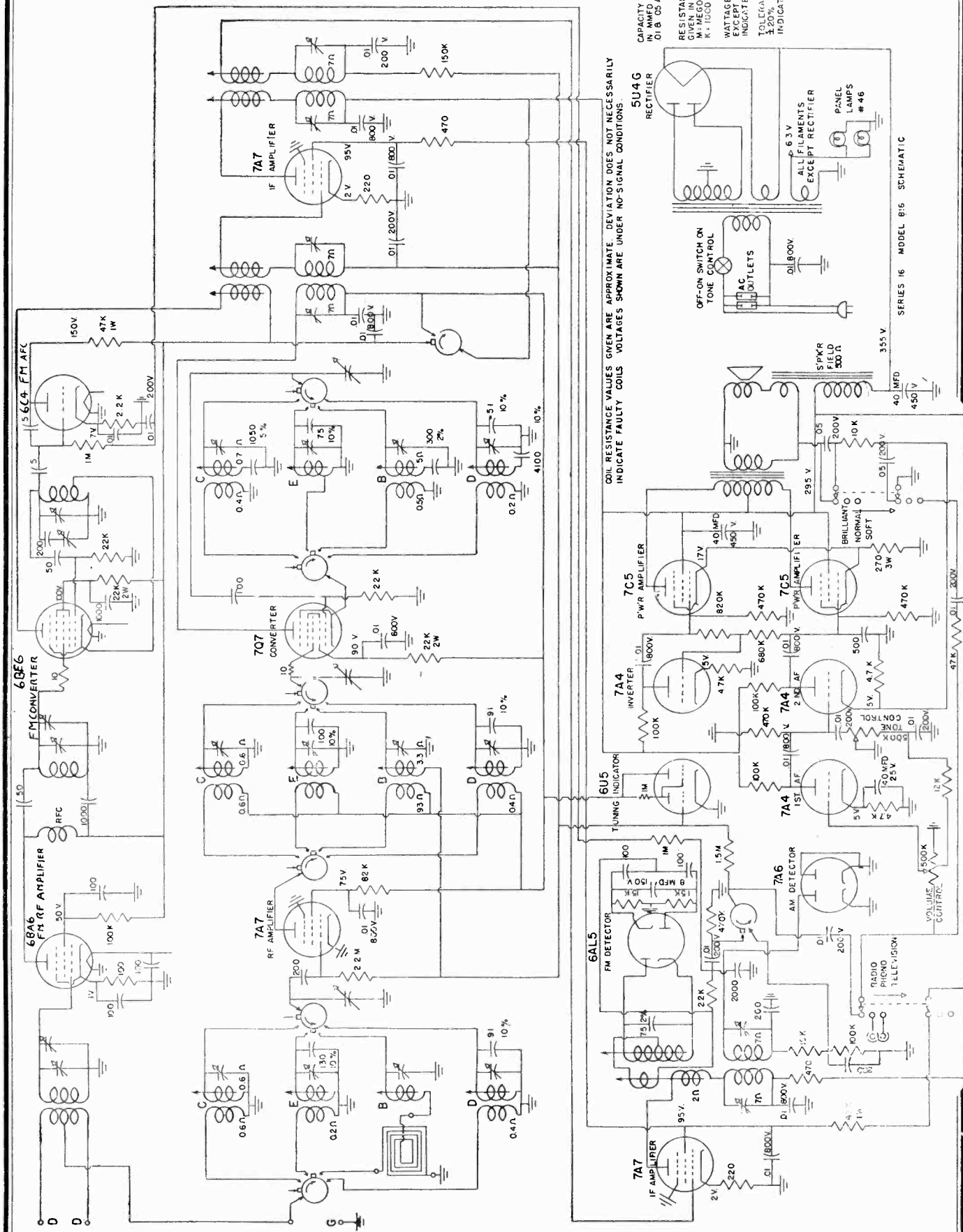
Part	Description	Part	Description
AD-11	Glass Dial	KB-13	Tone & Band Knob
AE-9	Escutcheon	KB-6	Push Buttons, Set of 7
AP-1	Wood Pulley	OG-1	Miter Gear, Pair
AP-21	Pointer	PC-3	Loop Plug
AS-1	Wood Pulley Stud	PC-5	Phono & Television Plug
CE-4	Filter Condenser 40-40	RV-5	Tone Control
CE-7	Cathode Bypass 40 mfd. 25v	PV-6	Volume Control
CE-7	Electrolytic 8 mfd. 150v	SP-5	Speaker
CV-15-2	Tuning Gang	SR-8	Band Switch
EG-5	Speaker Grommet	TP-8	Power Transformer
ES-12	Miniature Tube Shield	*TR-11	1st IF Transformer
HE-7	Speaker Mtg. Eyelet	*TR-12	2nd IF Transformer
IL-1	Panel Lamp 6-8v	*TR-13	3rd IF Transformer
KB-4	Volume Knob	*UK-12	Mixer Coil Assembly
KB-12	Tuning Knob	*UK-13	Oscillator Coil Assembly



Bottom View of Series 12 Chassis

To set the push buttons this exact procedure should be followed. A small screw driver will be needed.

1. Turn on the receiver and allow at least three minutes to warm up.
  2. Remove the push button by pulling straight out. A hooked instrument will assist in removing the end buttons.
  3. Loosen the LOCK SCREW at least one half turn.
  4. Using the screw driver with the blade in the screw slot, push the mechanism in firmly. Hold in during step 5. The mechanism may bind at first. Use sufficient force to break loose so that the push button and tuning control are independent.
  5. Tune the pointer past the desired station then back to the desired station and make the tuning adjustment as carefully as you know how.
  6. Tighten the LOCK SCREW.
  7. Check the setting of this push button by tuning away from the station manually, then pushing in firmly. Pushing the button must return the pointer to the position it had when the LOCK SCREW was tightened. If the station is not now tuned in perfectly repeat the steps 2 to 6 carefully.
  8. Adjust each of the seven buttons, or as many as you wish to set, exactly as outlined above.
- Any button can be set for any pointer position, however, you may find it more desirable to select the button nearest the pointer position so that each successive adjustment moves the pointer in the same direction. That is, the "M" button will be set for a station at the left of the dial, the "W" button will set for a station near the center, etc.



CAPACITY IS GIVEN  
IN MMFD EXCEPT  
0.1 & 0.05 ARE MFD.

RESISTANCE IS  
GIVEN IN OHMS  
M = MEGOHMS  
K = 1000 OHMS  
WATTAGE IS 1/2"  
EXCEPT WHERE  
INDICATED

TOLERANCE IS  
±20% UNLESS  
INDICATED

COIL RESISTANCE VALUES GIVEN ARE APPROXIMATE. DEVIATION DOES NOT NECESSARILY  
INDICATE FAULTY COILS. VOLTAGES SHOWN ARE UNDER NO-SIGNAL CONDITIONS.

SERIES 16 MODEL B16 SCHEMATIC

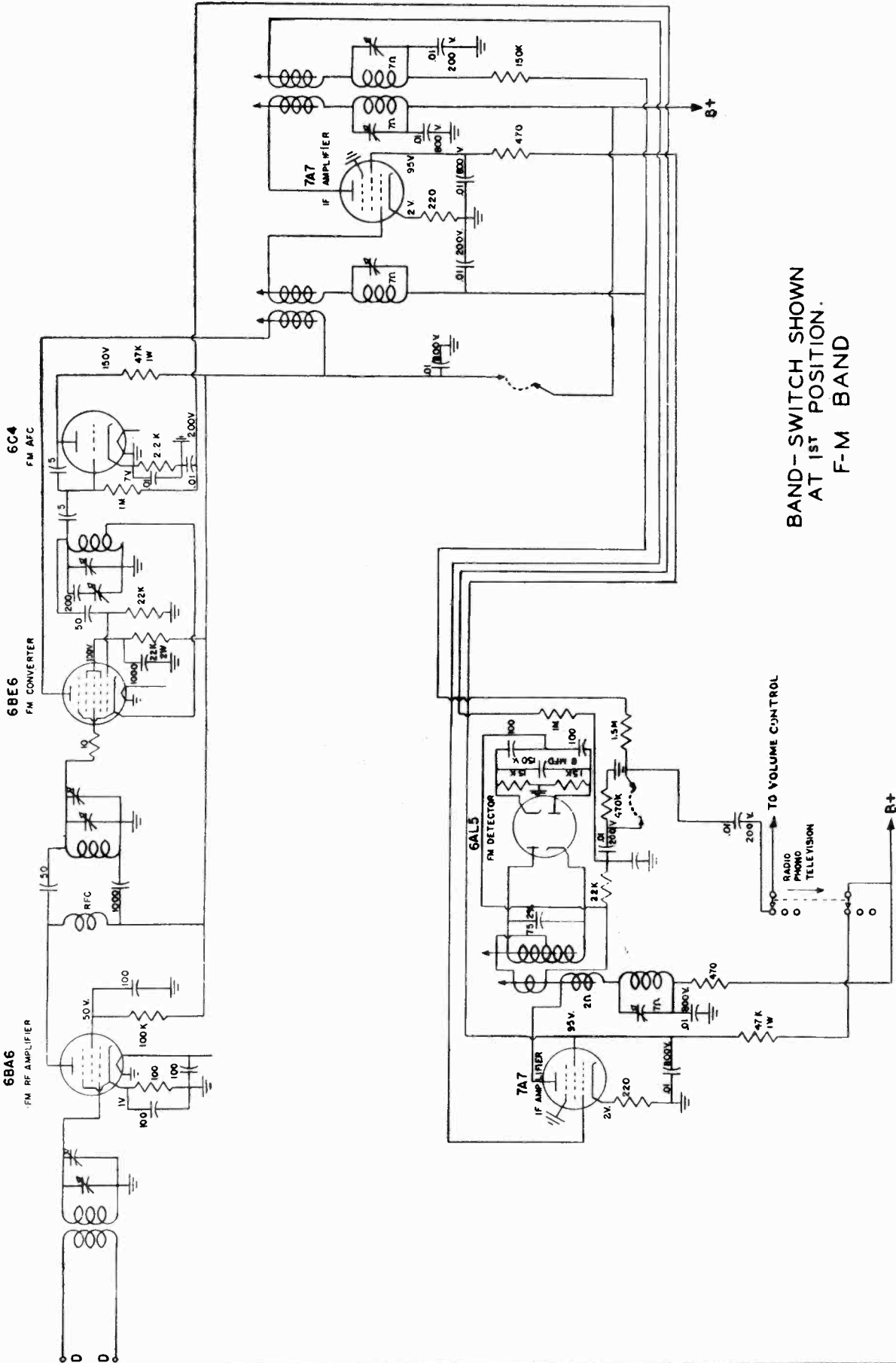


# CLARI-SKEMATIX

Registered Trademark

PAGE 18-8 MIDWEST

MODELS R-16, RT-16, RG-16, MIDWEST RADIO CORP.  
816, CHASSIS RGT-16

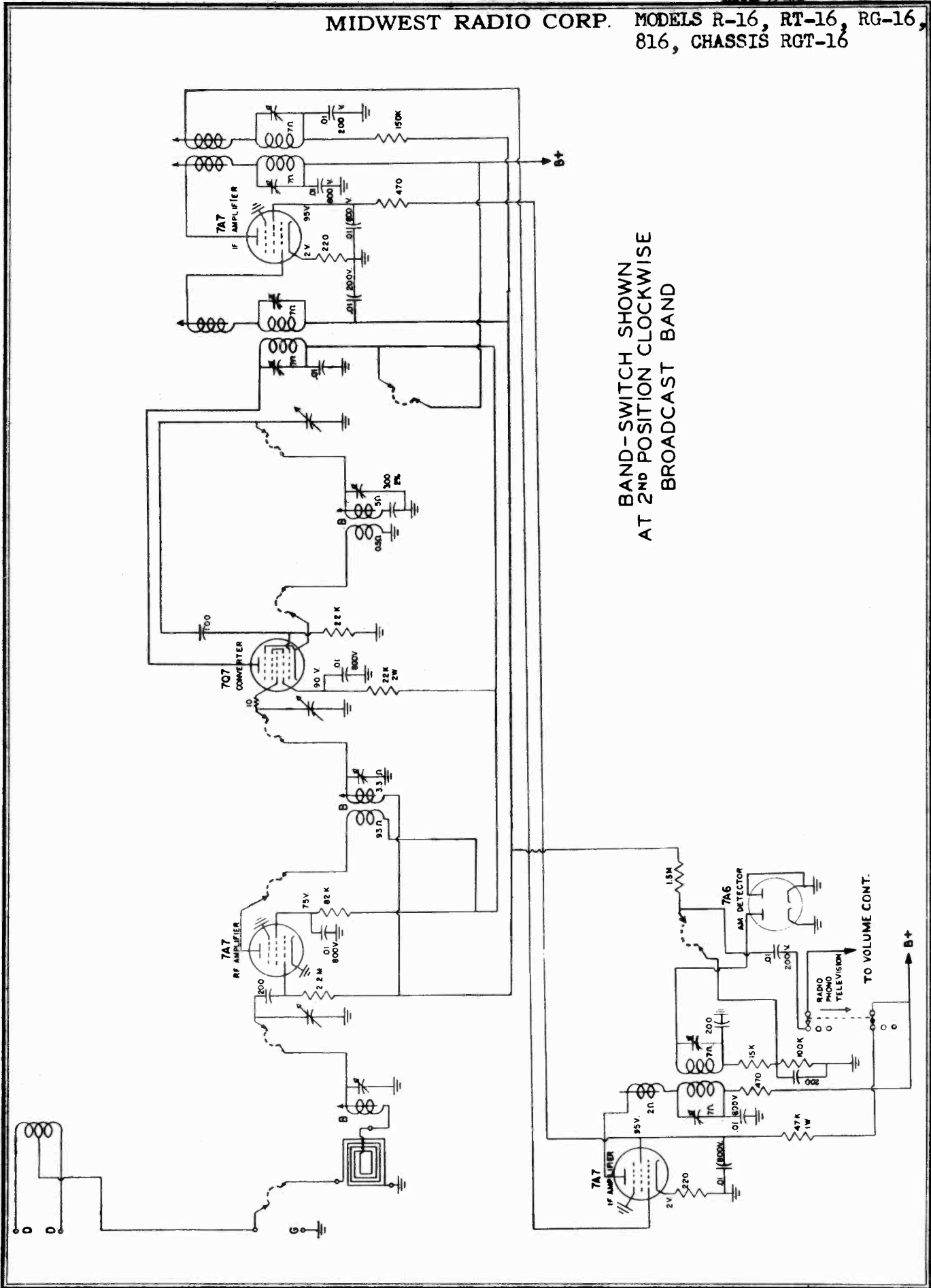


BAND-SWITCH SHOWN  
AT 1ST POSITION.  
F-M BAND

# CLARI-SKEMATIX

Registered Trademark

MIDWEST RADIO CORP. MODELS R-16, RT-16, RG-16, 816, CHASSIS RGT-16



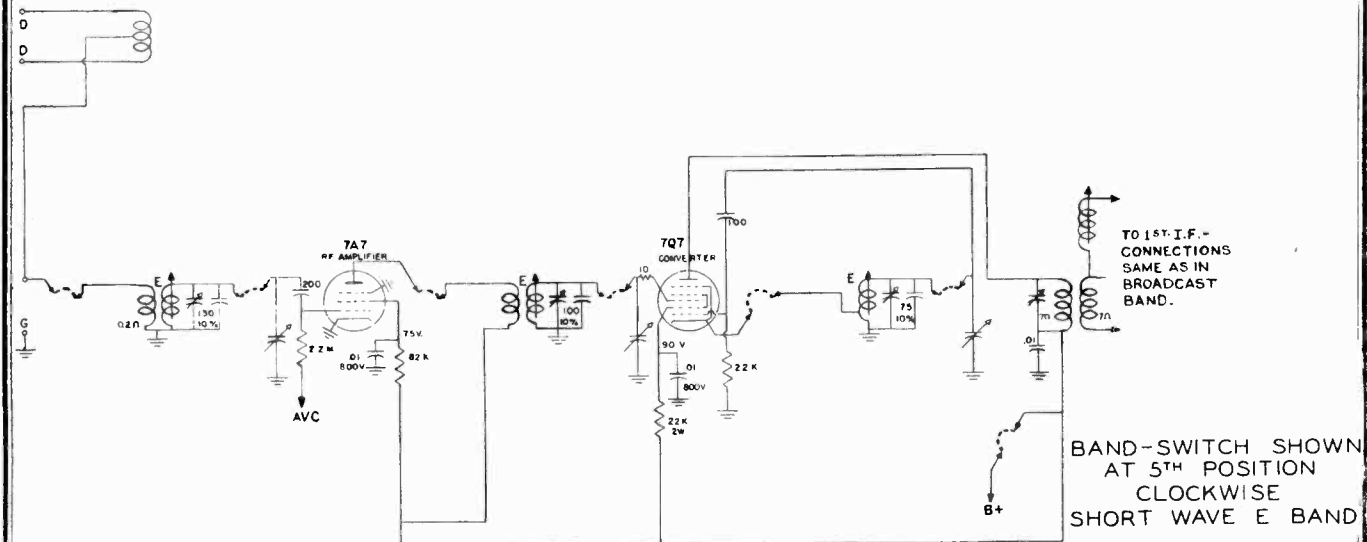
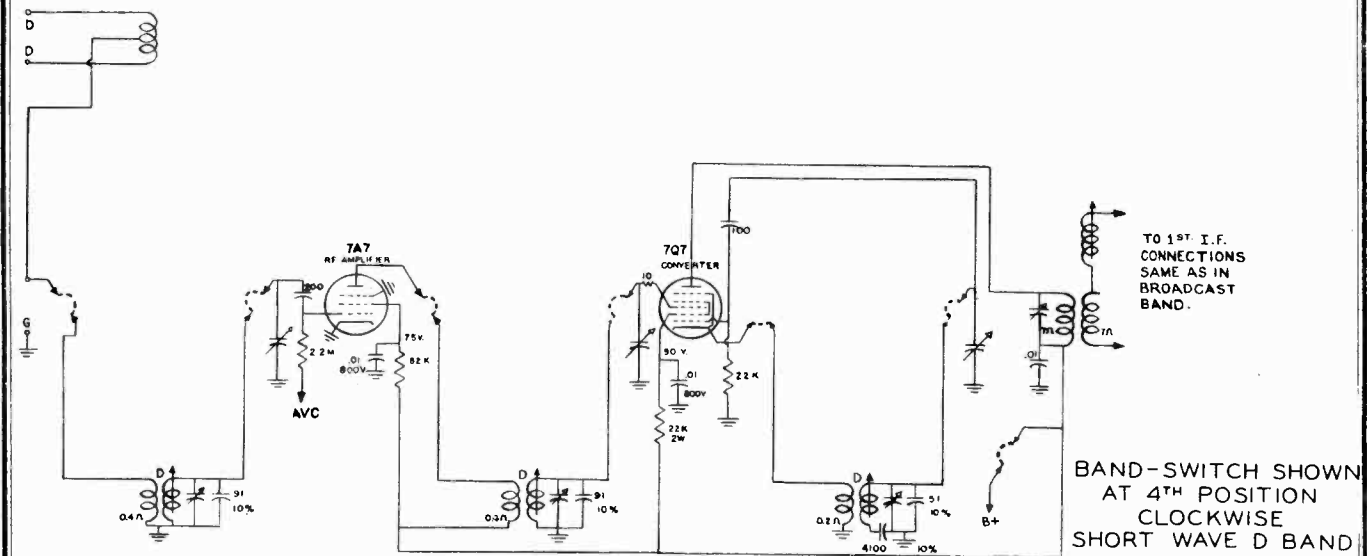
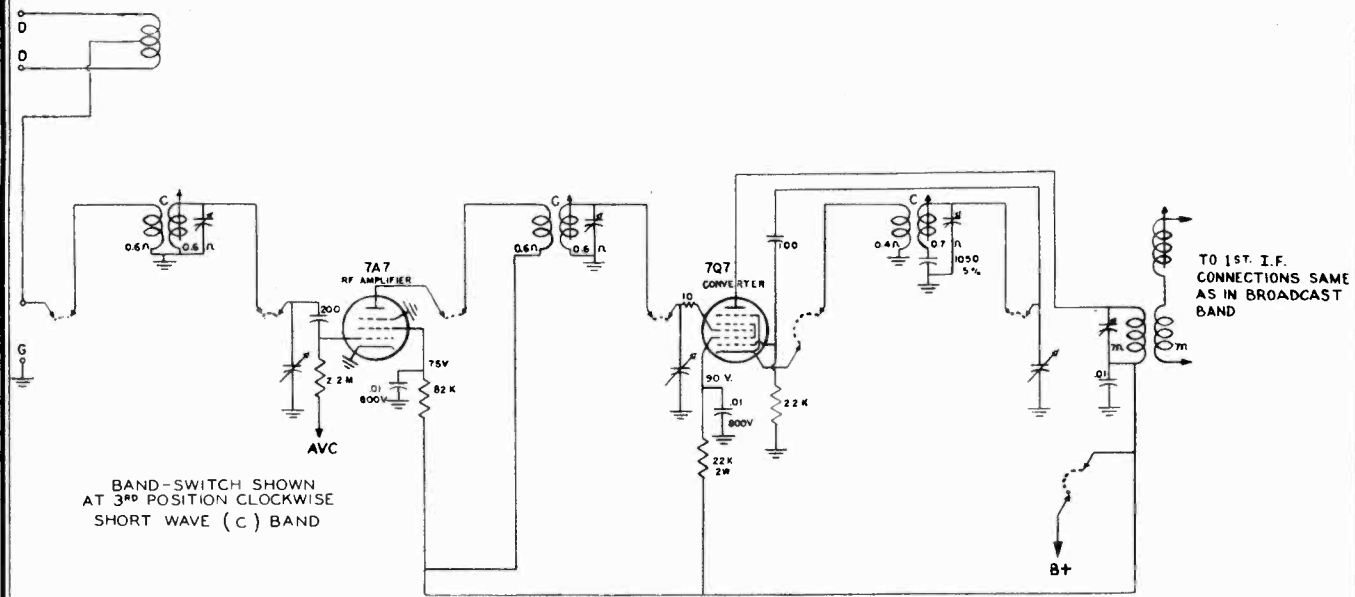
BAND-SWITCH SHOWN  
AT 2nd POSITION CLOCKWISE  
BROADCAST BAND

# CLARI-SKEMATIX

Registered Trademark

PAGE 18-10 MIDWEST

MODELS R-16, RT-16, RG-16, MIDWEST RADIO CORP.  
816, CHASSIS RGT-16



**ALIGNMENT CHART**

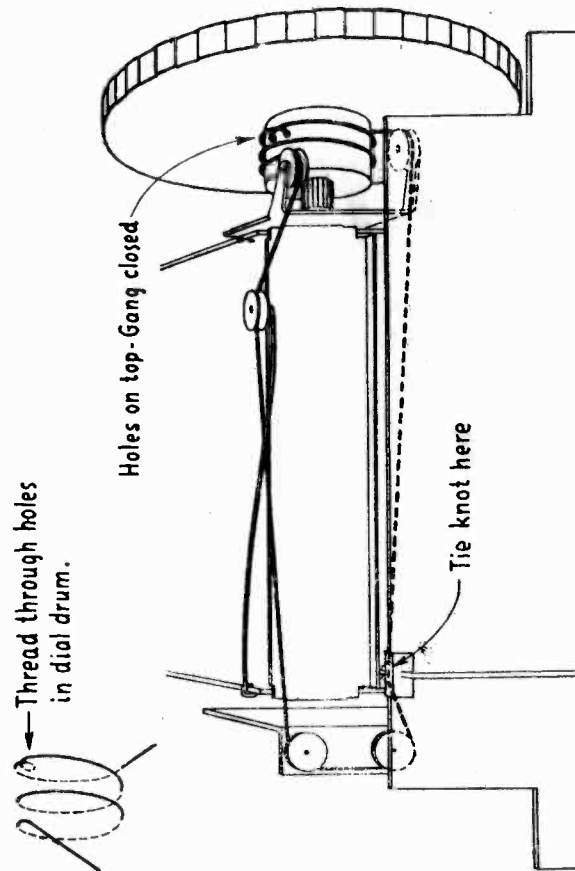
Coupling	Signal	Band Switch	Dial	Adjustment
To 7Q7 converter grid through .05 mfd. capacitor.	456 KC AM	B	1000 KC	Peak 1st, 2nd and 3rd IF trimmers on top of IF cans.
To "D" on antenna ground terminal strip through 200 mfd. and 400 ohms in service.	1600 KC AM	B	1600 KC	Peak RF, converter and oscillator trimmers marked "B".
	550 KC AM	B	550 KC	Peak converter and oscillator padder cores marked "B". Loop must be plugged in. Do not adjust RF.
	4.7 MC AM	C	4.7 MC	Peak "C" trimmers.
	1.6 MC AM	C	1.6 MC	Peak "C" cores.
	10 MC AM	D	10 MC	Peak "D" trimmer
	5 MC AM	D	5 MC	Peak "D" cores.
	22 MC AM	E	22 MC	Peak "E" trimmer.
	11.5 MC AM	E	11.5 MC	Peak "E" cores.
To 6BE6 mixer grid direct.	10.7 MC AM or CW*	A	100 MC	Peak core adjustments for avc (around 3 volts) at 1st, 2nd and primary of 3rd IF. Adjust secondary of 3rd IF for audio null from 30% amplitude modulated 10.7 MC IF signal.
To "D" and "D" on doublet terminal strip above "A-G" strip through a pair 150 ohm resistors.	105 MC WJ	A	105 MC	Peak RF mixer and oscillator trimmers for avc or audio.

\*Read text for use of CW for FM-IF alignment.

**ALIGNMENT** — Refer to the alignment chart for step by step procedure. It is preferable to align the FM IF stages with an AM or CW Signal. It should be noted that all adjustment are made for peak avc reading except the secondary of the third transformer. At this point, if you use an AM signal, it may be tuned for minimum audio signal; or the discriminator voltage may be used, reading it with a VTVM, and the secondary may be adjusted to the zero voltage. There may be some discrepancy between these methods, and if it is not excessive, is of no importance.

The FM RF alignment should be made using an FM signal and either avc or audio for peaking. In doing this alignment, or when feeding the IF signal into the FM mixer grid, care must be taken not to move the wiring. If the wiring is displaced so as to affect the inductance of the RF circuits it is difficult to re-establish the RF-Oscillator tracking.

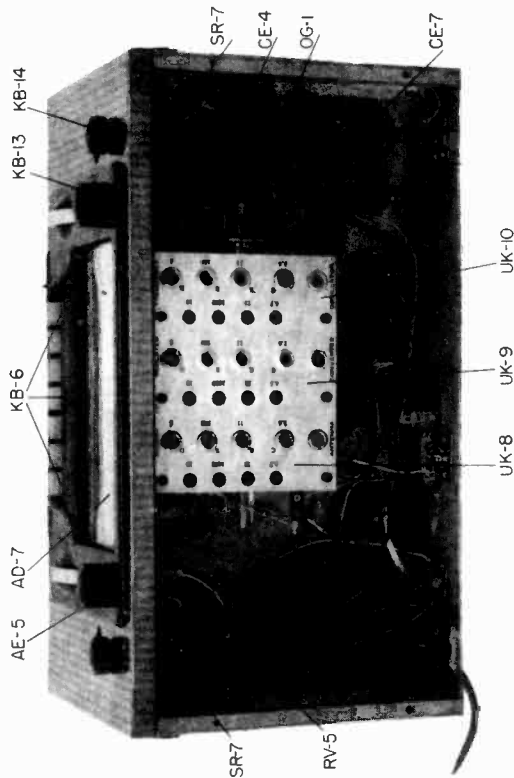
The AM, RF and IF alignment should be done with a VTVM across the avc. The recommended signal value is one which will generate 10 volts of avc. When aligning the "B" band the loop must be plugged in and you need not adjust the RF padder core. The RF padder is very broad and can be aligned only if the converter grid lead is connected to an RF type VTVM as indicator; this will usually involve a signal level greater than is normally available.



**Series 16 Dial Stringing**

**DIAL STRINGING** — Use a light weight flexible dial cord when replacing worn or broken cord such as Beven-Wilcox FSN-25-12.

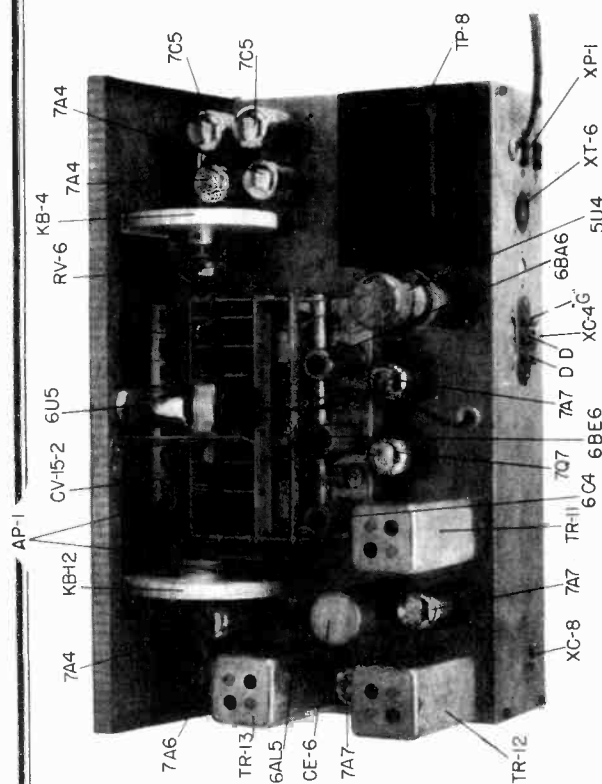
**REPLACEMENT PARTS** — Certain parts are available on an exchange basis; these are shown on the parts list with an "\*".



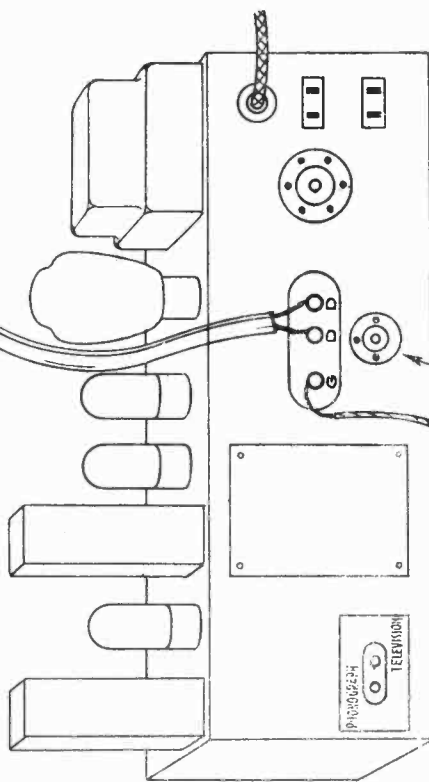
**PARTS LIST**

Part	Description	Part	Description
AD-6	Short Wave Dial	KB-12	Tuning Knob
AD-7	Glass Dial	KB-13	Tone & Band Knob
AD-9	Tone Disc Assembly	KB-14	Tone & Selector Knob, Small
AD-10	Selector Disc Assembly	KB-6	Push Buttons, Set of 7
AE-5	Escutcheon	OG-1	Miter Gear, Pair
AP-1	Wood Pulley	PC-3	Loop Plug
AP-21	Pointer	PC-5	Phono & Television Plug
AS-1	Wood Pulley Stud	RV-5	Tone Control
CE-6	Filter Condenser 40-40	RV-6	Volume Control
CE-4	Cathode Bypass 40 mfd. 25v	SP-2	Speaker
CE-7	Electrolytic 8 mfd. 150v	TP-8	Power Transformer
*CV-15-2	Tuning Gang	*TR-11	1st IF Transformer
EG-5	Speaker Grommet	*TR-12	2nd IF Transformer
ES-12	Miniature Tube Shield	*TR-13	3rd IF Transformer
HE-7	Speaker Mtg. Eyelet	*UK-8	RF Coil Plate
IL-1	Panel Lamp 6-8v	*UK-9	Mixer Coil Plate
KB-4	Volume Knob	*UK-10	Oscillator Coil Plate

Note: Order resistors and condensers by value, tolerance and wattage or voltage.  
 Note: When ordering include serial number of chassis, since Midwest records of changes in parts specifications are kept by that number.



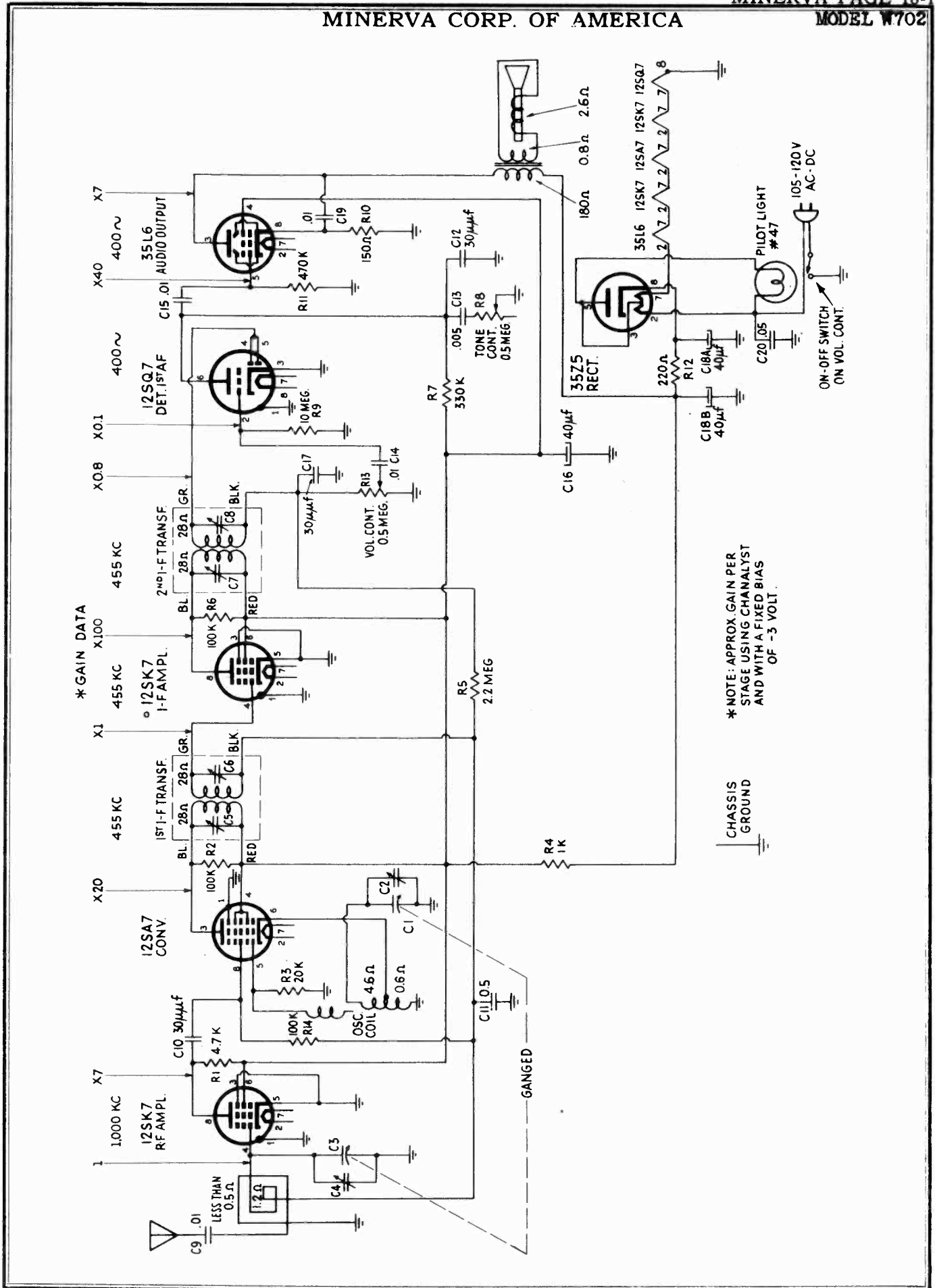
Twin lead from F.M. doublet.  
 The higher the doublet is mounted  
 the better the reception will be.

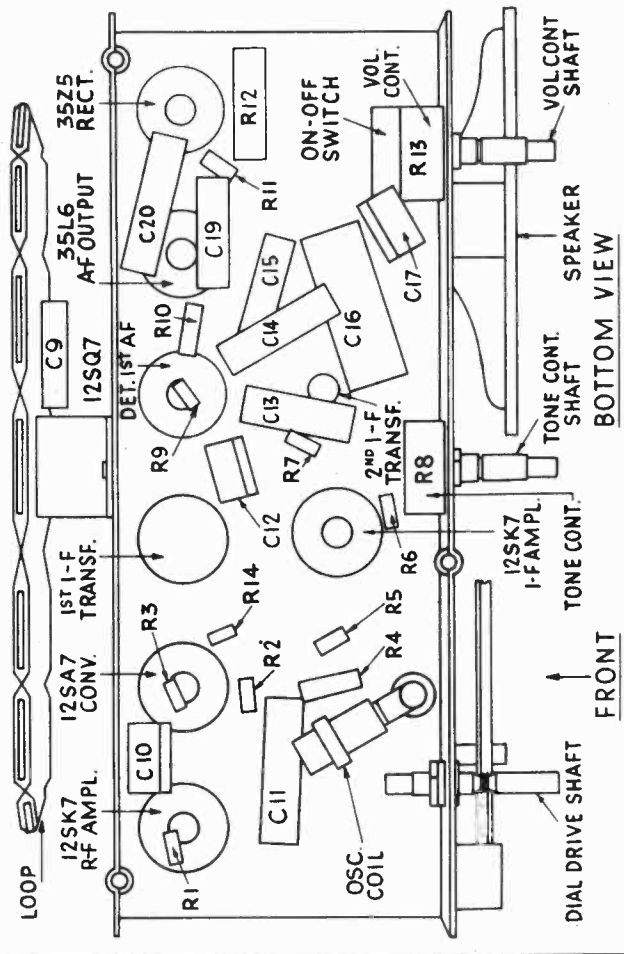
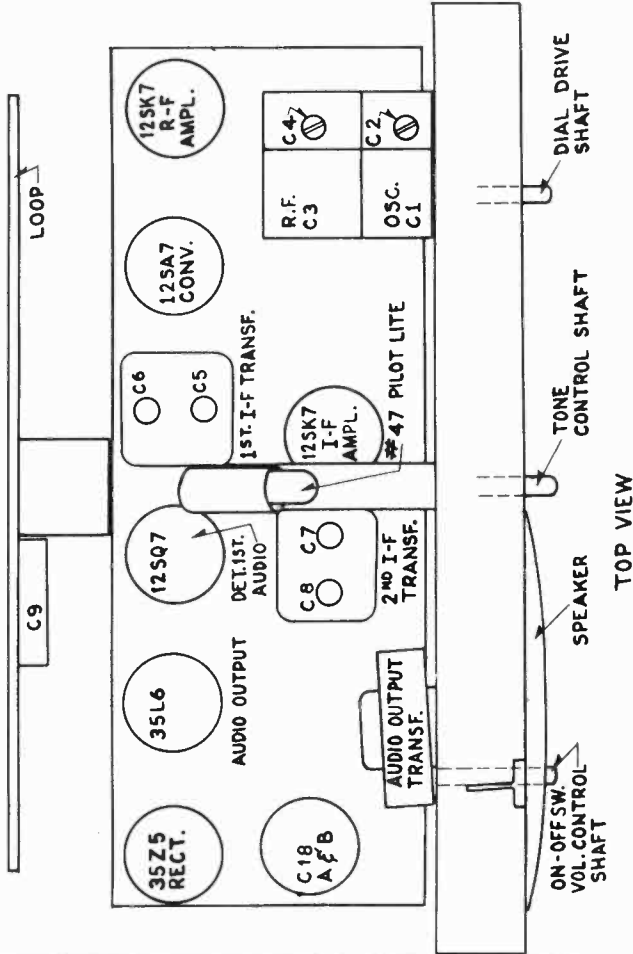
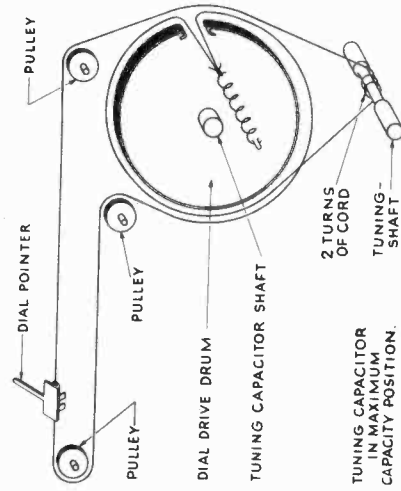


Loop must always be plugged in here.

Antenna Connections

MINERVA CORP. OF AMERICA





## MINERVA CORP. OF AMERICA

MODEL W702

TUBE	PIN NO.	VTVM	20,000 OHM	1,000 OHM	RESISTANCE	
			V	V		
12SK7 RF Amp.	1	0	0	0	0	
	2	AC	AC	AC	60 OHM	
	3	0	0	0	0	
	4	-0.85	-0.4	-0.2	3.0 MEG	
	5	0	0	0	0	
	6	83	83	83	OVER 5 MEG	
	7	AC	AC	AC	45 OHM	
	8	41	41	41	OVER 5 MEG	
12SA7 CONVERTER	1	0	0	0	0	
	2	AC	AC	AC	44 OHM	
	3	82	82	82	OVER 5 MEG	
	4	83	83	83	OVER 5 MEG	
	5					
Csc. Voltage	550 KC	-8.4	-7.0	-3.1	23K	
	1600 KC	-9.2	-7.9	-3.7	23K	
	6	0	0	0	0.6 OHM	
	7	AC	AC	AC	29.0	
	8	-0.85	-0.4	0	3.2 MEG	
	12SK7 IF Amp.	1	0	0	0	0
		2	AC	AC	AC	28 OHM
		3	0	0	0	0
4		-0.85	-0.4	-0.2	3.0 MEG	
5		0	0	0	0	
6		83	83	83	OVER 5 MEG	
7		AC	AC	AC	13 OHM	
8		82	82	82	OVER 5 MEG	
12SQ7 DET & 1st AUDIO AVC	1	0	0	0	0	
	2	-1.1	-0.7	-0.4	11.5 MEG	
	3	0	0	0	0	
	4	-0.7	-0.4	-0.2	0.4 MEG	
	5	-0.7	-0.4	-0.2	0.4 MEG	
	6	56	52	16	OVER 5 MEG	
	7	AC	AC	AC	13 OHM	
	8	0	0	0	0	
35L6 AUDIO OUTPUT	1	--	--	--	--	
	2	AC	AC	AC	88 OHM	
	3	107	107	107	OVER 500 K	
	4	83	83	83	OVER 500 K	
	5	0	0	0	.6 MEG	
	6	--	--	--	--	
	7	AC	AC	AC	52 OHM	
	8	5	5	5	170 OHM	
35Z5 RECTIFIER	1	--	--	--	--	
	2	AC	AC	AC	120 OHM	
	3	AC	AC	AC	120 OHM	
	4	114	114	114	OVER 500 K	
	5	AC	AC	AC	120 OHM	
	6	--	--	--	--	
	7	AC	AC	AC	90 OHM	
	8	128	128	128	OVER 500 K	

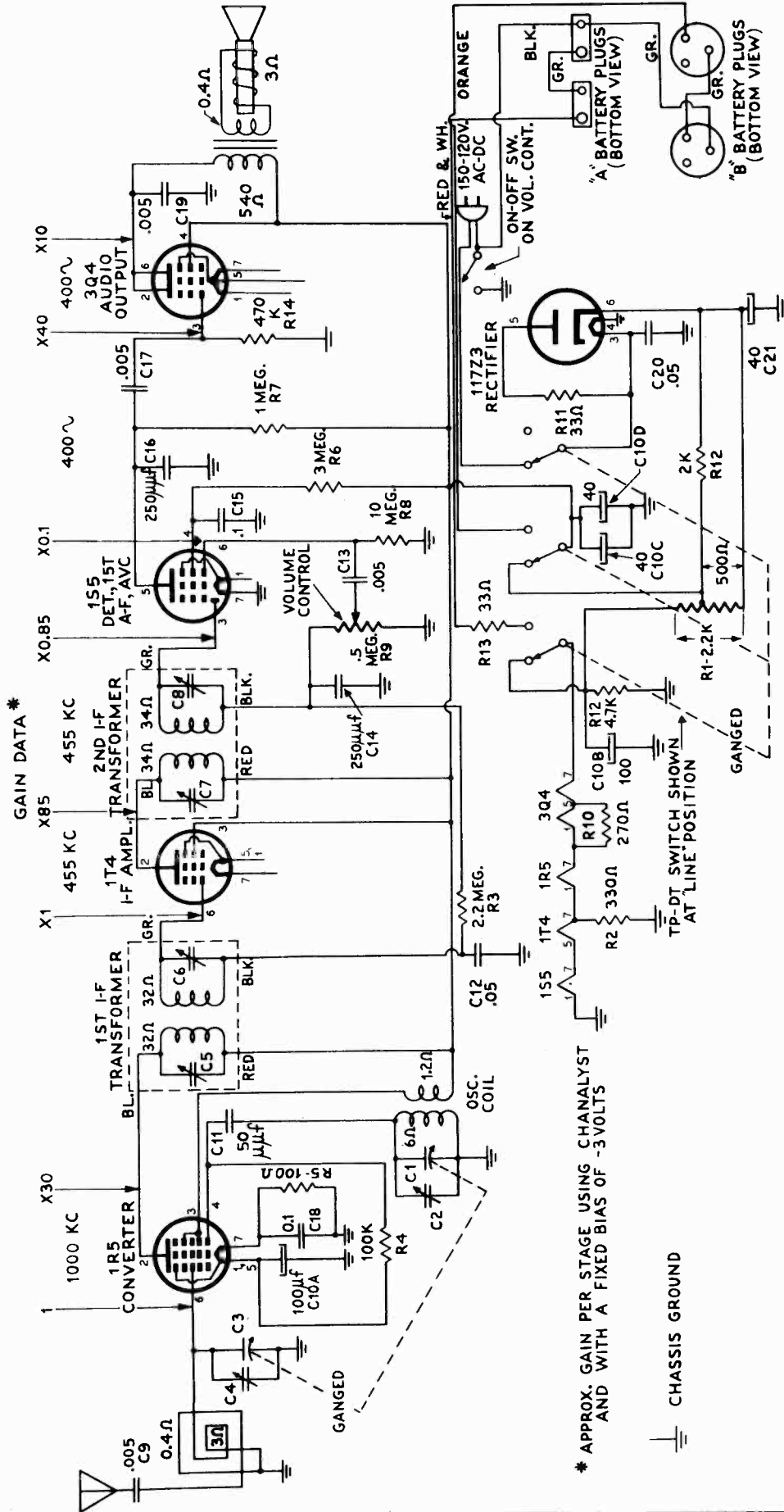
## IF ALIGNMENT

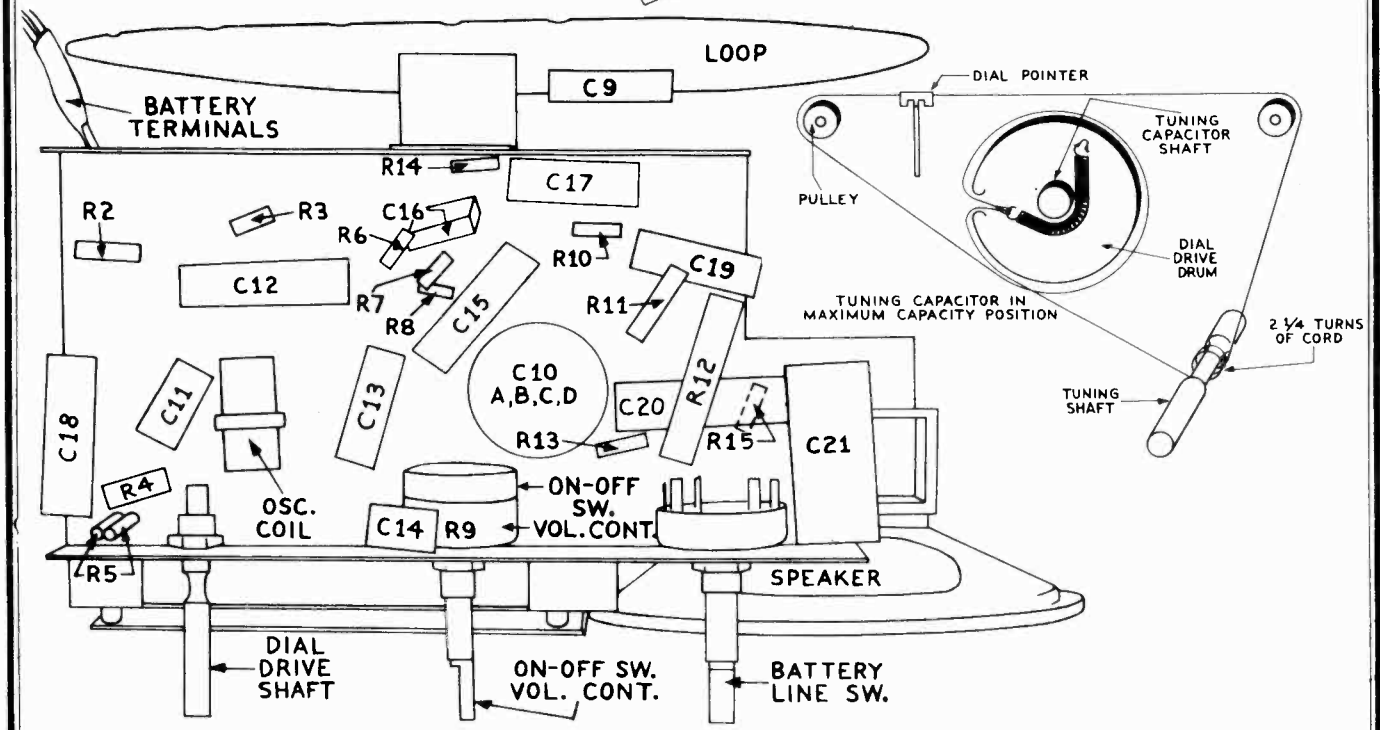
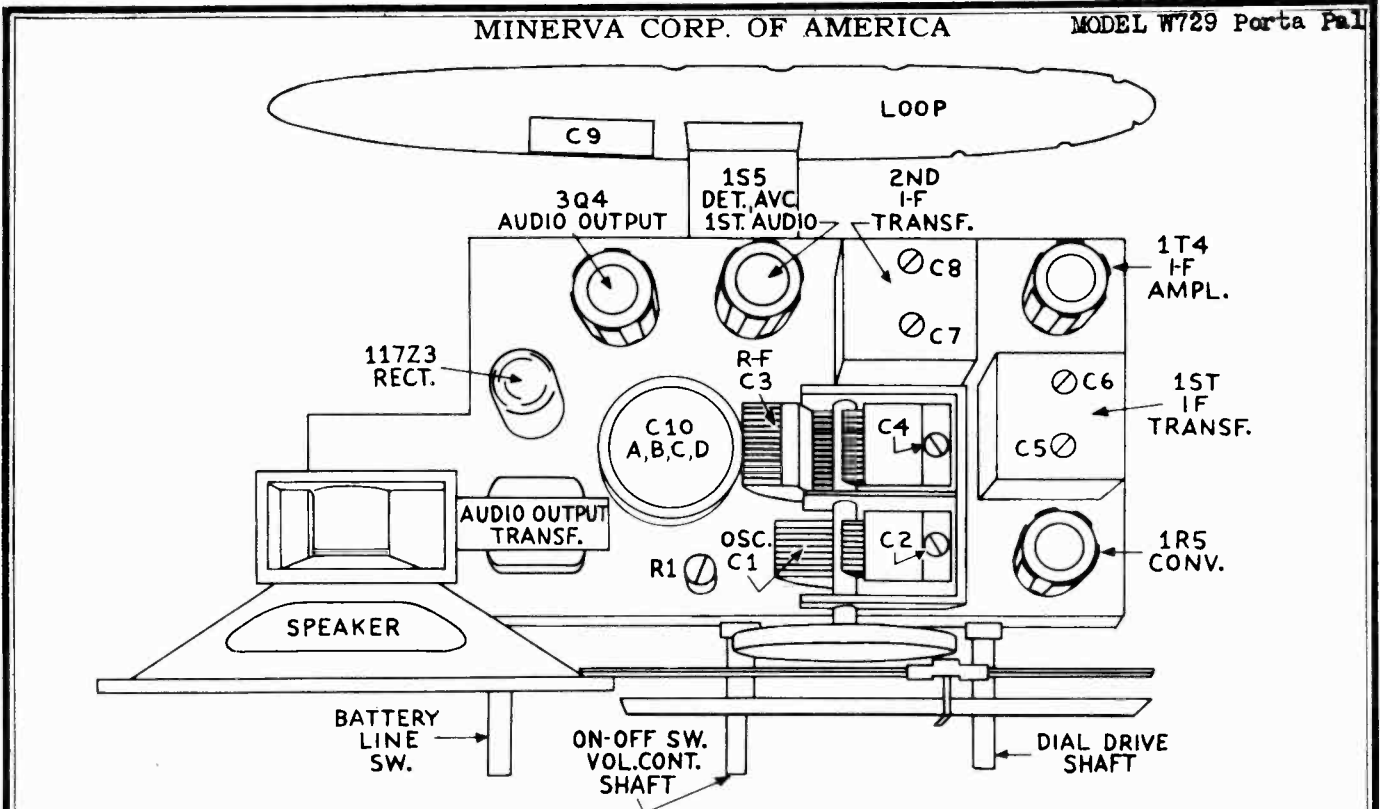
CONNECT AN OUTPUT METER ACROSS THE VOICE COIL OF THE RECEIVER. CONNECT A SIGNAL GENERATOR TO THE STANDARD HAZELTINE LOOP MODEL 1150 AND COUPLE IT LOOSELY TO THE RECEIVER LOOP. SET THE SIGNAL GENERATOR TO 455 KC AND FULLY MESH THE RECEIVER TUNING CAPACITOR. KEEP THE RECEIVER VOLUME CONTROL AT MAXIMUM AND THE OUTPUT OF THE SIGNAL GENERATOR SUFFICIENT TO GIVE A READABLE DEFLECTION ON THE OUTPUT METER. ADJUST FOR MAXIMUM IF TRIMMERS C8, C7, C6, C5.

## RF OSC. ADJUSTMENT

KEEPING THE SAME SETUP AS USED FOR IF ALIGNMENT SET THE SIGNAL GENERATOR AND RECEIVER TO 1600 KC AND ADJUST OSCILLATOR TRIMMER C2 FOR MAXIMUM OUTPUT. NEXT, SET THE SIGNAL GENERATOR AND RECEIVER TO 1400 KC AND ADJUST THE ANTENNA TRIMMER C4 FOR MAXIMUM OUTPUT.







**IF ALIGNMENT**

CONNECT AN OUTPUT METER ACROSS THE VOICE COIL OF THE RECEIVER. CONNECT A SIGNAL GENERATOR TO THE STANDARD HAXELTINE LOOP MODEL 1150 AND COUPLE IT LOOSELY TO THE RECEIVER LOOP. SET THE SIGNAL GENERATOR TO 455 KC AND FULLY MESH THE RECEIVER TUNING CAPACITOR. KEEP THE RECEIVER VOLUME CONTROL AT MAXIMUM AND THE OUTPUT OF THE SIGNAL GENERATOR SUFFICIENT TO GIVE A READABLE DEFLECTION ON THE OUTPUT METER. ADJUST FOR MAXIMUM IF TRIMMERS C8, C7, C6, C5.

**RF OSC. ADJUSTMENT**

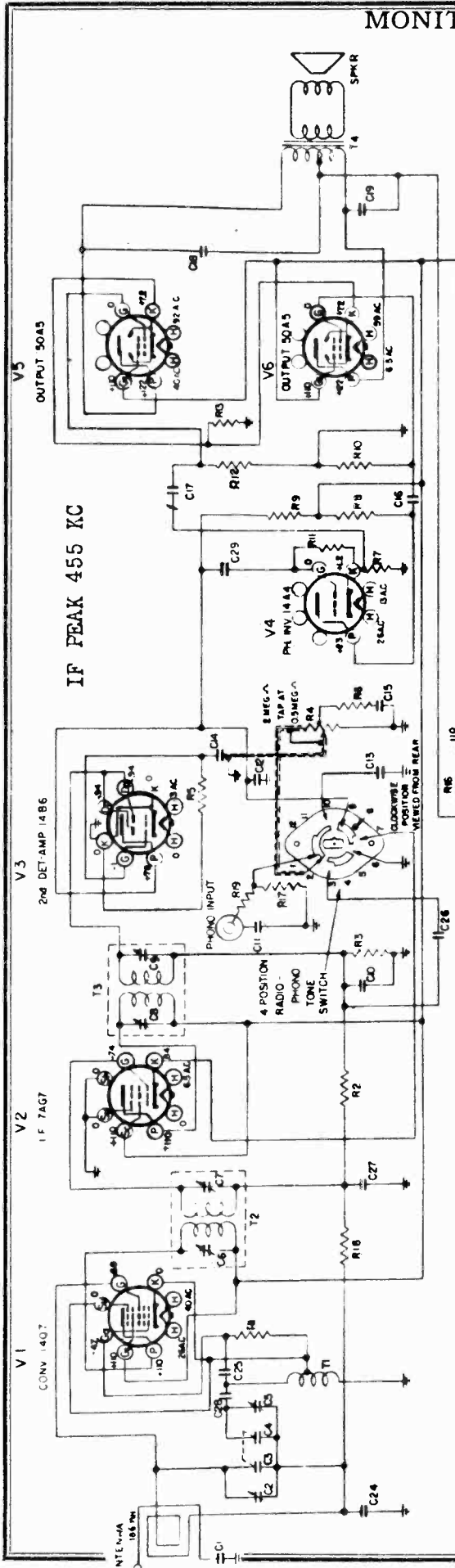
KEEPING THE SAME SETUP AS USED FOR IF ALIGNMENT SET THE SIGNAL GENERATOR AND RECEIVER TO 1600 KC AND ADJUST OSCILLATOR TRIMMER C2 FOR MAXIMUM OUTPUT. NEXT, SET THE SIGNAL GENERATOR AND RECEIVER TO 1400 KC AND ADJUST THE ANTENNA TRIMMER C4 FOR MAXIMUM OUTPUT.

## MINERVA PORTA PAL MODEL W729

TUBE	PIN NO.	VTVM	20,000 OHM	1,000 OHM	RESISTANCE
			V	V	
1R5 CONVERTER	1	+2.3	+2.3	+2.3	32 OHM
	2	+86	+86	+86	1.8 K
	3	+86	+86	+86	1.7 K
	4				
OSC. VOLTAGE	550 KC	-14	-6.3	-2.1	100 K
	1600 KC	-25	-14	-6	100 K
	5	+2.3	+2.3	+2.3	32 OHM
	6	0	0	0	3 OHM
	7	+3.5	+3.5	+3.5	46 OHM
1T4 IF AMP	1	+1.1	+1.1	+1.1	.8 OHM
	2	+86	+86	+86	1.9 K
	3	+86	+86	+86	1.9 K
	4	-0.4	0	0	2.8 MEG
	5	+1.15	+1.15	+1.15	18 OHM
	6	-0.13	0	0	2.8 MEG
	7	+2.25	+2.25	+2.25	30 OHM
1S5 DET. and 1st AF AVC	1	0	0	0	0
	2	--	--	--	--
	3	-0.15	-0.1	0	.5 MEG
	4	+22	+20	+6	2.8 MEG
	5	+10	+8	+2	1 MEG
	6	-0.1	0	0	10.5 MEG
	7	+1.15	+1.15	+1.15	18 OHM
3Q4 AUDIO OUTPUT	1	+3.5	+3.5	+3.5	44 OHM
	2	+82	+82	+82	2.4 K
	3	0	0	0	.5 MEG
	4	+86	+86	+86	1.7 K
	5	+4.5	+4.5	+4.5	56 OHM
	6	+82	+82	+82	2.4 K
	7	+6	+6	+6	70 OHM
117 Z3 RECTIFIER	1	--	--	--	--
	2	+120	+120	+120	2.2 K
	3	AC	AC	AC	480 OHM
	4	0	0	0	0
	5	AC	AC	AC	500 OHM
	6	+120	+120	+120	2.4 K
	7	0	0	0	0

ALL VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND AND WITH A LINE VOLTAGE OF 117 V AC.

LINE-BATTERY SWITCH IN "LINE" POSITION



NOTE: SOCKET VOLTAGES MODEL 700 AC DC RECEIVER MEASURED VALUES SHOULD BE WITHIN ± 10% AC LINE VOLTS 115 AC CYCLES D C MEASUREMENTS MADE WITH VTVM (VOLT OHMIST JUNIOR) AC MEASUREMENTS MADE WITH 1000 OHM/VOLT METER

**POWER OUTPUT:**  
Undistorted ..... 1.5 watts  
Maximum ..... 3 watts

**POWER SUPPLY:**  
105-125 volts, a.c. 60 cycles

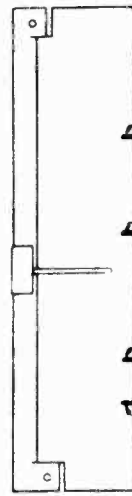
**POWER CONSUMPTION:** 45 watts

**LOUDSPEAKER:**  
5x7 inch oval (or 5-inch round); permanent magnet.  
Voice Coil Impedance: 3.2 ohms at 400 cycles.

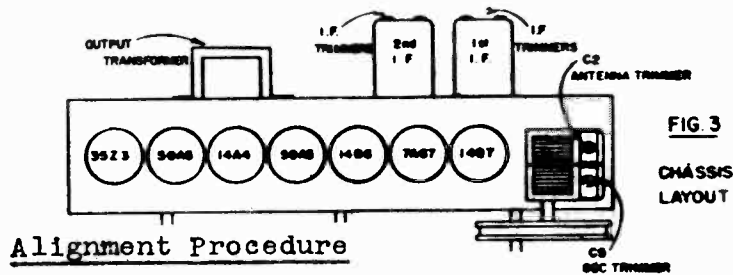
**NOTES:**  
R19, R20 and C28, shown in the above schematic, were not included in earlier models. The following changes were effected in later models: R2 changed from 10 to 2.2 megohms; R16 changed from 1800 to 560 ohms; R17 changed from 0.47 megohm to 0.22 megohm. The rectifier output voltage of +110 volts, as shown above, may be 10 to 15 volts lower in earlier models due to the higher resistance of R16 in the filter section.

FIG. 2

CALIBRATION DIAL PLATE



CHECK POINT (CAPACITOR FULLY CHARGED)	600 KC	1000 KC	DESCRIPTION	REF. NO. (SYM)	REVENUE	
C1	CAP. PAPER	0.01 MFD. 500V DC	OSC.	810417.6	REGR. 1.20% 810365-11	
C2	VAR.	0-22 MMFD.	RF	D10419.3	R2	RES. CARBON .022 MEG. ± 20% 810365-7
C3	VAR.	0-15 MMFD.	OSC.	D10419.3	R3	RES. CARBON .015 MEG. ± 20% 810365-11
C4	VAR.	0-15 MMFD.	OSC.	D10419.3	R4	RES. CARBON .015 MEG. ± 20% 810365-11
C5	TRIMMER	20-55 MMFD.	RF	A28135.2	R5	RES. CARBON .020 MEG. ± 20% 810365-11
C6	TRIMMER	20-55 MMFD.	RF	A28135.2	R6	RES. CARBON .020 MEG. ± 20% 810365-11
C7	TRIMMER	20-55 MMFD.	RF	A28135.2	R7	RES. CARBON .020 MEG. ± 20% 810365-11
C8	TRIMMER	20-55 MMFD.	RF	A28135.2	R8	RES. CARBON .020 MEG. ± 20% 810365-11
C9	TRIMMER	20-55 MMFD.	RF	A28135.2	R9	RES. CARBON .020 MEG. ± 20% 810365-11
C10	MICA	250 MMFD. 400V DC	RF	B10041.4	R10	RES. CARBON .020 MEG. ± 20% 810365-11
C11	PAPER	1 MFD. 500V DC	RF	B10417.6	R11	RES. CARBON .020 MEG. ± 20% 810365-11
C12	MICA	470 MMFD. 400V DC	RF	B10417.6	R12	RES. CARBON .020 MEG. ± 20% 810365-11
C13	PAPER	10 MMFD. 500V DC	RF	B10417.6	R13	RES. CARBON .020 MEG. ± 20% 810365-11
C14	PAPER	10 MMFD. 500V DC	RF	B10417.6	R14	RES. CARBON .020 MEG. ± 20% 810365-11
C15	PAPER	10 MMFD. 500V DC	RF	B10417.6	R15	RES. CARBON .020 MEG. ± 20% 810365-11
C16	PAPER	10 MMFD. 500V DC	RF	B10417.6	R16	RES. CARBON .020 MEG. ± 20% 810365-11
C17	PAPER	10 MMFD. 500V DC	RF	B10417.6	R17	RES. CARBON .020 MEG. ± 20% 810365-11
C18	PAPER	10 MMFD. 500V DC	RF	B10417.6	R18	RES. CARBON .020 MEG. ± 20% 810365-11
C19	PAPER	10 MMFD. 500V DC	RF	B10417.6	R19	RES. CARBON .020 MEG. ± 20% 810365-11
C20	PAPER	10 MMFD. 500V DC	RF	B10417.6	R20	RES. CARBON .020 MEG. ± 20% 810365-11
C21	PAPER	10 MMFD. 500V DC	RF	B10417.6	R21	RES. CARBON .020 MEG. ± 20% 810365-11
C22	ELECTR. 40 MMFD.	50V DC	RF	A10427	T1	OSC. COIL
C23	PAPER	0.5 MFD. 400V DC	RF	B10417.6	T2	IF COIL 455 KC
C24	PAPER	0.5 MFD. 400V DC	RF	B10417.6	T3	IF COIL 455 KC
C25	MICA	56 MMFD. 400V DC	RF	B10417.6	T4	AUDIO OUTPUT TRANSFORMER
C26	PAPER	0.1 MFD. 400V DC	RF	B10417.6		
C27	PAPER	0.1 MFD. 400V DC	RF	B10417.6		
C28	PAPER	0.05 MFD. 400V DC	RF	B10417.6		
C29	PAPER	0.05 MFD. 400V DC	RF	B10417.6		



A signal generator capable of producing a modulated radio-frequency signal, and a suitable output meter are required for proper alignment of the receiver.

Adjust the signal generator for 30%, 400 cycle modulation. At all times, use only the minimum signal intensity which will produce a readable indication on the output meter, in order to minimize alignment error due to a.v.c. action in the receiver.

Set the receiver controls for "Radio", maximum volume, and treble tone.

Make all adjustments with the signal generator connected directly to the external antenna lead of the receiver, and with the output meter across the speaker voice coil.

Use a non-metallic screwdriver in making all receiver alignment adjustments.

**NOTE:** The calibrated tuning dial of the receiver is fastened in the cabinet and cannot be used for reference during alignment. Therefore, calibration marks have been stamped on the plate on the front of the chassis, as shown in Figure 2. These are the reference marks referred to in the following procedure:

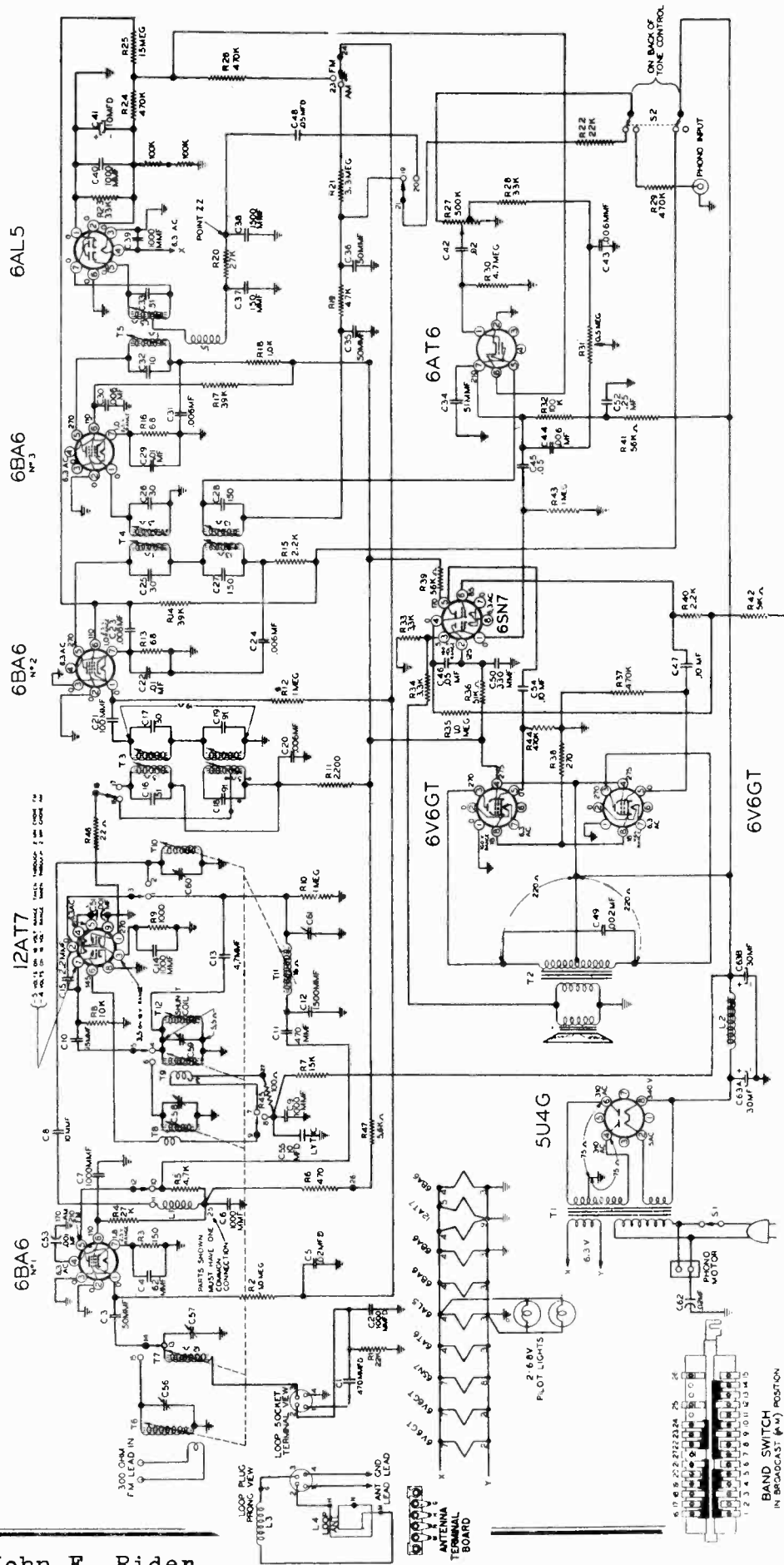
- Step 1. Set signal generator to 455 kc. and the receiver dial to a "quiet spot" between stations. Peak the I.F. trimmer condensers (Figure 3) for maximum signal indication on the output meter, beginning with the 2nd I.F. transformer.
- Step 2. Turn ganged tuning condenser to maximum capacity (fully meshed) and adjust dial pointer on cord so that it coincides with the extreme left hand white mark on the metal dial plate.
- Step 3. Set signal generator to 1500 kc. Turn ganged tuning condenser until pointer coincides with extreme right hand (1500 kc.) calibration mark. Adjust oscillator trimmer condenser C5 (Figure 3) for maximum indication on the output meter.
- Step 4. With the signal generator and receiver dial set as in step 3, adjust the antenna trimmer condenser C2 for maximum indication on the output meter.

When chassis has been returned to cabinet after alignment, the receiver calibration should be checked against the tuning dial. It may be found necessary to slide the dial pointer slightly in either direction on the cord to correct for small deviations in calibration.

MONTGOMERY WARD

MODEL 74BR-2707A

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



NOTE: The two 100k ohm resistors in series from PIN NO. 2 to ground are connected as shown only when aligning the FM I.F. Refer to FM I.F. alignment procedure.  
 NOTE: On some sets R46—22 ohm resistor is replaced with a 39 ohm resistor, Part no. C-981-45.

- Power Supply ..... 105 to 125 volts, AC, 60-cycles;  
 Chassis only 122 watts. With  
 phono operation 150 watts.
- Frequency Ranges... Broadcast Band—535 to 1620 kc.  
 FM Band—88 to 108 mc.
- Intermediate Freq. AM-455 kc.; FM-10.7 mc.
- Selectivity ..... AM-48 kc. broad at 1000 times sig-  
 nal, measured at 1000 kc.
- AM Sensitivity ..... I.F. FM-320 kc. broad at 10 times  
 down.  
 (For .5 watt output with external  
 antenna)—3 microvolts average
- FM Sensitivity ..... (For .5 watt output—10 micro-  
 volts average.
- Power Output ..... 8 watts, 10% distortion. 10 watts  
 maximum.
- Loud Speaker ..... 12" electrodynamic. Voice coil  
 impedance 3.2 ohms, 400 cycles.  
 down.

**ALIGNMENT PROCEDURE**

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

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

must be set at maximum. The tone control must be set for maximum treble.

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

**AM - I. F. ALIGNMENT**

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

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

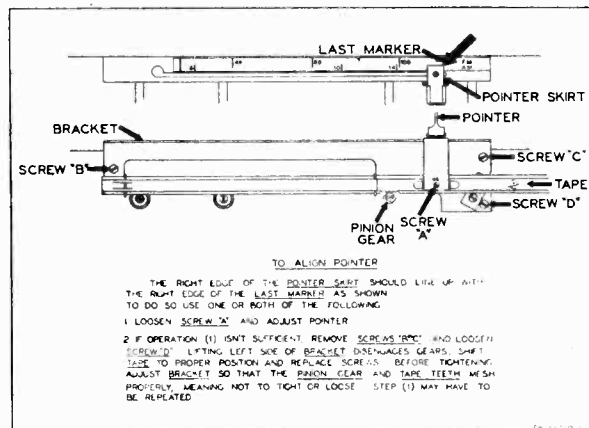
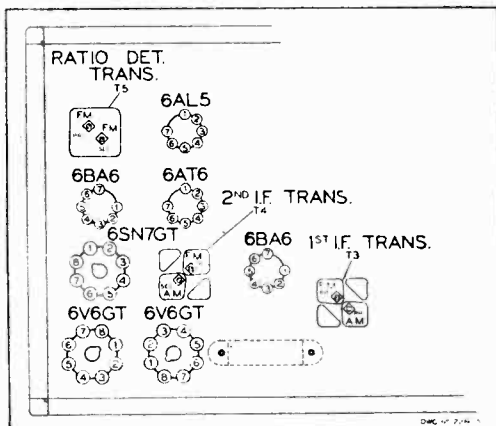
**BROADCAST BAND - R. F. ALIGNMENT**

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

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

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

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



MONTGOMERY WARD

MODEL 74BR-2707A

**ALIGNMENT PROCEDURE**

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

A non-metallic alignment tool must be used.

**IMPORTANT**

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

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

**NOTE**

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

A standard AM signal generator is required.

**FM - I. F. ALIGNMENT**

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

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

**NOTES ON FM—I.F. ALIGNMENT**

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

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

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

**FM - R. F. ALIGNMENT**

*Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of marker to the extreme right when iron cores are all the way out.*

*For adjustment, see dial mechanism illustration.*

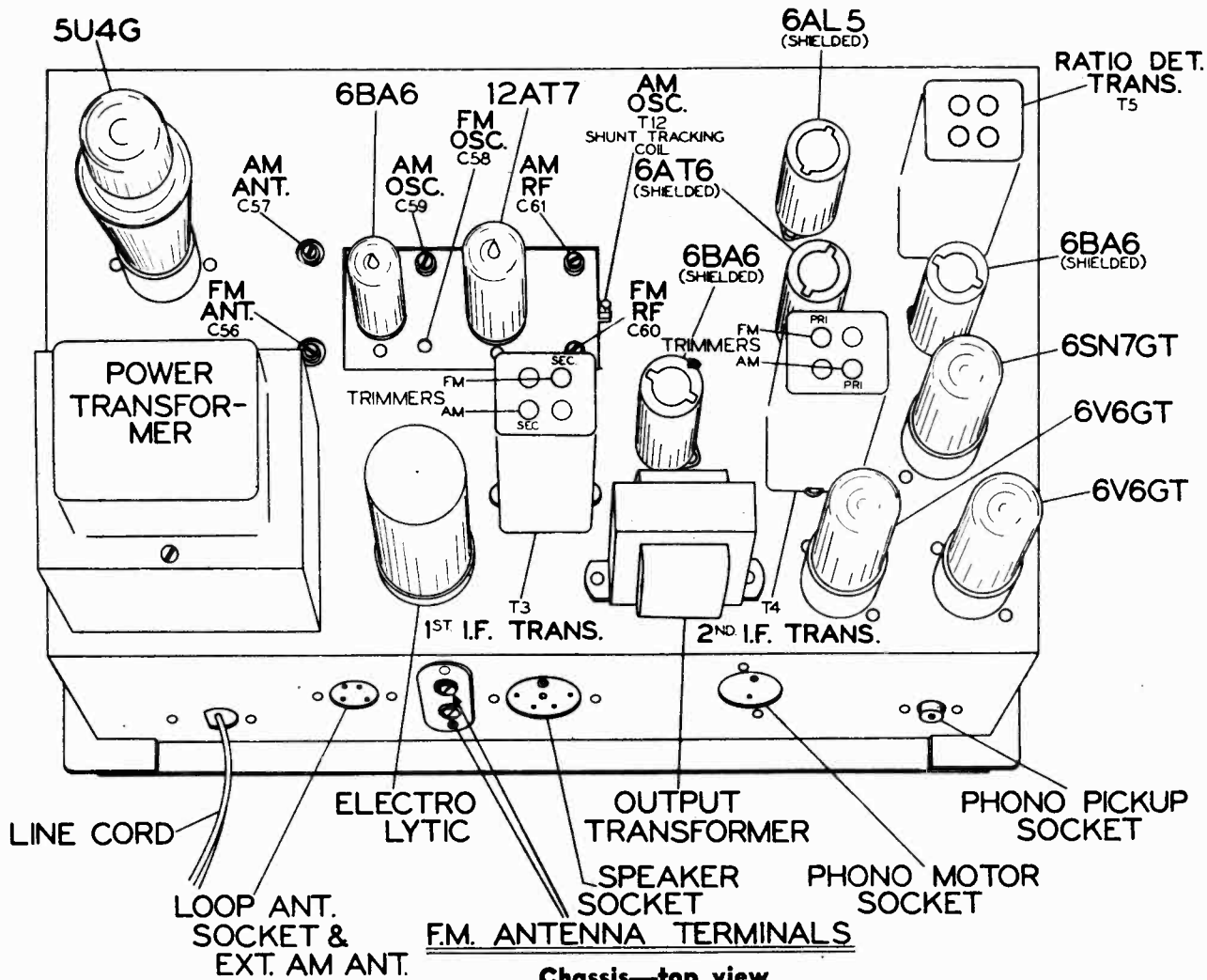
SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUST TO
100 Mc. Use about 10 microvolts	FM Antenna Terminals See note	300 ohms	C58 Osc. C60 R.F. C56 Ant.	Pin no. 2 of 6AL5 and Ground	Resonance about 3 volts

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

Band and to use the vacuum tube volt-meter as above for resonance indication. A weak carrier, however will not produce 3 volts.

NOTE: Connect 300 ohms in series with hot side of generator and connect to one screw. Connect cold side of generator to other screw





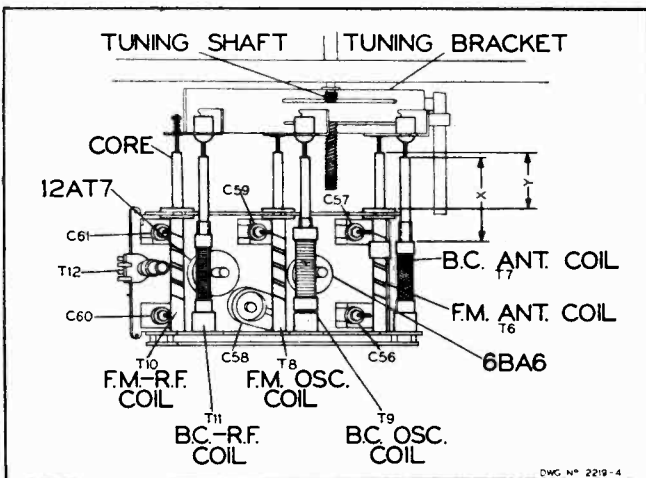
Chassis—top view

Tube and Lamp Complement.....

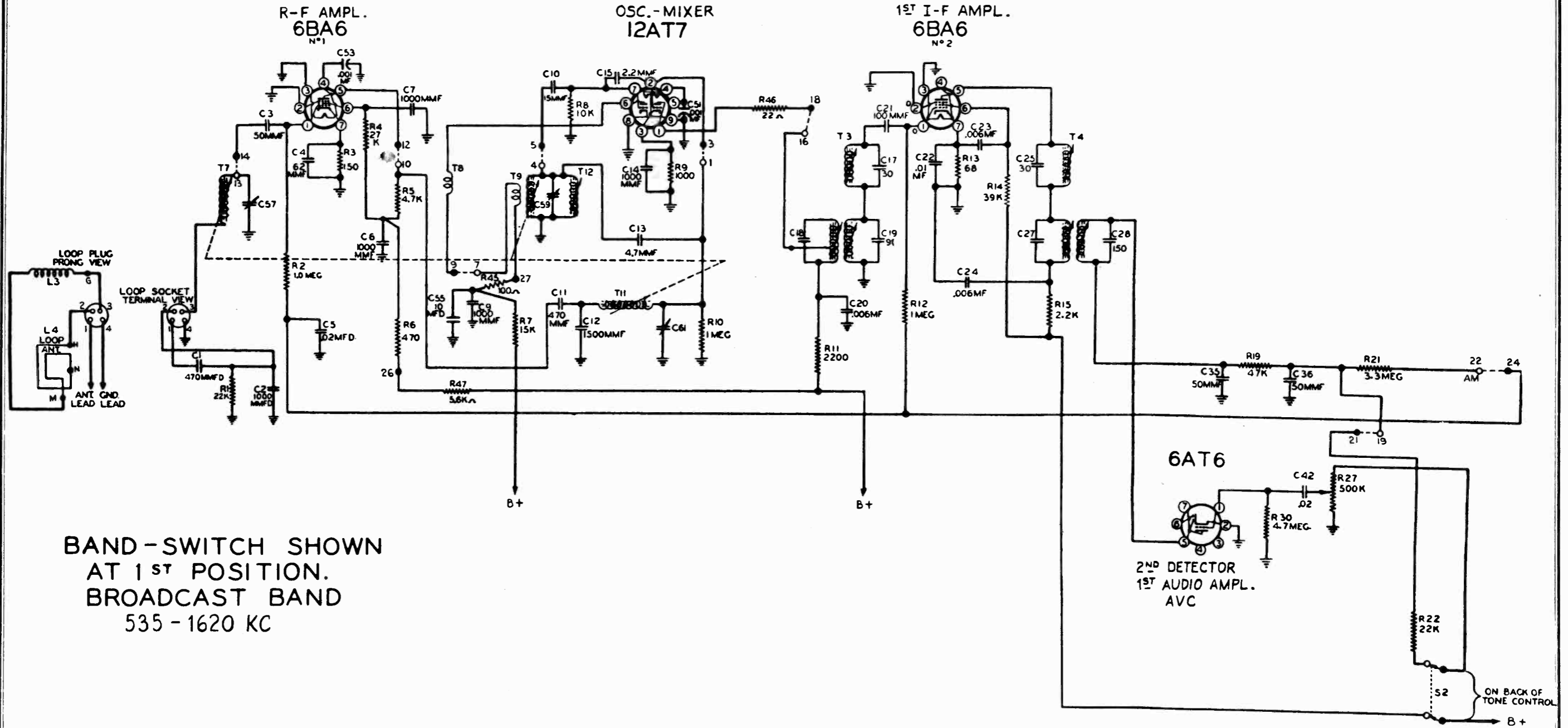
- 6BA6, FM—AM R.F. stage.
- 12AT7, FM—AM oscillator and mixer.
- 6BA6, FM—AM 1st I.F.
- 6BA6, FM— 2nd I.F.
- 6AL5, FM— ratio detector.
- 6AT6, AM detector.
- A. F. AMP. and A.V.C.
- 6SN7, Push-pull. Driver and phase-inverter.
- 5U4G, rectifier.
- 6V6, output.
- 6V6, output.
- T-44 dial lamp (2 used).

**TUNER ADJUSTMENT**

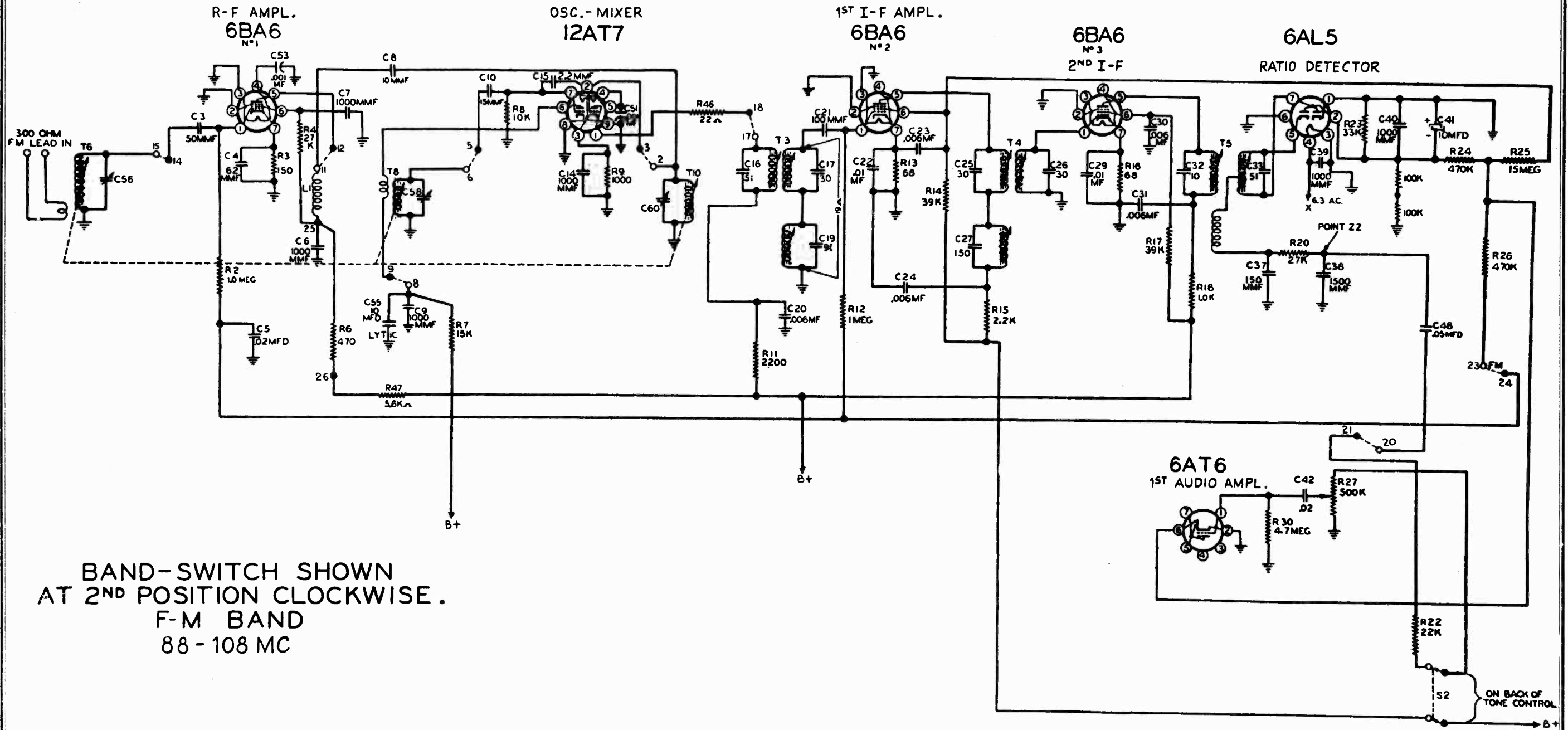
With tuner all the way out, dimension "X" should be 1½ inches. "Y" should be 1-1/16 inches. "X" is from the end of the slug to the edge of the coil winding. Check these dimensions before R.F. alignment is attempted of either the AM or FM band. No slug adjustment should be necessary since the slugs are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



DWG. NO. 2219-4



BAND-SWITCH SHOWN  
AT 1<sup>ST</sup> POSITION.  
BROADCAST BAND  
535 - 1620 KC



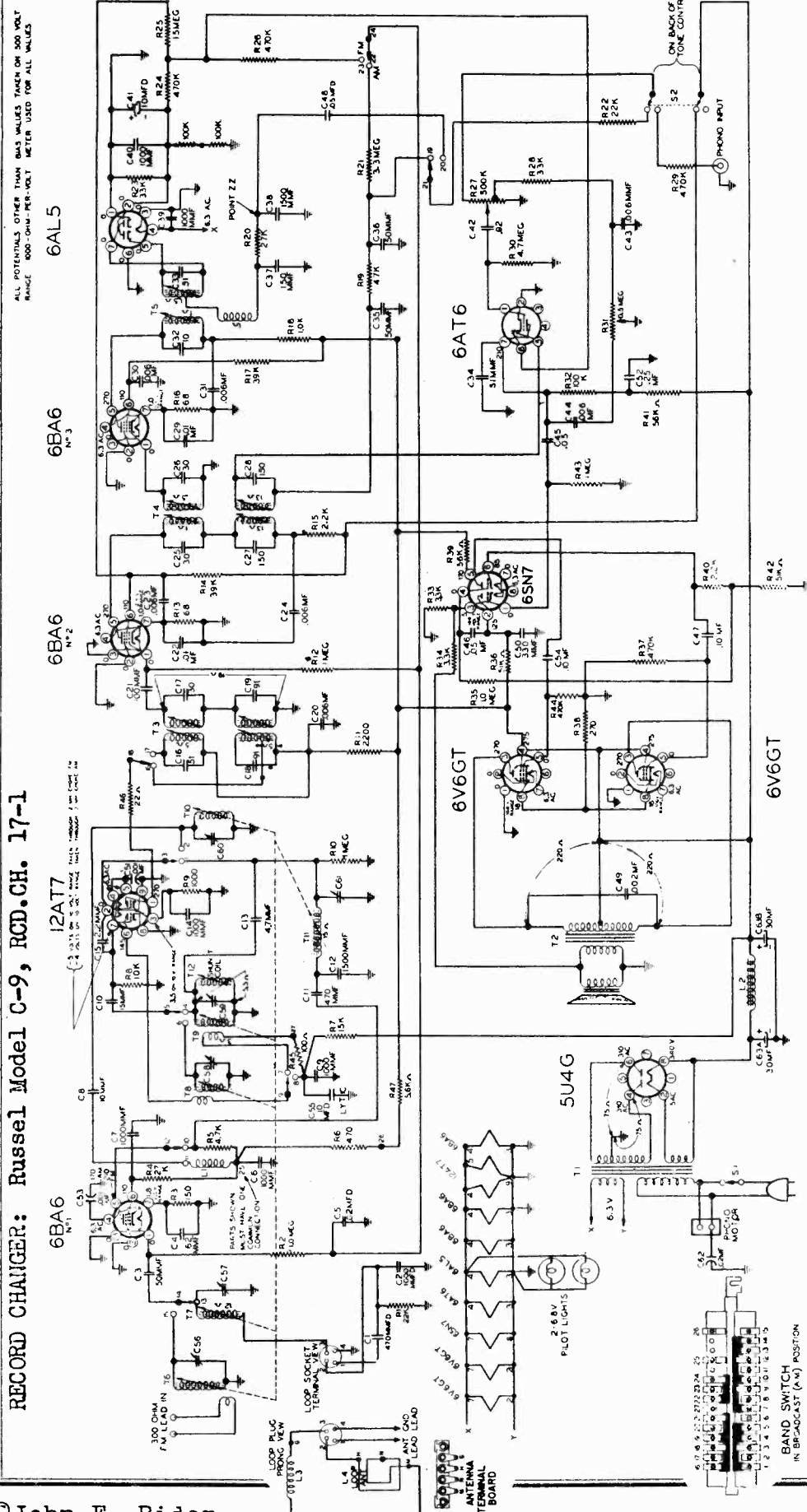
BAND-SWITCH SHOWN  
AT 2ND POSITION CLOCKWISE.  
F-M BAND  
88 - 108 MC

**REPLACEMENT PARTS LIST**

Ref. No.	Part No.	Description	Qty. Used In Set
<b>TUNER PARTS</b>			
<b>CONDENSERS</b>			
C58	A-8E-13575	Trimmer condenser	1
C56, 57, 59, 60, 61	A-2M-12618	Trimmer cond. plate	5
C1, C11	C-8G-11732	470 mmf, ±20%	2
C2	C-8G-13695	1000 mmf, ± 20%	1
C6, 7, 9, 14, 51, 53	C-8G-13201	1000 mmf, +20%—10%	6
C4	C-8G-13018	62 mmf, ± 10%	4
C12	C-8G-11731	1500 mmf, ±20%	1
C10	C-8G-13017	15 mmf, +10%	1
C3	C-8G-11484	50 mmf, ±10%	1
C8	C-8G-11789	10 mmf, ±10%	1
C13	A-8G-12495-6	4.7 mmf, ±20%	1
C15	A-8G-12495-4	2.2 mmf, ± 20%	1
C5	C-8D-11304	.02 mfd, 200 volts, ±20%	1
<b>RESISTORS</b>			
R4	C-9B2-79	27K ohms, 1 watt, 10%	1
R1	C-9B1-21	22K ohms, 1/2 watt, 20%	1
R3	C-9B1-52	150 ohms, 1/2 watt, 10%	1
R5	C-9B1-17	4700 ohms, 1/2 watt, 20%	1
R6	C-9B1-11	470 ohms, 1/2 watt, 20%	1
R8	C-9B1-19	10K ohms, 1/2 watt, 20%	1
R2, R10	C-9B1-31	1 megohm, 1/2 watt, 20%	2
R9	C-9B1-62	1000 ohms, 1/2 watt, 10%	1
R21	C-9B1-34	3.3 megohms, 1/2 watt, 20%	1
R45	C-9B1-50	100 ohms, 1/2 watt, 10%	1
R46	C-9B1-42	22 ohms, 1/2 watt, 10%	1
<b>COILS</b>			
T8	B-13D-13027	FM oscillator coil assembly	1
T6	B-13E-13028	FM antenna coil assembly	1
T10	B-13C-13029	FM R.F. coil assembly	1
T9	B-13D-13030	AM oscillator coil assembly	1
T7	B-13E-13031	AM antenna coil assembly	1
T11	B-13C-13032	AM R.F. coil assembly	1
L1	A-16A-13033	Choke coil assembly	1
T12	B-13D-12974	AM osc. shunt coil assembly	1
<b>MISCELLANEOUS</b>			
	B-208-13553	Band change slide switch	1
	or		
	B-201-12967	Band change slide switch	1
	A-15B-12997	7 prong, miniature tube socket	1
	A-15B-13430	9 prong, miniature tube socket	1
	A-200-12912	Drive bracket assembly	1
	A-200-13044	Pointer guide and bracket assembly	1
	A-3A-12308-1	Lead screw	1
	A-3J-12309	Pinion gear for lead screw	1
	A-49A-13447	Tension spring for lead screw	1
	A-25A-13019	Core grommets, for AM Band	3
	A-3M-13020	Insert for core grommet	3
	A-49A-12394	Spiral spring for FM cores	3
	C-2D-12990	Tape Guide	1
	B-2J-13006	Rack, with teeth	1
	A-2J-11041	Pointer tension spring, "M" shaped	1
	B-2G-10588-2	Pointer	1
	32F4-10830	4-40 x 1/8" screw to mount pointer	1
<b>MAIN CHASSIS PARTS</b>			
<b>CONDENSERS</b>			
63A, 63B	B-8C-11629	Electrolytic condenser, dual, 30-30 x 450 volts	1
C21	C-8G-11734	100 mmf, 20%, ceramic	1
C37	C-8F3-229	150 mmf, mica	1
C38	C-8G-13059	1500 mmf, ceramic	1
C34	C-8G-13060	51 mmf, ceramic	1
C20, 23, 24, 30, 31, 43, 44	C-8D-10785	.006 mfx600 volts, paper	7
C22, C29	C-8D-10761	.01 mfx400 volts, paper	2
C45, 46	C-8D-10813	.05 mfx400 volts, paper	2
C55	A-8C-12154	Electrolytic condenser 10 mfx450 volts	1
C49	C-8D-10789	.002 mfx600 volts, paper	1
C39, 40	C-8G-13201	1000 mmf, ceramic	2
C41	A-8C-13132	Electrolytic condenser 10 mfx50 volts	1
C52	C-8J-11321	.02 mfx600 volts	1
C48	C-8D-10770	.05 mfx200 volts	1
C50	C-8G-11741	330 mmf, ceramic	1
C42	C-8D-11304	.02 mfx200 volts	1

Ref. No.	Part No.	Description	Qty. Used In Set
C52	C-8D-13439	.25 mfx400 volts	1
C47, 54	C-8D-10760	.1 mfx400 volts	2
C35, 36	A-8F-13047	50 mmf, dual mica	1
C32	C-8G-11789	10 mmf, ceramic, 10%	1
C33	C-8G-11891	51 mmf, ceramic, 5%	1
C27, 28	C-8G-13025	150 mmf, ceramic	2
C17, 25, 26	C-8G-12159	30 mmf, ceramic	3
C18, 19	C-8G-12160	91 mmf, ceramic	2
C16	C-8G-13026	51 mmf, ceramic	1
<b>RESISTORS</b>			
R27	A-10A-13001	Volume control (500K) and switch	1
R31	A-11A-12988	Tone control (500K) and radio-phono switch	1
R32	C-9B1-86	100K ohms, 1/2 watt, 10%	1
R29, 44	C-9B1-94	470K ohms, 1/2 watt, 10%	2
R39, 41	C-9B1-83	56K ohms, 1/2 watt, 10%	2
R33, 34	C-9B1-68	3300 ohms, 1/2 watt, 10%	2
R30	C-9B1-35	4.7 megohms, 1/2 watt, 20%	1
R23, 28	C-9B1-80	33K ohms, 1/2 watt, 10%	2
R20	C-9B1-79	27K ohms, 1/2 watt, 10%	1
R22	C-9B1-78	22K ohms, 1/2 watt, 20%	1
R13, 16	C-9B1-48	68 ohms, 1/2 watt, 10%	2
R14, 17	C-9B2-81	39K ohms, 1 watt, 10%	2
R24, 26, 37	C-9B1-29	470K ohms, 1/2 watt, 20%	3
R25	C-9B1-302	15 megohms, 1/2 watt, 10%	1
R19	C-9B1-23	47K ohms, 1/2 watt, 20%	1
R7	C-9B4-76	15K ohms, 2 watts, 10%	1
R12, 35, 43	C-9B1-31	1 megohm, 1/2 watt, 20%	3
R40	C-9B1-66	2200 ohms, 1/2 watt, 10%	1
R36, 42	C-9B1-200	51K ohms, 1/2 watt, 5%	2
R38	C-9B4-55	270 ohms, 2 watts, 10%	1
R47	C-9B1-71	5600 ohms, 1/2 watt, 10%	1
R18	C-9B1-13	1000 ohms, 1/2 watt, 20%	1
R15, 11	C-9B2-15	2200 ohms, 1 watt, 20%	2
<b>COILS</b>			
T3	C-13A-13009-1	Input I.F. transformer, combination 455 kc. and 10.7 mc.	1
T4	C-13B-13014-1	Output I.F. transformer, combination 455 kc. and 10.7 mc.	1
T5	C-203-11745-1	Ratio det. coil assembly 10.7 mc.	1
L3	A-16A-13243	Loop loading coil	1
L4	B-14MA-11066-5	Loop antenna, B.C. Band	1
<b>TRANSFORMERS</b>			
T2	B-12C-13042	Output transformer for speaker	1
	B-12A-13038	Power transformer, primary, 50-60 cycles, 105-125 volts, AC	1
<b>SPEAKER</b>			
	B-18B-13043	Electrodynamic speaker, 12" less output transformer	1
<b>MISCELLANEOUS</b>			
	C-30A-13578	Dial scale	1
	B-5B-14153-41	Knob, small, with dot, mahogany	2
	B-5B-13308-41	Knob, large, without dot, mahog.	2
	B-5C-12457-41	Escutcheon, side pieces	2
	107259	Shield for pilot lite	2
	B-14M-11479	A.C. line cord	1
	A-3A-13003	Switch shaft	1
	A-2D-12983	Detent bracket (U shaped on front of set)	1
	A-43D-12934	"U" speed clip	1
	A-55C-12935	Ball bearing	1
	A-2D-13004	Switch activator bracket	1
	B-47A-12458	Pilot lite assembly	1
	A-46A-11739	Pilot lite, 6-8 volts, T-44	2
	A-25G-13448	Rubber chassis mounting cushion	4
	A-15C-10717	7 prong, miniature tube socket	4
	A-15B-10440	8 prong, octal socket	4
	A-19B-12644	Antenna socket	1
	A-7B-13050	FM dipole, 2-screw strip	1
	A-15B-11538	Speaker socket	1
	A-19B-12468	Phono motor socket	1
	A-19B-12170	Phono input socket	1
<b>RECORD CHANGER</b>			
	B-201-13455	Record changer (C-10) with Retracto cartridge	1
	8K-14224	Retracto crystal cartridge with needle	1
	55A-14225	Retracto needle only	1

RECORD CHANGER: Russel Model C-9, RCD.CH. 17-1



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

NOTE: On some sets R46—22 ohm resistor is replaced with a 39 ohm resistor, Part no. C-9B1-45.

**ELECTRICAL SPECIFICATIONS**

- Power Supply ..... 105 to 125 volts, AC, 60-cycles;  
Chassis only 122 watts. With  
phono operation 150 watts.
- Frequency Ranges ..... Broadcast Band—535 to 1620 kc.  
FM Band—88 to 108 mc.
- Intermediate Freq. .... AM-455 kc; FM-10.7 mc.
- Selectivity ..... AM-48 kc. broad at 1000 times sig-  
nal, measured at 1000 kc.

- I.F. FM-180 kc. broad at 2 times  
down.
- I.F. FM-320 kc. broad at 10 times  
down.
- AM Sensitivity ..... (For .5 watt output with external  
antenna)—3 microvolts average
- FM Sensitivity ..... (For .5 watt output—10 micro-  
volts average.
- Power Output ..... 8 watts, 10% distortion. 10 watts  
maximum.

**ALIGNMENT PROCEDURE**

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

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

must be set at maximum. The tone control must be set for maximum treble.

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

**AM - I. F. ALIGNMENT**

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

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

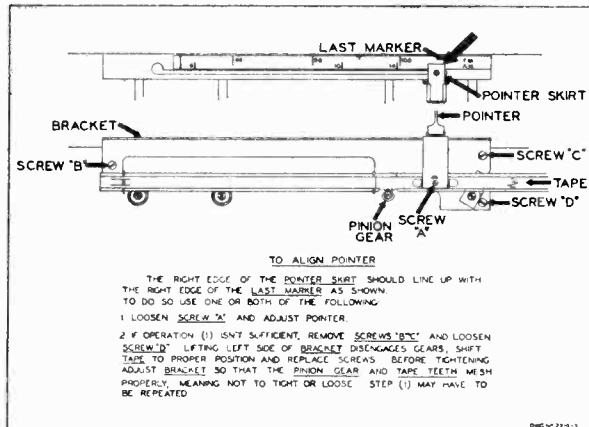
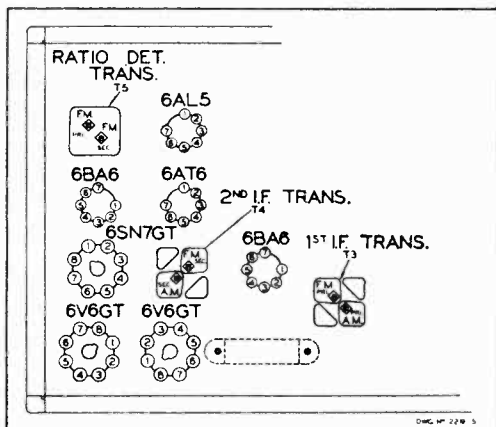
**BROADCAST BAND - R. F. ALIGNMENT**

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

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

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

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



**ALIGNMENT PROCEDURE**

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

A non-metallic alignment tool must be used.

**IMPORTANT**

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

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

**NOTE**

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

A standard AM signal generator is required.

**FM - I. F. ALIGNMENT**

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

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

**NOTES ON FM—I.F. ALIGNMENT**

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

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

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

**FM - R. F. ALIGNMENT**

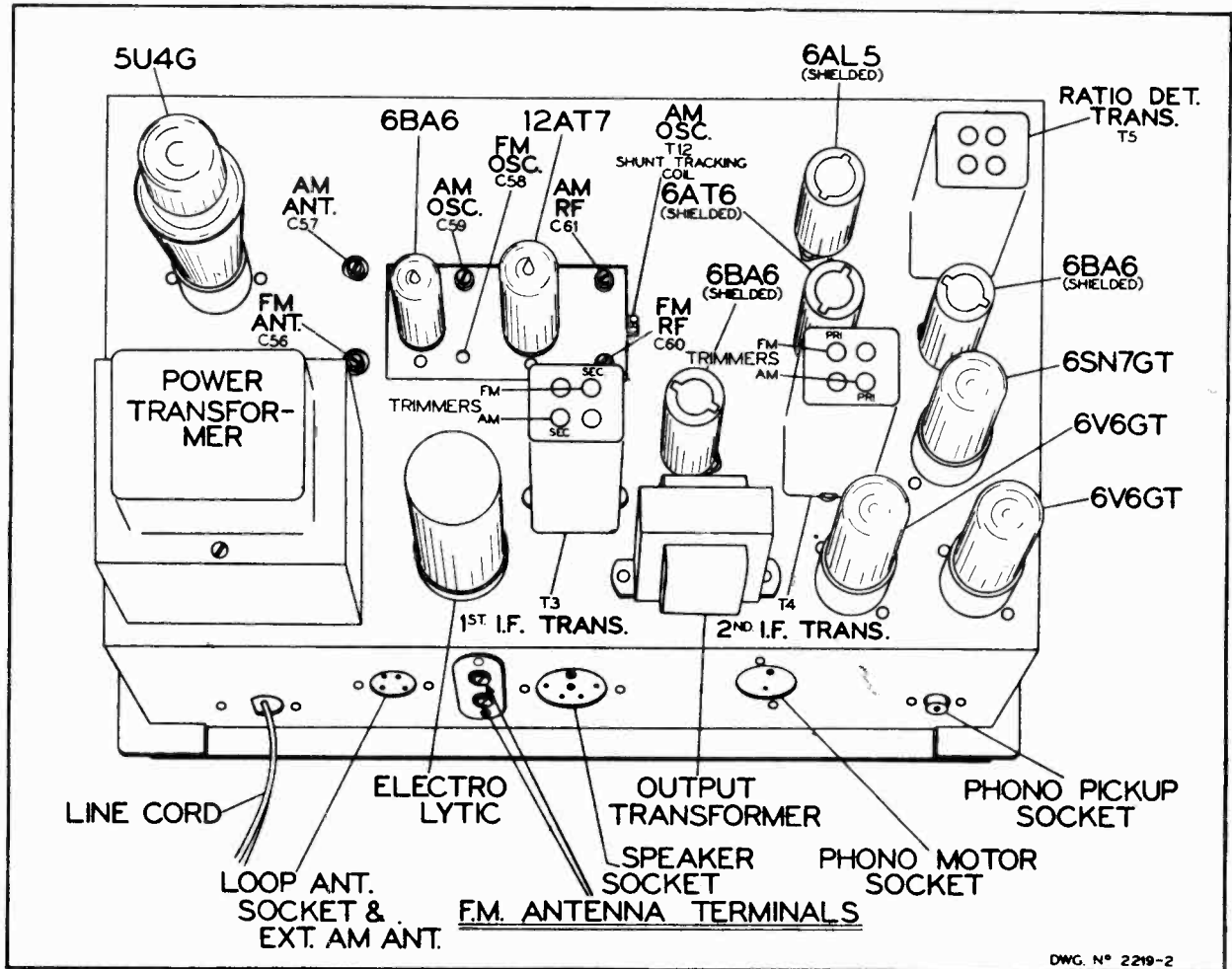
*Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of marker to the extreme right when iron cores are all the way out.*

*For adjustment, see dial mechanism illustration.*

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

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

Band and to use the vacuum tube volt-meter as above for resonance indication. A weak carrier, however will not produce 3 volts. NOTE: Connect 300 ohms in series with hot side of generator and connect to one screw. Connect cold side of generator to other screw

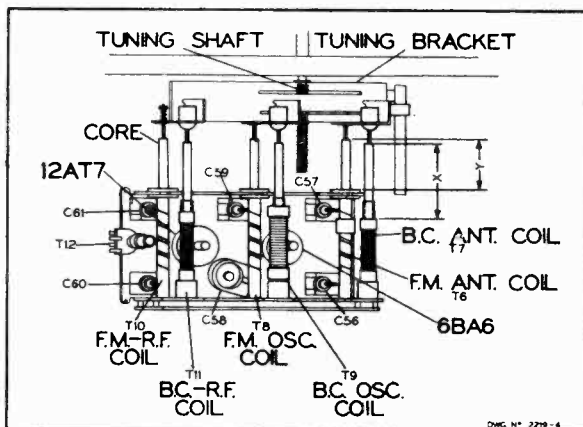


DWG. N° 2219-2

Chassis—top view

Loud Speaker..... 12" electrodynamic. Voice coil impedance 3.2 ohms, 400 cycles.  
 Tube and Lamp Complement..... 6BA6, FM—AM R.F. stage.  
 12AT7, FM—AM oscillator and mixer.  
 6BA6, FM—AM 1st I.F.  
 6BA6, FM— 2nd I.F.  
 6AL5, FM— ratio detector.  
 6AT6, AM detector.  
 A. F. AMP. and A.V.C.

6SN7, Push-pull. Driver and phase-inverter.  
 5U4G, rectifier.  
 6V6, output.  
 6V6, output.  
 T-44 dial lamp (2 used).



DWG. N° 2219-4

**TUNER ADJUSTMENT**

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

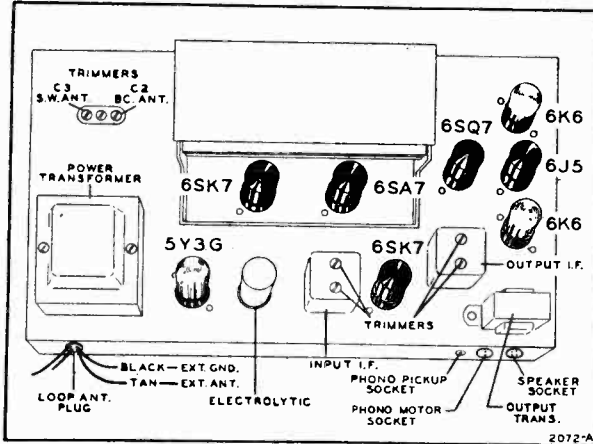


Ref. No.	Part No.	Description	Qty. Used In Set
<b>TUNER PARTS</b>			
<b>CONDENSERS</b>			
C58	A-8E-13575	Trimmer condenser	1
C56, 57, 59, 60, 61	A-2M-12618	Trimmer cond. plate	5
C1, C11	C-8G-11732	470 mmf, ±20%	2
C2	C-8G-13695	1000 mmf, ± 20%	1
C6, 7, 9, 14, 51, 53	C-8G-13201	1000 mmf, +20%—10%	6
C4	C-8G-13018	62 mmf, ± 10%	1
C12	C-8G-11731	1500 mmf, ±20%	1
C10	C-8G-13017	15 mmf, +10%	1
C3	C-8G-11484	50 mmf, ±10%	1
C8	C-8G-11789	10 mmf, ±10%	1
C13	A-8G-12495-6	4.7 mmf, ±20%	1
C15	A-8G-12495-4	2.2 mmf, ± 20%	1
C5	C-8D-11304	.02 mfd, 200 volts, ±20%	1
<b>RESISTORS</b>			
R4	C-9B2-79	27K ohms, 1 watt, 10%	1
R1	C-9B1-21	22K ohms, 1/2 watt, 20%	1
R3	C-9B1-52	150 ohms, 1/2 watt, 10%	1
R5	C-9B1-17	4700 ohms, 1/2 watt, 20%	1
R6	C-9B1-11	470 ohms, 1/2 watt, 20%	1
R8	C-9B1-19	10K ohms, 1/2 watt, 20%	1
R2, R10	C-9B1-31	1 megohm, 1/2 watt, 20%	2
R9	C-9B1-62	1000 ohms, 1/2 watt, 10%	1
R21	C-9B1-34	3.3 megohms, 1/2 watt, 20%	1
R45	C-9B1-50	100 ohms, 1/2 watt, 10%	1
R46	C-9B1-42	22 ohms, 1/2 watt, 10%	1
<b>COILS</b>			
T8	B-13D-13027	FM oscillator coil assembly	1
T6	B-13E-13028	FM antenna coil assembly	1
T10	B-13C-13029	FM R.F. coil assembly	1
T9	B-13D-13030	AM oscillator coil assembly	1
T7	B-13E-13031	AM antenna coil assembly	1
T11	B-13C-13032	AM R.F. coil assembly	1
L1	A-16A-13033	Choke coil assembly	1
T12	B-13D-12974	AM osc. shunt coil assembly	1
<b>MISCELLANEOUS</b>			
	B-208-13553	Band change slide switch	1
	or		
	B-201-12967	Band change slide switch	1
	A-15B-12997	7 prong, miniature tube socket	1
	A-15B-13430	9 prong, miniature tube socket	1
	A-200-12912	Drive bracket assembly	1
	A-200-13044	Pointer guide and bracket assembly	1
	A-3A-12308-1	Lead screw	1
	A-3J-12309	Pinion gear for lead screw	1
	A-49A-13447	Tension spring for lead screw	1
	A-25A-13019	Core grommets, for AM Band	3
	A-3M-13020	Insert for core grommet	3
	A-49A-12394	Spiral spring for FM cores	3
	C-2D-12990	Tape Guide	1
	B-2J-13006	Rack, with teeth	1
	A-2J-11041	Pointer tension spring, "M" shaped	1
	B-2G-10588-2	Pointer	1
	32F4-10830	4-40 x 1/8" screw to mount pointer	1
<b>MAIN CHASSIS PARTS</b>			
<b>CONDENSERS</b>			
63A, 63B	B-8C-11629	Electrolytic condenser, dual, 30-30 x 450 volts	1
C21	C-8G-11734	100 mmf, 20%, ceramic	1
C37	C-8F3-229	150 mmf, mica	1
C38	C-8G-13059	1500 mmf, ceramic	1
C34	C-8G-13060	51 mmf, ceramic	1
C20, 23, 24, 30, 31, 43, 44	C-8D-10785	.006 mfx600 volts, paper	7
C22, C29	C-8D-10761	.01 mfx400 volts, paper	2
C45, 46	C-8D-10813	.05 mfx400 volts, paper	2
C55	A-8C-12154	Electrolytic condenser 10 mfx450 volts	1
C49	C-8D-10789	.002 mfx600 volts, paper	1
C39, 40	C-8G-13201	1000 mmf, ceramic	2
C41	A-8C-13132	Electrolytic condenser 10 mfx50 volts	1
C62	C-8J-11321	.02 mfx600 volts	1
C48	C-8D-10770	.05 mfx200 volts	1
C50	C-8G-11741	330 mmf, ceramic	1

Ref. No.	Part No.	Description	Qty. Used In Set
C42	C-8D-11304	.02 mfx200 volts	1
C52	C-8D-13439	.25 mfx400 volts	1
C47, 54	C-8D-10760	.1 mfx400 volts	2
C35, 36	A-8F-13047	50 mmf, dual mica	1
C32	C-8G-11789	10 mmf, ceramic, 10%	1
C33	C-8G-11891	51 mmf, ceramic, 5%	1
C27, 28	C-8G-13025	150 mmf, ceramic	2
C17, 25, 26	C-8G-12159	30 mmf, ceramic	3
C18, 19	C-8G-12160	91 mmf, ceramic	2
C16	C-8G-13026	51 mmf, ceramic	1
<b>RESISTORS</b>			
R27	A-10A-13001	Volume control (500K) and switch	1
R31	A-11A-12988	Tone control (500K) and radio-phono switch	1
R32	C-9B1-86	100K ohms, 1/2 watt, 10%	1
R29, 44	C-9B1-94	470K ohms, 1/2 watt, 10%	2
R39, 41	C-9B1-83	56K ohms, 1/2 watt, 10%	2
R33, 34	C-9B1-68	3300 ohms, 1/2 watt, 10%	2
R30	C-9B1-35	4.7 megohms, 1/2 watt, 20%	1
R23, 28	C-9B1-80	33K ohms, 1/2 watt, 10%	2
R20	C-9B1-79	27K ohms, 1/2 watt, 10%	1
R22	C-9B1-78	22K ohms, 1/2 watt, 20%	1
R13, 16	C-9B1-48	68 ohms, 1/2 watt, 10%	2
R14, 17	C-9B2-81	39K ohms, 1 watt, 10%	2
R24, 26, 37	C-9B1-29	470K ohms, 1/2 watt, 20%	3
R25	C-9B1-302	15 megohms, 1/2 watt, 10%	1
R19	C-9B1-23	47K ohms, 1/2 watt, 20%	1
R7	C-9B4-76	15K ohms, 2 watts, 10%	1
R12, 35, 43	C-9B1-31	1 megohm, 1/2 watt, 20%	3
R40	C-9B1-66	2200 ohms, 1/2 watt, 10%	1
R36, 42	C-9B1-200	51K ohms, 1/2 watt, 5%	2
R38	C-9B4-55	270 ohms, 2 watts, 10%	1
R47	C-9B1-71	5600 ohms, 1/2 watt, 10%	1
R18	C-9B1-13	1000 ohms, 1/2 watt, 20%	1
R15, 11	C-9B2-15	2200 ohms, 1 watt, 20%	2
<b>COILS</b>			
T3	C-13A-13009-1	Input I.F. transformer, combination 455 kc. and 10.7 mc.	1
T4	C-13B-13014-1	Output I.F. transformer, combination 455 kc. and 10.7 mc.	1
T5	C-203-11745-1	Ratio det. coil assembly 10.7 mc.	1
L3	A-16A-13243	Loop loading coil	1
L4	B-14MA-11066-5	Loop antenna, B.C. Band	1
<b>TRANSFORMERS</b>			
T2	B-12C-13042	Output transformer for speaker	1
	B-12A-13038	Power transformer, primary, 50-60 cycles, 105-125 volts, AC	1
<b>SPEAKER</b>			
	B-18B-13043	Electrodynamics speaker, 12" less output transformer	1
<b>MISCELLANEOUS</b>			
	C-30A-13578	Dial scale	1
	B-5B-14153-41	Knob, small, with dot, mahogany	2
	B-5B-13308-41	Knob, large, without dot, mahog.	2
	B-5C-12457-41	Escutcheon, side pieces	2
	107259	Shield for pilot lite	2
	B-14M-11479	A.C. line cord	1
	A-3A-13003	Switch shaft	1
	A-2D-12983	Detent bracket (U shaped on front of set)	1
	A-43D-12934	"U" speed clip	1
	A-55C-12935	Ball bearing	1
	A-2D-13004	Switch activator bracket	1
	B-47A-12458	Pilot lite assembly	1
	A-46A-11739	Pilot lite, 6-8 volts, T-44	2
	A-25G-13448	Rubber chassis mounting cushion	4
	A-15C-10717	7 prong, miniature tube socket	4
	A-15B-10440	8 prong, octal socket	4
	A-19B-12644	Antenna socket	1
	A-7B-13050	FM dipole, 2-screw strip	1
	A-15B-11538	Speaker socket	1
	A-19B-12468	Phono motor socket	1
	A-19B-12170	Phono input socket	1
<b>RECORD CHANGER</b>			
	B-201-13964	Record changer (C-9) with P-30 cartridge	1
	P-30	Crystal cartridge with needle	1

**GENERAL DESCRIPTION**

The radio is a 5-band, superheterodyne, AC set using seven tubes plus a rectifier. The five bands, permeability-tuned, include the standard broadcast band and four shortwave spread bands. Six pushbuttons are provided. A loop antenna is built into the cabinet; provision is made also for the connection of an external antenna and ground.



**ELECTRICAL SPECIFICATIONS**

- Power Supply..... 105 to 125 volts AC, 60 cycles; 95 watts. Chassis only. 125 watt with phono operation.
- Frequency Ranges... Broadcast band—540 to 1600 kc.  
49-meter band—5.96 to 6.19 mc.  
31-meter band—9.1 to 10 mc.  
25-meter band—11.45 to 12.16 mc.  
19-meter band—14.94 to 15.46 mc.
- Intermediate Freq... 455 kc.
- Selectivity..... at 1000 kc, 35 kc at 1000 x signal
- Sensitivity..... 3.75 microvolts average for 1/2 watt output.
- Power Output..... 5.5 watts undistorted, 7.5 watts maximum.
- Loud Speaker..... 12" electrodynamic. Voice coil impedance 3.2 ohms.
- Tube and Lamp Complement..... 6SK7, tuned R. F. amplifier.  
6SA7, converter.  
6SK7, I. F. amplifier.  
6SQ7, detector, AVC, 1st audio.  
6J5GT, phase inverter.  
6K6GT, push-pull output.  
6K6GT, push-pull output.  
5Y3G, rectifier.  
T-44 dial lamp (2 used).

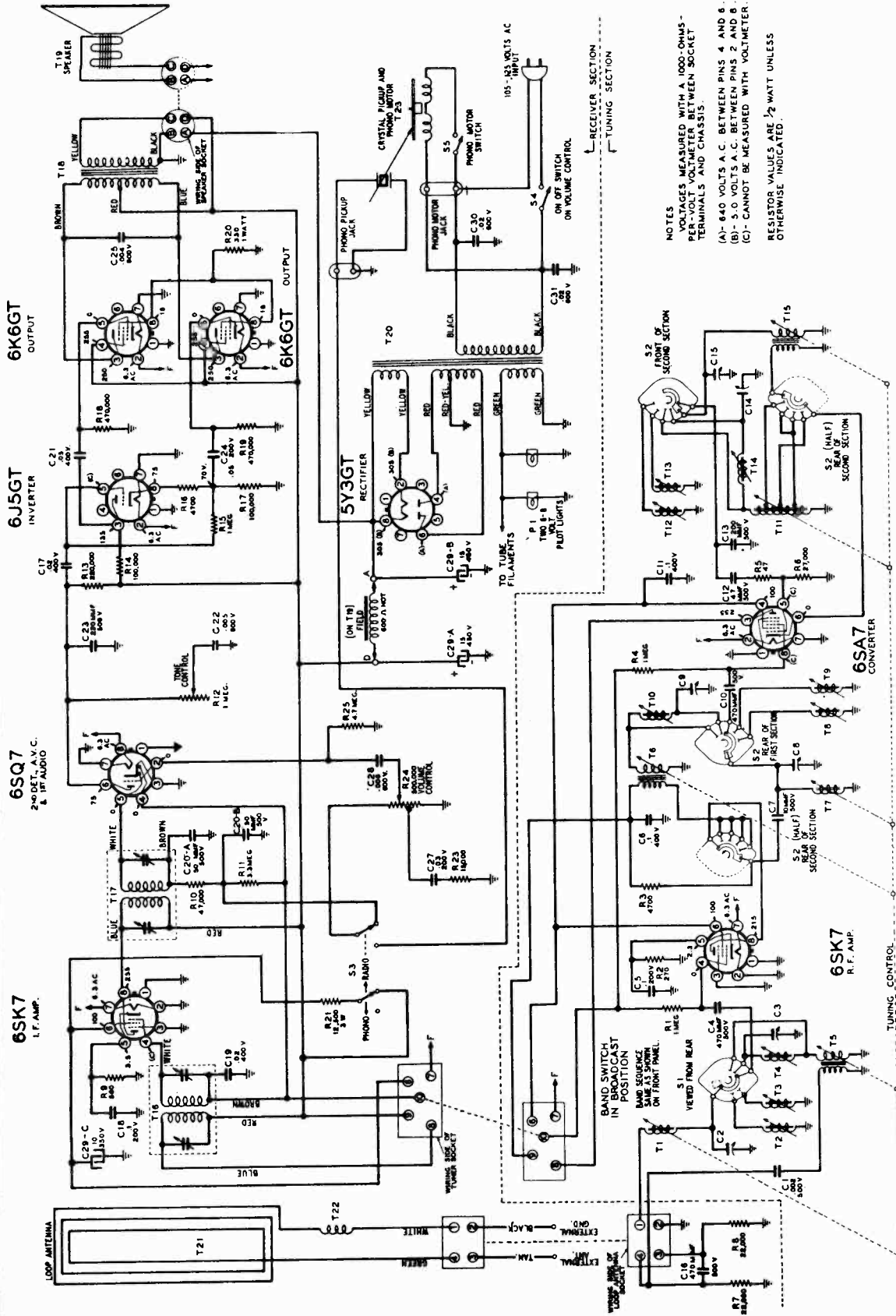
**RECEIVER STAGE SENSITIVITIES**

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

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

BAND	SIGNAL GENERATOR				INPUT FOR 500-MILLIWATT OUTPUT
	Frequency	Dummy Antenna	Connection to Receiver	Ground Connection	
Broadcast	1000 kc	200 mmf	External Antenna clip	Chassis	3.5 microvolts
	1000 kc	.1 mf	Grid (pin 4) of R. F. amp. (6SK7)	Chassis	8.9 microvolts
	1000 kc	.1 mf	Grid (pin 8) of Converter (6SA7)	Chassis	125 microvolts
	455 kc	.1 mf	Grid (pin 8) of Converter (6SA7)	Chassis	100 microvolts
	455 kc	.1 mf	Grid (pin 4) of I. F. amp. (6SK7)	Chassis	4500 microvolts
	400 cycles	.1 mf	Grid (pin 2) of Audio amp. (6SQ7)	Chassis	.1 volt
	400 cycles	.1 mf	Grid (pin 5) of Inverter (6J5GT)	Chassis	4.8 volts
31 meter*	9.6 mc	400 ohms	External Antenna clip	Chassis	1.6 microvolts
49 meter*	6.1 mc	400 ohms	External Antenna clip	Chassis	3.0 microvolts
25 meter*	11.8 mc	400 ohms	External Antenna clip	Chassis	5.0 microvolts
19 meter*	15.2 mc	400 ohms	External Antenna clip	Chassis	9.0 microvolts

\*Average sensitivity on short-wave bands at grid (pin 4) of R. F. amplifier is 8.5 microvolts.



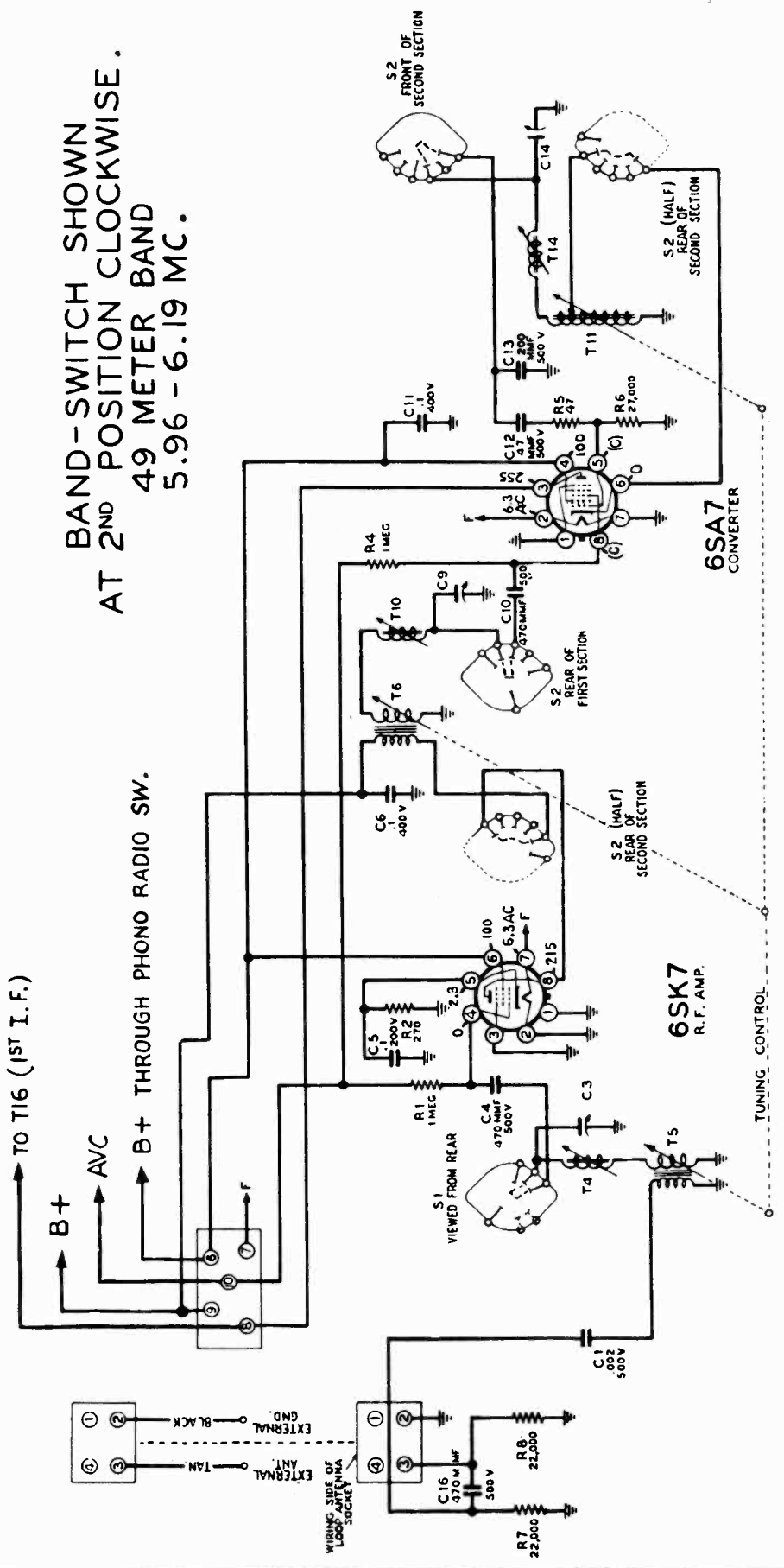
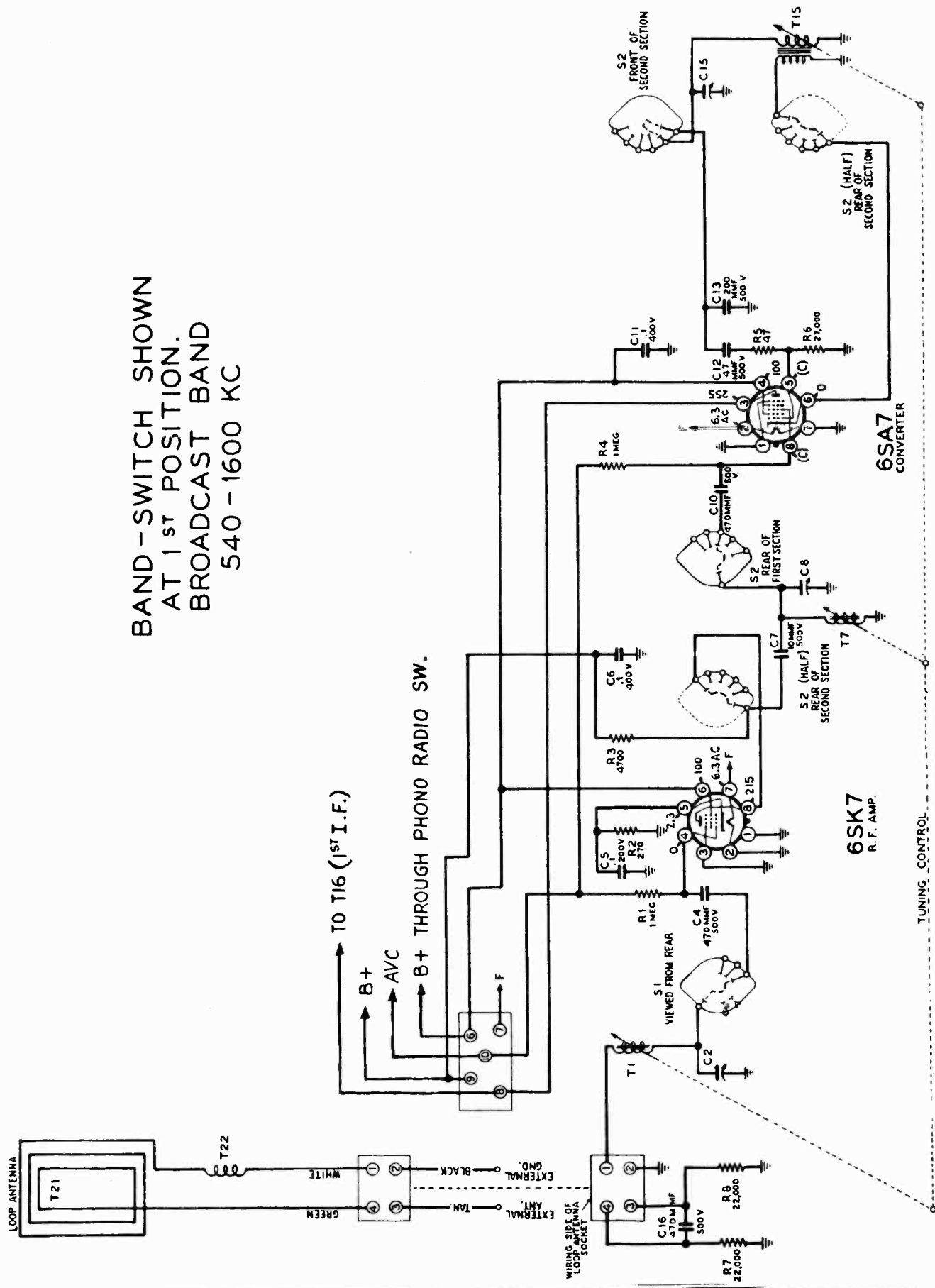
NOTES  
 VOLTAGES MEASURED WITH A 1000-OHMS-  
 PER-VOLT VOLTMETER BETWEEN SOCKET  
 TERMINALS AND CHASSIS.  
 (A)- 840 VOLTS A.C. BETWEEN PINS 4 AND 6  
 (B)- 5.0 VOLTS A.C. BETWEEN PINS 2 AND 8  
 (C)- CANNOT BE MEASURED WITH VOLTMETER.  
 RESISTOR VALUES ARE 1/2 WATT UNLESS  
 OTHERWISE INDICATED.

NOTE: On some sets R9, 560 ohms is replaced with a 220 ohm resistor.

RECORD CHANGERS: For 74BR-2708A, Webster Model 50, RCD. CH. 15-1; for 74BR-2708B, VM Model 800,  
 RCD. CH. 17-1; for 74BR-2708C, Russel Model C-9, RCD. CH. 17-1.

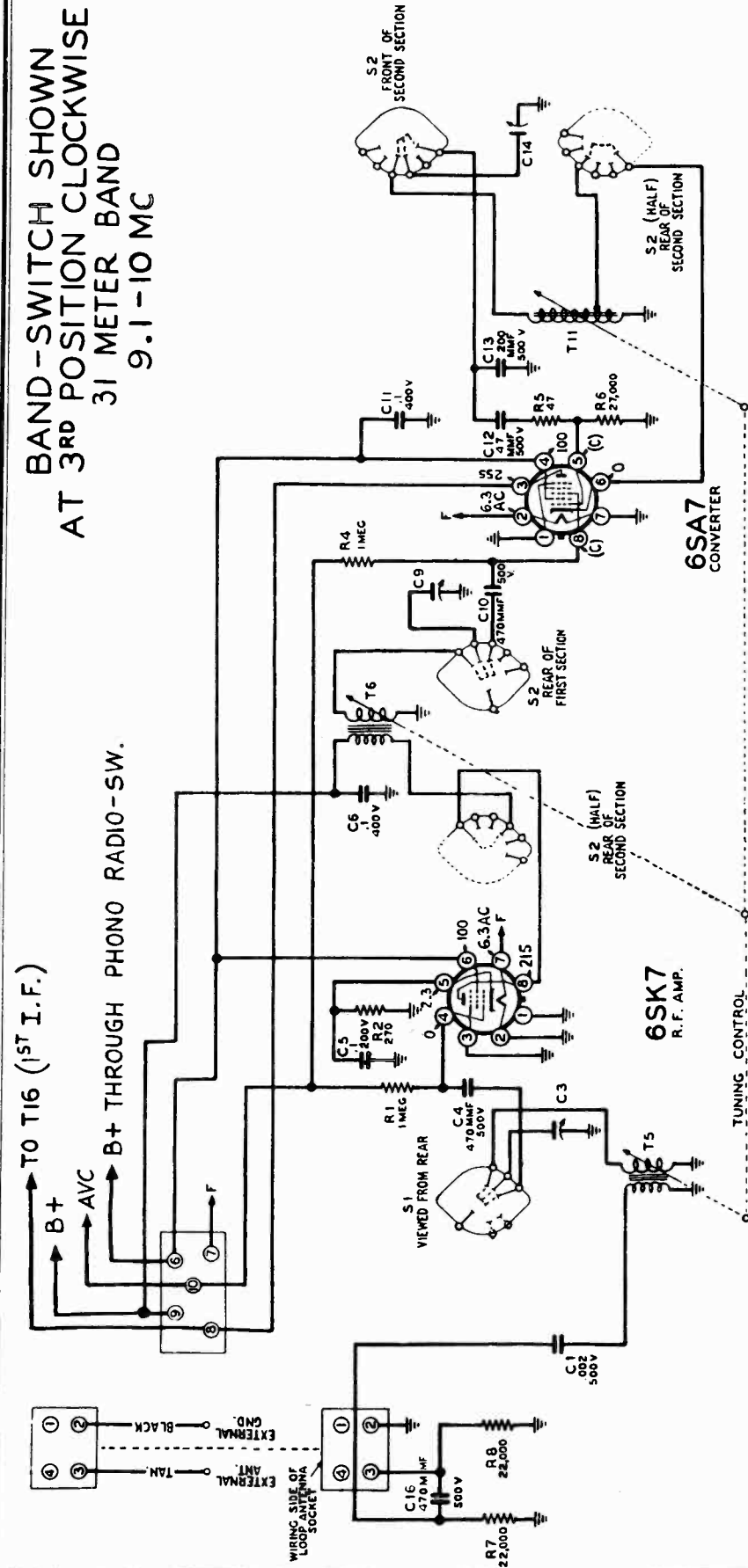
BAND-SWITCH SHOWN  
AT 1<sup>ST</sup> POSITION.  
BROADCAST BAND  
540 - 1600 KC

BAND-SWITCH SHOWN  
AT 2<sup>ND</sup> POSITION CLOCKWISE.  
49 METER BAND  
5.96 - 6.19 MC.

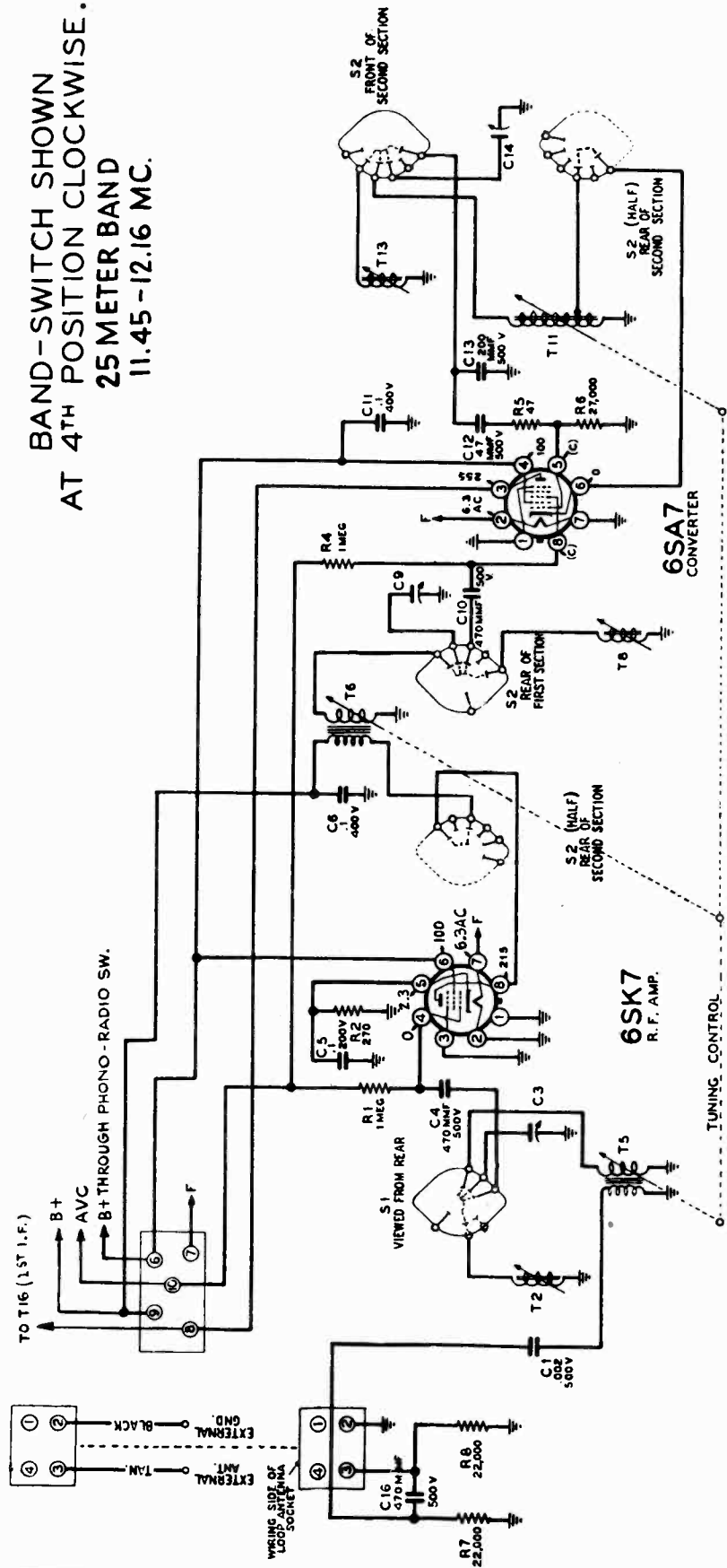


MODELS 74BR-2708A, 74BR-2708B, 74BR-2708C

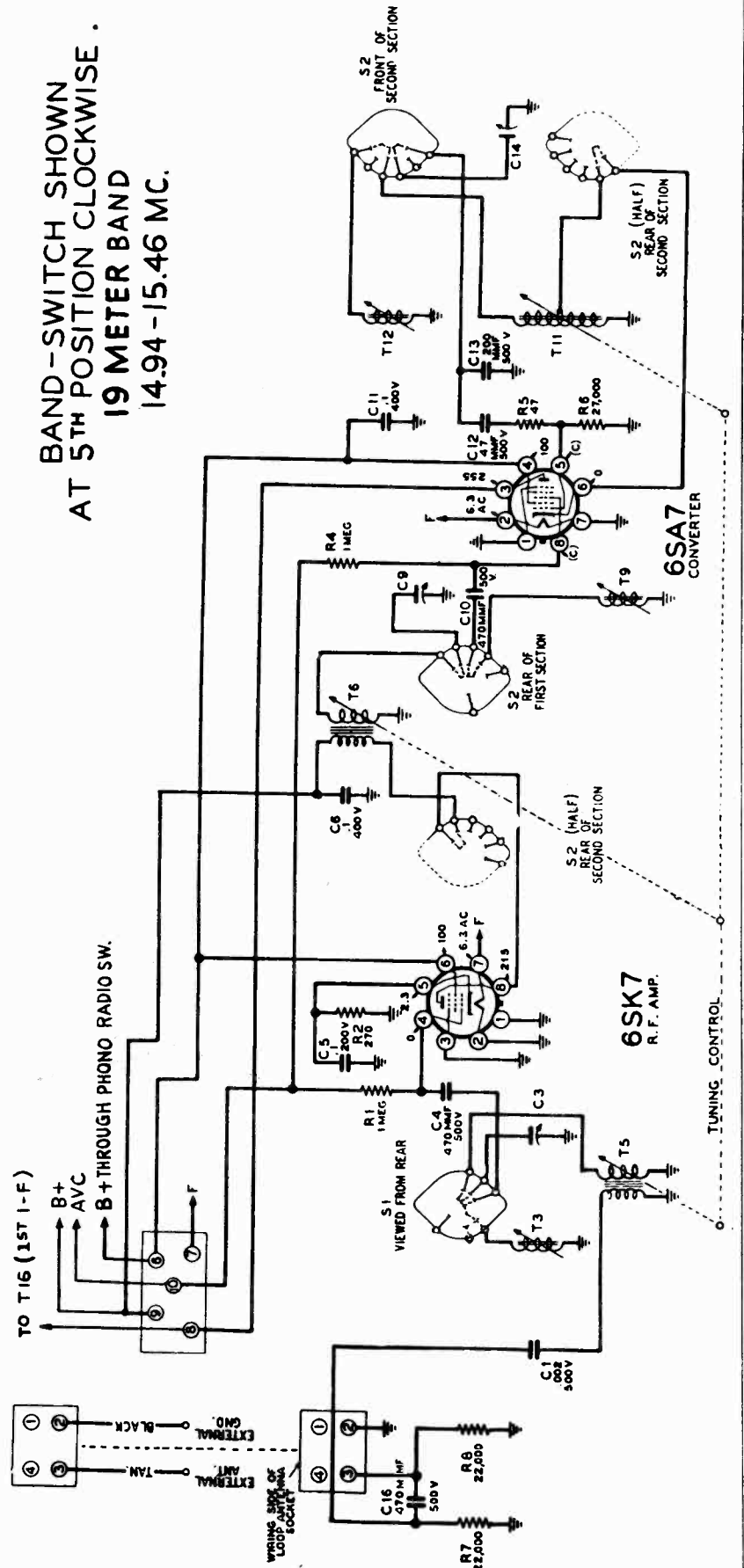
BAND-SWITCH SHOWN  
AT 3RD POSITION CLOCKWISE  
31 METER BAND  
9.1-10 MC



BAND-SWITCH SHOWN  
AT 4TH POSITION CLOCKWISE.  
25 METER BAND  
11.45-12.16 MC.



BAND-SWITCH SHOWN  
AT 5TH POSITION CLOCKWISE.  
19 METER BAND  
14.94-15.46 MC.



MONTGOMERY WARD

MODELS 74BR-2708A,  
74BR-2708B, 74BR-2708C

**ALIGNMENT PROCEDURE**

**MECHANICAL ADJUSTMENT**—The core tuning bar (see illustration of coils below) and dial pointer must be adjusted mechanically before any electrical alignment is attempted. Rotate the manual tuning control until the core bar is farthest from the coils. For proper adjustment the bar should be approximately 1/32 of an inch from the two rod guide angles.

With the core bar in this position, adjust the dial pointer to coincide with 1600 kc on the dial scale (see pointer alignment diagram below).

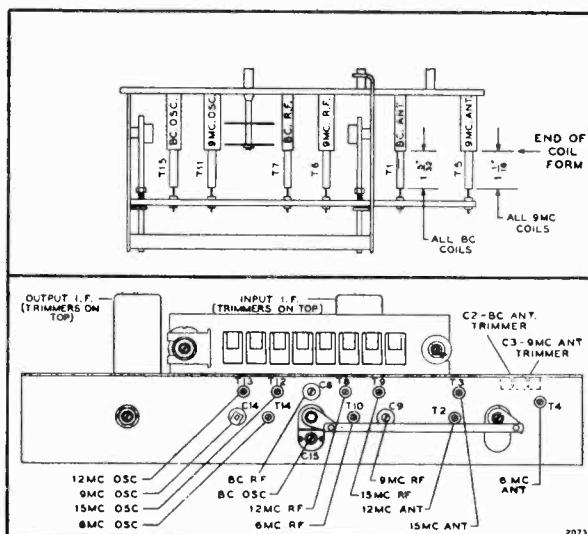
Rotate the core of each of the three broadcast coils (see illustration) until the end of the core is 1-5/32" from the end of the coil form. Rotate the three 9-mc cores until this dimension is 1-1/6" for these coils. After these adjustments have been made, the unit can be aligned electrically.

**ELECTRICAL ADJUSTMENT**—To align the set make the following preliminary adjustments: Set the tone control for treble tone; set the volume control at maximum; connect the ground post of the signal generator to the radio chassis; connect the output meter across a 3.2-ohm output load; and allow the receiver and signal generator to warm up for several minutes.

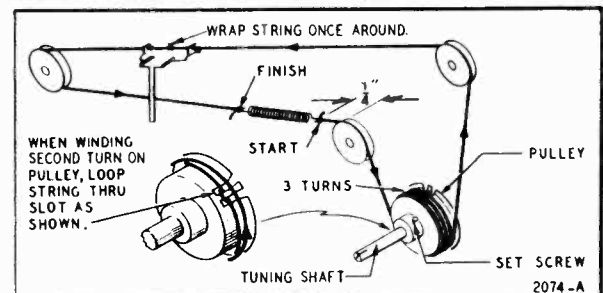
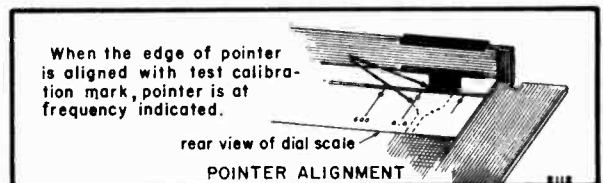
Align the set according to the sequence given in the chart. The indicated coupling capacitor is to be connected in series between the signal generator output lead and the receiver. Adjust the set for maximum output; reduce the input as needed to keep the output near 1.3 volts.

Locations of all the trimmers and coils are shown in the illustrations below. After adjustment, seal the coil cores with collodion or a similar substance (do not use cement).

BAND SWITCH SETTING	SIGNAL GENERATOR			DIAL POINTER SETTING	ADJUST TO MAXIMUM OUTPUT IN ORDER SHOWN
	Frequency	Coupling Capacitor	Connection to Receiver		
Broadcast (for I. F.)	455 kc	.1 mf	Grid (pin 8) of converter (6SA7)	1600 kc	Trimmers on output and input I. F. cans
Broadcast	1600 kc	200 mmf	Antenna lead	1600 kc	BC Osc. trimmer C15 BC R. F. trimmer C8 BC Ant. trimmer C2
	1400 kc	200 mmf	Antenna lead	1400 kc	Rotate cores of BC R. F. coil T7 and BC Ant. coil T1
31 Meter	9.6 mc	400 ohms	Antenna lead	9.6 mc	9 mc Osc. trimmer C14 9 mc R. F. trimmer C9 9 mc Ant. trimmer C3
49 Meter	6.1 mc	400 ohms	Antenna lead	6.1 mc	6 mc Osc. coil T14 6 mc R. F. coil T10 6 mc Ant. coil T4
25 Meter	11.8 mc	400 ohms	Antenna lead	11.8 mc	12 mc Osc. coil T13 12 mc R. F. coil T8 12 mc Ant. coil T2
19 Meter	15.2 mc	400 ohms	Antenna lead	15.2 mc	15 mc Osc. coil T12 15 mc R. F. coil T9 15 mc Ant. coil T3



View of Trimmers and Tuning Coils



**Replacing Dial Pointer Drive Cord**

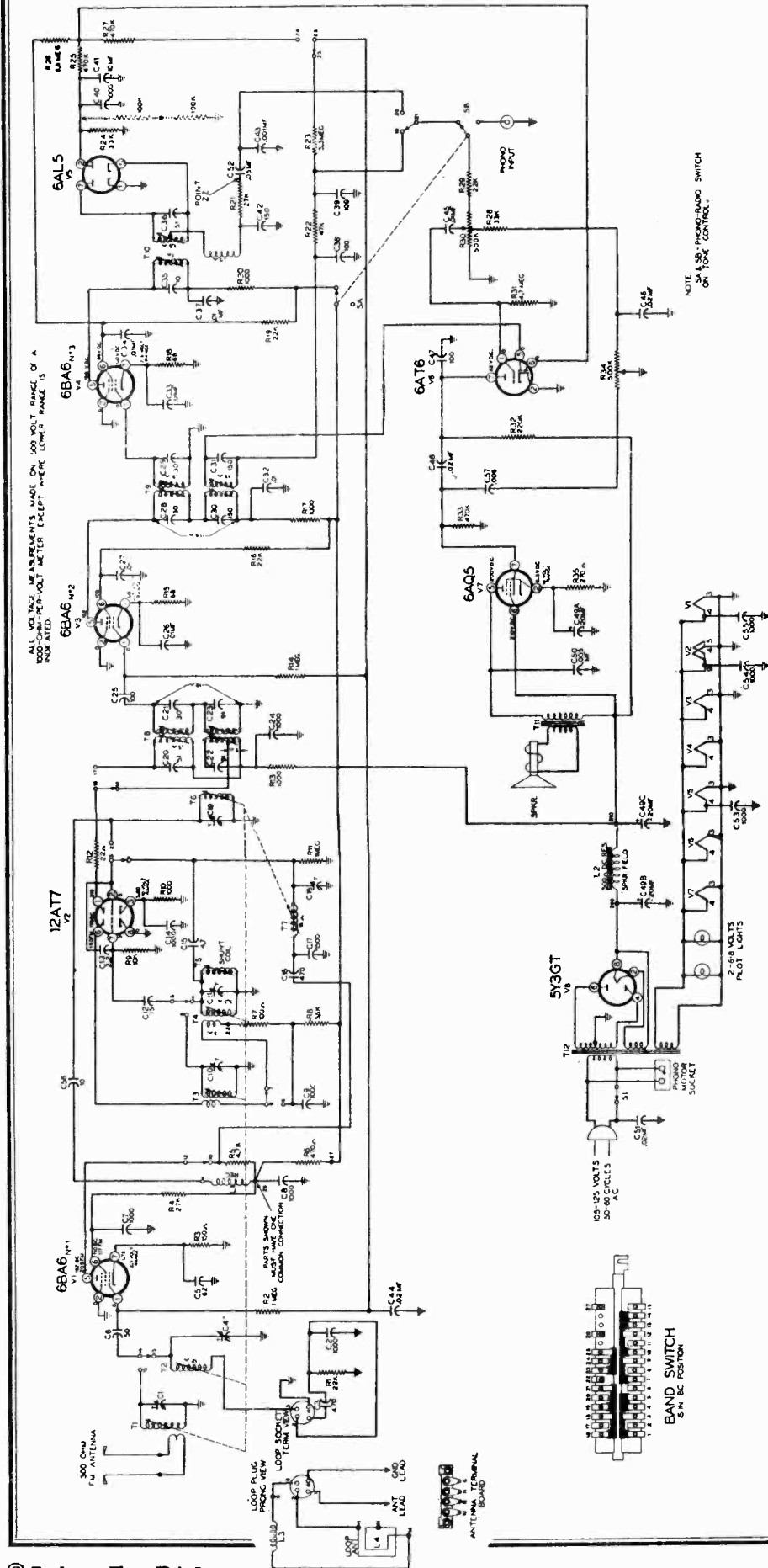
After stringing, spring must be 1/4" from idler when tuning shaft is in extreme counterclockwise position. To do this: Loosen set screw; hold tuning shaft firm and turn pulley by hand until spring is 1/4" from idler; tighten screw.

MODELS 74BR-2708A,  
74BR-2708B, 74BR-2708C

MONTGOMERY WARD

Ref. No.	Part No.	Description	Qty. Used In Set
<b>REMOVABLE TUNER ASSEMBLY</b>			
<b>CAPACITORS*</b>			
C1	BEB-8F-10767	.002 mf, 500 volts, 10%, mica	1
C2, C3	BE-124143	Dual, broadcast (67-123 mmf) and 9 mc (95-175 mmf) ant. trimmers	1
C4, C10	BEB-8F3-121	470 mmf, 500 volts, 10%, mica	2
C5	BEC-8D-10771	.1 mf, 200 volts, +20%—10%	1
C6, C11	BEC-8D-10760	.1 mf, 400 volts, +20%—10%	2
C7	BEB-8F5-101	10 mmf, 500 volts, 10%, silver mica	1
C8	BEA-8G-7205	Broadcast RF trimmer (120-220 mmf)	1
C9	BEA-8G-7206	9 mc RF trimmer (60-110 mmf)	1
C12	BEB-8F3-109	47 mmf, 500 volts, 10%, mica	1
C13	BEB-8F-10763	220 mmf, 500 volts, 3%, silver mica	1
C14	BE-124145	9 mc oscillator trimmer (7-35 mmf)	1
C15	BE-124144	Broadcast oscillator trimmer (15-27 mmf)	1
<b>RESISTORS*</b>			
R1, R4	BEC-9B1-31	1 megohm 1/2 watt, 20%	2
R2	BEC-9B1-55	270 ohms, 1/2 watt, 10%	1
R3	BEC-9B1-70	4700 ohms, 1/2 watt, 10%	1
R5	BEC-9B1-46	47 ohms, 1/2 watt, 10%	1
R6	BEC-9B1-79	27,000 ohms, 1/2 watt, 10%	1
R12	BEC-9B1-22	33,000 ohms, 1/2 watt, 20%	1
<b>COILS (complete with cores)</b>			
T1	BE-111195	Broadcast antenna coil	1
T2	BE-111191	12 mc antenna coil	1
T3	BE-111192	15 mc antenna coil	1
T4	BE-111189	6 mc antenna coil	1
T5	DE-111190	9 mc antenna coil	1
T6	BE-10959	9 mc RF coil	1
T7	BE-10962	Broadcast RF coil	1
T8	BE-10960	12 mc RF coil	1
T9	BE-10961	15 mc RF coil	1
T10	BE-10958	6 mc RF coil	1
T11	BE-110157	9 mc oscillator coil	1
T12	BE-110159	15 mc oscillator coil	1
T13	BE-110158	12 mc oscillator coil	1
T14	BE-110156	6 mc oscillator coil	1
T15	BE-110161	Broadcast oscillator coil	1
<b>MISCELLANEOUS</b>			
S1	BEB-20A-10964	Band switch, antenna	1
S2	BEB-20A-10965	Band switch, oscillator and RF	1
	BE-121210	Socket, octal, molded (6SA7)	1
	BE-121171	Socket, laminated (6SK7GT)	1
*The values of the resistors and mica capacitors listed above (except C13) are based on RMA standards. Due to conditions beyond our control some sets have been shipped with components of pre-standardized values. This set will operate equally well with components of either group. An illustration of the differences			
Ref. No.	Part No.	Description	Qty. Used In Set
<b>MAIN CHASSIS</b>			
<b>CAPACITORS*</b>			
C16	BEC-8F3-12	470 mmf, 20%, mica	1
C17, C19	BEC-8D-10774	.02 mf, 400 volts, 20%	2
C18	BEC-8D-10771	.1 mf, 200 volts, +20%—10%	1
C20-A	BE-129165B	Dual, 50 mmf each section, mica	1
C20-B			1
C21	BEC-8D-10813	.05 mf, 400 volts, 20%	1
C22	BEC-8F3-10	220 mmf, 20%, mica	1
C23	BEC-8D-10935	.005 mfd x 600 v. +40—15%	1
C24	BEC-8D-10770	.05 mf, 200 volts, 20%	1
C25	BEC-8D-10788	.004 mf, 600 volts, 20%	1
C27	BEC-8D-10992	.03 mf, 200 volts, 20%	1
C28	BEC-8D-10785	.006 mf, 600 volts, 20%	1
C29-A, -B, -C	BE-119109	Electrolytic, 15 x 450 volts, 15 mf x 450 volts, 10 mf x 350 volts	3
C30, C31	BEC-8J-11321	.02 mf, 600 volts, 20%	2
<b>RESISTORS*</b>			
R7, R8	BEC-9B1-21	22,000 ohms, 1/2 watt, 20%	2
R9	BEC-9B1-59	560 ohms, 1/2 watt, 10%	1
R10	BEC-9B1-23	47,000 ohms, 1/2 watt, 20%	1
R11	BEC-9B1-34	3.3 megohms, 1/2 watt, 20%	1
R13	BEC-9B1-27	220,000 ohms, 1/2 watt, 20%	1
R14, R17	BEC-9B1-86	100,000 ohms, 1/2 watt, 10%	2
R15	BEC-9B1-31	1 megohm, 1/2 watt, 20%	1
R16	BEC-9B1-70	4700 ohms, 1/2 watt, 10%	1
in both resistors and capacitors follows: Pre-standardized value—50,000 ohms, 1/2 watt, 10% RMA value—47,000 ohms, 1/2 watt, 10% Pre-standardized value—200 mmf, 500 volts, 20% RMA value—220 mmf, 500 volts, 20%			
Ref. No.	Part No.	Description	Qty. Used In Set
<b>SOCKETS</b>			
BE-121210		Socket, octal, molded (all tubes except 6SK7, 1F amp.)	5
BE-121273		Socket, octal, laminated (for 6SK7, 1F amplifier)	1
BE-121280		Socket, 1-terminal, for phono pickup	1
BEB-47A-10808		Socket assembly, for dial light	1
<b>MISCELLANEOUS</b>			
T19	BEB-18B-10616	Speaker, 12" electrodynamic	1
T21	BEA-19A-111539	Plug on speaker leads	1
T22	BEA-14MA-11066-5	Loop antenna (ribbon only)	1
	BEA-16A-11113	Choke on loop terminal board	1
	BEA-19A-11322	Plug on loop antenna leads	1
	BE-107401	Phono motor cable assembly	1
PI	BE-10724	Plug on phono pickup leads	1
	BE-112-1001	Dial scale	1
	BE-10794	Dial light, 6-8 volts, type 44	2
	BEB-2G-10588-1	Dial pointer	1
	BEB-53A-10989	String for dial pointer	32" yd.
	BE-120377	Tension spring for dial pointer	1
	BE-112985D-37	Escutcheon	1
	BEB-5B-13320-37	Knob, band switch or radio-phon	2
	BEB-5D-13307-37	Knob, tuning and volume	2
	BE-107266	Line cord and plug	1
	BEA-2L-11293	Band switch link	1
	BE-112961	Station call letters	1 set
	BE-112-1017-37	Clips, for escutcheon	2
<b>RECORD CHANGER PARTS</b>			
<b>MODELS 74BR-2708A, B</b>			
		Nylon 1-J crystal cartridge with needle	1
		Nylon needle only for above	1
		<b>MODEL 74BR-2708C</b>	
		C-9 Changer	1
		Crystal cartridge with special needle	1

MODELS 74BR-2715A, 84BR-2715A, 84BR-2715B



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

On some sets R12, 22 ohms, C-9B1-42 is replaced with C-9B1-45, a 39 ohm resistor.

On some sets C24, 40, 53 Part No. C-8G-13016 (uninsulated type) is replaced with an insulated type, same value, Part No. C-8G-13201.

On some sets C26 is .05 — 200 volts.

When T10 is Part No. B-13M-15475 which is tuned top and bottom, capacitor C42 is 100 mmfd instead of 150 mmfd.

Assembly number B-201-15176 is the 148 Changer with a P-30 cartridge as

shown in the radio service manual and radio owner's guide. The needle information is correct.

On some sets, assembly number B-201-15173 is the 148 Changer with an Astatic LT crystal cartridge. This cartridge and needle is different than the P-30 above and when requiring a new needle, it should be specified for use with an LT cartridge.

When T10 is Part No. B-13M-15475 which is top and bottom tuned, C34 and R19 are connected to the junction between C35 and C37.

RECORD CHANGERS: For 74BR-2715A and 84BR-2715A, VM Model 800, RCD. CH. 17-1. For 84BR-2715B, Webster Model 148, RCD. CH. 18-1

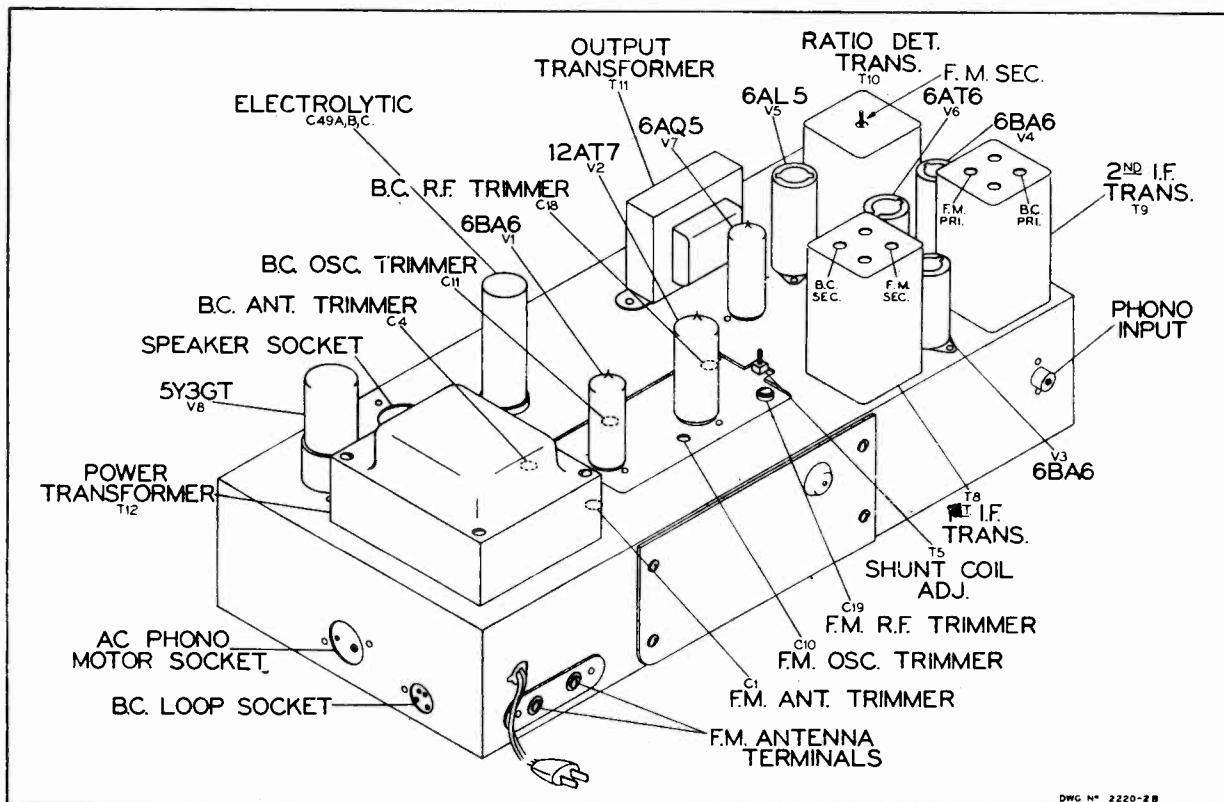


MONTGOMERY WARD

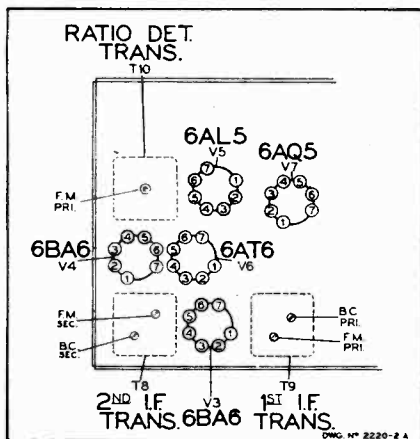
MODELS 74BR-2715A,  
84BR-2715A, 84BR-2715B

**SPECIAL ALIGNMENT INFORMATION**

*Read this before attempting any alignment.*



DWG. N° 2220-2B



DWG. N° 2220-2A

**ELECTRICAL SPECIFICATIONS**

- Power Supply..... 105 to 125 volts, AC, 60-cycles;  
Chassis only 75 watts. With  
phono operation 100 watts.
- Frequency Ranges... Broadcast Band—535 to 1620 kc.  
FM Band— 88 to 108 mc.
- Intermediate Freq. AM-455 kc.; FM-10.7 mc.
- Selectivity..... AM-42 kc. broad at 1000 times sig-  
nal, measured at 1000 kc.
- I.F. FM-200 kc. broad at 2 times  
down.
- I.F. FM-400 kc. broad at 10 times  
down.

This model radio is made with two groups of I. F. coil assemblies.

One group has T8 and T9 with iron cores which are slotted to accommodate the alignment tool and T10 with trimmers on top and bottom. The two views shown here should be used when aligning this type. The part numbers of these I. F.'s are as follows:

T 8.....	B-13A-15473	INPUT I. F.
T 9.....	B-13B-15474	SECOND I. F.
T10.....	B-13M-15475	RATIO DET. (top and bottom tuned)

The other group of I. F.'s has iron cores which have molded into them threaded screws which are slotted for the alignment tool.

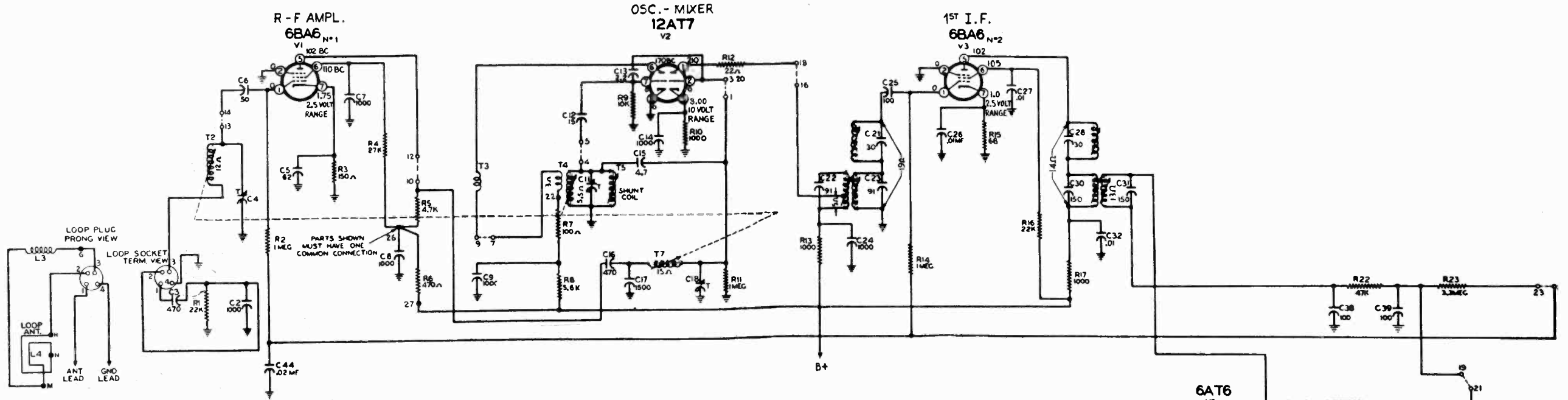
The two views for the alignment of this type of I. F. are shown elsewhere in this manual. The part numbers of these I. F.'s are:

T 8.....	C-13A-13009	INPUT I. F.
T 9.....	C-13B-13014	SECOND I. F.
T10.....	C-203-11745-1	RATIO DET. (bottom tuned)

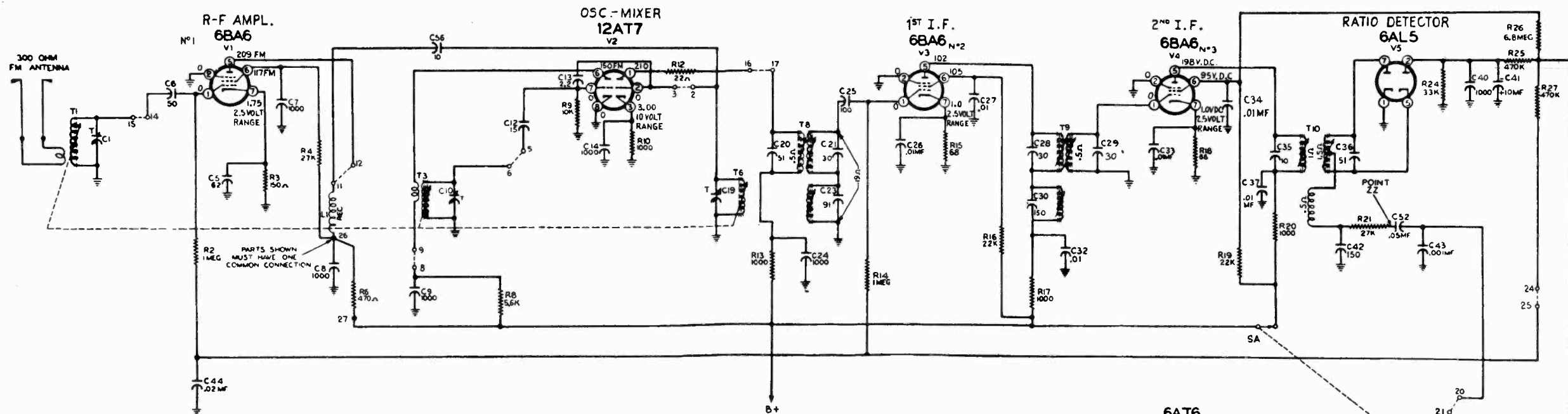
- AM Sensitivity..... (For .5 watt output with external  
antenna)—5 microvolts average.
- FM Sensitivity..... (For .5 watt output)—25 micro-  
volts average.
- Power Output..... 2 watts, 10% distortion. 4 watts  
maximum.
- Loud Speaker..... 12" electrodynamic. Voice coil  
impedance 3.2 ohms, 400 cycles.

MONTGOMERY WARD

MODELS 74BR-2715A, 84BR-2715A, 84BR-2715B



BAND-SWITCH SHOWN AT 1<sup>ST</sup> POSITION. BROADCAST BAND 535 - 1620 KC.



BAND-SWITCH SHOWN AT 2<sup>ND</sup> POSITION CLOCKWISE. F-M BAND 88 - 108 MC

MONTGOMERY WARD

MODELS 74BR-2715A,  
84BR-2715A, 84BR-2715B

**ALIGNMENT PROCEDURE**

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

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

must be set at maximum. The tone control must be set for maximum treble.

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

**AM - I. F. ALIGNMENT**

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

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

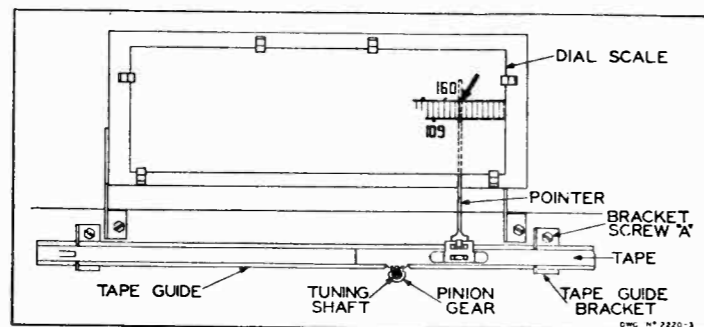
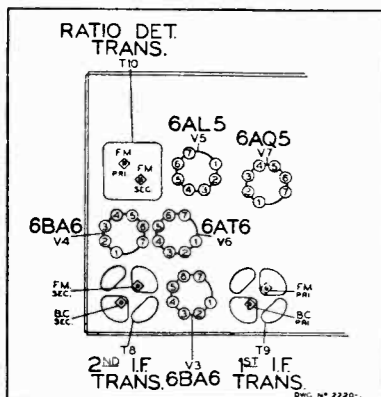
**BROADCAST BAND - R. F. ALIGNMENT**

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

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST
1620 Kc.	AM Antenna and Ground	200 mmf.	C11 Osc. trimmer for maximum
535 Kc.	AM Antenna and Ground	200 mmf.	T5 for maximum 1/2 watt
1620 Kc. Use 5 microvolts	AM Antenna and Ground	200 mmf.	C4 and C18 for max. 1/2 watt. See note

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

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



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

MONTGOMERY WARD

MODELS 74BR-2715A,  
84BR-2715A, 84BR-2715B

**ALIGNMENT PROCEDURE**

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

A non-metallic alignment tool must be used.

**IMPORTANT**

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

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

**NOTE**

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

A standard AM signal generator is required.

**FM - I. F. ALIGNMENT**

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

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

**NOTE ON FM - I.F. ALIGNMENT**

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

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

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

**FM - R. F. ALIGNMENT**

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

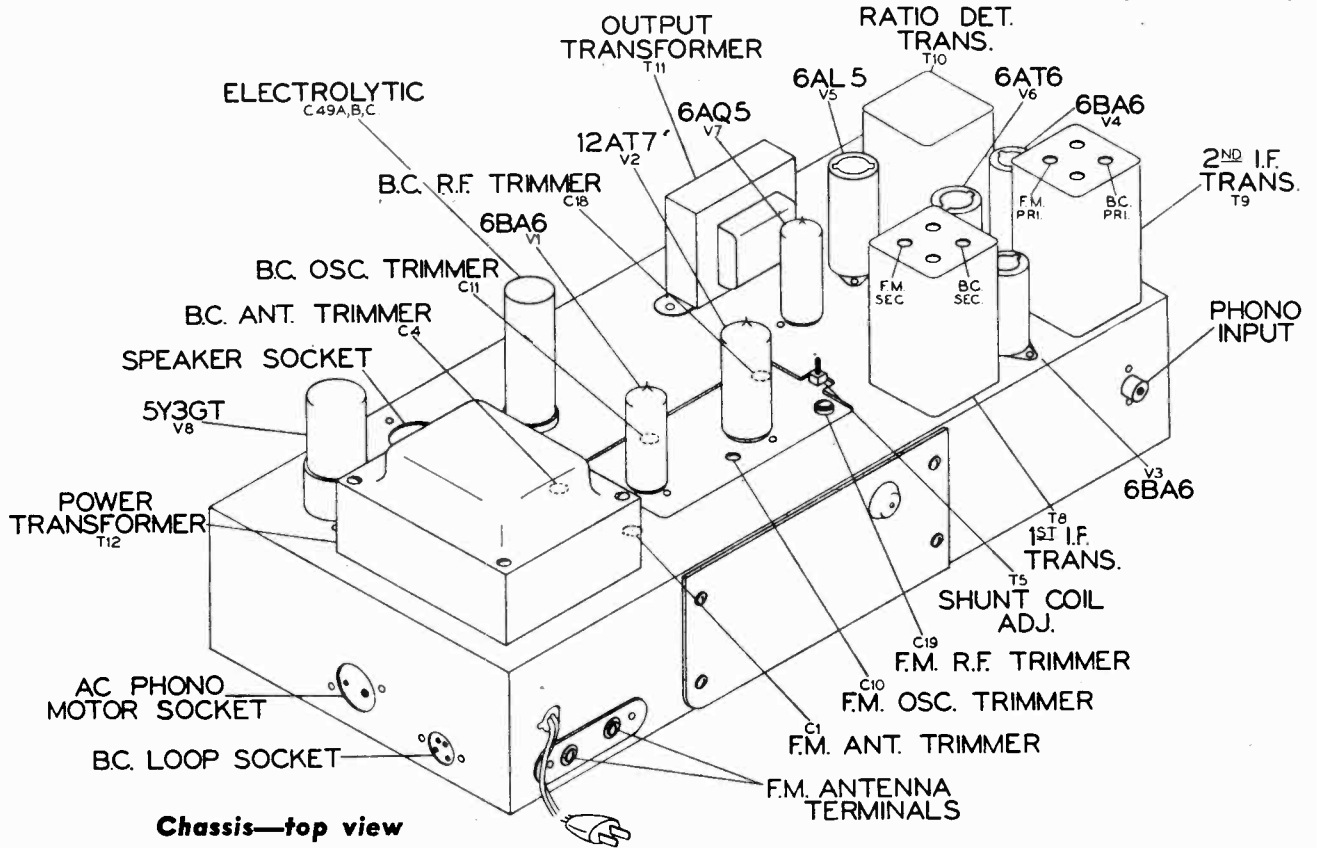
SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUST TO
100 Mc. Use about 25 microvolts	FM Antenna Terminals See note	300 ohms	C10 Osc. C19 R.F. C1 Ant.	Pin No. 2 of 6AL5 and Ground	Resonance about 3 volts

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

Band and to use the vacuum tube volt-meter as above for resonance indication. A weak carrier, however will not produce 3 volts. NOTE: Connect 300 ohms in series with hot side of generator and connect to one screw. Connect cold side of generator to other screw.

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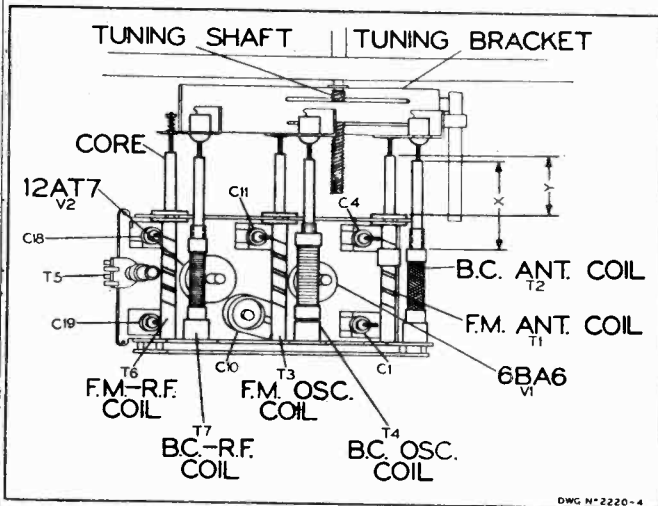
MODELS 74BR-2715A,  
84BR-2715A, 84BR-2715B



**Chassis—top view**

Tube and Lamp  
Complement.....

- 6BA6, FM—AM R.F. stage.
- 12AT7, FM—AM oscillator and mixer.
- 6BA6, FM—AM 1st I.F.
- 6BA6, FM—2nd I.F.
- 6AL5, FM ratio detector.
- 6AT6, AM detector.
- A.F. AMP. and A.V.C.
- 6AQ5, Audio output.
- 5Y3, rectifier.
- T-44 dial lamp (2 used).



**TUNER ADJUSTMENT**

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

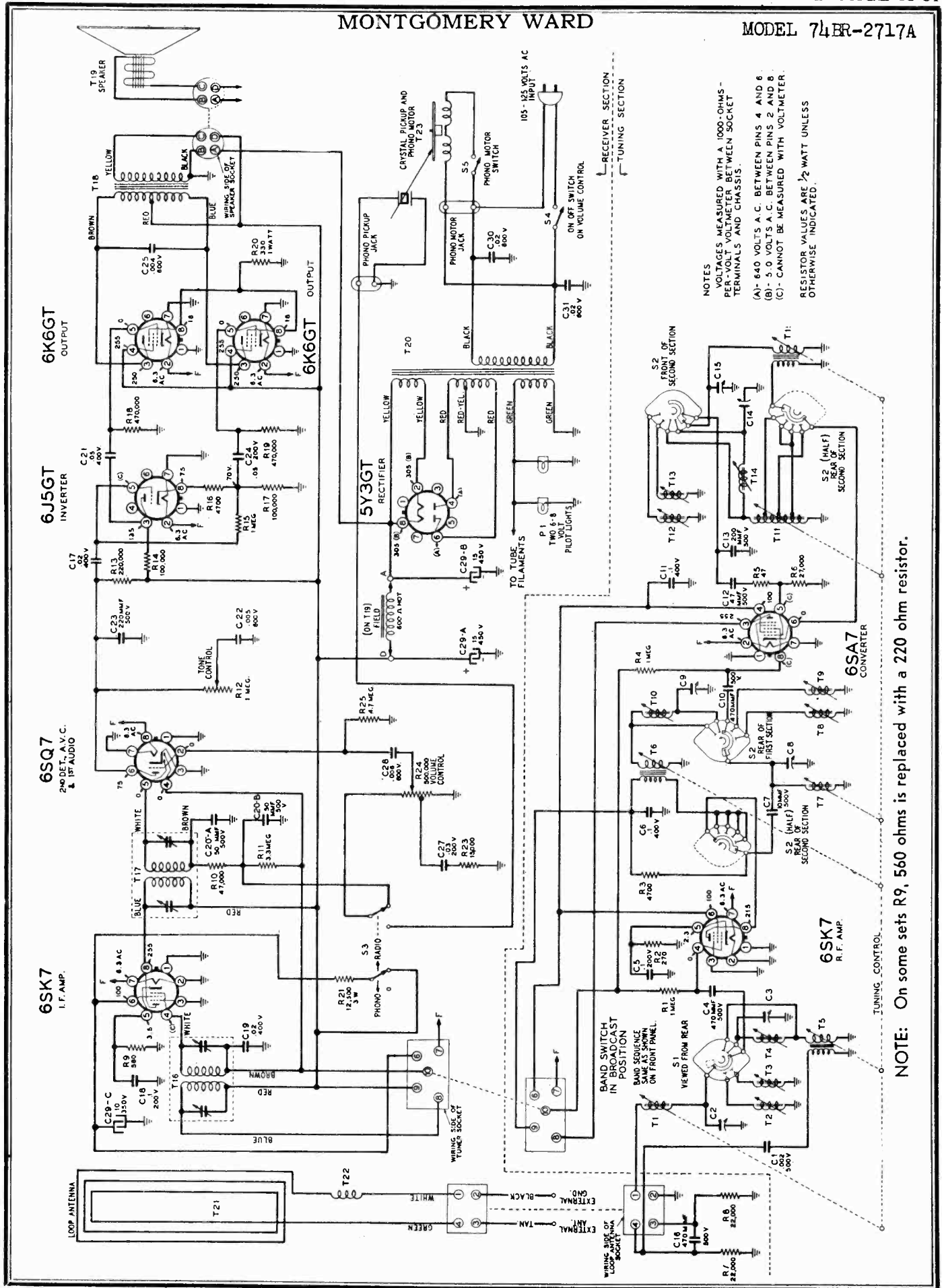
## MONTGOMERY WARD

MODELS 74BR-2715A,  
84BR-2715A, 84BR-2715B

Ref. No.	Part No.	Description	Qty. Used In Set	Ref. No.	Part No.	Description	Qty. Used In Set
<b>TUNER CHASSIS PARTS</b>							
<b>CONDENSERS</b>							
C10	A-8E-13575	Trimmer condenser	1	C20	C-8G-13026	51 mmf, ceramic, 5%	1
C1, 4, 11, 19, 18	A-2M-12618	Trimmer cond. plate	5	C30, 31	C-8G-13025	150 mmf, ceramic, 5%	2
C3, 16	C-8G-11732	470 mmf, $\pm 20\%$	2	C21, 28, 29	C-8G-12159	30 mmf, ceramic, 5%	3
C2	C-8G-13695	1000 mmf, $\pm 20\%$	1	C35	C-8G-11789	10 mmf, ceramic,	1
C8, 7, 9, 14, 54, 55	C-8G-13201	1000 mmf, $\pm 20\%$ —10%	6	C36	C-8G-11891	51 mmf, ceramic	1
C5	C-8G-13018	62 mmf, $\pm 10\%$	1	<b>RESISTORS</b>			
C17	C-8G-11731	1500 mmf, $\pm 20\%$	1	R30, S1	A-10A-13114	Volume control (500K ohms) and switch	1
C12	C-8G-13017	15 mmf, $\pm 10\%$	1	R34, SA, SB	A-11A-13115	Tone control (500K ohms) and radio-phonograph switch	1
C6	C-8G-11484	50 mmf, $\pm 10\%$	1	R32	C-9B1-27	220K ohms, $\frac{1}{2}$ watt, 20%	1
C56	C-8G-11789	10 mmf, $\pm 10\%$	1	R15, 18	C-9B1-48	68 ohms, $\frac{1}{2}$ watt, 10%	2
C15	A-8G-12495-6	4.7 mmf, $\pm 20\%$	1	R14	C-9B1-31	1 megohm, $\frac{1}{2}$ watt, 20%	1
C13	A-8G-12495-4	2.2 mmf, $\pm 20\%$	1	R19, 16	C-9B2-78	22K ohms, 1 watt, 10%	2
C44	C-8D-11304	.02 mfd, 200 volts, $\pm 20\%$	1	R24, 28	C-9B1-80	33K ohms, $\frac{1}{2}$ watt, 10%	2
<b>RESISTORS</b>				R21	C-9B1-79	27K ohms, $\frac{1}{2}$ watt, 10%	1
R4	C-9B2-79	27K ohms, 1 watt, 10%	1	R8	C-9B2-71	5600 ohms, 1 watt, 10%	1
R1	C-9B1-21	22K ohms, $\frac{1}{2}$ watt, 20%	1	R22	C-9B1-23	47K ohms, $\frac{1}{2}$ watt, 20%	1
R3	C-9B1-52	150 ohms, $\frac{1}{2}$ watt, 10%	1	R29	C-9B1-21	22K ohms, $\frac{1}{2}$ watt, 20%	1
R5	C-9B1-17	4700 ohms, $\frac{1}{2}$ watt, 20%	1	R31	C-9B1-35	4.7 megohms, $\frac{1}{2}$ watt, 20%	1
R6	C-9B1-11	470 ohms, $\frac{1}{2}$ watt, 20%	1	R25, 27, 33	C-9B1-29	470K ohms, $\frac{1}{2}$ watt, 20%	3
R9	C-9B1-19	10K ohms, $\frac{1}{2}$ watt, 20%	1	R35	C-9B1-55	270 ohms $\frac{1}{2}$ watt, 10%	1
R2, 11	C-9B1-31	1 megohm, $\frac{1}{2}$ watt, 20%	2	R26	C-9B1-36	6.8 megohms, $\frac{1}{2}$ watt, 20%	1
R10	C-9B1-62	1000 ohms, $\frac{1}{2}$ watt, 10%	1	R13, 20, 17	C-9B1-13	1000 ohms, $\frac{1}{2}$ watt, 20%	2
R23	C-9B1-34	3.3 megohms, $\frac{1}{2}$ watt, 20%	1	<b>COILS</b>			
R7	C-9B1-50	100 ohms, $\frac{1}{2}$ watt, 10%	1	T8	C-13A-13009	Input I.F. transformer, combination, 455 kc. and 10.7 mc.	1
R12	C-9B1-42	22 ohms, $\frac{1}{2}$ watt, 10%	1	or	B-13A-15473	455 kc. and 10.7 mc.	1
<b>COILS</b>				T9	C-13B-13014	Second I.F. transformer, combination, 455 kc. and 10.7 mc.	1
T3	B-13D-13027	FM oscillator coil assembly	1	or	B-13B-15474	455 kc. and 10.7 mc.	1
T1	B-13E-13028	FM antenna coil assembly	1	T10	C-203-11745-1	Ratio det. coil assembly 10.7 mc.	1
T6	B-13C-13029	FM R.F. coil assembly	1	or	B-13M-15475	10.7 mc.	1
T4	B-13D-13030	AM oscillator coil assembly	1	L3	A-16A-13243	Loop loading coil	1
T2	B-13E-13031	AM antenna coil assembly	1	L4	A-14MA-11066-1	Loop antenna ribbon	1
T7	B-13C-13032	AM R.F. coil assembly	1	<b>TRANSFORMERS</b>			
L1	A-16A-13033	Choke coil assembly	1	T12	B-12A-13120	Power transformer, primary, 50-60 cycles, 105-125 volts A.C.	1
T5	B-13D-12974	AM osc. shunt coil assembly	1	T11	B-12C-13556	Output transformer, for speaker	1
<b>MISCELLANEOUS</b>				<b>SPEAKER</b>			
B-208-13553	B-208-13553	Band change slide switch	1	L2	B-18B-13585-1	Electrodynamic speaker, 12-inch, less output transformer	1
or				<b>MISCELLANEOUS</b>			
B-201-12967	B-201-12967	Band change slide switch	1	B-30A-13611	Dial scale	1	
A-15B-12997	A-15B-12997	7 prong, miniature tube socket	1	B-5B-13744	Knob, mahog. or wal. "Volume"	1	
A-15B-13430	A-15B-13430	9 prong, miniature tube socket	1	B-5B-13745	Knob, mahog. or wal. "Tone"	1	
C-2D-14437	C-2D-14437	Drive bracket assembly	1	B-5B-13746	Knob, mahog. or wal. "Tuning"	1	
A-25A-13019	A-25A-13019	Core grommets, for AM Band	3	B-5B-13747	Knob, mahog. or wal. "Band switch"	1	
A-3M-13020	A-3M-13020	Insert for core grommet	3	B-2G-13612	Escutcheon, mahog. or walnut	1	
A-49A-12394	A-49A-12394	Spiral spring for FM cores	3	B-14M-11479	Line cord and plug	1	
A-2J-11041	A-2J-11041	Pointer tension spring, "M" shaped	1	A-3A-12933-1	Band switch shaft	1	
B-2D-12316	B-2D-12316	Tape guide	1	A-55C-12935	Ball bearing	1	
B-2J-12922	B-2J-12922	Rack tape, with teeth and pointer bracket	1	B-47A-11094-4	Pilot lite and bracket assembly	1	
B-2G-13613	B-2G-13613	Pointer	1	A-46A-11739	Pilot lite, 6-8 volts, T-44	2	
A-200-15016	A-200-15016	Drive, pinion and lead screw assembly	1	A-15C-13174	Miniature socket, 7 prong	5	
<b>MAIN CHASSIS PARTS</b>				<b>RECORD CHANGER</b>			
<b>CONDENSERS</b>				<b>MODELS 74BR-2715A, 84BR-2715A</b>			
C49B, 49C, 49A	A-8C-13555	Electrolytic, 20—20 x 350 volts; 20 x 25 volts	1	D-21H-13293	V-M Changer with P-30 cartridge	1	
C50	C-8D-10935	.005 mf x 600 volts	1	P-30	Crystal cartridge with needle	1	
C27, 32, 33, 34, 37, 45	C-8D-10761	.01 mf x 400 volts, 20%	6	<b>MODEL 84BR-2715B</b>			
C57	C-8D-10785	.006 mf x 600 volts, 20%	1	B-201-15176	148 Changer with P-30 cartridge	1	
C41	A-8C-13132	Electrolytic, 10 mf x 50 volts	1	P-30	Crystal cartridge with needle	1	
C43	C-8D-10787	.001 x 600 volts, 20%	1				
C52, C26	C-8D-10770	.05 x 200 volts, 20%	2				
C51, 46	C-8D-10774	.02 x 400 volts, 20%	2				
C48	C-8J-11321	.02 x 600 volts, 20%	1				
C25, 47	C-8G-13131	100 mmf, ceramic, 10%	2				
C24, 40, 53	C-8G-13016	1000 mmf, ceramic, 20%	3				
C42	C-8F3-229	150 mmf, mica, 5%	1				
C38, 39	A-8F-13127	.0001 mf, dual mica, 20%	1				
C22, 23	C-8G-12160	91 mmf, ceramic, 5%	2				

MONTGOMERY WARD

MODEL 74ER-2717A



NOTES  
 VOLTAGES MEASURED WITH A 1000-OHMS PER-VOLT VOLTMETER BETWEEN SOCKET TERMINALS AND CHASSIS.  
 (A)- 640 VOLTS A. C. BETWEEN PINS 4 AND 6  
 (B)- 5.0 VOLTS A. C. BETWEEN PINS 2 AND 8  
 (C)- CANNOT BE MEASURED WITH VOLTMETER.  
 RESISTOR VALUES ARE  $\frac{1}{2}$  WATT UNLESS OTHERWISE INDICATED.

NOTE: On some sets R9, 560 ohms is replaced with a 220 ohm resistor.

## RECEIVER STAGE SENSITIVITIES

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

speaker connected. The volume control must be set at maximum.

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

BAND	SIGNAL GENERATOR				INPUT FOR 500-MILLIWATT OUTPUT
	Frequency	Dummy Antenna	Connection to Receiver	Ground Connection	
Broadcast	1000 kc	200 mmf	External Antenna clip	Chassis	3.5 microvolts
	1000 kc	.1 mf	Grid (pin 4) of R. F. amp. (6SK7)	Chassis	8.9 microvolts
	1000 kc	.1 mf	Grid (pin 8) of Converter (6SA7)	Chassis	125 microvolts
	455 kc	.1 mf	Grid (pin 8) of Converter (6SA7)	Chassis	100 microvolts
	455 kc	.1 mf	Grid (pin 4) of I. F. amp. (6SK7)	Chassis	4500 microvolts
	400 cycles	.1 mf	Grid (pin 2) of Audio amp. (6SQ7)	Chassis	.1 volt
	400 cycles	.1 mf	Grid (pin 5) of Inverter (6J5GT)	Chassis	4.8 volts
31 meter*	9.6 mc	400 ohms	External Antenna clip	Chassis	1.6 microvolts
49 meter*	6.1 mc	400 ohms	External Antenna clip	Chassis	3.0 microvolts
25 meter*	11.8 mc	400 ohms	External Antenna clip	Chassis	5.0 microvolts
19 meter*	15.2 mc	400 ohms	External Antenna clip	Chassis	9.0 microvolts

\*Average sensitivity on short-wave bands at grid (pin 4) of R. F. amplifier is 8.5 microvolts.

## ELECTRICAL SPECIFICATIONS

Power Supply..... 105 to 125 volts AC, 60 cycles; 95 watts. Chassis only. 125 watt with phono operation.

Frequency Ranges..... Broadcast band—540 to 1600 kc.  
49-meter band—5.96 to 6.19 mc.  
31-meter band—9.1 to 10 mc.  
25-meter band—11.45 to 12.16 mc.  
19-meter band—14.94 to 15.46 mc.

Intermediate Freq..... 455 kc.

Selectivity..... at 1000 kc, 35 kc at 1000 x signal  
Sensitivity..... 3.75 microvolts average for 1/2 watt output.

Power Output..... 5.5 watts undistorted, 7.5 watts maximum.

Loud Speaker..... 10" electrodynamic. Voice coil impedance 3.2 ohms.

Tube and Lamp Complement..... 6SK7, tuned R. F. amplifier.

6SA7, converter.

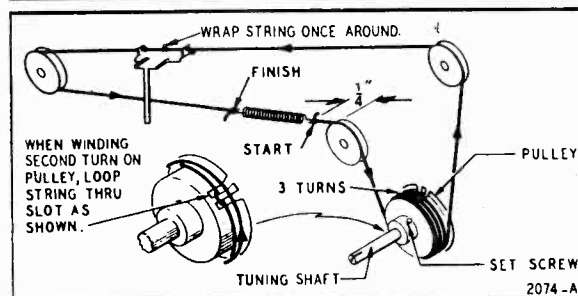
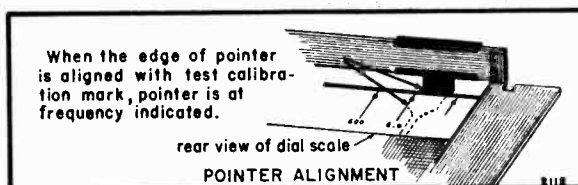
6SK7, I. F. amplifier.

6SQ7, detector, AVC, 1st audio.

6J5GT, phase inverter.

6K6GT, push-pull output.

6K6GT, push-pull output.  
5Y3G, rectifier.  
T-44 dial lamp (2 used).



## Replacing Dial Pointer Drive Cord

After stringing, spring must be 1/4" from idler when tuning shaft is in extreme counterclockwise position. To do this: Loosen set screw; hold tuning shaft firm and turn pulley by hand until spring is 1/4" from idler; tighten screw.

MONTGOMERY WARD

MODEL 74BR-2717A

ALIGNMENT PROCEDURE

**MECHANICAL ADJUSTMENT**—The core tuning bar (see illustration of coils below) and dial pointer must be adjusted mechanically before any electrical alignment is attempted. Rotate the manual tuning control until the core bar is farthest from the coils. For proper adjustment the bar should be approximately 1/32 of an inch from the two rod guide angles.

With the core bar in this position, adjust the dial pointer to coincide with 1600 kc on the dial scale (see pointer alignment diagram below).

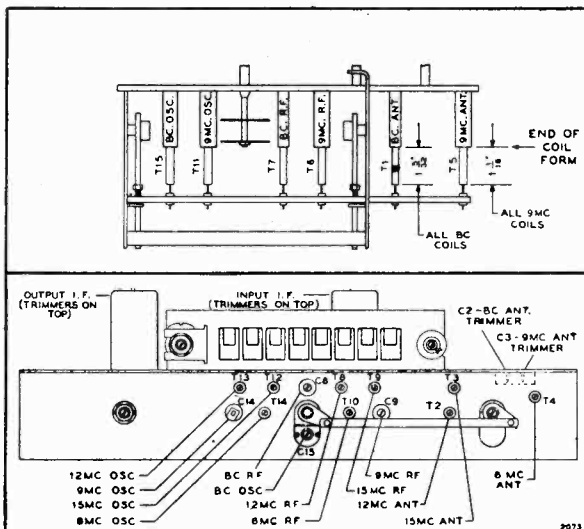
Rotate the core of each of the three broadcast coils (see illustration) until the end of the core is 1-5/32" from the end of the coil form. Rotate the three 9-mc cores until this dimension is 1-1/6" for these coils. After these adjustments have been made, the unit can be aligned electrically.

**ELECTRICAL ADJUSTMENT**—To align the set make the following preliminary adjustments: Set the tone control for treble tone; set the volume control at maximum; connect the ground post of the signal generator to the radio chassis; connect the output meter across a 3.2-ohm output load; and allow the receiver and signal generator to warm up for several minutes.

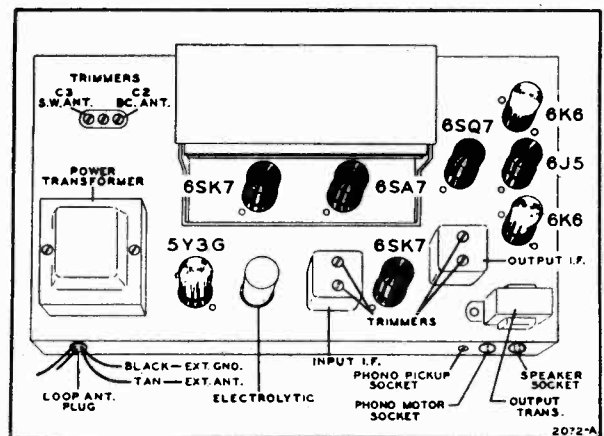
Align the set according to the sequence given in the chart. The indicated coupling capacitor is to be connected in series between the signal generator output lead and the receiver. Adjust the set for maximum output; reduce the input as needed to keep the output near 1.3 volts.

Locations of all the trimmers and coils are shown in the illustrations below. After adjustment, seal the coil cores with collodion or a similar substance (do not use cement).

BAND SWITCH SETTING	SIGNAL GENERATOR			DIAL POINTER SETTING	ADJUST TO MAXIMUM OUTPUT IN ORDER SHOWN
	Frequency	Coupling Capacitor	Connection to Receiver		
Broadcast (for I. F.)	455 kc	.1 mf	Grid (pin 8) of converter (6SA7)	1600 kc	Trimmers on output and input I. F. cans
Broadcast	1600 kc	200 mmf	Antenna lead	1600 kc	BC Osc. trimmer C15 BC R. F. trimmer C8 BC Ant. trimmer C2
	1400 kc	200 mmf	Antenna lead	1400 kc	Rotate cores of BC R. F. coil T7 and BC Ant. coil T1
31 Meter	9.6 mc	400 ohms	Antenna lead	9.6 mc	9 mc Osc. trimmer C14 9 mc R. F. trimmer C9 9 mc Ant. trimmer C3
49 Meter	6.1 mc	400 ohms	Antenna lead	6.1 mc	6 mc Osc. coil T14 6 mc R. F. coil T10 6 mc Ant. coil T4
25 Meter	11.8 mc	400 ohms	Antenna lead	11.8 mc	12 mc Osc. coil T13 12 mc R. F. coil T8 12 mc Ant. coil T2
19 Meter	15.2 mc	400 ohms	Antenna lead	15.2 mc	15 mc Osc. coil T12 15 mc R. F. coil T9 15 mc Ant. coil T3



View of Trimmers and Tuning Coils

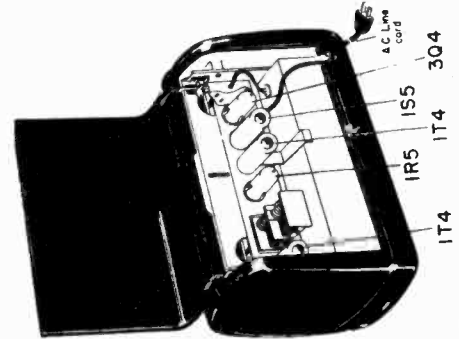
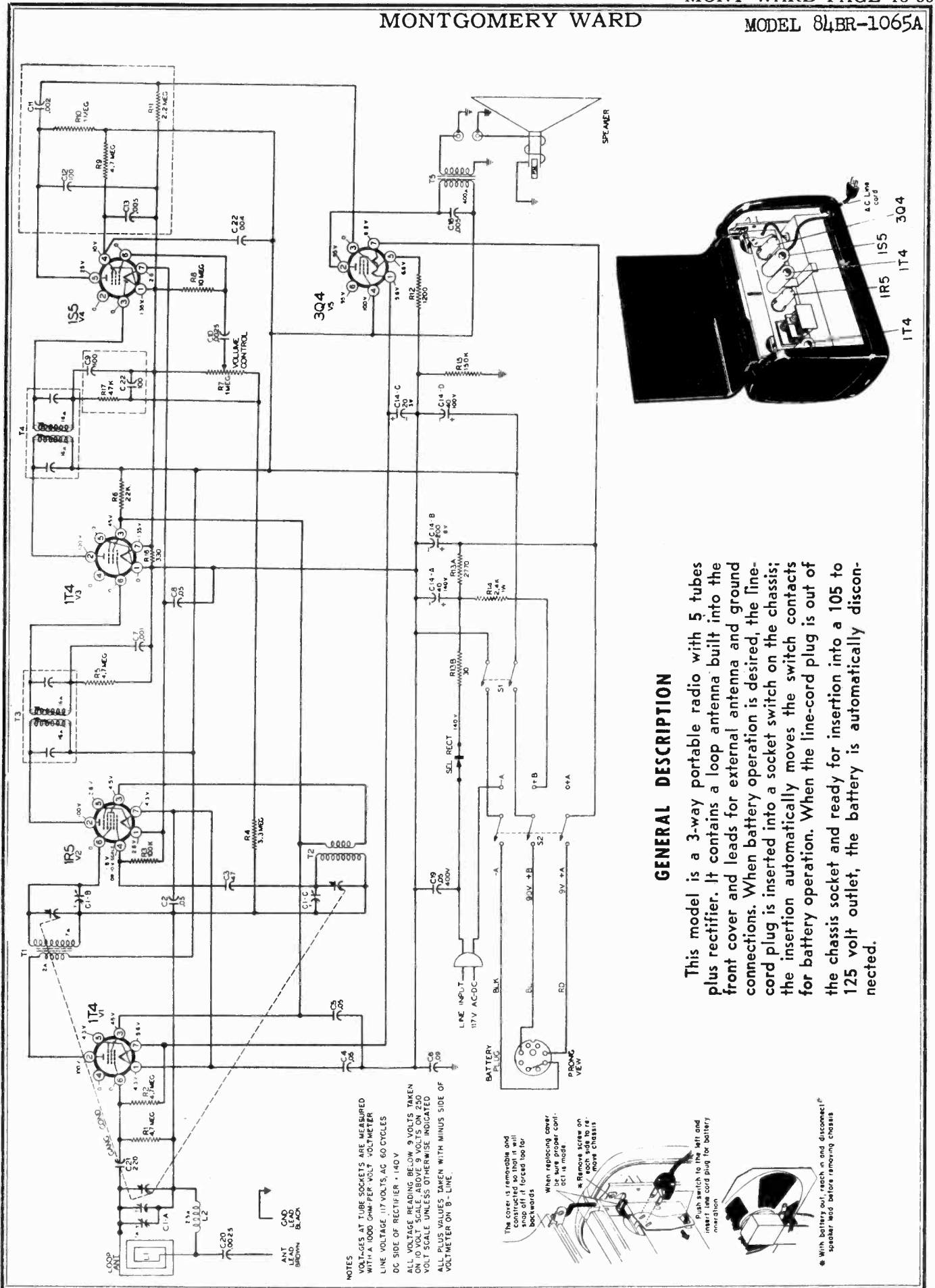




MODEL 74BR-2717A

## MONTGOMERY WARD

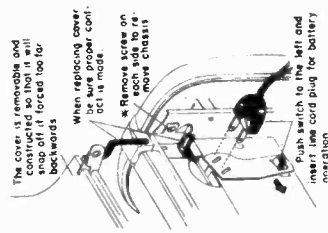
Ref. No.	Part No.	Description	Qty. Used In Set	Ref. No.	Part No.	Description	Qty. Used In Set
<b>REMOVABLE TUNER ASSEMBLY</b>							
<b>CAPACITORS*</b>							
C1	BEB-8F-10767	.002 mf, 500 volts, 10%, mica	1	C22	BEC-8D-10935	.005 mfd x 600 v. +40-15%	1
C2, C3	BE-124143	Dual, broadcast (67-123 mmf) and 9 mc (95-175 mmf) ant. trimmers	1	C24	BEC-8D-10770	.05 mf, 200 volts, 20%	1
C4, C10	BEB-8F3-121	470 mmf, 500 volts, 10%, mica	2	C25	BEC-8D-10788	.004 mf, 600 volts, 20%	1
C5	BEC-8D-10771	.1 mf, 200 volts, +20% -10%	1	C27	BEC-8D-10992	.03 mf, 200 volts, 20%	1
C6, C11	BEC-8D-10760	.1 mf, 400 volts, +20% -10%	2	C28	BEC-8D-10785	.006 mf, 600 volts, 20%	1
C7	BEB-8F5-1071	10 mmf, 500 volts, 10%, silver mica	1	C29-A, -B, -C	BE-119109	Electrolytic, 15 x 450 volts, 15 mf x 450 volts, 10 mf x 350 volts	1
C8	BEA-8G-7205	Broadcast RF trimmer (120-220 mmf)	1	C30, C31	BEC-8J-11321	.02 mf, 600 volts, 20%	2
C9	BEA-8G-7206	9 mc RF trimmer (60-110 mmf)	1	<b>RESISTORS*</b>			
C12	BEB-8F3-109	47 mmf, 500 volts, 10%, mica	1	R7, R8	BEC-9B1-21	22,000 ohms, 1/2 watt, 20%	2
C13	BEB-8F-10763	220 mmf, 500 volts, 3%, silver mica	1	R9	BEC-9B1-59	560 ohms, 1/2 watt, 10%	1
C14	BE-124145	9 mc oscillator trimmer (7-35 mmf)	1	R10	BEC-9B1-23	47,000 ohms, 1/2 watt, 20%	1
C15	BE-124144	Broadcast oscillator trimmer (15-27 mmf)	1	R11	BEC-9B1-34	3.3 megohms, 1/2 watt, 20%	1
<b>RESISTORS*</b>				R13	BEC-9B1-27	220,000 ohms, 1/2 watt, 20%	1
R1, R4	BEC-9B1-31	1 megohm 1/2 watt, 20%	2	R14, R17	BEC-9B1-86	100,000 ohms, 1/2 watt, 10%	2
R2	BEC-9B1-55	270 ohms, 1/2 watt, 10%	1	R15	BEC-9B1-31	1 megohm, 1/2 watt, 20%	1
R3	BEC-9B1-70	4700 ohms, 1/2 watt, 10%	1	R16	BEC-9B1-70	4700 ohms, 1/2 watt, 10%	1
R5	BEC-9B1-46	47 ohms, 1/2 watt, 10%	1	R18, R19	BEC-9B1-29	470,000 ohms, 1/2 watt, 20%	2
R6	BEC-9B1-79	27,000 ohms, 1/2 watt, 10%	1	R20	BEC-9B2-56	330 ohms, 1 watt, 10%	1
R12	BEC-9B1-22	33,000 ohms, 1/2 watt, 20%	1	R21	BE-10662	12,500 ohms, 3 watts, 10%	1
<b>COILS (complete with cores)</b>				R23	BEC-9B1-20	15,000 ohms, 1/2 watt, 20%	1
T1	BE-111195	Broadcast antenna coil	1	R24, S4	BEA-10A-10586	Volume control (500,00 ohms) and on-off switch	1
T2	BE-111191	12 mc antenna coil	1	R25	BEC-9B1-35	4.7 megohms, 1/2 watt, 20%	1
T3	BE-111192	15 mc antenna coil	1	R12, S3	BE-125180	Tone control (1 megohm) and radio-phono switch	1
T4	BE-111189	6 mc antenna coil	1	<b>COILS AND TRANSFORMERS</b>			
T5	BE-111190	9 mc antenna coil	1	T16	BE-108177	Input IF coil complete in can (Range of trimmers: 110-210 mmf)	1
T6	BE-10959	9 mc RF coil	1	T17	BE-108176	Output IF coil complete in can (Range of trimmers: 80-140 mmf)	1
T7	BE-10962	Broadcast RF coil	1	T18	BEB-12C-10234	Output transformer	1
T8	BE-10960	12 mc RF coil	1	T20	BE-104202B	Power transformer, for 50-60 cycles	1
T9	BE-10961	15 mc RF coil	1	<b>SOCKETS</b>			
T10	BE-10958	6 mc RF coil	1	BE-121200	Socket, 4-terminal, for loop ant	1	
T11	BE-110157	9 mc oscillator coil	1	BE-121279	Socket, 5-terminal, for tuner	1	
T12	BE-110159	15 mc oscillator coil	1	BEA-15B-11538	Socket, 4-terminal, for speaker	1	
T13	BE-110158	12 mc oscillator coil	1	BE-121199	Socket, 2-terminal, for phono motor	1	
T14	BE-110156	6 mc oscillator coil	1	BE-121210	Socket, octal, molded (all tubes except 6SK7, IF amp.)	5	
T15	BE-110161	Broadcast oscillator coil	1	BE-121273	Socket, octal, laminated (for 6SK7, IF amplifier)	1	
<b>MISCELLANEOUS</b>				BE-121280	Socket, 1-terminal, for phono pickup	1	
S1	BEB-20A-10964	Band switch, antenna	1	BEB-47A-10808	Socket assembly, for dial light	1	
S2	BEB-20A-10965	Band switch, oscillator and RF	1	<b>MISCELLANEOUS</b>			
	BE-121210	Socket, octal, molded (6SA7)	1	T19	BEB-18B-10617-1	Speaker, 10" electrodynamic	1
	BE-121171	Socket, laminated (6SK7GT)	1	BEA-19A-11539	Plug on speaker leads	1	
	BE-117907	Tuning shaft	1	BEB-14MA-11066	Loop antenna (ribbon only)	1	
	BE-117798	Pinion gear on tuning shaft	1	T22	BEA-16A-11113	Choke on loop terminal board	1
	BE-120393	Spring, intermediate link, under ends of treadle bar	2	BEA-19A-11322	Plug on loop antenna leads	1	
	BE-131251	Washer, "C" on slug tuning bar	4	BE-107401	Phono motor cable assembly	1	
	BEB-2C-7245	Gear segment	1	BE-10724	Plug on phono pickup leads	1	
	BEA-2J-7439	Spring clip, for coils	9	BE-112-1001	Dial scale	1	
	BE-131316B	Washer "C", for 9 mc coils	3	BE-10794	Dial light, 6-8 volts, type 44	2	
	BE-134134	Grommet for core mounting (all broadcast and 9 mc coils)	6	BEB-2G-10588-1	Dial pointer	1	
	BE-134126	Grommet for coil mounting (broadcast RF and antenna coils)	2	BEB-53A-10989	String for dial pointer	32"	
	BE-134125	Grommet for coil mounting (broadcast oscillator coil)	1	BE-120377	Tension spring for dial pointer string	1	
	BEA-25A-7619	Grommet for all 9 mc coils	3	BE-112985D-37	Escutcheon, Walnut	1	
	BEB-202-10475	Pushrod assembly, station selectors	6	BE-112985D-41	Escutcheon, mahogany	1	
	BE-120366	Spring, pushrod return	6	BEB-5B-13320-37	Knob, band switch or radio-phono, Walnut	2	
	BEA-2J-7176	Cam-locking spring on pushrod assembly	6	BEB-5B-13320-41	Knob, band switch or radio-phono, mahogany	2	
	BEA-2J-7627-1	Retainer spring on pushrod assy.	6	BEB-5D-13307-37	Knob, tuning and volume, Walnut	2	
	BE-121281	Plug, 5-prong	1	BEB-5B-13307-41	Knob, tuning and volume, mahogany	2	
	BE-128-759-37	Pushbutton	2	BE-107266	Line cord and plug	1	
	BE-131210	Washer, "C", on end plate	2	BEA-2L-11293	Band switch link	1	
	BE-112801	Drive pulley	1	BE-112961	Station call letters	1 set	
<b>MAIN CHASSIS</b>				BE-112-1017-37	Clips, for escutcheon, Walnut	2	
<b>CAPACITORS*</b>				BE-112-1017-37	Clips, for escutcheon, mahogany	2	
C16	BEC-8F3-12	470 mmf, 20%, mica	1	<b>RECORD CHANGER PARTS</b>			
C17, C19	BEC-8D-10774	.02 mf, 400 volts, 20%	2	B-201-13304-3	VM-800 Changer	1	
C18	BEC-8D-10771	.1 mf, 200 volts, +20% -10%	1	P30	Crystal cartridge with special needle	1	
C20-A	BE-129165B	Dual, 50 mmf each section, mica 20%	1				
C20-B			1				
C21	BEC-8D-10813	.05 mf, 400 volts, 20%	1				
C23	BEC-8F3-10	220 mmf, 20%, mica	1				



**GENERAL DESCRIPTION**

This model is a 3-way portable radio with 5 tubes plus rectifier. It contains a loop antenna built into the front cover and leads for external antenna and ground connections. When battery operation is desired, the line-cord plug is inserted into a socket switch on the chassis; the insertion automatically moves the switch contacts for battery operation. When the line-cord plug is out of the chassis socket and ready for insertion into a 105 to 125 volt outlet, the battery is automatically disconnected.

**NOTES**  
 VOLTAGES AT TUBE SOCKETS ARE MEASURED WITH A 1000 OHM-PER-VOLT VOLTMETER  
 LINE VOLTAGE 117 VOLTS, AC 60 CYCLES  
 DC SIDE OF RECTIFIER • 140V  
 ALL VOLTAGE READINGS BELOW 9 VOLTS TAKEN ON 10 VOLT SCALE (500, 9 VOLTS ON 25)  
 ALL PLUS VALUES TAKEN WITH MINUS SIDE OF VOLTMETER ON B - LINE



\* With battery out, reach in and disconnect speaker lead before removing chassis

## ALIGNMENT PROCEDURE AND RECEIVER STAGE SENSITIVITIES

The Alignment Procedure below includes the sensitivities at the input of various stage. 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

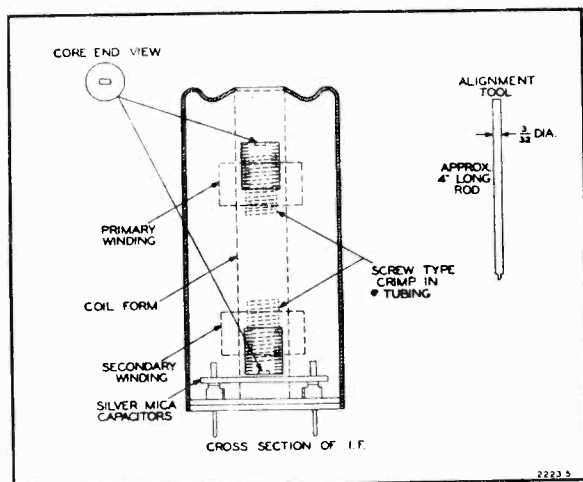
50 milliwatt output with speaker connected. The volume control must be set to maximum.

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

FREQUENCY	COUPLING CAPACITOR	DIAL SETTING	CONNECTION TO RADIO	GROUND CONNECTION	ADJUST	INPUT FOR 50 MILLIWATTS OUTPUT
455 kc.	.1 mfd.	1000 kc.	Pin No. 6 of 1R5	B— (shell of lytic)	I.F. slugs	100 microvolts
1600 kc.	.1 mfd.	1600 kc.	Pin No. 6 of 1R5	B— (shell of lytic)	C1-C	_____
1400 kc.	.1 mfd.	1400 kc.	Pin No. 6 of 1T4 R.F. tube	B— (shell of lytic)	C1-B	10 microvolts
1400 kc.	200 mmf.	1400 kc.	Ant. lead (see note below)	Ground lead	C1-A	2 microvolts
400 cycles	.05 mfd.	_____	Pin No. 6 of 1S5	B— (shell of lytic)	_____	.06 volts
400 cycles	.05 mfd.	_____	Pin No. 3 of 3Q4	B— (shell of lytic)	_____	3 volts

NOTE: This adjustment must be made with chassis installed in cabinet and loop knife switches connected. With one hand hold both covers open with their shoulders together. This allows access to the chassis and also allows the loop to work without undue chassis capa-

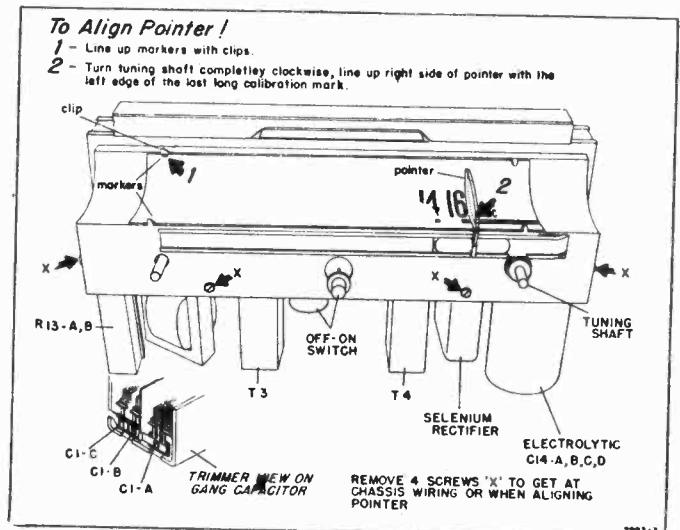
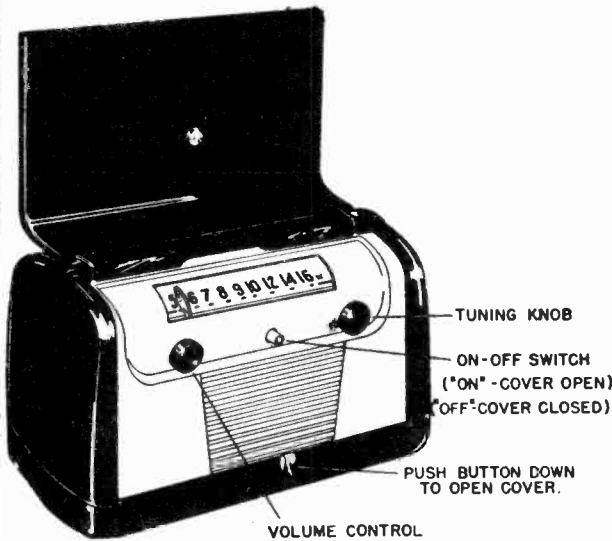
city effects. The antenna section of the gang has two trimmers. One is C1-A and the other is on the opposite side of the gang which is accessible when chassis is in the cabinet.



**CAUTION**—The I.F. transformer construction is such that two resonance peaks occur for each winding, one peak when the slug is above its coil and another peak when the slug is below its coil. Be sure the upper cores are above the top coils and the lower cores are below the bottom coils (see coil drawing).

## ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts DC or 50-60 cycle AC, 25 watts.
Battery:	Wards Battery Pack No. 62-33.
Size:	9 1/2" by 2 5/8" by 4 3/8".
"A"	—9 volts, 50 milliamperes.
"B"	—90 volts, 14 milliamperes.
Frequency Range	535 to 1600 kc.
Intermediate Freq.	455 kc.
Selectivity	At 1000 kc, 36 kc at 1000 x signal.
Sensitivity	4 microvolts average for .05 watt output.
Power Output	125 milliwatts undistorted. 250 milliwatts maximum.
Loud Speaker	4" x 6", P.M., v.c. impedance 3.2 ohms.
Tube Complement	1T4 R.F. stage. 1R5 converter. 1T4 I.F. amplifier. 1S5 detector, AVC, audio amplifier. 3Q4 output amplifier.
Rectifier	Selenium type.

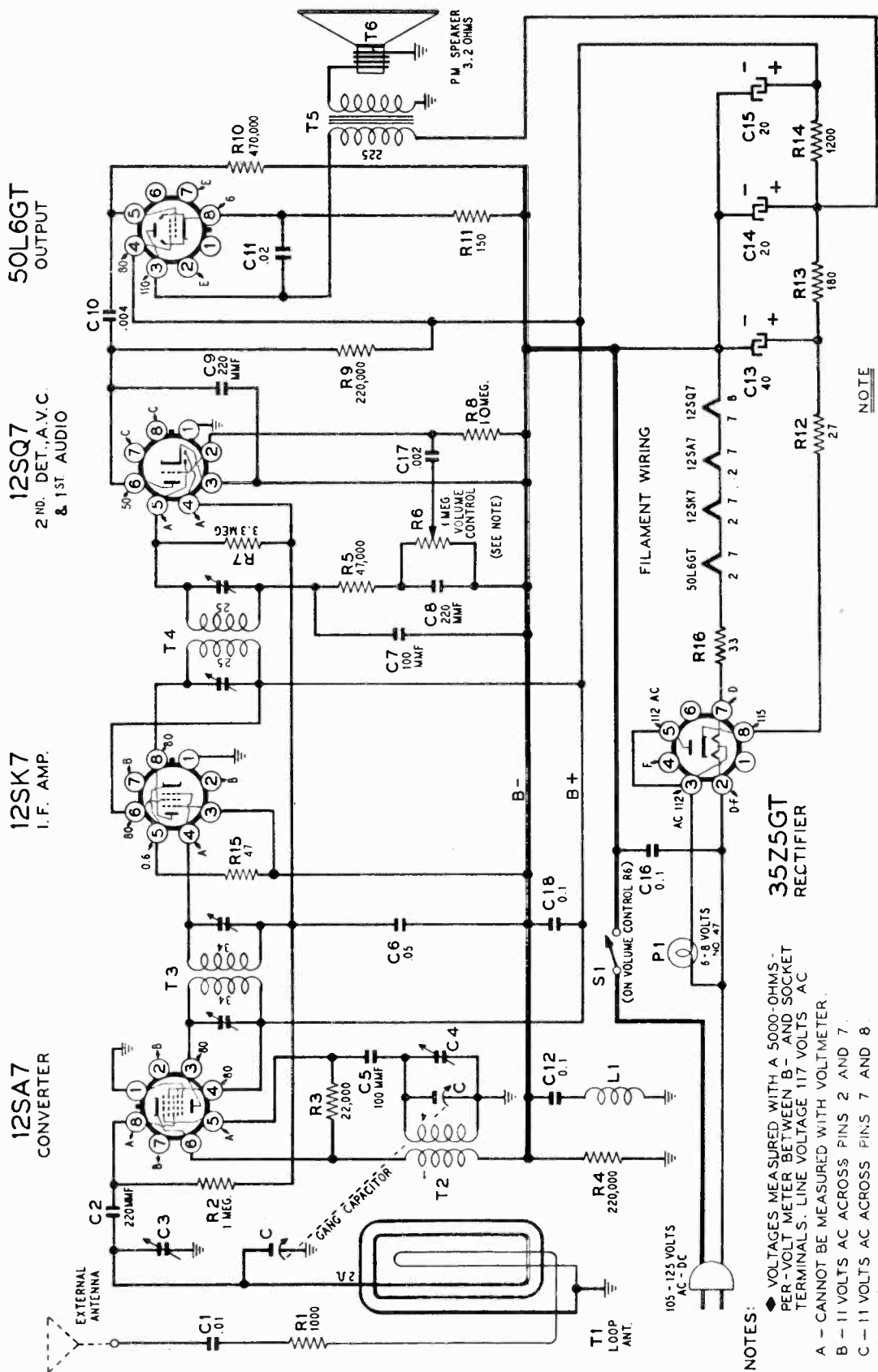


Ref. No.	Part No.	Description	Qty. Used in Set
<b>CONDENSERS</b>			
C14A, C14B, C14C, C14D	A-8C-14453	Electrolytic filter cond. 40 x 150, 200 x 10, 20 x 50, 40 x 150.	1
C1A, C1B, C1C	B-8A-14073	3 gang var. condenser, with trimmers	1
C2, C4, C5, C8	C-8D-14460	.05 x 200 volts, tubular	4
C6	C-8D-11251	.09 x 400 volts, tubular	1
C19	C-8D-14461	.05 x 400 volts, tubular	1
C16	C-8D-14462	.005 x 200 volts, tubular	1
C20, C10	C-8G-14454	2500 mmf, ceramic	2
C7	C-8G-13695	1000 mmf, ceramic	1
C21	C-8G-14459	220 mmf, ceramic	1
C3	C-8G-12198	47 mmf, ceramic	1
C22	C-8D-10788	.004 x 600 volts, tubular	1
<b>RESISTORS</b>			
R7	A-10B-14070	Volume control (1 megohm) less switch	1
R1, R2, R5	C-9B1-106	4.7 megohms, 1/2 watt,	3
R3	C-9B1-86	100K ohms, 1/2 watt	1
R4	C-9B1-104	3.3 megohms, 1/2 watt	1
R6	C-9B1-78	22K ohms, 1/2 watt	1
R15	C-9B1-88	150K ohms, 1/2 watt	1
R12	C-9B1-63	1200 ohms, 1/2 watt	1
R14	C-9B2-168	2400 ohms, 1 watt	1
R8	C-9B1-37	10 megohms, 1/2 watt	1
R16	C-9B1-56	330 ohms, 1/2 watt	1
R13A, R13B	A-9D-14067	2770 ohms; 30 ohms, 7.5 watts candohm	1
<b>CONDENSERS AND RESISTOR COMBINATION</b>			
C9, C22, R17	A-201-15005	Diode filter assembly. 100 mmf; 100 mmf; 47K ohms	1
C11, C12, C13, R9, R10, R11	B-201-14083	Audio coupling strip. .002 mf; 100 mmf; .005 mf; 4.7 meg.; 1 meg.; 2.2 meg.	1
<b>DIAL AND TUNING PARTS</b>			
	B-2M-14426	Dial scale	1
	A-6M-14088	Pointer	1
	A-2J-14085	Rack tape with teeth and pointer carriage	1

Ref. No.	Part No.	Description	Qty. Used in Set
	B-2D-14084	Tape guide	1
	A-5B-14109-61	Knob, volume and tuning	2
	D-2G-13979	Escutcheon	1
	B-6A-14099	Crystal	1
	200-14138	Dual gear assembly, with backlash spring A-49A-14403	1
	A-3A-14079	Tuning shaft	1
	A-3J-14077	Pinion gear that drives tape	1
	A-3J-14080	Spur gear, drives dual gears	1
<b>SPEAKER</b>			
	B-18A-14100	4 x 6-inch, oval, P.M. speaker, less transformer	1
T5	B-12C-14066	Output transformer, for speaker	1
<b>COILS</b>			
T3	B-13A-14394	Input I.F. transformer, 455 K.C.	1
T4	B-13B-14395	Output I.F. transformer, 455 K.C.	1
T2	A-43D-14071	Oscillator coil	1
T1	A-13C-14072	R.F. coil	1
L2	A-16A-14398	Loading coil	1
L1	200-14449	Front cover assembly, with built-in loop	1
<b>MISCELLANEOUS</b>			
	200-14450	Rear cover assembly	1
	A-20C-14069	AC-DC-Battery slide switch	1
	B-14M-13860	A.C. line cord and plug	1
	A-15C-13174	7-prong, miniature, tube socket	5
	B-20C-14114	On-off switch	1
	A-2M-14110	Pushrod, for on-off switch	1
	A-49A-14111	Compression spring, for pushrod	1
	A-5B-14112-61	Pushbutton, for on-off switch	1
	B-14A-14082	Battery cable assembly	1
	A-21J-12775	Rectifier, selenium type	1
	C-5M-13961-59	Handle	1
	A-5B-13988-59	Tenite door lock	2
	A-2M-14056	Spring, for lock	2
	D-5C-13817-59	Cabinet end pieces	2

MODELS 84BR-1503D,  
84BR-1504D

MONTGOMERY WARD



50L6GT  
OUTPUT

12SQ7  
2ND. DET., A.V.C.  
& 1ST AUDIO

12SK7  
I.F. AMP.

12SA7  
CONVERTER

35Z5GT  
RECTIFIER

NOTES:  
♦ VOLTAGES MEASURED WITH A 5000-OHMS PER-VOLT METER BETWEEN B- AND SOCKET TERMINALS. LINE VOLTAGE 117 VOLTS AC  
A - CANNOT BE MEASURED WITH VOLTMETER.  
B - 11 VOLTS AC ACROSS PINS 2 AND 7.  
C - 11 VOLTS AC ACROSS PINS 7 AND 8  
D - 35 VOLTS AC ACROSS PINS 2 AND 7  
E - 49 VOLTS AC ACROSS PINS 2 AND 7  
F - 117 VOLTS AC ACROSS PINS 2 AND 4.  
WHERE NO READING IS INDICATED VOLTAGE IS ZERO.

NOTE  
SOME SETS HAVE 500,000 OHM VOLUME CONTROL  
Intermediate Freq....455 kc.

NOTE: On some sets the B+ lead of the second IF is connected to C14 instead of C15.

MONTGOMERY WARD

MODELS 84BR-1503D,  
84BR-1504D

**ALIGNMENT PROCEDURE**

(Position of trimmers shown on next page)

- Output meter across 3.2-ohm output load. keep output near 0.4 volts.
- Volume control at maximum for all adjustments.
- Loop antenna should be connected to receiver and in its proper position when making adjustments.
- Align for maximum output. Reduce input as needed to

SIGNAL GENERATOR				TUNER SETTING	ADJUST TRIMMERS TO MAXIMUM OUTPUT in order shown
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection		
455 kc	0.1 mf	Grid (pin 4) of 12SK7	Pin 3 of 12SK7 (B- of set)	Capacitor full open (plates out of mesh)	2 trimmers on output IF can
455 kc	0.1 mf	Grid (pin 8) of 12SA7	Pin 3 of 12SK7 (B- of set)	Capacitor full open (plates out of mesh)	2 trimmers on input IF can
1630 kc	0.1 mf	Grid (pin 8) of 12SA7	Pin 3 of 12SK7 (B- of set)	Capacitor full open (plates out of mesh)	Oscillator trimmer C4 on gang
1400 kc	200 mmf	External antenna clip	Pin 3 of 12SK7 (B- of set)	Set dial pointer at 1400 kc	Antenna trimmer C3 on gang

**RECEIVER STAGE SENSITIVITIES**

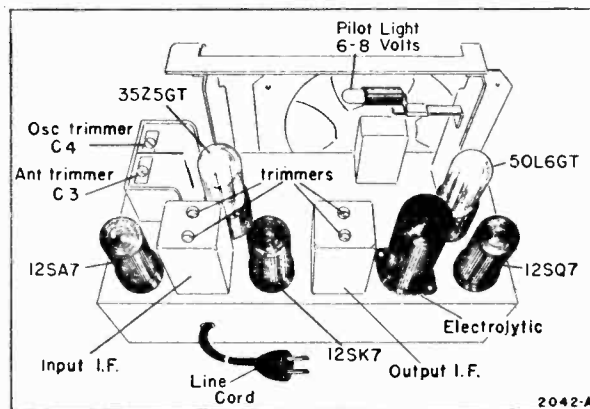
The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 kc for all readings. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm, 5-watt resistor across the secondary winding of the output transformer. A reading of 0.4 volts AC across this resistor will be equivalent to a 50-milliwatt

output with the speaker connected.

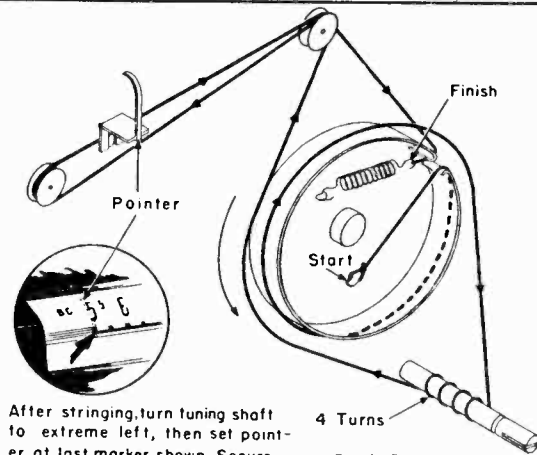
The signal source must be an accurately calibrated signal generator capable of supplying both 1000 kc and 455 kc signals modulated 30% with a 400-cycle audio signal. Variations of plus or minus 25% are usually permissible.

The volume control must be set to maximum.

SIGNAL GENERATOR				INPUT FOR 50-MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection	
1000 kc	200 mmf or RMA dummy antenna	External antenna clip	Pin 3 of 12SK7 (B- of set)	24 microvolts
1000 kc	0.1 mf	Grid (pin 8) of converter (12SA7)	Pin 3 of 12SK7 (B- of set)	98 microvolts
455 kc	0.1 mf	Grid (pin 8) of converter (12SA7)	Pin 3 of 12SK7 (B- of set)	74 microvolts
455 kc	0.1 mf	Grid (pin 4) of I.F. amp. (12SK7)	Pin 3 of 12SK7 (B- of set)	3200 microvolts
400 cycles	0.1 mf	Grid (pin 2) of audio amp. (12SQ7)	Pin 3 of 12SK7 (B- of set)	.043 volts
400 cycles	0.1 mf	Grid (pin 5) of output amp. (50L6GT)	Pin 3 of 12SK7 (B- of set)	2.0 volts



Chassis View, Showing Trimmer Location



After stringing, turn tuning shaft to extreme left, then set pointer at last marker shown. Secure pointer to string with glue.

Dial Stringing Diagram

NOTE: Some sets have 3 turns instead of 4.

MODELS 84BR-1503D,  
84BR-1504D

MONTGOMERY WARD

**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. Simple AVC voltage is applied to the grids of the converter and IF-amplifier tubes.

**ELECTRICAL SPECIFICATIONS**

Power Supply.....105 to 125 volts, DC or 50-60 cycle AC, 24 watts. Also made for 25-cycle AC.  
Frequency Range .....530 to 1630 kc.

Selectivity .....At 1000 kc, 60 kc at 1000 x signal.  
Sensitivity .....26 microvolts average for .05-watt output.  
Power Output .....0.9 watt undistorted, 1.0 watt maximum.  
Loud Speaker.....4" x 6" oval, P.M., v.c. impedance 3.2 ohms.  
Tube Complement...12SA7, converter  
12SK7, IF amplifier  
12SQ7, detector, AVC, audio  
50L6GT, output amplifier  
3Z5GT, rectifier  
T-47, dial lamp, G.E., 6-8 volts

**NOTE:**— Disregard gang condenser and loop information shown below. B-8A-11628 gang condenser must be used with loop C-212-13035 (Walnut) or C-212-13035-1 (Ivory). B-8A-10827 gang must be used with C-212-10435 or C-212-11058 loops. Check part number on defective item and order accordingly.

Ref. No.	Part No.	Description	Qty. Used in Set
<b>CAPACITORS*</b>			
C, C3, C4	B-210-10040-1	2-gang capacitor assembly, including antenna and oscillator trimmers	1
C1	C-8D-10761	.01 mf, 400 volts, 20%	1
C2, C8, C9	C-8F3-10	220 mmf, 500 volts, 20%, mica	3
C5, C7	C-8F3-8	100 mmf, 500 volts, 20%, mica	2
C6	C-8D-10770	.05 mf, 200 volts, 20%	1
C10	C-8D-10788	.004 mf, 600 volts, 20%	1
C11	C-8D-10772	.02 mf, 600 volts, 20%	1
C12, C16	C-8D-10760	.1 mf, 400 volts, +20—10%	2
C13, C14, C15	A-8C-10077	Electrolytic for 60 cycles; 40 mf x 150 volts, 20 mf x 150 volts, 20 mf x 150 volts	1
C13, C14, C15	A-8C-10946	Electrolytic for 25 cycles; 60 mf x 150 volts, 40 mf x 150 volts, 40 mf x 150 volts	1
C17	C-8D-10789	.002 mf, 600 volts, 20%	1
C18	C-8D-10771	.1 mf, 200 volts, +20—10%	1
<b>RESISTORS*</b>			
R1	C-9B1-13	1000 ohms, 1/2 watt, 20%	1
R2	C-9B1-31	1 megohm, 1/2 watt, 20%	1
R3	C-9B1-78	22,000 ohms, 1/2 watt, 10%	1
R4, R9	C-9B1-90	220,000 ohms, 1/2 watt, 10%	2
R5	C-9B1-82	47,000 ohms, 1/2 watt, 10%	1
R6, S1	A-10A-10075	Volume control (500,000 ohms) and switch	1
	A-10A-12540	Volume control (1 megohm) and switch	1
R7	C-9B1-34	3.3 megohms, 1/2 watt, 20%	1
R8	C-9B1-37	10 megohms, 1/2 watt, 20%	1
R10	C-9B1-94	470,000 ohms, 1/2 watt, 10%	1
R11	C-9B1-52	150 ohms, 1/2 watt, 10%	1
R12	C-9B2-43	27 ohms, 1 watt, 10%	1
R13	C-9B2-53	180 ohms, 1 watt, 10%	1
R14	C-9B2-63	1200 ohms, 1 watt, 10%	1
R15	C-9B1-5	47 ohms, 1/2 watt, 20%	1
R16	C-9B2-44	33 ohms, 1 watt, 10%	1
<b>TRANSFORMERS AND COILS</b>			
L1	A-16A-10090	Choke coil	1
T1	C-212-13035	Loop antenna assembly, (includes loop, back, resistor R1, and capacitor C1)	1

Ref. No.	Part No.	Description	Qty. Used in Set
T2	A-13D-10089	Oscillator coil	1
T3	B-13B-10091	Input IF transformer, complete in can. (Range of trimmers: 45-85 mmf each)	1
T4	B-13B-10092	Output IF transformer, complete in can. (Range of trimmers: 43-80 mmf each)	1
T5	B-12C-10074	Output transformer for speaker	1
<b>SPEAKER</b>			
T6	B-18A-14352	4-in. x 6-in. oval P.M. speaker	1
<b>DIAL AND TUNING PARTS</b>			
	200-14383	Dial bracket assembly	1
	B-6D-14354	Dial scale	1
	A-6A-14350	Crystal for dial	1
	A-2D-10036	Bracket for crystal (walnut)	2
	A-2D-10036-1	Bracket for crystal (ivory)	2
	A-2G-10095	Pointer	1
	A-53A-10576	Drive cord for dial pointer	36"
	A-49A-10078	Tension spring for dial drive cord	1
	A-46A-10793	Dial light bulb, 6-8 volts, type T-47	1
	A-55A-10093	Socket and bracket for dial light	1
	A-3A-10035	Tuning shaft	1
	B-29E-466	Spring washer, for tuning shaft	1
<b>MISCELLANEOUS</b>			
	5C-10000-46	Cabinet, bakelite, walnut	1
	5C-10000-9	Cabinet, bakelite, ivory	1
	C-23J-10433	Back only for cabinet	1
	B-5B-10011-17	Knob, tenite, walnut	2
	B-5B-10011-8	Knob, tenite, ivory	2
	A-15B-10440	Socket, octal, for all tubes but 12SK7	4
	121177	Socket, octal, for 12SK7	1
	B-14M-10088	Line cord and plug	1
	A-2M-10096	Stud, for fastening back to cabinet	4
	42A-10097	Screw, 8-18 x 7/8 hex head, for mounting chassis	3

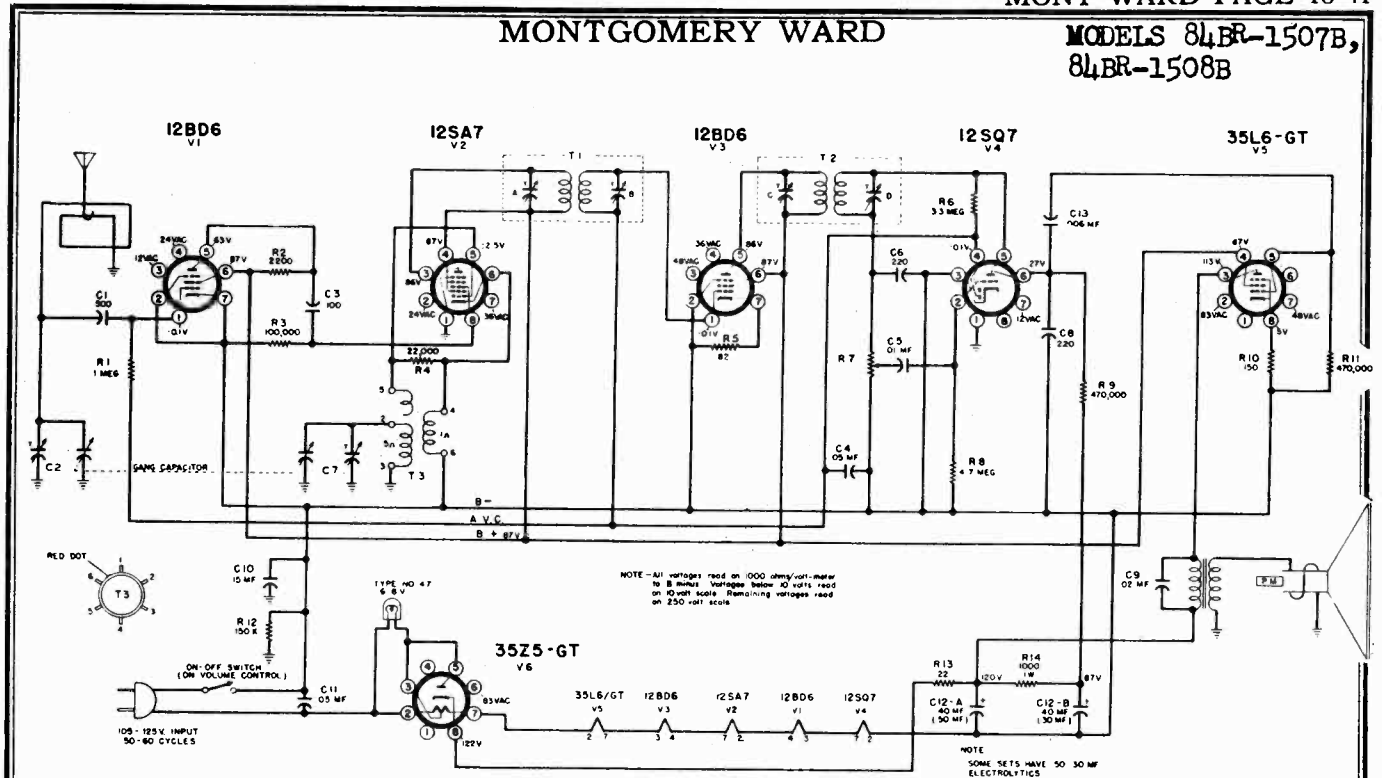
\*The values of the resistors and mica capacitors listed above are based on RMA standards. Due to conditions beyond our control some receivers have been shipped with components of pre-standardized values. This receiver will operate equally well with components of either group. An illustration of the differences in both resistors and capacitors follows:  
Pre-standardized value—50,000 ohms, 1/2 watt, 10%  
RMA value—47,000 ohms, 1/2 watt, 10%  
Pre-standardized value—200 mmf, 500 volts, 20%  
RMA value—220 mmf, 500 volts, 20%

**NOTE ON TUBE REPLACEMENT**

Replace a defective metal 12SK7 tube with another metal tube. Replace a glass 12SK7 tube with a metal tube or with an exact duplicate of the tube now in the set.

MONTGOMERY WARD

MODELS 84BR-1507B,  
84BR-1508B



NOTE: On some sets slug tuned I.-F.'s are used instead of trimmer tuned I.-F.'s. 108-140H and 108-145 are trimmer tuned. B-13A-12023 and B-13B-12022 are slug tuned. The slug tuned I.-F.'s

are tuned from the top and bottom (secondary on top, primary on bottom).  
When slug tuned I. F.'s are used, R5 is 270 ohms.

GENERAL DESCRIPTION

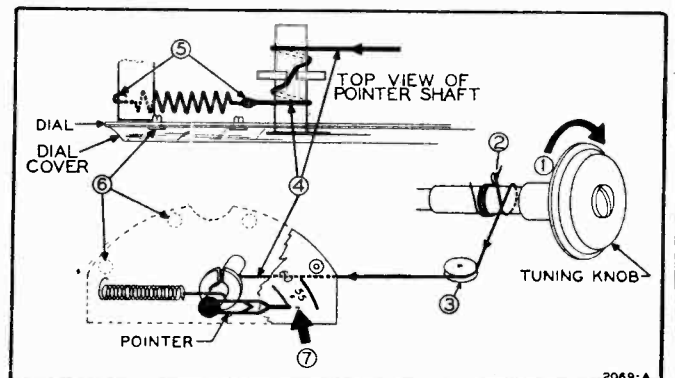
This receiver is a single-band, AC-DC set which uses 5 tubes plus a rectifier. The antenna input and oscillator circuits are tuned by a two-gang capacitor. A loop antenna is built into the cabinet; provision is made also for the connection of an external antenna. AVC voltage is applied to the grids of the R.F. converter, and IF-amplifier tubes.

ELECTRICAL SPECIFICATIONS

- Power Supply..... 105 to 125 volts, DC or 50-60 cycle AC, 35 watts.
- Frequency Range..... 530 to 1650 kc.
- Intermediate Freq. 455 kc.
- Selectivity..... At 1000 kc, 55 kc at 1000 x signal.
- Sensitivity..... 40 microvolts average for .05 watt output.
- Power Output..... 0.8 watts undistorted, 1 watt maximum.
- Loud Speaker..... 5" P.M., v.c. impedance 3.2 ohms.
- Tube Complement..... 12BD6, R. F. stage.  
12SA7, converter.  
12BD6, I. F. amplifier.  
12SQ7, detector, AVC, audio amplifier.  
35L6GT, output amplifier.  
35Z5GT, rectifier.

REPLACING DIAL POINTER DRIVE CORD—Six inches of cord are required in the set. Use a piece slightly longer so that knots may be tied at each end. Numbers below correspond to circled numbers in diagram.

1. Rotate tuning knob to extreme clockwise position. This closes tuning condenser. Knob should remain in this position until installation is completed.
2. Tie cord to loop in spring as shown. Wind cord one turn around shaft in direction shown.
3. Pass cord over idler pulley.
4. Pass cord over pointer shaft; wind it one turn around shaft; pass it through key washer; wind it one more turn around shaft.
5. Hook spring over end of dial support. Tie cord to spring. **IMPORTANT:** Before tying knot stretch spring enough so that full contraction of spring will rotate pointer shaft at least one-half turn.
6. Remove dial crystal by removing Cinch buttons.
7. Make sure tuning knob is in extreme clockwise position. Then rotate pointer clockwise, against friction of shaft, until it is in horizontal position, as shown.





MODELS 84BR-1507B,  
84BR-1508B

## 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.

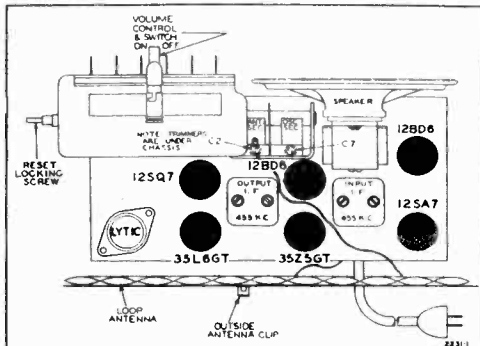
The table below lists the sensitivity at various points. All measurements are based on an output of 50-milliwatts. This may be measured by disconnecting the

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 permissible. 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. 8 of 12SA7	12SQ7 Pin 3	Rotor full open	Trimmers on output and input I.F. cans	100 microvolts
1650 kc.	.1 mf.	Pin No. 8 of 12SA7	12SQ7 Pin 3	Rotor full open	Oscillator trimmer C7 (on bottom)	_____
1400 kc.	none	See note A	none	Set dial at 1400	Antenna trimmer C2 (on bottom)	_____
1400 kc.	.1 mf.	External antenna clip	12SQ7 Pin 3	1400 kc.	_____	13 microvolts
400 cycles	.1 mf.	12SQ7, Pin 2	12SQ7 Pin 3	_____	_____	.05 volts

Note A: Lay output lead of generator in back of loop antenna.

Turn up generator output. Loop antenna will pick up energy.



CHASSIS VIEW, SHOWING TUBE LOCATIONS  
(See note on I.F.'s.)

## INSTALLATION

This radio is a superheterodyne set which may be operated from either alternating (AC) or direct (DC) current. The set contains a built-in antenna (aerial) and may be used to tune in stations on the standard broadcast band, 530 to 1650 kilocycles.

**ANTENNA AND GROUND**—The antenna built into the rear of the cabinet is sufficient for receiving programs from local stations and from powerful nearby stations. This antenna is directional, that is, reception is improved when the antenna is facing in certain directions. Therefore after tuning in a station try the radio in several positions.

In locations remote from broadcasting stations or where receiving conditions are poor, an outside antenna, 50 to 75 feet long including lead-in, will give best results. The antenna should be erected as high as possible, as far from surrounding objects as is practical, and at right angles to street car lines and power lines. Connect the antenna lead-in wire to the antenna clip at the rear of the radio.

No ground wire is required with this radio.

**POWER**—This receiver has been designed to operate on 105 to 125 volt, either DC or 50- to 60-cycle AC. If you are in doubt as to the voltage of your power supply, consult your local power company. Do not insert the plug in the power receptacle unless you are sure that the correct voltage is available.

**AC OPERATION**—Insert the line-cord into your AC receptacle. Turn the set on and tune in a station. Keep the volume low. A low steady hum may be heard. Reverse the plug in the receptacle and notice whether there is any difference. Leave the plug in the position which gives less hum.

**DC OPERATION**—On direct current the set will not operate with the plug in one position in the receptacle even though the pilot lamp lights, but will operate normally with the plug in the other position. Insert the plug and turn the volume control to the right. If no sound is heard after one minute, reverse the plug.

## OPERATION

**CONTROLS**—The knob on the front is both the on-off switch and the volume control. When this control is turned all the way to the left the set is off. A slight rotation to the right will click the switch and turn the set on. The knob may then be used to regulate the volume. When the set is turned on the dial lamp lights dimly; as the tubes warm up the light becomes brighter. Be sure your radio is turned completely off when not in use; otherwise the tubes will wear out unnecessarily.

The knob on the right side of the cabinet is the tuning knob; it may be used to tune in (select) stations in the standard broadcast band. When selecting a station turn the knob back and forth until the tone is clearest and loudest. Do not use the tuning knob to regulate volume; the volume control should be used for that purpose after the station has been tuned in properly.

The operating frequency, in kilocycles, of each of your local stations is listed in the radio section of your

## MONTGOMERY WARD

MODELS 84BR-1507B,  
84BR-1508B

newspaper. The numbers on the radio dial may be converted into kilocycles by multiplying by 10; for example, 90 on the dial represents 900 kilocycles.

**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

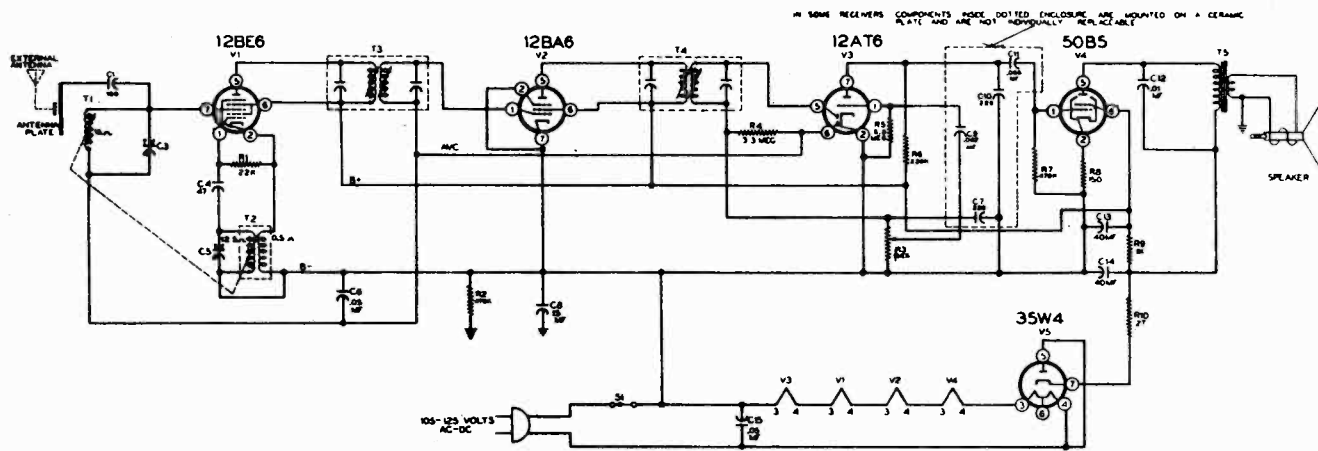
illustration) is loose. If it is not, turn it several turns to the left (counterclockwise).

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 pushbutton.
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.

Ref. No.	Part No.	Description
<b>CONDENSERS</b>		
C12A, C12B	A-8C-11375 or A-8C-15030 or A-8C-15262	Filter cond., 40 mfd. x 40 mfd. x 150 volts Filter cond., 40 mfd. x 40 mfd. x 150 volts Filter cond. 50 mfd. x 30 mfd. x 150 volts
C4	C-8D-10770	.05 x 200 volts, tubular
C9	C-8D-10774	.02 x 400 volts tubular
C5	C-8D-11738	.01 x 200 volts, tubular
C11	C-8D-10813	.05 x 400 volts, tubular
C10	C-8D-10953	.15 x 400 volts, tubular
C13	C-8D-10785	.006 x 600 volts, tubular
C6, C8	C-8G-11733	220 mmf., ceramic
C1	C-8G-11822	500 mmf., ceramic
C3	C-8G-11734	100 mmf., ceramic
<b>RESISTORS</b>		
R14	C-9B2-62	1000 ohms, 1 watt, 10%
R9, R11	C-9B1-94	470K ohms, 1/2 watt, 20%
R8	C-9B1-35	4.7 megohms, 1/2 watt, 20%
R6	C-9B1-34	3.3 megohms, 1/2 watt, 20%
R4	C-9B1-78	2.2K ohms, 1/2 watt, 20%
R13	C-9B1-42	22 ohms, 1/2 watt, 10%
R3	C-9B1-25	100K ohms, 1/2 watt, 20%
R2	C-9B1-66	2200 ohms, 1/2 watt, 10%
R12	C-9B1-26	150K ohms, 1/2 watt, 20%
R1	C-9B1-31	1 megohm, 1/2 watt, 20%
R10	C-9B1-52	150 ohms, 1/2 watt, 10%
R5	C-9B1-49 or C-9B1-55	82 ohms, 1/2 watt, 10% 270 ohms, 1/2 watt, 10%
<b>COILS</b>		
T3	C-13E-15281 or C-13E-15294	Loop antenna assembly, complete on back
T1	B-13D-15277 108140Q or B-13A-12023-1	Oscillator coil Input I.F. coil in can, 455 Kc.
T2	108145H or B-13B-12022-1	Output I.F. coil in can, 455 Kc.
<b>SOCKETS</b>		
	A-15C-15189 121171 121216 A-47A-11470	7-prong, tube socket 8-prong socket, laminated Socket base, bakelite Pilot light socket assembly
<b>SPEAKER</b>		
	114197 B-12C-15278	5-inch P.M. speaker Output transformer for speaker

Ref. No.	Part No.	Description
<b>DIAL PARTS</b>		
	115448	End plate (right hand bracket)
	115448C	End plate (left hand bracket)
	115146	Cams
	115143	Key washer (13 used on cam shaft)
	117528	Brass spacer (one used on cam shaft)
	117602	Brass spacer (four used on cam shaft)
	131181	Spring washers, for locking collar
	117604	Locking collar
	117600	Level shaft
	115361	Lever with roller
	120283	Return spring for levers
	115449B	Dial bracket assembly
	112785	Pointer
	A-53A-10989	Drive cord, 6 inches used
	A-49A-11087	Spring on tuning shaft, for cord
	A-3N-11086	Spacer under above spring
	120143	Take-up spring for drive cord
	B-6D-10241-2	Dial scale
	112-659-1	Crystal, clear, for dial scale
	A-2M-7758	Cinch buttons for fastening scale to bracket
	117833	Brass spacer (for spacing pointer from dial)
<b>MISCELLANEOUS</b>		
	10798	Line cord and plug
R7	101218 or A-10A-10626	Volume control and switch, 1 meg.
C1-A, C1-B	B-8A-10211 107249 134123 13141	2-gang variable condenser Pilot light bulb, type T-47 Rubber bumper (bottom of cabinet) Cinch buttons, to cover trimmer holes in cabinet
	B-5B-14298-8	Pushbutton (6 used), Ivory
	A-23L-11900	Station call letters, set
	A-6C-14299	Acetate tabs for call letters
	5C-11228-9	Cabinet, bakelite, ivory color
	128-686-8	Knob, volume, ivory color
	A-5B-10994-9	Knob, tuning, ivory color
	A-3F-10995	Locking screw for tuning knob
	120388	Locking spring for tuning knob
	A-2H-10996	Reset key
	5C-11228-36	Cabinet, walnut
	128-686-37	Knob, volume, walnut
	A-5B-10994-36	Knob, tuning, walnut
	B-5B-14298-37	Pushbuttons, walnut

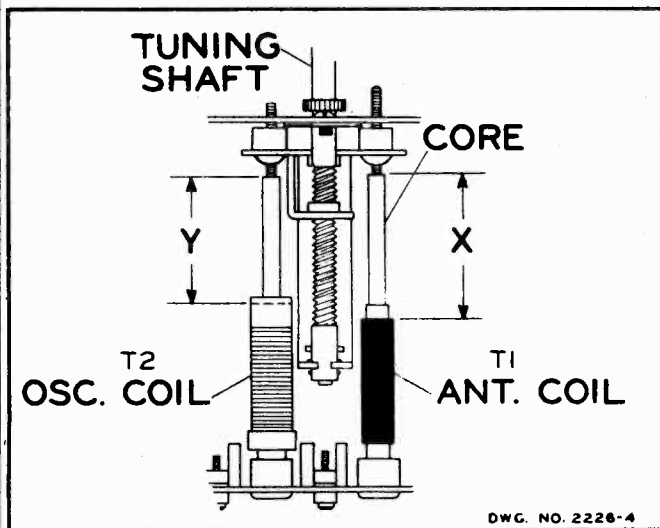
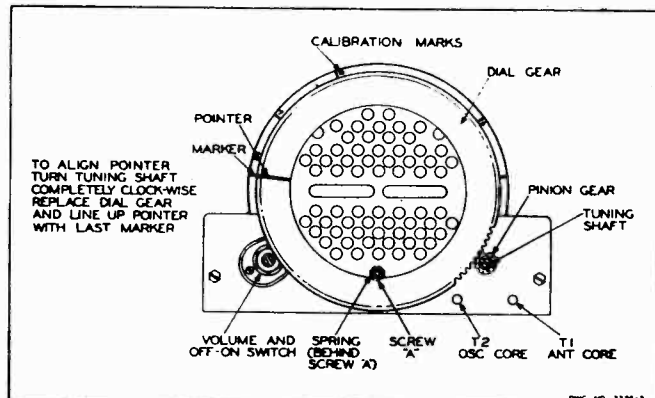
MODELS 84BR-1515A, 84BR-1516A, MONTGOMERY WARD  
84BR-1815A, 84BR-1816A



On some sets the four condensers C7, C9, C10, C11 are in one unit. Replace a defective section with an external single unit.

**GENERAL DESCRIPTION**

This radio is a permeability-tuned, AC-DC set using 4 tubes plus a rectifier. The metal back plate of the cabinet serves as a self-contained antenna. A clip is provided for connection of an external antenna; it is riveted to a washer which is capacity-coupled to the back plate. Simple AVC voltage is applied to the converter and IF-amplifier tubes. The filament string is across the AC line.



With tuner all the way out, dimension "Y" is 1-15/64".  
Dimension "X" is 1 1/2".

**ELECTRICAL SPECIFICATIONS**

- Power Supply ..... 105 to 125 volts, DC or 50-60 cycles AC, 35 watts.
- Frequency Range ..... 535 to 1620 kc.
- Intermediate Freq. .... 455 kc.
- Selectivity ..... At 1000 kc., 55 kc. at 1000 x signal.
- Sensitivity ..... 20 microvolts average for .05 watt output.
- Power Output ..... 0.7 watts undistorted, 1.0 watts maximum.
- Loud Speaker ..... 4", P.M., v.c. impedance 3.2 ohms.
- Tube Complement ..... 12BE6, converter  
12BA6, I.F. amplifier  
12AT6, detector, AVC, audio amplifier  
50B5, output amplifier  
35W4, rectifier.

MONTGOMERY WARD

MODELS 84BR-1515A, 84BR-1516A,  
84BR-1815A, 84BR-1816A

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 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

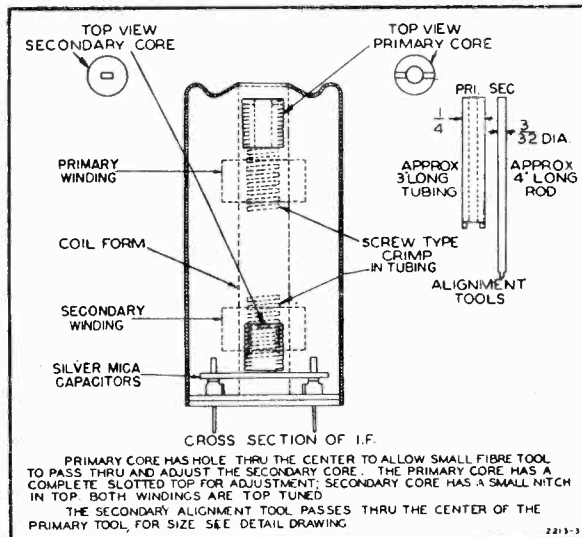
speaker voice coil and substituting a 3.2-ohm, 5-watt resistor across the secondary winding of the output transformer. A reading of .4 volts AC across this resistor will be equivalent to a 50-milliwatt output with the speaker connected. Variations of plus or minus 25% are usually permissible. Volume 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	12BE6, Pin 7	12AT6, Pin 2	Iron cores all the way out	Cores in output and input I.F. cans	45 microvolts
1620 kc.	.1 mf	12BE6, Pin 7	12AT6, Pin 2	Iron cores all the way out	Oscillator trimmer C5	_____
1620 kc.	2 mmf see note	External antenna clip	12AT6, Pin 2	1620 kc.	Antenna trimmer C3*	20 microvolts
1400 kc.	2 mmf see note	External antenna clip	12AT6, Pin 2	1400 kc.	Adjust position of ant. core (see coil illustration view)	20 microvolts
400 cycles	.1 mf	12AT6, Pin 1	12AT6, Pin 2	_____	_____	.03 volts

\*After the antenna coil has been tracked at 1400 kc., it is necessary to check the antenna trimmer C3 again at 1620 kc. If no appreciable change in trimmer adjustment is necessary, the coil is in track. If the trimmer

requires considerable change, the position of the antenna core at 1400 kc. must be readjusted. These two adjustments should be made several times, until no trimmer adjustment is required at 1620 kc.

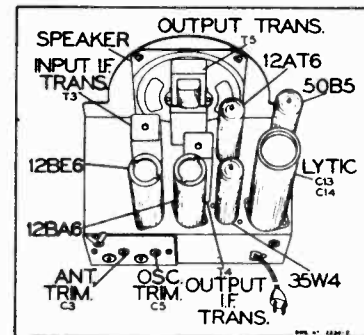
NOTE: Anything larger than 2 mmfd. will produce mistrack.



**CAUTION**—The I.F. transformer construction is such that two resonance peaks occur for each winding, one peak when the slug is above its coil and another peak when the slug is below its coil. Be sure the upper core is above the top coil and the lower core is below the bottom coil (see coil drawing above).

INSTALLATION

This radio is a superheterodyne set which may be operated from either alternating (AC) or direct (DC) current. The plate antenna on the rear of the cabinet serves as a built-in antenna for the set, which tunes over the standard broadcast band, 535 to 1620 kilocycles.



**ANTENNA AND GROUND**—The plate antenna on the rear of the cabinet is sufficient for receiving programs from local stations and from powerful nearby stations. In locations remote from broadcasting stations or where receiving conditions are poor, an outside antenna, 50 to 75 feet long including lead-in, will give best results. The antenna should be erected as high as possible, as far from surrounding objects as is practical, and at right angles to street car lines and power lines. Connect the antenna lead-in wire to the antenna clip at the rear of the radio.

No ground wire is required with this radio.

**POWER**—This receiver has been designed to operate on 105-125 volts, either DC or 50- to 60-cycle AC. If you are in doubt as to the voltage of your power supply, consult your local power company. Do not insert the plug in the power receptacle unless you are sure that the correct voltage is available.

OPERATION

**CONTROLS**—The knob on the left is both the on-off switch and the volume control. When this control is turned all the way to the left the set is off. A slight ro-

MODELS 84BR-1515A, 84BR-1516A, MONTGOMERY WARD  
84BR-1815A, 84BR-1816A

tation to the right clicks the switch and turns the set on. The knob may then be used to regulate the volume. Be sure your radio is turned completely off when not in use; otherwise the tubes will wear out unnecessarily.

The knob on the right is the tuning knob; it may be used to tune in stations on the standard broadcast band. When selecting a station turn the knob back and forth until the tone is clearest and loudest. Do not use the tuning knob to regulate volume; the volume control should be used for that purpose after the station has been tuned in properly.

The operating frequency, in kilocycles, of each of your local stations is usually listed in the radio section of your newspaper. The numbers on the radio dial may be converted into kilocycles by multiplying by 10. For example, 80 on the dial represents 800 kilocycles.

**DC OPERATION**—On direct current the set will not operate with the plug in one position in the receptacle, but will operate normally with the plug in the other position. Insert the plug and turn the volume control to the right. If no sound is heard after one minute, reverse the plug.

**AC OPERATION**—Insert the line-cord into your AC receptacle. Turn the set on and wait 30 seconds for tubes to warm up; tune in a station; keep the volume low. A low steady hum may be heard. Reverse the plug in the receptacle and notice whether there is any difference. Leave the plug in the position which gives less hum.

Ref. No.	Part No.	Description	Qty. Used
<b>CAPACITORS</b>			
C13, C14	A-8C-15030	Electrolytic, 40 mfd x 40 mfd x 150 volts	1
C4	C-8G-12198	.000047 mfd, ceramic	1
C1	C-8G-11734	100 mmf, 20%, ceramic	1
C7, C10	C-8G-11733	.00022 mmf, ceramic	2
C9	C-8D-10778	.002 x 600 volts, paper	1
C11	C-8D-10935	.005 x 600 volts, paper	1
C12	C-8D-11738	.01 x 200 volts, paper	1
C6	C-8D-10770	.05 x 200 volts, paper	1
C15	C-8D-10813	.05 x 400 volts, paper	1
C8	C-8D-10953	.15 x 400 volts, paper	1
C5	A-2M-14468	Trimmer plate for osc. small, with 1 ear	1
C3	A-2M-12618	Trimmer plate for antenna, small, with 2 ears	1
C3, C5	A-2M-14467	Trimmer bottom plate, for both trimmers. Large, flat, with 1 ear	2
	A-6M-12616	Insulator, clear, for antenna	1
	B-6M-12616-S-2	Insulator, silvered, for osc.	1
<b>RESISTORS</b>			
R3, S1	A-10A-12380	Volume control (1 megohm) and switch	1
R1	C-9B1-78	22K ohms, 1/2 watt, 10%	1
R10	C-9B1-43	27 ohms, 1/2 watt, 10%	1
R4	C-9B1-34	3.3 megohms, 1/2 watt, 20%	1
R8	C-9B1-52	150 ohms, 1/2 watt, 10%	1
R9	C-9B2-62	1000 ohms, 1 watt, 10%	1
R2, R7	C-9B1-94	470K ohms, 1/2 watt, 10%	2
R6	C-9B1-90	220K ohms, 1/2 watt, 10%	1
R5	C-9B1-36	6.8 megohms, 1/2 watt, 20%	1
<b>SPEAKER</b>			
	B-18A-14390	Speaker, 4" P.M., less trans former	1
T5	B-12C-14320	Output transformer, for speaker	1
<b>COILS</b>			
T3	B-13A-13071	Input I.F. transformer	1
T4	B-13B-13072	Output I.F. transformer	1
T2	A-13D-14418	Oscillator coil assembly	1
T1	A-13E-14417	Antenna coil assembly	1
	B-51A-13812	Iron core for oscillator coil	1
	or		
	A-51A-12443	Iron core for antenna coil	1
	B-51A-14463	Iron core for antenna coil	1
	or		
	B-51A-14396	Iron core for antenna coil	1

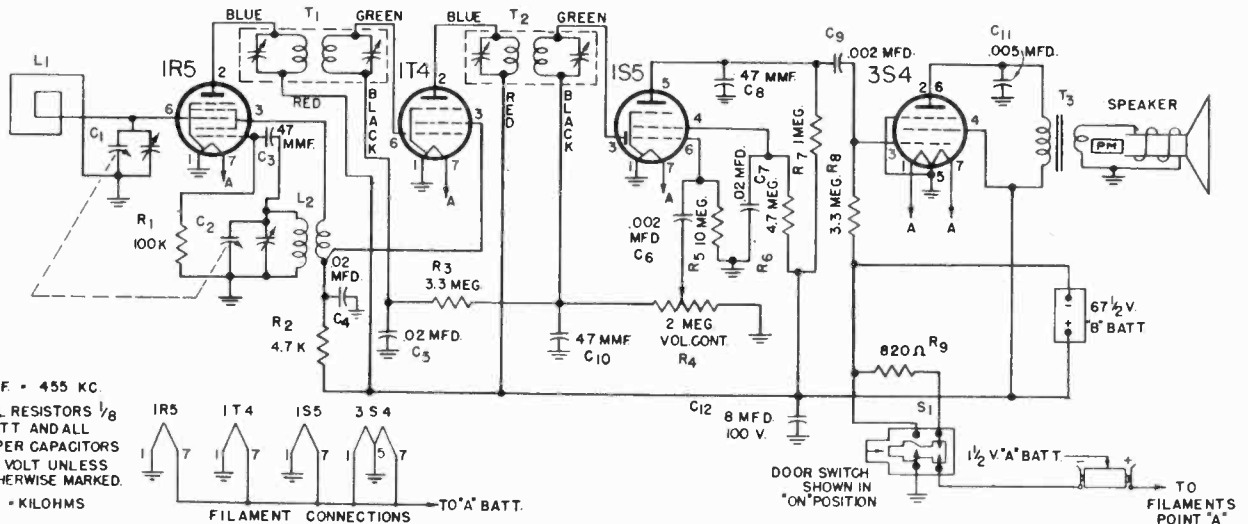
NOTE: Ref. No. C8, Part No. C-8D-10935 should be C-8D-10953.

Ref. No.	Part No.	Description	Qty. Used
<b>DIAL AND TUNING PARTS</b>			
	B-29A-7479	Washer, used with tension spring	1
	A-2J-13522	Tension spring for dial ring gear	1
	A-3A-13478	Drive shaft	1
	A-3L-12388	Drive pinion	1
	A-200-14497	Dial ring gear and pointer assembly	1
<b>MODELS 84BR-1515A 84BR-1516A</b>			
	B-23G-13951	Dial scale, (Decal)	1
	A-5B-13948-8	Knob, Ivory	2
	A-5B-13948-37	Knob, Walnut	2
<b>MODELS 84BR-1815A 84BR-1816A</b>			
	B-6D-15086	Dial scale	1
	A-5B-15067-63	Knob, Ivory	2
	D-5C-14466-64	Escutcheon	1
	A-43D-15144	Push-on clips	2
<b>MISCELLANEOUS</b>			
	A-2M-10096	Snap-in rivet to fasten top of antenna plate	2
	B-2M-11205	Snap-in rivet to fasten bottom of antenna plate	2
	A-15C-13174	Socket, 7-prong, miniature	5
	B-14M-10088-3	Line cord	1
	A-2H-10974	Tube shield	2
<b>MODELS 84BR-1515A 84BR-1516A</b>			
	5C-12514-9	Cabinet, Ivory color	1
	5C-12514-36	Cabinet, Walnut color	1
	B-13E-14421	Antenna plate	1
<b>MODELS 84BR-1815A 84BR-1816A</b>			
	D-24D-14321	Cabinet, walnut	1
	D-24D-14321	Cabinet, bleached	1
	B-13E-15100	Antenna plate	1

NOTE:— CORRECT DRIVE SHAFT NUMBER IS: A-3A-15154.

MONTGOMERY WARD

MODEL 84GCB-1062A



This radio is a condenser tuned receiver using cut plate tracking oscillator section and employs four tubes in a superheterodyne circuit. A highly efficient litz wound loop is assembled in a low loss polystyrene cover and is connected to the receiver input by means of flexible plastic covered leads passing through an insulating bushing. No provision is made for the use of an external antenna.

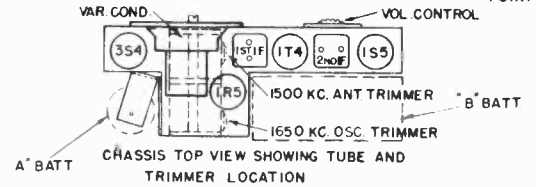
Power is obtained from a single 1 1/2 volt flashlight type cell and a 67 1/2 volt "B" battery. All tube filaments are connected in parallel. A.V.C. voltage is applied to the I.F. amplifier tube only. Bias for the output tube is obtained from a resistor in the minus B lead.

**ELECTRICAL SPECIFICATIONS**

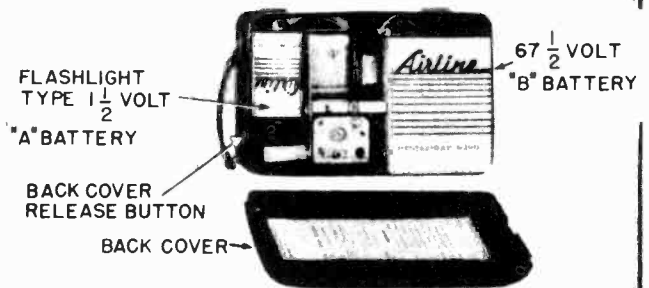
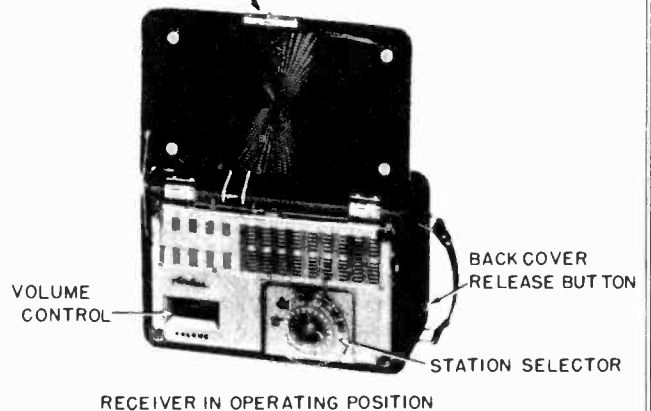
- Power Supply.....1 1/2 volt "A" cell @ 250 MA and 67 1/2 volt "B" battery @ 9 MA (with fresh batteries)
- Frequency Range...540 to 1650 KC
- Intermediate Freq. ...455 KC
- Selectivity .....At 1000 Kilocycles, 28 KC at 10 X signal
- Sensitivity .....400 Microvolts per meter average for .05 watt output.
- Power Output .....70 Milliwatts undistorted (with fresh batteries)
- Loud Speaker .....2 1/2" P.M. v.c. impedance 3.2 ohms
- Tube Complement....1R5 Converter  
 1T4 I.F. Amplifier  
 1S5 Detector, AVC, audio amplifier  
 3S4 Power Amplifier

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

QUANTITY	TYPE	MANUFACTURER
1	1 1/2 volt "A"	Airline #62-23, Eveready size "D", Burgess No. 2, Ray-O-Vac size "D" or equivalent.



FRONT COVER RELEASE CATCH



- 1 67 1/2 volt "B" Airline #62-43 or #62-10, Eveready #467, Burgess type XXD, Ray-O-Vac Type #4367 or equivalent.

**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 measurements.

In order to make the adjustments listed in the table below, it is necessary to first remove the front panel in order to remove the chassis from the cabinet. The loop leads must also be disconnected (unsolder) and extended by means of short leads. 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 permissible. Volume control 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 (front section)	Chassis	Variable Condenser fully open	Trimmers 1st and 2nd I.F. transformer	100 microvolts
1650 KC	Coupling loop see note 1	None	None	Variable Condenser fully open	Oscillator Trimmer (Rear section)	-----
1500 KC	Coupling loop see note 2	None	None	1500 KC	Ant. trimmer (front section)	-----
400 cycles	.1 mfd condenser	High side of volume control	Chassis	-----	-----	.045 volts

Note 1 - Connect signal generator leads to a three turn radiating loop approximately 4" in diameter placed about 8" from the loop of the receiver.

Note 2 - After chassis is installed in cabinet and re-connected to its loop re-adjust the antenna trimmer by ear, with low signal input.

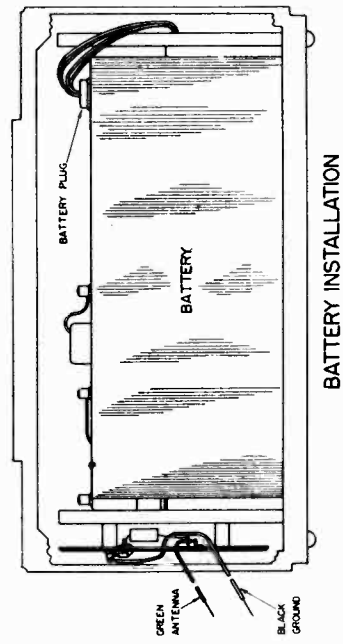
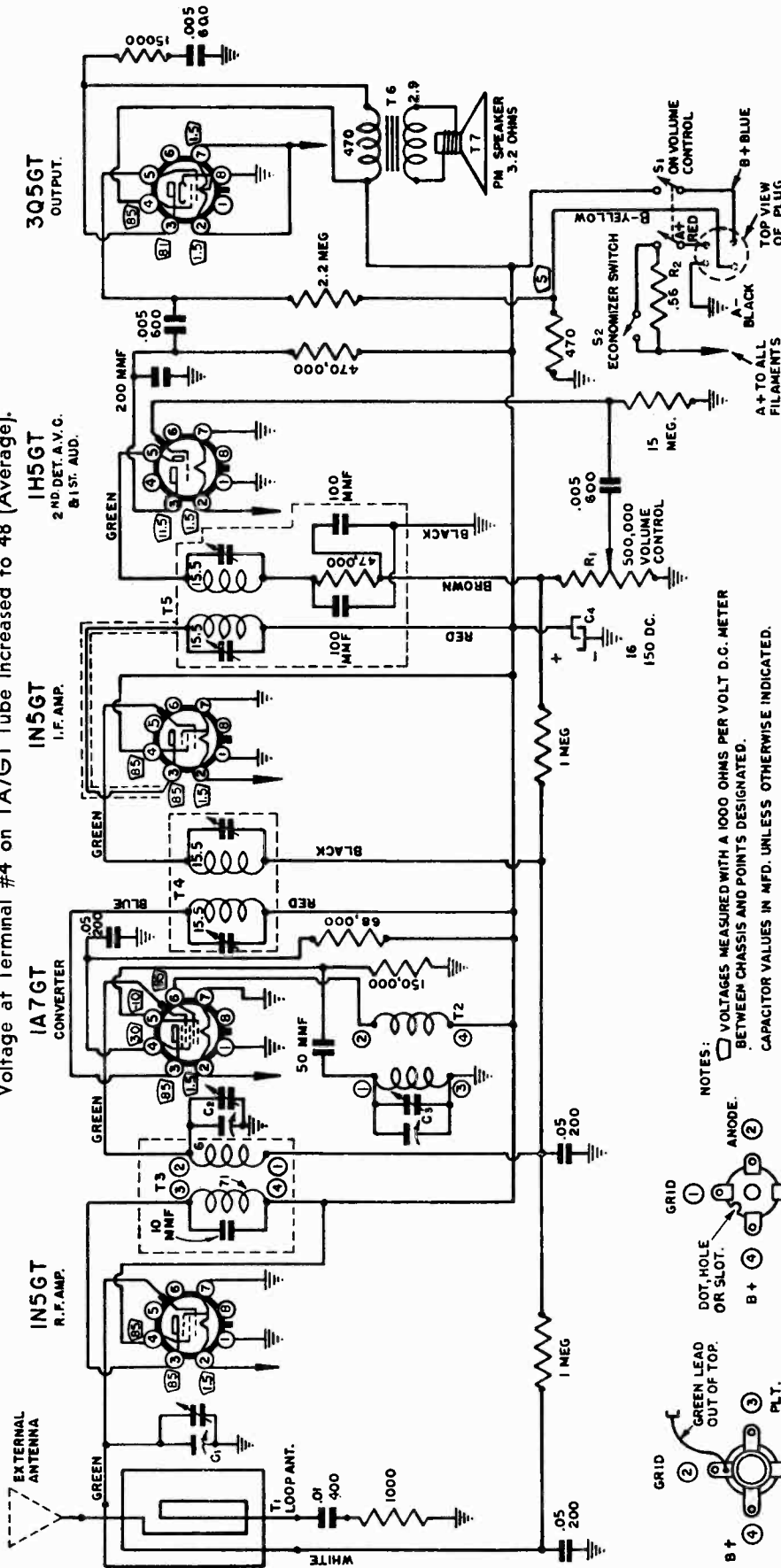
Ref. No.	Part No.	Description	Qty. Used
<b>CAPACITORS</b>			
C12	5.417	Electrolytic, 8 mfd. 100 V.	1
C3, C8, C10	4.109-12	47 mmf. Ceramic	3
C6, C9	3.101-3	.002 x 150 volts, Paper	2
C11	3.101-5	.005 x 150 volts, Paper	1
C4, C5, C7	3.101-11	.02 x 150 volts, Paper	3
<b>RESISTORS</b>			
R4	8.216-1	Volume Control (2 meg-ohms)	1
R9	7.105-185	820 ohms 1/2 watt, 20%	1
R2	7.105-13	4.7 K 1/2 watt, 20%	1
R1	7.105-45	100 K ohms, 1/2 watt, 20%	1
R3, R8	7.105-101	3.3 Meg ohm, 1/2 watt, 20%	2
R6	7.105-164	4.7 meg ohm, 1/2 watt, 20%	1
R5	7.105-171	10 meg ohm, 1/2 watt, 20%	1
<b>SPEAKER</b>			
	30.315	Speaker, 2 1/2" P.M., less trans.	1
T3	9.207-A	Output Transformer	1
<b>COILS</b>			
T1	1.412-2	Input I.F. Transformer	1
T2	1.413-2	Output I.F. Transformer	1
L2	1.466	Oscillator Coil	1
L1	35.209	Loop Ant. Assembled to plate	1
<b>DIAL PARTS</b>			
	13.123	Tuning Knob	1
	13.124	Volume Knob	1
<b>MISCELLANEOUS</b>			
	35.246	Cabinet complete (less loop plate and front panel and baffle) specify color	1
	13.155	Back Cover (specify Color)	1
	35.244	Front Cover (with catch and stay arm)	1
	35.245	Front Panel (with screws)	1
	35.198	Handle with loops	1
	33.172	Snap-in Rivet, for holding loop antenna	4
	24.220	Socket, 7 prong, miniature	4
	35.243	Door Switch (with resistor)	1
	35.242	"A" Battery holder assembly (less output transformer)	1
	35.210	"B" Battery connector ass'y	1

MONTGOMERY WARD

MODEL 84KR-1209B

Note on "B" Models—Resistor - 68,000 Ohm in Screen Circuit of 1A7GT Tube, Replaced with 33,000 Ohm.

Voltage at Terminal #4 on 1A7GT Tube increased to 48 (Average).



NOTES:   
 □ VOLTAGES MEASURED WITH A 1000 OHMS PER VOLT D.C. METER BETWEEN CHASSIS AND POINTS DESIGNATED.   
 CAPACITOR VALUES IN MFD. UNLESS OTHERWISE INDICATED.   
 RESISTOR AND COIL VALUE IN OHMS.   
 WHERE VALUE OF COILS IS NOT SHOWN, RESISTANCE IS LESS THAN ONE OHM.   
 ALL RESISTORS ARE RATED AT 1/2 WATT, ±20%

VIEW OF COILS.   
 T2  
 GRID (1) ANODE (2) GRND. (3)   
 T3  
 GRID (2) DOT, HOLE OR SLOT. (3) B+ (4) AVC (1)   
 GREEN LEAD OUT OF TOP. (3) PLT.   
 B+

- TUNING RANGE . . . 535-1620 KC.
- INTERMEDIATE-FREQUENCY . . . 455 KC.
- SELECTIVITY . . . Over-all band width 35 KC at 1000 X signal at 1000 KC.
- SENSITIVITY . . . 12 Microvolts for 50 Milliwatts output.
- POWER OUTPUT . . . 150 M. W. undistorted 330 M. W. maximum.
- LOUD SPEAKER . . . 5 inch diameter P. M. Magnet 2.15 oz. Alnico V. Voice coil 3.2 ohms impedance.



RECEIVER STAGE SENSITIVITIES

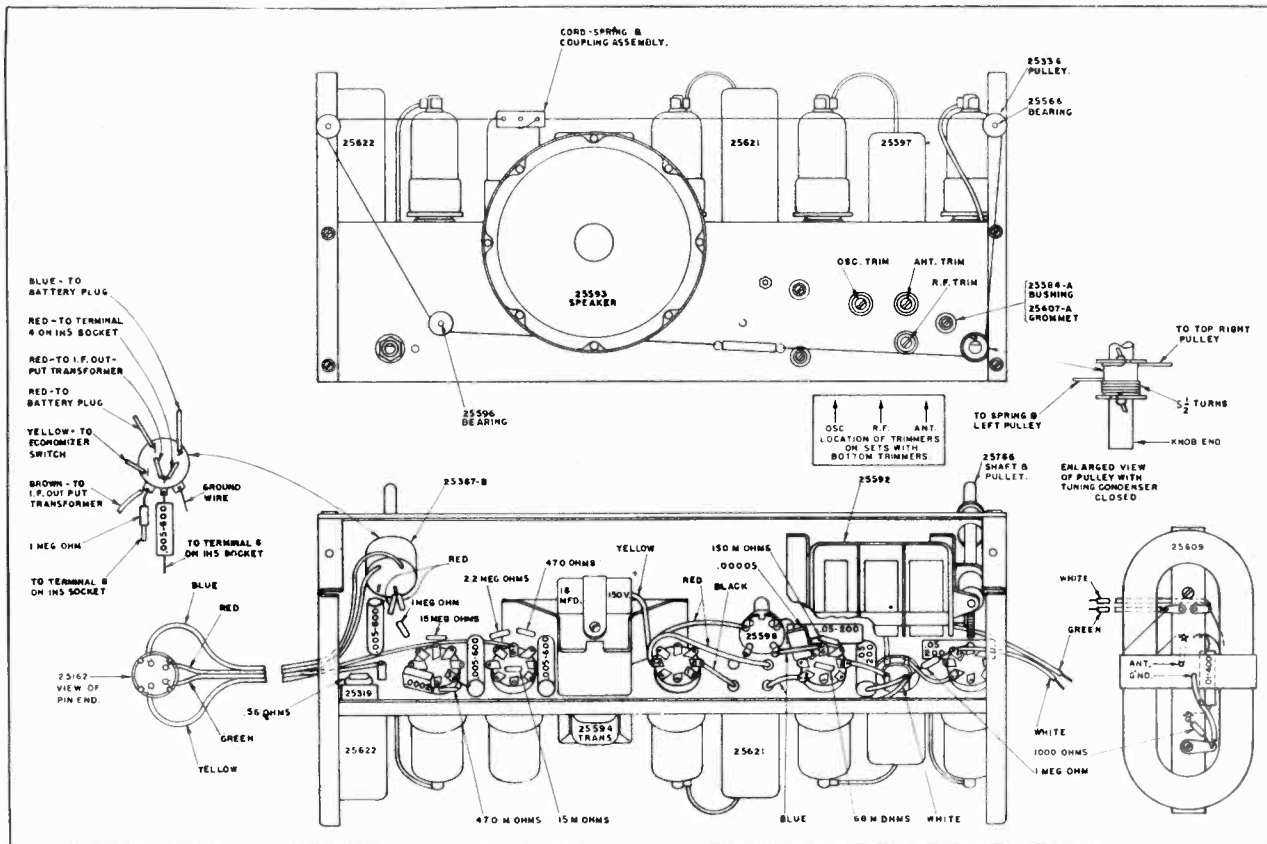
The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 kc for all readings. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm, 5-watt resistor across the secondary winding of the output transformer. A reading of 0.4 volts AC across this resistor will be equivalent to a 50-milliwatt output with the

speaker connected.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 kc and 455 kc signals modulated 30% with a 400-cycle audio signal. Variations of plus or minus 25% are usually permissible.

The volume control must be set to maximum.

SIGNAL GENERATOR				INPUT FOR 50 MILLIWATT OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RADIO	GROUND CONNECTION	
1000 KC	200 Mmf or RMA Dummy Antenna	External Antenna Clip	To Ground Lead	12 uv
1000 KC	.1 Mfd.	Grid (Top Connection) of R. F. Amp. (1N5)	To Chassis	20 uv
1000 KC	.1 Mfd.	Grid (Top Connection) of Converter (1A7)	To Chassis	220 uv
455 KC	.1 Mfd.	Grid (Top Connection) of Converter (1A7)	To Chassis	125 uv
455 KC	.1 Mfd.	Grid (Top Connection) I. F. Amp. (1N5)	To Chassis	6000 uv
400 Cycles	.1 Mfd.	Grid (Top Connection) Audio Amp. (1H5)	To Chassis	.1 v.
400 Cycles	.1 Mfd.	Grid (Pin) of Output Amp. (3Q5)	To Chassis	1.5 v.



MONTGOMERY WARD

MODEL 8LKR-1209B

- Output meter across 3.2-ohm output load.
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed

to keep output near 0.4 volts.

- Loop antenna should be connected to receiver and in its proper position when making adjustments.

SIGNAL GENERATOR				TUNER SETTING	ADJUST TRIMMERS TO MAXIMUM OUTPUT IN ORDER SHOWN
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RADIO	GROUND CONNECTION		
455 KC	.1	Grid Cap of 1N5GT (I.F.)	To Chassis	Capacitor full open (plates out of mesh)	2 trimmers on output IF can T5 (25622)
455 KC	.1	Grid Cap of 1A7GT	To Chassis	Capacitor full open (plates out of mesh)	2 trimmers on input IF can T4 (25621)
1620 KC	200 Mmf	Antenna Lead	To Chassis	Capacitor full open (plates out of mesh)	Oscillator trimmer C3 on gang
1400 KC	200 Mmf	Antenna Lead	To Chassis	Set dial pointer at 1400 KC	Antenna and R. F. trimmers C1, C2 on gang

Ref. No.	Part No.	Description	Qty. Used In Set
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Ref. No.	Part No.	Description	Qty. Used In Set
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CAPACITORS

C 1-2-3	25592	3 Gang Tuning Capacitor Including Trimmers	1
C 4	25600	Electrolytic 16 Mfd. 150 V.	1
	8661	.05 Mfd. 200 V. Tubular	3
	8583	.01 Mfd. 400 V. Tubular	1
	14061	.005 Mfd. 600 V. Tubular	3
	14370	200 Mmf. Mica	1
	17091	50 Mmf. Mica	1

RESISTORS

R 1	25367	Control-Volume Including On-Off Switch	1
	14365	15 Megohm 1/2 Watt 20%	1
	25134	2.2 Megohm 1/2 Watt 20%	1
	8766	1 Megohm 1/2 Watt 20%	2
	25042	470,000 Ohm 1/2 Watt 20%	1
	14616	150,000 Ohm 1/2 Watt 20%	1
NOTE—	25040	68,000 Ohm 1/2 Watt 20%	1
	17164	15,000 Ohm 1/2 Watt 20%	1
	25414	1,000 Ohm 1/2 Watt 20%	1
	25085	470 Ohm 1/2 Watt 20%	1
	25613	.56 Ohm 1/2 Watt 10%—Wire Wound	1

TRANSFORMERS AND COILS

T.1	25609	Loop Antenna (Includes Mounting Strips and Termination)	1
T 2	25598	Oscillator	1
T 3	25597	(Includes Shield Can and 10 Mmf. Condenser)	1
T 4	25621	Transformer—IF Input	1
T 5	25622	Transformer — IF Output (Complete in Can — Includes 2 - 100 Mmf. Capacitors Built-In With Trimmers)	1
T 6	25594	Transformer—Speaker (Includes Mounting Clamp)	1

SPEAKER

T 7	25593	5" P. M. Speaker	1
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SWITCHES

S 1		Part of Volume Control	
S 2	25319	S. P. S. T. Slide Switch	1

DIAL AND TUNING PARTS

	25566	Bearing—Short (For Upper Wood Pulleys)	2
	25596	Bearing—Long (For Lower Wood Pulley)	1
	25767	Cord — Dial (Includes Spring and Pointer Coupling)	1
	25336	Pulley—Wood	3
	25809	Plate—Assembly (Includes Dial Backing Plate with Bracket, Track and Pointer)	1
	25586	Pointer	1
	25581	Track (For Pointer)	1
	25590	Scale—Dial	1
	25766	Shaft — Tuning (Includes "Spool" Pulley)	1
	25774	Screw — Set 8 — 32 x 1/8 (Used in Worm Gear of Tuning Condenser)	1
	25654	Screw — Wood — 4 x 1/4 (Mounting Dial Back Plate)	4

MISCELLANEOUS

	25553	Back — Chassis (Removable Back Plate)	1
	25591	Cabinet—Wood	1
	25603	Cap—Grid	4
	25605	End—Chassis	2
	25696	Knob—Bakelite	2
	25612	Plug — 4 Prong (For Battery Cable)	1
	25620	Socket—Octal, For Tubes	5
	25618	Screw — 10-32 x 7/8 (For Mounting Chassis)	2

\*The values of the resistors listed above are based on RMA standards. Due to conditions beyond our control some receivers have been shipped with resistors of pre-standardized values. This receiver will operate equally

well with resistors of either group. An illustration of the difference follows:

Pre-standardized value - 50,000 ohms,  
RMA value - 47,000 ohms,

Note on "B" Models—#25040 resistor replaced with #25144 resistor 33,000 ohm, 1/2 watt 20%.

BATTERY USED . . . (Wards 62-57): Battery dimensions, 16 x 6 5/8 x 4 1/2". "A" 1 1/2 volts. "B" 90 volts. "A" current 300 M. A., B current 11.5 M. A.

**ANTENNA**—For maximum operating performance unwind the full length of the antenna wire from the back of the radio. For local stations it is not necessary to unwind more than sufficient length to obtain satisfactory volume.

**CAUTION**—Do not use a ground connection or attach to a water pipe in any manner.

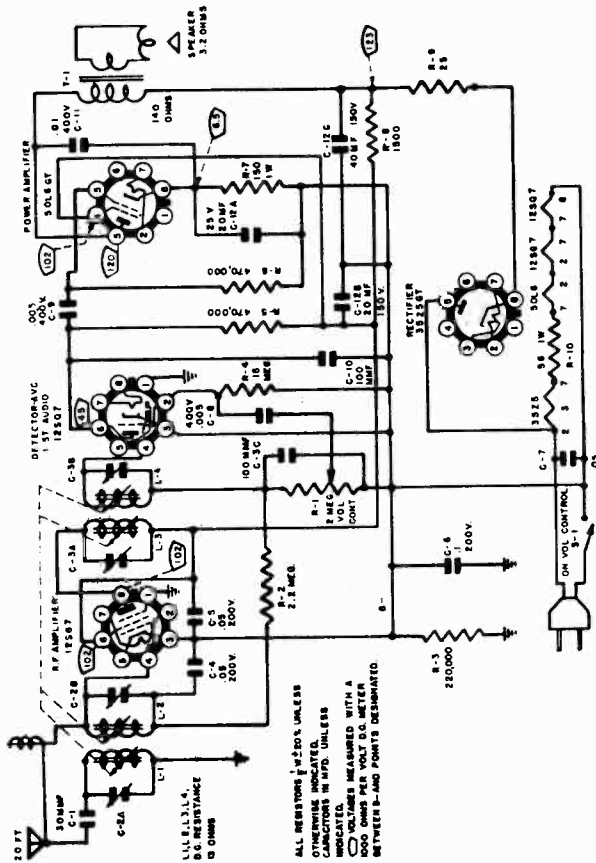
**POWER SUPPLY**—This radio will operate on a power supply of 117 volts AC, 50 to 60 cycle or 117 volts DC. Reverse the line plug, selecting the position which gives the least hum.

**CAUTION**—117 Volt DC Operation—When used on a DC line, if the set does not operate after one minute, reverse the line plug.

**RECEIVER STAGE SENSITIVITIES**

FREQUENCY	SIGNAL GENERATOR		INPUT FOR 50 MW OUTPUT
	COUPLING CAPACITOR	CONNECTION TO RECEIVER	
1000 KC	50 MMF	Disconnect Antenna and use 50 MMF coupling capacitor	450 Microvolts
1000 KC	.05 MFD	I2SG7 R.F., Pin 4	1,400 Microvolts
1000 KC	.05 MFD	I2SQ7 DET., Pin 4	13,000 Microvolts
400 Cycle	.05 MFD	I2SQ7 1st A.F., Pin 2	.024 Volts
400 Cycle	.05 MFD	50L6 Output, Pin 5	1.1 Volts

NOTE: Generator Grounded to B—.



**GENERAL DESCRIPTION**

This model is a 3 tube (plus rectifier) tuned radio frequency receiver using four core tuned circuits.

**ELECTRICAL SPECIFICATIONS**

- POWER SUPPLY . . . . . 105-125 Volt AC or DC  
50-60 Cycles
- FREQUENCY RANGE . . . . . 540-1620 KC
- SELECTIVITY . . . . . 80 KC Broad at 100 times signal, 1,000 KC
- SENSITIVITY . . . . . 450 Microvolts input for 50 MW (.05 watts) output
- POWER OUTPUT . . . . . 1.6 Watts maximum
- LOUD SPEAKER . . . . . 4" PM Dynamic
- VOICE COIL IMPEDANCE . . . . . 3.2 Ohms at 400 cycles
- ANTENNA . . . . . 20 Ft. of Antenna wire attached to radio
- TUBE COMPLEMENT . . . . . I-12SG7 R.F. Amplifier  
I-12SQ7 Det., 1st Audio A.V.C.  
I-50L6 Power Output  
I-35Z5 Rectifier

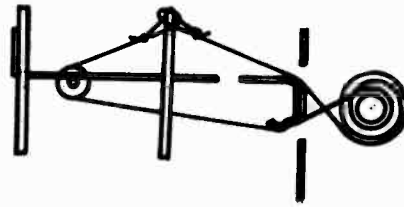
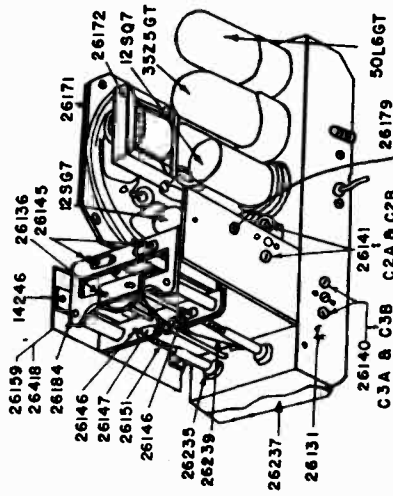
### ALIGNMENT PROCEDURE

Volume Control—Maximum for all adjustments. Use output meter across voice coil terminals. Core adjustment tool can be made by slating end of Bakelite rod.

CAUTION: Do not make any alignment adjustments except at frequencies shown on chart.

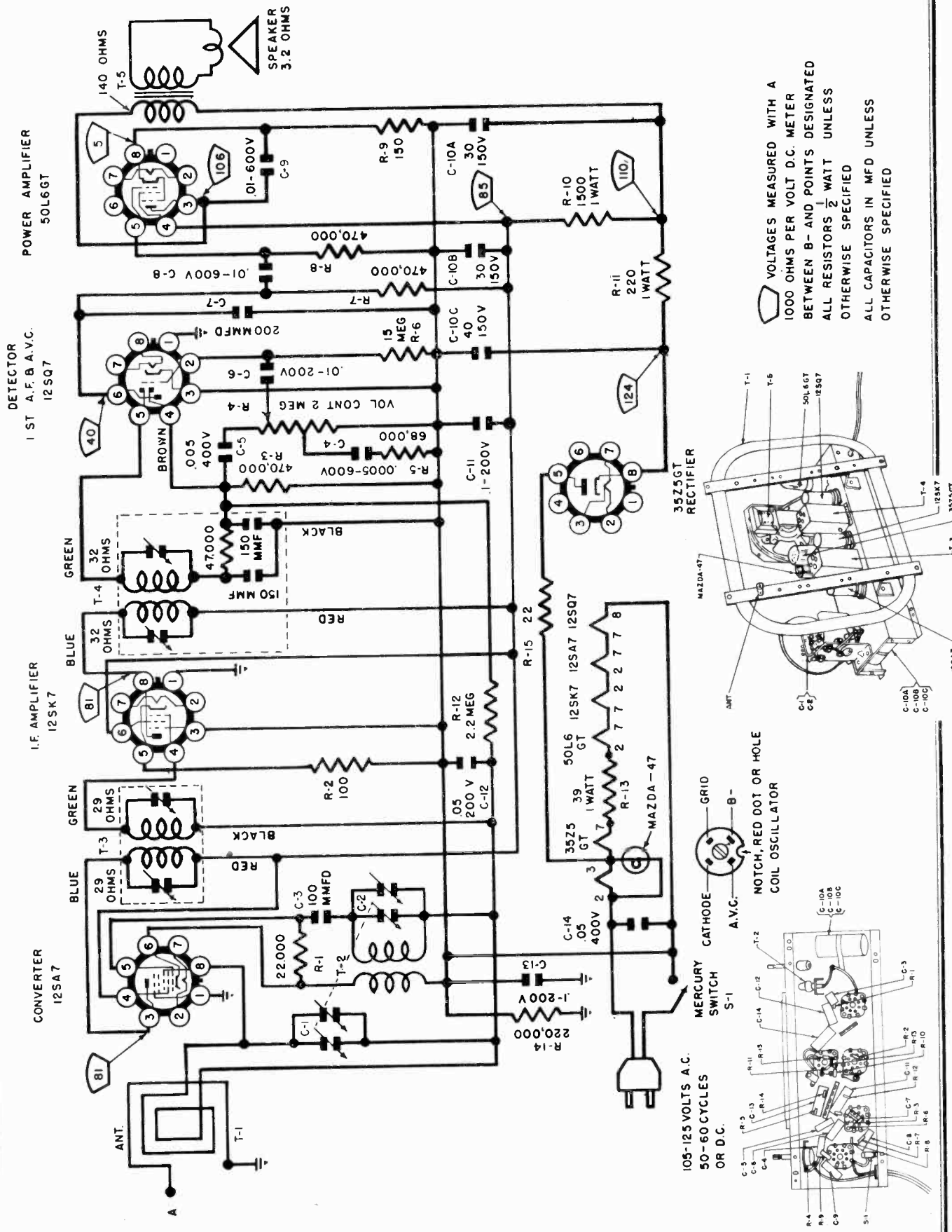
SIGNAL GENERATOR		RADIO	
FREQUENCY SETTING	CONNECTION TO RADIO	DIAL SETTING	ADJUST TO MAXIMUM
1620 KC	No direct connection (See Note)	High frequency extreme (Cores backed out of coils)	Trimmer Condensers 26140, 26141 (Remove cardboard back to expose trimmer adjustment)
1400 KC	No direct connection (See Note)	1400 KC	Cores 26145, 26146 (Be sure there is a resonance point on all 4 cores)

NOTE: Unwind attached antenna wire and place near a short wire connected to signal generator terminal. Do not make direct connection between radio and generator. No ground connection required.



DIAL STRING 9-9/16" over loops

REF. NO.	PART NO.	DESCRIPTION	QTY. USED IN SET	REF. NO.	PART NO.	DESCRIPTION	QTY. USED IN SET
	26236	Ivory White Cabinet	1	26410	Yellow Knob		2
	26291	Red Cabinet	1	26411	Blue Knob		2
	26290	Green Cabinet	1	26147	Nut—Stamped (Used on Cores)		4
	26289	Yellow Cabinet	1	26135-A	Pulley—Dial		1
	26292	Blue Cabinet	1	26110	Resistor—Carbon 150 Ohm 1W.		1
L 1-2-4	26184	Assembly Carriage	1	26006	Resistor—Fuse 25 Ohm		1
	26238	Assembly Coil	3	R 5-6	Resistor—Carbon 470,000 Ohm 1/2W.		2
	26239	Assembly Dial Cord	1	26169	Resistor—Carbon 1500 Ohm 1/2W.		1
L 3	26247	Assembly Plate Coil and Terminal Panel	1	25134	Resistor—Carbon 2.2 Meg. 1/2W.		1
	26180-D	Back—Cabinet—Cardboard	1	25041	Resistor—Carbon 220,000 1/2W.		1
	26189-A	Clip—Electrolytic Condenser Mounting	1	14365	Resistor—Carbon 15 Meg. 1/2W.		1
C 2-A, 2-B	26141-B	Condenser—Trimmer—Input	1	26168-A	Resistor—Wire Wound 56 Ohm 1W.		1
C 3-A, 3-B, 3-C	26140-C	Condenser—Trimmer—Output	1	26170-A	Screw—Chassis Mounting		2
12-A-B-C	26156-B	Condens.—Electrolytic 40-20-150V., 20-25V.	1	26159-A	Scale—Dial—Ivory-Red		1
C 10	26190	Condenser—100 M MF	1	26418	Scale—Dial—Gold-White		1
C 6	26157	Condenser—Tubular .1 — 200V.	1	26131	Shaft—Tuning		1
C 11	8583	Condenser—Tubular .01 — 400V.	1	26171-B	Speaker—4" (Less Transformer)		1
C 4-5-7	8661	Condenser—Tubular .05 — 200V.	3	26148-A	Spring—Pulley Bearing		1
C 8-9	17646	Condenser—Tubular .005 — 400V.	2	26150	Spring—Core Lock (Short)		2
C 1	26412	Condenser—Ceramic 30 M MF	1	26151	Spring—Core Lock (Long)		2
R 1-5-1	26177-A	Control—Volume with Sw. 2.2 Meg.	1	26149	Spring—Tuning Shaft		1
	26145-F	Core—Iron (Short Screw)	2	26237	Spring—Chassis to Cabinet		1
	26146-F	Core—Iron (Long Screw)	2	26172-C	Transformer (For Speaker only)		1
	26235	Grammets—Coil	4	14246	Tri-Mounts (For Dial Scale)		2
	26136-B	Guide—Carriage (Brass Rods)	2	26247	Tri-Mounts (For Back)		3
	26161-B	Ivory White Knob	2	26152-A	Washer—250 O.D., .090 I.D.		4
	26408	Red Knob	2	26181-A	Washer—Cup—Antenna Spool		3
	26409	Green Knob	2	26179	Wire—Antenna 20 Ft.		3



**ALIGNMENT PROCEDURE**

**VOLUME CONTROL  
MAXIMUM FOR ALL ADJUSTMENTS**

The following equipment is required for aligning:  
 A signal generator which will provide an accurately calibrated signal at the test frequencies as listed.  
 Output indicating meter; non-metallic screw driver.  
 Dummy antennas—.1 mfd., 200 mmfd. condensers.

Signal Generator		Connection To Radio	Condenser Setting	Adjust Trimmers To Maximum
Frequency Setting	Dummy Antenna			
455 kc	.1 Mfd.	12SA7, Pin 8	Turn rotor plates to full open	1st IF Transformer 2nd IF Transformer
1620 kc	200 Mmfd.	Antenna Lead "A"	Turn rotor plates to full open	Osc. trimmer on tuning condenser
1400 kc	200 Mmfd.	Antenna Lead "A"	Tune rotor to Maximum output	Ant. section trimmer on tuning condenser

The dial pointer may be adjusted to the scale calibration by slipping the pointer on the dial cord.

**RECEIVER STAGE SENSITIVITIES**

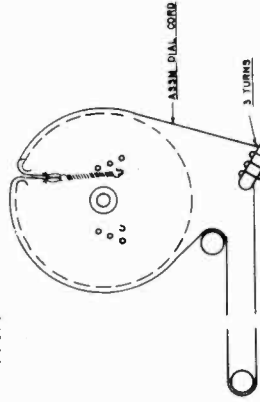
The following table lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .05 watts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of 0.4 volts across this resistor will be equivalent to a .05

watt output with the speaker connected. The volume control must be set to maximum. The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations of Plus or Minus 25% are usually permissible.

**SIGNAL GENERATOR**

Frequency	Coupling Capacitor	Connection to Receiver	Ground Connection	INPUT FOR .05 WATT OUTPUT
1000 kc	200 mmf or RMA Dummy Antenna	External Antenna Lead "A"	No Connection	23 microvolts
1000 kc	.1 mfd.	12 SA7 Mixer, Pin 8	12SK7 Pin 8 (B-)	110 microvolts
455 kc	.1 mfd.	12 SA7 Mixer, Pin 8	Same as above	95 microvolts
455 kc	.1 mfd.	12SK7 I-F, Pin 4	Same as above	5700 microvolts
400 cycles	.1 mfd.	12SQ7 1st A-F, Pin 2	Same as above	.065 volts
400 cycles	.1 mfd.	50L6GT Output, Pin 5	Same as above	1.6 volts

**DIAL CORD REPLACEMENT**—is best accomplished by replacing complete cord assembly No. 26440 which is made up to correct length. In an emergency 30 lb. fish line may be used. See picture for correct installation.



DIAL CORD 31½" OVER LOOPS

**GENERAL DESCRIPTION**

This model is a 4-tube (plus rectifier) A.C.-D.C. End Table Radio. Controls are provided for tuning and volume. Other features include a P. M. dynamic speaker, bass boost circuit, and built-in loop antenna. An automatic "Off-On" switch is provided.

**ELECTRICAL SPECIFICATIONS**

Power Supply . . . . . 105-125 volts A.C. or D.C.  
27 watts.

Frequency Range . . . 540-1620 KC.

Intermediate  
Frequency . . . . . 455 KC.

Selectivity . . . . . 48 KC broad at 1000 times  
signal, 1000 KC.

Sensitivity . . . . . (for .05 watts output) 23 micro-  
volts average.

Power Output . . . . . 550 milliwatts maximum  
330 milliwatts at less than  
10% distortion.

Loud Speaker . . . . . 4" P.M. dynamic.

Voice Coil Impedance 3.2 ohms at 400 cycles.

Tube and Dial Light | 12SA7 Mixer  
Complement . . . . . | 12SK7 I.F. Amp.  
| 12SQ7 2nd Det. 1st AF. & A.V.C.  
| 50L6GT Power output  
| 35Z5GT Rectifier  
| No. 47 Dial Lamn

**ANTENNA**—This radio has an effective self-contained loop antenna and should require no outside antenna for the average installation. If an outside antenna is required, attach to the connection "A" (see Removal of Chassis). The loop is directional and various room locations may affect the stations received.

**CAUTION**—Do not use a ground connection or attach to a water pipe in any manner.

**POWER SUPPLY**—This radio will operate on a power supply of 117 volts A.C. 50-60 cycle, or 117 volts D.C. Reverse the line plug, selecting the position which gives the least hum.

**CAUTION**—117 Volt D.C. Operation—When used on a D.C. line if the set does not operate after one minute reverse the line plug.

**CAPACITORS**

REF. NO.	PART NO.	DESCRIPTION	QTY. USED IN SET
C10-A, C10-B,		Electrolytic-40-30-30	
C10-C	26079	Mfd. 150V.	1
C-14	17531	.05 Mfd. 400V. Tubular	1
C-3	8872	.0001 Mfd. Mica	1
C-7	14370	.0002 Mfd. Mica Ceramic	1
C-12	26467	.05 Mfd. 200V. Tubular	1
C-11, C-13	26157	.1 Mfd. 200V. Tubular	2
C-5	17646	.005 Mfd. 400V. Tubular	1
C-6	8877	.01 Mfd. 200V. Tubular	1
C-8, C-9	8876	.01 Mfd. 600V. Tubular	2
C-1, C-2	26081	Gang Tuning Capocitor	1
C-4	8874	.0005 Mfd. 600V.	1

**RESISTORS**

R-5	25040	68,000 Ohm 1/2 W. Carbon	1
R-3, R-7, R-8	25042	470,000 Ohm 1/2 W. Carbon	3
R-14	25041	220,000 Ohm 1/2 W. Carbon	1
R-1	25038	22,000 Ohm 1/2 W. Carbon	1
R-12	25134	2.2 Meg. 1/2 W. Carbon	1
R-9	25202	150 Ohm 1/2 W. Carbon	1
R-2	26445	100 Ohm 1/2 W. Carbon	1
R-6	14365	15 Meg. 1/2 W. Carbon	1
R-15	26466	22 Ohm 1/2 W. Co-bon	1
R-10	25230	1500 Ohm 1W. Carbon	1
R-11	26084	220 Ohm 1W. Carbon	1
R-13	26085	39 Ohm 1W. Wire Wound	1
R-4	26485	Volume Control	1

**TRANSFORMERS & COILS**

T-1	26439	Loop Antenna	1
T-2	26078	Coil-Oscillator	1
T-4	26432	Transformer-I.F. Output	1

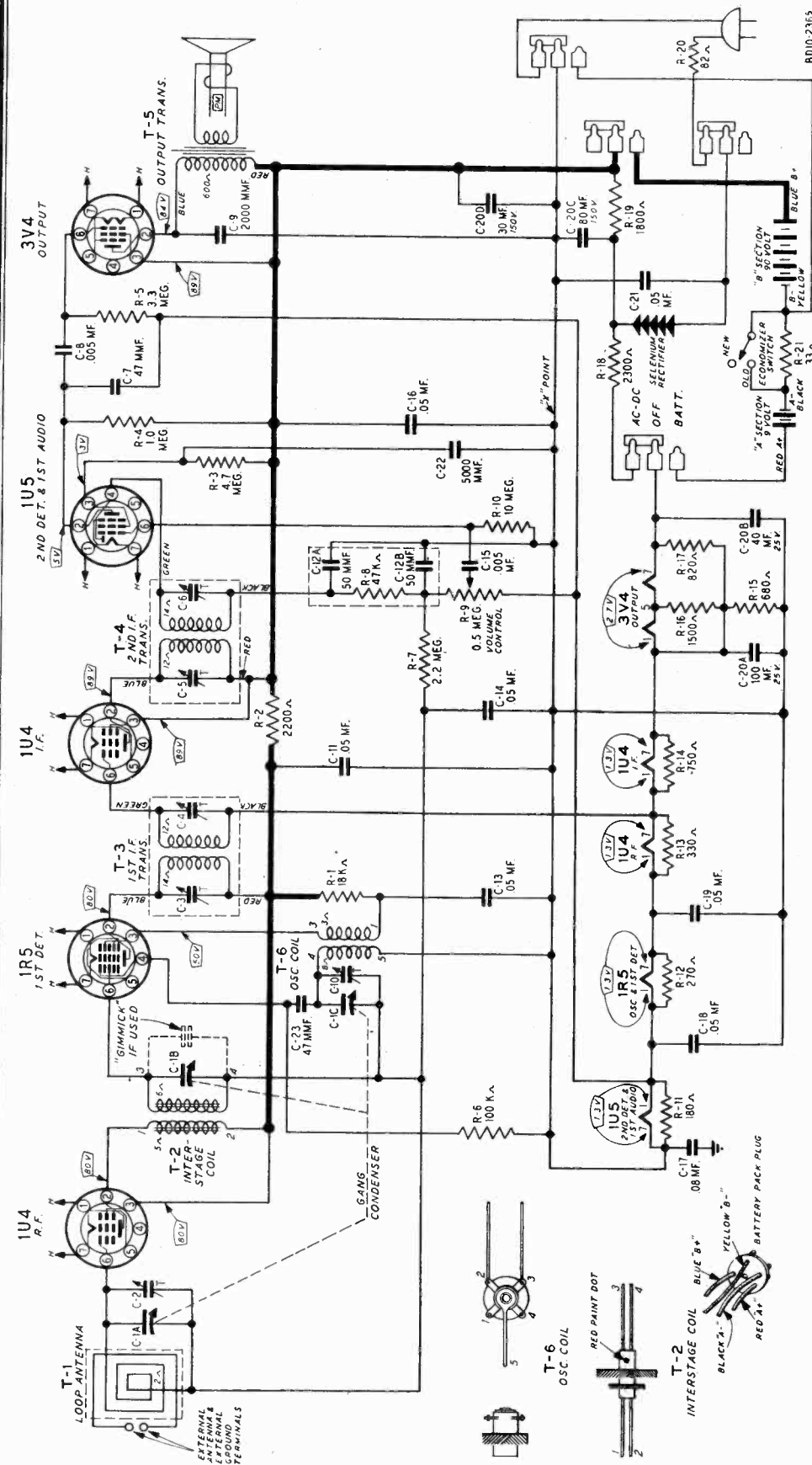
REF. NO.	PART NO.	DESCRIPTION	QTY. USED IN SET
T-3	26433	Transformer-I.F. Input	1
T-5	26092	Transformer Output Speaker Only	1

**DRIVE AND DIAL ASSEMBLY**

	26440	Dial Cord Assembly	1
	26491	Tuning Condenser Pulley and Bearing	1
	25987	Bearing Dial Pulley	2
	26077-B	Bearing-Tuning Shaft	1
	25584-A	Bushing-Headed	3
	25607-B	Rubber Grommet	3
	25925	Dial Pointer	1
	25336	Dial Pulley (Wood)	2
	26026	Set Screw (For Tuning Condenser Pulley)	1
	26086-D	Tuning Shaft	1
	14786	Spring-Dial Cord	1
	26429	Track-Dial Pointer	1
	17466	"C" Washer	1
	26452	Knob—Volume and Tuning	2
	26453-B	Dial Scale	1

**MISCELLANEOUS**

	26438	4" Speaker & Transformer	1
	26428	Bracket—Speaker Mounting	1
	26240	Cord—AC with Plug	1
	26087	Socket—Dial Lamp	1
	26139	Socket—Tube	5
	26171-B	4" PM Speaker Only	1
	26089	Mercury Switch	1
	26094-B	Washer—Strip (For I.F. Transformer)	1
	26099	Hinge Pin for Door Front	2



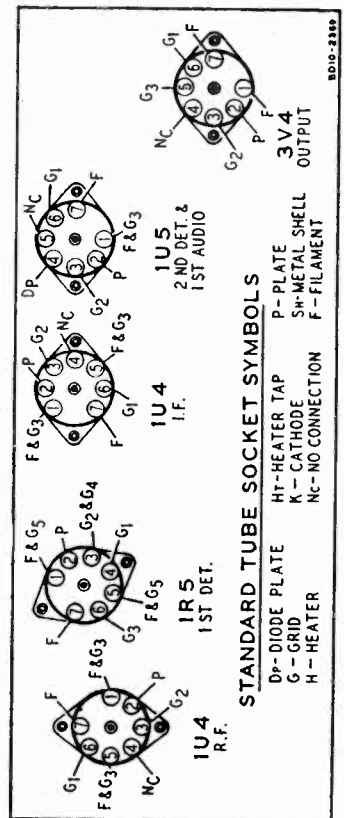
**TUBE SOCKET VOLTAGES**

Socket voltages are shown on the schematic diagram at the tube socket terminals with set operating on AC. All voltages except those for the filaments are between the socket terminal and "X" point.

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

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

A variation of ±10% is usually permissible.



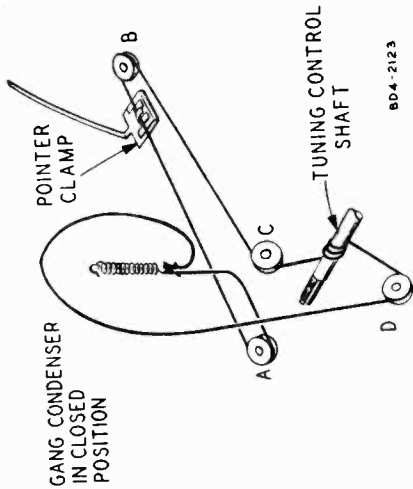
**STANDARD TUBE SOCKET SYMBOLS**

- DP-DIODE PLATE
- G-GRID
- H-HEATER
- K-CATHODE
- NC-NO CONNECTION
- P-METAL SHELL
- F-FILAMENT



**DRIVE CORD REPLACEMENT**

Turn the gang condenser to the fully closed position. Use a new 10X52 Drive Cord Assembly and fasten one end to the tension spring. Fasten the other end of the tension spring to the hook on the drive pulley. Pass the cord through the slot in the drive pulley rim and continue around pulley rim 1/4 turn clockwise. Pass cord around pulleys A, B, and C as shown in the illustration. Wind three turns clockwise (viewed from rear of chassis) around tuning control shaft. The turns must progress toward rear of chassis. Pass cord around pulley D and continue 3/4 turn clockwise around large drive pulley. Pass cord through the slot in the pulley rim then stretch the tension spring and fasten free end of cord to it.



8D4-2123

**ELECTRICAL SPECIFICATIONS**

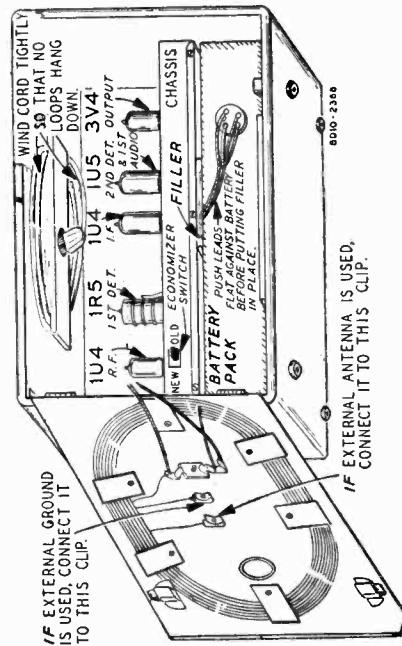
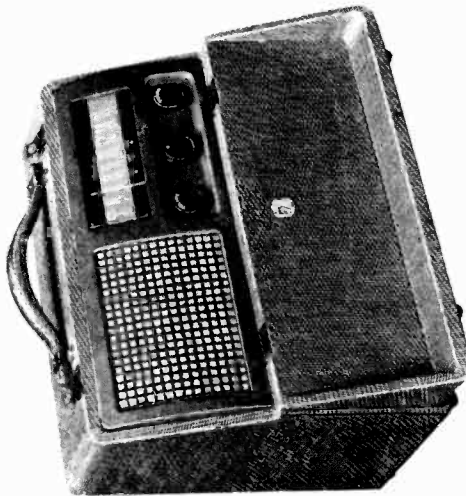
Power Supply....."A" Battery Supply—9 Volts, 50 Ma.  
 "B" Battery Supply—90 Volts, 11 Ma. or 105-125 volts AC, 25-60 cycles, 12 watts or 105-125 volts DC  
 Battery Pack.....Ward's Battery Pack No. 62-35  
 Frequency Range.....540-1600 KC  
 Intermediate Frequency 455 KC  
 Selectivity.....At 1000 KC, 45 KC wide at 1000 times signal  
 Sensitivity.....(for .05 watt output with external antenna) 10 microvolts average  
 Power Output......03 watt maximum  
 Loud Speaker.....0.125 watt 10% distortion  
 Voice Coil Impedance 5 1/4" PM dynamic 3.2 ohms at 400 cycles

**Tube Complement**

- 1 1R5 1st Detector
- 1 1U4 I-F Amplifier
- 1 1U4 R-F Amplifier
- 1 1U5 2nd Detector, AVC and 1st A-F Amplifier
- 1 3V4 Power Output

**GENERAL DESCRIPTION**

This model is a five tube AC-DC or battery operated portable radio. Controls are provided for tuning, volume and AC-DC or Battery selection. Other features include a built-in Air Wave Loop Aerial, automatic volume control, tuned R-F stage, PM dynamic speaker and a selenium rectifier for AC operation. The dial scale is calibrated to cover frequencies between 540 and 1600 kilocycles.



8D10-2308

MONTGOMERY WARD

MODEL 8LWG-1056B

**ALIGNMENT PROCEDURE**

Volume Control—Maximum All Adjustments.  
 Allow Chassis and Signal Generator to "Heat Up" for several Minutes.  
 The equipment in column at right is required for aligning:

Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.  
 Output Indicating Meter; Non-Metallic Screwdriver.  
 Dummy Antenna—.1 mf., 50 mmf.

SIGNAL GENERATOR				CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM See Trimmer Illustration
Frequency Setting	Coupling Capacitor	Connection to Radio	Ground Connection		
455 kc	.1 mf	Control Grid 1U4 I-F Pin 6	"X" Point	Turn Rotor To Full Open	2nd I-F (C-5) & (C-6)
455 kc	.1 mf	Control Grid 1R5 1st Det. Pin 6	"X" Point	Turn Rotor To Full Open	1st I-F (C-3) & (C-4)
1620 kc	.1 mf	Control Grid 1U4 R-F Pin 6	"X" Point	Turn Rotor To Full Open	Oscillator (C-10)
1400 kc Note C	50 mmf	External Antenna Clip On Loop See Note A	External Ground clip on loop	Turn Rotor To Max. Output. Set Indicator to 1400 KC See Note B	Gimmick
1400 kc	Same as Above	Same as Above	Same as Above	Same as Above	Antenna (C-2)

NOTE A—Re-assemble chassis in cabinet and close the cabinet back before making adjustment.

NOTE B—Tune in a 1400 KC signal. If pointer is not at the 1400 KC mark on the dial scale, move the pointer on the string to the 1400 KC mark.

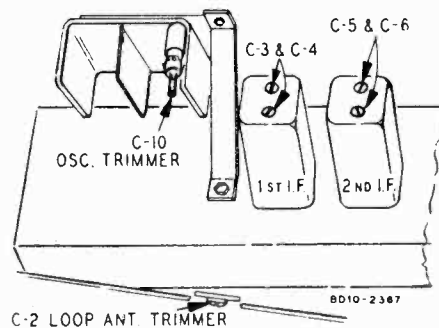
NOTE C—Some receivers may have a "gimmick" capacity formed by twisting two wires together on the gang condenser. The "gimmick" capacity is set at the factory and normally will not require adjustments when realigning the receiver. Adjustment is obtained by twisting or untwisting the wires.

**RECEIVER STAGE SENSITIVITIES**

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm 5 watt resistor across the secondary winding of the output transformer. A reading of .4 volt AC

across this resistor will be equivalent to a 50 milliwatt output with the speaker connected. The volume control must be set to maximum. The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Output variations of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR 50 MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Receiver	Ground Connection	
1000 kc	200 mmf. or RMA Dummy Antenna	Loop Antenna— External antenna clip	Ext. Gnd. Clip	4.0 microvolts
1000 kc	.1 mf.	1U4 R-F—Pin 6	"X" Point	25 microvolts
455 kc	.1 mf.	1R5 1st Detector—Pin 6	"X" Point	90 microvolts
455 kc	.1 mf.	1U4 I-F—Pin 6	"X" Point	3500 microvolts
400 cycles	.1 mf.	1U5 1st A-F—Pin 6	"X" Point	.022 volt
400 cycles	.1 mf.	3V4 Output—Pin 3	"X" Point	1.8 volts



# REPLACEMENT PARTS

Ref. No. Part No. Description Qty. Used in Set

## CAPACITORS

C-1A	} 14A205	Gang Condenser & Drive Pulley.....	1
C-1B			
C-1C			
C-2	17A123	1.5 — 12 mmf Trimmer.....	1
C-3	} Part of T-3 (1st I.F. Transformer)		
C-4			
C-5	} Part of T-4 (2nd I.F. Transformer)		
C-6			
C-7			
C-8	} B66502	.005 mf 200 V Tubular.....	2
C-15			
C-9	47X520	2000 mmf Ceramic.....	1
C-10	26A489	1-8 mmf Trimmer Assy.....	1
C-11	} B66503	.05 mf 200 V Tubular.....	6
C-13			
C-14			
C-16			
C-18			
C-19			
C-12A	} Part of 76X1 Resistor Capacitor Combination		
C-12B			
C-17	B66803	.08 200 V Tubular.....	1
C-20A	} 45X356	100 mf 25 V } Dry	1
C-20B		40 mf 25 V } Electrolytic	
C-20C		80 mf 150 V }	
C-20D		30 mf 150 V }	
C-21	D66503	.05 400 V Tubular.....	1
C-22	47X507	5000 mmf Ceramic.....	1
C-23	47X516	2.0 mmf Ceramic.....	1

## RESISTORS

		Ohms	Watts		
R-1	B84183	18K	.5	Carbon.....	1
R-2	B84222	2200	.5	Carbon.....	1
R-3	B85475	4.7 meg.	.5	Carbon.....	1
R-4	B84105	1 meg.	.5	Carbon.....	1
R-5	B85335	3.3 meg.	.5	Carbon.....	1
R-6	B84104	100K	.5	Carbon.....	1
R-7	B85225	2.2 meg.	.5	Carbon.....	1
R-8	Part of 76X1 Resistor Capacitor Combination				
R-9	36X370	.5 meg.		Volume Control	1
R-10	B85106	10 meg.	.5	Carbon.....	1
R-11	B84181	180	.5	Carbon.....	1
R-12	B84271	270	.5	Carbon.....	1
R-13	B84331	330	.5	Carbon.....	1
R-14	B84751	750	.5	Carbon.....	1
R-15	B84681	680	.5	Carbon.....	1
R-16	B84152	1500	.5	Carbon.....	1
R-17	B84821	820	.5	Carbon.....	1
R-18	43X237	2300		Wire Wound	1
R-19	B84182	1800	.5	Carbon.....	1
R-20	43X223	82		Wire Wound	1
R-21	B85330	33	.5	Carbon.....	1

Ref. No. Part No. Description Qty. Used in Set

## TRANSFORMERS AND COILS

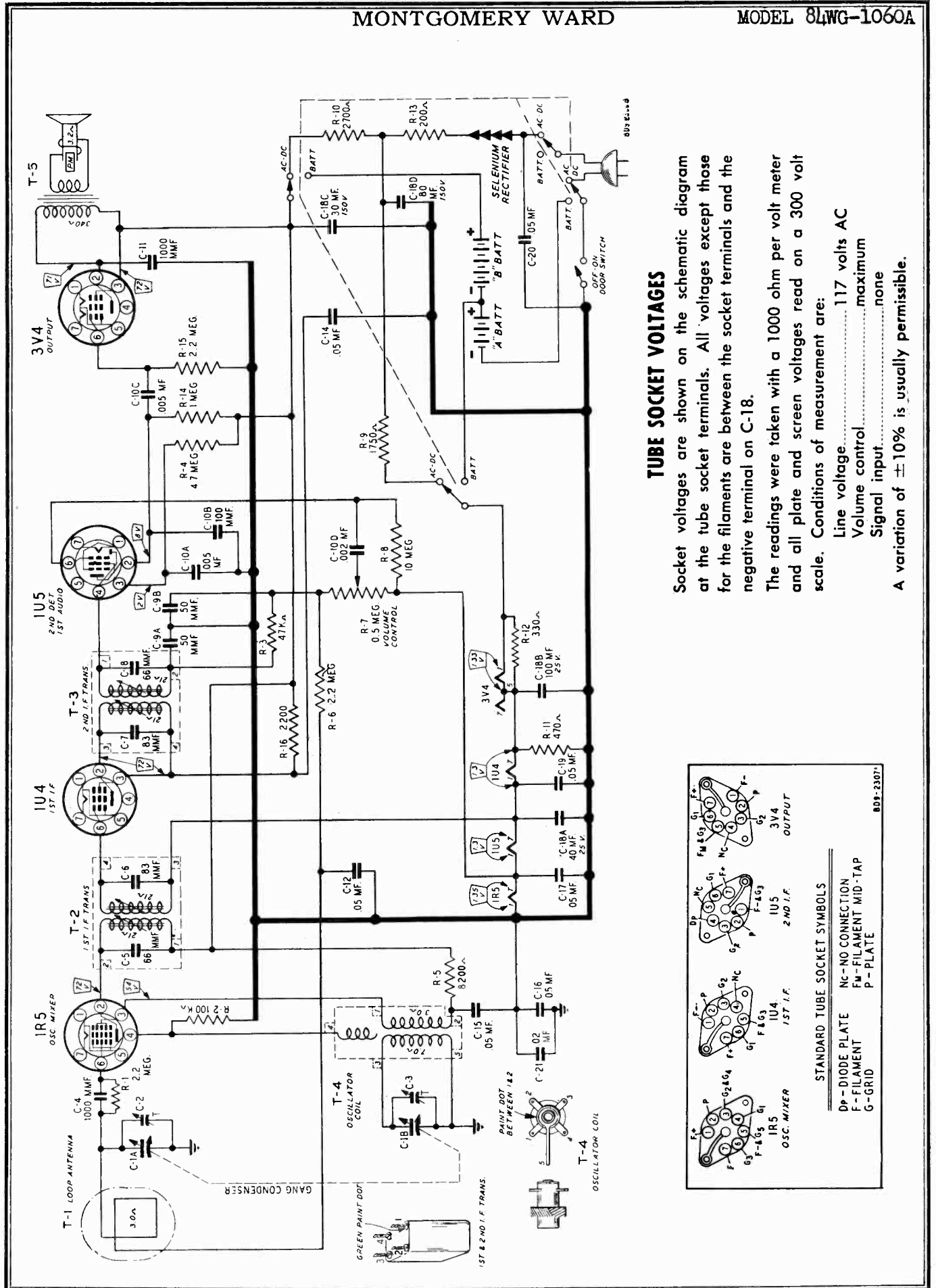
T-1	9A1993	"B" Range Loop Antenna .....	1
T-2	9A1989	Interstage Coil Assembly .....	1
T-3	9A1991	1st I-F Transformer and Can Assembly	1
T-4	9A1992	2nd I-F Transformer and Can Assembly	1
T-5		Output Transformer (see Miscellaneous)	
T-6	9A1990	Oscillator Coil Assembly .....	1

## DIAL AND DRIVE ASSEMBLY

25X1504	Dial Brace Bracket.....	1
58X693	Dial Scale .....	1
17X97*	Celluloid Crystal .....	1
15X191	Pointer (For Dial Scale).....	1
25X832	Gang Condenser Mounting Bracket.....	1
6X21	} Grommet	3
20X329		
	Mtg. Gang Condenser....	3
28X95	Drive Cord Tension Spring.....	1
10X52	Drive Cord Assembly.....	1
4X989	Escutcheon .....	1
26X505	Drive Shaft .....	1
19X192	"C" Washer for Drive Shaft.....	2

## MISCELLANEOUS

12A443	5 1/4" P.M. Speaker complete with Output Transformer .....	1
3A426	Tube Socket (Miniature) .....	5
32X390	Tube Shield (1R5) .....	1
2A175	Battery Saver Switch.....	1
2A371	AC-DC-Off-Batt. Switch .....	1
13X429	Battery Cable and Plug Assembly.....	1
10A626	Knob, Switch .....	1
10A627	Knob, Tuning .....	1
10A628	Knob, Volume .....	1
13X546	Line Cord and Plug Assembly.....	1
11X117	Shield, Volume Control and Switch (Paper) .....	1
32X368	Shield, Volume Control and Switch (Metal) .....	1
66X7	Selenium Rectifier .....	1
76X1	Resistor Capacitor Combination.....	1



**TUBE SOCKET VOLTAGES**

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages except those for the filaments are between the socket terminals and the negative terminal on C-18.

The readings were taken with a 1000 ohm per volt meter and all plate and screen voltages read on a 300 volt scale. Conditions of measurement are:

- Line voltage..... 117 volts AC
  - Volume control..... maximum
  - Signal input..... none
- A variation of ±10% is usually permissible.

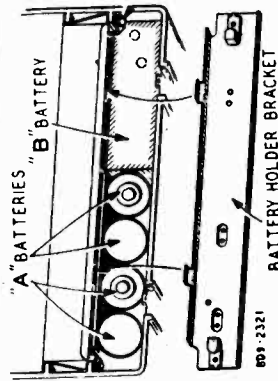
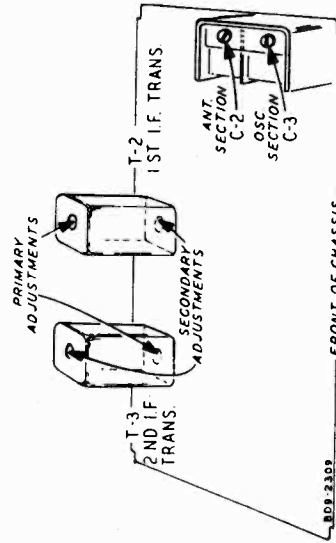
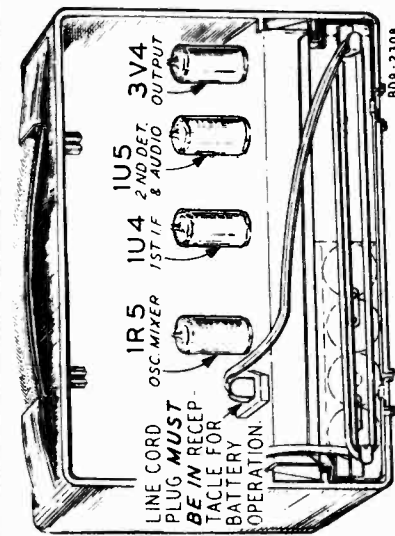
STANDARD TUBE SOCKET SYMBOLS

DP - DIODE PLATE  
 NC - NO CONNECTION  
 F - FILAMENT  
 G - GRID

1R5 OSC. MIXER  
 1U4 1ST I.F.  
 1U5 2ND I.F.  
 3V4 OUTPUT

MODEL 84WG-1060A

MONTGOMERY WARD



**REMOVAL OF CHASSIS FROM CASE**

To remove the chassis from the case it will be necessary to open the front cover and carefully remove the two control knobs, pointer and the screw on the front panel above the volume control knob at the side of the ON-OFF switch plunger. Then open the back cover and unsolder two antenna leads. Remove two chassis mounting clamps located underneath the chassis and withdraw the batteries.

**ALIGNMENT PROCEDURE**

- The following equipment is required for aligning.
  - Dummy Antenna—.1 mf.
  - A Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
  - Output Indicating Meter—Non-Metallic Screwdriver.
- Volume Control — Maximum All Adjustments.
- Allow Signal Generator to "Heat Up" for several minutes.

SIGNAL GENERATOR		RECEIVER	
Frequency Setting	Coupling Capacitor	Connection to Radio	Ground Connection
455 kc	.1 mf	Control Grid 1R5—Pin 6	"X" Point See Note "B"
1610 kc		Loop See Note A	Condenser Setting Adjust for maximum output. See trimmer illustration.
1500 kc		Loop See Note A	Rotor fully open
1400 kc		Loop See Note A	1st IF Pri. & Sec. 2nd IF Pri. & Sec.

Remove chassis from case (See paragraph Removal of Chassis From Case) and temporarily solder a .5 megohm resistor across the two loop terminals on the chassis.

Remove temporary resistor, replace chassis in case and resolder loop leads to terminals.

**NOTE A:** Connect a loop of wire approximately one foot in diameter across the antenna and ground posts of the signal generator. Place radio approximately 2 feet from loop.

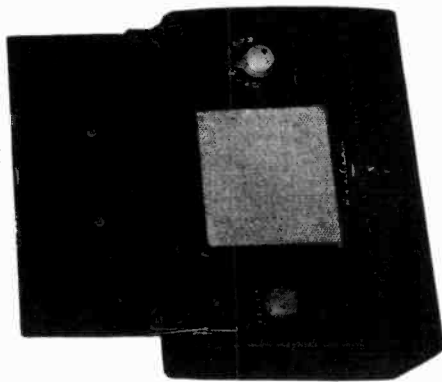
**NOTE B:** Heavy lines (B) on circuit diagram designate "X" Point.

**RECEIVER STAGE SENSITIVITIES**

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm 5 watt resistor across the secondary winding of the output transformer.

A reading of .4 volt across this resistor will be equivalent to a 50 milliwatt output. The volume control must be set to maximum. The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of plus or minus 25% are usually permissible.

SIGNAL GENERATOR		INPUT FOR 50 MILLIWATT OUTPUT	
Freq.	Coupling Capacitor	Connection to Receiver	Ground Connection
1000 kc	.1 mf	1R5 Mixer Pin 6	X Point (Note B, Page 2)
455 kc	.1 mf	1R5 Mixer Pin 6	X Point (Note B, Page 2)
455 kc	.1 mf	1U4 IF Amp. Pin 6	X Point (Note B, Page 2)
400 cycles	.1 mf	1U5 2nd Det. Pin 6	X Point (Note B, Page 2)
400 cycles	.1 mf	3V4 Output Pin 6	X Point (Note B, Page 2)



**GENERAL DESCRIPTION**

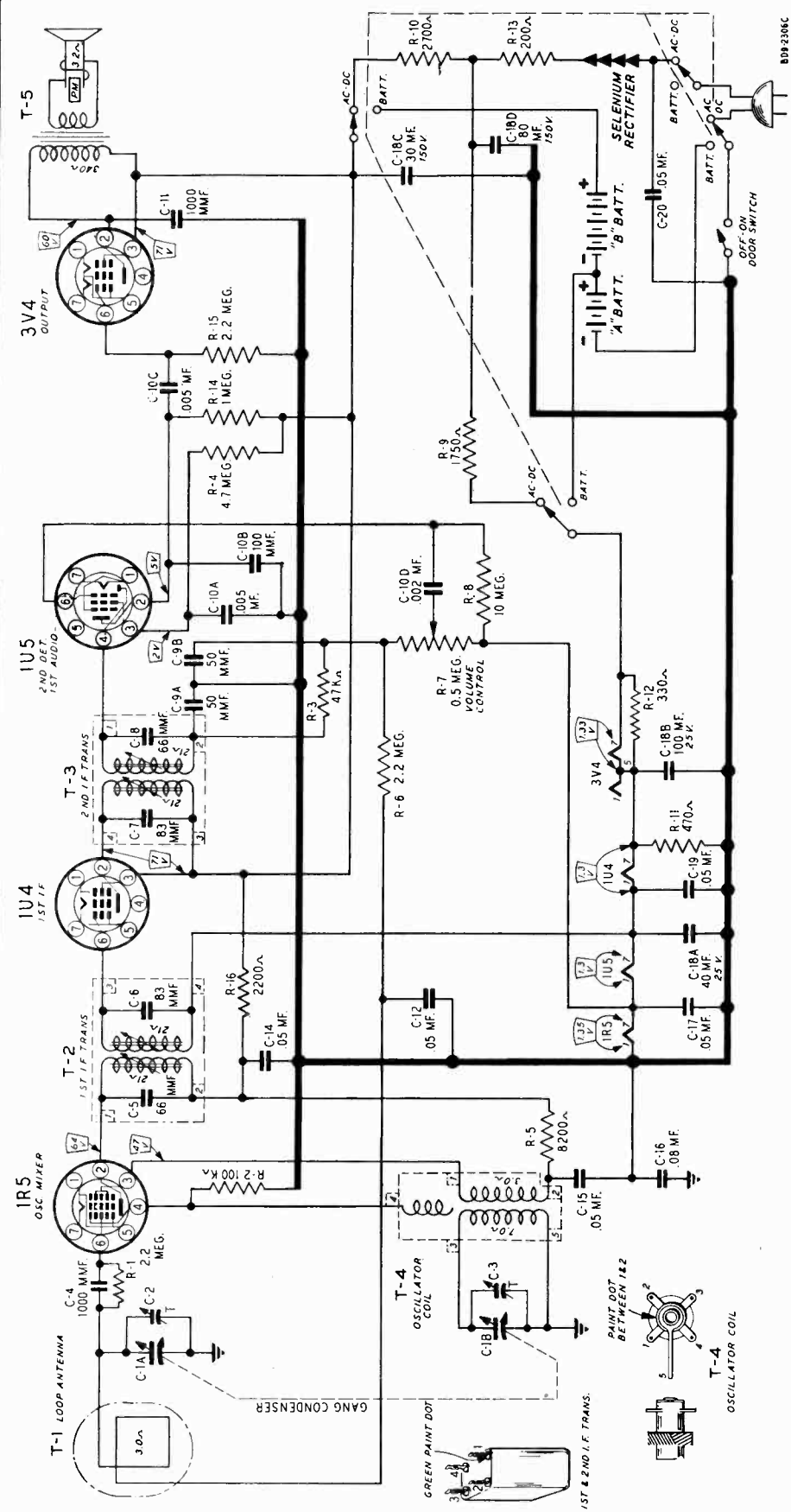
This model is a 4 tube AC-DC or battery operated portable radio receiver. Controls are provided for tuning, volume, and AC-DC or battery selection. Features include a built-in Airwave Loop Aerial, automatic volume control, PM dynamic speaker and a Selenium rectifier for AC operation. The dial scale is calibrated to cover frequencies between 540-1600 kilocycles.

**ELECTRICAL SPECIFICATIONS**

- Power Supply..... One—67½ Volt "B" Battery  
Four—1½ Volt "A" Batteries  
(Size "D" Flashlight Cells)  
105-125 volts AC, 25-60 cycles,  
10 watts  
or  
105-125 volts DC
- Wards Battery Numbers 62-43 or 62-10 "B" Battery  
62-23—"A" Battery (4 required)
- Frequency Range 540-1600 kc
- Intermediate Frequency 455 kc
- Selectivity..... At 1000 kc, 45 kc wide at 1000  
times signal
- Sensitivity..... 300 microvolts per meter average (for .05 watt output)
- Power Output..... .100 watt maximum  
.060 watt 10% distortion
- Loud Speaker..... 4" PM Dynamic
- Voice Coil Imp..... 3.2 ohms at 400 cycles

Ref. No.	Part No.	Description	Qty. Used in Set
<b>CAPACITORS</b>			
C-1A } C-1B } C-2 } C-3 } C-4 } C-11 } C-5 } C-6 } C-7 } C-8 } C-9A } C-9B } C-10A } C-10B } C-10C } C-10D }	14A200 47X519 76X2	Gang Condenser Assembly Part of C-1 Gang Condenser 1000 mmf Ceramic Part of T-2 1st I.F. Trans. Part of T-3 2nd I.F. Trans. Part of 76X1 Resistor Capacitor Combination (See Miscellaneous) Multiple Capacitor Combination	1 2 1
C-12 } C-13 } C-14 } C-15 } C-16 } C-17 } C-19 } C-20 } C-18A } C-18B } C-18C } C-18D }	46X393 45X356 866203	.05 200 V. Tub. (Hi-Temp) 40 mf 25 V } Dry Electrolytic 100 mf 25 V } 30 mf 150 V } 80 mf 150 V } .02 mf 200 V Tubular	7 1 1 1 1 1 1 1 1 1 1 1
*C-21	866203	Tubular	1
<b>RESISTORS</b>			
OHMS WATTS			
R-1 } R-6 } R-15 }	885225 884104	2.2 Meg. 0.5 Carbon 100 K 0.5 Carbon	3 1
R-2 } R-3 }	885475 884822	Part of 76X1 Resistor Capacitor Combination (See Miscellaneous) 4.7 Meg. 0.5 Carbon	1 1
R-4 } R-5 } R-7 } R-8 } R-9 } R-10 } R-11 } R-12 } R-13 } R-14 } R-16 }	885475 884822 36X375 885106 43X226 884272 883471 883331 43X225 885105 884222	8200 0.5 Carbon 0.5 Meg. 0.5 Carbon 10 Meg. 0.5 Carbon 1750 6.0 Wire Wound 2700 0.5 Carbon 470 0.5 Carbon 330 0.5 Carbon 200 6.0 Wire Wound 1 Meg. 0.5 Carbon 2200 0.5 Carbon	1 1 1 1 1 1 1 1 1 1 1
<b>TRANSFORMERS AND COILS</b>			
T-1 } T-2 } T-3 }	9A1951 9A1955	Loop Antenna 1st and 2nd I.F. Transformers	1 2
T-4 } T-5 }	9A1952	Oscillator Coil Output Transformer (See Miscellaneous)	1 1
<b>MISCELLANEOUS</b>			
76X1 } 66X8 } 12A483 } 13X600 } 2A379 } 2A380 } 3A426 } 15X243 } 28X545 } 10A656 } 10A657 } 13X596 } 16X127 } 28X548 } 14X430 } 14X432 } 26A479 } 26A482 } 9X215 } 26A480 } 4X1003 } 4X1004 } 26A481 }	Resistor Capacitor Combination Selenium Rectifier 4" P.M. Speaker Complete with Output Transformer Line Cord & Plug Assembly Changeover Switch On-Off Switch Miniature Tube Socket Pointer Drive Card Tension Spring Knob (Tuning) Knob (Volume) "B" Battery Cable Assembly Rectifier Shield Spring (Mtg. Rear Cover to Case) Grille Baffle Rear Cover Assembly Complete with Clips and Pins Front Cover Assembly Loop Back (Less Loop Antenna) Escutcheon (Handle) Assembly Complete with Mtg. Hardware Right Hinge Assembly Left Hinge Assembly Case Assembly Complete with Bumpers, Spring Holders, Spring Washers, Release Button, Case, Latch and Springs, (Less Front and Rear Cover)	1 1 1 1 1 1 4 1 1 1 1 1 1 2 1 1 1 1 2 1 1 1	

\*Added in later production issue "A" receivers.

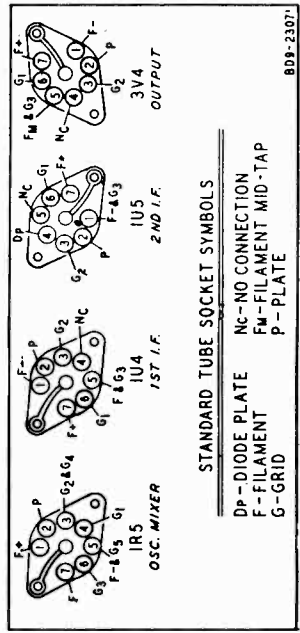


**TUBE SOCKET VOLTAGES**

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages except those for the filaments are between the socket terminals and the negative terminal on C-18.

The readings were taken with a 1000 ohm per volt meter and all plate and screen voltages read on a 300 volt scale. Conditions of measurement are:

- Line voltage..... 117 volts AC
- Volume control..... maximum
- Signal input..... none
- A variation of  $\pm 10\%$  is usually permissible.



MONTGOMERY WARD

MODEL 84WG-1060C

ALIGNMENT PROCEDURE

The following equipment is required for aligning.  
 A Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.  
 Output Indicating Meter — Non-Metallic Screwdriver.

Dummy Antenna—.1 mf.  
 Volume Control — Maximum All Adjustments.  
 Allow Signal Generator to "Heat Up" for several minutes.

SIGNAL GENERATOR				RECEIVER	
Frequency Setting	Coupling Capacitor	Connection to Radio	Ground Connection	Condenser Setting	Adjust for maximum output. See trimmer illustration.
Remove chassis from case (See paragraph Removal of Chassis From Case) and temporarily solder a .5 megohm resistor across the two loop terminals on the chassis.					
455 kc	.1 mf	Control Grid 1R5—Pin 6	"X" Point See Note "B"	Rotor fully open	1st IF Pri. & Sec. 2nd IF Pri. & Sec.
Remove temporary resistor, replace chassis in case and resolder loop leads to terminals.					
1610 kc		Loop See Note A	Loop See Note A	Rotor fully open	Oscillator (C-3)
1500 kc		Loop See Note A	Loop See Note A	Turn Rotor to Maximum Output	Set Pointer at 1500 kc
1400 kc		Loop See Note A	Loop See Note A	Turn Rotor to Maximum Output	Antenna (C-2)

NOTE A: Connect a loop of wire approximately one foot in diameter across the antenna and ground posts of the signal generator. Place radio approximately 2 feet from loop.

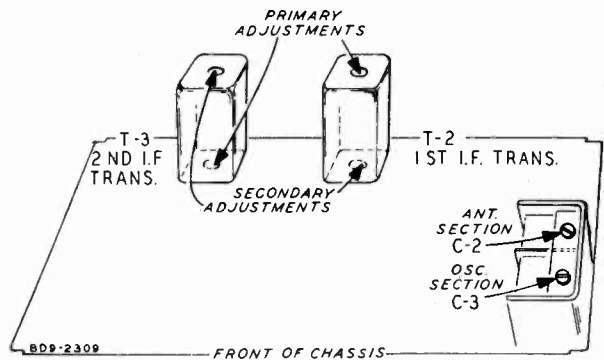
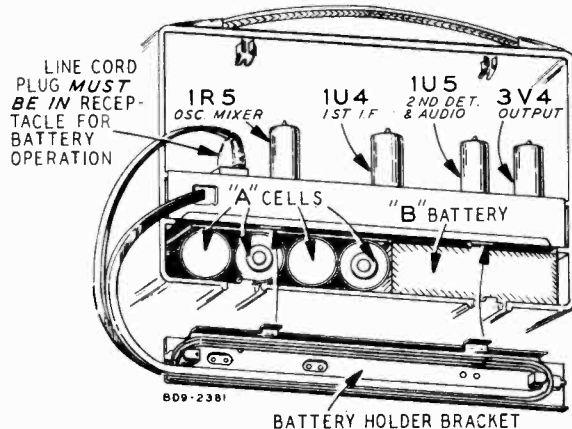
NOTE B: Heavy lines (B-) on circuit diagram designate "X" Point.

RECEIVER STAGE SENSITIVITIES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm 5 watt resistor across the secondary winding of the output transformer.

A reading of .4 volt across this resistor will be equivalent to a 50 milliwatt output. The volume control must be set to maximum. The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of plus or minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR 50 MILLIWATT OUTPUT
Freq.	Coupling Capacitor	Connection to Receiver	Ground Connection	
1000 kc	.1 mf	1R5 Mixer Pin 6	X Point (Note B, Page 2)	130 microvolts
455 kc	.1 mf	1R5 Mixer Pin 6	X Point (Note B, Page 2)	120 microvolts
455 kc	.1 mf	1U4 IF Amp. Pin 6	X Point (Note B, Page 2)	4000 microvolts
400 cycles	.1 mf	1U5 2nd Det. Pin 6	X Point (Note B, Page 2)	.053 volt
400 cycles	.1 mf	3V4 Output Pin 6	X Point (Note B, Page 2)	3.2 volts





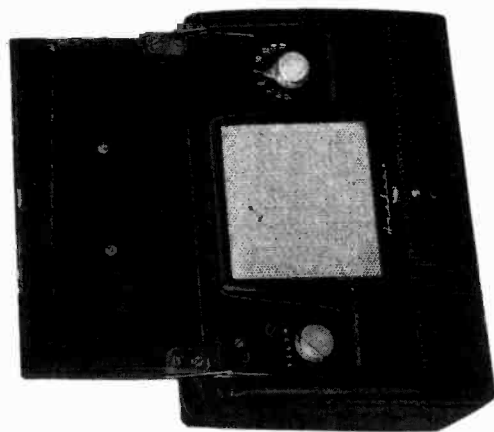
MODEL 84WG-1060C

MONTGOMERY WARD

Ref. No.	Part No.	Description	Qty. Used in Set	Ref. No.	Part No.	Description	Qty. Used in Set
<b>CAPACITORS</b>							
C-1A } C-1B } C-2 } C-3 } C-4 } C-5 } C-6 } C-7 } C-8 }	14A200	Gang Condenser Assembly	1	T-1	9A1951	Loop Antenna	1
C-9A } C-9B } C-10A } C-10B } C-10C } C-10D }	47X519	Part of C-1 Gang Condenser	2	T-2 } T-3 }	9A1995	1st and 2nd I.F. Transformers	2
C-11 } C-12 } C-13 } C-14 } C-15 } C-16 } C-17 } C-18 } C-19 } C-20 }	76X2	1000 mmf Ceramic	1	T-4	9A1952	Oscillator Coil	1
C-21 } C-22 } C-23 } C-24 } C-25 } C-26 } C-27 } C-28 } C-29 } C-30 }	46X393	Part of T-2 1st I.F. Trans.	6	T-5		Output Transformer (See Miscellaneous)	1
C-31 } C-32 } C-33 } C-34 } C-35 } C-36 } C-37 } C-38 } C-39 } C-40 }	B66803	Part of T-3 2nd I.F. Trans.	1	76X1		Resistor Capacitor Combination	1
C-41 } C-42 } C-43 } C-44 } C-45 } C-46 } C-47 } C-48 } C-49 } C-50 }	45X356	Part of 76X1 Resistor Capacitor Combination (See Miscellaneous)	1	66X8		Selenium Rectifier	1
C-51 } C-52 } C-53 } C-54 } C-55 } C-56 } C-57 } C-58 } C-59 } C-60 }	885225	Multiple Capacitor Combination	1	12A483		4" P.M. Speaker Complete with Output Transformer	1
C-61 } C-62 } C-63 } C-64 } C-65 } C-66 } C-67 } C-68 } C-69 } C-70 }	884104	200 V. Tub. (Hi-Temp)	3	13X600		Line Card & Plug Assembly	1
C-71 } C-72 } C-73 } C-74 } C-75 } C-76 } C-77 } C-78 } C-79 } C-80 }	885475	.08 mf 200 V Tubular	1	2A379		Changeover Switch	1
C-81 } C-82 } C-83 } C-84 } C-85 } C-86 } C-87 } C-88 } C-89 } C-90 }	884822	40 mf 25 V	1	2A380		On-Off Switch	1
C-91 } C-92 } C-93 } C-94 } C-95 } C-96 } C-97 } C-98 } C-99 } C-100 }	883375	100 mf 25 V Dry Electrolytic	1	3A426		Miniature Tube Socket	4
C-101 } C-102 } C-103 } C-104 } C-105 } C-106 } C-107 } C-108 } C-109 } C-110 }	885106	30 mf 150 V	1	15X243		Pointer	1
C-111 } C-112 } C-113 } C-114 } C-115 } C-116 } C-117 } C-118 } C-119 } C-120 }	885106	80 mf 150 V	1	28X545		Drive Cord Tension Spring	1
C-121 } C-122 } C-123 } C-124 } C-125 } C-126 } C-127 } C-128 } C-129 } C-130 }	883331	OHMS WATTS	3	10A709		Knob (Tuning)	1
C-131 } C-132 } C-133 } C-134 } C-135 } C-136 } C-137 } C-138 } C-139 } C-140 }	885225	2.2 Meg.	3	10A710		Knob (Volume)	1
C-141 } C-142 } C-143 } C-144 } C-145 } C-146 } C-147 } C-148 } C-149 } C-150 }	884104	100 K	1	13X596		"B" Battery Coble Assembly	1
C-151 } C-152 } C-153 } C-154 } C-155 } C-156 } C-157 } C-158 } C-159 } C-160 }	885475	4.7 Meg.	1	16X127		Rectifier Shield	1
C-161 } C-162 } C-163 } C-164 } C-165 } C-166 } C-167 } C-168 } C-169 } C-170 }	884822	8200	1	28X548		Spring (Mtg. Rear Cover to Case)	2
C-171 } C-172 } C-173 } C-174 } C-175 } C-176 } C-177 } C-178 } C-179 } C-180 }	883375	0.5 Meg.	1	14X440		Baffle	1
C-181 } C-182 } C-183 } C-184 } C-185 } C-186 } C-187 } C-188 } C-189 } C-190 }	885106	10 Meg.	1	14X441		Grille	1
C-191 } C-192 } C-193 } C-194 } C-195 } C-196 } C-197 } C-198 } C-199 } C-200 }	43X226	1750	1	26A479		Rear Cover Assembly Complete with Clips and Pins	1
C-201 } C-202 } C-203 } C-204 } C-205 } C-206 } C-207 } C-208 } C-209 } C-210 }	884272	2700	1	26A482		Front Cover Assembly	1
C-211 } C-212 } C-213 } C-214 } C-215 } C-216 } C-217 } C-218 } C-219 } C-220 }	883471	470	1	9X215		Loop Back (Less Loop Antenna)	1
C-221 } C-222 } C-223 } C-224 } C-225 } C-226 } C-227 } C-228 } C-229 } C-230 }	883331	330	1	26A495		Escutcheon (Handle) Assembly Complete with Mtg. Hardware	2
C-231 } C-232 } C-233 } C-234 } C-235 } C-236 } C-237 } C-238 } C-239 } C-240 }	43X225	200	1	4X1003		Right Hinge Assembly	1
C-241 } C-242 } C-243 } C-244 } C-245 } C-246 } C-247 } C-248 } C-249 } C-250 }	885105	1 Meg.	1	4X1004		Left Hinge Assembly	1
C-251 } C-252 } C-253 } C-254 } C-255 } C-256 } C-257 } C-258 } C-259 } C-260 }	884222	2200	1	26A481		Case Assembly Complete with Bumpers, Spring Holders, Spring Washers, Release Button, Case, Latch and Springs, (Less Front and Rear Cover)	1

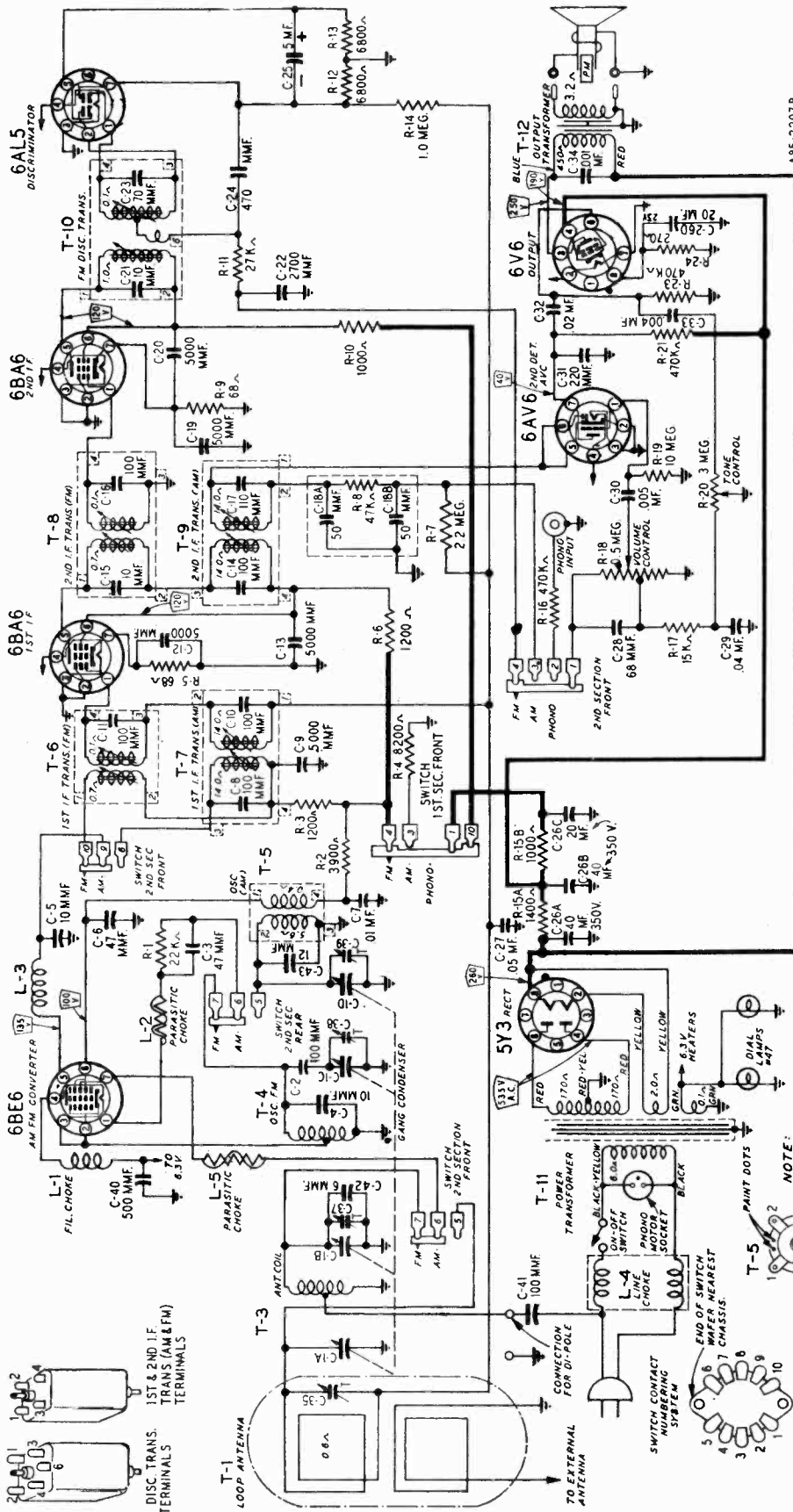
**ELECTRICAL SPECIFICATIONS**

Power Supply..... One—67½ Volt "B" Battery  
 Four—1½ Volt "A" Batteries  
 (Size "D" Flashlight Cells)  
 105-125 volts AC, 25-60 cycles, C-18D  
 10 watts  
 or  
 105-125 volts DC  
 Wards Battery Numbers 62-43 or 62-10 "B" Battery  
 62-23—"A" Battery (4 required)  
 540-1600 kc  
 455 kc  
 At 1000 kc, 45 kc wide at 1000 R-15  
 times signal  
 300 microvolts per meter aver- R-3  
 age (for .05 watt output)  
 .100 watt maximum  
 .060 watt 10% distortion  
 4" PM Dynamic  
 3.2 ohms at 400 cycles  
**Tube** 1 1R5 Mixer  
**Complement** 1 1U4 IF Amplifier  
 1 1U5 2nd Detector AVC and 1st AF  
 Amplifier  
 1 3V4 Output



MONTGOMERY WARD

MODEL 84WG-2506A



- Loud Speaker..... 10" PM Dynamic
- Voice Coil Impedance..... 3.2 ohms 400 cycles
- Tube and Dial Lamp Complement**
- 1 6BE6 FM-AM Converter
- 1 6BA6 1st I-F Amplifier
- 1 6BA6 2nd I-F Amplifier
- 1 6AL5 FM Discriminator
- 1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
- 1 6V6GT Audio Output
- 1 5Y3GT Rectifier
- 2 No. 47 Dial Lamps

- AM-50 KC broad at 1000 times signal, measured at 1000 KC
- I.F. FM-200 KC broad at 2 times down
- I.F. FM-800 KC broad at 200 times down
- (For .5 watt output with external antenna) 20 microvolts average
- (For .5 watt output) 200 microvolts average
- Power Output..... 4.5 watts maximum
- 2.5 watts 10% distortion

**ELECTRICAL SPECIFICATIONS**

- Power Supply..... 105-125 volts AC 50-60 cycles, 60 watts.
- Frequency Ranges..... Broadcast 540-1600 KC
- Intermediate Frequency..... AM-455KC
- FM-10.7 MC
- Frequency Modulation 88-108 MC
- AM Sensitivity.....
- FM Sensitivity.....
- Power Output.....

NOTE:  
COIL WINDINGS FOR WHICH NO RESISTANCES ARE SHOWN HAVE A D.C. RESISTANCE OF LESS THAN 0.1.

OSC. COIL (AM)

### RECEIVER STAGE SENSITIVITIES AM AND AUDIO STAGES

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

The volume control must be set to maximum.

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

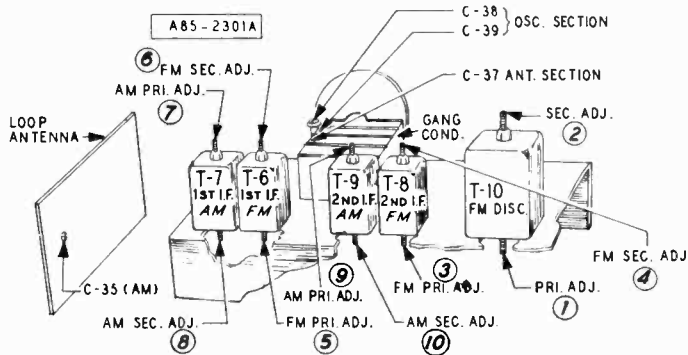
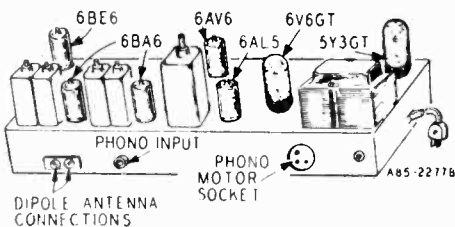
SIGNAL GENERATOR				
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	INPUT FOR .5 WATT OUTPUT
1000 KC	200 mm.f or RMA Dummy Antenna	External Antenna Lead	Chassis	25 Microvolts
1000 KC	.05 mf	6BE6 Converter Pin 7	Chassis	60 Microvolts
455 KC	.05 mf	6BE6 Converter Pin 7	Chassis	58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

### FM STAGES

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

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

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



### TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were 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:

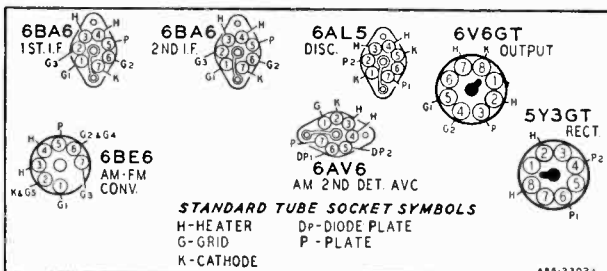
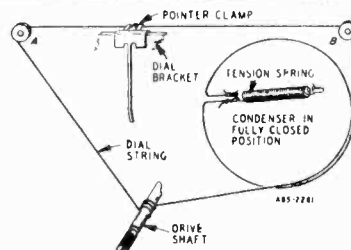
- Line voltage.....117 Volts AC
- Signal Input.....None

A variation of ±10% is usually permissible.

### DRIVE CORD REPLACEMENT

#### DIAL POINTER CORD

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



MONTGOMERY WARD

MODEL 8LWG-2506A

**ALIGNMENT PROCEDURES  
AM STAGES**

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

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

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

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

**FM STAGES**

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

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

SIGNAL GENERATOR		CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING						
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
I-F	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	2nd I-F Pri. (3) 2nd I-F Sec. (4) Note C	Maximum Deflection
	10.7 MC	Unsolder lead from Pin 7 to band switch. Insert 100K ohm resistor between Pin 7 and Ground and feed signal into Pin 7 of 6BE6	.01 mf	FM	Rotor Fully Open	1st I-F Pri. (5) Note C	Maximum Deflection
	10.7 MC	Same as above	.01 mf	FM	Rotor Fully Open	1st I-F Sec. (6) Note C	Maximum Deflection

**RECHECK I-F ADJUSTMENTS IN ORDER GIVEN**

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

**RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN**

**FM ALIGNMENT NOTES**

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the A.V.C. line at the 27 K. ohm resistor (R-11) and its junction with terminal strip. A signal of .1 volt must be fed into the receiver for this adjustment.

Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from A.V.C. and connect it at the audio takeoff point at the 1

megohm resistor (R-14) and its junction with the terminal strip. Adjust for zero voltage indication.

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

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

MODEL 8LWG-2506A

MONTGOMERY WARD

Ref. No.	Part No.	Description	Qty. Used in Set	Ref. No.	Part No.	Description	Qty. Used in Set
C-1A	14A-04	Gang Condenser & Pulley	1				
C-1B							
C-1C							
C-1D							
C-2	47X511	100 mmf Ceramic	1				
C-3	47X517	47 mmf Ceramic	1				
C-4	47X523	10 mmf Ceramic	1				
C-5	47X512	10 mmf Ceramic	1				
C-6	47X463	47 mmf Ceramic	1				
C-7	D66103	.01 mf 400 V Tubular	1				
C-8		Part of T-7 (1st I.F. Trans.—AM)					
C-10		Part of T-6 (1st I.F. Trans.—FM)					
C-11		Part of T-9 (2nd I.F. Trans.—AM)					
C-9		Silvered Ceramic	5				
C-12							
C-13							
C-19							
C-20							
C-14							
C-17							
C-15		Part of T-8 (2nd I.F. Trans.—FM)					
C-16		50.50 mmf (Part of 76X1 Resistor-Capacitor Combination)					
C-18A		Part of T-10 (Discriminator Trans.)					
C-18B		Part of T-10 (Discriminator Trans.)					
C-21		Molded Mica	1				
C-23		Silvered Mica	1				
C-22	47X492	2700 mmf	1				
C-24	47X510	470 mmf	1				
C-25	45X361	5 mf 100 V Dry Electrolytic	1				
C-26A		40 mf 350 V					
C-26B		350 V					
C-26C		350 V					
C-26D		25 V					
C-27	B66503	.05 mf 200 V Tubular	1				
C-28	47X471	68 mmf Molded Mica	1				
C-29	B66403	.04 mf 200 V Tubular	1				
C-30	D66502	.005 mf 400 V Tubular	1				
C-31	47X468	220 mmf Ceramic	1				
C-32	D66203	.02 mf 400 V Tubular	1				
C-33	B66402	.004 mf 200 V Tubular	1				
C-34	H66102	.001 mf 800 V Tubular	1				
C-35	17A235	2.24 mmf Trimmer	1				
-37		Part of C-1 Gang Condenser					
C-39		1.8 mmf Trimmer	1				
C-38	26A489	500 mmf Ceramic	1				
C-40	47X508	500 mmf Ceramic	1				

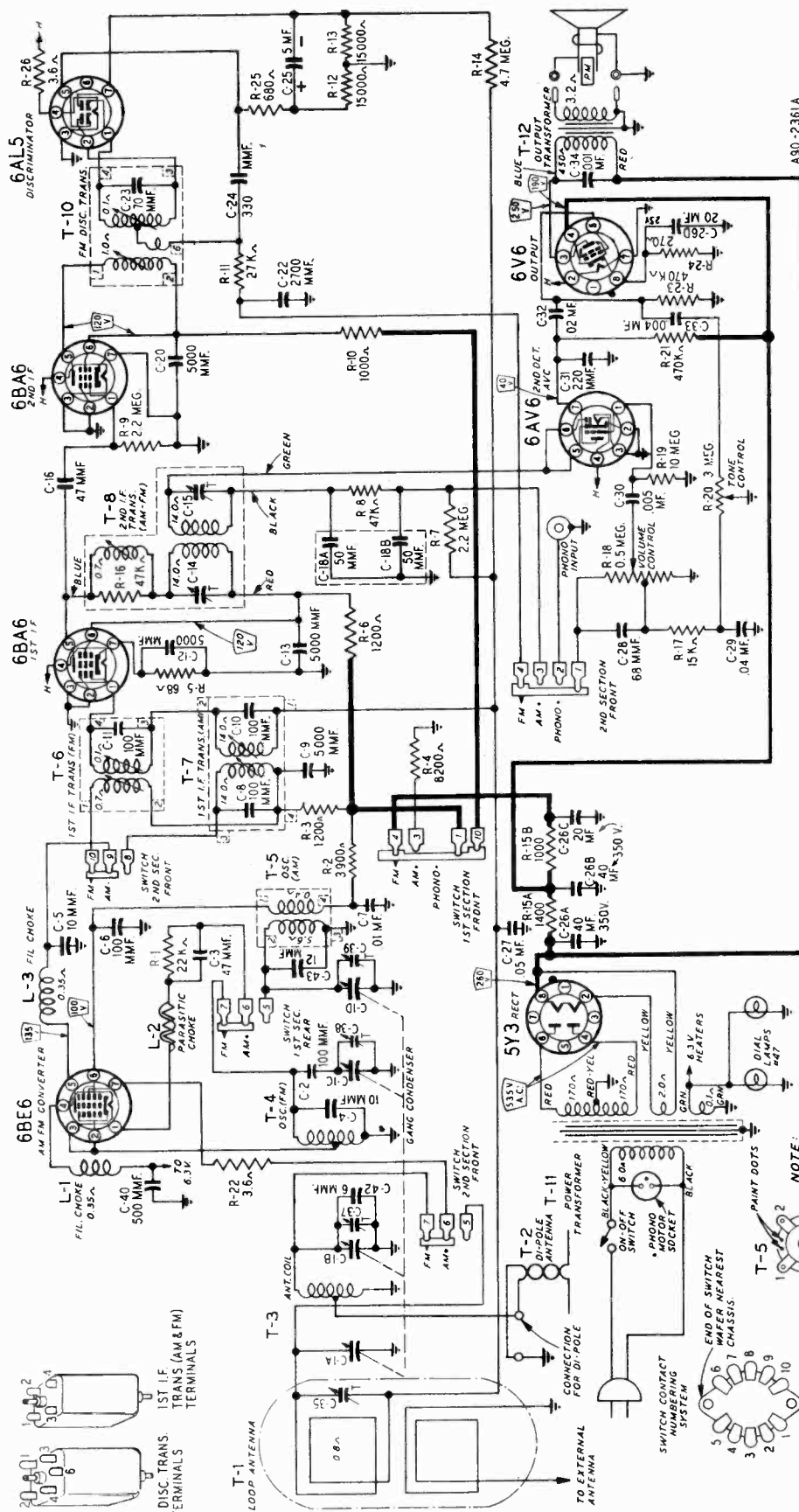
Ref. No.	Part No.	Description	Qty. Used in Set	Ref. No.	Part No.	Description	Qty. Used in Set
C-41	47X476	100 mmf Molded	1				
C-42	47X521	6 mmf Ceramic	1				
C-43	47X522	12 mmf Ceramic	1				
		<b>RESISTORS</b>					
		Ohms					
		Watts					
R-1	B84223	22 K 0.5 Carbon	1				
R-2	B83392	3900 0.5 Carbon	1				
R-3	B84122	1200 0.5 Carbon	2				
R-6							
R-4	D84822	8200 2.0 Carbon	1				
R-5	B83680	68 0.5 Carbon	2				
R-9	B85225	2.2 meg. 0.5 Carbon	1				
R-7	B85225	2.2 meg. 0.5 Carbon	1				
R-8		47 K (Part of 76X1 Resistor-Capacitor Combination)					
R-10	B84102	1000 0.5 Carbon	1				
R-11	B84273	27 K 0.5 Carbon	1				
R-12	B84682	6800 0.5 Carbon	2				
R-13							
R-14	B85105	1 meg. 0.5 Carbon	1				
R-15A		1400 6.0 Wire Wound	1				
R-15B		1000 4.0	1				
R-16	B85474	470 K 0.5 Carbon	3				
R-21							
R-23							
R-17	B84153	15 K 0.5 Carbon	1				
R-18	36X372	.5 meg. Volume control and switch	1				
R-19	B85106	10 meg. 0.5 Carbon	1				
R-20	40X285	3 meg. Tone Control	1				
R-24	B84271	270 0.5 Carbon	1				
L-1		<b>TRANSFORMERS AND COILS</b>					
L-3	9A1882	Filament Choke	2				
L-2	9A1940	Parasitic Choke	1				
L-4	9A1930	Line Choke	1				
L-5	9A1967	Parasitic Choke	1				
T-1	26A478	"B" Range Loop Antenna Assembly	1				
T-3	9A1956	Antenna Coil Assembly	1				
T-4	9A1938	Oscillator Coil (FM)	1				
T-5	9A1929	Oscillator Coil Assembly (AM)	1				
T-6	9A1932	1st I.F. Transformer (FM)	1				
T-7	9A1934	1st I.F. Transformer (AM)	1				
T-8	9A1933	2nd I.F. Transformer (FM)	1				
T-9	9A1935	2nd I.F. Transformer (AM)	1				
T-10	9A1936	Discriminator Coil Assembly	1				
T-11	53X290	Power Transformer	1				
T-12	51X134	Output Transformer	1				

Ref. No.	Part No.	Description	Qty. Used in Set	Ref. No.	Part No.	Description	Qty. Used in Set
MISCELLANEOUS							
76X1		Resistor-Capacitor Combination	1				
12A480		10" P.M. Speaker	1				
3A303		Tube Socket—Octal (8 prong) Molded	2				
3A426		Tube Socket—Miniature	4				
3A427		Tube Socket—Miniature (for AM-FM Converter Tube)	1				
3A304		Phono Motor Socket	1				
3A305		Phono Socket—Single Pin Tip	1				
2A375		Band Change Switch	1				
13X546		Line Cord and Plug Assembly	1				
10A651		Knob (Tuning)	1				
10A652		Knob (Volume Control and Switch)	1				
10A654		Knob (Tone)	1				
10A655		Knob (Phono—BC—FM)	1				
4X999		Escutcheon	1				
		<b>DIAL AND DRIVE ASSEMBLY</b>					
58X699		Dial Glass	1				
24X446		Idler Pulley	2				
15X241		Painter	1				
25X1569		Dial Bracket	1				
7A103		No. 47 Pilot Light Bulb	2				
7A202		Pilot Light Socket Assembly	1				
26X486		Drive Shaft	1				
41X26		Reflector, Dial Light	2				
28X113		Drive Cord Tension Spring	1				
10X66		Drive Cord Assembly	1				
19X192		"C" Washer (Mtg. drive shaft)	2				
6X21		Rubber Grommet (Mtg. gang cond.)	3				
20X260		Condenser Cushion Stud (Mtg. gang condenser)	3				
58X702		Dial background	1				

MONTGOMERY WARD

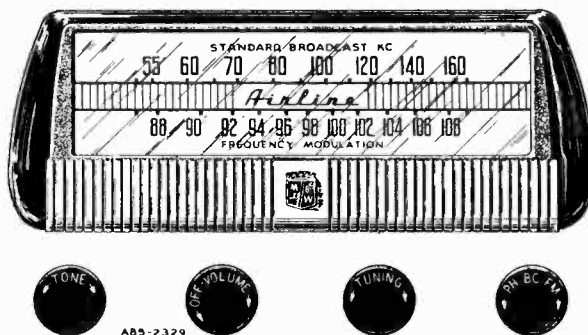
MODEL 8LWG-2506B



MODEL 84WG-2506B

MONTGOMERY WARD

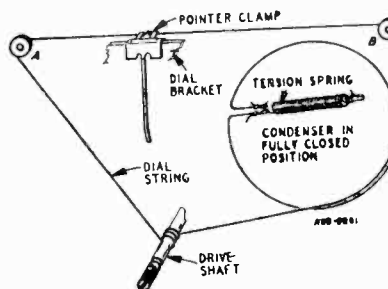
- Tube and Dial Lamp Complement**
- 1 6BE6 FM-AM Converter
  - 1 6BA6 1st I-F Amplifier
  - 1 6BA6 2nd I-F Amplifier
  - 1 6AL5 FM Discriminator
  - 1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
  - 1 6V6GT Audio Output
  - 1 5Y3GT Rectifier
  - 2 No. 47 Dial Lamps



**DRIVE CORD REPLACEMENT**

**DIAL POINTER CORD**

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



**ELECTRICAL SPECIFICATIONS**

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

**MISCELLANEOUS**

- 12A480 10" P.M. Speaker..... 1
- 3A303 Tube Socket—Octal (8 prong) Molded ..... 2
- 3A426 Tube Socket—Miniature ..... 4
- 3A427 Tube Socket—Miniature (for AM-FM Converter Tube) ..... 1
- 3A304 Phono Motor Socket..... 1
- 3A305 Phono Socket—Single Pin Tip..... 1
- 2A375 Band Change Switch..... 1
- 13X546 Line Cord and Plug Assembly..... 1
- 10A651 Knob (Tuning) ..... 1

MONTGOMERY WARD

MODEL 8LWG-2506B

**ALIGNMENT PROCEDURES  
AM STAGES**

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

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

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

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

**FM STAGES**

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

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

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

**RECHECK I-F ADJUSTMENTS IN ORDER GIVEN**

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

**RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN**

**FM ALIGNMENT NOTES**

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

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



### RECEIVER STAGE SENSITIVITIES AM AND AUDIO STAGES

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

The volume control must be set to maximum.

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

#### SIGNAL GENERATOR

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

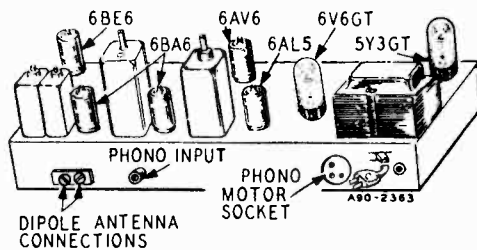
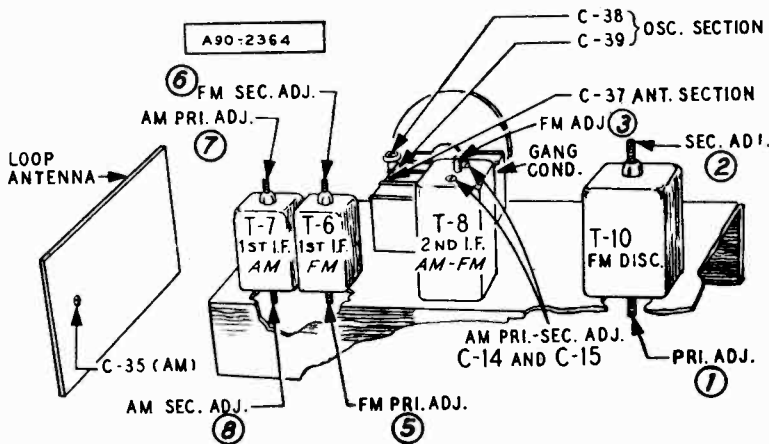
#### FM STAGES

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

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

#### SIGNAL GENERATOR

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

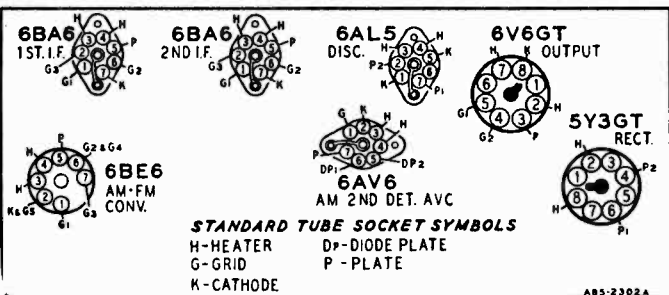


#### TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were 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.



MONTGOMERY WARD

MODEL 8LWG-2506B

C-1A } C-1B } C-1C } C-1D }	14A204	Gang Condenser & Pulley	1	Part of C-1 Gang Condenser.	C-37 } C-39 }
C-2	47X511	100 mmf Ceramic	1	Trimmer	C-38
C-3	47X517	47 mmf Ceramic	1	500 mmf Ceramic	C-40
C-4	47X523	10 mmf Ceramic	1	6 mmf Ceramic	C-42
C-5	47X512	10 mmf Ceramic	1	12 mmf Ceramic	C-43
C-6	47X476	100 mmf Molded Mica	1		
C-7	D66103	.01 mf 400 V Tubular	1		
C-8 } C-10 }		Part of T-7 (1st I.F. Trans.—AM)			
C-11		Part of T-6 (1st I.F. Trans.—FM)			
C-9 } C-12 } C-13 } C-20 }	47X507	5000 mmf Silvered Ceramic	4		
C-14 } C-15 }		Part of T-8 (2nd I.F. Trans.—AM-FM)			
C-16	47X463	47 mmf Ceramic	1		
C-18A } C-18B }	47X112	50-50 mmf Dual Mica	1		
C-22	47X492	2700 mmf Molded Mica	1		
C-23		Part of T-10 (Discriminator Trans.)			
C-24	47X529	330 mmf Silvered Mica	1		
C-25	45X361	5 mf 100 V Dry Electrolytic	1		
C-26A } C-26B } C-26C } C-26D }	45X359	40 mf 350 V } 40 mf 350 V } 20 mf 350 V } 20 mf 25 V }	1		
C-27	B66503	.05 mf 200 V Tubular	1		
C-28	47X471	68 mmf Molded Mica	1		
C-29	B66403	.04 mf 200 V Tubular	1		
C-30	D66502	.005 mf 400 V Tubular	1		
C-31	47X468	220 mmf Ceramic	1		
C-32	D66203	.02 mf 400 V Tubular	1		
C-33	B66402	.004 mf 200 V Tubular	1		
C-34	H66102	.001 mf 800 V Tubular	1		
C-35	17A235	2.24 mmf Trimmer	1		
R-1	884223	22 K	0.5	Carbon	
R-2	883392	3900	0.5	Carbon	
R-3 } R-6 }	884122	1200	0.5	Carbon	
R-4	D84822	8200	2.0	Carbon	
R-5	883680	68	0.5	Carbon	
R-7 } R-9 }	885225	2.2 meg.	0.5	Carbon	
R-8	B85473	47 K	0.5	Carbon	
R-10	884102	1000	0.5	Carbon	
R-11	884273	27 K	0.5	Carbon	
R-12 } R-13 } R-17 }	884153	15 K	0.5	Carbon	
R-14	885475	4.7 meg.	0.5	Carbon	
R-15A } R-15B }	43X224	1400	6.0	Wire Wound	
R-16		Part of T-8 (2nd I.F. Transformer AM—FM)			
R-21 } R-23 }	885474	470 K	0.5	Carbon	
R-18	36X372	.5 meg.		Volume control and switch	
R-19	885106	10 meg.	0.5	Carbon	
R-20	40X285	3 meg.		Tone Control	
R-22 } R-26 }	43X233	3.6	0.5	Wire Wound	
R-24	884271	270	0.5	Carbon	
R-25	885681	680	0.5	Carbon	
L-1 } L-3 }	9A1882	Filament Choke			
L-2	9A1940	Parasitic Choke			
T-1	9A1972	"B" Range Loop Antenna Assembly			
T-2	9A2001	Dipole Antenna Assembly			
T-3	9A1956	Antenna Coil Assembly			
T-4	9A1938	Oscillator Coil (FM)			
T-5	9A1929	Oscillator Coil Assembly (AM)			
T-6	9A1932	1st I.F. Transformer (FM)			

10A652 Knob (Volume Control and Switch) 1  
 10A654 Knob (Tone) 1  
 10A655 Knob (Phono—BC—FM) 1  
 4X 999 Escutcheon 1

**DIAL AND DRIVE ASSEMBLY**

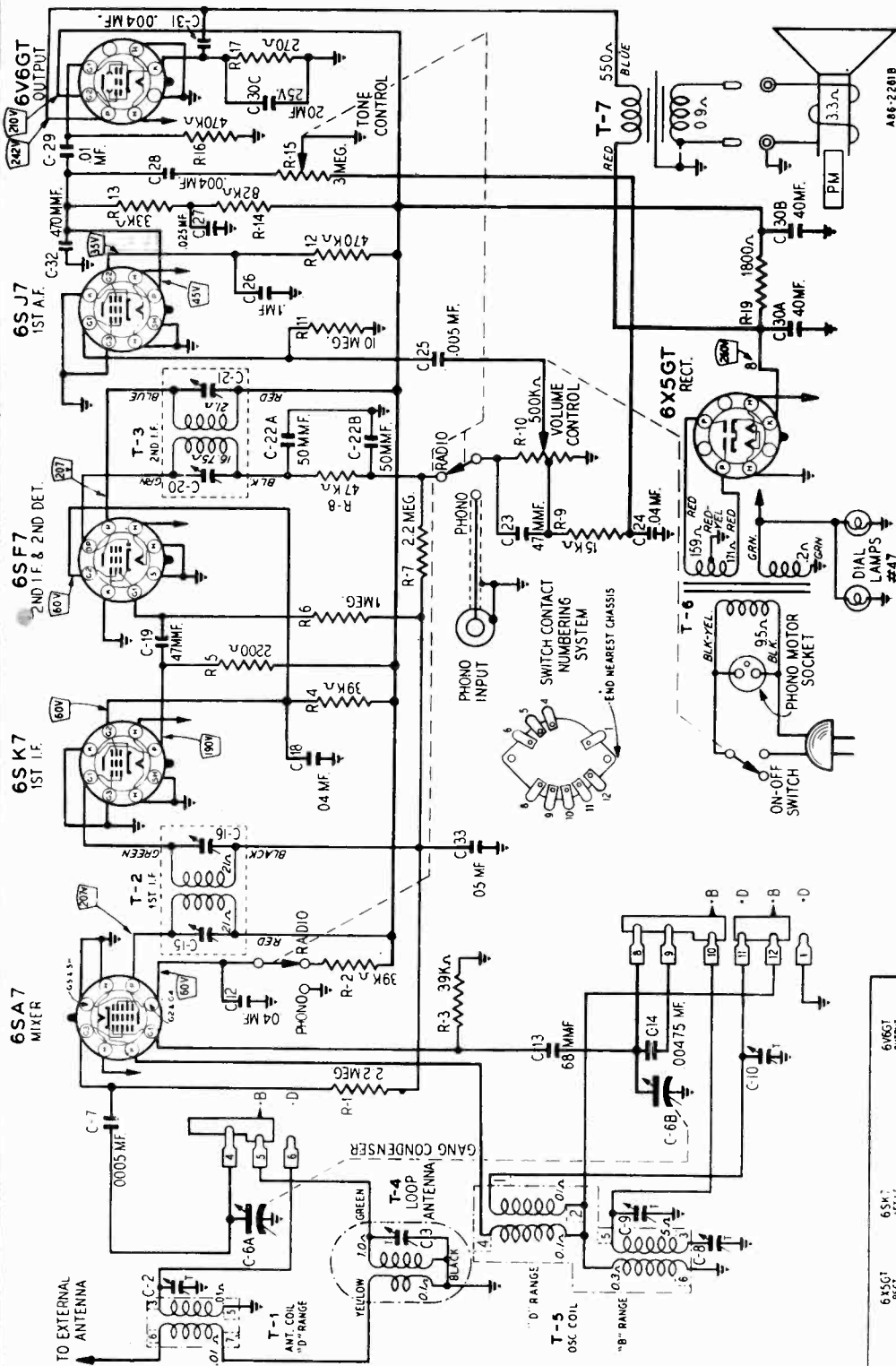
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 24X446 Idler Pulley 2  
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 25X1569 Dial Bracket 1  
 7A103 No. 47 Pilot Light Bulb 2  
 7A202 Pilot Light Socket Assembly 1  
 26X486 Drive Shaft 1  
 41X26 Reflector, Dial Light 2  
 28X113 Drive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

**TRANSFORMERS AND COILS (Cont.)**

T-7 9A1934 1st I.F. Transformer (AM) 1  
 T-8 9A1973 2nd I.F. Transformer (AM—FM) 1  
 T-10 9A1970 Discriminator Coil Assembly 1  
 T-11 53X290 Power Transformer 1  
 T-12 51X134 Output Transformer 1

**TRANSFORMERS AND COILS**

L-1 }  
L-3 }
 9A1882 | Filament Choke | 2 || L-2 | 9A1940 | Parasitic Choke | 1 |
T-1	9A1972	"B" Range Loop Antenna Assembly	1
T-2	9A2001	Dipole Antenna Assembly	1
T-3	9A1956	Antenna Coil Assembly	1
T-4	9A1938	Oscillator Coil (FM)	1
T-5	9A1929	Oscillator Coil Assembly (AM)	1
T-6	9A1932	1st I.F. Transformer (FM)	1



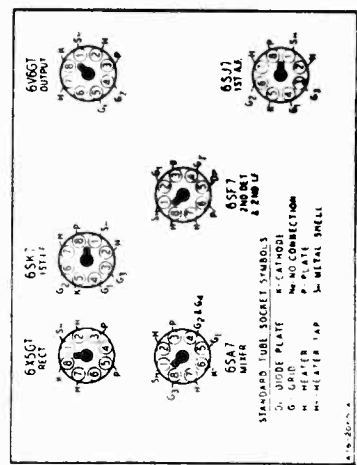
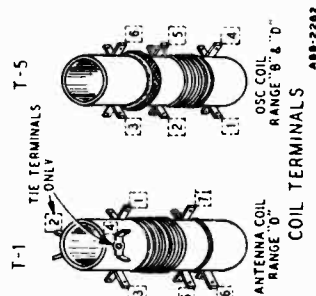
**TUBE SOCKET VOLTAGES**

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

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

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

A variation of ± 10% is usually permissible.



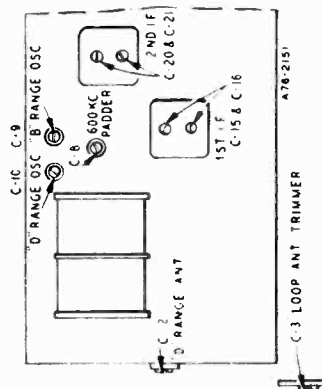
**ALIGNMENT PROCEDURE**

Volume Control—Maximum All Adjustments.  
 Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.  
 Allow Chassis and Signal Generator to "Heat Up" for several minutes.  
 The following equipment is required for aligning:  
 An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.  
 Output Indicating Meter; Non-Metallic Screwdriver.  
 Dummy Antennas—.1 mf., 50 mmf., and 400 ohms.

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

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

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



**RECEIVER STAGE SENSITIVITIES**

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

1.26 volts across this resistor will be equivalent to a .5 watt output with the speaker connected. The volume control must be set to maximum. The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR			Ground Connection	Connection to Receiver	INPUT FOR .5 WATT OUTPUT
Frequency	Coupling Capacitor	Ground Connection			
1000 kc	200 mmf or RMA Dummy Antenna	External antenna lead	Chassis	9 microvolts	
1000 kc	.05 mf	6SA7 Mixer, Pin 8	Same as above	42 microvolts	
455 kc	.05 mf	6SA7 Mixer, Pin B	Same as above	40 microvolts	
455 kc	.05 mf	6SK7 1st I-F, Pin 4	Same as above	1075 microvolts	
455 kc	.05 mf	6SF7 2nd I-F, Pin 2	Same as above	3900 microvolts	
400 cycles	.05 mf	6SJ7 1st A-F, Pin 4	Same as above	.08 volt	
400 cycles	.05 mf	6V6GT Output, Pin 5	Same as above	3.75 volts	

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

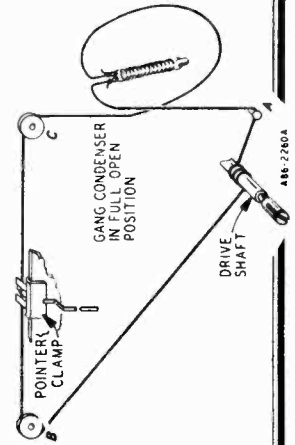
Repeat above oscillator adjustments at 1620 and 600 KC until readjusting the oscillator Range B Trimmer (C9) causes no further improvement in output.

RANGE D	Antenna Lead	400 Ohm	D Range	Turn Rotor to Full Open	Oscillator Range D (C10)
	Antenna Lead <td>400 Ohm <td>D Range <td>Tune Rotor to Max. Output <td>Antenna Range D (C2) Rock Rotor—See Note B</td> </td></td></td>	400 Ohm <td>D Range <td>Tune Rotor to Max. Output <td>Antenna Range D (C2) Rock Rotor—See Note B</td> </td></td>	D Range <td>Tune Rotor to Max. Output <td>Antenna Range D (C2) Rock Rotor—See Note B</td> </td>	Tune Rotor to Max. Output <td>Antenna Range D (C2) Rock Rotor—See Note B</td>	Antenna Range D (C2) Rock Rotor—See Note B

LOOP RANGE B	Reassemble chassis in cabinet.	50 mmf	B Range	Tune Rotor to Max. Output	Antenna Range B (C3)
	Antenna Lead <td>50 mmf <td>B Range <td>Tune Rotor to Max. Output <td></td> </td></td></td>	50 mmf <td>B Range <td>Tune Rotor to Max. Output <td></td> </td></td>	B Range <td>Tune Rotor to Max. Output <td></td> </td>	Tune Rotor to Max. Output <td></td>	

**DRIVE CORD REPLACEMENT**

Turn the gang condenser to the fully open position. Use a new 10X65 drive cord assembly or a piece of cord 48 inches long and tie one end to the tension spring. Hook the other end of the tension spring to the tab on the drive pulley. Pass the cord through the slot in the drive pulley rim around idler stud A and wind three and one-half turns clockwise around the tuning shaft (turns must progress away from chassis). Then pass cord over idler pulleys B and C. Wrap cord counterclockwise around drive pulley, stretch tension spring and fasten free end of cord to spring.



Ref. No.	Part No.	Description	Qty. Used in Set
C-2	17A164	5-50 mmf Trimmer	1
C-3	17A235	2-24 mmf Trimmer	1
C-6A	14A196	Gang Condenser with Drive Pulley	1
C-6B	866501	0005 mf 200 V Tubular	1
C-7	17A155	350-430 mmf Trimmer	1
C-8	17A109	2.5-35 mmf Dual Trimmer	1
C-9	D66403	.04 mf 400 V Tubular	2
C-10	47X466	.68 mmf Moulded Tubular	1
C-11	46X289	.00475 mf Part of T-2 (1st I-F Coil Assy.)	1
C-12	47X463	.47 mmf Moulded	2
C-13	47X112	50-50 mmf Dual Mica	1
C-14	D64403	.04 mf 400 V Tubular	1
C-15	D66502	.005 mf 400 V Tubular	1
C-16	D67104	.10 mf 400 V Tubular	1
C-17	D64253	.025 mf 400 V Tubular	1
C-18	D66402	.004 mf 400 V Tubular	1
C-19	D66103	.01 mf 400 V Tubular	1
C-20	45X346	40 mf 450 V Electrolytic	1
C-21	C-30B	40 mf 450 V Electrolytic	1
C-22	C-30C	25 V Tubular	1
C-23	H66402	.004 mf 800 V Tubular	1
C-24	47X467	.470 mmf Moulded	1
C-25	B66503	.05 mf 200 V Tubular	1

**TRANSFORMERS AND COILS**

Part No.	Ref. No.	Description	Qty. Used in Set
9A1917	T-1	"D" Range Antenna Coil Assembly	1
9A1814	T-2	1st I-F Coil Assembly	1
9A1815	T-3	2nd I-F Coil Assembly	1
26A474	T-4	"B" Range Loop Antenna Assembly	1
9A1918	T-5	"B" & "D" Range Oscillator Coil Assembly	1
53X282	T-6	117 Volt, 60 Cycle, Standard Power Transformer	1
51X134	T-7	Output Transformer	1

**DIAL AND DRIVE ASSEMBLY**

Part No.	Ref. No.	Description	Qty. Used in Set
S-58X13		Dial Bracket Assembly (including Dial Bracket, Idle Pulley, Rivets, and Dial Glass)	1
6X21		Rubber Grammet	3
20X329		Cond. Cushion Stud	3
26X485		Drive Shaft	1
19X192		"C" Washer (For Drive Shaft)	2
15X241		Painter	1
28X113		Drive Card Tension Spring	1
10X65		Drive Card Assembly	1
7A199		Pilot Light Socket Assembly	1
7A103		No. 47 Pilot Light Bulb	2
58X696		Dial Glass	1
4X999		Escutcheon	1

**MISCELLANEOUS**

Part No.	Ref. No.	Description	Qty. Used in Set
12A476		10" P.M. Speaker	1
3A303		Tube Socket—Octal (8 prong) moulded	6
3A304		Phono Motor Socket	1
3A305		Phono Socket—Single Pin Tip	1
2A372		Band Change Switch	1
13X328		Line Cord and Plug Assembly	1
10A651		Knob (Tuning)	1
10A652		Knob (Off-On Volume)	1
10A653		Knob (SW-BC)	1
10A650		Knob (Tone—R.P.)	1

**TYPE W-28A148 RECORD CHANGER PARTS**

Part No.	Ref. No.	Description	Qty. Used in Set
W-15X090-1		Motor Assembly, 60 cycles, 115-120 V.	1
W-17X412-11		50 Cycle Drive Sleeve Assembly	1
Shure P30-1		Crystal Cartridge and Semi-Permanent Needle Assembly	1
		Semi-Permanent Needle (Specify part number and letters stamped on crystal)	1

**CAPACITORS**

Ref. No.	Part No.	Description	Qty. Used in Set
C-2	17A164	5-50 mmf Trimmer	1
C-3	17A235	2-24 mmf Trimmer	1
C-6A	14A196	Gang Condenser with Drive Pulley	1
C-6B	866501	0005 mf 200 V Tubular	1
C-7	17A155	350-430 mmf Trimmer	1
C-8	17A109	2.5-35 mmf Dual Trimmer	1
C-9	D66403	.04 mf 400 V Tubular	2
C-10	47X466	.68 mmf Moulded Tubular	1
C-11	46X289	.00475 mf Part of T-2 (1st I-F Coil Assy.)	1
C-12	47X463	.47 mmf Moulded	2
C-13	47X112	50-50 mmf Dual Mica	1
C-14	D64403	.04 mf 400 V Tubular	1
C-15	D66502	.005 mf 400 V Tubular	1
C-16	D67104	.10 mf 400 V Tubular	1
C-17	D64253	.025 mf 400 V Tubular	1
C-18	D66402	.004 mf 400 V Tubular	1
C-19	D66103	.01 mf 400 V Tubular	1
C-20	45X346	40 mf 450 V Electrolytic	1
C-21	C-30B	40 mf 450 V Electrolytic	1
C-22	C-30C	25 V Tubular	1
C-23	H66402	.004 mf 800 V Tubular	1
C-24	47X467	.470 mmf Moulded	1
C-25	B66503	.05 mf 200 V Tubular	1

**RESISTORS**

Ref. No.	Part No.	Description	Qty. Used in Set
R-1	885225	2.2 meg. OHMS	2
R-2	C84393	39 K	2
R-3	884393	39 K	1
R-4	884222	2200	1
R-5	885105	1 meg	1
R-6	885473	47 K	1
R-7	884153	15 K	1
R-8	36X358	500 K	1
R-9	885106	10 meg.	1
R-10	885474	470 K	2
R-11	884333	33 K	1
R-12	884823	82 K	1
R-13	40X276	3.0 meg.	1
R-14	C84271	270	1
R-15	D84182	1800	1

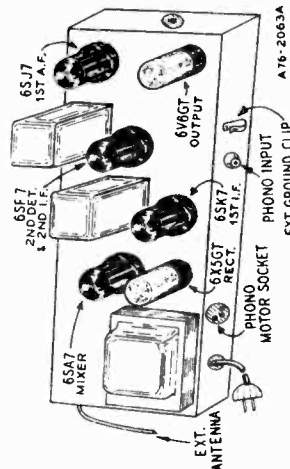
**GENERAL DESCRIPTION**

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

**50 CYCLE OPERATION**

If it is desired to use the record changer on a 50 cycle power supply, it will be necessary to replace the drive sleeve assembly on the record changer motor shaft with a 50 cycle drive sleeve assembly. This assembly is listed in the parts list.

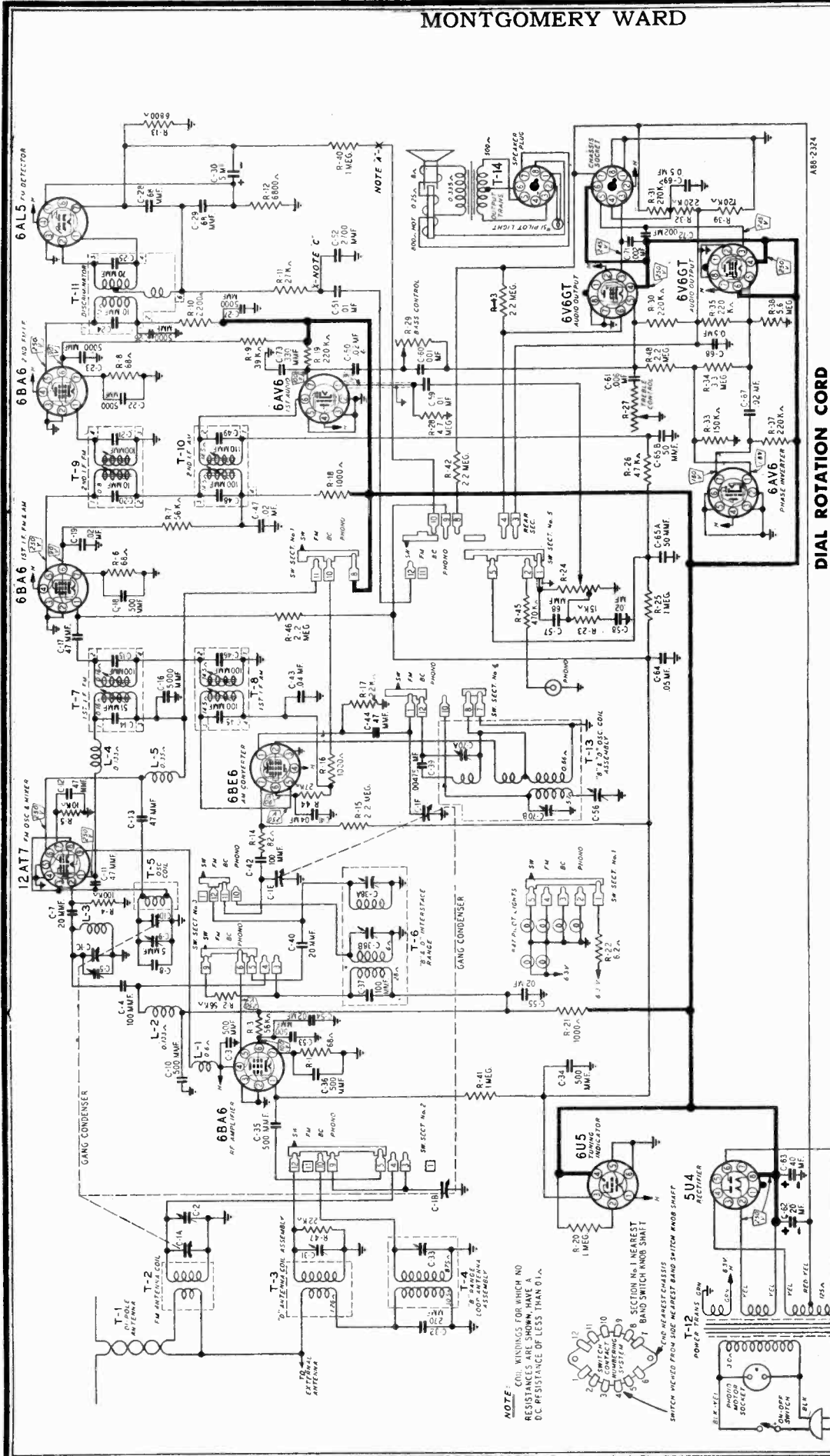
To change the sleeve turn the record selector shelf to the 12" position and lift the turntable off of the record changer. Loosen the set screw holding the drive sleeve on the motor shaft and remove the old sleeve. Install the new 50 cycle drive sleeve and replace the turntable.



- Power Supply..... 105-125 volts AC, 60 cycles, 45 watts. (65 watts phono operating)
- Frequency Range..... B range—540-1600 KC  
D range—5.75 to 18.3 MC
- Intermediate Frequency..... 455 KC
- Selectivity..... 40 KC broad at 1000 times signal, 1000 KC
- Sensitivity..... (for .5 watt output) with external antenna  
B range—9 microvolts average  
D range—20 microvolts average
- Power Output..... 4 watts maximum  
2.3 watts, 10% distortion
- Loud Speaker..... 10" PM dynamic
- Voice Coil Impedance..... 3.2 ohms at 400 cycles

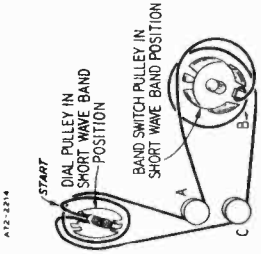
MONTGOMERY WARD

MODEL 81WG-2712A

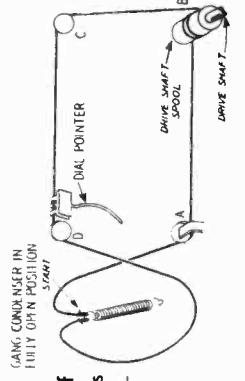


NOTE: COIL WINDINGS FOR WHICH NO RESISTANCE IS GIVEN ARE TO BE WOUND WITH D.C. RESISTANCE OF LESS THAN 0.1 Ω.

SECTION No. 1 NEAREST BAND SWITCH KNOB SHAFT  
SWITCH WICED FROM SIDE NEAREST BAND SWITCH KNOB SHAFT



**DIAL ROTATION CORD**  
Use a new 10X67 drive cord assembly or a new length of cord 21 inches long for the installation. Both the dial pulley and the band switch pulley must be turned to the short wave band position as shown in the illustration. Install the new cord exactly as shown then change the position of the band switch several times and note the movement of the dial.



**DRIVE CORD REPLACEMENT**  
Use a new 10X61 drive cord assembly or a new length of cord 50 inches long for the installation. Install the cord as shown in the illustration, winding three turns counter-clockwise around the drive shaft spool with the turns progressing towards the front end of the drive shaft. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.

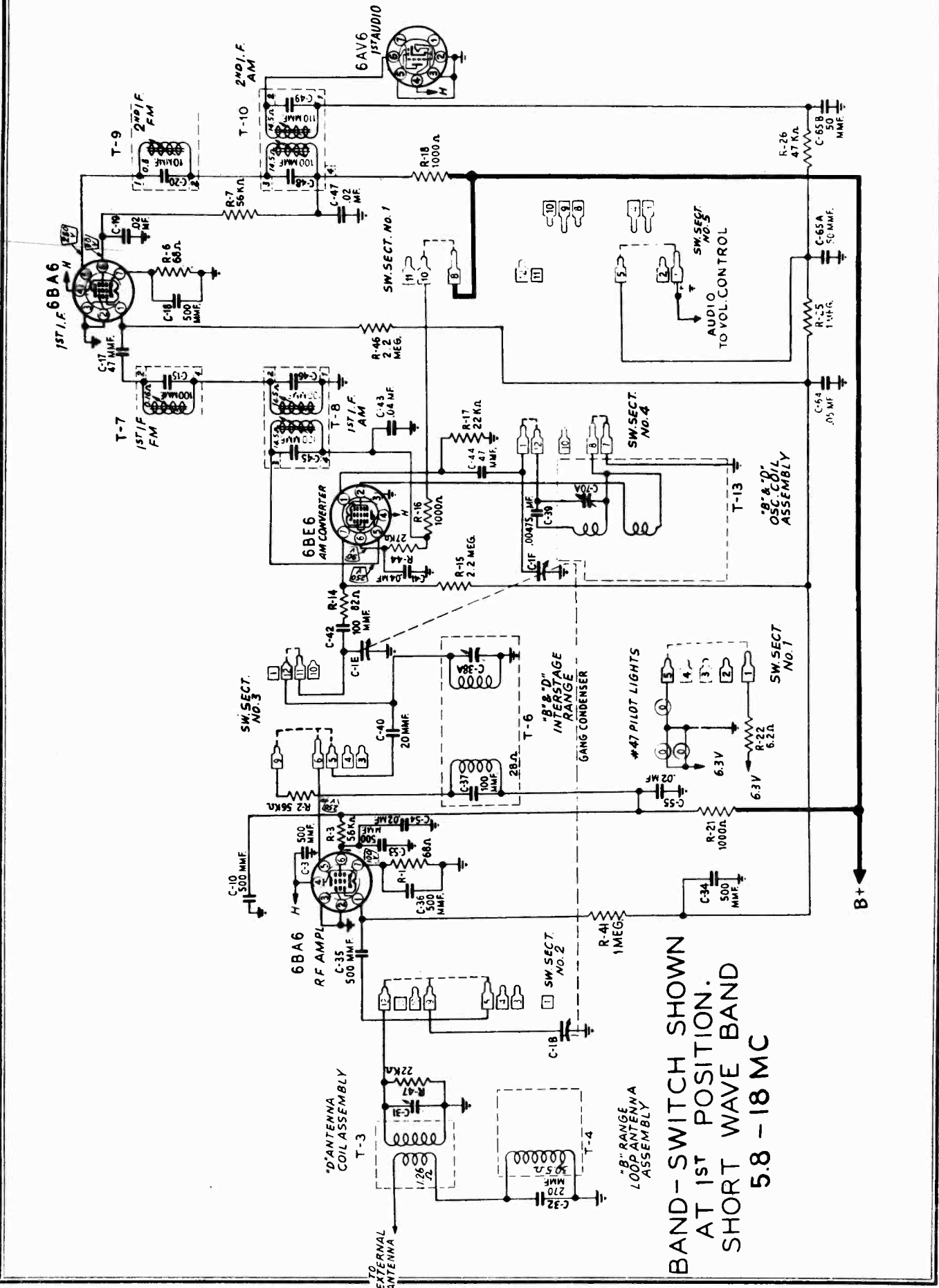
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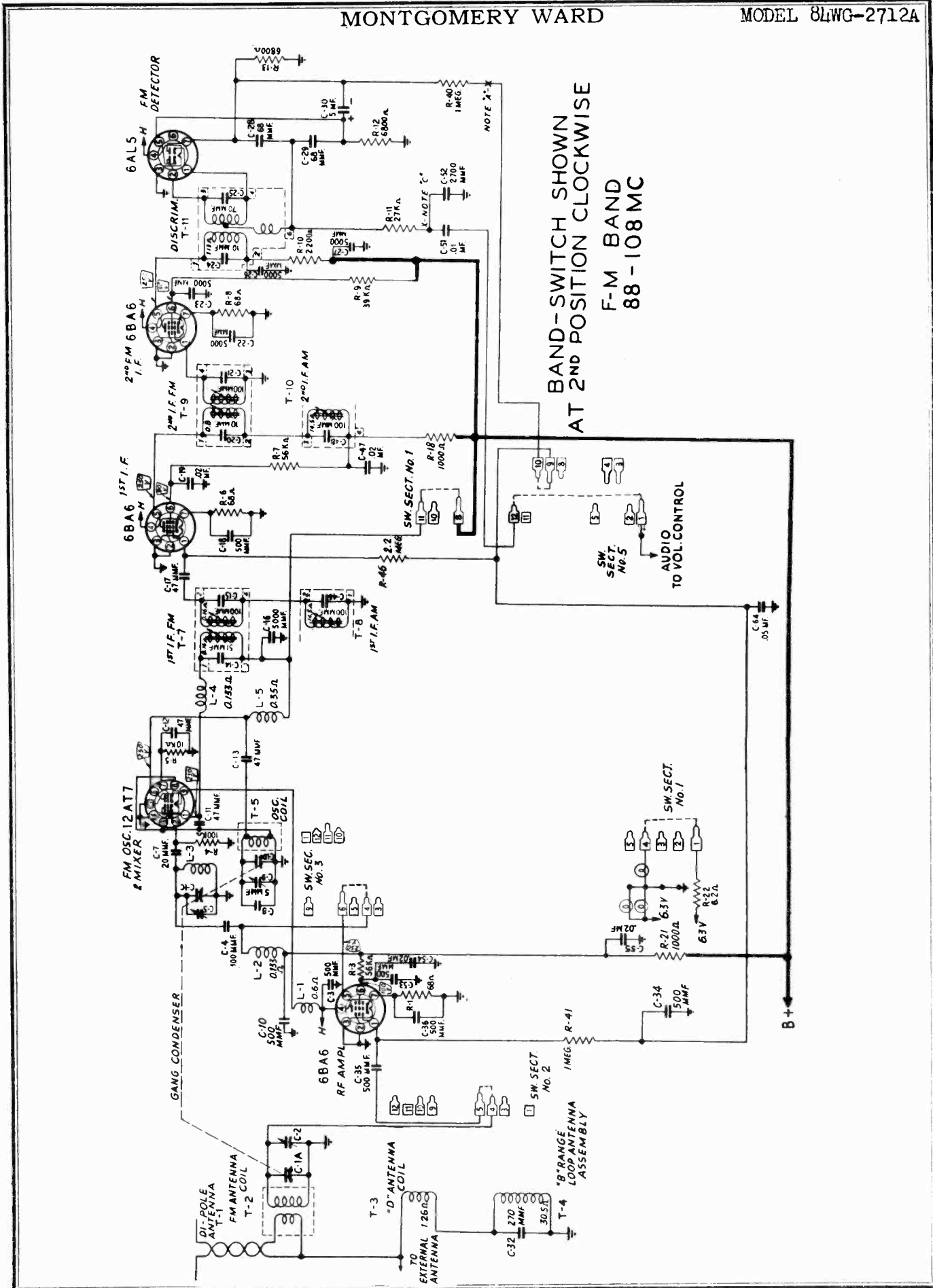
PAGE 18-80 MONT WARD

MODEL 8LWG-2712A

MONTGOMERY WARD



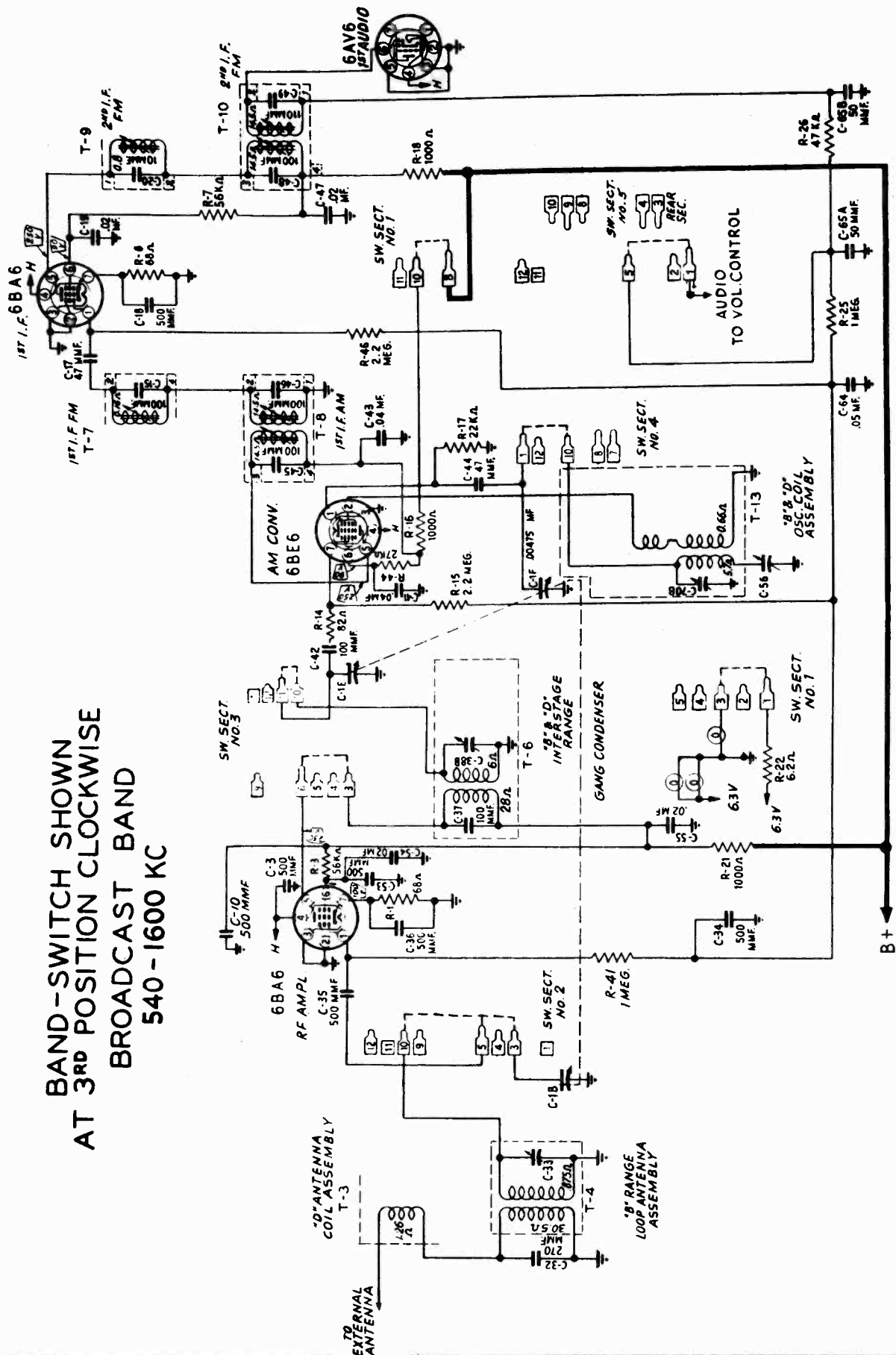
BAND - SWITCH SHOWN  
AT 1ST POSITION.  
SHORT WAVE BAND  
5.8 - 18 MC



© John F. Rider



**BAND-SWITCH SHOWN  
AT 3RD POSITION CLOCKWISE  
BROADCAST BAND  
540 - 1600 KC**



## MONTGOMERY WARD

MODEL 8LWG-2712A

A 100,000 Ohm 1/2 Watt Resistor (R50) was connected between the top of the Volume Control R-24 and ground, this resistor improves the Audio Amplifier stability. See Figure 2. for the location of this Resistor.

The following additional parts are used:

<u>REFERENCE NO.</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>
R-49	B-84222	2,200 Ohm 0.5 Watt
R-50	B-85104	100 K Ohm 0.5 Watt

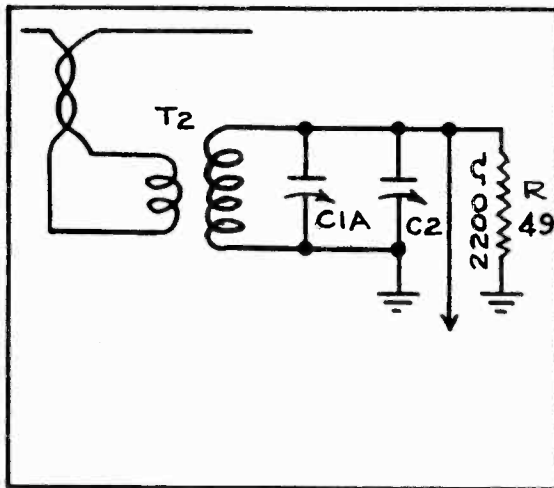


FIG. 1

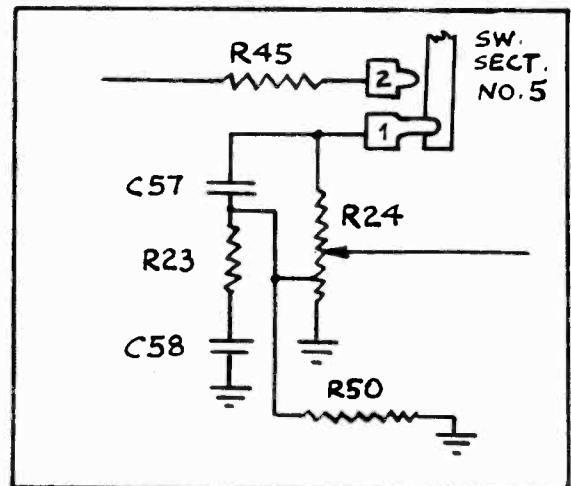


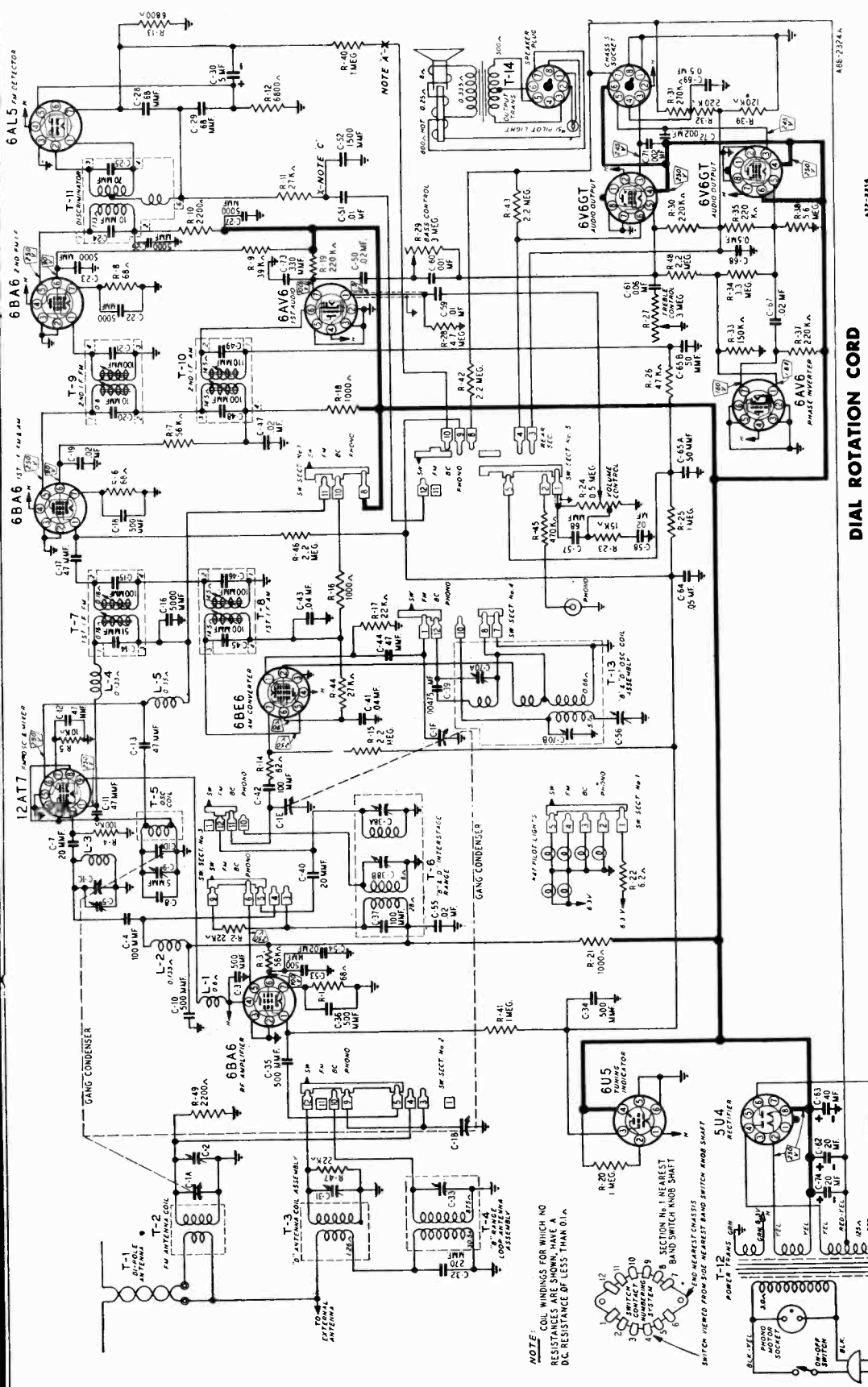
FIG. 2

Two production changes were made as follows:

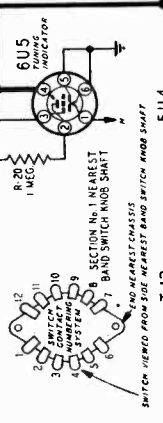
A 2,200 Ohm, 1/2 watt Resistor (R49) was connected across the secondary of the F.M. Antenna Coil T-2. This resistor broadens the frequency response curve of this coil. See Figure 1. for location of this Resistor.

MODEL 6LWG-2712B

MONTGOMERY WARD

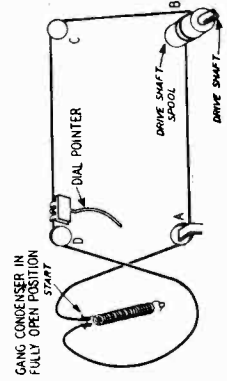


NOTE: COIL WINDINGS FOR WHICH NO RESISTANCES ARE SHOWN, HAVE A D.C. RESISTANCE OF LESS THAN 0.1 A.



**DIAL ROTATION CORD**

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



**DRIVE CORD REPLACEMENT**

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

MONTGOMERY WARD

MODELS 8LWG-2712A,  
8LWG-2712B

**ALIGNMENT PROCEDURE  
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 5000 ohms.

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

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

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

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

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

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

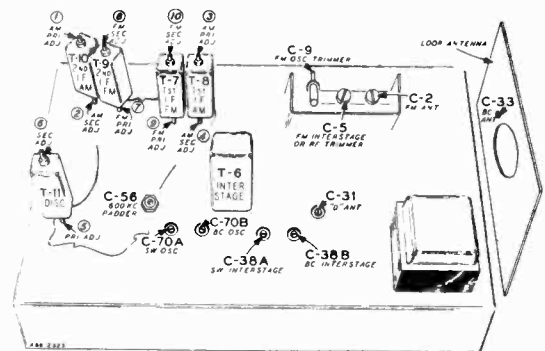
NOTE C—Disconnect zero center DC vacuum tube voltmeter from AVC and reconnect to junction of R-11, C-51 and C-52. Adjust for zero voltage indication.

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

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

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

NOTE G—Oscillator frequency below signal frequency.

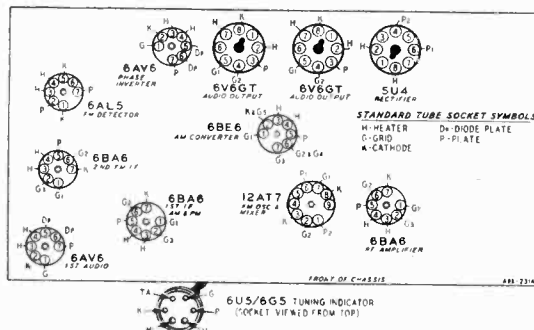


**TUBE SOCKET VOLTAGES**

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

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

A variation of ±10% is usually permissible.



MODELS 8LWG-2712A,  
8LWG-2712B

MONTGOMERY WARD

**RECEIVER STAGE SENSITIVITIES  
AM AND AUDIO STAGES**

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

The volume control must be set to maximum.

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

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	
1000 KC	200 mmf or RMA Dummy Antenna	External Antenna Lead	Chassis	2 Microvolts
1000 KC	.05 mf	6BA6 Interstage Pin 1	Chassis	8 Microvolts
1000 KC	.05 mf	6BE6 Converter Pin 7	Chassis	65 Microvolts
455 KC	.05 mf	6BE6 Converter Pin 7	Chassis	55 Microvolts
455 KC	.05 mf	6BA6 1st I-F Pin 1	Chassis	3500 Microvolts
400 cycles	.05 mf	6AV6 1st A-F Pin 1	Chassis	.045 Volt
400 cycles	.05 mf	6V6GT Output Pin 5	Chassis	1.65 Volts

**FM STAGES**

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

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

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

**ALIGNMENT PROCEDURE  
AM BROADCAST AND SHORT WAVE BAND**

The following is required for aligning:

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

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

Volume Control—Maximum all Adjustments.

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

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

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

After each range is completed, repeat the procedure as a final check.  
Note A—If the pointer is not at 1400 KC on the dial, reset pointer at the 1400 KC mark on the dial scale.

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



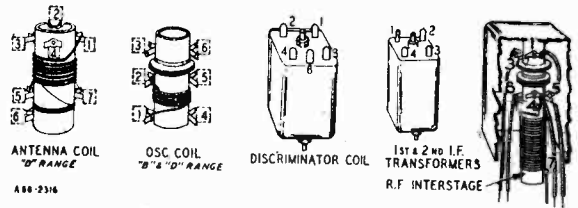
This is a three band, ten tube (plus tuning eye and rectifier tube) receiver with automatic record changer, for the reception of both AM and FM stations. The R-F and I-F stages use the latest type high gain miniature type tubes and built-in Air Wave Aerials are provided for the FM and Broadcast bands. Features include the new Roto-Selector dial with only one band visible at a time, compensator circuits to prevent oscillator drift, automatic volume control, beam power output stage, electro dynamic loud speaker and an electrostatic shield in the power transformer to reduce power line noise.

**Tube and Dial Lamp Complement**

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

**ELECTRICAL SPECIFICATIONS**

Power Supply.....	105-125 volts AC 60 cycles, 110 watts, 130 watts with record changer
Frequency Ranges.....	Broadcast 540-1600 KC Frequency Modulation 88-108 MC Short Wave 5.8-18 MC
Intermediate Frequency.....	AM—455 KC FM—10.7 MC
Selectivity.....	AM—37 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—700 KC broad at 200 times down
AM Sensitivity.....	(For .5 watt output with external antenna) Broadcast, 2 microvolts average Short Wave, 4 microvolts average
FM Sensitivity.....	(For .5 watt output) 25 microvolts average
Power Output.....	12.0 watts maximum 9.0 watts 10% distortion
Loud Speaker.....	12" Electro Dynamic
Voice Coil Impedance.....	8.0 ohms 400 cycles

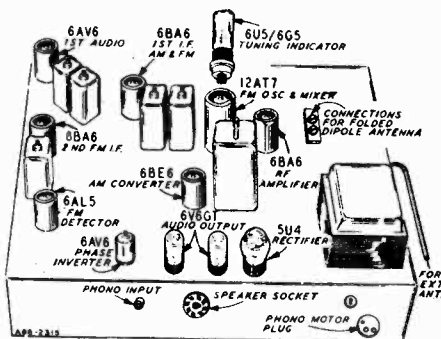


**50 CYCLE AC OPERATION**

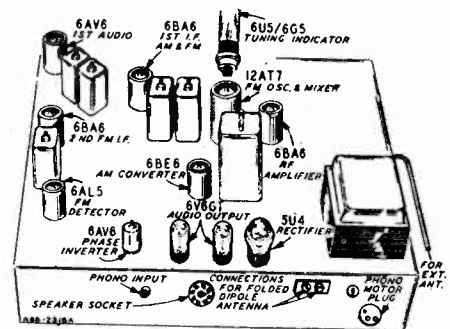
If it is desired to operate this radio on a 50 cycle 105-125 volt AC power source no changes are necessary to the radio chassis.

If it is desired to use the record changer on a 50 cycle power supply, it will be necessary to replace the drive sleeve assembly on the record changer motor shaft with a 50 cycle drive sleeve assembly. This assembly is listed in the parts list.

To change the sleeve turn the recorder selector shelf to the 12" position and lift the turntable off of the record changer. Loosen the set screw holding the drive sleeve on the motor shaft and remove the old sleeve. Install the new 50 cycle drive sleeve and replace the turntable.



84WG-2712A



84WG-2712B

MODEL 84WG-2712A

MONTGOMERY WARD

Ref. No.	Part No.	Description	Qty. Used in Set	Ref. No.	Part No.	Description	Qty. Used in Set	Ref. No.	Part No.	Description	Qty. Used in Set
<b>CAPACITORS</b>											
C-1	26A483	Tuner and Gang Assembly	1	C-40	47X516	20 mmf	Ceramic	R-17	B84223	22K	2
C-2	17A247	3.0-12 mmf Trimmer	2	C-41	D66403	.04 mf	Tubular	R-47		0.5	Carbon
C-3				C-42				R-19			
C-10				C-43				R-30			
C-18				C-44				R-35			
C-34				C-45				R-33			
C-35				C-46				R-37			
C-36				C-47				R-20			
C-53				C-48				R-22			
C-4	47X496	500 mmf	7	C-49				R-23			
C-42				C-50				R-24			
C-7	47X497	100 mmf	2	C-51	B66103	.01 mf	Tubular	R-25			
C-8	47X516	20mmf	1	C-52	47X492	2700 mmf	Molded	R-40			
C-8	47X500	5 mmf	1	C-53	17A241	300-475 mmf	Trimmer	R-26			
C-9	17A255	1.8 mmf	1	C-54	B66203	.02 mf	Tubular	R-27			
C-11	47X499	47 mmf	1	C-55	D66102	.001 mf	Tubular	R-29			
C-12				C-56	D66602	.006 mf	Tubular	R-28			
C-13				C-57	45X351	20 mf	Dry Electrolytic	R-31			
C-19				C-58	45X302	40 mf	Dry Electrolytic	R-32			
C-22				C-59	B66503	.05 mf	Tubular	R-33			
C-23				C-60	47X112	50-50 mmf	Dual Mica	R-34			
C-26	47X498	47 mmf	3	C-61	A66504	.5 mf	Tubular	R-38			
C-27				C-62	17A246	3.2-35 mmf	Dual Trimmer	R-39			
C-17	47X495	47 mmf	1	C-63	D66202	.002 mf	Tubular	R-43			
C-19				C-64	47X470	330 mmf	Molded	R-44			
C-47				C-65A				R-45			
C-50	D66203	.02 mf	6	C-65B							
C-54				C-68							
C-55				C-69							
C-67				C-70A							
C-20				C-70B							
C-21				C-71							
C-24				C-72							
C-25				C-73							
C-28	47X501	68 mmf	3								
C-29											
C-57											
C-30	45X361	5 mf	1								
C-31	17A253	5-50 mmf	1								
C-32	47X445	270 mmf	1								
C-32	47X57	100 mmf	1								
C-39	46X289	.00475 mf	1								
C-38A	17A252	1.3-12 mmf	1								
C-38B											

Ref. No.	Part No.	Description	Qty. Used in Set	Ref. No.	Part No.	Description	Qty. Used in Set
<b>RESISTORS</b>							
R-1				L-1	9A1881	Filament Choke Assembly	1
R-6				L-2	9A1880	FM R.F. Plate Choke	2
R-8				L-4	9A1946	FM R.F. Coil	1
R-2	B83680	68 Ohms	3	L-5	9A1882	FM Oscillator Plate Choke	1
R-3	C85223	22K	1	T-1	9A1900	Di-Pole Antenna Assembly	1
R-3	B85563	56K	1	T-2	9A1945	FM Antenna Coil	1
R-4	B84104	100K	1	T-3	9A1957	"D" Antenna Coil Assembly	1
R-5	B84103	10K	1	T-4	26A436	Loop Antenna Assembly	1
R-7	C84563	56K	1	T-5	9A1948	Oscillator Coil (FM)	1
R-9	C84393	39K	1	T-6	9A1947	Interstage "B" & "D" Range Coil Assembly	1
R-10	B85222	2200	1	T-7	9A1950	1st I-F Transformer (FM)	1
R-11	B84273	27K	1	T-8	9A1934	1st I-F Transformer (AM)	1
R-12	B83682	6800	2	T-9	9A1933	2nd I-F Transformer (FM)	1
R-13	B84820	82	1	T-10	9A1935	2nd I-F Transformer (AM)	1
R-14				T-11	9A1936	Discriminator Coil	1
R-15				T-12	53X293	Power Transformer	1
R-42	B85225	2.2 meg.	4	T-13	9A1918	"B" & "D" Oscillator Coil Assembly	1
R-46							
R-48							
R-16	B85102	1000	3				
R-18							
R-21							

**TRANSFORMERS AND COILS**

**RESISTORS**

(See Miscellaneous)

MONTGOMERY WARD

MODEL 84WG-2712B

Ref. No.	Part No.	Description	Qty. Used in Set	Ref. No.	Part No.	Description	Qty. Used in Set
C-1	26A483	Tuner and Gang Assembly	1	R-17	884223	22K	2
C-2	17A247	3.0-12 mmf Trimmer	2	R-19	885224	220K	4
C-3				R-20	Part of 13X549 Cable and Socket Assembly		
C-10	47X496	500 mmf Ceramic	7	R-22	43X217	6.2	1
C-18				R-23	885153	15K	1
C-34				R-24	36X374	.5 meg.	1
C-35				R-25	885105	1 meg.	3
C-36				R-40	885473	47 K	1
C-37	47X497	100 mmf Ceramic	2	R-26	40X286	3 meg.	2
C-42	47X516	20mmf Ceramic	2	R-29	885475	4.7 meg.	1
C-40	47X500	5 mmf Ceramic	1	R-31	883274	270K	1
C-8	17A255	1.8 mmf Trimmer	1	R-32	883224	220 K	1
C-9	47X499	47 mmf Ceramic	1	R-33	884154	150 K	1
C-11				R-34	885335	3.3 meg.	1
C-12	47X498	47 mmf Ceramic	3	R-38	885565	5.6 meg.	1
C-13				R-39	883124	120 K	1
C-14	Part of T-7	1st I-F (FM)		R-43	884225	2.2 meg.	1
C-15				R-44	884273	27K	1
C-16				R-45	885474	470K	1
C-22	47X507	5000 mmf Ceramic	5	R-49	884222	2200	1
C-23							
C-26							
C-27							
C-17	47X495	47 mmf Ceramic	1				
C-19							
C-47							
C-50	D66203	.02 mf 400 V Tubular	6				
C-54							
C-55							
C-67							
C-20	Part of T-9	2nd I-F (FM)					
C-21							
C-24	Part of T-11	Discriminator					
C-25							
C-28	47X501	68 mmf Ceramic	3				
C-29							
C-30	45X361	5 mf 100 V Dry Electrolytic	1				
C-31	17A253	5.50 mmf Trimmer	1				
C-32	47X445	270 mmf Molded	1				
C-33	17A123	1.5-12 mmf Trimmer	1				
C-37	47X57	100 mmf Molded	1				
C-38A	17A252	1.3-12 mmf Dual Trimmer	1				
C-38B	46X289	.00475 mf 180 V Tubular	1				
C-39							
<b>CAPACITORS</b>							
C-41	D66403	.04 mf 400 V Tubular	2	R-17	884223	22K	2
C-43	Part of T-8	1st I-F (AM)		R-19	885224	220K	4
C-45				R-20	Part of 13X549 Cable and Socket Assembly		
C-46				R-22	43X217	6.2	1
C-48	Part of T-10	2nd I-F (AM)		R-23	885153	15K	1
C-49				R-24	36X374	.5 meg.	1
C-51	B66103	.01 mf 200 V Tubular	2	R-25	885105	1 meg.	3
C-52	47X528	1500 mmf Molded	1	R-40	885473	47 K	1
C-55	17A241	300-475 mmf Trimmer	1	R-26	40X286	3 meg.	2
C-56	B66203	.02 mf 200 V Tubular	1	R-29	885475	4.7 meg.	1
C-58	D66102	.031 mf 400 V Tubular	1	R-31	883274	270K	1
C-60	D66602	.006 mf 400 V Tubular	1	R-32	883224	220 K	1
C-61	45X351	20 mf 450 V Dry Electrolytic	1	R-33	884154	150 K	1
C-62	45X302	40 mf 450 V Dry Electrolytic	1	R-34	885335	3.3 meg.	1
C-63	B66503	.05 mf 200 V Tubular	1	R-38	885565	5.6 meg.	1
C-64	47X112	50-50 mmf Dual Mica	1	R-39	883124	120 K	1
C-65A				R-43	884225	2.2 meg.	1
C-65B				R-44	884273	27K	1
C-68	A66504	.5 mf 100 V Tubular	2	R-45	885474	470K	1
C-69	17A246	3.2-35 mmf Dual Trimmer	1				
C-70A							
C-70B							
C-71	D66202	.002 mf 400 V Tubular	2				
C-72	47X470	330 mmf Molded	1				
C-73	45X373	20 mf 450 V Dry Electrolytic	1				
C-74							
<b>RESISTORS</b>							
R-1	883680	68 Ohms	3	L-1	9A1881	Filament Choke Assembly	1
R-6				L-2	9A1880	FM R-F Plate Choke	2
R-8				L-4	9A1946	FM R-F Coil	1
R-2	C85223	22K	1	L-3	9A1882	FM Oscillator Plate Choke	1
R-3	885563	56K	1	L-5	9A1962	Di-Pole Antenna Assembly	1
R-4	884104	100K	1	T-1	9A1966	FM Antenna Coil	1
R-5	884103	10K	1	T-2	9A1957	"D" Antenna Coil Assembly	1
R-7	C84563	56K	1	T-3	26A436	Loop Antenna Assembly	1
R-9	C84393	39K	1	T-4	9A1948	Oscillator Coil ("M")	1
R-10	885222	2200	1	T-5	9A1947	Interstage "B" & "D" Range Coil Assembly	1
R-11	884273	27K	1	T-6	9A1950	1st I-F Transformer (FM)	1
R-12	883682	6800	2	T-7	9A1934	1st I-F Transformer (AM)	1
R-13	884820	82	1	T-8	9A1933	2nd I-F Transformer (AM)	1
R-14				T-9	9A1935	2nd I-F Transformer (AM)	1
R-15	885225	2.2 meg.	4	T-10	9A1936	Discriminator Coil	1
R-42				T-11	53X293	Power Transformer	1
R-46				T-12	9A1988	"B" & "D" Oscillator Coil Assembly	1
R-48				T-13		Output Transformer	1
R-16	885102	1000	3	T-14		(See Miscellaneous)	1
R-18							
R-21							



MODELS 84WG-2712A, MONTGOMERY WARD

84WG-2712B MODEL 84WG-2712A

MODEL 84WG-2712B

Ref. No. Part No. Description Qty. Used in Set

MISCELLANEOUS

12A481	12" E.D. Speaker complete with out-put transformer	1
3A303	Tube socket—octal (8 prong) molded	4
3A425	Tube socket (miniature)	6
32X346	Tube shield (miniature)	6
32X388	Tube Shield (For 12AT7)	1
3A436	Tube socket (For 12AT7)	1
3A427	Tube socket (R-F Amp)	1
3A304	Phono Motor Socket	1
3A305	Phono Socket—Single pin	1
2A376	Rotary Snap Switch	1
2A377	Band Switch	1
13X328	Line Cord and Plug Assembly	1
10A509	Tuner Buttons	6
28X320	Springs (Tuner Button)	6
10A662	Knob (Band)	1
10A667	Knob (Tuning)	1
10A666	Knob (Bass)	1
10A665	Knob (Treble)	1
10A664	Knob (Volume)	1
10A663	Knob (Off-On)	1
4X870	Escutcheon Eye	1
7A32	No. 51 Pilot Light (Jewel)	1
7A222	Jewel (Pilot Light)	1
13X549	Cable and Socket Assembly—Tuning Indicator	1
6X21	Rubber Grommets } Mtg. Gang	4
20X329	Condenser Cushion Stud } Cond.	4

DIAL AND DRIVE ASSEMBLY

26A435	Dial Bracket Assembly	1
26A484	Dial and Drum Assembly Complete with Dial Background, Collar, Dial Drum and Dial Scale	1
15X221	Pointer	1
26X500	Dial Drum Shaft	1
26A440	Pulley and Collar Assembly (For dial drum shaft)	1
26A437	Band Switch Pulley Assembly	1
26X468	Band Switch Shaft	1
26A441	Crown Gear Assembly (For Mtg. to Band Switch)	2
26A434	Idler Bracket Assembly	1
25X1389	Drive Shaft Bracket	1
26X467	Drive Shaft	1
24X551	Drive Shaft Spool	1
10X67	Drive Cord Assembly (Band Change)	1
28X524	Tension Spring (Band Change)	1
10X61	Drive Cord and Clip Assembly (Dial Drive)	1
28X530	Tension Spring (Dial Drive)	1
41X72	Light Shield (Band Indicator)	4
41X35	Light Shield (Dial)	2
7A103	No. 47 Pilot Light	6
7A187	Pilot Light Socket Assembly (Dual)	1
7A209	Indicator Light Socket Assembly	4
25X498	Tuning Eye Clamp	1
25X1396	Tuning Eye Bracket	1
26A485	Escutcheon and Crystal Assembly Complete with name plate, escutcheon, etc.	1

TYPE W-28A146 RECORD CHANGER PARTS

W-15X090-1	Motor Assembly, 60 cycles, 115-120 V.	1
W-15X090-1	50 Cycle Drive Sleeve Assembly	1
Shure P30-1	Crystal Cartridge and semi-Permanent Needle Assembly	1
	Semi-Permanent Needle	1
	(Specify part number and letters stamped on crystal)	

Ref. No. Part No. Description Qty. Used in Set

MISCELLANEOUS

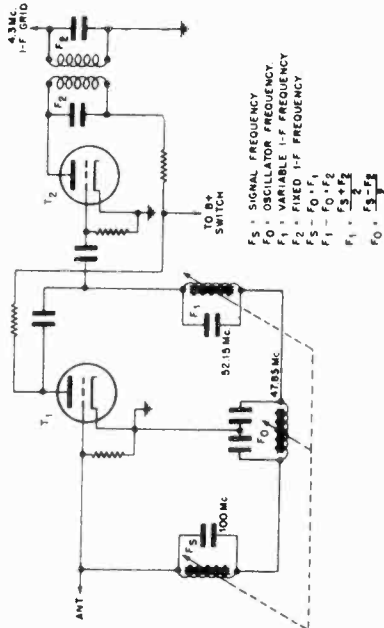
12A481	12" E.D. Speaker complete with out-put transformer	1
3A303	Tube socket—octal (8 prong) molded	4
3A425	Tube socket (miniature)	6
32X386	Tube shield (miniature)	6
32X388	Tube Shield (For 12AT7)	1
3A436	Tube socket (For 12AT7)	1
3A427	Tube socket (R-F Amp)	1
3A304	Phono Motor Socket	1
3A305	Phono Socket—Single pin	1
2A376	Rotary Snap Switch	1
2A377	Band Switch	1
13X328	Line Cord and Plug Assembly	1
26A485	Escutcheon and Crystal Assy.	1
10A509	Tuner Buttons	6
28X320	Springs (Tuner Button)	6
4X870	Escutcheon Eye	1
10A662	Knob, Band	1
10A667	Knob, Tuning	1
10A663	Knob, On-Off	1
10A664	Knob, Volume	1
10A665	Knob, Treble	1
10A666	Knob, Bass	1
25X498	Tuning Eye Clamp	1
25X1396	Tuning Eye Bracket	1
13X549	Cable and Socket Assembly—Tuning Indicator	1
6X21	Rubber Grommets } Mtg. Gang	4
20X329	Condenser Cushion Stud } Cond.	4
7A32	No. 51 Pilot Light (Jewel)	1
7A222	Jewel	1

DIAL AND DRIVE ASSEMBLY

26A435	Dial Bracket Assembly	1
26A484	Dial and Drum Assembly Complete with Dial Background, Collar, Dial Drum and Dial Scale	1
15X221	Pointer	1
26X500	Dial Drum Shaft	1
26A440	Pulley and Collar Assembly (For dial drum shaft)	1
26A437	Band Switch Pulley Assembly	1
26X468	Band Switch Shaft	1
26A441	Crown Gear Assembly (For Mtg. to Band Switch)	2
26A434	Idler Bracket Assembly	1
25X1389	Drive Shaft Bracket	1
26A494	Drive Shaft & Spool Assembly	1
10X45	Drive Cord Assembly (Band Change)	1
28X524	Tension Spring (Band Change)	1
10X66	Drive Cord and Clip Assembly (Dial Drive)	1
28X530	Tension Spring (Dial Drive)	1
41X72	Light Shield (Band Indicator)	4
41X35	Light Shield (Dial)	2
7A103	No. 47 Pilot Light	6
7A187	Pilot Light Socket Assembly (Dual)	1
7A209	Indicator Light Socket Assembly	4

TYPE W-28A146 RECORD CHANGER PARTS

W-15X090-1	Motor Assembly, 60 cycles, 115-120 V.	1
W-17X412-11	50 Cycle Drive Sleeve Assembly	1
Shure P30-1	Crystal Cartridge and semi-Permanent Needle Assembly	1
	Semi-Permanent Needle	1
	(Specify part number and letters stamped on crystal)	



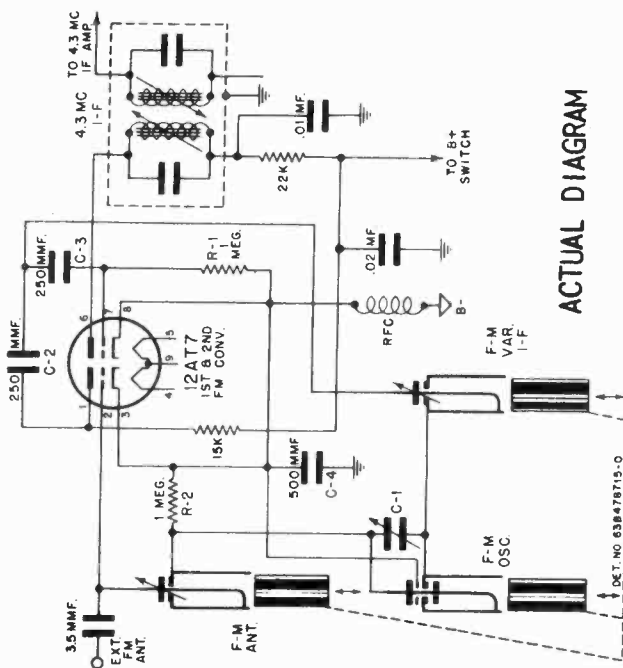
FUNCTIONAL DIAGRAM

THEORY OF THE FM TUNER

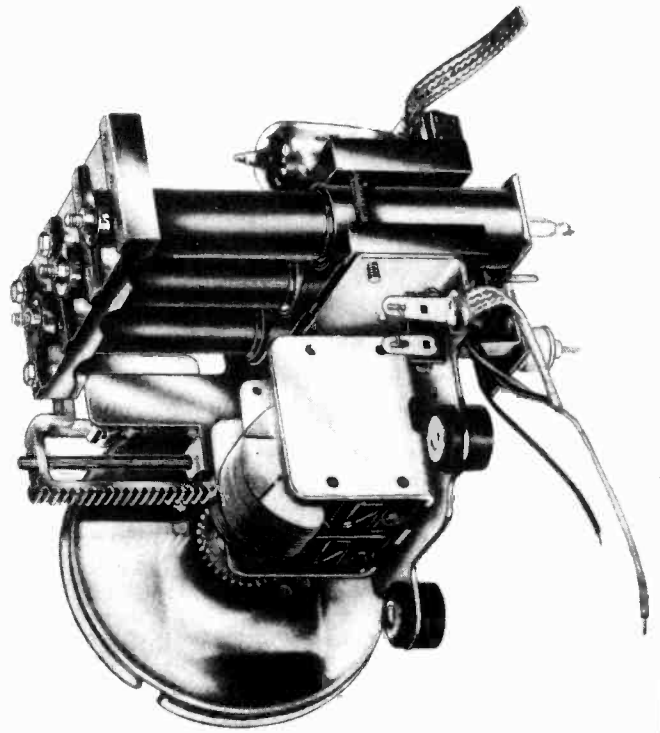
Referring to the functional schematic diagram in Figure 2, the triode T1 serves both as an oscillator and first converter, and triode T2 serves as the second converter. Oscillator voltage injection for the second converter is obtained through the coupling capacitor from the plate of T1. T1 and T2 are sections of the 12AT7 twin-triode tube.

The frequency relationships are given in Figure 2. The oscillator  $F_0$  beats with the incoming signal  $F_s$  to produce the first intermediate frequency  $F_1$ , which is variable.  $F_1$  then beats with the same oscillator frequency  $F_0$  in the second converter to produce the second intermediate frequency  $F_2$  which is 4.3 Mc. With a 100 Mc signal the oscillator frequency is 47.85 Mc and the variable intermediate frequency is 52.15 Mc.

This system of reception permits the oscillator to be resonated with a high capacitance, 250 micromicrofarads in this case. Consequently, changes in the tube characteristics during warm-up do not produce objectionable changes in oscillator frequency. This contributes materially to the stability of the system.



ACTUAL DIAGRAM



Below are instructions and methods for replacing the integral parts of the Tuner. Although this paragraph does not include instructions for all of the replaceable parts, the instructions are explicit enough to guide and assist the service man whenever it becomes necessary to replace any part that becomes faulty. A short analysis of the Tuner mechanism by the service man before attempting any replacement is highly recommended. It will be noticed that it is necessary, in some cases, to remove the Tuner from the chassis before making the replacement. Since it entails disconnecting leads, removing the Tuner from the chassis should be avoided, unless it is an absolute necessity. Many parts, such as cores, dial pulley, tuning gang and top core clamp, can be replaced without removing the Tuner from the chassis. A constant reference to Figure 4 will be necessary for the exact location of the component parts. Also, it will be necessary to refer to the specific receiver service manual for dial cord restringing instructions and alignment procedure. Of course, alignment of the FM and BC circuits will be necessary if the gang capacitor, iron cores, inductors, or trimmers are replaced, or if the position of the iron cores or inductors have changed in the Tuner.

**IRON CORE REPLACEMENT**

1. Remove the three screws (29) and lockwashers (17).
2. Remove the clamp and iron core assembly from the Tuner by merely lifting "up" on the bakelite piece (7) to which the cores are mounted.
3. Remove the core requiring replacement by turning the core in a counterclockwise direction.
4. To make the replacement, place spring (33) over the core stud and screw the core into the swivel nut (18).
5. Reassemble the Tuner.
6. It will be necessary to realign the FM circuits after replacing any core.

**V.H.F. INDUCTOR REPLACEMENT**

1. Unsolder all leads attached to the Tuner.
2. Disconnect the dial restringing system.
3. Remove the tuner mounting screws and lift the Tuner from the chassis.
4. Loosen the four screws (39).

5. To replace the faulty inductor, insert the center conductor of the inductor into the slot in the iron core. The tip must be pointed toward the front of the Tuner. The inductor should be placed between the clamp (7) as follows: The metal tubing of the first inductor (from the rear of the tuner) must be even with the top of the clamps (7); 1/32" of the metal tubing must be above the top of the clamps for the center inductor and 1/16" of the metal tubing of the third inductor should be above the clamps. It must be remembered that the oscillator frequencies depend upon the amount of iron core inserted in the inductor and during alignment the setting of this initial dimension is obtained by turning the swivel nuts (18).

6. Tighten the four screws (30). Care must be exercised when tightening these screws. If the screws are extremely tight, the inductor may be damaged or the iron core will not slide freely in the inductor.

7. Mount the tuner in the chassis.

8. Resolder all leads.

**CAUTION:** When soldering to the antenna or variable IF inductor, be careful that solder does not run over the threads of the capacitor. Never attempt to change the length of the connecting leads, as this may affect tuner tracking and performance.

9. It will be necessary to realign the FM circuits after replacing any inductor.

**DRIVE PULLEY NOTES**

Should it ever become necessary to remove or adjust the drive pulley (19) observe the following points when replacing:

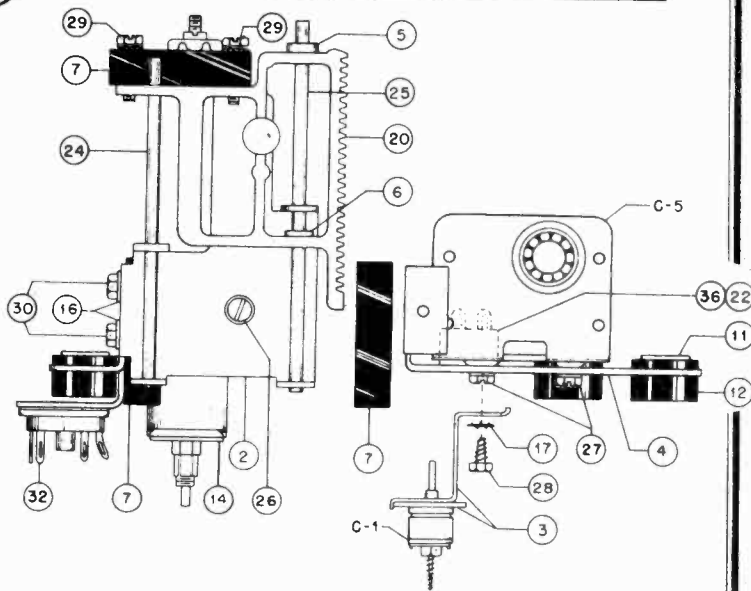
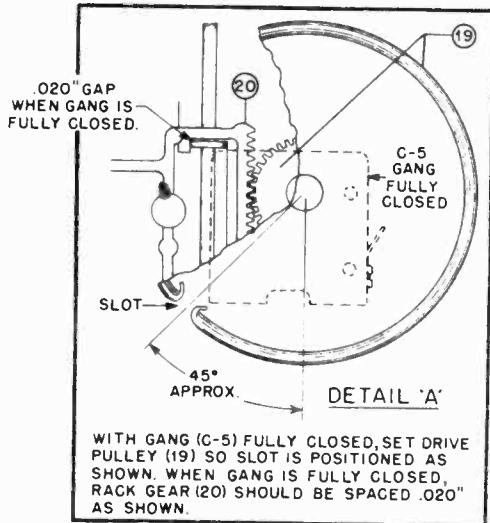
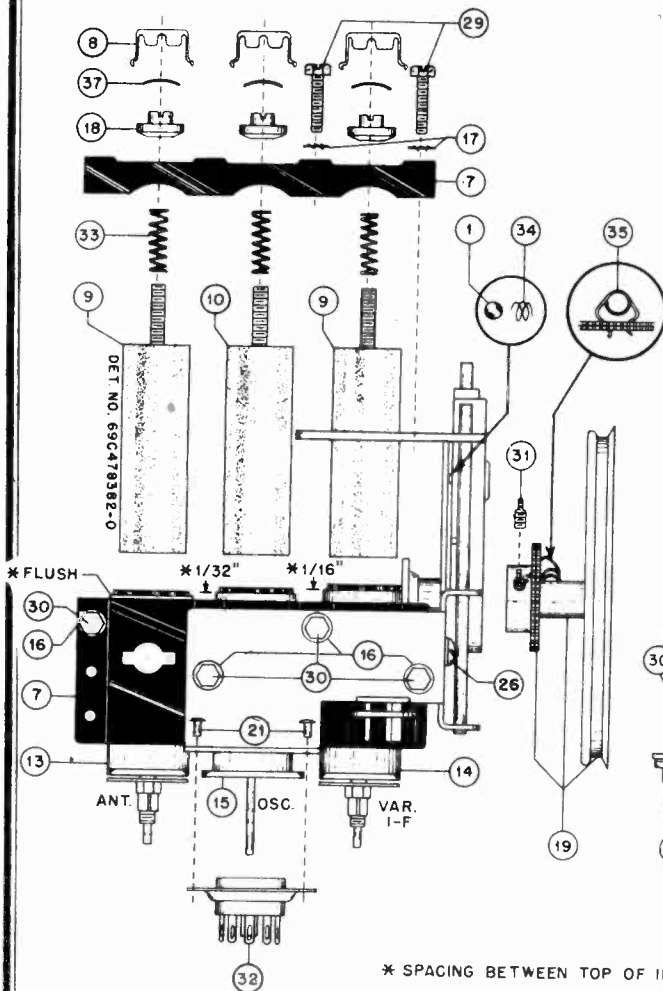
1. The gang capacitor (C-5) must be positioned by means of its mounting screws (27) so that the drive pulley split gear (19) engages the rack gear (20) properly.
2. To eliminate play between the drive pulley and rack gear, it is necessary to offset the drive pulley split gear so that the torsion spring (35) will exert tension against the two halves of the split gear.
3. Before tightening the drive pulley setscrews (31) make sure that you position the drive pulley (19) as shown in Figure 4 - Detail A. With gang capacitor (C-5) fully meshed, the perm tuning cores should be spaced .020 as shown.

**REPLACEMENT PARTS LIST**

REF. NO.	PART NO.	DESCRIPTION
	1X470540	FM-BC TUNING UNIT PT-14 (complete) ..... Exchange
C-1	19A470426	Trimmer, variable air: 2.5 mmf to 30 mmf
C-2	21R2729	Mica: 250 mmf 500V .....

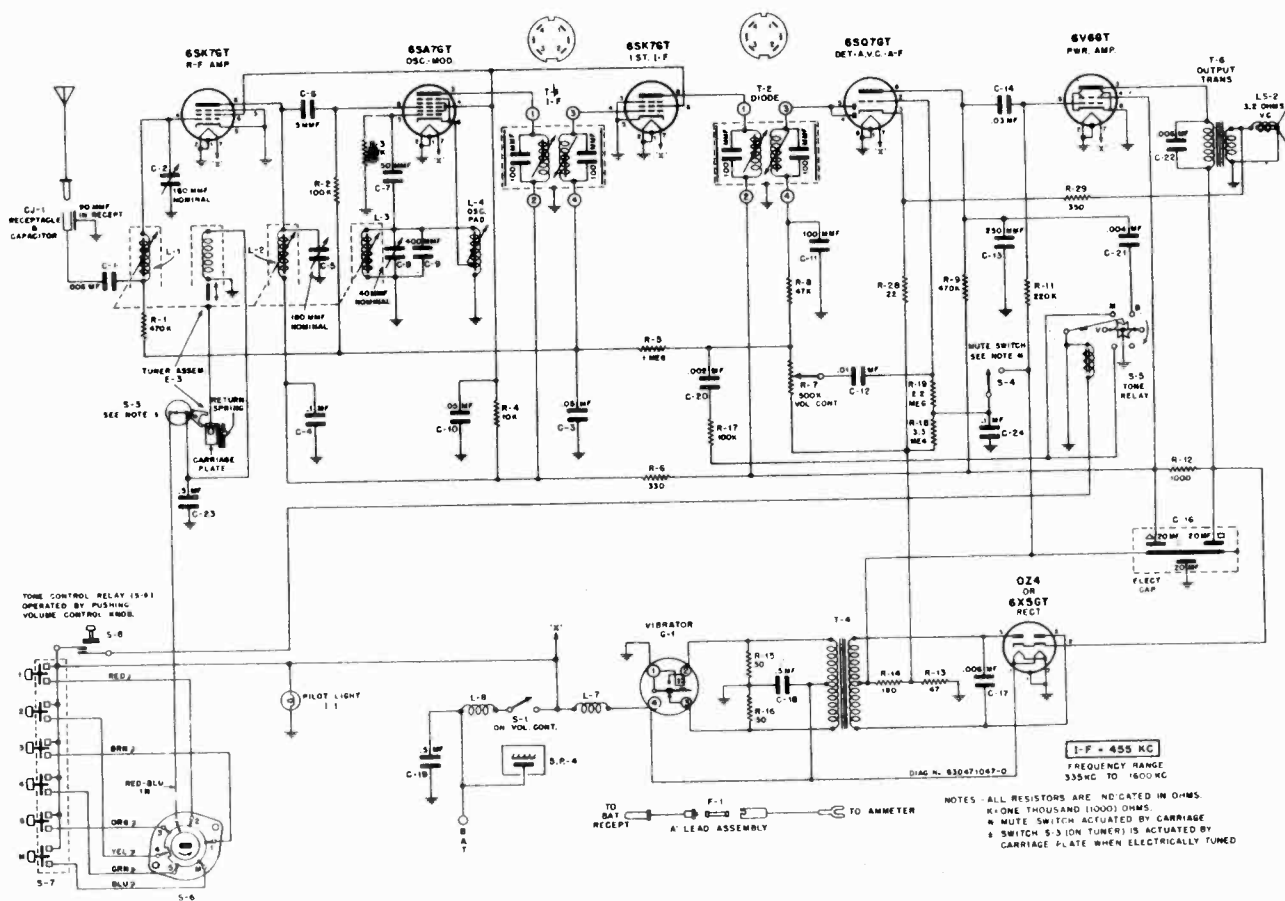
C-3	21R2729	Mica: 250 mmf 500V .....
C-4	21R2730	Mica: 500 mmf 500V .....
C-5	19K75415	Variable, 2 gang; cut oscillator plates
R-1	6R6046	1 meg 10% 1/2 W insulated .....
R-2	6R6004	1 meg 1/2 W insulated .....

PARTS LOCATION



\* SPACING BETWEEN TOP OF INDUCTOR AND BAKELITE CLAMP (7).

1	43K470555	Ball, steel .....	20	44C470438	Rack, drive gear: die cast; includes two brass guide rod bushings .....
2	7C470437	Bracket, guide rod .....	21	5S7770	Rivet: .088 x 5/32; nickel plated .....
3	1X470554	Bracket & Strip Assembly (trimmer mtg)..	22	5S7707	Rivet: .122 x 5/32; nickel plated .....
4	7C470436	Bracket, tuner .....	24	47K470419	Rod, guide: 3-17/32" long .....
5	43A478009	Bushing, guide rod (upper) .....	25	47A470418	Rod, guide: 3-29/32" long .....
6	43A478010	Bushing, guide rod (lower) .....	26	3S7158	Screw: 6-32 x 3/16 slotted binderhead machine screw; cadmium plated .....
7	42B470431	Clamp, core and inductor .....	27	3S7155	Screw: 6-32 x 3/16 slotted hex head machine screw; cadmium plated .....
8	42A72725	Clip, swivel nut .....	28	3S7508	Screw: #6 x 1/4 PKZ plain hex head; cadmium plated .....
9	46K471627	Core, powdered iron (FM Ant & Var IF) Specify color of paint dot on old core when ordering .....	29	3S1925	Screw: 6-32 x 5/8 slotted hex head machine screw; cadmium plated .....
10	46K471799	Core, powdered iron (FM Osc) Specify color of paint dot on old core when ordering .....	30	3S478002	Screw: 6-32 x 1-5/8 slotted hex head machine screw; cadmium plated .....
11	5A12105	Eyelet, mtg .....	31	3S7113	Setscrew: 8-32 x 1/4 slab head; cadmium plated .....
12	37K15125	Grommet, rubber (tuner mtg) .....	32	9A470424	Socket, tube: Noval; 9 prong; tan .....
13	24C470580	Inductor, VHF, and Capacitor (antenna).	33	41A74880	Spring, core tension .....
14	24K470581	Inductor, VHF, and Capacitor (Var IF)..	34	41A470518	Spring, compression .....
15	24K470582	Inductor, VHF, and Capacitor (Osc) ....	35	41A478047	Spring, torsion .....
16	4S7650	Lockwasher: #6 internal; cadmium plated .....	36	31A70083	Strip, terminal: 1 insulated #2 ground..
17	4S7666	Lockwasher: #6 external; cadmium plated .....	37	4A74936	Washer, spring (swivel nut) .....
18	2A72726	Nut, swivel .....			
19	1X470552	Pulley, Gears and Bushing Assembly ....			

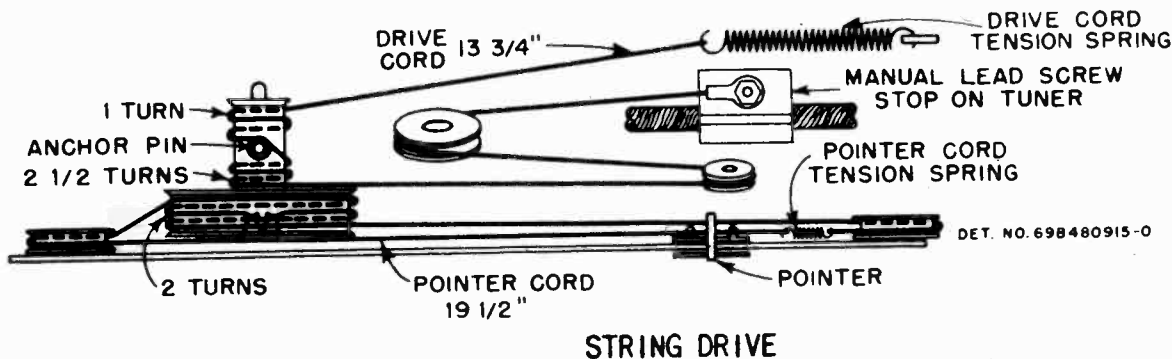


**TO SET THE PUSH BUTTONS**

1. Turn on the receiver and press the "M" button.
2. With the tuning knob, tune in the station you desire to set up. Make a mental note of the program.
3. Press the No. 1 button.
4. Push the set-up button (on left side of radio) in as far as it will go and release.
5. Turn the tuning knob until the previously noted program is heard. (The dial will not indicate the station to which the button is set). The dial pointer may reach the end of the dial scale before

the desired station is received; however, continue turning the tuning knob until the station is received. The dial mechanism will not be affected.

6. Press the "M" button and the No. 1 button is set. Check the setting of the button by tuning in the desired station having the "M" button pushed in and then push the automatic button. Either button should give the same volume and clarity.
7. Repeat the above procedure, steps 2 through 6 for each of the remaining push buttons.



ALIGNMENT

INSTRUCTIONS.- Remove front and rear covers to expose all adjustments. Use alignment tool (Motorola Part No. 66A76278) for adjusting tuner cores; a small screwdriver can be used for all other adjustments. Construct RF dummy antenna as shown in Figure 1; the 21" coaxial lead needed in its construction is the same type as used for lead-in on Motorola car antennas. Tuner gauge (Motorola Part No. 66X76825) is useful though not essential for more

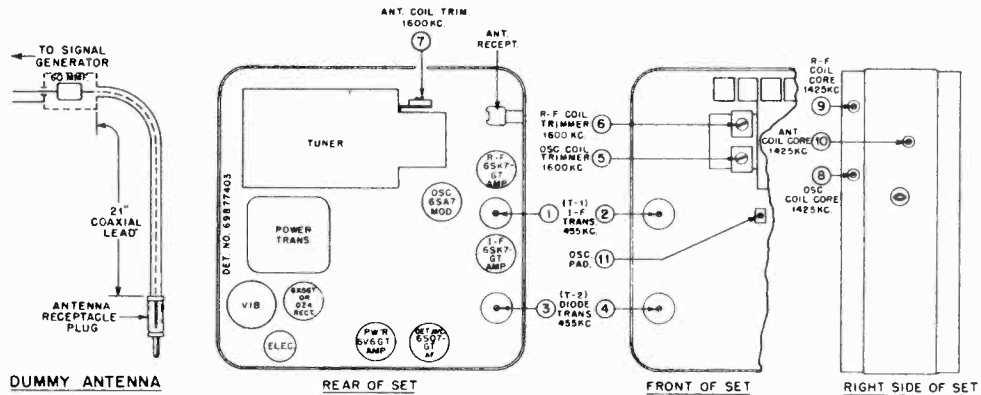
accurate setting of tuner to alignment frequencies at 1600 and 1425 Kc. Set volume control at maximum and keep output of signal generator no higher than is necessary to obtain output reading. Push "M" button to place tuner in manual position. IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores; the slightest inward pressure may move the tuner carriage and result in inaccurate alignment.

STEP	TUNER POSITION SET TO	DUMMY ANTENNA	SIG. GEN. LEAD CONNECTED TO	SIG. GEN. SET AT	ADJUST FOR PEAK
1.	High frequency end (cores out).	.1 mfd at Sig.Gen.	Osc.Mod grid (#8 pin)	455 Kc	1 & 2, 3 & 4
2.	High freq. end, tuning shaft against stop. Cores should be set to project 1-1/8" from cans.*	60 mmf at Sig.Gen. in series with 21" long coax lead.	Ant. recept.	1600 Kc	5, 6 & 7
3.	EXACTLY one full turn in from high freq.end. Use knob setscrew as indicator. Start measuring turn the moment tuner carriage starts moving inward. *	"	"	1425 Kc	8, 9 & 10
4.	EXACTLY four more full turns in (as indicated by knob setscrew)	"	"	Power off.	11 for max. noise.

NOTE: If oscillator padder core (11) adjustment is too far off, repeat alignment procedure, steps 2, 3, & 4. It may be necessary to repeat alignment more than once if padder adjustment has been tampered with.

5. Assemble receiver and peak antenna trimmer (#7) to car antenna.

\*For greater accuracy in setting tuner to alignment frequencies, use gauge (Motorola Part No. 66X76825).

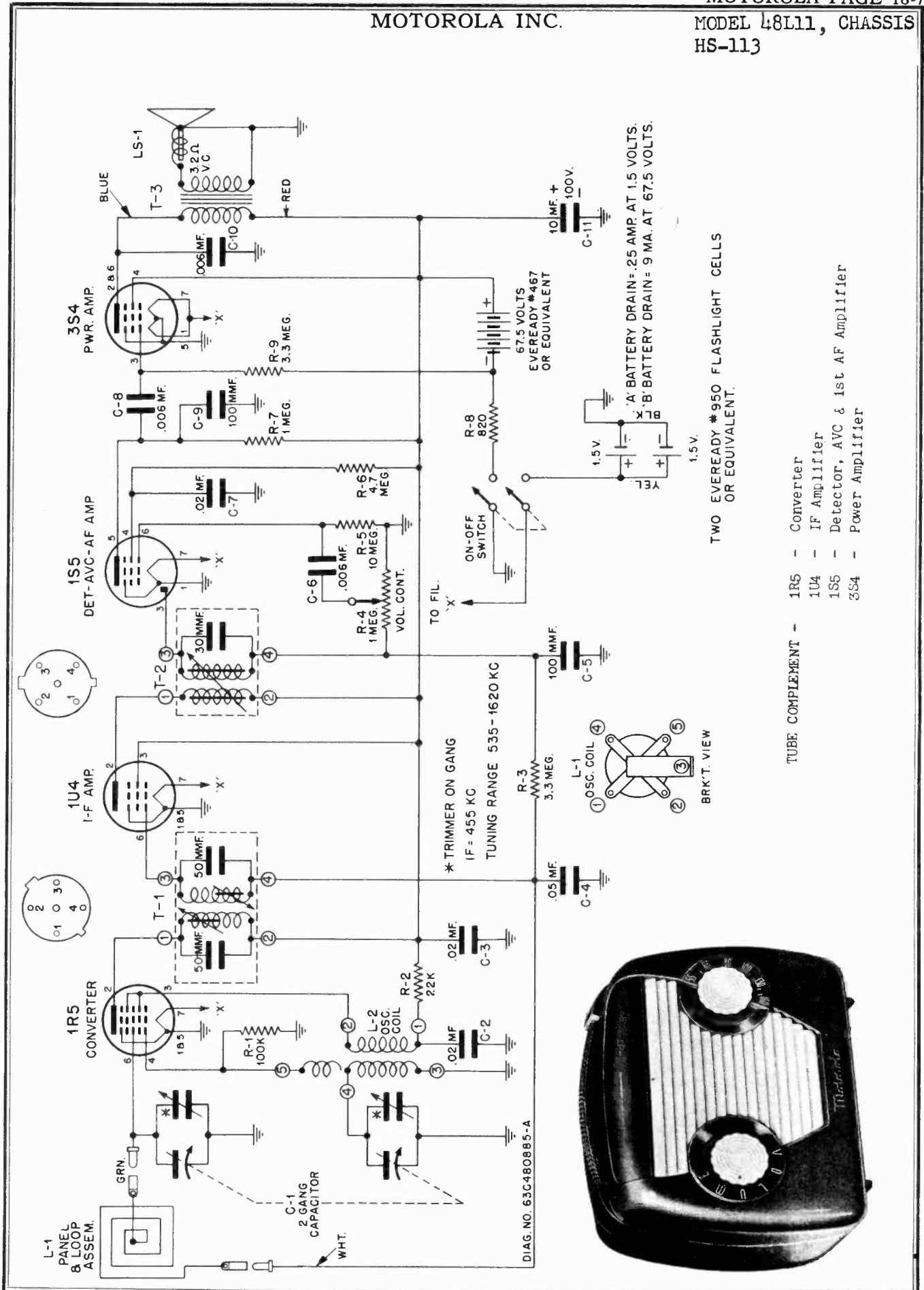


REF. NO.	PART NO.	DESCRIPTION	TUBE & TRIMMER LOCATION
<b>CAPACITORS</b>			
C-1	8C4529	Paper: .008 mmf 100V .....	C-18 8A19133 Paper: .5 mf 100V .....
C-2	20A70601	Mica trimmer: 50-180 mmf; with mtg bracket	C-19 8A17028 Paper: .5 mf 100V .....
C-3	8A13514	Paper: .05 mf 100V .....	C-20 8A4736 Paper: .002 mf 400V .....
C-4	8K13186	Paper: .1 mf 400V .....	C-21 8A71909 Paper: .004 mf 400V .....
C-5	20A70601	Mica trimmer: 50-180 mmf; with mtg bracket	C-22 8A71910 Paper: .008 mf 400V .....
C-6	21K70720	Mica: 5 mmf 500V .....	C-23 8A19133 Paper: .5 mf 100V .....
C-7	21R6513	Mica: 50 mmf 300V .....	C-24 8A472035 Paper: .1 mf 100V .....
C-8	20A70214	Mica trimmer: 30-60 mmf; with mtg bracket	
C-9	21A71872	Ceramic: 400 mmf 5% .....	<b>CAPACITOR-JACK</b>
C-10	8A14791	Paper: .05 mf 400V .....	CJ-1 9A78027 Receptacle & Capacitor Assembly: antenna receptacle with built-in 90 mmf capacitor
C-11	21B77562	Ceramic: 100 mmf .....	
C-12	8K23690	Paper: .01 mf 400V .....	<b>TUNER ASSEMBLY</b>
C-13	21R6648	Mica: 250 mmf 500V .....	E-3 - ST-56 (Order Stock Tuner Part No. 1X471070 and Adaptor Kit #4 Part No. 1X471074) (SR7). For complete tuner information- Exchange tion, refer ST-56 Service Manual Kit Part No. 54P76045.
C-14	8A71911	Paper: .03 mf 400V .....	
C-16	23A75429	Electrolytic: 20-20 mf 400V 20 mf 25V ..	
C-17	8A12840	Paper: .008 mf 1800V (use with power transformer 25B70950 only) .....	<b>FUSE</b>
or	8K472215	Paper: .008 mf 1800V (use with power transformer 25B472214 only) .....	F-1 65X4637 20 amp: type 3AG .....

MODEL SR7

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REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
<b>VIBRATOR</b>			<b>MECHANICAL PARTS</b>		
G-1	48B3333	Full wave: non-sync .....	1X76848		Background & Strip Assembly: plastic back-ground with reinforcing strip .....
<b>PILOT LIGHT</b>			43A28112		Bushing, shaft .....
I-1	65X4151	Pilot light: 6-8V clear; #51 .....	38A10544		Button, plug: for 1/4 hole; copper oxide finish (ant. trim. hole plug) .....
<b>COILS</b>			47A76599		Button, station set-up: (automatic tuner station set-up button - on housing) ...
L-1 & L-2	24B71881	Antenna or RF (specify color of paint dot when ordering) .....	42A4215		Clip, vibrator grounding .....
L-3	24B71879	Oscillator (specify color of paint dot when ordering) .....	11M8944		Cord, dial: 18 lb; black .....
L-4	24A70227	Oscillator padder: includes mtg clip and adjustable iron core .....	1X76832		Cover, back .....
L-5	24K70840	"A" Choke .....	16D76809		Cover, front .....
L-6	24K73535	Dial light & speaker field choke: 9 turns #16 yellow wire .....	1X76835		Escutcheon & Dial Scale Assembly .....
L-7	24A70199	"A" Choke: with mtg bracket .....	5S7805		Eyelet: .140 x .141 steel (dial back-ground mtg) .....
L-8	24A74934	"A" Choke .....	37C24221		Gasket, speaker: rubber .....
<b>SPEAKER</b>			14K17059		Insulator, electrolytic: cardboard tube.
LS-2	50B76589		38A76525		Knob, control: with setscrew .....
or	50B472011	PM: 6-1/4"; 3.2 ohm VC .....	4S8412		Lockwasher: #4 split (tuning shaft) ....
<b>RESISTORS</b>			29R5294		Lug, soldering (on flexible tuning shaft) .....
Note:	Unless otherwise specified, all resistors are fixed carbon, insulated type, 20%.		2S7051		Nut: 3/8-32 x 9/16 hex Plainut (vol. cont. mtg) .....
R-1	6R6032	470,000 1/2W .....	2S7029		Nut: 3/8-32 x 1/2 hex; nickel plated (shaft bushing mtg) .....
R-2	6R6075	100,000 1/2W .....	64K73978		Plate, dial scale retainer .....
R-3	6R6056	47,000 1/2W .....	1A76580		Pointer & Slider .....
R-4	6R6106	10,000 1W N.I. ....	1X76842		Pulley Assembly, dial ratio: one large and one small pulley assembled together ...
R-5	6R6004	1 meg 1/2W .....	34B76524		Scale, dial .....
R-6	6R6147	330 1W .....	3S6932		Screw: 4-40 x 3/16 slotted binderhead locking type machine screw; cad pl (tone relay mtg) .....
R-7	18A71920		3S8175		Screw: #4 x 3/16 PKZ slotted hex head sheet metal screw; cad pl (fastens drive cord to tuner) .....
or	18A70170	Volume control: 500,000: with SPST switch	3S8022		Screw: 4-40 x 1/4 slotted binderhead machine screw; cad pl (tuning shaft retainer)..
R-8	6R6056	47,000 1/2W .....	3S7454		Screw: #8 x 1/4 PKZ plain hex head sheet metal screw; cad pl .....
R-9	6R6032	470,000 1/2W .....	3S7456		Screw: #8 x 1/4 PKA slotted acorn head sheet metal screw; antique copper finish (housing screws) .....
R-10	6R2122	4.7 meg 1/2W .....	3S7453		Screw: #8 x 1 PKZ plain hex head sheet metal screw; cad pl (power trans. mtg) .....
R-11	6R6015	220,000 1/2W .....	3S7368		Screw: 8-32 x 1-25/32 slotted oval head machine screw; cad pl .....
R-12	6R3953	1,000 1W .....	1X472054		Shaft Assembly, tuning: flexible shaft complete with gear, bearing & bracket..
R-13	6R5550	47 10% 1/2W .....	1X76833		Shaft, volume control: knob shaft with tone control contact actuating washer .....
R-14	6R6390	180 10% 1W N.I. ....	47A73635		Shaft, volume control: hair-pin shaped; 29/32" long (plugs into vol. cont.) ...
R-15	6R476042	50 1W .....	37A17215		Shield, rubber light (on push buttons)..
R-16	6R476042	50 1W .....	1X71049		Shield & Sleeve Assembly (for T-1,2) ...
R-17	6R6075	100,000 1/2W .....	26A77123		Shield, tube socket (soldered between tube socket contacts) .....
R-18	6R2118	3.3 meg 1/2W .....	1X76841		Socket, dial light: complete with lead..
R-19	6R3927	2.2 meg 1/2W .....	9A6788		Socket, tube: octal .....
R-22	6R6015	220,000 1/2W .....	9A70208		Socket, tube: 4 pin (vibrator) .....
R-29	6R6010	330 1/2W .....	2S7087		Speednut: for .093 round (dial scale mtg)
<b>SWITCHES</b>			41A73619		Spring, string tension: small (pointer cord tension) .....
S-1		ON-OFF: part of volume control .....	41A73996		Spring, string tension: large (drive cord tension) .....
S-2	40A70872	Tone: slider type .....	31A72404		Strip, terminal: 1 insulated lug, #1 mtg.
S-3	1B70944	Solenoid: with mtg plate .....	31A71196		Strip, terminal: 3 insulated lugs, #1 mtg
S-4	40A70931	Mute .....	9A12705		Wafer, electrolytic insulating: bakelite..
S-5	1X71470	Relay MR-5, tone control: complete .....	9K14906		Wafer, insulating: armitite (used under electrolytic) .....
	1K70617	Magnet, tone relay .....			
S-6	40B70952	Selector .....			
S-7	1K73625	Push button assembly			
S-8	40B71383	Tone control actuating .....			
<b>SPARK PLATE</b>					
SP-4	1X74252	Spark Plate Assembly .....			
<b>TRANSFORMERS</b>					
T-1,2	24B76553	IF or diode: 455 Kc; with padding capacitor: iron core tuned; less shield can..			
T-4	25B70950	Power transformer .....			
or	25B472214	Power transformer .....			
T-6	25B72258	Output transformer: with tone relay mtg bracket			





ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment. Follow the procedure carefully.

A low range output meter should be connected to the speaker voice coil terminal and receiver chassis. Set receiver volume control to maximum. For greatest accuracy, keep output of receiver at approximately .05 watt (.05 watt = .40 volt on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.

The IF and diode transformer tuning cores are slotted for a small size fibre screwdriver. Do not press hard on the fibre screwdriver during alignment as damage to the coil forms or tuning cores may result.

Loop antenna should be connected to chassis during alignment.

Chart I gives complete alignment procedure for Chassis HS-113.

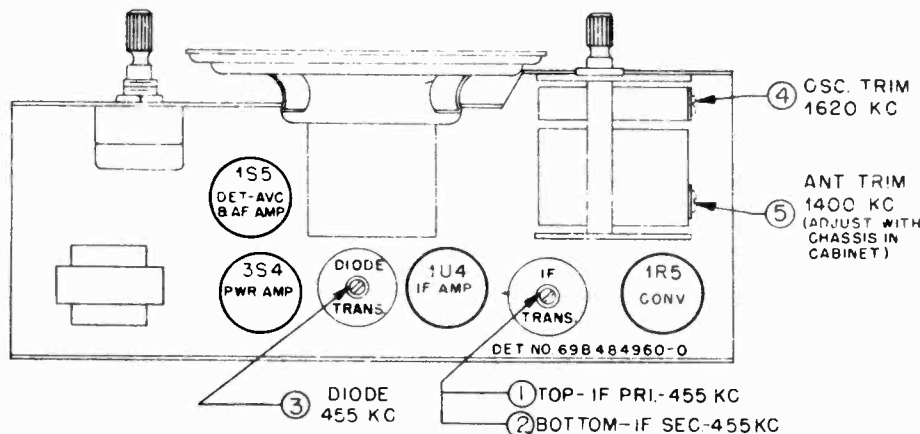
ALIGNMENT PROCEDURE

(Refer to Figure 2 for location of all alignment trimmers and cores).

STEP	DIAL SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
<b>IF ALIGNMENT</b>						
1.	Gang fully opened	.1 mf	Converter grid* & chassis	455 Kc	1, 2 & 3	Adjust for maximum.
<b>RF ALIGNMENT</b>						
2.	Gang fully opened	.1 mf	Converter grid* & chassis	1620 Kc	4	This sets oscillator to dial scale
3.	-	-	-	-	-	Install chassis in cabinet, leaving output meter connected to speaker.
4.	1400 Kc	None	Radiation loop**	1400 Kc	5	Tune signal in on receiver, then adjust loop trimmer (5) for maximum. Loop trimmer is reached through hole under plug button on side of cabinet.

\* A convenient point for this connection is the stator lug of the loop section of the tuning capacitor.

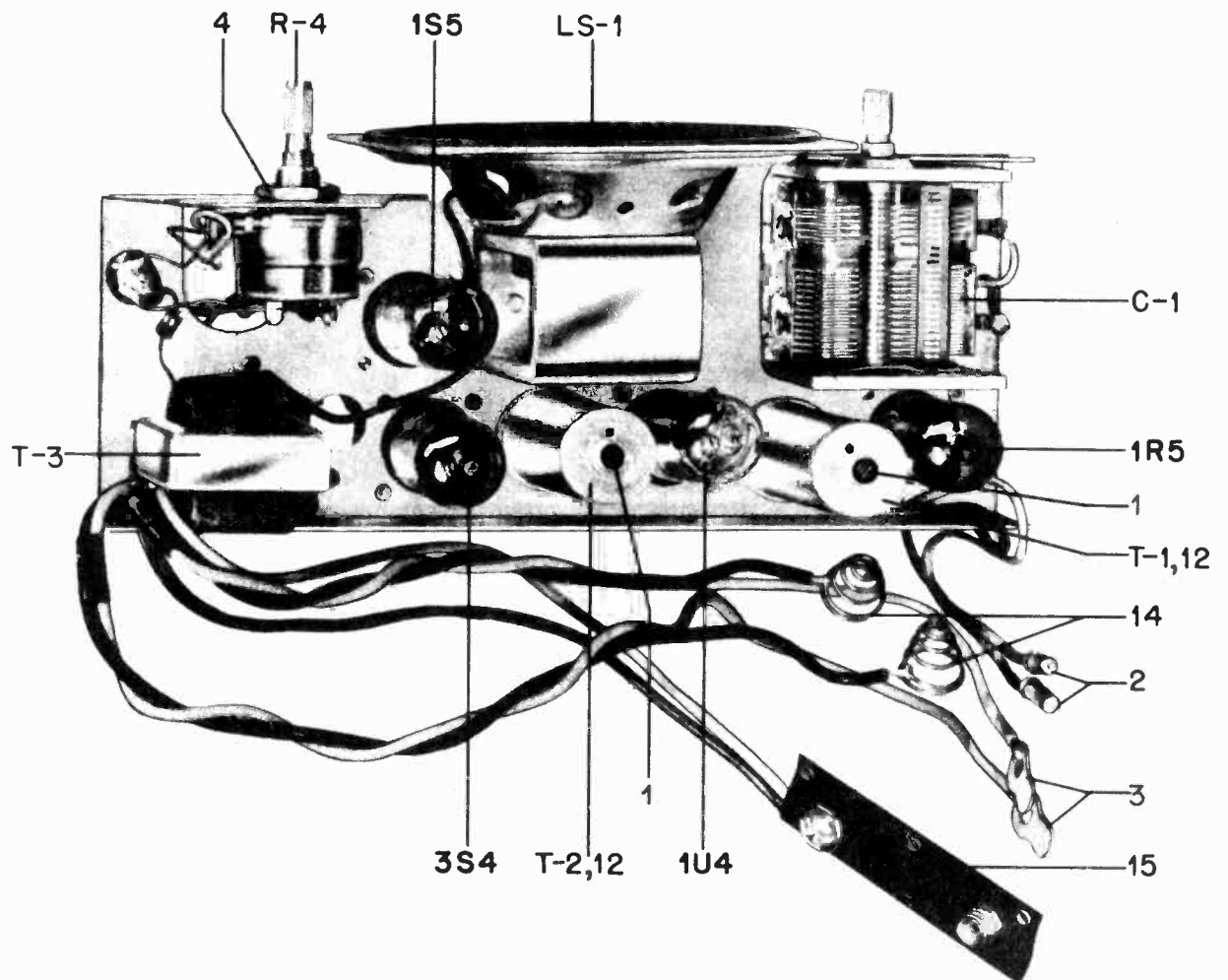
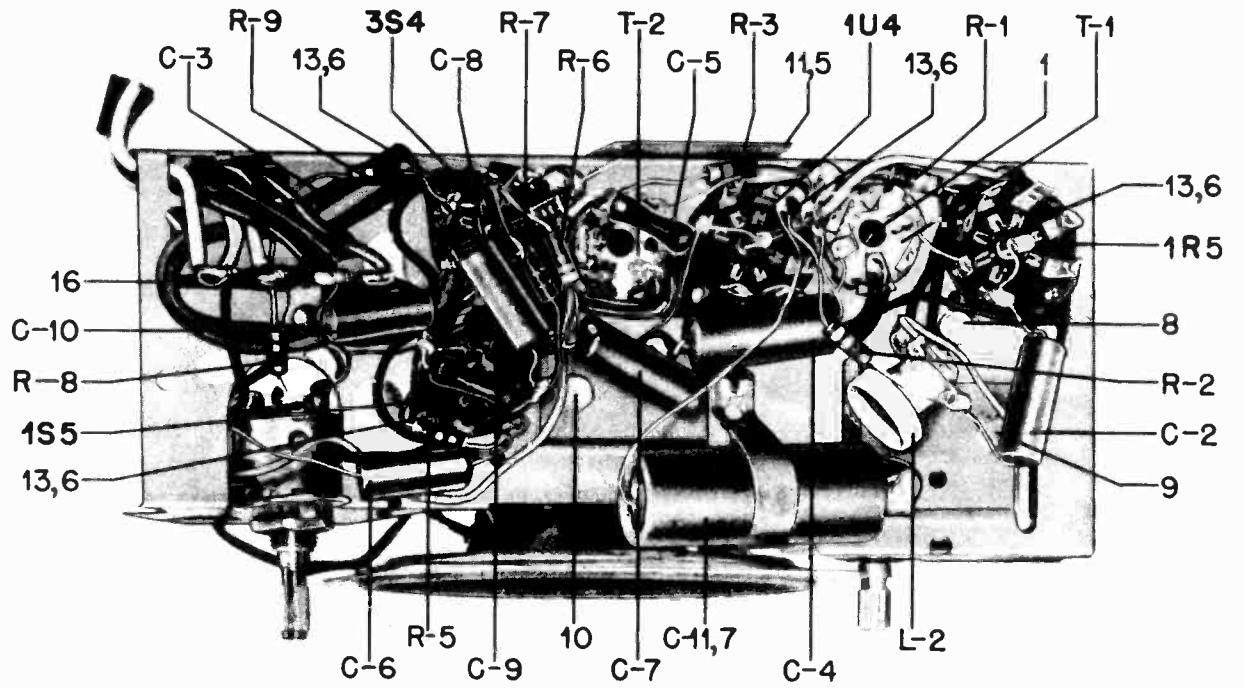
\*\* Connect output of signal generator to a 5" diameter, 3 turn loop and bring loop close enough to receiver loop to obtain output of 50 milliwatts (.40V) on output meter. Vary distance between loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".



TUBE & ALIGNMENT ADJUSTMENT LOCATIONS

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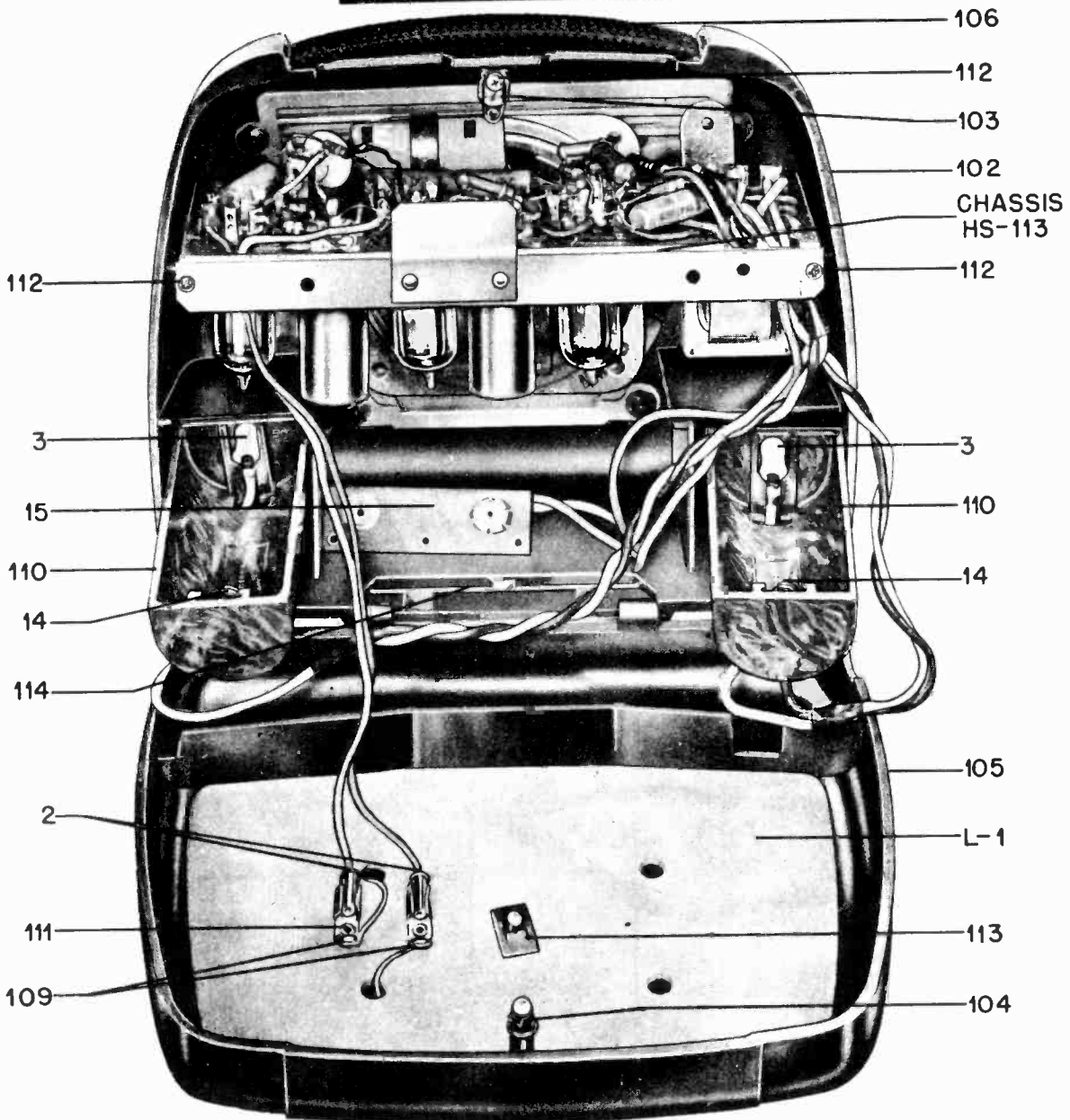
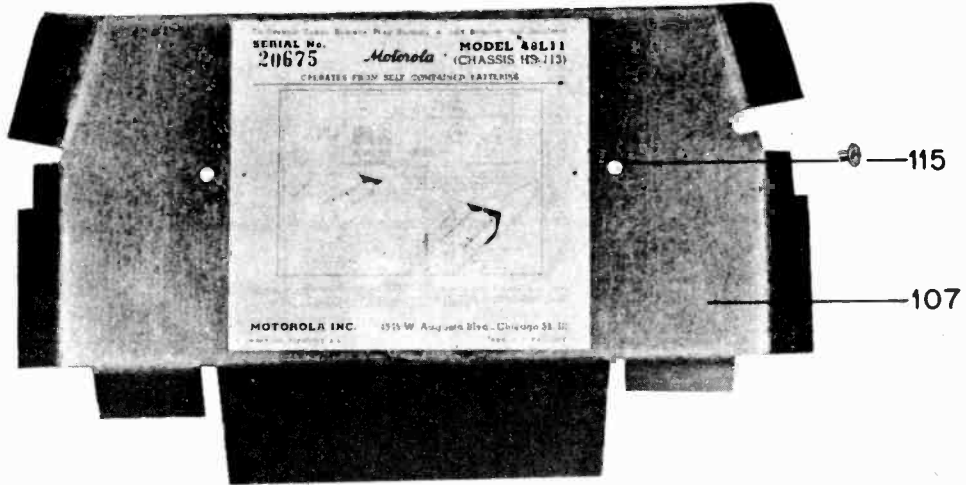
MODEL 48L11, CHASSIS HS-113



PARTS LOCATION - TOP & BOTTOM VIEW

MODEL 48L11, CHASSIS  
HS-113

MOTOROLA INC.



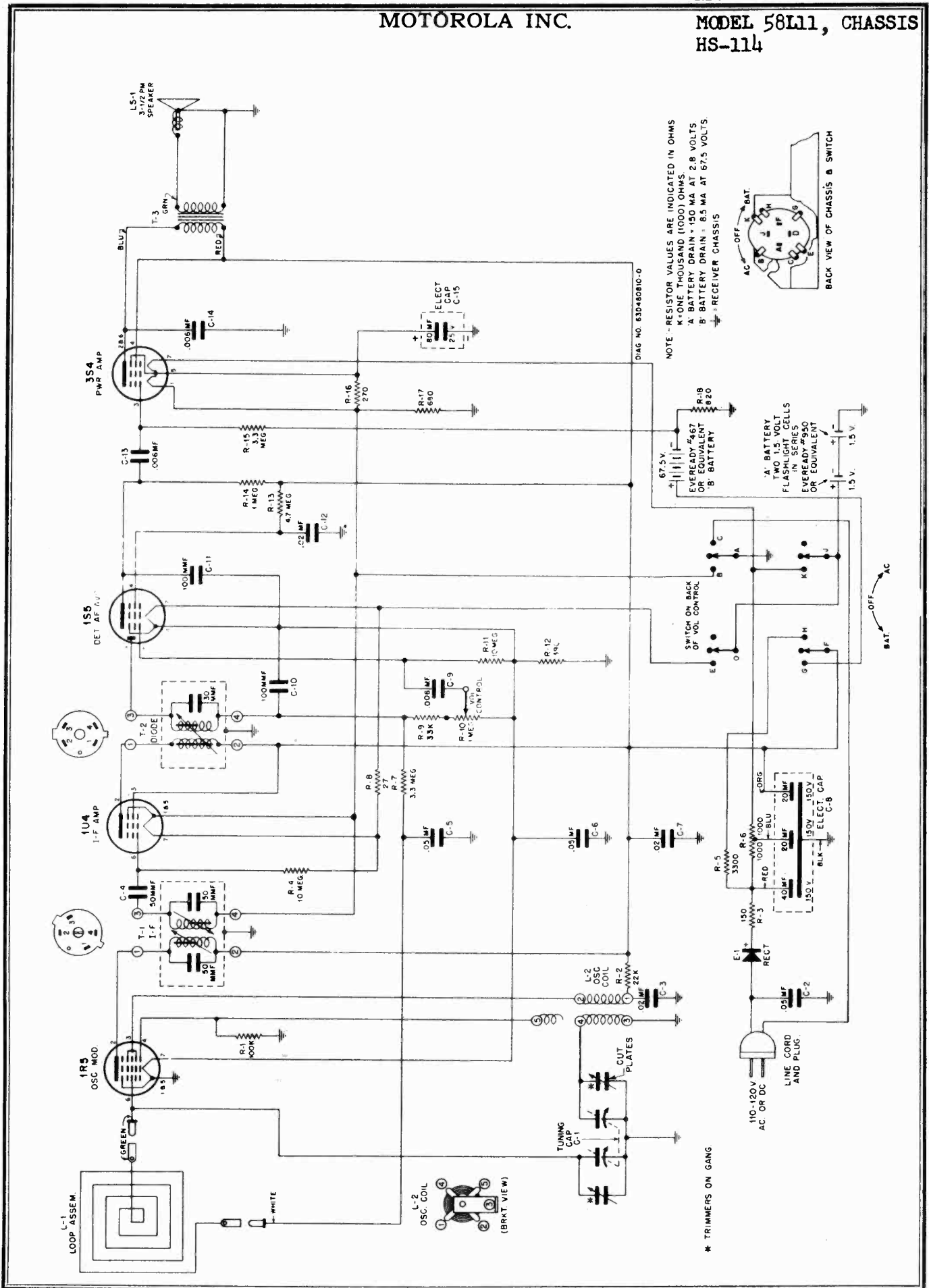
PARTS LOCATION - REAR VIEW



MODEL 48L11, CHASSIS  
HS-113

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REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
<b>CAPACITORS</b>					
C-1	19K480051	Variable: 2 $\mu$ g	5	5S7769	Rivet: .088 x 3/32 steel; nkl pl (shield mounting)
C-2	8K471628	Paper: .02 mf 100V	6	5S7771	Rivet: .088 x 3/16 steel; nkl pl (tube socket mtg)
C-3	8K471628	Paper: .02 mf 100V	7	5S7706	Rivet: .122 x 1/8 steel; pol nkl (electrolytic mtg)
C-4	8A71213	Paper: .05 mf 100V	8	3S7506	Screw: #6 x 1/4 PKZ plain hex head sheet metal screw; cad pl (osc coil mtg)
C-5	21B77286	Ceramic: 100 mmf 500V	9	3S7247	Screw: #6-32 x 3/16 slotted locking hex head machine screw; cad pl (tuning cap mounting)
C-6	8C4529	Paper: .006 mf 100V	10	3S7205	Screw: #8-32 x 1/4 slotted locking hex head machine screw; cad pl (spkr mtg)
C-7	8K471628	Paper: .02 mf 100V	11	26A480034	Shield, circuit
C-8	8C4529	Paper: .006 mf 100V	12	1K482716	Shield & Sleeve Assembly (for T-1 & T-2)
C-9	21B77286	Ceramic: 100 mmf 500V	13	9A472524	Socket, tube: 7 prong miniature; wafer type
C-10	8C4529	Paper: .006 mf 100V	14	41A480057	Strip, battery contact
C-11	23A75235	Electrolytic: 10 mf 100V	15	31A480032	Strip, terminal ("B" battery connector)
			16	31K51511	Strip, terminal: 3 insulated lugs, #3 gnd; 3/8 spacing
<b>COILS</b>					
L-1	24B480082	Panel and Loop Assembly	<b>CABINET PARTS</b>		
L-2	24A478022	Oscillator coil	101	38K480148	Button, plug 1/4"; maroon
<b>RESISTORS</b>					
NOTE: All resistors are 1/2W, 20% carbon, insulated type unless otherwise specified.					
R-1	6R6031	100,000 10%	102	1X481314	Cabinet Assembly: complete with handle, grille and back cover catch. Less back cover and hinge spring
R-2	6R6297	22,000 10%	103	42A480079	Clip, fuse (cover catch)
R-3	6R2118	5.3 meg	104	42A480078	Clip, speed (on back cover catch stud)
R-4	18K480059	Volume control: 1 meg; with LPST switch	105	16B480088	Cover, cabinet back
R-5	6R2109	10 meg	106	55B478415	Handle, carrying
R-6	6R2122	4.7 meg	107	14C480095	Insulator, chassis: gray fibre
R-7	6R6004	1 meg	108	36B480195	Knob, control
R-8	6R6269	820 10%	109	9A481743	Receptacle, 1-pin (on loop)
R-9	6R2118	3.3 meg	110	15B481896	Retainer "A" battery: plastic
<b>SPEAKER</b>					
	50B480048 or		111	5S7720	Rivet: .083 x 1/8 steel; nkl pl (loop receptacle mtg)
	50B480050 or		112	3S486008	Screw: #4 x 1/4 Phillips round head thread cutting screw (cover retainer mtg & chassis retainer)
	50B482759	Speaker: 3-1/2" PM; 3.2 ohm VC	113	2S7089	Speednut: for .187 round 3/8 x 5/8; black parkerized finish (loop retainer)
<b>TRANSFORMERS</b>					
T-1	24B480042	IF Transformer: 455 Kc; complete less shield	114	41A480094	Spring, hinge (back cover)
T-2	24B480040	Diode transformer: 455 Kc; complete less shield	115	46B480108	Stud, trimount (chassis insulator mtg)
T-3	25B470822	Output transformer	<b>CHASSIS PARTS - MECHANICAL</b>		
<b>CHASSIS PARTS - MECHANICAL</b>					
1	46A470885	Core, iron: threaded (T-1 & T-2 tuning)			
2	5S7855	Eyelet: .156 x .484 (loop lead tips)			
3	29K3020	Lug, soldering (battery contact)			
4	2S7051	Nut: 3/8-32 x 9/16 hex; cad pl (vol control mtg)			



MODEL 58L11, CHASSIS  
HS-114

MOTOROLA INC.

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment. Follow the procedure carefully.

If the receiver is operated from an AC power line during alignment, use an isolating transformer between receiver and power line.

A low range output meter should be connected to the speaker voice coil terminal and receiver chassis. Set receiver volume control to maximum.

For greatest accuracy, keep output of receiver at approximately .05 watt (.05 watt = .40 volt on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.

The IF & diode transformer tuning cores are slotted for a small size fibre screwdriver. Do not press hard on the fibre screwdriver during alignment as damage to the coil forms or tuning cores may result.

Loop antenna should be connected to chassis during alignment.

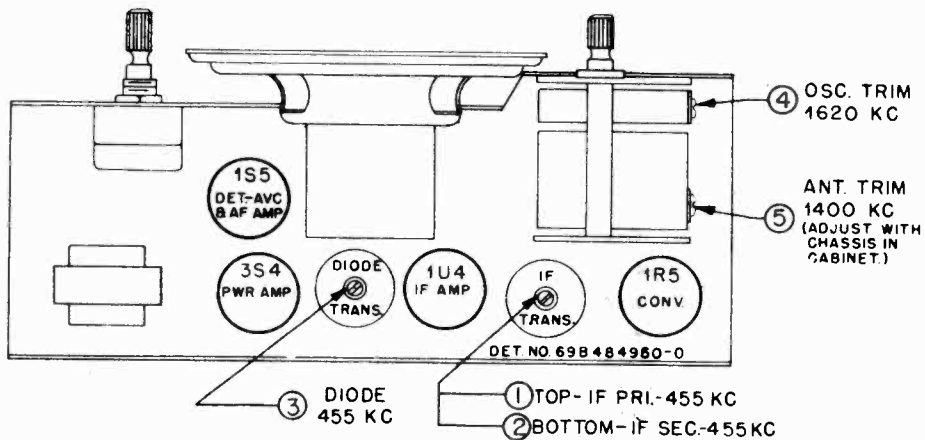
CHART I. ALIGNMENT PROCEDURE

(Refer to Figure 2 for location of all alignment trimmers and cores).

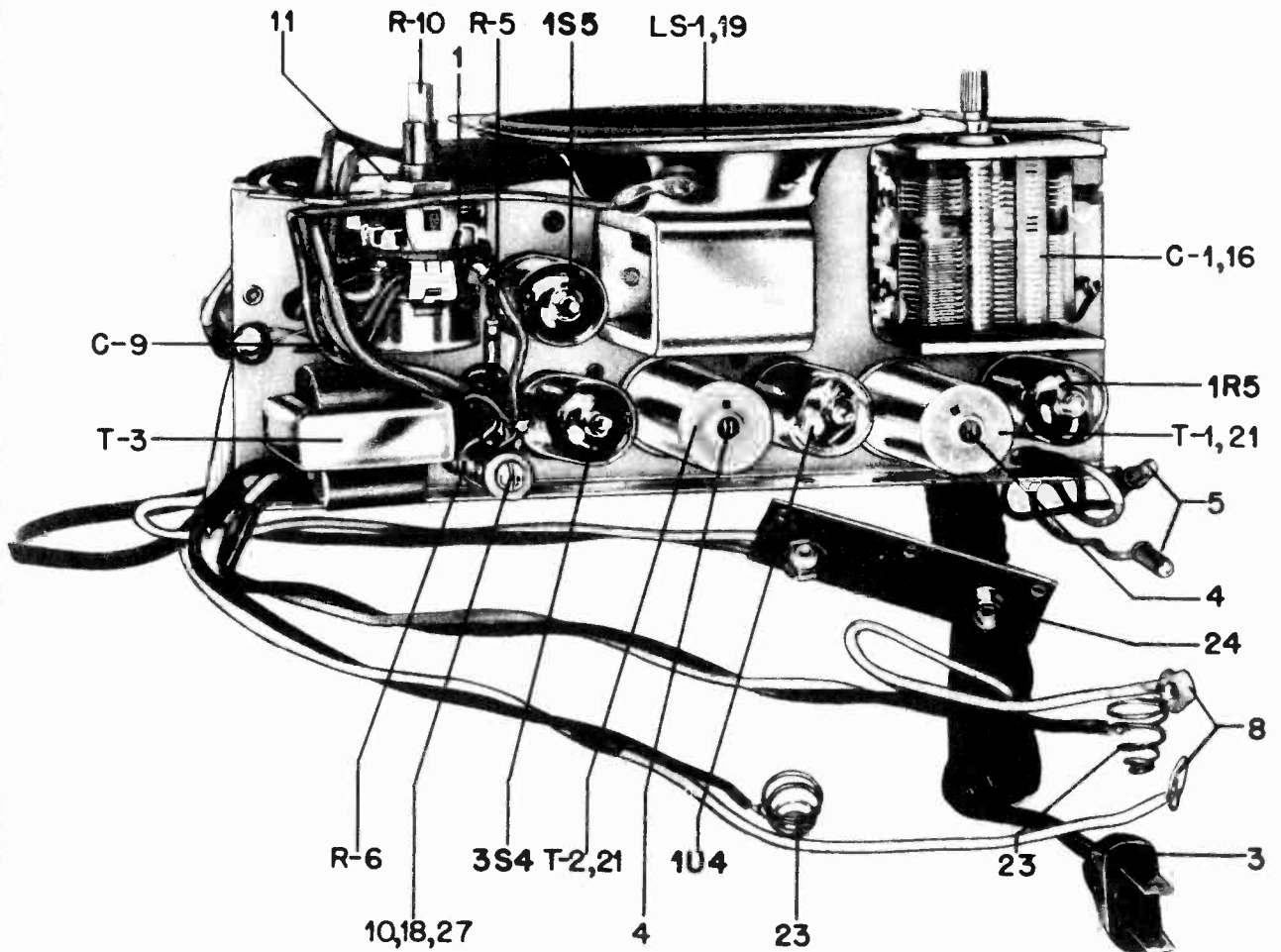
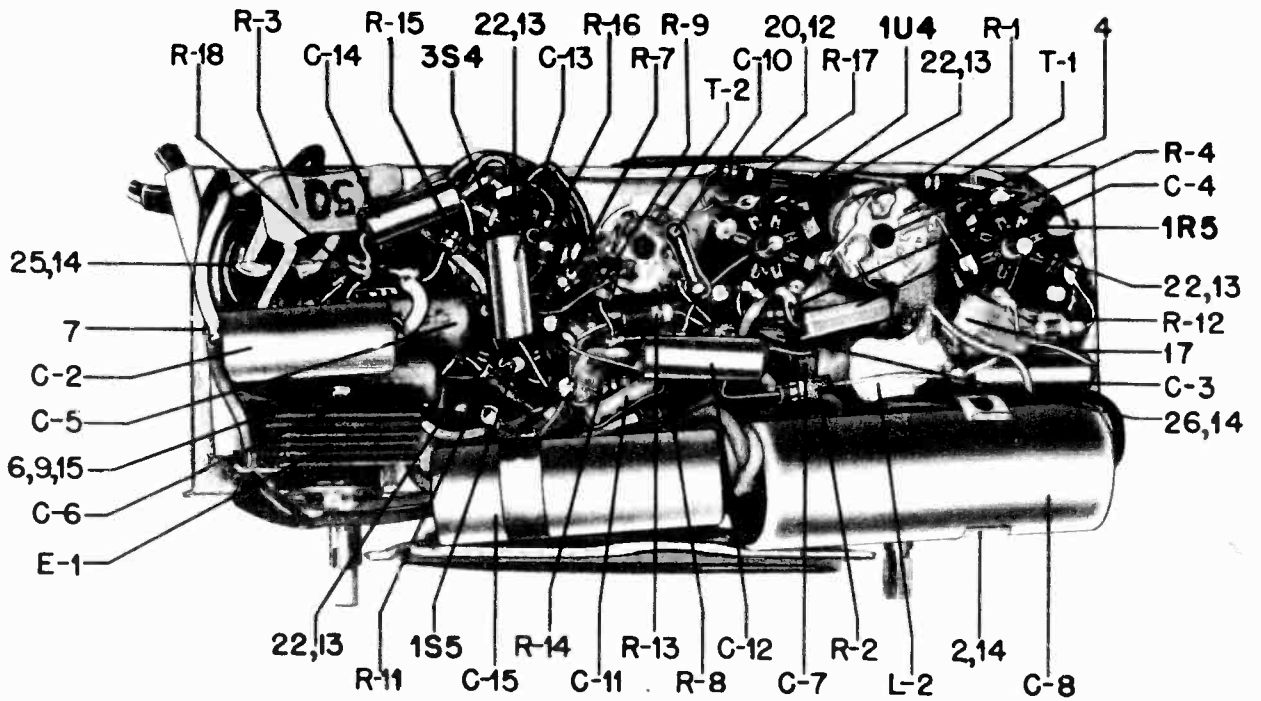
STEP	DIAL SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
IF ALIGNMENT 1.	Gang fully opened	.1 mf	Converter Grid* & chassis	455 Kc	1, 2 & 3	Adjust for maximum.
RF ALIGNMENT 2.	Gang fully opened	.1 mf	Converter grid* & chassis	1620 Kc	4	This sets oscillator to dial scale.
3.	-	-	-	-	-	Install chassis in cabinet, leaving output meter connected to speaker.
4.	1400 Kc	None	Radiation loop**	1400 Kc	5	Tune signal in on receiver, then adjust loop trimmer (5) for maximum. Loop trimmer is reached through hole under plug button on side of cabinet.

\* A convenient point for this connection is the stator lug of the loop section of the tuning capacitor.

\*\* Connect output of signal generator to a 5" diameter, 3 turn loop and bring loop close enough to receiver loop to obtain output of 50 milliwatts (.40V) on output meter. Vary distance between loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".

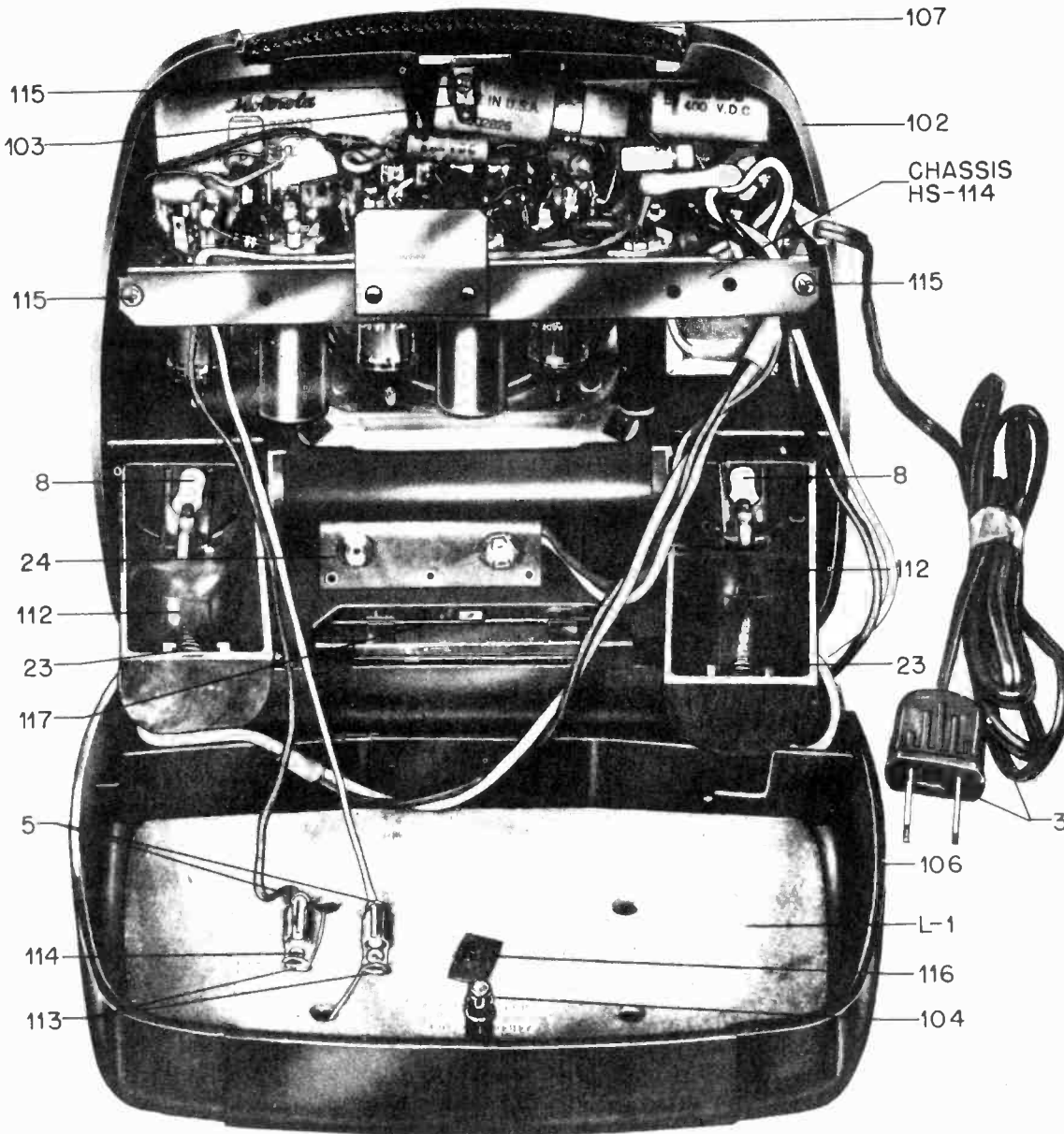
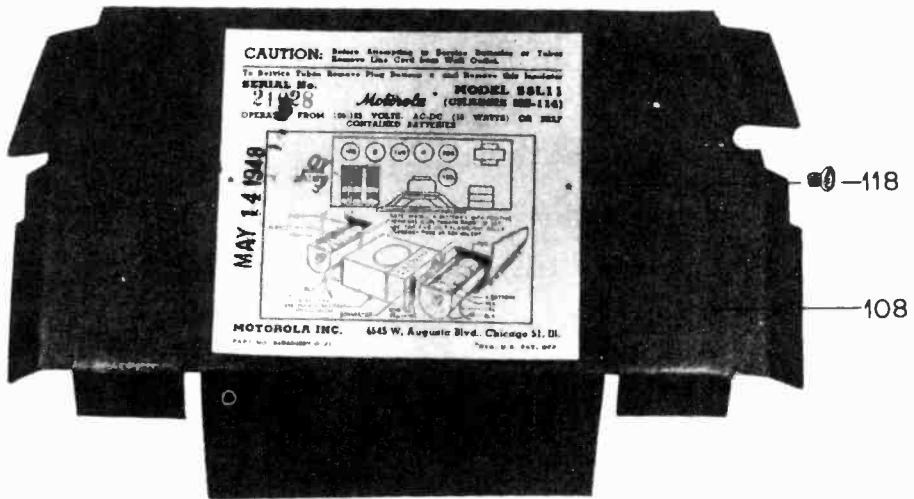


TUBE & ALIGNMENT ADJUSTMENT LOCATIONS



PARTS LOCATION - TOP & BOTTOM VIEWS





PARTS LOCATIONS - REAR VIEW

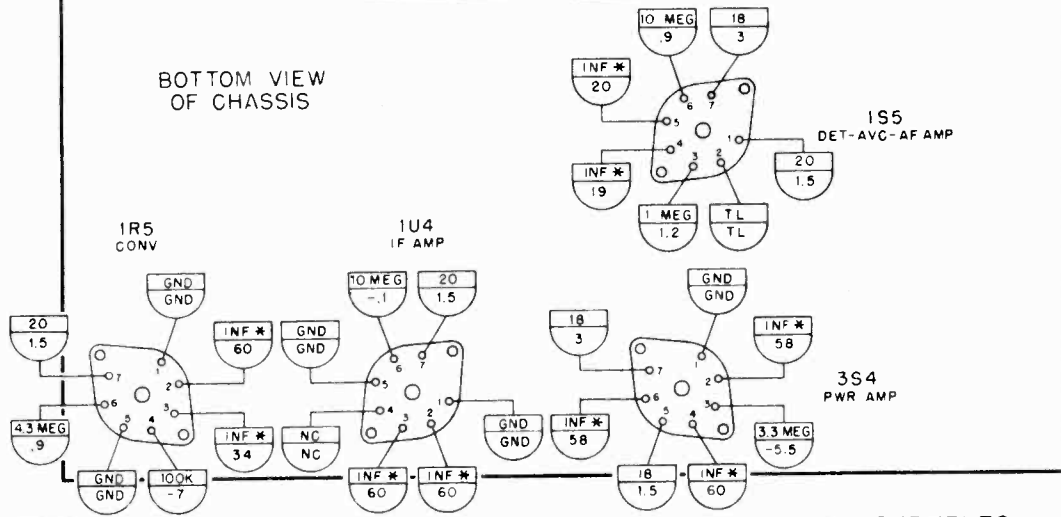
MOTOROLA INC.

MODEL 58L11, CHASSIS HS-114

DIAGRAM NO. 638484965

FRONT

BOTTOM VIEW OF CHASSIS



☐ = RESISTANCE MEASUREMENTS.

◐ = VOLTAGE MEASUREMENTS.

\* = MEASUREMENTS MAY VARY, DEPENDING ON CONDITION OF ELECTROLYTIC CAPACITOR.

TL = TIE LUG.

NC = NO CONNECTION.

CONDITIONS OF MEASUREMENTS

A VTVM WAS USED TO MAKE ALL MEASUREMENTS. MEASUREMENTS ARE MADE FROM TUBE BASE PIN INDICATED TO CHASSIS.

SET IS OPERATED FROM FRESH BATTERIES DURING VOLTAGE MEASUREMENTS.

SWITCH LEVER IS SET TO 'BAT' POSITION.

VOLTAGE TOLERANCE ±10%.

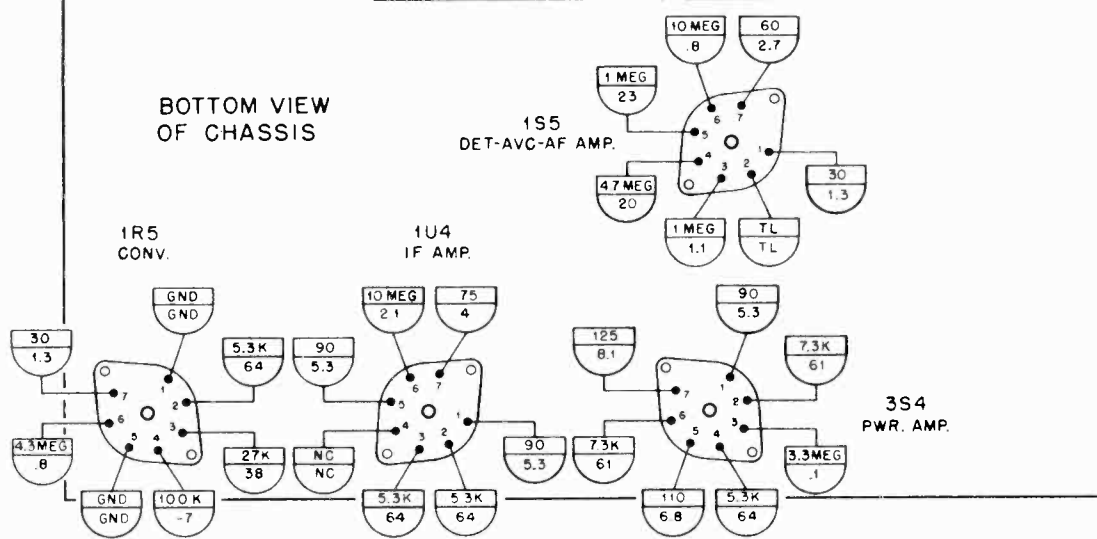
RESISTANCE TOLERANCE ±20%.

VOLTAGE & RESISTANCE DIAGRAM - BATTERY OPERATED

DIAG NO. 638484966-0

FRONT

BOTTOM VIEW OF CHASSIS



☐ = RESISTANCE MEASUREMENTS.

◐ = VOLTAGE MEASUREMENTS

TL = TIE LUG.

NC = NO CONNECTION.

CONDITIONS OF MEASUREMENTS

A VTVM WAS USED TO MAKE ALL MEASUREMENTS.

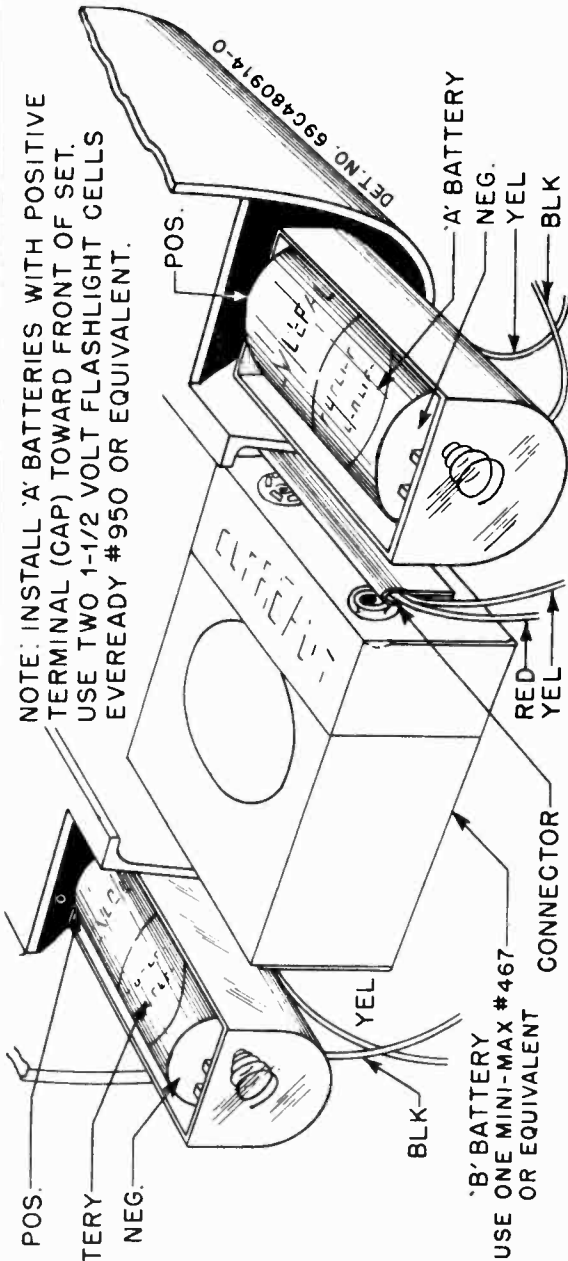
MEASUREMENTS ARE MADE FROM TUBE BASE PIN INDICATED TO CHASSIS.

SET IS OPERATED FROM 117V AC DURING VOLTAGE MEASUREMENTS.

SWITCH LEVER IS SET TO AC/DC POSITION.

VOLTAGE TOLERANCE ±10% RESISTANCE TOLERANCE ±20%.

VOLTAGE & RESISTANCE DIAGRAM - AC OPERATED



BATTERY REPLACEMENT DETAIL

- TUBE COMPLEMENT - 1R5 - Converter  
 1U4 - IF Amplifier  
 1S5 - Detector, AVC & 1st AF Amplifier  
 3S4 - Power Amplifier  
 Rectifier - Selenium type - for AC/DC operation

POWER SUPPLY - Operates from 105-125 volts AC/DC (15 watts) or from the following self-contained batteries:  
 Two 1-1/2V flashlight cells (Eveready #950 or equivalent)  
 One 67-1/2V "B" battery (Eveready #467 or equivalent)

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

Tubes can be replaced without removing chassis from cabinet. Just open back cover and remove chassis insulator to expose tubes. Two plug buttons hold chassis insulator in position.

To remove the chassis from the cabinet:

1. Remove control knobs.
2. Open back cover and remove chassis insulator.
3. Disconnect the two loop leads from the pin receptacles.
4. Remove the two Phillips head screws on each end of chassis and slide chassis out of cabinet.



MOTOROLA INC.

MODEL 58L11, CHASSIS HS-114

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
<b>ELECTRICAL PARTS</b>			2	42K75826	Clip, electrolytic mtg .....
<b>CAPACITORS</b>			3	30B470621	Cord, line & plug: 6 feet long .....
C-1	19K480051	Variable: 2 gang .....	4	46A470885	Core, iron: threaded (T-1 & T-2 tuning).
C-2	8K471628	Paper: .05 mf 400V .....	5	5S7855	Eyelet: .156-.484 (loop lead tips) .....
C-3	8K471628	Paper: .02 mf 100V .....	6	4S7895	Lockwasher: #5 internal; cad pl (rectifier mtg) .....
C-4	21K77373	Ceramic: 50 mmf 590V .....	7	29R3019	Lug, soldering: #6 (line cord anchor) ..
C-5	8A71213	Paper: .05 mf 100V .....	8	29R3020	Lug, soldering (battery contact) .....
C-6	8A71213	Paper: .05 mf 100V .....	9	2S7010	Nut: 5-40 x 1/4 hex; cad pl (rect. mtg).
C-7	8K471628	Paper: .02 mf 100V .....	10	2S7005	Nut: 6-32 x 1/4 hex; cad pl (resistor mtg) .....
C-8	23B75808	Electrolytic: 40-20-20 mf/150V .....	11	2S7051	Nut: 3/8-32 x 9/16 hex; cad pl (volume control mtg) .....
C-9	8C4529	Paper: .006 mf 100V .....	12	5S7769	Rivet: .088 x 3/32 steel; nkl pl (circuit shield mtg) .....
C-10	21B77286	Ceramic: 100 mmf 500V .....	13	5S7771	Rivet: .088 x 3/16 steel; nkl pl (socket mounting) .....
C-11	21B77286	Ceramic: 100 mmf 500V .....	14	5S7706	Rivet: .122 x 1/8 steel; nkl pl (electrolytic clip & term strip mtg) .....
C-12	8K471628	Paper: .02 mf 100V .....	15	3S7311	Screw: 5-40 x 7/8 slotted hex head machine screw; cad pl (rectifier mtg) .....
C-13	8C4529	Paper: .006 mf 100V .....	16	3S7247	Screw: 6-32 x 3/16 slotted locking hex head machine screw; cad pl (gang mtg) .....
C-14	8C4529	Paper: .006 mf 100V .....	17	3S7506	Screw: #6 x 1/4 PKZ plain hex head sheet metal screw; cad pl (osc coil mtg) .....
C-15	23A25888	Electrolytic and strap: 80 mf-25V .....	18	3S1451	Screw: 6-32 x 2 slotted round head machine screw; cad pl (resistor mtg) .....
<b>RECTIFIER</b>			19	3S7205	Screw: 8-32 x 1/4 slotted locking type hex head machine screw; cad pl (spkr mtg) ..
E-1	48B478111	Selenium Rectifier: half-wave .....	20	26A480034	Shield, circuit .....
<b>COILS</b>			21	1K482718	Shield & Sleeve Assembly (for T-1 & T-2)
L-1	24B480092	Panel and Loop Assembly .....	22	9A472534	Socket, tube: 7 prong miniature; wafer type
L-2	24A478022	Oscillator Coil .....	23	41A480057	Spring, battery contact .....
<b>SPEAKER</b>			24	31A480032	Strip, terminal ("B" battery connector).
LS-1	50B480048 or	Speaker: 3-1/2"; PM .....	25	31K51511	Strip, terminal: 3 insulated lugs, #3 gnd; 3/8 spacing .....
	50B480050 or		26	31K471565	Strip, terminal: 3 insulated lugs, #4 gnd; 3/8 spacing .....
	50B482759		27	9K470939	Washer, insulating: 3/8-.136-.062; armite R-6 insulating) .....
<b>TRANSFORMERS</b>			<b>CABINET PARTS</b>		
T-1	24B480042	IF, 455 Kc: complete but less shield ...	101	38K480148	Button, plug: 1/4"; maroon .....
T-2	24B480040	Diode, 455 Kc: complete but less shield.	102	1X480149	Cabinet Assembly: complete with handle, grille and back cover catch. Less back cover and hinge spring .....
T-3	25B470622	Output Transformer .....	103	42A480079	Clip, fuse (cover catch) .....
<b>RESISTORS</b>			104	42A480078	Clip, speed (on back cover catch stud)..
Note:	All resistors are 1/2 watt, 20%, carbon, insulated type unless otherwise specified.		105	42K482797	Clip, speed (on volume knob) .....
R-1	6R6031	100,000 10% .....	106	16L480088	Cover, cabinet back .....
R-2	6R6397	22,000 10% .....	107	55B478415	Handle, carrying .....
R-3	17A78986	Wirewound: 150 10% 2-1/2W .....	108	14C480095	Insulator, chassis: gray fibre .....
R-4	6R2109	10 meg .....	109	36K480195	Knob, control (tuning) .....
R-5	6R5581	3,300 10% .....	110	36B480082	Knob, volume control: includes clip ....
R-6	17A470618	Wirewound: 2,000 10% 5W; center tapped	111	36B480086	Lever, switch (BAT-OFF-AC/DC switch lever)
R-7	6R2118	3.3 meg .....	112	15B481896	Retainer, "A" battery: plastic .....
R-8	6R5683	27 10% .....	113	9A481743	Receptacle, 1-pin (on loop) .....
R-9	6R6012	33,000 .....	114	5S7720	Rivet: .083 x 1/8 steel; nkl pl (loop receptacle mtg) .....
R-10	16B480049	Volume Control: 1 meg; with switch .....	115	3S488008	Screw: #4 x 1/4 Phillips round head, thread cutting screw (cover retainer mtg & chassis retainer) .....
R-11	6R2109	10 meg .....	116	2S7089	Speednut: for .187 round; 3/8 x 5/8; black parkerized finish (loop retainer) ....
R-12	6R5554	390 10% .....	117	41A480094	Spring, hinge (back cover) .....
R-13	6R2122	4.7 meg .....	118	46B480108	Stud, trimount (chassis insulator mtg)
R-14	6R6004	1 meg .....			
R-15	6R2118	3.3 meg .....			
R-16	6R6432	270 10% .....			
R-17	6R6040	680 10% .....			
R-18	6R6269	820 10% .....			
<b>CHASSIS PARTS - MECHANICAL</b>					
1	15A481339	Baffle, switch .....			

**ALIGNMENT**

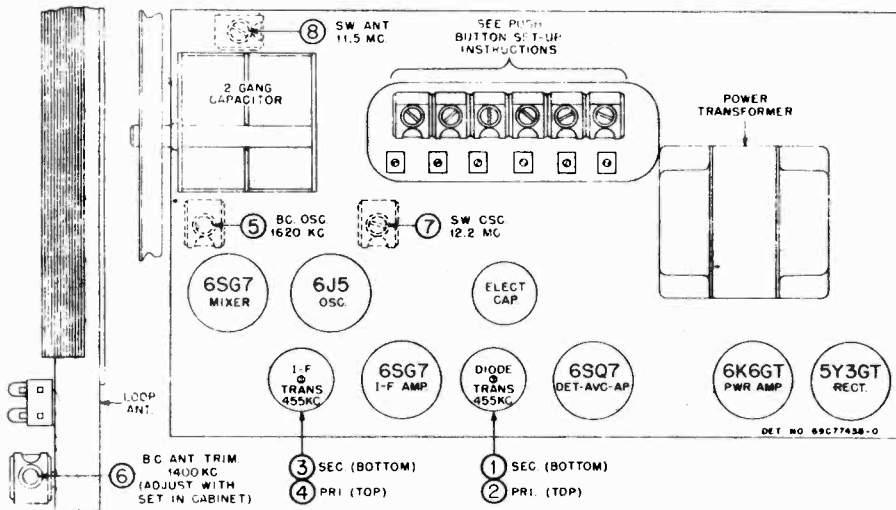
Refer to Figure 2 for location of adjustment trimmers and cores. Connect a low range output meter across speaker voice coil. Volume control should be set at maximum for all operations.

The signal generator used, should possess good frequency stability and should be of the modulated type. For greatest accuracy, keep the receiver output at approximately 50 milliwatts (.38V on output meter) during alignment. Vary signal generator output (not receiver volume control) to maintain this output during alignment.

Step	Gang Setting	Band	Dummy	Generator Connected to	Generator Frequency	Trimmer or Core	Remarks
1	Fully opened	B. C	.1mf	Mixer grid & chassis	455 kc	1, 2, 3, & 4	Adjust I. F. & Diode trans. for maximum
2	Fully opened	B. C	-	Radiation loop*	1620 kc	5	Set oscillator to dial scale
3	1400 KC	B. C	-	Radiation loop*	1400 kc	6 †	Tune signal generator for max. on output meter, then peak trimmer.
4	12.2 MC	SW	50mmf	Short wave antenna terminal	12.2 Mc	7	Set osc. to dial scale.
5	11.5 MC	SW	50mmf	Short wave antenna terminal	11.5 Mc	8	Tune signal generator for max. on output meter, then peak trimmer.

† Repeat after chassis and loop are installed in cabinet.

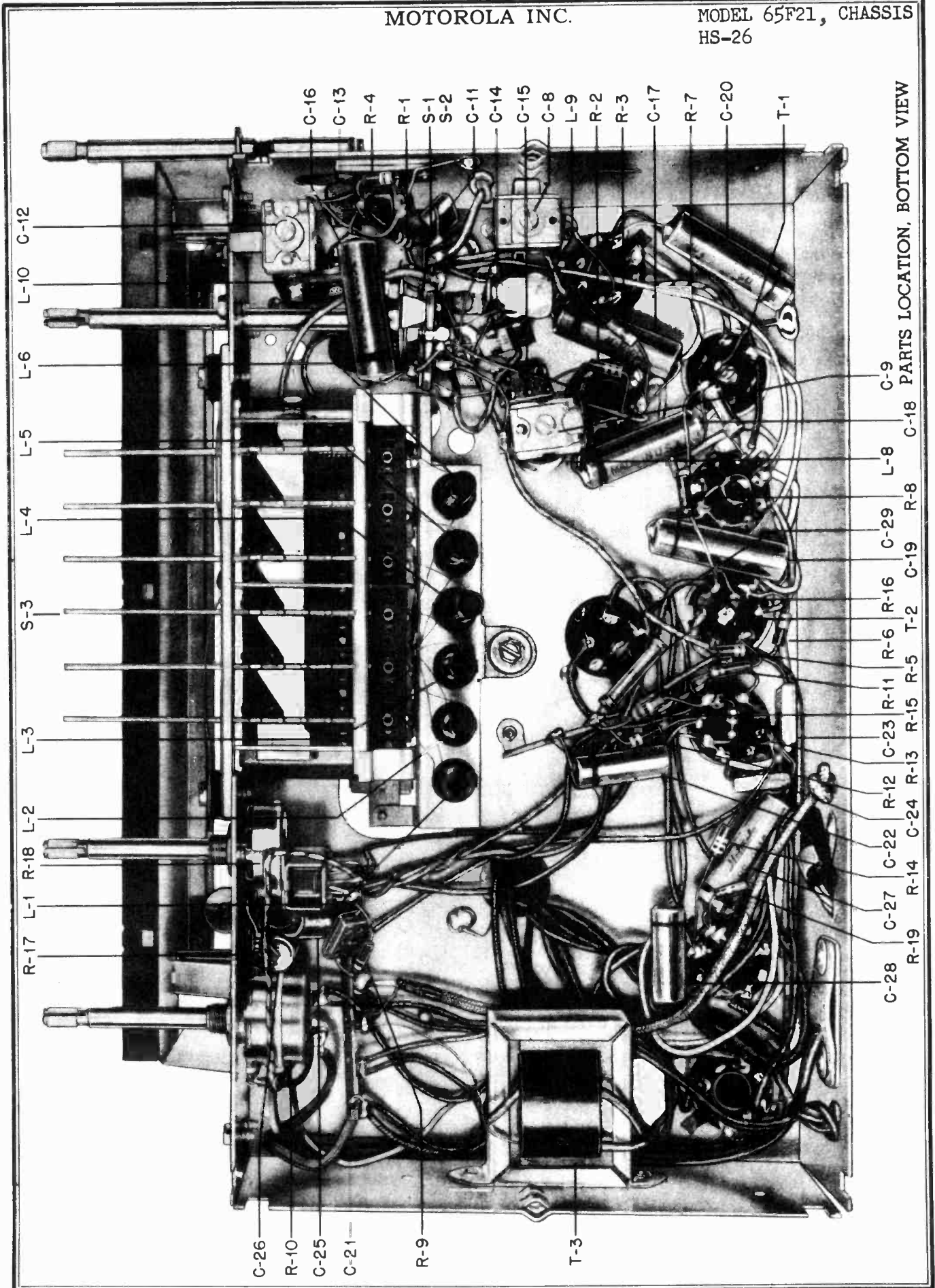
\* Connect output of signal generator to a 5" diameter, 3 turn loop. With volume on full, bring loop close enough to receiver until output of 50 milliwatts is obtained (.38V on output meter). Vary distance between generator and receiver loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".



**TUBE & TRIMMER LOCATIONS**

MOTOROLA INC.

MODEL 65F21, CHASSIS  
HS-26



REF. NO.	PART NO.	DESCRIPTION
C-14	21A28020	Silver mica: 535 mmf 3%
C-15	21R6642	Mica: 50 mmf 500V
C-16	8S9816	Paper: .05 mf 400V
C-17	8S9816	Paper: .05 mf 400V
C-18	8S9816	Paper: .05 mf 400V
C-19	8S9816	Paper: .05 mf 400V
C-20	8S9816	Paper: .05 mf 400V
C-21	21R6641	Mica: 100 mmf 500V
C-22	8S9813	Paper: .005 mf 600V
C-23	21R6639	Mica: 500 mmf 500 V
C-24	21R6639	Mica: 500 mmf 500 V
C-25	8S9813	Paper: .005 mf 600 V
C-26	8S9813	Paper: .005 mf 600 V
C-27	8S9816	Paper: .05 mf 400 V
C-28	8S9813	Paper: .005 mf 600 V
C-29	23A27718	Electrolytic: 30-30-20Mf/350-300-25 V.

**DIAL LIGHTS**

I-1		
I-2	65X4151	6-8 V; bayonet base; type #51

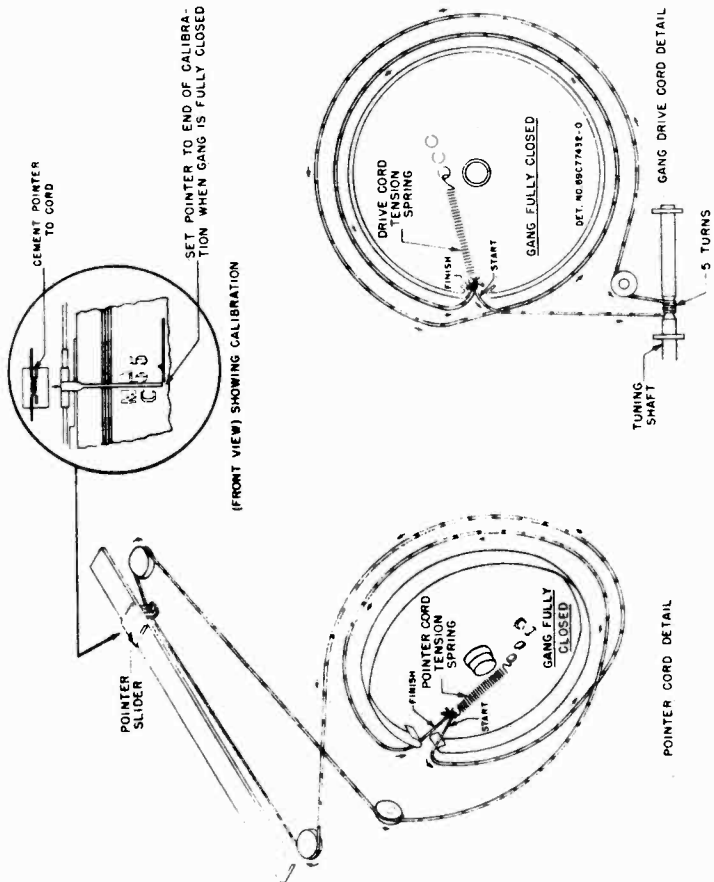
**COILS**

L-1		
L-6		
L-7	24K71224	Loop Assembly, antenna: complete; includes loop, trimmer and lead assembly
L-8	24A70549	S.W. oscillator
L-9	24A70546	B.C. oscillator
L-10	24A70548	S.W. antenna

**RESISTORS**

R-1	6R6032	470,000 1/2 W
R-2	6R6056	47,000 1/2 W
R-3	6R6090	470 1/2 W
R-4	6R2122	4.7 meg 1/2 W

Note: All resistors are 1/2 W 20% insulated type unless otherwise specified.



**POINTER AND DRIVE CORD RESTRINGING DETAIL**

REF. NO.	PART NO.	DESCRIPTION
CAPACITORS		
C-1		
C-6		Capacitor and Mounting Strip Assembly, push button tuning: see Permeability Tuner PT-8 Parts List
C-7	1X72363	Variable: 2 gang; with pulley
C-8	20A71140	Mica trimmer: 10-80 mmf; includes "L" mounting bracket
C-9	20A71141	Mica trimmer: 10-80 mmf
C-10	20A71226	Mica trimmer: 2-12 mmf; includes mounting bracket
C-11	21R6642	Mica: 50 mmf 500 V
C-12	20A71125	Mica: 10-80 mmf; includes "L" mounting bracket
C-13	21R2724	Mica: 1000 mmf 5% 500 V

NOTE - A V.T.V.M. WAS USED TO MAKE MEASUREMENTS. IF A 20,000 OHM PER VOLT METER IS USED ALL GRID & AVC VOLTAGES WILL READ LOWER

MEASUREMENTS ARE MADE FROM TUBE BASE PIN TERMINALS TO CHASSIS.

PHONO-RADIO SWITCH IN RADIO POSITION

VOLUME CONTROL ON FULL

VOLTAGE TOLERANCE ±10%

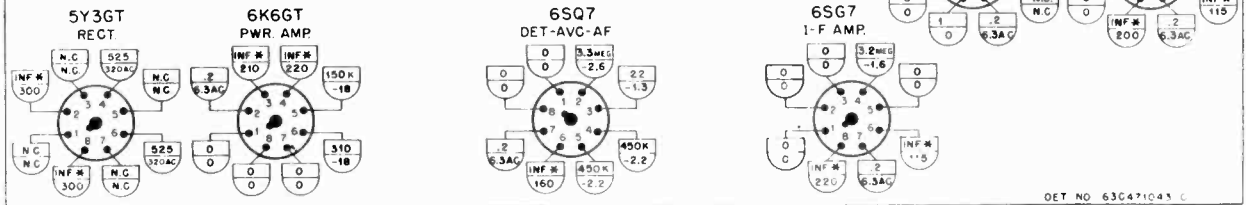
RESISTANCE TOLERANCE ±20%

BAND SWITCH IN BC POSITION

\* MEASUREMENTS MAY VARY DUE TO ELECTROLYTIC CAPACITOR C-29 IN CIRCUIT.

□ = RESISTANCE MEASUREMENTS.

○ = VOLTAGE MEASUREMENTS.



DET NO. 63C47C43 C

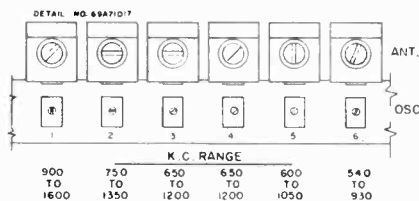
VOLTAGE & RESISTANCE DIAGRAM

TUBE COMPLEMENT - 6SG7 Mixer, 6J5 Oscillator, 6SG7 I.F. Amplifier, 6SQ7 Detector, AVC and 1st A.F. Amplifier, 6K6GT Power Amplifier and 5Y3GT Rectifier.

POWER SUPPLY - 117V A.C. 65 Watts.

INSTRUCTIONS FOR SETTING PUSH BUTTONS

1. Turn the radio "on" and allow it to warm up for a period of at least fifteen minutes.
2. Make a list of the frequencies of the nearby stations you wish to tune in automatically. It is recommended that you select the most powerful stations.
3. Turn the band switch to "BC" position and carefully tune in the first station to be set up.
4. Adjust a signal generator to zero beat with this station. NOTE: While it is advisable to use a signal generator for accuracy, it is not an absolute necessity.
5. Turn the band switch to "PB" position.
6. Push the button to be set up, making sure to select a button having the proper frequency range to include the station you are setting. See Figure 3.
7. The tuner adjustment screws are accessible from the back of the radio. (See Figure 2).
8. Adjust the oscillator screw until the signal from the generator, or station is heard. Carefully adjust the screw to maximum volume.
9. Now adjust the antenna trimmer screw for maximum volume.
10. Follow the same procedure for the remaining buttons.
11. It is advisable, after all buttons are set up, to repeat steps 8, 8 and 9 for maximum performance



PUSH BUTTON SET-UP DETAIL



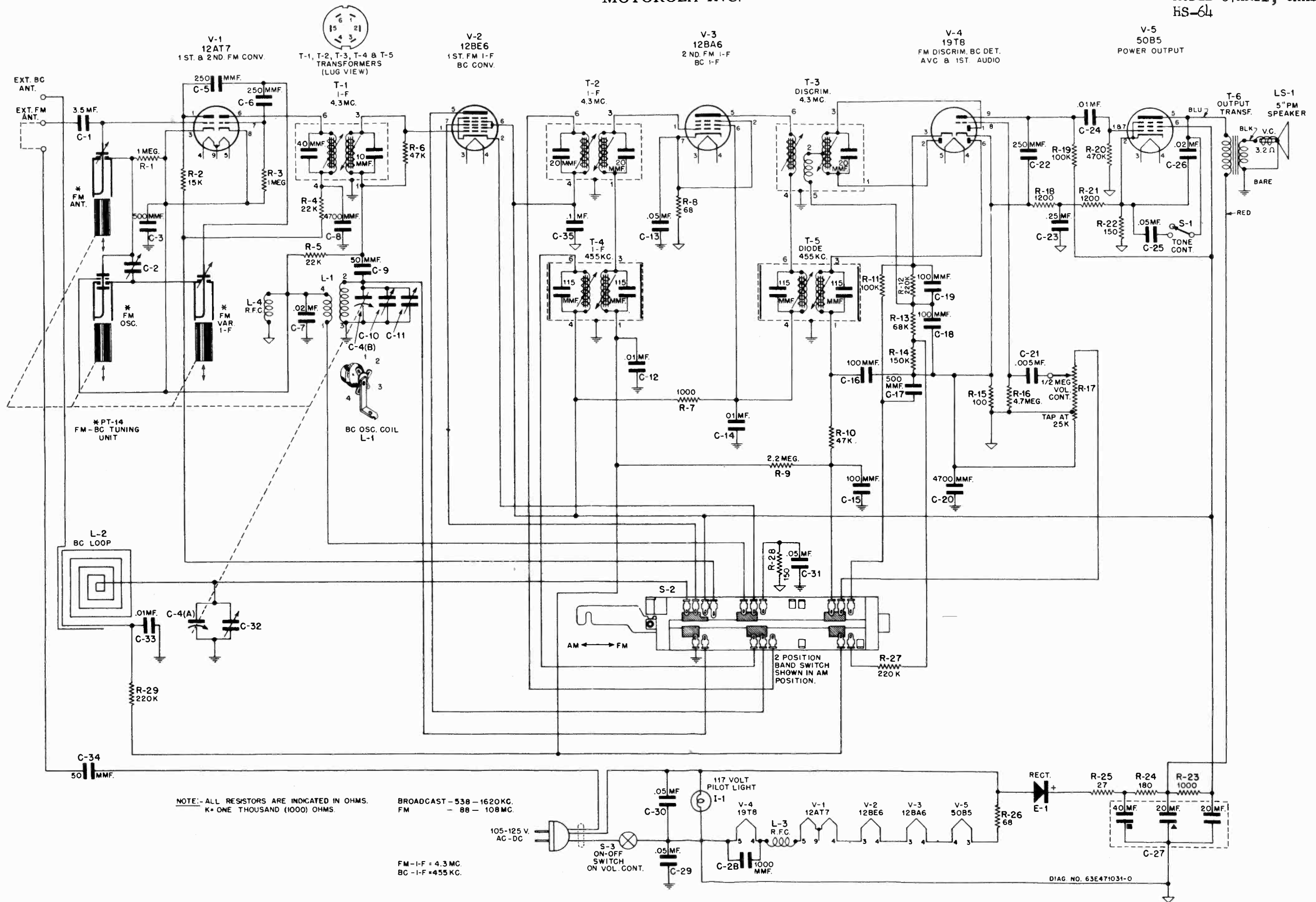
MODEL 65F21, CHASSIS  
HS-26

MOTOROLA INC.

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
R-5	6R2122	4.7 meg 1/2 W		5A11072	Rivet, shoulder: .235" long; nickel plated (cord pulley mounting)
R-6	6R3927	2.2 meg 1/2 W		5A71736	Rivet, shoulder: 1/2" long; nickel plated (cord pulley mounting)
R-7	6R6088	22,000 1/2 W, N.I.		34B70471	Scale, dial: glass
R-8	6R6053	1000 1/3 W, N.I.		3S8301	Screw, steel: #2 x 1/2" Phillips ovl. hd wood screw; antique bronze finish (escutcheon mounting)
R-9	6R6004	1 meg 1/2 W		3S7534	Screw, steel: #8 x 1-3/8" PKA slotted sheet metal screw; cadmium plated (chassis mounting)
R-10	18A70066	Volume control: 1 meg; with SPST switch; tapped at 300,000 ohms		3S7396	Screw, steel: 10-32 x 2" slotted hex head machine screw; copper plated (record changer mounting)
R-11	6R6004	1 meg 1/2 W		47A71129	Shaft, tuning
R-12	6R2118	3.3 meg 1/2 W		1A71049	Shield & Iron Core Sleeve Assembly (for I.F. or diode transformer)
R-13	6R6406	22 1/2 W		9K71233	Socket, pilot light: with 10-1/2" lead
R-14	6R6015	220,000 1/2 W		9A6790	Socket, tube: molded octal; plain type (for all but I.F. amp)
R-15	6R2085	39 1/2 W		9A6788	Socket, tube: (replacement) molded octal; plain type (to be used in place of 9A6790 when mounting lugs on chassis break off)
R-16	6R6035	270 1 W N.I.		9A6792	Socket, tube: molded octal; with center shield (for I.F. amp)
R-17	6R6012	33,000 1/2 W		9A70165	Socket, tube: (replacement) molded octal; with center shield (to be used in place of 9A6792 when mounting lugs on chassis break off)
R-18	18A70086	Tone control: 1 meg; with DPDT switch		41A26190	Spring, cushion: top (record changer mounting)
R-19	6R6339	150,000 1/2 W		41A21807	Spring, cushion: bottom (record changer mounting)
<u>SPEAKER</u>				41A14244	Spring, tension coil (pointer cord)
	50B71799	Electrodynamic: 10": 1275 ohm field; 3.2 ohm V.C.		41A14111	Spring, tension coil (drive cord)
<u>SWITCHES</u>				37K2114	Strip, channel: rubber; 1" long (dial scale mtg.)
S-1				31A12847	Strip, terminal: 2 insulated lugs; #3 mounting
S-2	40A71127	Band selector: three position		31A22190	Strip, terminal: 4 insulated lugs; #3 ground
S-3		Switch Assembly, push button: See Permeability Tuner PT-8 Parts List		32A27676	Strip, shaft bearing: fibre
<u>TRANSFORMERS</u>				56X31509	Support, cabinet lid
T-1	24B70545	I.F.: 455 KC: complete with iron cores and padding capacitor, but less shield		38C70588	Tabs, call letter
T-2	24B70537	Diode: 455 KC: complete with iron cores and padding capacitor, but less shield		4A21577	Washer, *C* (used on tuning shaft)
T-3	25B21175	Output		4A71133	Washer, spring (used on tuning shaft)
T-4	25B21248	Power		<u>PERMEABILITY TUNER</u>	
<u>MISCELLANEOUS</u>				1X71110	Permeability Tuner PT-8: complete
	38B71139	Button, push: plastic (includes insert spring 41A12983)		<u>CAPACITORS</u>	
	16E71221	Cabinet Assembly: console type		C-1	
	35K71223	Cloth, grill		C-6	20A72336 Capacitor and Mounting Strip Assembly: capacitors not replaceable separately; consist of C-1, 146-521 mhf; C-2, 100-412 mhf; C-3, 65-344 mhf; C-4, 65-344 mhf; C-5, 41-246 mhf; C-6, 6-155 mhf.
	11M8944	Cord, dial: 18 lb; black		<u>COILS</u>	
	30K21859	Cord, line: 9 ft. long; with plug		L-1	1X72416 Coil Assembly, P.B. oscillator: 540-930 kc: includes core and clip (brown)
	1X72436	Dial Assembly: complete: includes dial plate, pointer rail, 3 cord pulleys, 2 mounting brackets and glass dial scale. (pointer not included)		L-2	1X72417 Coil Assembly, P.B. oscillator: 600-1050 kc: includes core and clip (red)
	13B70494	Escutcheon, push button		L-3	1X72418 Coil Assembly, P.B. oscillator: 650-1200 kc: includes core and clip (orange)
	5A71081	Eyelet, chassis mounting: 1/4" x 1/4" diameter body; 1/4" diameter head		L-4	1X72416 Coil Assembly, P.B. oscillator: 650-1200 kc: includes core and clip (orange)
	5A71092	Grommet, rubber: 5/8" x 3/4" diam. (chassis mounting)		L-5	1X72419 Coil Assembly, P.B. oscillator: 730-1350 kc: includes core and clip (yellow)
	5A70404	Grommet, rubber: gang cushion		L-6	1X72420 Coil Assembly, P.B. oscillator: 900-1800 kc: includes core and clip (green)
	5A71130	Grommet, rubber: 1/4" x 1/2" diameter body: 3/4" diameter head (chassis retainer)		<u>SWITCH</u>	
	3AC70505	Knob, control: plain		S-3	40B71105 Switch Assembly, push button
	36K70509	Knob, control: branded		<u>MISCELLANEOUS</u>	
	1X76402	Lead Assembly, phono-pick-up: includes plug: 42" long		5A70098	Eyelet, steel: 23/64" thick x 7/32" I.D. x 1/2" diameter head (tuner mounting)
	1X72364	Lead Assembly, speaker: four conductor: with receptacle		5A70404	Grommet, rubber (tuner mounting)
	32A24816	Lock, line cord: fibre		3S8175	Screw, steel: #4 x 3/16" PKZ slotted hex head, sheet metal screw; cadmium plated (trimmer mounting)
	4S7656	Lockwasher, steel: 3/8" internal; cadmium plated (band switch mounting)			
	4S1376	Nut, steel: 3/8-32 x 1/2" hex; cadmium plated (band switch mounting)			
	2S7051	Nut, steel: 3/8-32 x 9/16" hex; palnut: cadmium plated (volume & tone control mounting)			
	9A12705	Plate, electrolytic capacitor mounting: bakelite			
	28K71775	Plug, 1 pin (on phono pick-up lead)			
	28K19871	Plug, 4 pin (on antenna loop)			
	52B71136	Pointer, dial			
	49A23960	Pulley, cord: 1/4" groove (cord guide)			
	49A21552	Pulley, cord: 1/2" groove (cord guide)			
	9A30680	Receptacle, 3 prong (on phono motor leads)			
	9K28049	Receptacle, 4 prong: bakelite (loop antenna receptacle)			

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MODEL 67XM21, CHASSIS HS-64



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

BROADCAST - 538 - 1620 KC.  
FM - 88 - 108 MC.

FM - I-F = 4.3 MC.  
BC - I-F = 455 KC.

DIAG NO. 63E471031-0

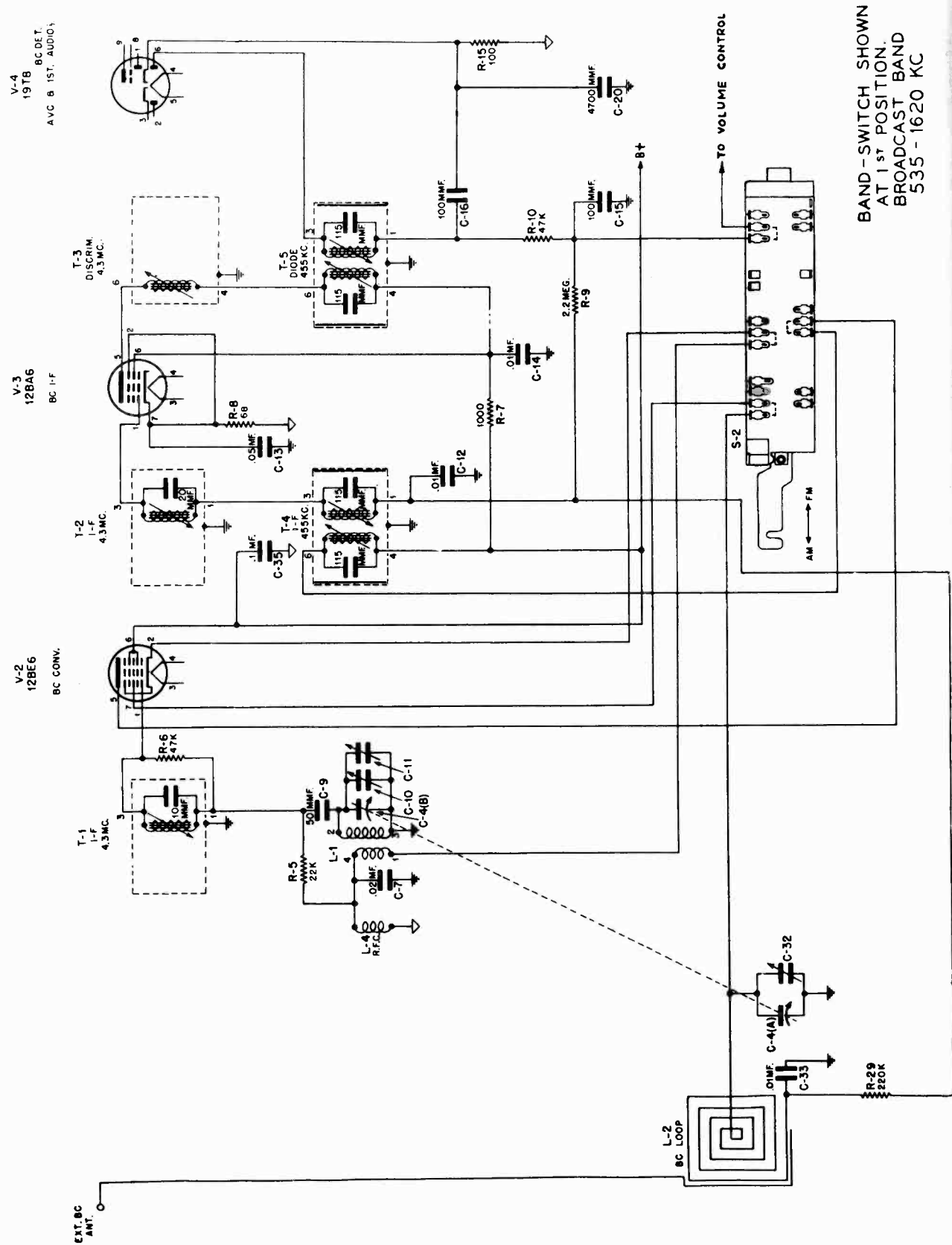
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MODEL 67XM21, CHASSIS HS-64



BAND-SWITCH SHOWN AT 1<sup>ST</sup> POSITION. BROADCAST BAND 535 - 1620 KC

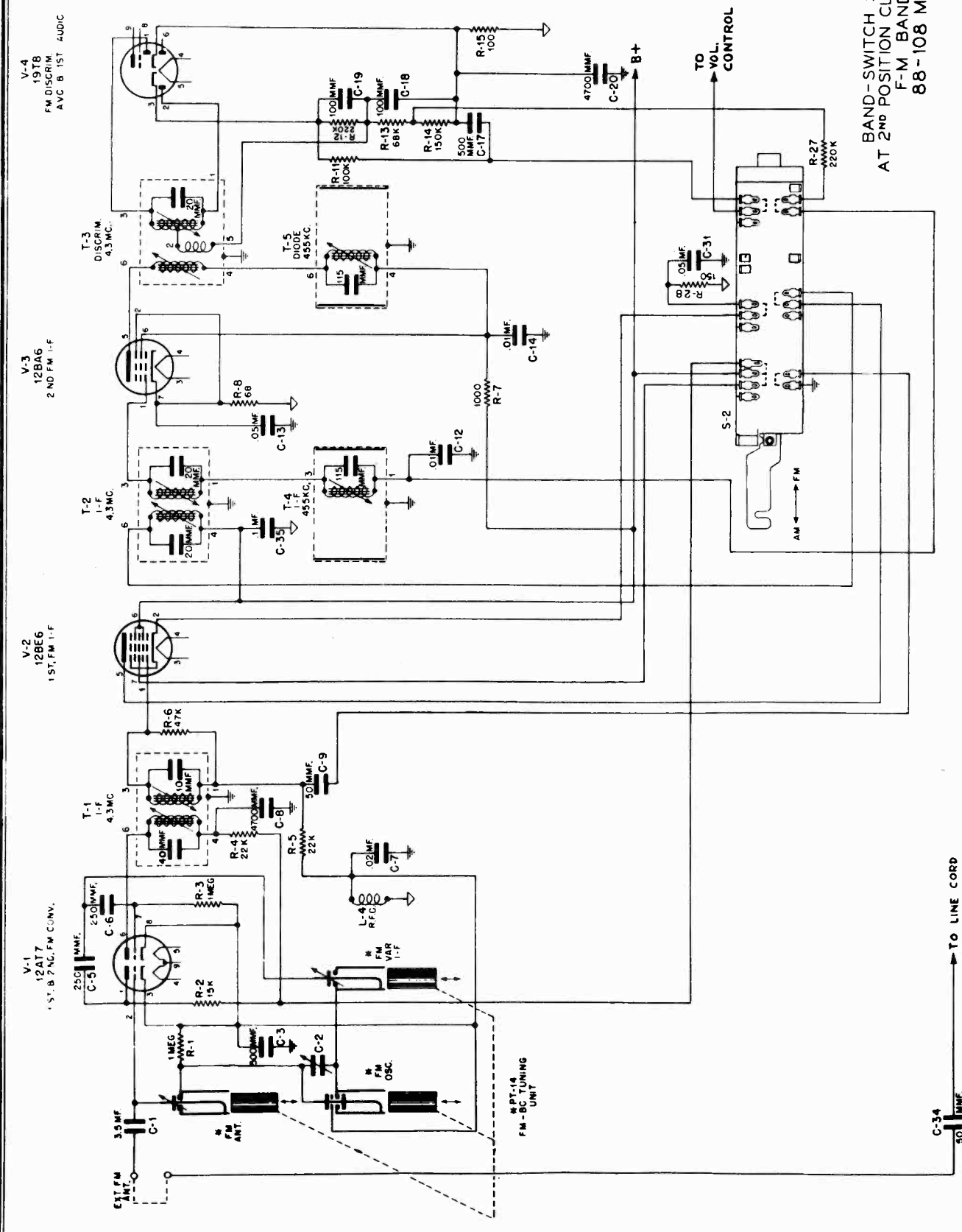
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PAGE 18-28 MOTOROLA

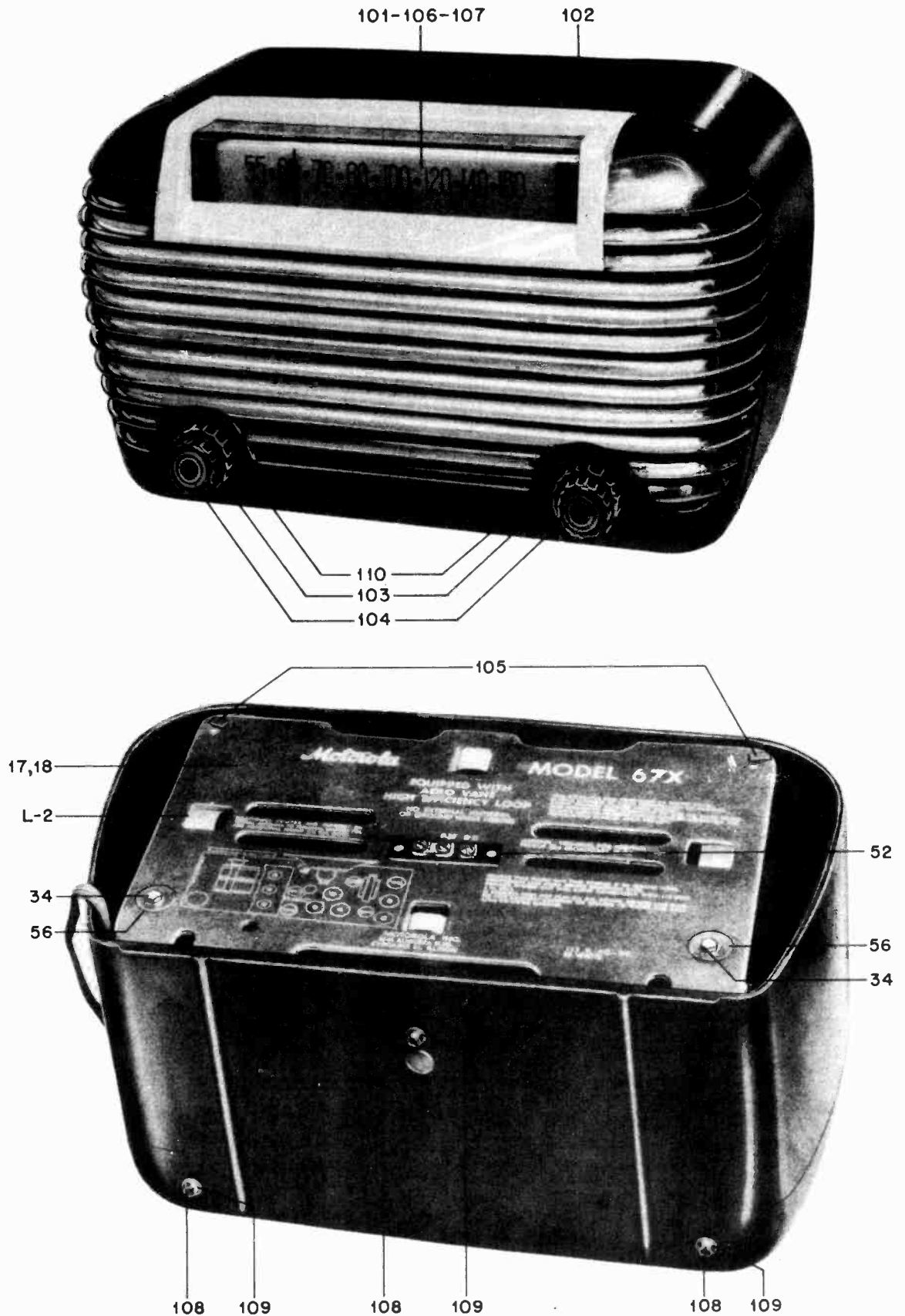
MODEL 67XM21, CHASSIS HS-64



BAND-SWITCH SHOWN AT 2<sup>ND</sup> POSITION CLOCKWISE. F-M BAND 88 - 108 MC

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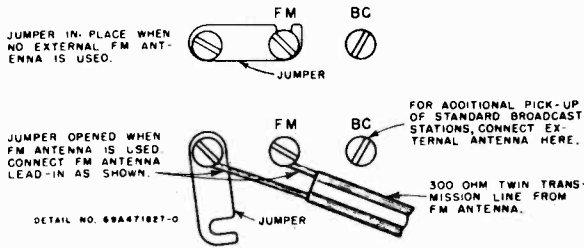
MODEL 67XM21, CHASSIS HS-64



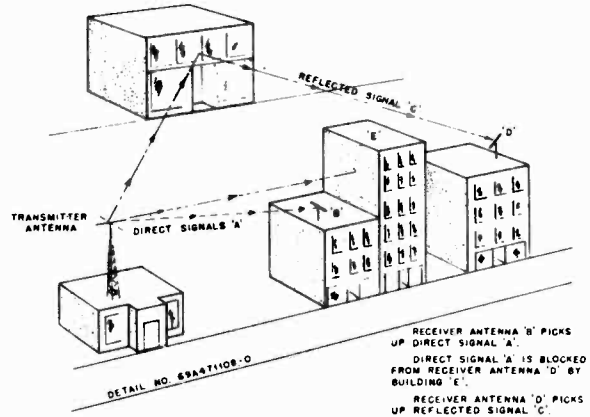
PARTS LOCATION - CABINET

MODEL 67XM21, CHASSIS  
HS-64

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**EXTERNAL ANTENNA TERMINALS**



**DIRECT & REFLECTED FM RECEPTION PATHS**

**ALIGNMENT**

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

It is suggested that an isolation transformer be used between receiver and power line. If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator output to B- instead of the receiver chassis.

If set oscillates when aligning the broadcast band, connect receiver B- to receiver chassis. CAUTION: Don't forget to disconnect B- from receiver chassis after alignment.

Use an insulated wrench when adjusting the FM tuner trimmers. Order Motorola FM Alignment Wrench, Part Number 66A471864.

A special wrench for adjusting the slotted nuts on the tuner cores will be required also. You can easily fabricate one from a Motorola auto set Volume Control Shaft and Coupling Assembly (Part Number 1B70847, \$.30 list) by simply spreading out the forked ends and filing to fit. Solder the assembly together to make it rigid.

**COMPLETE ALIGNMENT PROCEDURE USING AM SIGNAL GENERATOR**

An AM (30% amplitude modulated) signal generator covering the frequencies shown in Alignment Chart I, is used to align the broadcast and FM bands. A low range output meter, connected across the speaker voice coil, is used as an output indicator.

The broadcast alignment is conventional; instructions are given in the following alignment chart.

The FM band alignment can be satisfactorily performed by following the instructions in the chart. When properly aligned, the discriminator does not respond to amplitude modulation and since an AM type signal generator is used for aligning the FM circuits, it is necessary to detune the discriminator secondary and leave it that way until all of the FM circuits have been aligned. After completing the alignment of the FM circuits, proceed to align the discriminator secondary by applying a 4.3 Mc AM signal to the control grid (pin #7) of the 2nd FM converter tube and adjusting the discriminator secondary core for minimum audio output. No adjustment of the FM circuits should be attempted with AM after the discriminator secondary has been properly aligned.

CHART I. ALIGNMENT PROCEDURE USING AM SIGNAL GENERATOR

STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
<b>465 Kc IF CHANNEL ALIGNMENT</b>							
1.	1620 Kc	BC	.1 mf	12BE6 (V-2) BC Conv. Grid (Pin #1)	465 Kc	1, 2, 3 & 4	Adjust for maximum output.
<b>BROADCAST BAND ALIGNMENT</b>							
2.	1620 Kc (gang fully opened)	BC	.1 mf	12BE6 (V-2) BC Conv. Grid (Pin #1)	1620 Kc	5	This sets oscillator to dial. (Calibrate pointer by fully closing gang and noting position of pointer slider. Pointer slider should be in line with right hand hole in dial background, as shown in Figure 7.)

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MODEL 67XM21, CHASSIS  
HS-64

## ALIGNMENT (cont'd)

STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
3.	1400 Kc	BC	None	Radiation loop*	1400 Kc	6	Tune in signal with receiver tuning knob, then peak trimmer 6.
<u>4.3 MC IF CHANNEL ALIGNMENT</u>							
4.	-	-	-	-	-	7	Detune discriminator secondary by screwing core out as far as it will go.
5.	(extreme high frequency end)	FM	.001 mf	12AT7 (V-1) 2nd FM Converter Grid (#7 Pin)	4.3 Mc	8,9,10, 11 & 12	Adjust for maximum output.
6.	-	-	-	-	-	13	Check the position of the FM Osc. tuning core 13. Set spacing between the core and bakelite piece to which it is mounted, to two turns from tight by turning tuning core slotted nut.
7.	98 Mc	FM	None	FM Ant. terminal	98 Mc	16	Tuner is set to 98 Mc by moving cores out with tuning shaft until spacing between bakelite pieces is 1-9/32". See Figure 4. Peak 16 for maximum output.
8.	90 Mc	FM	None	FM Ant. terminal	90 Mc	17 & 18	Tune in signal with receiver tuning knob, then adjust 17 & 18 for maximum output.
9.	105 Mc	FM	None	FM Ant. terminal	105 Mc	14 & 15	Tune in signal with receiver tuning knob, then adjust 14 & 15 for maximum output.
10.	-	-	-	-	-	-	Repeat Steps 8 and 9 several times until further adjustment does not increase the output. Make the final <u>trimmer</u> adjustment at <u>105 Mc.</u> (i.e., trimmers 17 & 18 <u>105 Mc.</u> )
11.	105 Mc	FM	None	Radiate signal (or use station after performing Step 12).	105 Mc	17	Adjust for maximum output with built-in antenna connected.
<u>ALIGN DISCRIMINATOR SECONDARY</u>							
12.	-	FM	.001 mf	12AT7 (V-1) 2nd FM Converter Grid (#7 Pin)	4.3 Mc	7	Adjust discriminator secondary for minimum response. The correct adjustment is sharply defined minimum response point between the two peaks.

\* Connect output of signal generator to a 5" diameter, 3 turn loop and radiate signal into receiver loop. Minimum distance between loops should never be less than 12".

MODEL 67XM21, CHASSIS  
HS-64

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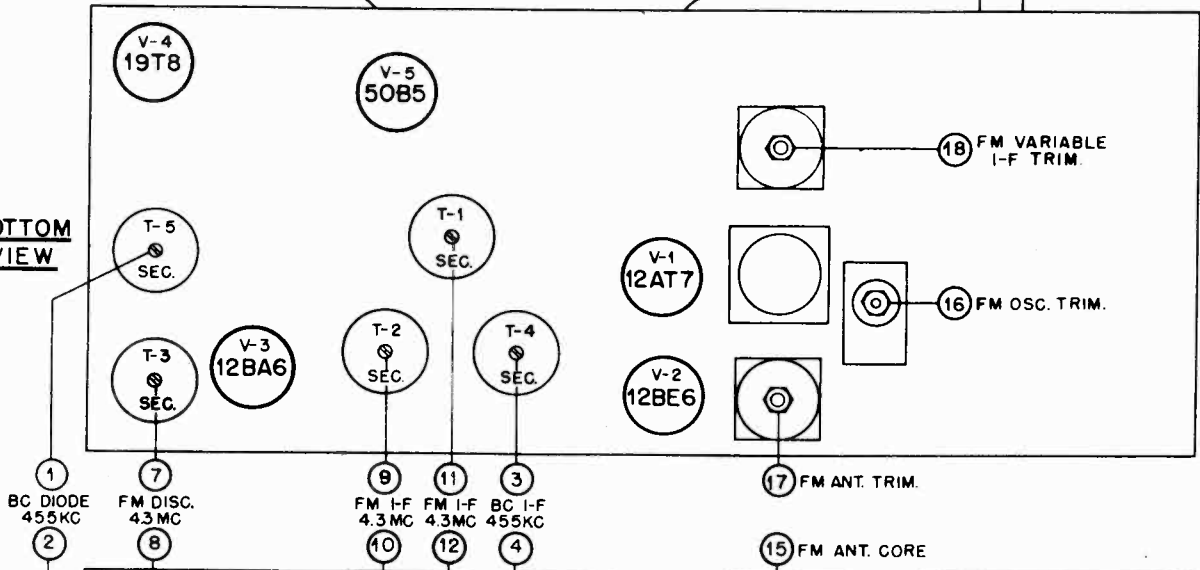
## ALIGNMENT PROCEDURE WHEN USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

- | STEP | OPERATION   |
|------|---|
|      | <u>455 Kc IF Channel Alignment</u>  |
| 1.   | Same as Step 1 in Chart I (Use AM signal generator)   |
|      | <u>Broadcast Band Alignment</u>   |
| 2.   | Same as Steps 2 and 3 in Chart I (Use AM signal generator)  |
|      | <u>4.3 Mc IF Channel Alignment (Use FM Signal Generator &amp; Oscilloscope)</u>   |
| 3.   | (A) Discriminator <ol style="list-style-type: none"> <li>1. Connect the input terminals of the oscilloscope vertical amplifier to the high side of the receiver volume control and B-.</li> <li>2. Connect the FM generator synchronizing voltage output terminals to a phase shifting network, consisting of a variable 1/2 megohm resistor in series with a .002 mf capacitor. The input to the oscilloscope horizontal amplifier is connected across the .002 mf capacitor. See Figure 5. (This phase shifting network may not work with every oscilloscope. Different values of R &amp; C may be required.)</li> <li>3. Apply an FM 4.3 Mc signal (125 Kc deviation) through a .001 mf capacitor to the control grid (pin #1) of tube V-3 in the 2nd FM IF Amplifier stage.</li> <li>4. Adjust discriminator primary (8) for maximum amplitude. The phase shifting network resistor is adjusted to give only one trace.</li> <li>5. Adjust discriminator secondary (7) until a symmetrical pattern is obtained, with peaks occurring at about 100 Kc above and below 4.3 Mc and is substantially linear between peaks. The trace should pass through the intersection of the vertical and horizontal axis. The phase shifting network should be adjusted to give only a single pattern at all times. See Figure 6. It will be necessary to go over discriminator primary (8) and secondary (7) adjustments several times before a pattern of maximum amplitude and correct symmetry is obtained.</li> </ol> |
|      | (B) 4.3 Mc IF Amplifiers <ol style="list-style-type: none"> <li>1. Apply an FM 4.3 Mc signal (100 Kc deviation) to the control grid (pin #1) of tube V-2 in the 1st FM IF amplifier stage, through a .001 mf capacitor and adjust both primary and secondary cores (9 &amp; 10) to get a symmetrical pattern as before, with peaks occurring at a slightly lower deviation.</li> <li>2. Apply an FM 4.3 Mc signal (100 Kc deviation) to the FM antenna terminal and adjust both primary and secondary cores (11 &amp; 12) until a symmetrical pattern substantially linear between peaks, is obtained.</li> </ol>   |
|      | <u>FM Band Alignment - Use FM Signal Generator &amp; Output Meter</u>   |
| 4.   | Check the position of the FM oscillator tuning core (13). Set the spacing between the core and the bakelite piece to two turns from tight by turning tuning core slotted nut.   |
| 5.   | Connect generator output directly to the receiver FM antenna terminal.  |
| 6.   | Set receiver tuner to 98 Mc by moving cores out with tuning shaft until spacing between bakelite pieces is 1-9/32". See Figure 4. Also set FM signal generator to 98 Mc (22-1/2 Kc deviation). Adjust FM oscillator trimmer (16) for maximum output.  |
| 7.   | Set FM signal generator to 90 Mc (22-1/2 Kc deviation). Tune in signal with receiver tuning knob and then adjust FM variable IF and FM antenna trimmers (17 & 18) for maximum output.   |
| 8.   | Set FM signal generator to 105 Mc (22-1/2 Kc deviation). Tune in signal with receiver tuning knob and then adjust variable IF and antenna cores (14 & 15) for maximum indication on output meter.   |
| 9.   | Repeat steps 7 and 8 several times until further adjustment does not increase the output. Make the final <u>trimmer</u> adjustment at 105 Mc. (i.e., 17 & 18 at 105 Mc.)  |
| 10.  | Close FM antenna link on loop panel. Radiate an FM 105 Mc (22-1/2 Kc deviation) signal into FM antenna (line cord). Tune in signal with receiver tuning knob and then repeak FM antenna trimmer (17).   |

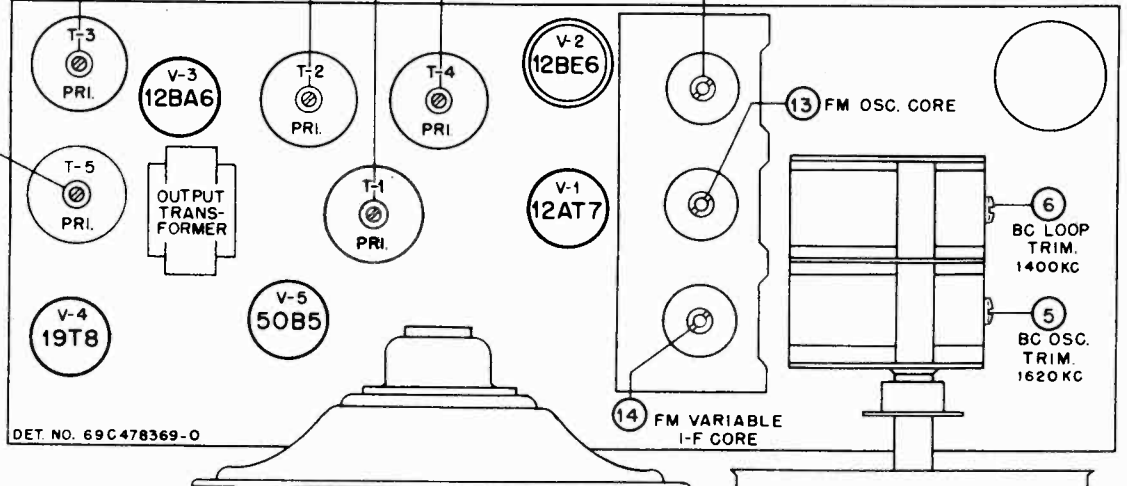
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MODEL 67XM21, CHASSIS HS-64

**BOTTOM VIEW**



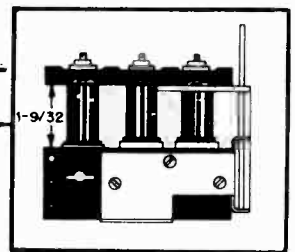
**TOP VIEW**



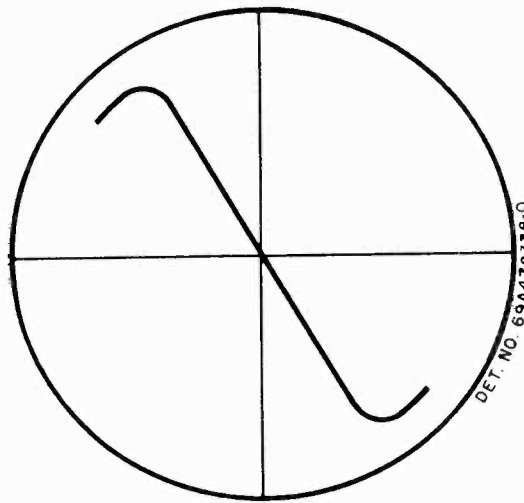
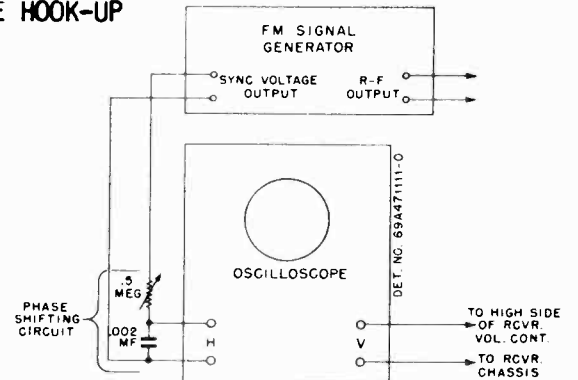
**TUBE & TRIMMER LOCATIONS**

**METHOD OF SETTING TUNER TO 98MC.**

TURN TUNING SHAFT UNTIL DISTANCE BETWEEN BAKELITE PIECES IS 1-9/32" AS SHOWN IN ILLUSTRATION.



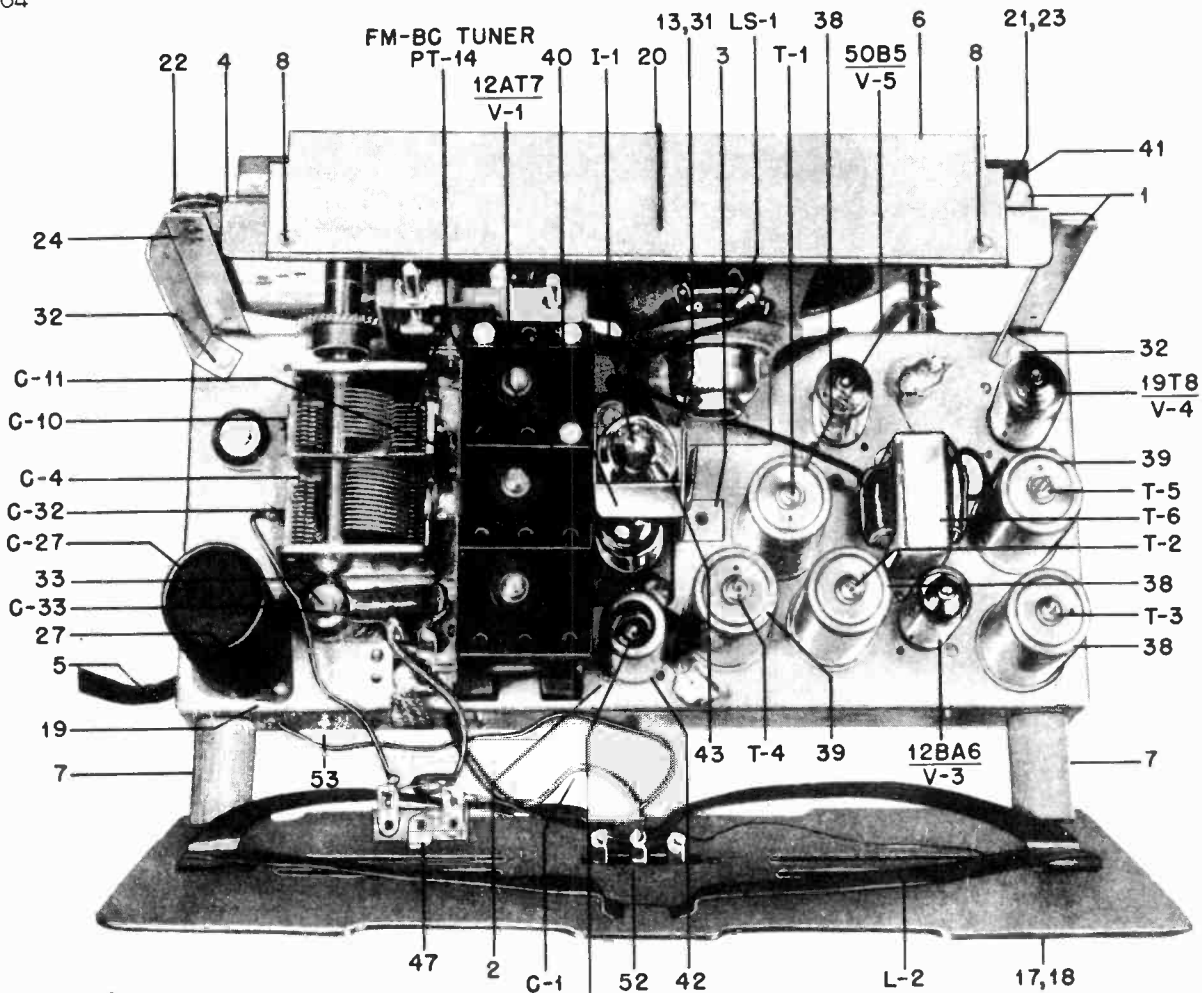
**SIGNAL GENERATOR & OSCILLOSCOPE HOOK-UP**



4.3 MC

OSCILLOSCOPE PATTERN

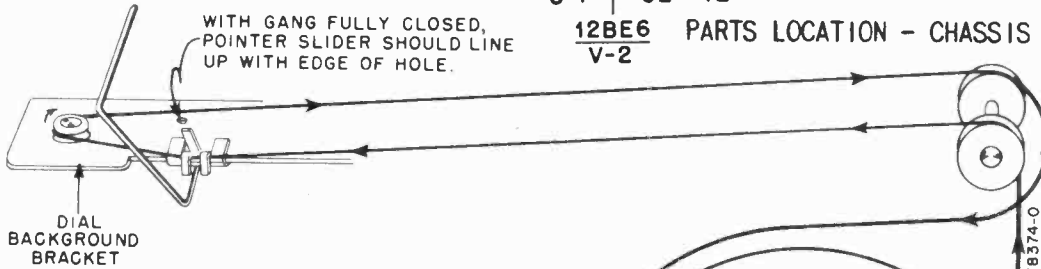




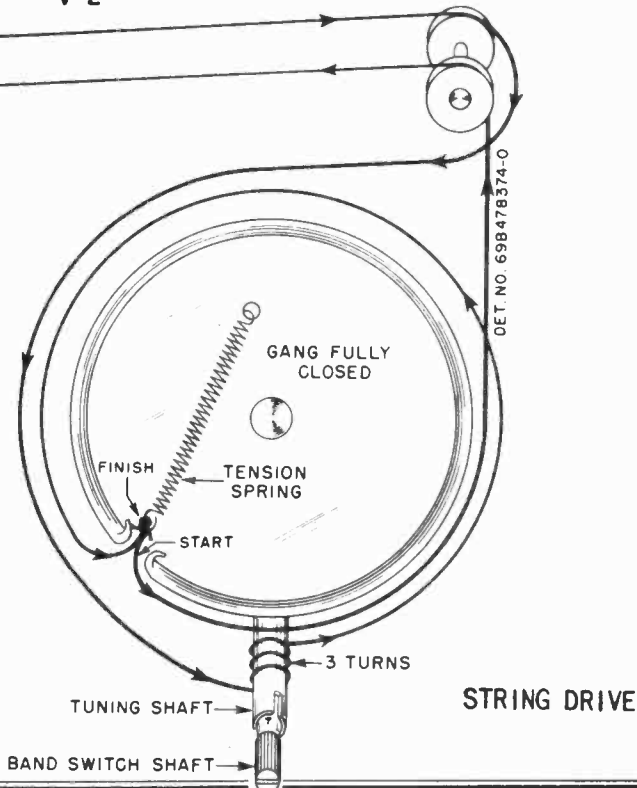
WITH GANG FULLY CLOSED,  
POINTER SLIDER SHOULD LINE  
UP WITH EDGE OF HOLE.

12BE6  
V-2

PARTS LOCATION - CHASSIS HS-64 - TOP VIEW

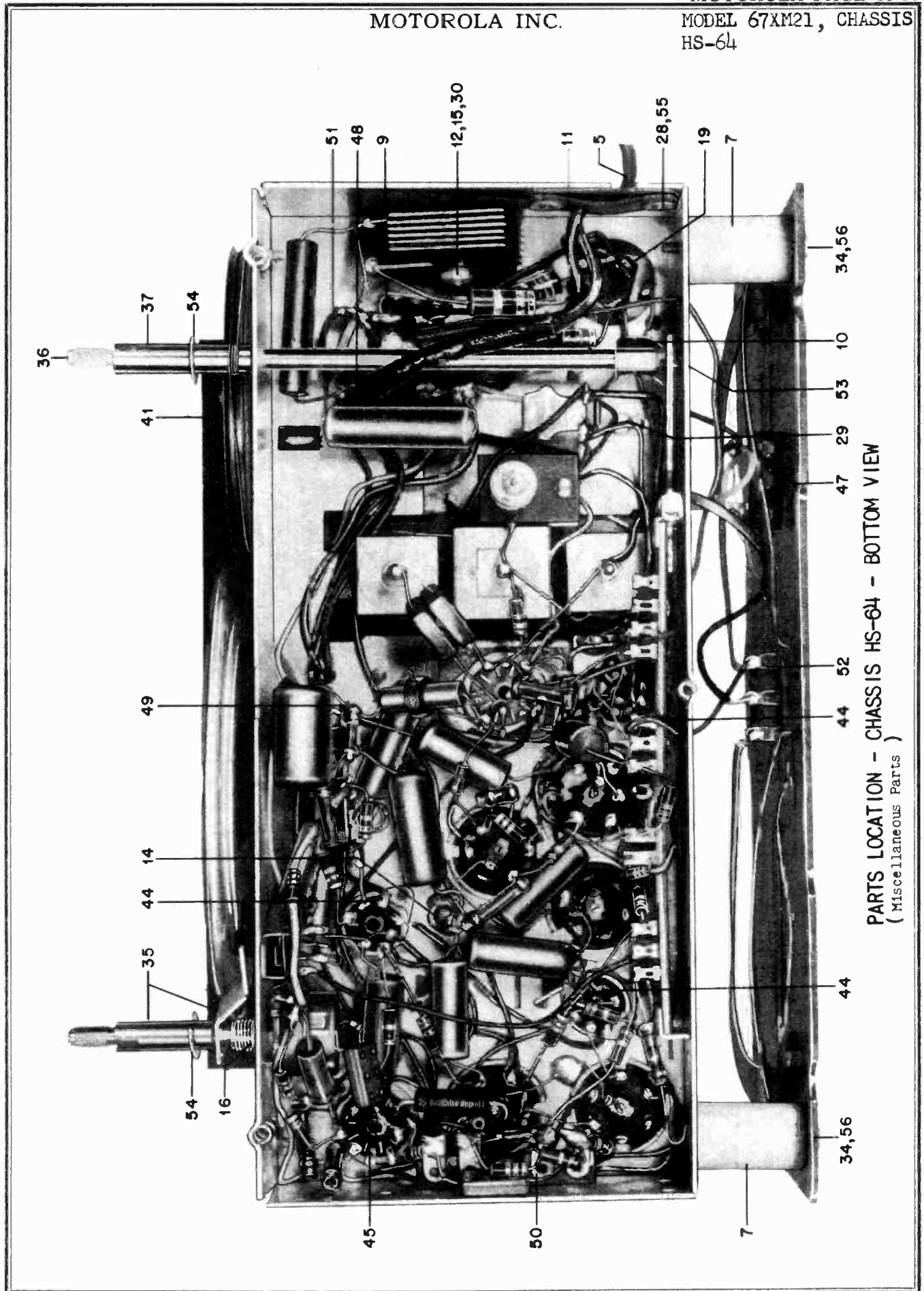


NOTE:  
USE 18 LB. TEST FISH LINE.

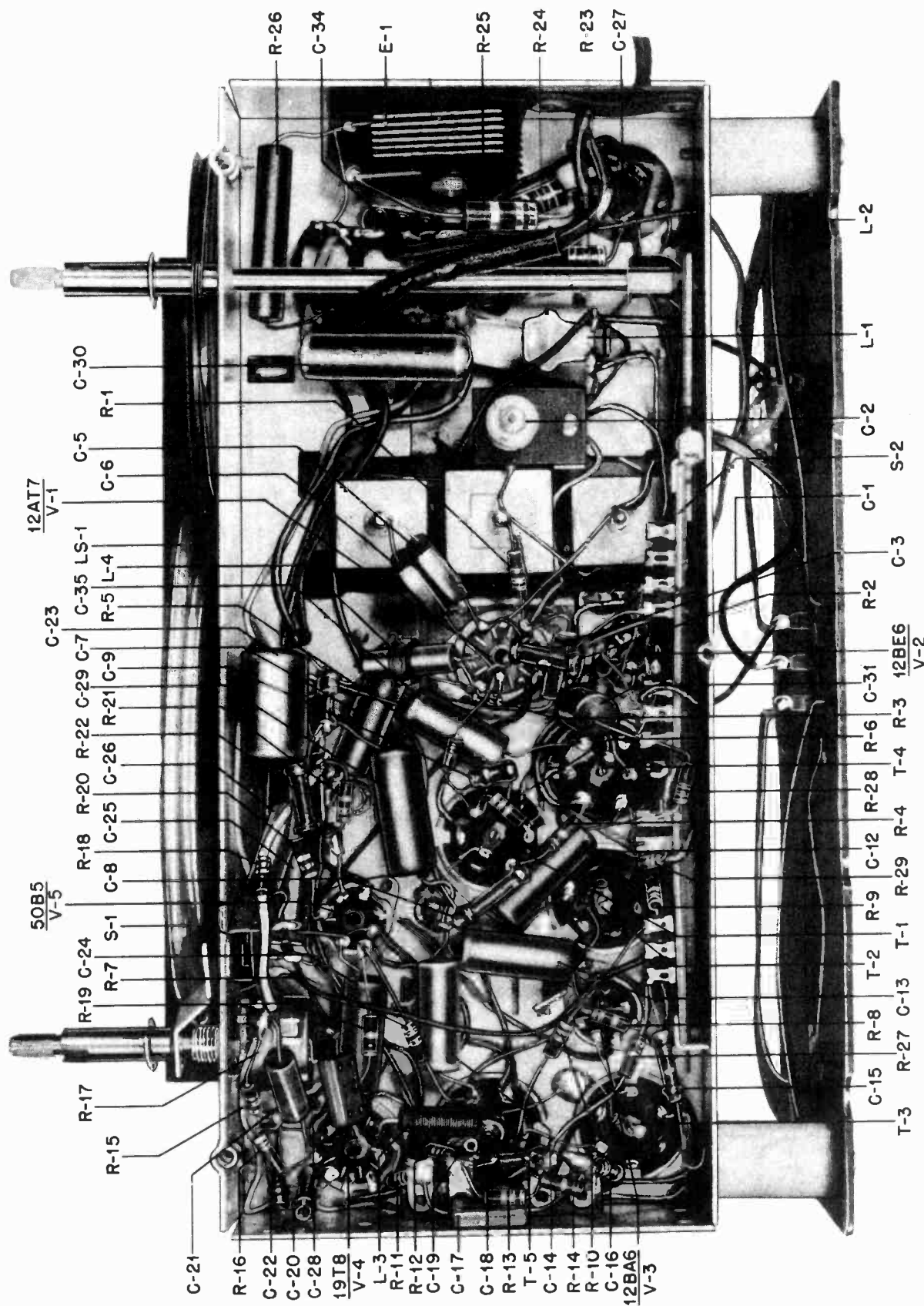


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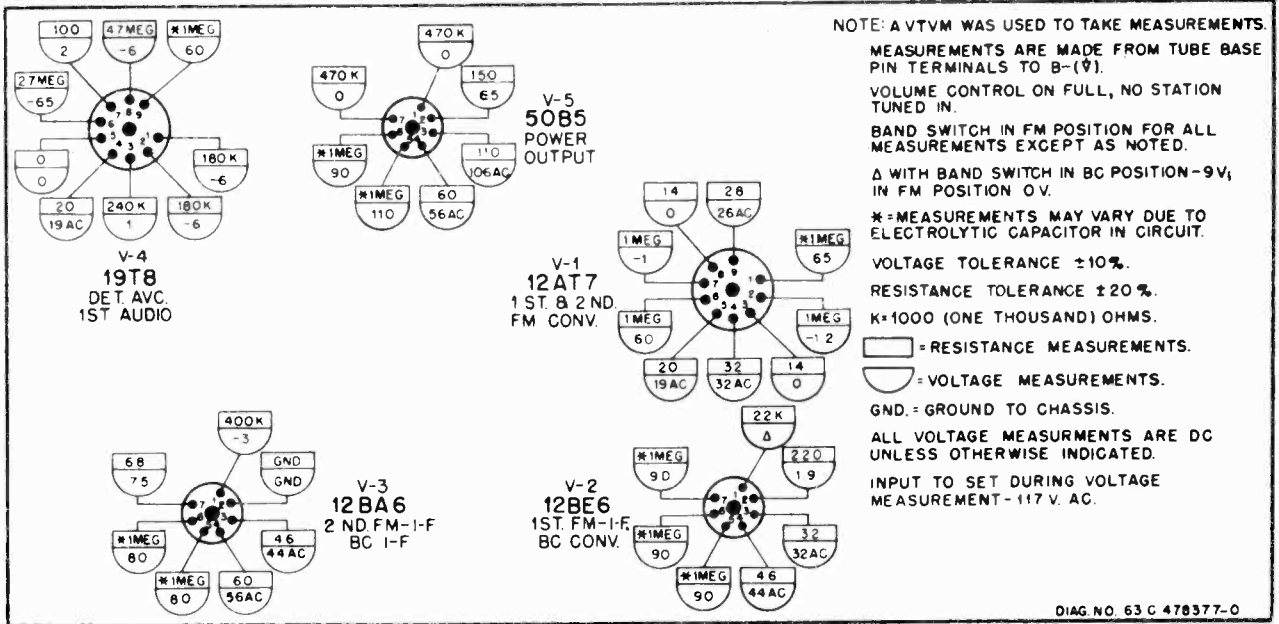
MODEL 67M21, CHASSIS HS-64



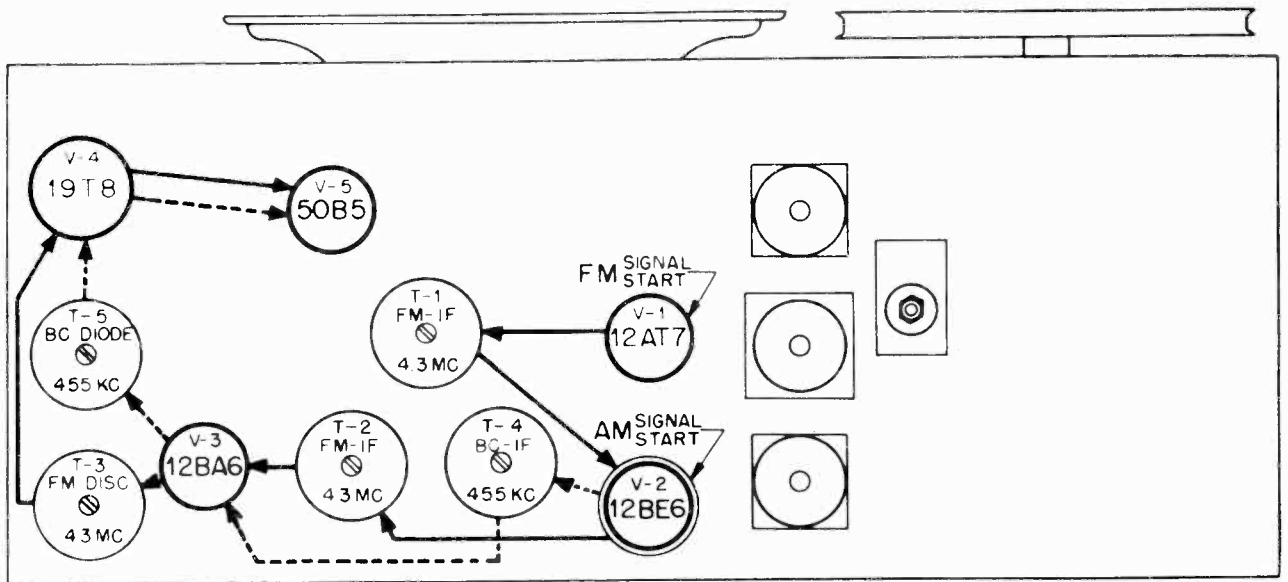
PARTS LOCATION - CHASSIS HS-64 - BOTTOM VIEW  
(Miscellaneous Parts)



**PARTS LOCATION - CHASSIS HS-64 - BOTTOM VIEW**  
 (Capacitors, Resistors, Coils, Transformers, Switches)



VOLTAGE & RESISTANCE DIAGRAM



BOTTOM OF CHASSIS

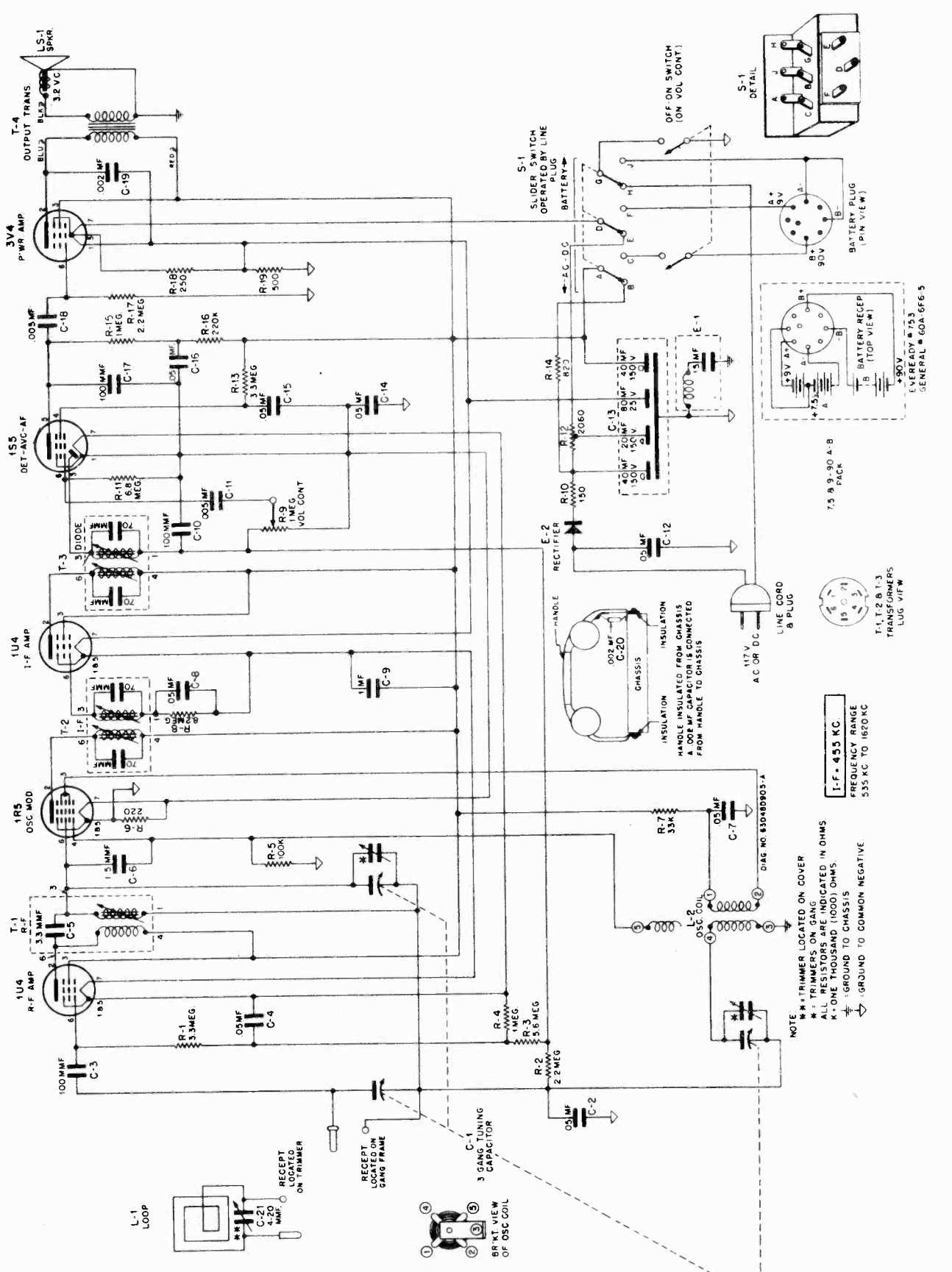
-----  $\rightarrow$  AM SIGNAL PATH  
 —————  $\rightarrow$  FM SIGNAL PATH

BC & FM SIGNAL PATHS THROUGH RECEIVER

MODEL 67XM21, CHASSIS  
HS-64

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
<b>CHASSIS PARTS HS-64</b>					
<b>CAPACITORS</b>					
C-1	21K470578	Special: 3.5 mmf .....	R-11	6R6075	100,000 .....
C-2	19A470428	Trimmer: variable air; 2.5 mmf to 30 mmf .....	R-12	6R6015	220,000 .....
C-3	21R2730	Silver Mica: 500 mmf 500V .....	R-13	6R6001	68,000 .....
C-4	19K76415	Variable: 2 gang; cut oscillator plates; with trimmers C-10, C-11 & C-32 .....	R-14	6R8182	150,000 .....
C-5	21R2729	Silver Mica: 250 mmf 500V .....	R-15	6R6018	100 .....
C-6	21R2729	Silver Mica: 250 mmf 500V .....	R-16	6R2122	4.7 meg .....
C-7	8S9802	Paper: .02 mf 400V .....	R-17	18A470427	Volume Control: .5 meg; tapped at 25,000 ohms; with SPST switch .....
C-8	21B470587	Ceramic: 4700 mmf 500V .....	R-18	6R6393	1200 10% .....
C-9	21K77373	Ceramic: 50 mmf 500V .....	R-19	6R6075	100,000 .....
C-10	-	Trimmer: part of gang capacitor C-4 .....	R-20	6R6032	470,000 .....
C-11	-	Trimmer: part of gang capacitor C-4 .....	R-21	6R6393	1200 10% .....
C-12	8S9801	Paper: .01 mf 100V .....	R-22	6R6293	150 not insulated .....
C-13	8A71213	Paper: .05 mf 100V .....	R-23	6R476004	1000 2 watt .....
C-14	8S9809	Paper: .01 mf 400V .....	R-24	6R3968	180 10% 2 watt .....
C-15	21B77286	Ceramic: 100 mmf 500V .....	R-25	6R3994	27 10% 2 watt .....
C-16	21B77286	Ceramic: 100 mmf 500V .....	R-26	17A470492	Wire wound: 68 5% 2 watt insulated .....
C-17	21R6839	Mica: 500 mmf 500V .....	R-27	6R6015	220,000 .....
C-18	21B77286	Ceramic: 100 mmf 500V .....	R-28	6R3992	150 .....
C-19	21B77286	Ceramic: 100 mmf 500V .....	R-29	6R6015	220,000 .....
C-20	21B470587	Ceramic: 4700 mmf 500V .....	<b>SWITCHES</b>		
C-21	8A24968	Paper: .005 mf 100V .....	S-1	40K21758	Slider Switch: SPDT .....
C-22	21K77375	Ceramic: 250 mmf 500V .....	S-2	40B470432	Bandswitch .....
C-23	8A470504	Paper: .25 mf 50V .....	<b>TRANSFORMERS</b>		
C-24	8S9809	Paper: .01 mf 400V .....	T-1	24B470561	1st IF, 4.3 Mc: complete with iron cores and padding capacitors, but less shield
C-25	8K471635	Paper: .05 mf 400V .....	T-2	24B470563	2nd IF, 4.3 Mc: complete with iron cores and padding capacitors, but less shield
C-26	8A471019	Paper: .02 mf 400V .....	T-3	24B470565	Discriminator, 4.3 Mc: complete with iron cores and padding capacitors, but less shield .....
C-27	23B470429	Electrolytic: 40 mf-200V, 20-20 mf 150V: includes insulating tube .....	T-4	24B75487	IF, 455 Kc: complete with iron cores and padding capacitors, but less shield ...
C-28	21R6838	Mica: 1000 mmf 500V .....	T-5	24B470559	Diode, 455 Kc: complete with iron cores and padding capacitors, but less shield
C-29	8A471623	Paper: .05 mf 200V .....	T-6	25B76117	Output .....
C-30	8S9816	Paper: .05 mf 400V .....	<b>MISCELLANEOUS CHASSIS PARTS</b>		
C-31	8A71213	Paper: .05 mf 100V .....	1	1X77345	Background Support & Pulleys Assembly ..
C-32	-	Trimmer: part of gang capacitor C-4 .....	2	26A24869	Base, tube shield .....
C-33	8S9801	Paper: .01 mf 100V .....	3	7K470917	Bracket, pilot light mounting .....
C-34	21R6842	Mica: 50 mmf 500V .....	4	11M8944	Cord, dial: #18 lb black .....
C-35	8K471636	Paper: .1 mf 200V .....	5	30K31258	Cord, line and plug: 3 conductor .....
<b>RECTIFIER</b>					
E-1	48B90140	Selenium Rectifier: half wave .....	6	35B77311	Dial Background: tan plastic; with rein- forcing strip .....
<b>DIAL LIGHT</b>					
I-1	65A470930	Lamp, incandescent: 117V 10W .....	7	57K470568	Dowel, back mounting: wood; 1-3/16" long
<b>COILS</b>					
L-1	24A470556	BC Oscillator .....	8	5S7805	Eyelet, snap-in (dial background mtg) ..
L-2	24K77323	Loop Antenna: winding only .....	9	14A470428	Insulator, rectifier: armite paper .....
L-3	24A74989	Filament Choke .....	10	1X470545	Lever & Rivet Assembly (on band switch shaft) .....
L-4	24A470505	RF Choke .....	11	32K31259	Lock, line cord: fibre .....
<b>SPEAKER</b>					
LS-1	50B76198	5" PM; 3.2 ohm voice coil .....	12	4S7650	Lockwasher: #6 internal; cadmium plated (rectifier mtg) .....
<b>RESISTORS</b>					
Note: All resistors are insulated carbon type, 20%, 1/2W unless otherwise specified.					
R-1	6R6004	1 meg .....	13	4S7657	Lockwasher: #8 external; cadmium plated (speaker mtg) .....
R-2	6R3996	15,000 not insulated .....	14	29R5227	Lug, soldering: #8L .....
R-3	6R6048	1 meg 10% .....	15	2S7002	Nut: 6-32 x 5/16 hex; cadmium plated (rectifier mtg) .....
R-4	6R6028	22,000 .....	16	2S7051	Nut: 3/8-32 x 9/16 Palmnut; cadmium pla- ted (volume control mtg) .....
R-5	6R6028	22,000 .....	17	1X470547	Panel Assembly, cabinet back: less loop winding but includes 3 screw terminal strip and 2 lug terminal strip .....
R-6	6R6056	47,000 .....	18	24C470597	Panel & Loop Assembly: complete cabinet back panel, including loop winding ....
R-7	6R6301	1000 .....			
R-8	6R2039	68 10% .....			
R-9	6R3927	2.2 meg .....			
R-10	6R6056	47,000 .....			





NOTE  
 \* TRIMMERS LOCATED ON COVER  
 † TRIMMERS ON GANG  
 ALL RESISTORS ARE INDICATED IN OHMS  
 K = ONE THOUSAND (1000) OHMS  
 ‡ = GROUND TO CHASSIS  
 ▽ = GROUND TO COMMON NEGATIVE

I-F = 455 KC  
 FREQUENCY RANGE  
 535 KC TO 1620 KC

7.5 9-30 A-B  
 PACK

TRANSFORMERS  
 LUG VIEW

BATTERY RECP  
 (TOP VIEW)  
 GENERAL # 60A-6F6 5

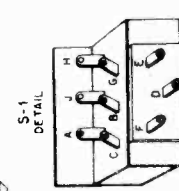
LINE CORD  
 8 PLUG

INSULATION  
 HANDLE INSULATED FROM CHASSIS  
 A .002 MF CAPACITOR IS CONNECTED  
 FROM HANDLE TO CHASSIS

SLIDER SWITCH  
 OPERATED BY LINE  
 PLUG

OFF-ON SWITCH  
 (ON VOL CONT)

BATTERY  
 90V



S-1  
 DETAIL

BATTERY PLUG  
 (PIN VIEW)

AC OR DC  
 117V

19 G 21

T-1, T-2, T-3  
 TRANSFORMERS  
 LUG VIEW

DIAE NO. 8304RDRO3-A

C-7  
 .05 MF

R-7  
 33K

L-2  
 OSC COIL

C-13  
 40 MF 20 MF 80 MF 40 MF  
 150V 150V 25V 150V

R-14  
 20K

R-10  
 150

R-12  
 2000

R-11  
 100K

R-9  
 100K

R-8  
 100K

R-7  
 33K

R-6  
 100K

R-5  
 100K

R-4  
 1MEG

R-3  
 3.3 MEG

R-2  
 2.2 MEG

R-1  
 3.3 MEG

R-18  
 250

R-17  
 2.2 MEG

R-16  
 220K

R-15  
 1MEG

R-14  
 20K

R-13  
 3.3 MEG

R-12  
 2000

R-11  
 100K

R-10  
 150

R-9  
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R-4  
 1MEG

R-3  
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R-2  
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 250

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 2.2 MEG

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 1MEG

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 2.2 MEG

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 220K

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 1MEG

R-14  
 20K

R-13  
 3.3 MEG

R-12  
 2000

R-11  
 100K

R-10  
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R-9  
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R-8  
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R-6  
 100K

R-5  
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R-4  
 1MEG

R-3  
 3.3 MEG

R-2  
 2.2 MEG

R-1  
 3.3 MEG

R-18  
 250

R-17  
 2.2 MEG

R-16  
 220K

R-15  
 1MEG

R-14  
 20K

R-13  
 3.3 MEG

R-12  
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R-11  
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R-10  
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R-9  
 100K

R-8  
 100K

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R-6  
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R-5  
 100K

R-4  
 1MEG

R-3  
 3.3 MEG

R-2  
 2.2 MEG

R-1  
 3.3 MEG

R-18  
 250

R-17  
 2.2 MEG

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 220K

R-15  
 1MEG

R-14  
 20K

R-13  
 3.3 MEG

R-12  
 2000

R-11  
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R-2  
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R-14  
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R-13  
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R-4  
 1MEG

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 3.3 MEG

R-2  
 2.2 MEG

R-1  
 3.3 MEG

R-18  
 250

R-17  
 2.2 MEG

R-16  
 220K

R-15  
 1MEG

R-14  
 2

MOTOROLA INC.

MODEL 68L11, CHASSIS  
HS-119

## ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment. Follow the procedure carefully.

A suitable output meter should be connected across the speaker voice coil. Set receiver volume control to maximum; for greatest accuracy keep output of receiver at approximately .05 watt throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment. (.05 watt = .40 volt on output meter). The alignment tool should be of an insulated type such as Motorola part number 66A71008.

If receiver is operated from AC line during alignment, it is suggested that an isolating transformer be used between receiver and power line. If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator to B- instead of the receiver chassis.

Refer to Figure 1 for location of all adjustments.

Normally, alignment can be made with trimmers 5, 6 & 7. However, if range of these trimmers is insufficient to obtain peak, adjustment can be made with trimmers 5A and 6A.

**R.F. COIL.** The inductance of this coil is set at time of manufacture by adjusting the iron core. No resetting of this core should be made unless it has been tampered with. If so, readjustment can be made by proceeding as follows:

Tune in 600 Kc signal and peak Padder Adj. (8). Next tune in 1400 Kc signal and peak trimmer (6). Repeat both adjustments until maximum response is obtained at both ends; the last adjustment should be trimmer (6).

## ALIGNMENT PROCEDURE CHART

STEP	DIAL SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET TO	ADJUST TRIMMER OR CORE	REMARKS
IF ALIGNMENT						
1.	Gang fully opened	.1 mf	OSC-MOD grid*	455 Kc	1,2,3 & 4	Adjust for maximum output
RF ALIGNMENT						
2.	1600 Kc**	-	Radiation loop***	1600 Kc	5	This sets osc. to dial scale
3.	1400 Kc	-	Radiation loop***	1400 Kc	6 & 7	Tune signal for max. with receiver tuning knob, then peak trimmers 6 & 7.
4.	1400 Kc	-	Radiation loop***	1400 Kc	7	With chassis assembled into cabinet, repeak antenna trimmer. Cabinet rear cover should be closed.

\* A convenient point is the stator of the tuning capacitor.

\*\* First close gang fully and set last mark on dial scale tape to calibration mark as shown in Figure 2 then set to 1600 Kc.

\*\*\* Connect output of signal generator to a 5" diameter, 3 turn loop and bring loop close enough to receiver loop to obtain output of 50 milliwatts (.40V) on output meter. Vary distance between loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".

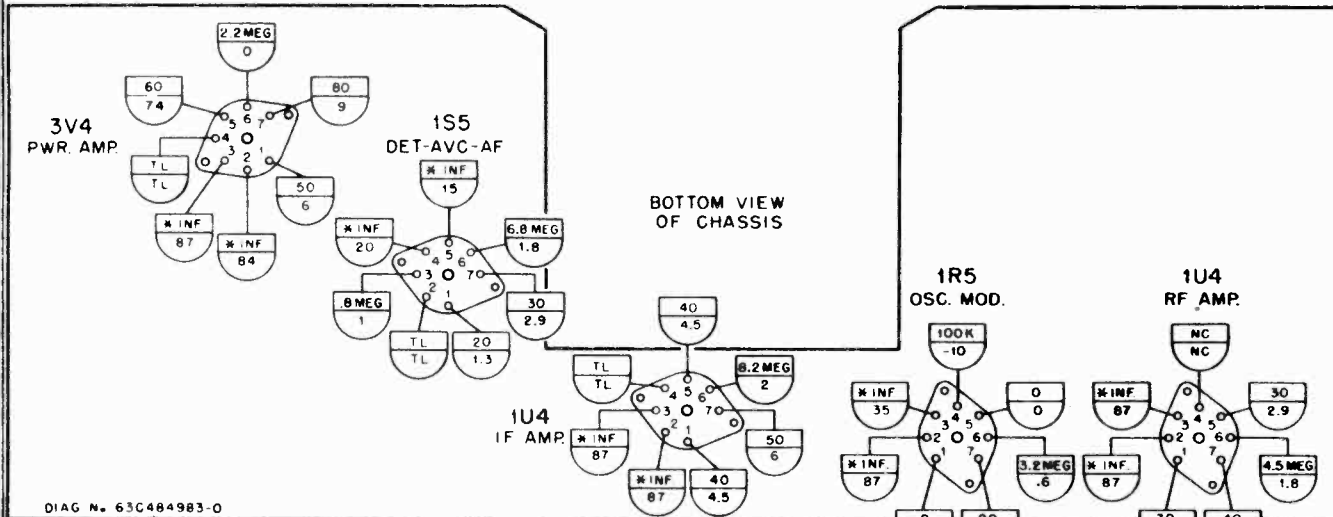
TUNING RANGE - 535 to 1620 Kc

IF FREQUENCY - 455 Kc

TUBE COMPLEMENT - 1U4 - RF Amplifier  
1R5 - Oscillator-Modulator  
1U4 - IF Amplifier  
1S5 - Detector, AVC & 1st AF Amplifier  
3V4 - Power Amplifier  
Rectifier - Selenium type (for house current operation)

POWER SUPPLY - Operates from 105-125 volts AC or DC (15 watts), or self-contained battery pack. Use Eveready #753 or General #60A-6F6-5.





NOTE: A VTVM WAS USED TO MAKE MEASUREMENTS.

MEASUREMENTS ARE MADE FROM TUBE BASE PIN TO B-( $\nabla$ )

SET WAS OPERATED FROM FRESH BATTERY FOR VOLTAGE MEASUREMENTS.

SET WAS IN 'BATTERY' POSITION AND POWER SWITCH WAS 'ON' FOR RESISTANCE MEASUREMENTS; BATTERY WAS DISCONNECTED.

VOLTAGE TOLERANCE  $\pm 10\%$ . RESISTANCE TOLERANCE  $\pm 20\%$ .

= RESISTANCE MEASUREMENTS.

= VOLTAGE MEASUREMENTS

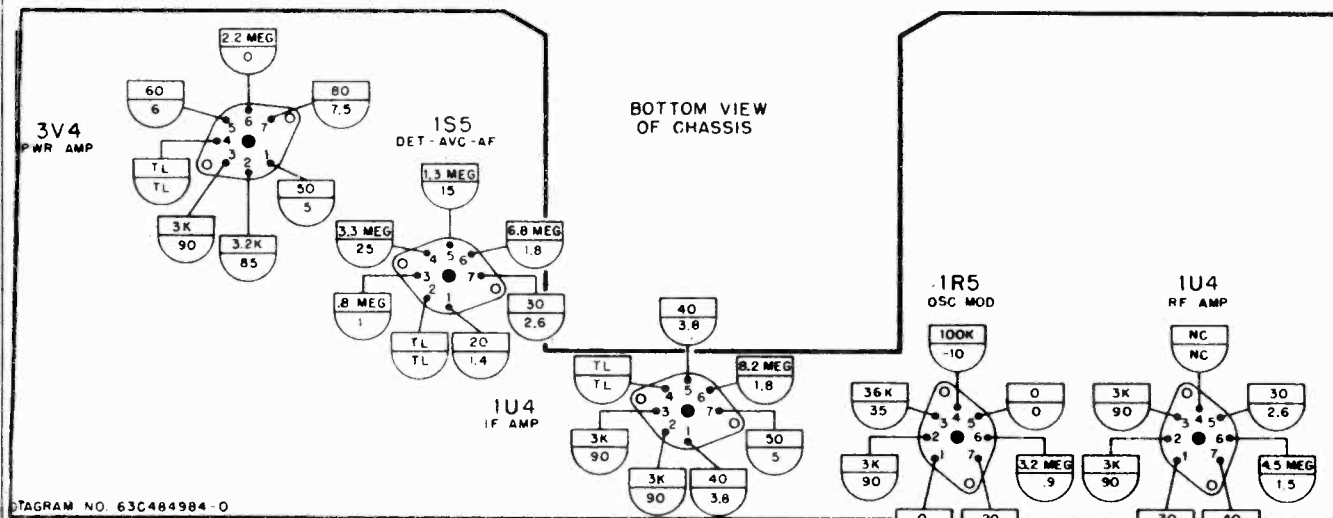
K = ONE THOUSAND (1000) OHMS.

TL = TIE LUG.

NC = NO CONNECTIONS

\* = WILL VARY, DEPENDING ON CONDITION OF ELECTROLYTIC CAPACITOR.

VOLTAGE & RESISTANCE DIAGRAM - BATTERY OPERATED



NOTE: A VTVM WAS USED TO MAKE MEASUREMENTS. MEASUREMENTS ARE MADE FROM TUBE BASE PIN TO B-( $\nabla$ ).

SET WAS OPERATED FROM 117 V. AC LINE FOR VOLTAGE MEASUREMENTS.

SET WAS IN AC POSITION AND POWER SWITCH WAS 'ON' FOR RESISTANCE MEASUREMENTS.

= RESISTANCE MEASUREMENTS

= VOLTAGE MEASUREMENTS.

K = 1000 (ONE THOUSAND) OHMS.

VOLTAGE TOLERANCE  $\pm 10\%$

RESISTANCE TOLERANCE  $\pm 20\%$

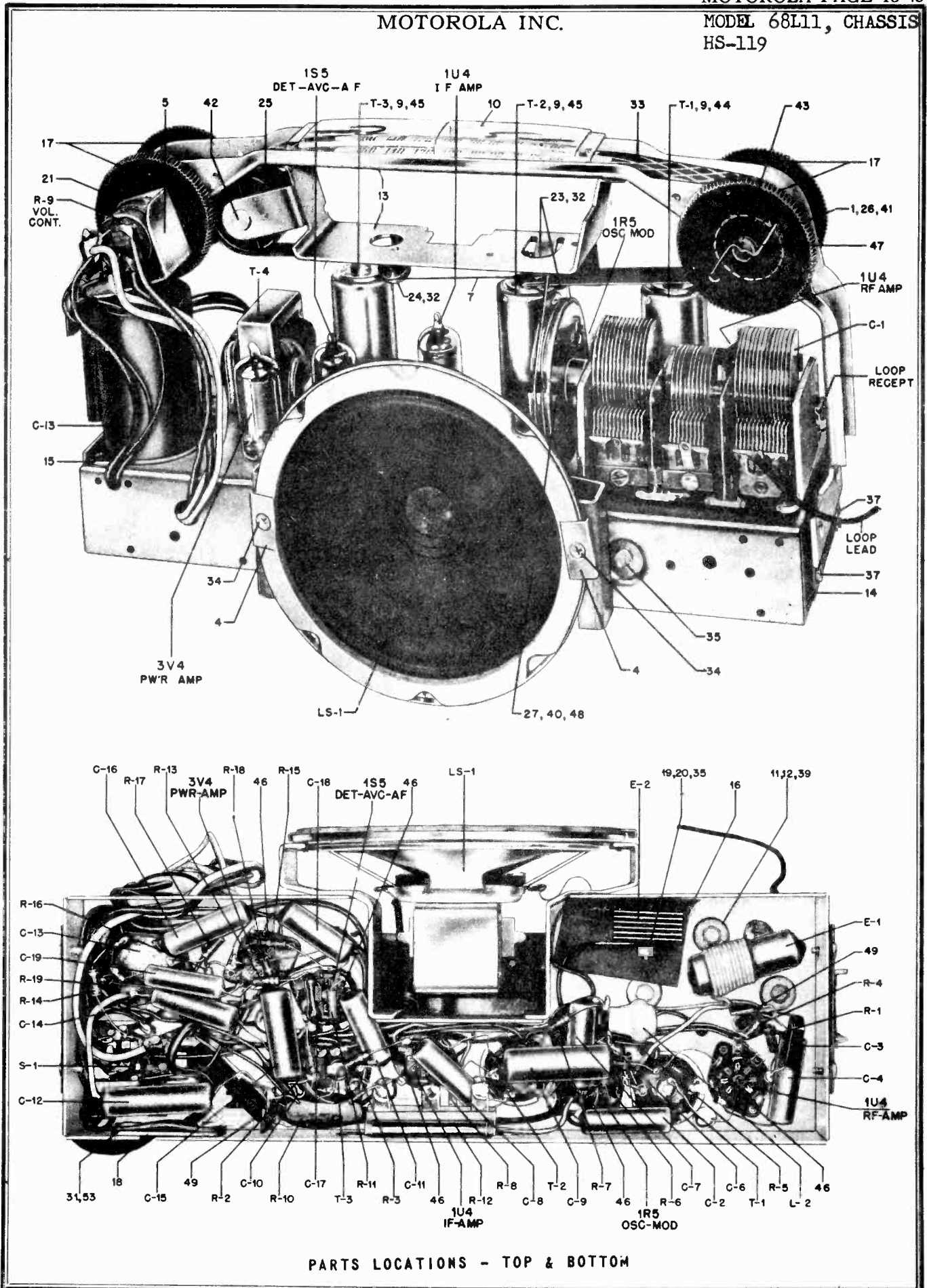
TL = TIE LUG

NC = NO CONNECTION

VOLTAGE & RESISTANCE DIAGRAM - AC OPERATED

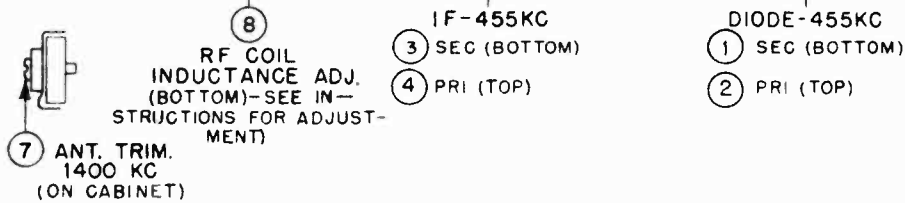
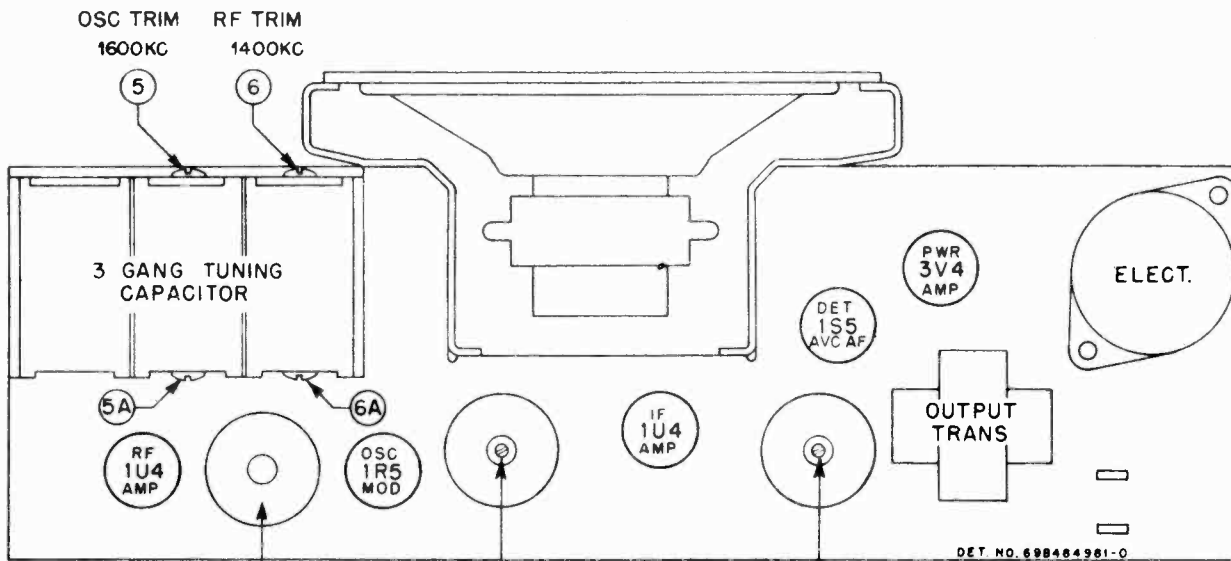
MOTOROLA INC.

MODEL 68L11, CHASSIS HS-119

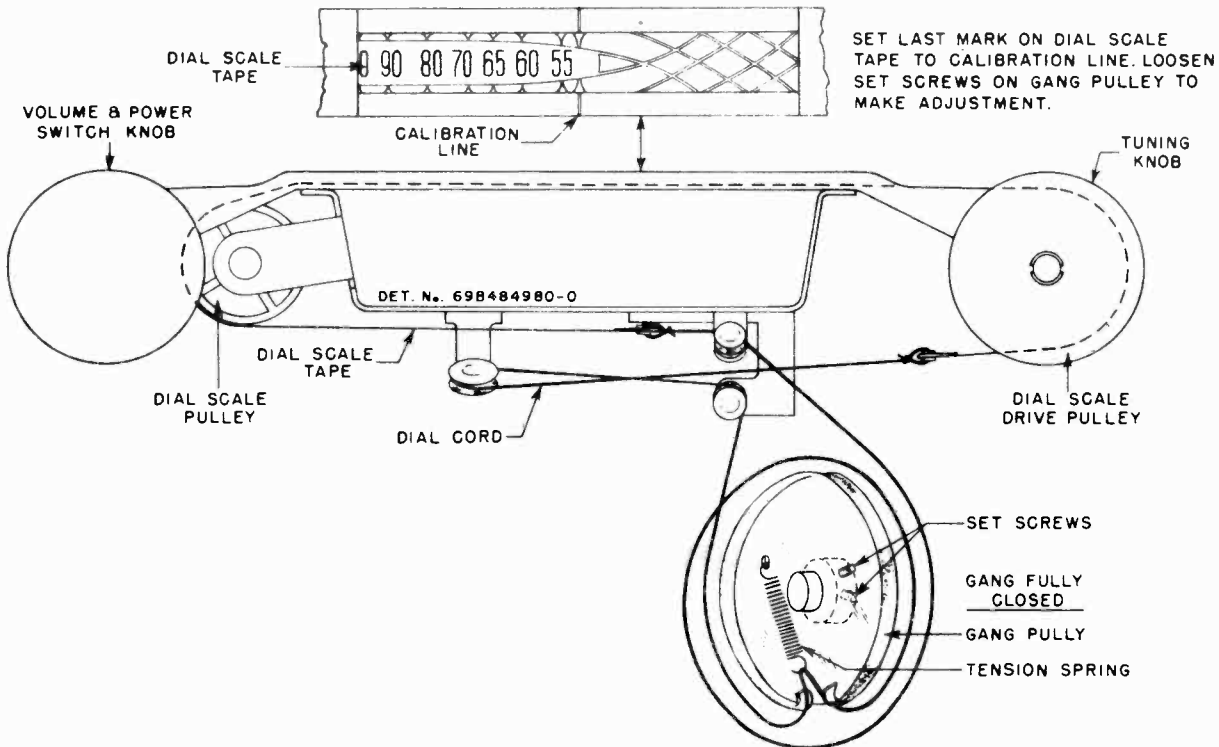


PARTS LOCATIONS - TOP & BOTTOM

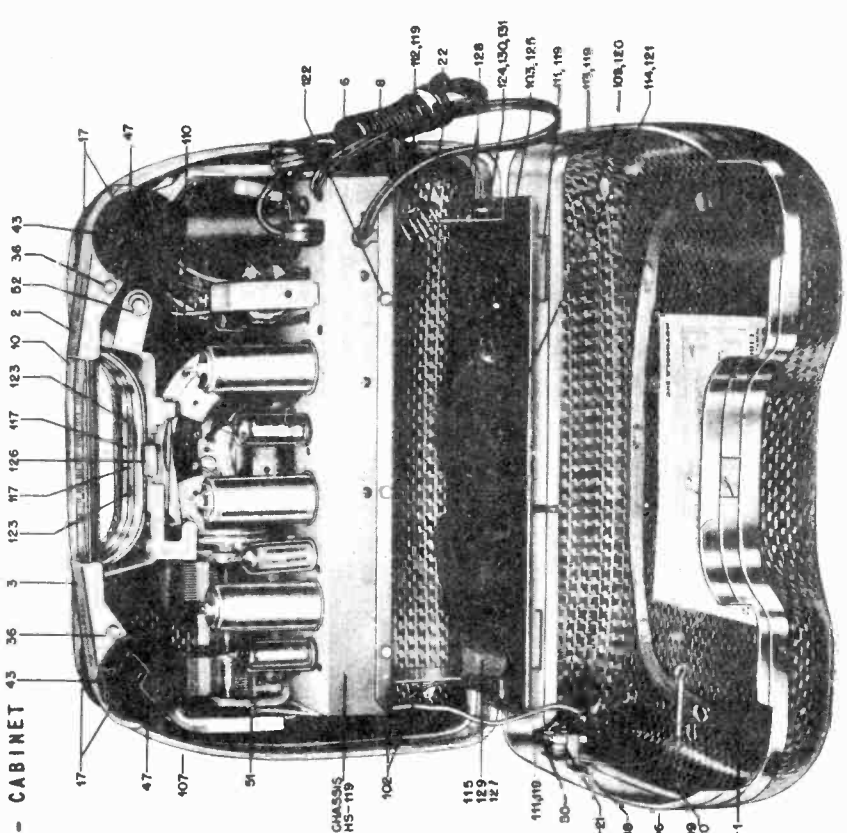
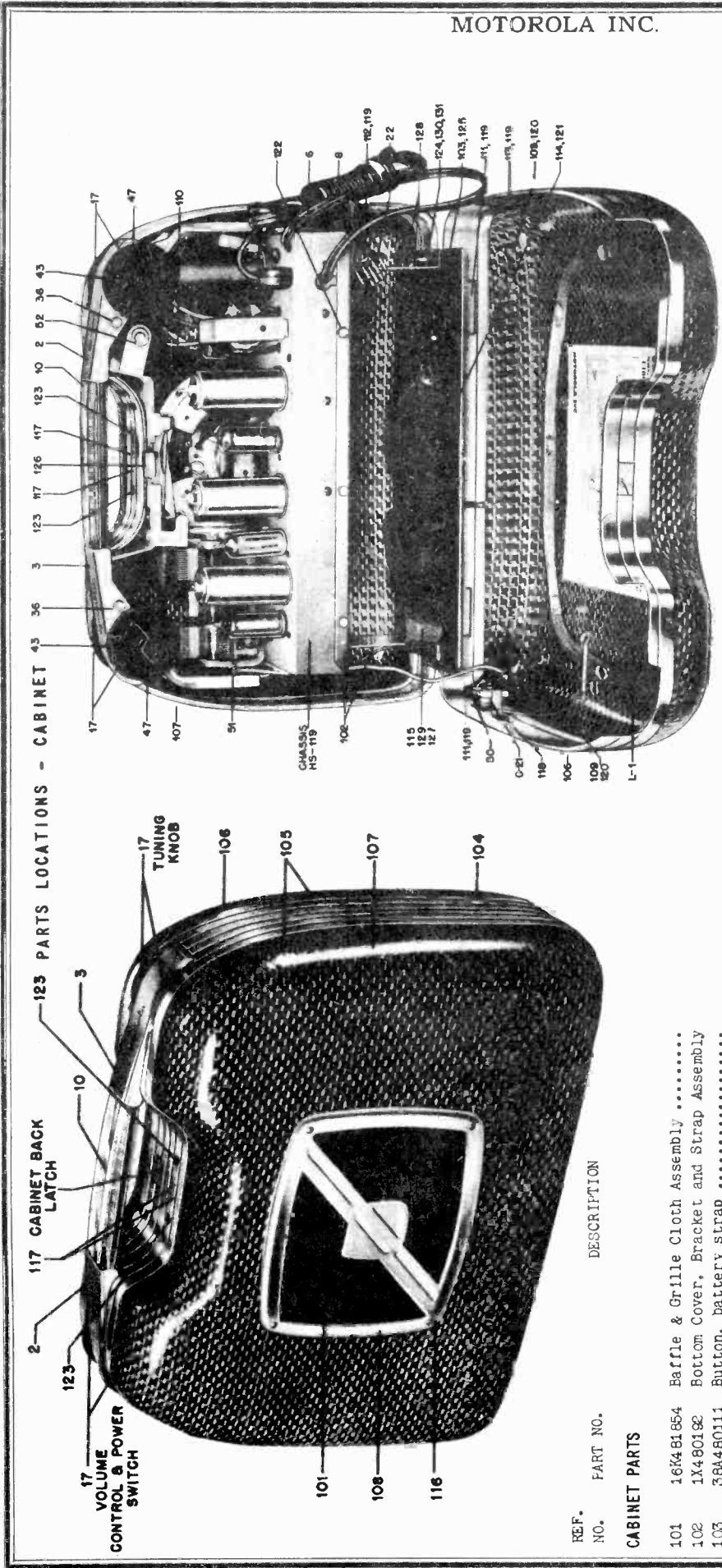
© John F. Rider



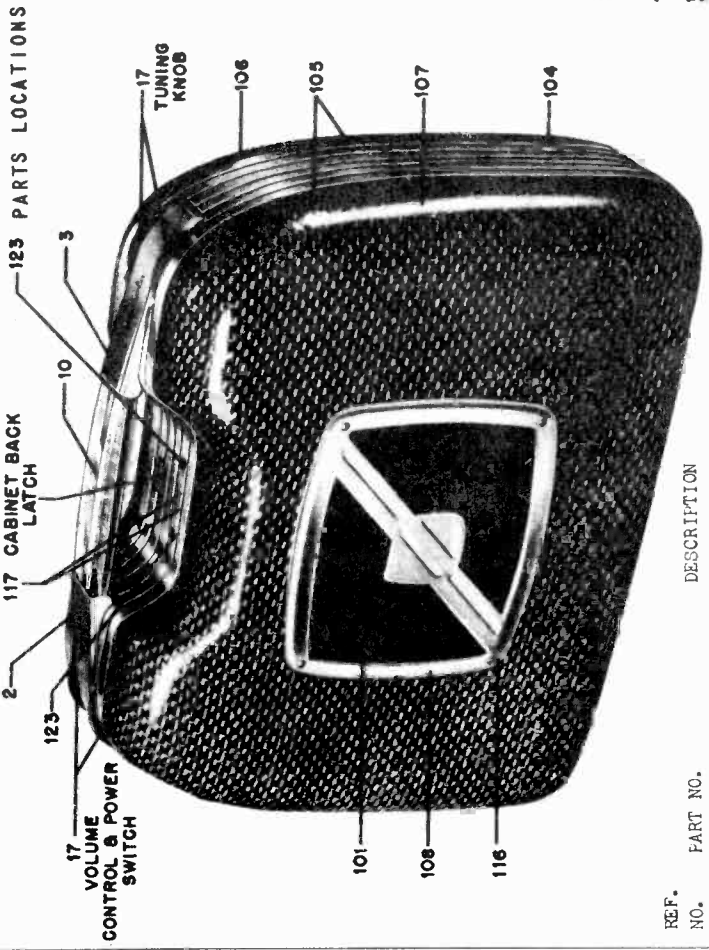
TUBE & ALIGNMENT ADJUSTMENT LOCATIONS



DIAL CORD RESTRINGING DETAIL



118	501683	Rivet: .122 x 3/16; brass; nkl pl (trimmer mtg)
119	526842	Rivet: .140 x 7/32; steel; nkl pl (hinge & insulator mtg)
120	588484	Rivet: .140 x 1/4; steel; nkl pl (rubber foot mtg)
121	582840	Rivet: .140 x 3/8 steel; nkl pl (bottom trim pl mtg)
122	382695	Screw: #6 x 3/16 PKZ slotted hex head sheet metal screw; cad pl (chassis bottom cover assembly mtg)
123	38468125	Screw: #6 x 3/8 Phillips flat head machine screw cad pl (chassis mtg)
124	383360	Screw: #6 x 1/2 PKZ plain hex head sheet metal screw cad pl (chassis mtg)
125	94480110	Socket, battery strap
126	414480158	Spring, cabinet latch
127	1X480193	Strap and Button Assembly

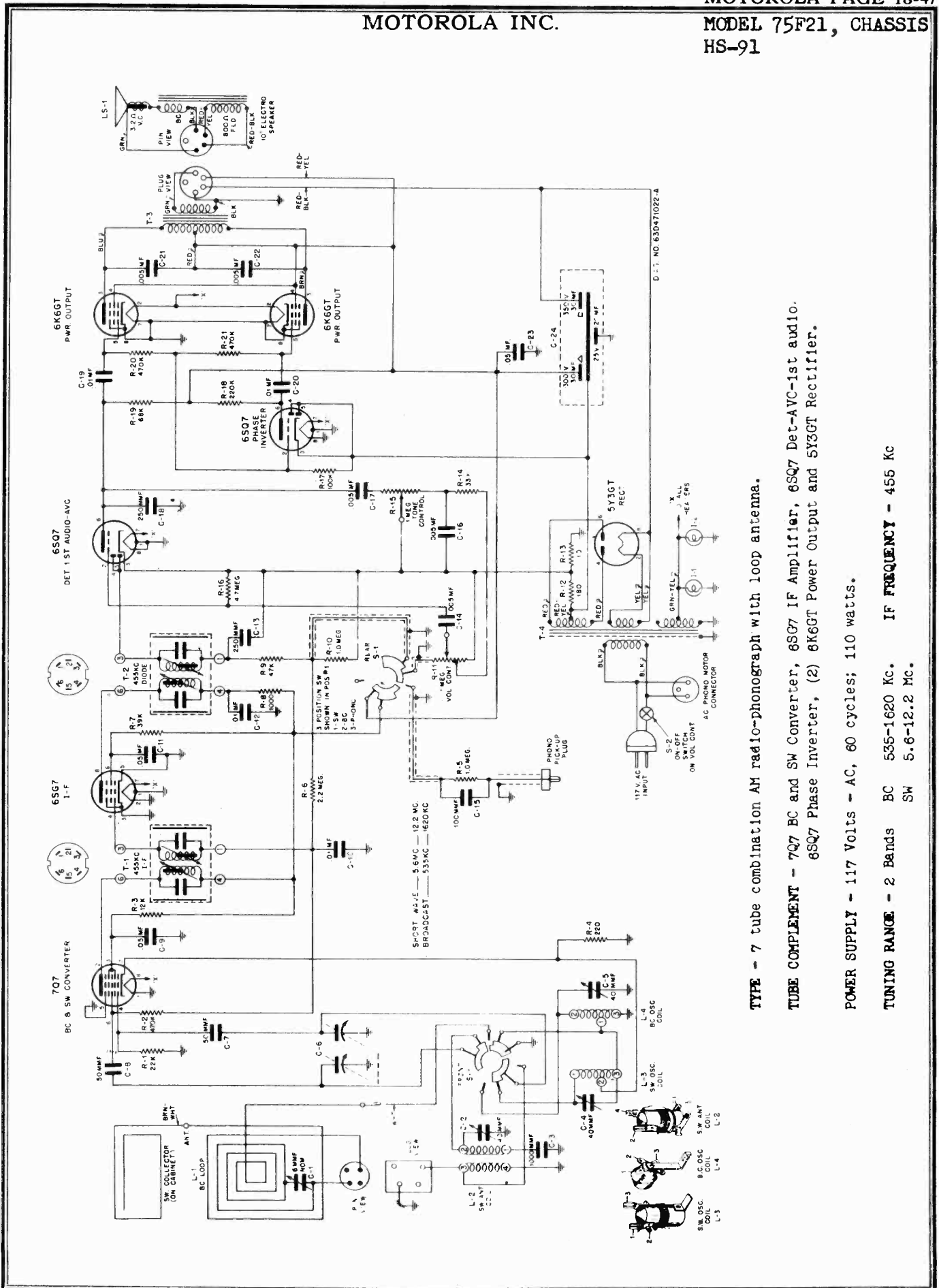


REF. NO.	PART NO.	DESCRIPTION
101	16X481854	Baffle & Grille Cloth Assembly
102	1X480192	Bottom Cover, Bracket and Strap Assembly
103	384480111	Button, battery strap
104	38X480170	Button, plug
105	16C480183	Cabinet, portable: complete
106	1X480191	Cabinet, back section: includes loop end trimmer
107	16X480186	Cabinet, front section: includes baffle, escutcheon and cloth
108	13C480169	Escutcheon, cabinet
109	37K480189	Foot, rubber
110	32B484259	Gasket, speaker
111	55X480188	Hinge; cabinet
112	144X82140	Insulator, cord outlet (cabinet front)
113	144X82141	Insulator, cord retainer (cabinet back)
114	64B480168	Panel, cabinet bottom; fibre board
115	587771	Rivet: .088 x 3/16; steel; nkl pl (stud & strap mtg)
116	586841	Rivet: .088 x 1/4; brass; nkl pl (escutcheon mtg)
117	5C6843	Rivet: .093 x 3/16 steel; nkl pl (latch spring mtg)

MODEL 68L11, CHASSIS HS-119

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REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION	P.L.F. NO.	PART NO.	DESCRIPTION
<b>ELECTRICAL PARTS</b>								
<b>CAPACITORS</b>								
C-1	10B480125	Variable: 3 gang	R-6	6R6076	100,000 1/2M	18	32A24815	Lock, line cord: fibre
C-2	8S9805	Paper: .05 mf 100V	R-6	6R6083	220 1/2M	19	487686	Lockwasher: #5 internal; cad pl (rectifier mtg)
C-3	21R6641	Mica: 100 mf 800V	R-7	6R6082	33,000 1/2M	20	287010	Nut: 5/40 x 1/4 hex; cad pl (rect. mtg)
C-4	8S9805	Paper: .05 mf 100V	R-8	6R6085	9.2 meg 10% 1/2K	21	287051	Nut: 3/8-32 x 9/16 hex; Painut; cad pl (volume control mtg)
C-5	21R77268	Mica: 3.3 mf; part of T-1	R-9	1A4480103	Volume Control: 1 meg with power switch	22	2877272	Plug, 9 pin (battery connector)
C-6	21B77267	Molded: 1.5 mf	R-10	17A78988	150 10% 2-1/2M; wirewound; coated	23	49A12646	Pulley, cord: 7/32 groove
C-7	8S9805	Paper: .05 mf 100V	R-11	6R6087	6.8 meg 1/2M	24	49A21741	Pulley, cord: 5/8 groove
C-8	8S9805	Paper: .05 mf 100V	R-12	17K75249	2090 5% 5M wirewound	25	49M480116	Pulley, scale tape: plain
C-9	8S9805	Paper: .05 mf 100V	R-13	6R2116	3.3 meg 1/2M	26	49M480115	Pulley, scale tape: tapped for setscrew, Pulley and Bushing Assembly: less set-screws (gang drive)
C-10	21B77286	Ceramic: 100 mf 600V	R-14	6R6004	820 10% 1/2K	27	14A80174	Rivet: .088 x 3/16 steel; nkl pl (tube socket mtg)
C-11	8S9813	Paper: .05 mf 200V	R-15	6R6015	1 meg 1/2K	28	5S7771	Rivet: .122 x 5/32 steel; nkl pl (terminal strip mtg)
C-12	8S9816	Paper: .05 mf 400V	R-16	6R6027	220,000 1/2M	29	5S7707	Rivet: .122 x 5/32 steel; nkl pl (electrolytic inductor mtg and insulator bracket mtg)
C-13	23K76985	Electrolytic: 40-40-20-80 mf/150-150-150-25V includes cover	R-17	6R6287	2.2 meg 1/2M	30	5S7701	Rivet: .122 x 9/32; steel; nkl pl (line cord lock mtg)
C-14	8S9805	Paper: .05 mf 100V	R-18	6R6288	260 10% 1/2M	31	5F7708	Rivet: .122 x 9/32; steel; nkl pl (line cord lock mtg)
C-15	8S9805	Paper: .05 mf 100V	R-19	6R6282	500 10% 1/2M	32	5A71246	Rivet, shoulder: .187" long; nkl pl
C-16	8S9805	Paper: .05 mf 100V	R-20	6R6282	500 10% 1/2M	33	3A8480127	Scale, dial: flexible tape
C-17	21B77286	Ceramic: 100 mf 600V	R-21	6R6282	500 10% 1/2M	34	3S2974	Screw: 4-40 x 5/16; Phillips head machine screw; cad pl (speaker mtg)
C-18	8S9824	Paper: .002 mf 400V	R-22	24B76560	RF Broadcast: includes coupling capacitor (C-6) but less shield	35	3S7311	Screw: 6-40 x 7/8 slotted hex head machine screw; cad pl (rectifier mtg)
C-19	8S9824	Paper: .002 mf 400V	R-23	24B77264	Diode, 455 Kc; includes padding capacitors but less shield	36	4S3276	Screw: #6 x 3/16 PK2 plain hex head sheet metal screw; cad pl (slider switch mtg and knob shaft bracket mtg)
C-20	8S9824	Paper: .002 mf 400V	R-24	24B76652	Output Transformer	37	3S2654	Screw: #6 x 1/4 PK2 plain hex head sheet metal screw; cad pl (osc coil mtg)
C-21	20A480185	Trimmer, mica: 4 mf to 20 mf	R-25	24B76652	Output Transformer	38	3S2654	Screw: #6 x 1/4 PK2 plain hex head sheet metal screw; cad pl (osc coil mtg)
<b>CAPACITOR-CHOKE</b>								
E-1	1A77283	Capacitor and Choke Assembly: includes .15 mf 200V paper capacitor & coil						
<b>RECTIFIER</b>								
E-2	48B47811	Selenium Rectifier: half-wave						
<b>COILS</b>								
L-1	2A480184	Loop Antenna: winding only						
L-2	2A478943	Oscillator coil						
<b>SPEAKER</b>								
L-3	50M480196	Speaker: 5"; PH						
or	50C76453	Speaker: 5"; PH (used in early sets)						
<b>RESISTORS</b>								
NOTE: All resistors are 1/2", 20% carbon, insulated type unless otherwise specified.								
R-1	6R2118	3.3 meg 1/2M						
R-2	6R2927	2.2 meg 1/2M						
R-3	6R3966	5.6 meg 10% 1/2K						
R-4	6R6004	1 meg 1/2K						



TYPE - 7 tube combination AM radio-phonograph with loop antenna.

TUBE COMPLEMENT - 7Q7 BC and SW Converter, 6SG7 IF Amplifier, 6SQ7 Det-AVC-1st audio, 6SQ7 Phase Inverter, (2) 6K6GT Power Output and 5Y3GT Rectifier.

POWER SUPPLY - 117 Volts - AC, 60 cycles; 110 watts.

TUNING RANGE - 2 Bands BC 535-1620 Kc. IF FREQUENCY - 455 Kc.  
SW 5.6-12.2 Mc.

**ALIGNMENT**

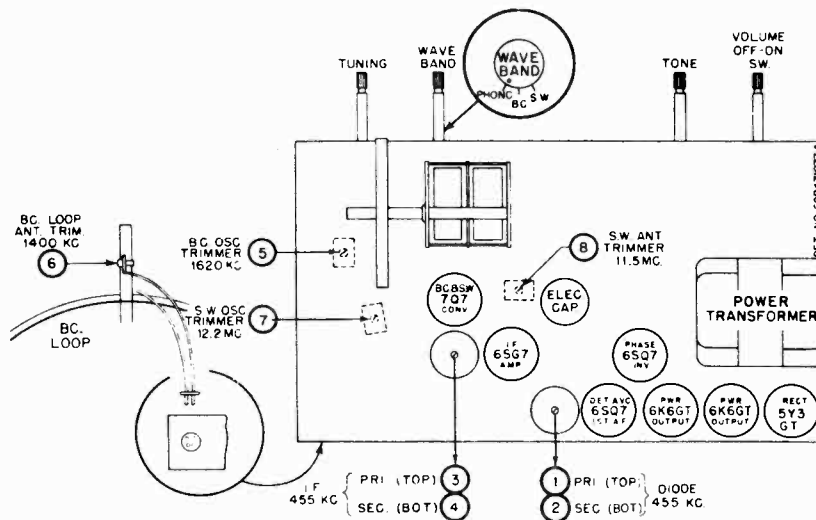
Refer to Figure 2 for location of adjustment trimmers and cores. Connect a low range output meter across speaker voice coil. Volume control should be set at maximum for all operations.

The signal generator used, should possess good frequency stability and should be of the modulated type. For greatest accuracy, keep the receiver output at approximately 50 milliwatts (.38V on output meter) during alignment. Vary signal generator output (not receiver volume control) to maintain this output during alignment.

Step	Gang Setting	Band	Dummy	Generator Connected to	Generator Frequency	Trimmer or Core	Remarks
1	Fully opened	B. C	.1mf	Conv. grid & chassis.	455 kc	1, 2, 3, & 4	Adjust I. F. & Diode trans. for maximum
2	Fully opened	B. C	-	Radiation loop*	1620 kc	5	This sets osc. to dial scale.
3	1400 KC	B. C	-	Radiation loop*	1400 kc	6 †	Tune signal generator for max. on output meter, then peak trimmer.
4	12.2 MC	SW	50mmf	Short wave antenna terminal	12.2 Mc	7	This sets oscillator to dial scale.
5	11.5 MC	SW	50mmf	Short wave antenna terminal	11.5 Mc	8	Tune signal generator for max. on output meter, then peak trimmer.

† Repeat after chassis and loop are installed in cabinet.

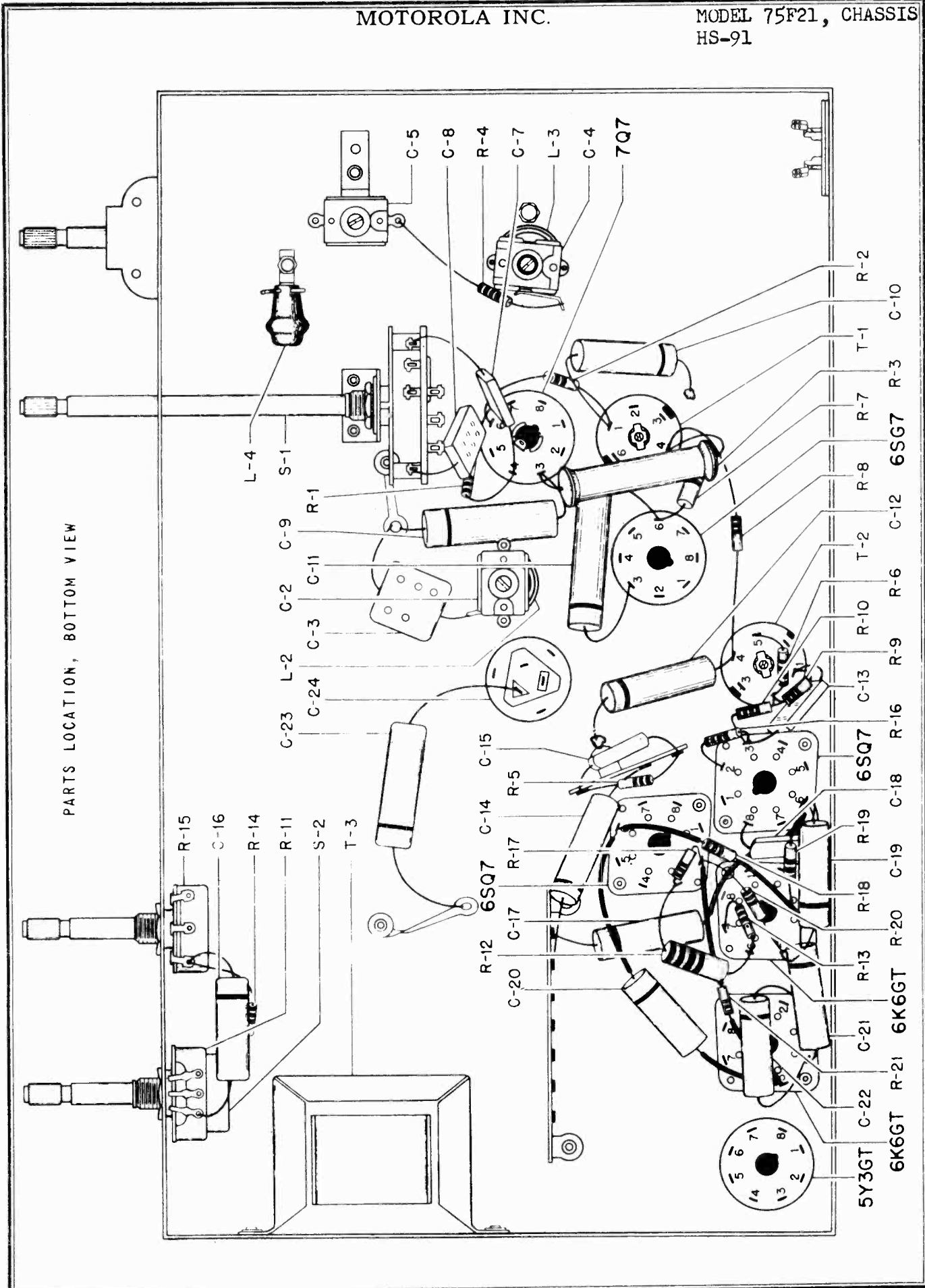
\* Connect output of signal generator to a 5" diameter, 3 turn loop. With volume on full, bring loop close enough to receiver until output of 50 milliwatts is obtained (.38V on output meter). Vary distance between generator and receiver loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".



TUBE & TRIMMER LOCATIONS

MOTOROLA INC.

MODEL 75F21, CHASSIS  
HS-91



PARTS LOCATION, BOTTOM VIEW



NOTE ALL MEASUREMENTS MADE WITH A V.T.V.M.  
MEASUREMENTS ARE MADE FROM TUBE BASE  
PIN TERMINALS TO CHASSIS.  
RESISTANCE MEASUREMENTS ± 20%.  
VOLTAGE MEASUREMENTS ± 10%.  
K=1000 (ONE THOUSAND) OHMS.  
BAND SWITCH IN B.C. POSITION.  
VOLUME CONTROL & TONE CONTROL  
FULLY TO RIGHT.  
\* = RESISTANCE WILL VARY DUE TO ELECTRO-  
LYTIC CAPACITOR IN CIRCUIT.  
□ = RESISTANCE MEASUREMENTS.  
○ = VOLTAGE MEASUREMENTS.

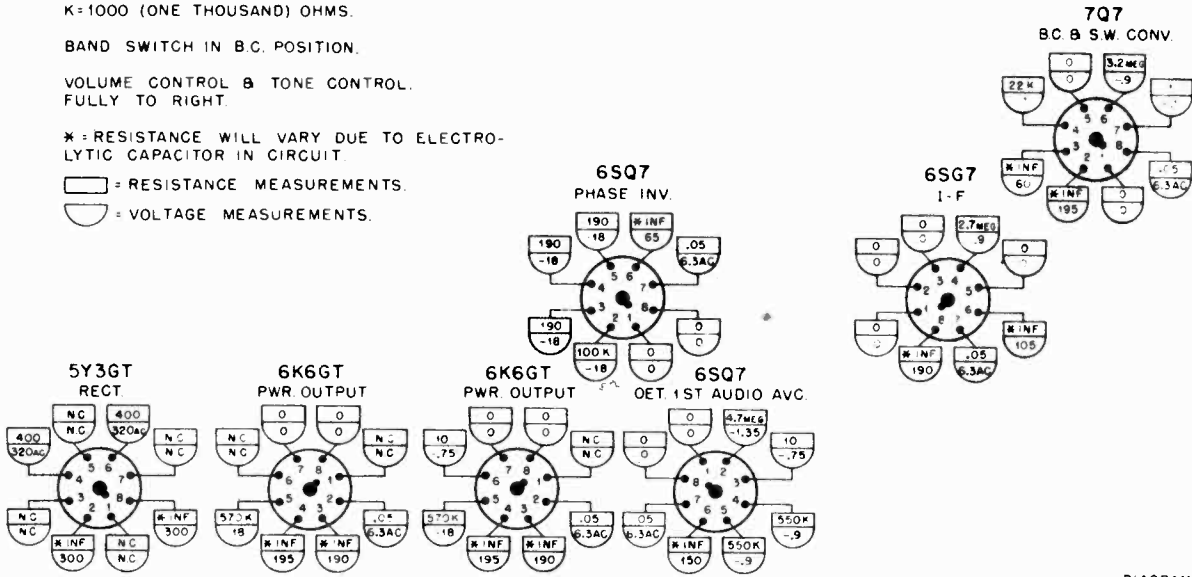
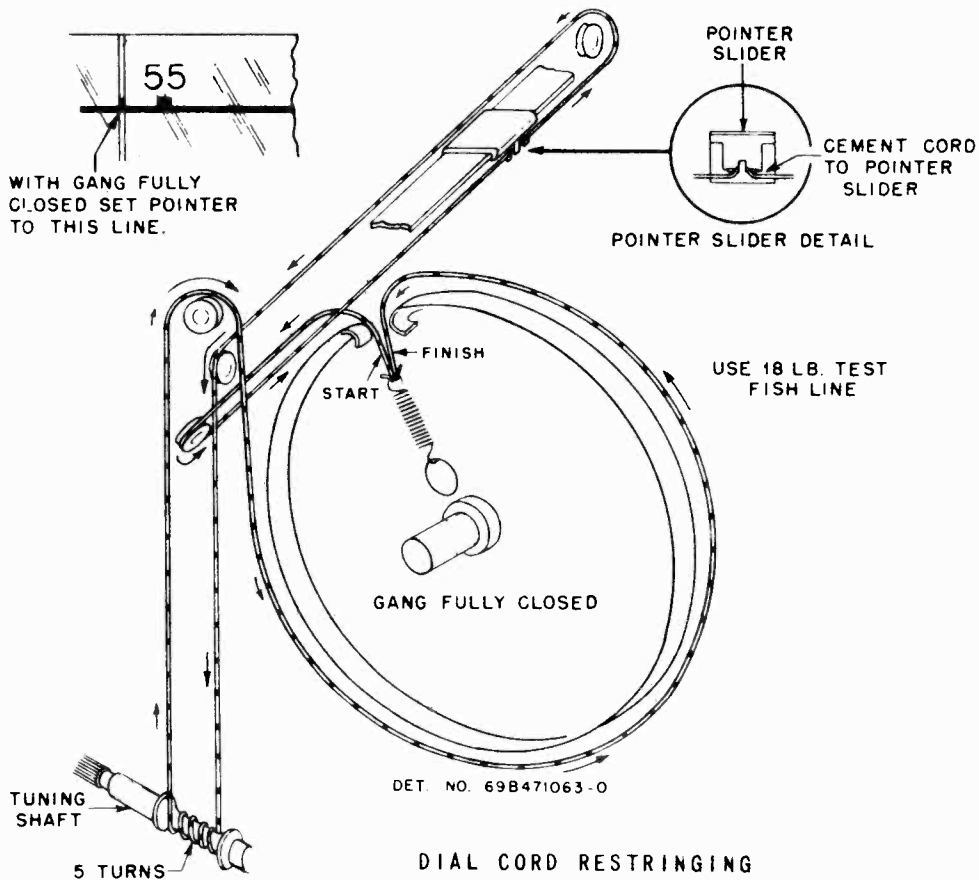


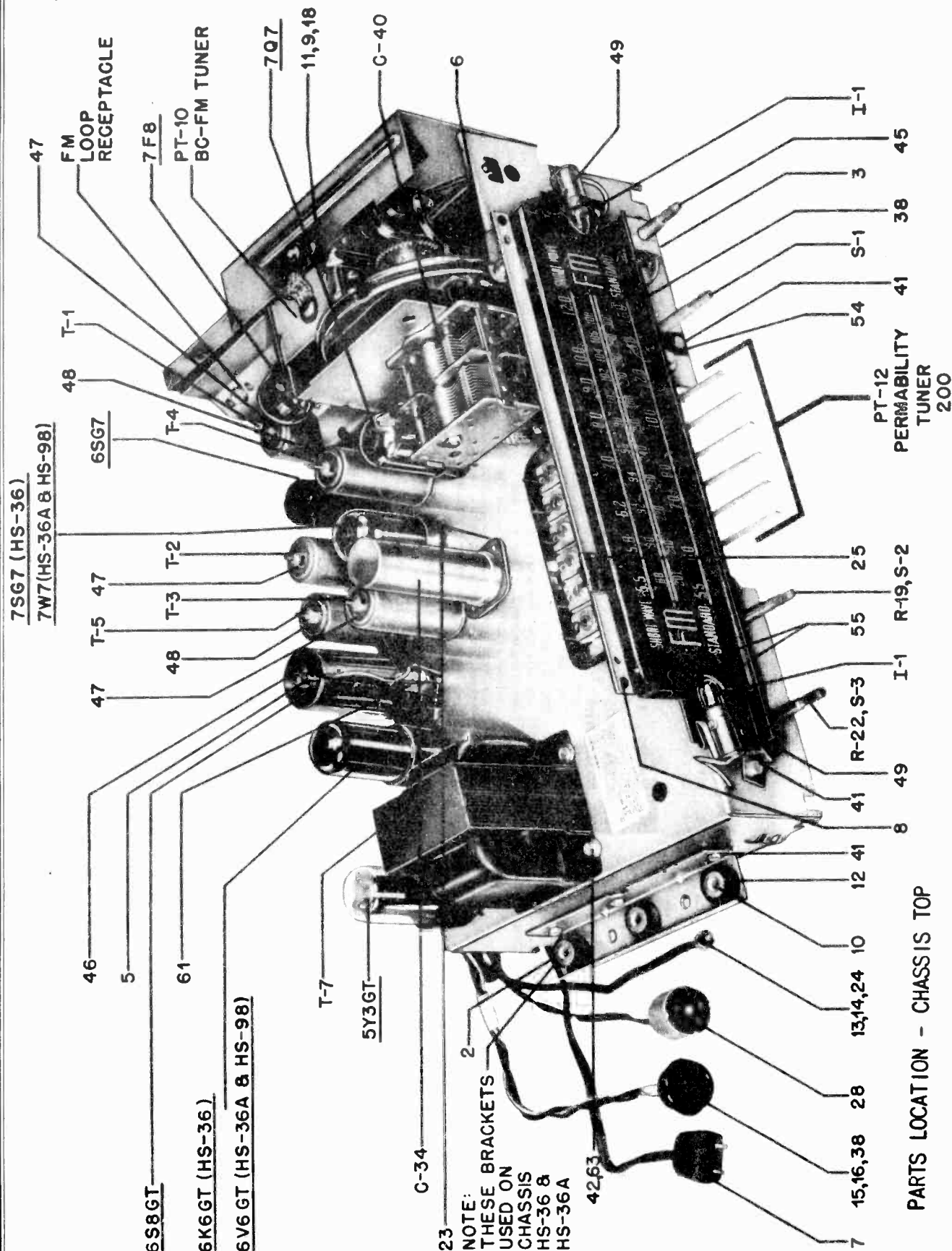
DIAGRAM No. 63C471069-0

VOLTAGE & RESISTANCE DIAGRAM



REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION	
<b>ELECTRICAL PARTS</b>									
<b>CAPACITORS</b>									
C-1	20A71226	Mica trimmer: 2-12 mmf.	R-19	6R6001	66,000 1/2W	5A12106	MISCELLANEOUS CHASSIS HARDWARE		
C-2	20A71141	Mica trimmer: 10-80 mmf.	R-20	6R6032	470,000 1/2W	4S7656	Eyelet, gang assembly mtg.		
C-3	21R2724	Mica: 1000 mmf 5% 300V	R-21	6R6032	470,000 1/2W		Loc washer: 3/8" internal; cadmium plated (band switch mounting)		
C-4	20A71141	Mica trimmer: 10-80 mmf.	<b>SWITCHES</b>						
C-5	20A75254	Mica trimmer: 10-80 mmf.	S-1	40B74864	Bandswitch: 3 position	2S1376	Nut: 3/8-32 x 1/2" hex; cadmium plated (band switch mounting)		
C-6	19R72560	Variable: 2 gars.	S-2	-	ON-OFF (part of volume control)	2S7061	Nut: 3/8-32 x 9/16" hex Palnut; cadmium plated (volume & tone control mtg)		
C-7	21R6642	Mica: 50 mmf 500V	<b>TRANSFORMERS</b>						
C-8	21R6642	Mica: 50 mmf 500V	T-1	2A175487	IF: 455 Kc; complete with cores and padding capacitors but less shield.	5A12814	Rivet, shoulder: 5/32" long; nickel plated (control pulley mtg)		
C-9	8S9816	Paper: .05 mf 400V	T-2	24B70637	Diode: 455 Kc; complete with cores and padding capacitors but less shield.	3S7461	Screw: #8 x 3/4 PKZ slotted hex head; cadmium plated (gang assem. mtg)		
C-10	8S9801	Paper: .01 mf 400V	<b>MECHANICAL PARTS</b>						
C-11	8S9816	Paper: .05 mf 400V	<b>CHASSIS PARTS</b>						
C-12	8S9809	Paper: .01 mf 400V	LS-1	50B72379	Electrodynamic: 10"; 1275 ohm field; 3.2 ohm v.c.	5A71082	Grommet, rubber: 5/8 x 3/4" diam. (chassis cushion)		
C-13	21R6648	Mica: 250 mmf 500V	<b>COILS</b>						
C-14	9S9813	Paper: .005 mf 600V	L-1	24C75532	6-8V; tubular bayonet base; #47.	5A71130	Grommet, rubber (chassis retainer)		
C-15	21R6641	Mica: 100 mmf 500V	L-2	24B74822	Loop Antenna: includes trimmer and lead assembly	5A70098	Eyelet: 23/64 x 7/32 I.D. x 1/2 dia-meter head		
C-16	8S9813	Paper: .005 mf 600V	L-3	24A74820	S.W. Oscillator	3S9359	Screw: #8 x 1-6/8 PKA slotted hex head sheet metal screw; cadmium plated		
C-17	8S9813	Paper: .005 mf 600V	L-4	24A84821	B.C. Oscillator: includes mounting bracket	<b>CABINET PARTS</b>			
C-18	21R6648	Mica: 250 mmf 500V	L-5	24C75532	Loop Antenna: includes trimmer and lead assembly	16P75821	Cabinet, phon-radio console		
C-19	8S9809	Paper: .01 mf 400V	L-6	65X11854	6-8V; tubular bayonet base; #47.	35R72310	Cloth, grille		
C-20	8S9809	Paper: .01 mf 400V	L-7	24C75532	Loop Antenna: includes trimmer and lead assembly	11R72768	Dial Scale Assembly: dial scale complete with dial light housings and light shields		
C-21	8S9813	Paper: .005 mf 600V	L-8	24B74822	S.W. Antenna	15A72344	Cover, dial light housing		
C-22	8S9813	Paper: .005 mf 600V	L-9	24A74820	S.W. Oscillator	60A71259	Housing, dial light; plastic.		
C-23	8S9816	Paper: .05 mf 400V	L-10	23A27718	Electrolytic: 30-30-20 mf 350-300-25V	32A74491	Gasket, light shield; rubber.		
C-24	23A27718	Electrolytic: 30-30-20 mf 350-300-25V	L-11	24C75532	Loop Antenna: includes trimmer and lead assembly	5A72771	Grommet, light shield: 1-1/8 O.D. x 3/4" I.D. x 3/8 thk.		
<b>DIAL LIGHTS</b>									
I-1 & I-2	65X11854	6-8V; tubular bayonet base; #47.	<b>RESISTORS</b>						
Note: All resistors are fixed insulated carbon type with 20% tolerance unless otherwise specified.									
R-1	6R6028	22,000 1/2W	R-8	6R6301	1000 1/2W	15R77566	Cover, push button escutcheon		
R-2	6R6032	470,000 1/2W	R-9	6R6066	47,000 1/2W	13C72362	Escutcheon, dial (lower) plastic		
R-3	6R3987	12,000 10% 3W N.I.	R-10	6R6046	1 meg 10% 1/2W	13R72361	Escutcheon, dial (upper) plastic		
R-4	6R6270	220 10% 1/2W	R-11	18K74891	Volume control: carbon; 1 meg; with SPST switch; tapped at 300,000 ohms	55A72506	Handle, drawer		
R-5	6R6004	1 meg 1/2W	R-12	6R5968	180 10% 2W	56B72313	Hinge & Stop Combination (phono drawer)		
R-6	6R6433	2.2 meg 10% 1/2W	R-13	6R5821	10 10% 1/2W	11R76447	Knob, control: plain		
R-7	6R5588	38,000 10% 1W	R-14	6R6410	33,000 10% 1/2W	11R76448	Knob, control: branded		
R-8	6R6301	1000 1/2W	R-15	18K77599	Tone Control: carbon; 1 meg	56X31506	Track, drawer		
R-9	6R6066	47,000 1/2W	R-16	6R6446	4.7 meg 10% 1/2W	<b>RECORD CHANGER MOUNTING PARTS</b>			
R-10	6R6046	1 meg 10% 1/2W	R-17	6R6075	100,000 1/2W	38A22210	Button, plug 3/8"; bronze finish.		
R-11	18K74891	Volume control: carbon; 1 meg; with SPST switch; tapped at 300,000 ohms	R-18	6R6015	220,000 1/2W	3S7396	Screw: 10/32 x 2" slotted hex head machine screw; copper plated		
R-12	6R5968	180 10% 2W	<b>CORDS</b>						
R-13	6R5821	10 10% 1/2W	C-1	20A71226	Mica trimmer: 2-12 mmf.	41A21607	Spring, cushion (bottom)		
R-14	6R6410	33,000 10% 1/2W	C-2	20A71141	Mica trimmer: 10-80 mmf.	41A28190	Spring, cushion (top)		
R-15	18K77599	Tone Control: carbon; 1 meg	C-3	21R2724	Mica: 1000 mmf 5% 300V	497611	Washer: 1/2 x 7/32 x .046 thck.		
R-16	6R6446	4.7 meg 10% 1/2W	C-4	20A71141	Mica trimmer: 10-80 mmf.				
R-17	6R6075	100,000 1/2W	C-5	20A75254	Mica trimmer: 10-80 mmf.				
R-18	6R6015	220,000 1/2W	C-6	19R72560	Variable: 2 gars.				

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76F31, CHASSIS HS-36, HS-36A,  
HS-98

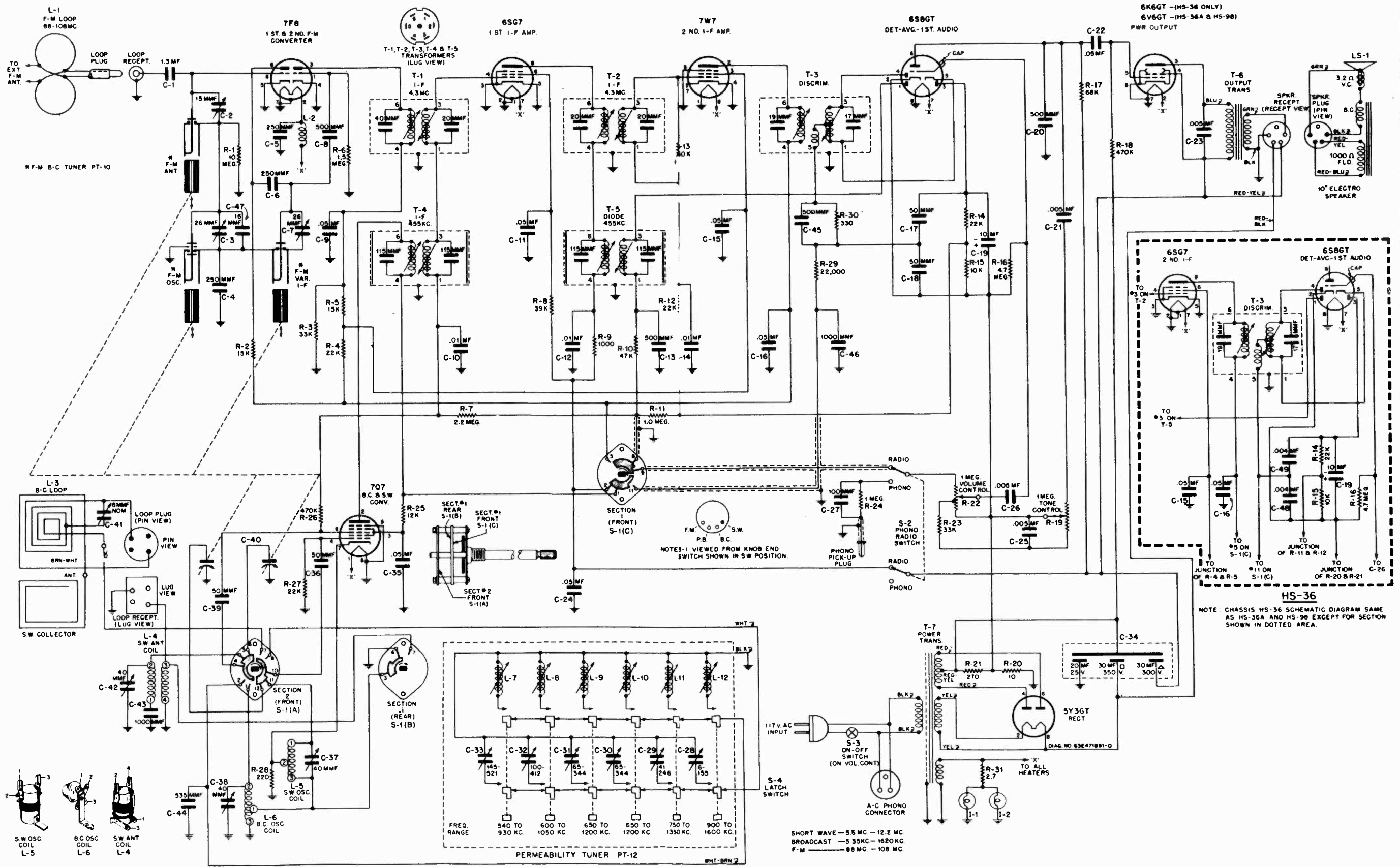


NOTE:  
THESE BRACKETS  
USED ON  
CHASSIS  
HS-36 &  
HS-36A

PARTS LOCATION - CHASSIS TOP

MOTOROLA INC.

MODELS 75F31, 75F31A, 75F31B, 76F31, CHASSIS HS-36, HS-36A, HS-98



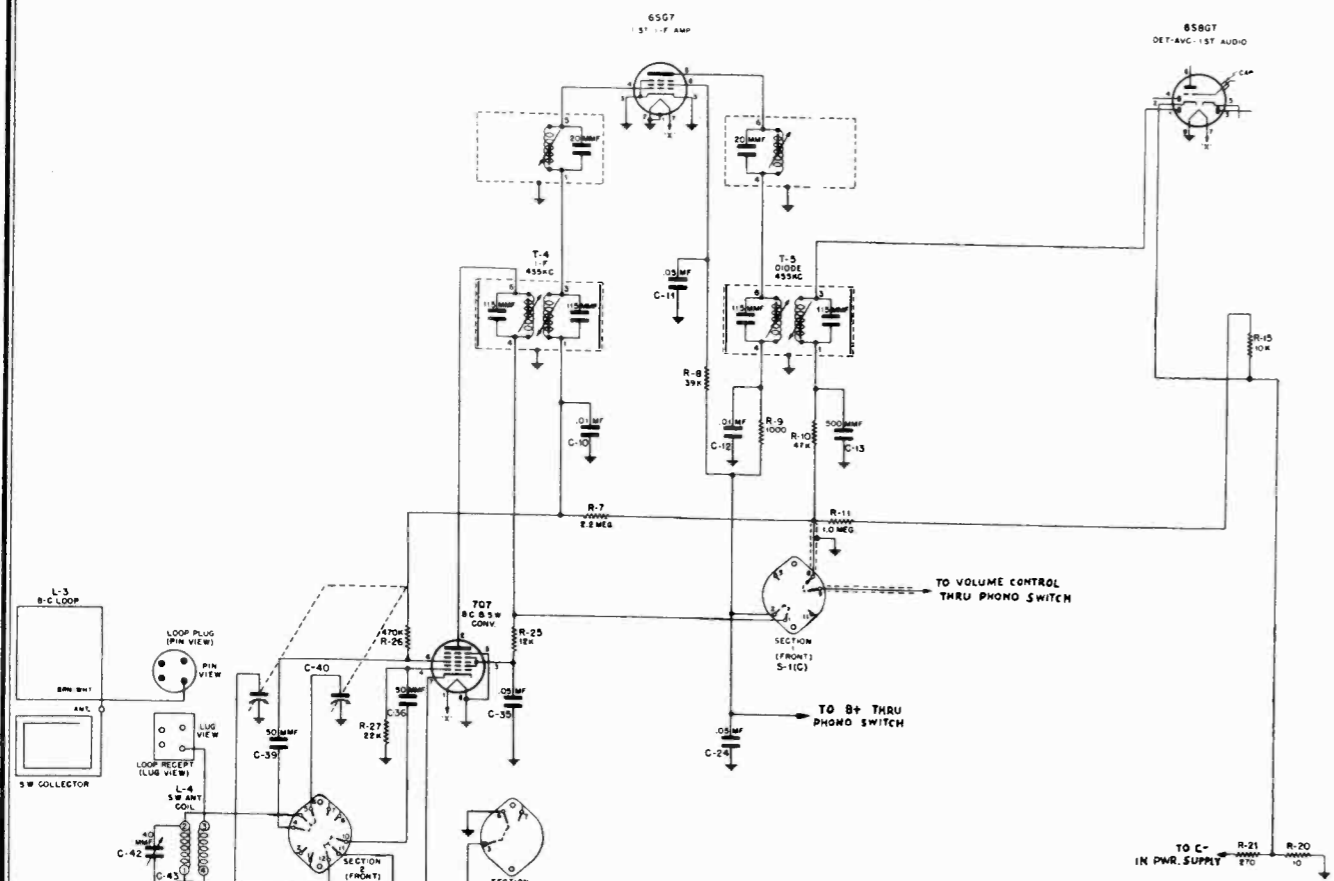
NOTE: CHASSIS HS-36 SCHEMATIC DIAGRAM SAME AS HS-36A AND HS-98 EXCEPT FOR SECTION SHOWN IN DOTTED AREA.

# CLARI-SKEMATIX

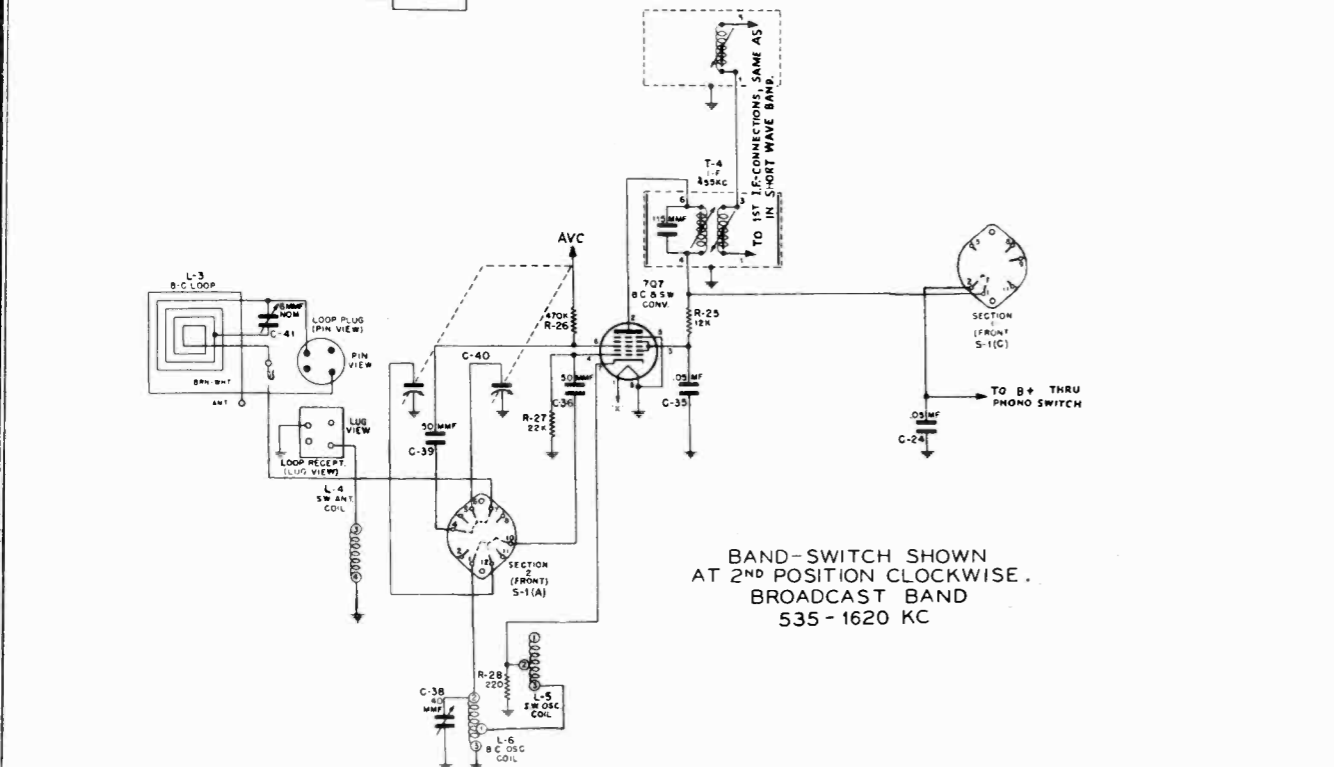
Registered Trademark

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MOTOROLA INC. MODELS 75F31, 75F31A, 75F31B,  
76F31, CHASSIS HS-36, HS-36A,  
HS-98



BAND-SWITCH SHOWN  
AT 1ST POSITION.  
SHORT WAVE BAND  
5.6 - 12.2 MC



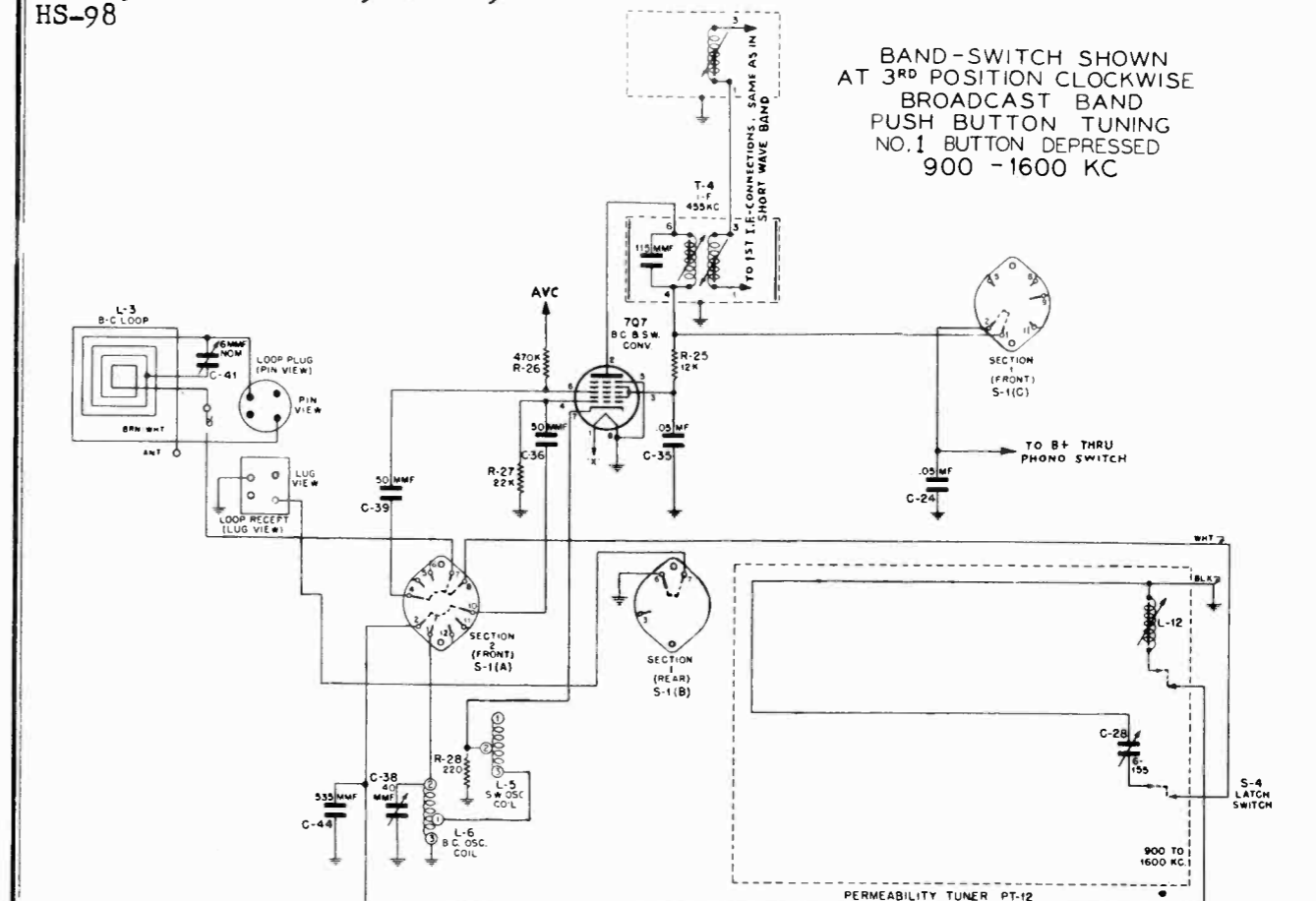
BAND-SWITCH SHOWN  
AT 2ND POSITION CLOCKWISE.  
BROADCAST BAND  
535 - 1620 KC

# CLARI-SKEMATIX

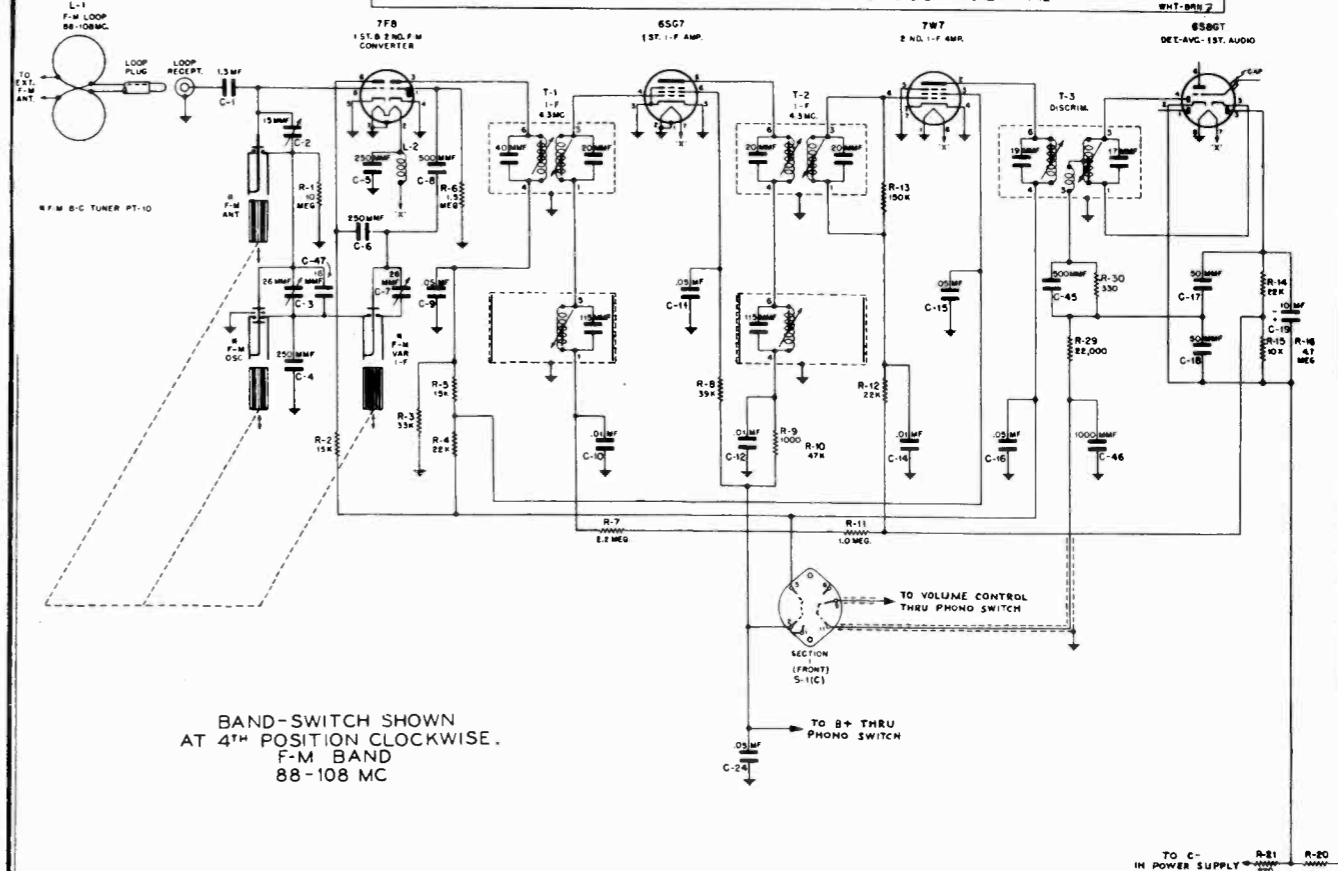
Registered Trademark

PAGE 18-56 MOTOROLA

MOTOROLA INC. MODELS 75F31, 75F31A, 75F31B,  
76F31, CHASSIS HS-36, HS-36A,  
HS-98



BAND-SWITCH SHOWN  
AT 3RD POSITION CLOCKWISE  
BROADCAST BAND  
PUSH BUTTON TUNING  
NO.1 BUTTON DEPRESSED  
900 - 1600 KC



BAND-SWITCH SHOWN  
AT 4TH POSITION CLOCKWISE.  
F-M BAND  
88 - 108 MC

MOTOROLA INC.

MODELS 75F31, 75F31A, 75F31B,  
76F31, CHASSIS HS-36, HS-36A,  
HS-98

## ALIGNMENT PROCEDURE WHEN USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

STEP

OPERATION

### 455 Kc IF Channel Alignment

1. Same as step 1 in Chart I (Use AM signal generator)

### Broadcast Band Alignment

2. Same as steps 2 & 3 in Chart I (Use AM signal generator)

### SW Band Alignment

3. Same as steps 4 & 5 in Chart I (Use AM signal generator)

### 4.3 Mc IF Channel Alignment Using FM Signal Generator & Oscilloscope

#### 4. (A) Discriminator -

1. Connect the input terminals of the oscilloscope vertical amplifier to the high side of the receiver volume control and the chassis.
2. Connect the FM generator synchronizing voltage output terminals to a phase shifting network, consisting of a variable 1/2 megohm resistor in series with a .002 mf capacitor. The input to the oscilloscope horizontal amplifier is connected across the .002 mf capacitor. See Figure 9. (This phase shifting network may not work with every oscilloscope. Different values of R & C may be required).
3. Apply an FM 4.3 Mc signal (125 Kc deviation) through a .01 mf capacitor to the control grid (pin #4) of the 7W7 tube in the second IF amplifier stage.
4. Screw discriminator secondary core (9) out as far as it will go.
5. Adjust discriminator primary until the pattern obtained on the scope is symmetrical about the vertical axis. The phase shifting network resistor is adjusted to give only one trace. The pattern obtained is the resonance curve of the primary, whose maximum response should be at exactly 4.3 Mc. (See Figure 10).
6. Adjust discriminator secondary until a symmetrical pattern is obtained, with peaks occurring at about 100 Kc above and below 4.3 Mc and is substantially linear between peaks. The trace should pass through the intersection of the vertical and horizontal axis. The phase shifting network should be adjusted to give only a single pattern at all times. (See Figure 11).

#### (B) 4.3 Mc IF Amplifiers -

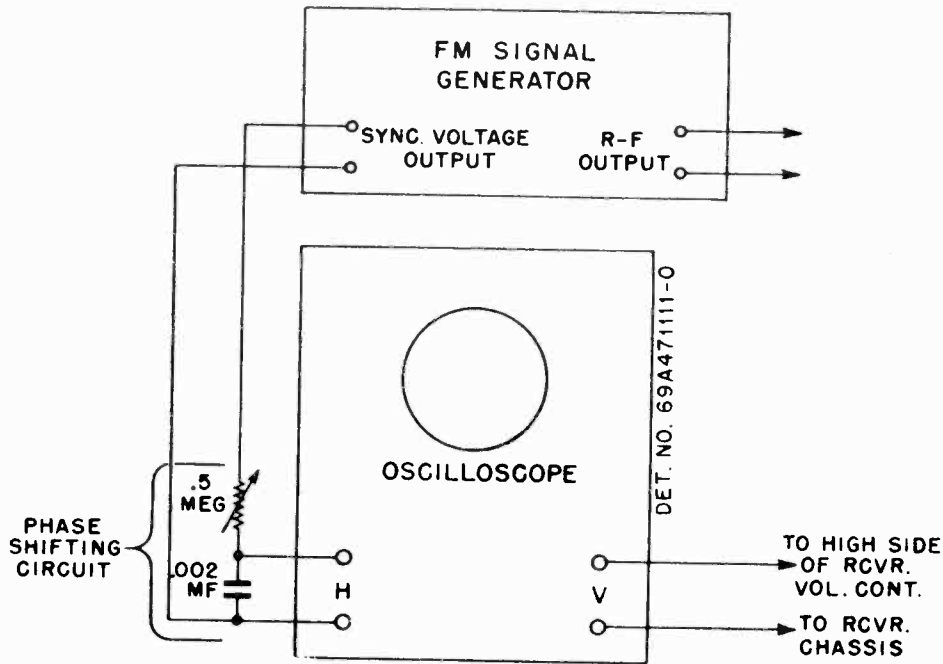
1. Apply an FM 4.3 signal (100 Kc deviation) to the control grid (pin #4) of the 6SG7 tube in the 1st IF amplifier stage, through a .001 mf capacitor and adjust both primary and secondary cores (11 & 12) to get a symmetrical pattern as before, with peaks occurring at a slightly lower deviation.
2. Apply an FM 4.3 signal (100 Kc deviation) to the control grid (pin #1) of the 7F8 tube, and adjust both primary and secondary cores (13 & 14) until a symmetrical pattern substantially linear between peaks, is obtained.

### FM Band Alignment

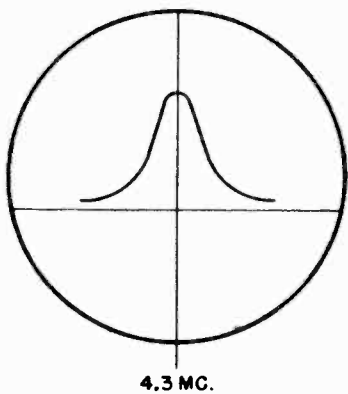
5. Check the position of the FM oscillator tuning core (18). Set the spacing between the core and the bakelite piece to which it is mounted, to 1/32" by turning tuning core slotted nut.

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 76F31, CHASSIS HS-36, HS-36A,  
 HS-98

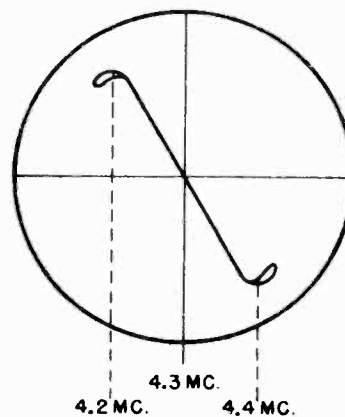
6. Remove the FM loop and connect generator output directly to the receiver FM loop receptacle.
7. Set receiver dial to 90 Mc and also FM signal generator to 90 Mc. (22-1/2 Kc deviation). Adjust FM oscillator, antenna and variable IF trimmers (15, 16 & 17) for maximum indication on output meter. (Output meter should be connected across speaker voice coil).
8. Set receiver dial to 105 Mc and also FM signal generator to 105 Mc (22-1/2 Kc deviation). Adjust FM oscillator, antenna and variable IF Cores (18, 19 & 20) for maximum indication on output meter.
9. Repeat steps 7 & 8 several times until further adjustment does not increase the output. Make the final trimmer adjustment at 105 Mc. (i.e. trimmers 15, 16 & 17 at 105 Mc).
10. Connect FM loop antenna to receiver receptacle. Radiate an FM 105 Mc (22-1/2 Kc deviation) signal into FM loop. Set receiver dial to 105 Mc and adjust trimmer (17) for maximum.



SIGNAL GENERATOR & OSCILLOSCOPE HOOK-UP



PATTERN WITH DISCRIMINATOR PRIMARY (10) CORRECTLY ADJUSTED



PATTERN WITH DISCRIMINATOR SECONDARY (9) CORRECTLY ADJUSTED.

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MODELS 75F31, 75F31A, 75F31B,  
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HS-98

**ALIGNMENT PROCEDURE WHEN USING AM MODULATED SIGNAL GENERATOR  
AND STANDARD OUTPUT METER FOR COMPLETE ALIGNMENT**

STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
<b>455 Kc IF CHANNEL ALIGNMENT</b>							
1.	1820 Kc (gang fully opened)	BC	.1 mf	7Q7 BC & SW Conv. Grid (Pin #4) & Chassis	455 Kc	1,2,3 & 4	Adjust for maximum output.
<b>BROADCAST BAND ALIGNMENT</b>							
2.	1400 Kc	BC	.1 mf	7Q7 BC & SW Conv. Grid (Pin #4) & Chassis	1400 Kc	5 (BC Osc. Trim)	This sets oscillator to dial. With gang fully meshed, pointer should be at last mark on dial; then set to 1400 Kc and set oscillator.
3.	1400 Kc	BC	None	Radiation Loop *	1400 Kc	6 (BC Loop Antenna Trim)	Adjust for maximum output
<b>SW. BAND ALIGNMENT</b>							
4.	11.5 Mc	SW	.1 mf	7Q7 BC & SW Conv. Grid (Pin #4) & Chassis	11.5 Mc	7 (SW Osc. Trim)	This sets osc. to dial. Make sure osc. is higher in frequency than the signal by checking image response which should occur with the input signal at 12.41 Mc.
5.	11.5 Mc	SW	50 mmf	SW Ant. Terminal and Chassis	11.5 Mc	8 (SW Ant. Coil Trim)	BC loop plug should be disconnected. Adj. for maximum output.
<b>4.3 Mc IF CHANNEL ALIGNMENT</b>							
6.						9 (Disc. Sec.)	Detune discriminator secondary by screwing core out as far as it will go.
7.	112 Mc	FM	.001 mf	7F8 2nd FM Converter Grid (#1 Pin) & Chassis	4.3 Mc	10,11, 12,13 & 14 (4.3 Mc IF)	Adjust for maximum output
<b>FM BAND ALIGNMENT</b>							
8.						18 (FM Osc. Core)	Check the position of the FM Osc. tuning core 18. Set spacing between the core and bakelite piece to which it is mounted, to 1/32" by turning tuning core slotted nut.
9.	90 Mc	FM	None	FM loop antenna receptacle and chassis; remove FM loop.	90 Mc	15,16 & 17 (FM Osc., Ant. & Variable IF trim)	Adjust for maximum output.

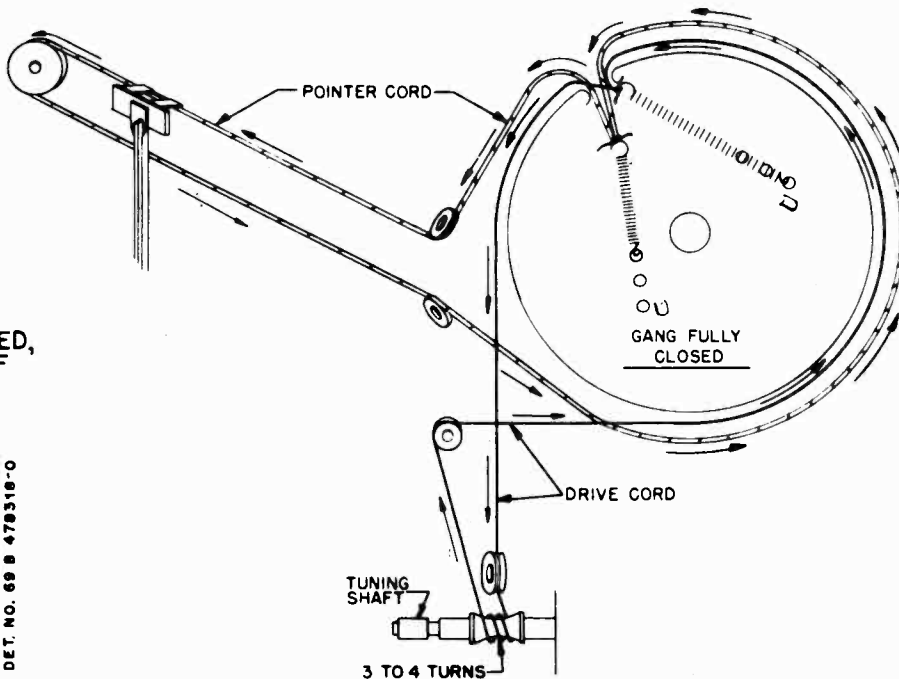


MODELS 75F31, 75F31A, 75F31B,  
76F31, CHASSIS HS-36, HS-36A,  
HS-98

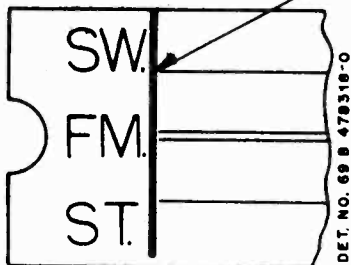
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STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
10.	105 Mc	FM	None	FM loop antenna receptacle and chassis; remove FM loop	105 Mc	18, 19 & 20 (FM Osc., Ant. & Variable IF cores)	Adjust for maximum output
11.							Repeat steps 9 and 10 several times until further adjustment does not increase the output. Make the final trimmer adjustment at 105 Mc (i.e., trimmers 15, 16 and 17 at 105 Mc.)
12.	105 Mc	FM	None	Radiation loop *	105 Mc	17 (FM Ant. Trim)	Adjust for maximum output with FM loop antenna connected.
<b>ALIGN DISCRIMINATOR SECONDARY</b>							
13.		FM	.001 mf	7F8 2nd FM Converter Grid (#1 Pin) & Chassis	4.3 Mc	9 (Disc. Sec.)	Adjust discriminator secondary for minimum response. The correct adjustment is the sharply defined minimum response point between the two peaks.

\* Connect output of signal generator to a 5" diameter, 3 turn loop & radiate signal into receiver loop. Minimum distance between loops should never be less than 12".



NOTE:  
WITH GANG FULLY CLOSED,  
SET POINTER TO END OF  
LINE ON DIAL SCALE.



USE 18LB. TEST FISH LINE.

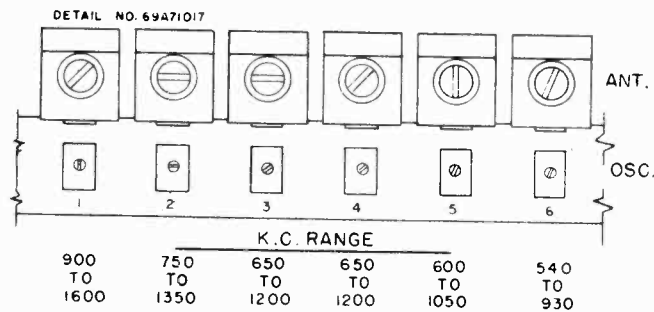
POINTER & DRIVE CORD DETAIL

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76F31, CHASSIS HS-36, HS-36A,  
HS-98

### INSTRUCTIONS FOR SETTING PUSH BUTTONS

**NOTE:** Only standard broadcast stations can be set up on pushbuttons.

1. Turn the radio "on" and allow it to warm up for at least fifteen minutes.
2. Make a list of the frequencies of the nearby stations you wish to tune in automatically. It is recommended that you select the most powerful stations.
3. Turn the band switch to "BC" position and carefully tune in the first station to be set up.
4. Adjust a signal generator to zero beat with this station. **NOTE:** While it is advisable to use a signal generator for accuracy, it is not an absolute necessity.
5. Turn the band switch to "PB" position.
6. Push the button to be set up, making sure to select a button having the proper frequency range to include the station you are setting.
7. The tuner adjustment screws are accessible from the back of the radio.
8. Adjust the oscillator screw until the signal from the generator, or station is heard, carefully adjust the screw to maximum volume.
9. Now adjust the antenna trimmer screw for maximum volume.
10. Follow the same procedure for the remaining buttons.
11. It is advisable, after all buttons are set up, to repeat steps 6, 8 and 9 for maximum performance.



### PUSH BUTTON TUNER ADJUSTMENTS

#### ALIGNMENT

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

**ALIGNMENT PROCEDURE WHEN USING AM MODULATED SIGNAL GENERATOR AND STANDARD OUTPUT METER FOR COMPLETE RECEIVER ALIGNMENT.**

An AM (amplitude modulated) signal generator covering the frequencies shown in alignment chart, is used to align the broadcast, short wave and FM bands. A low range output meter, connected across the speaker voice coil is used as an output indicator.

The broadcast and short wave alignment is conventional; full instructions are given in the following alignment chart.

The FM band alignment can be satisfactorily performed by following the instructions in the chart. When properly aligned, the discriminator does not respond to amplitude modulation and since an AM type signal generator is used for aligning the FM circuits, it is necessary to detune the dis-

criminator secondary and leave it that way until all of the FM circuits have been aligned. After completing the alignment of the FM circuits, proceed to align the discriminator secondary by applying a 4.3 Mc AM signal to the control grid of the 7F8 2nd FM converter tube and adjusting the discriminator secondary core for minimum audio output. No adjustment of the FM circuits should be attempted with AM after the discriminator secondary has been properly aligned.

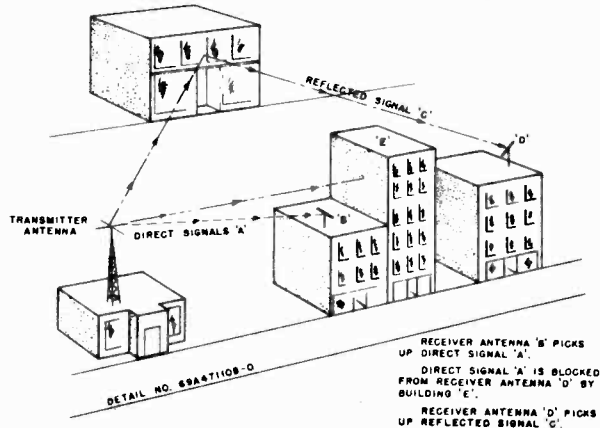
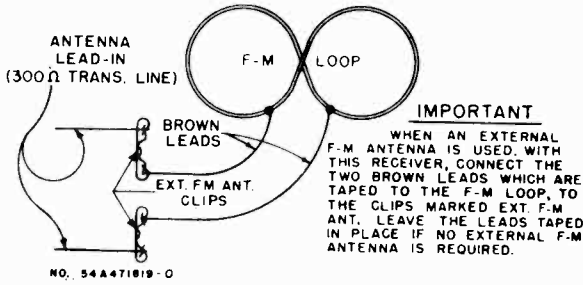
Use a 30% AM (amplitude modulated) signal throughout entire alignment procedure.

A special wrench for adjusting the slotted nuts on the tuner cores will be required. You can easily fabricate one from a Motorola auto set Volume Control Shaft and Coupling Assembly (Part No. 1B70847, \$.30 list) by simply spreading out the forked ends and filing to fit. Solder the assembly together to make it rigid.

Use an insulated screwdriver when adjusting the FM tuner trimmers.

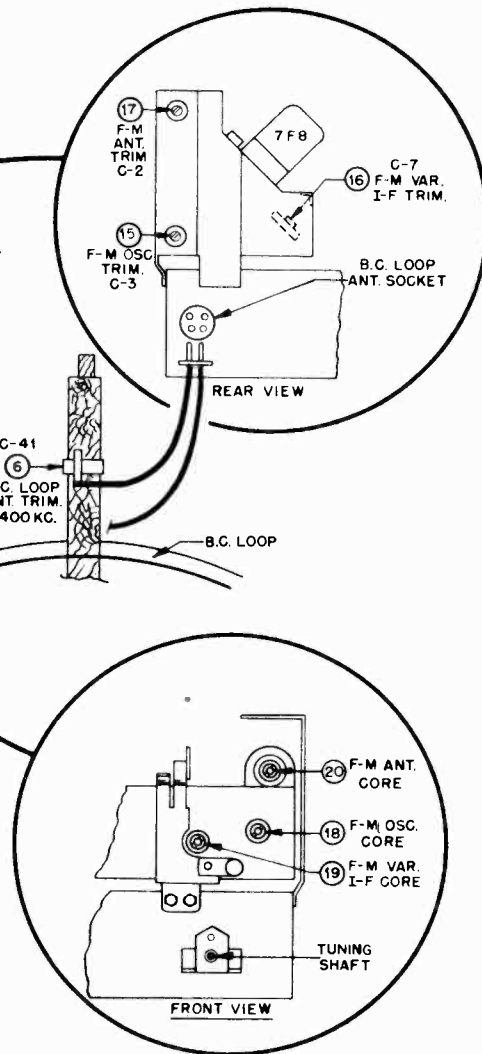
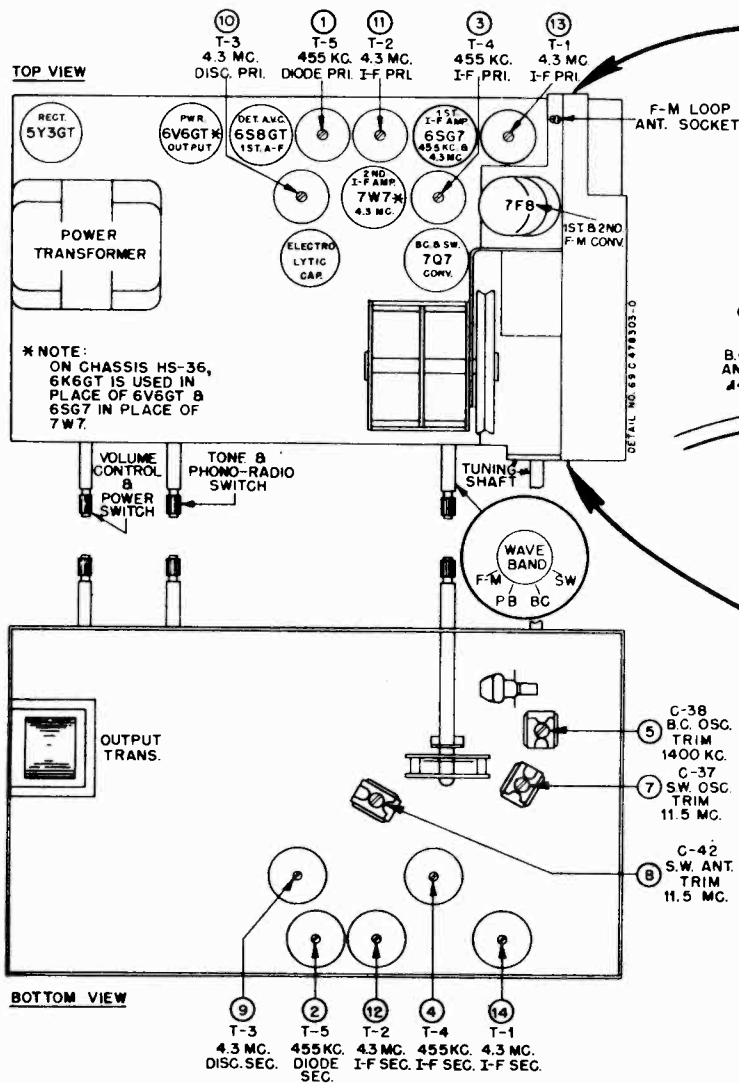
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76F31, CHASSIS HS-36, HS-36A,  
HS-98

MOTOROLA INC.



**FM LOOP ANTENNA**

**DIRECT & REFLECTED FM RECEPTION PATHS**



**TUBE & TRIMMER LOCATIONS**

MOTOROLA INC.

MODELS 75F31, 75F31A, 75F31B, 76F31, CHASSIS HS-36, HS-36A, HS-98

NOTE: - A VTVM WAS USED TO MAKE MEASUREMENTS. IF A 20,000 OHM PER VOLT METER IS USED ALL GRID & AVC VOLTAGES WILL READ LOWER.

MEASUREMENTS ARE MADE FROM TUBE BASE PIN TERMINALS TO CHASSIS.

VOLUME CONTROL ON FULL.

VOLTAGE TOLERANCE  $\pm 10\%$ .

RESISTANCE TOLERANCE  $\pm 20\%$ .

$\triangle$  BAND SWITCH IN BC POSITION; BAND SWITCH IN FM POSITION FOR ALL OTHER MEASUREMENTS.

PHONO RADIO SWITCH IN RADIO POSITION.

\* MEASUREMENTS MAY VARY DUE TO ELECTROLYTIC CAPACITOR IN CIRCUIT.

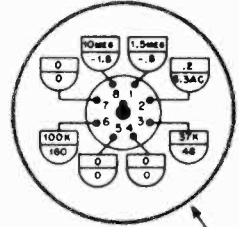
K = 1000 (ONE THOUSAND) OHMS.

\*\* = TIE POINT.

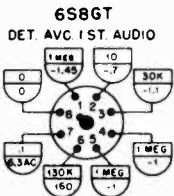
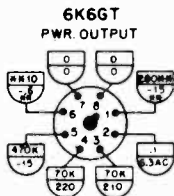
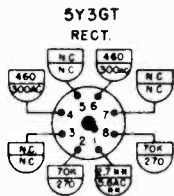
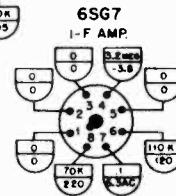
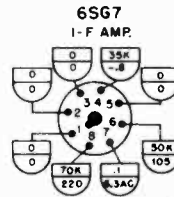
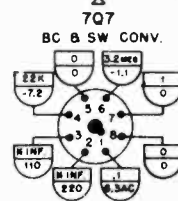
$\square$  = RESISTANCE MEASUREMENTS.

$\cup$  = VOLTAGE MEASUREMENTS.

7F8  
1ST. & 2ND. FM CONV.



TUBE LOCATED ON TOP OF CHASSIS



VOLTAGE & RESISTANCE DIAGRAM - CHASSIS HS-36

NOTE: - A VTVM WAS USED TO MAKE MEASUREMENTS. IF A 20,000 OHM PER VOLT METER IS USED ALL GRID & AVC VOLTAGES WILL READ LOWER.

MEASUREMENTS ARE MADE FROM TUBE BASE PIN TERMINALS TO CHASSIS.

VOLUME CONTROL ON FULL.

VOLTAGE TOLERANCE  $\pm 10\%$ .

RESISTANCE TOLERANCE  $\pm 20\%$ .

$\triangle$  BAND SWITCH IN BC POSITION; BAND SWITCH IN FM POSITION FOR ALL OTHER MEASUREMENTS

PHONO RADIO SWITCH IN RADIO POSITION.

\* MEASUREMENTS MAY VARY DUE TO ELECTROLYTIC CAPACITOR IN CIRCUIT.

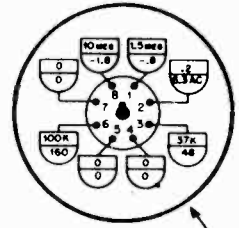
K = 1000 (ONE THOUSAND) OHMS.

\*\* = TIE POINT.

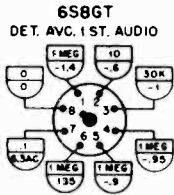
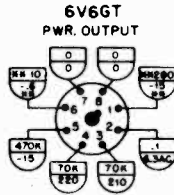
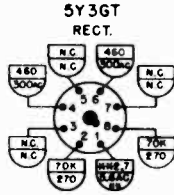
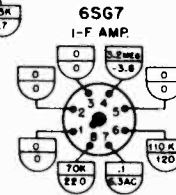
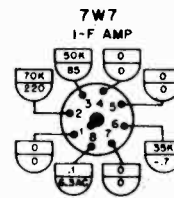
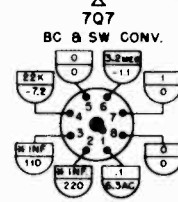
$\square$  = RESISTANCE MEASUREMENTS.

$\cup$  = VOLTAGE MEASUREMENTS.

7F8  
1ST. & 2ND. FM CONV.



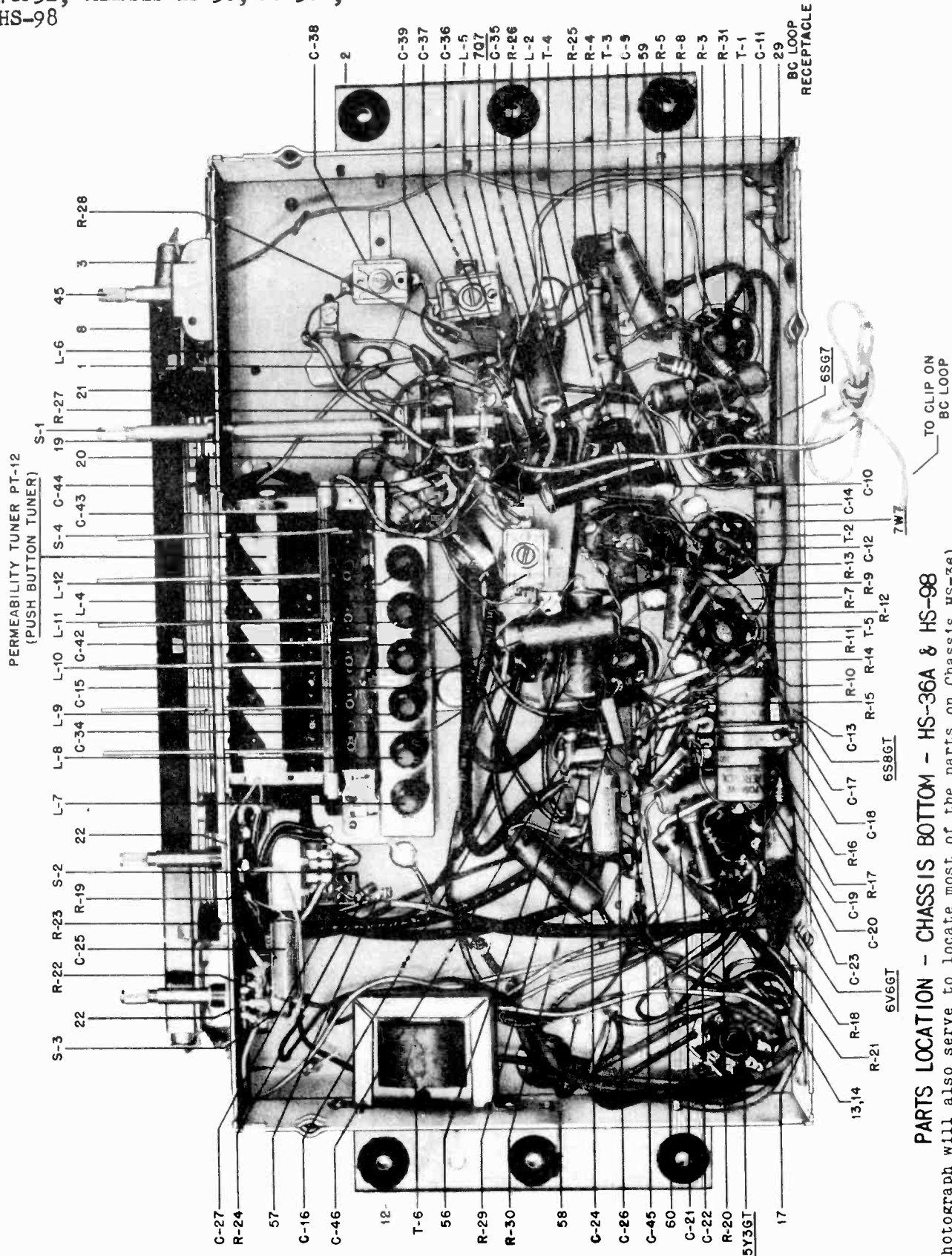
TUBE LOCATED ON TOP OF CHASSIS



VOLTAGE & RESISTANCE DIAGRAM CHASSIS HS-36A & HS-98

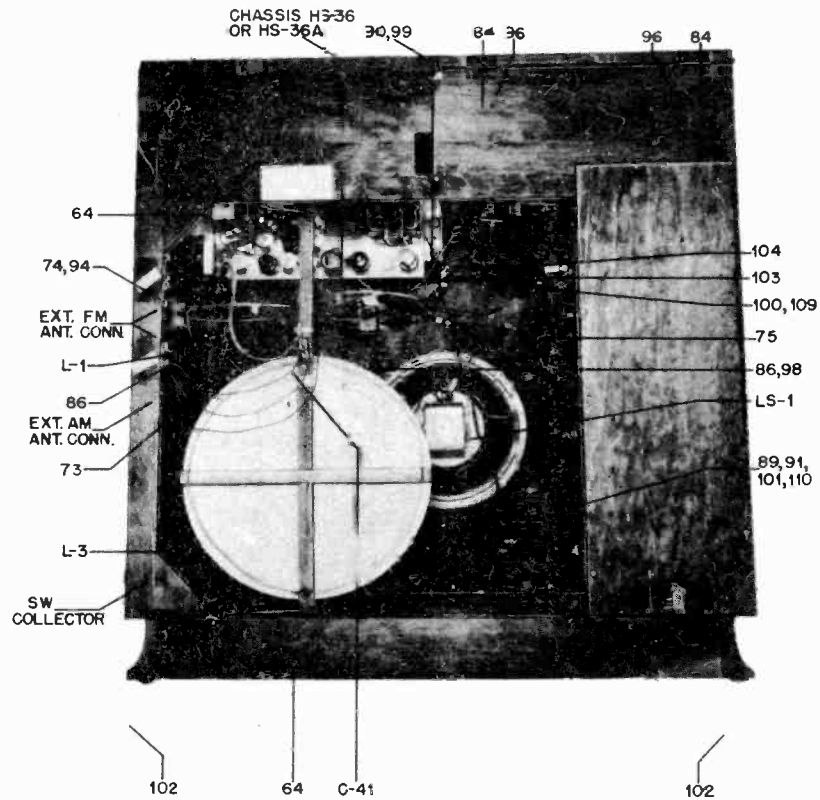
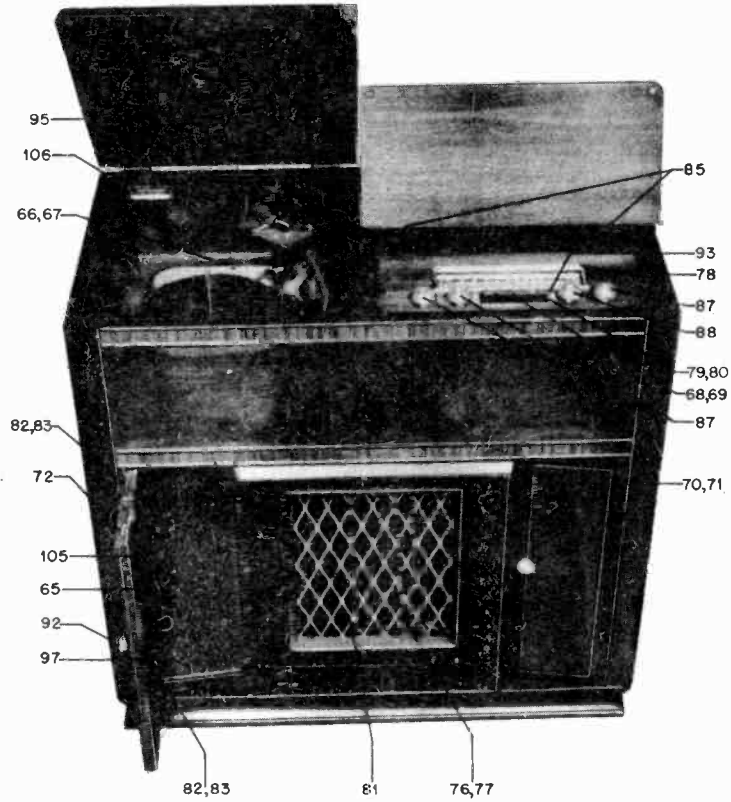
MODELS 75F31, 75F31A, 75F31B,  
76F31, CHASSIS HS-36, HS-36A,  
HS-98

MOTOROLA INC.

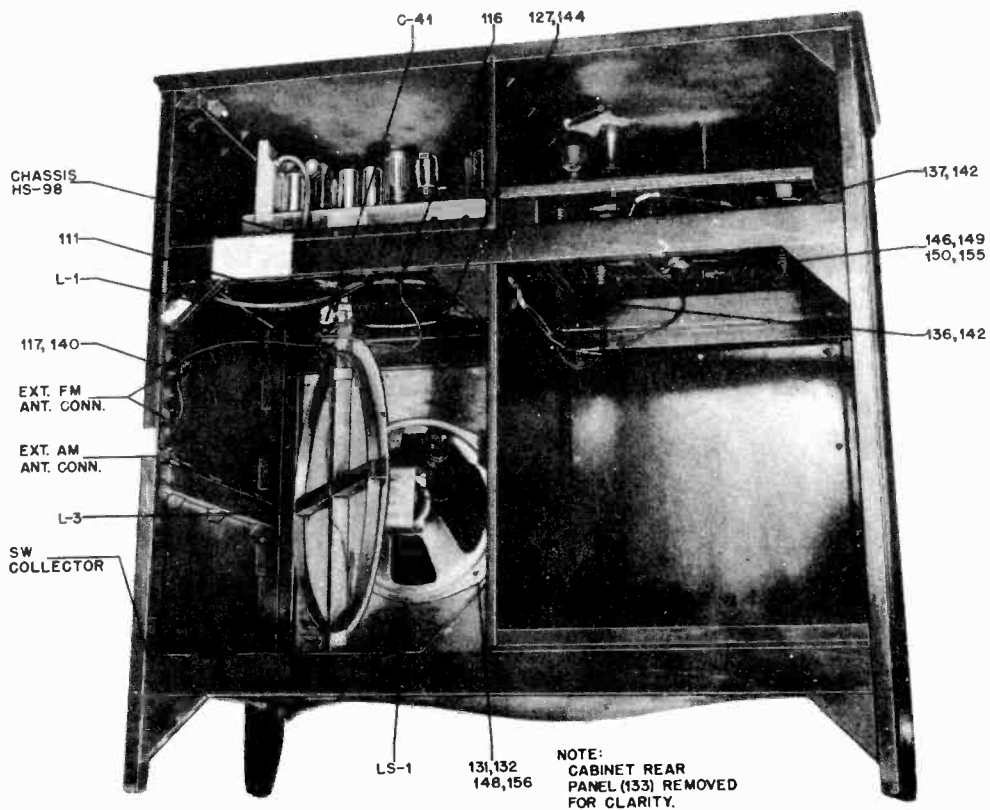
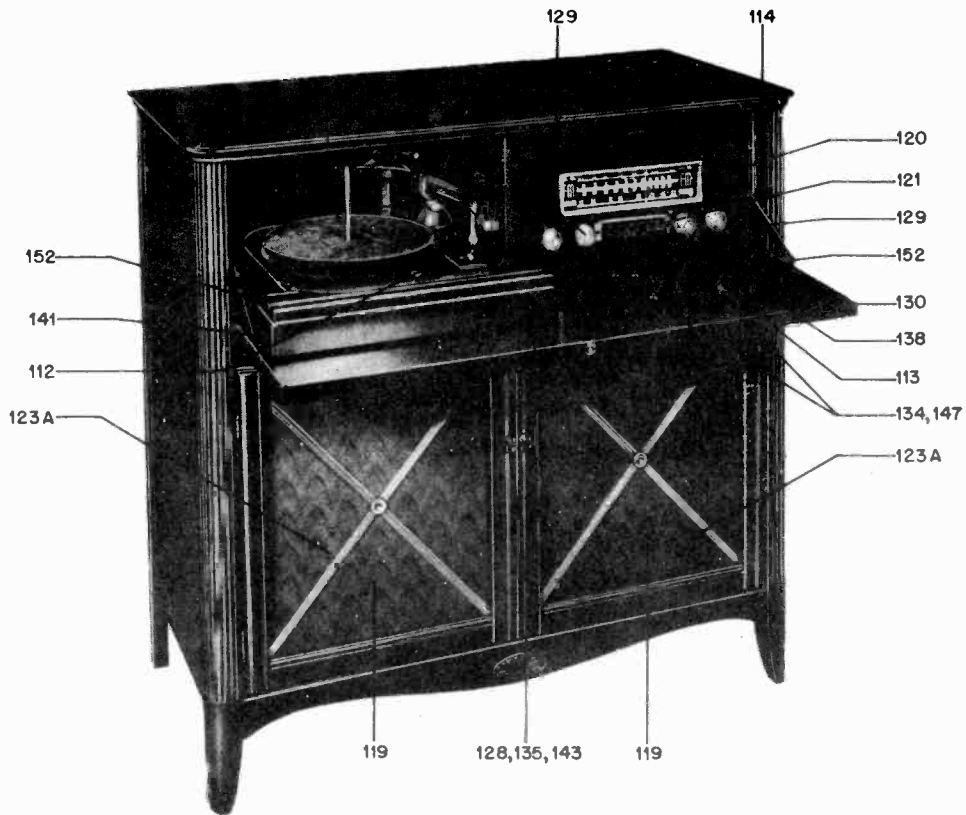


**PARTS LOCATION - CHASSIS BOTTOM - HS-36A & HS-98**  
(This photograph will also serve to locate most of the parts on Chassis HS-36)

MOTOROLA INC. MODELS 75F31, 75F31A, 75F31B,  
CHASSIS HS-36, HS-36A, HS-98



PARTS LOCATION- CABINET-MODELS 75F31, 75F31A & 75F31B

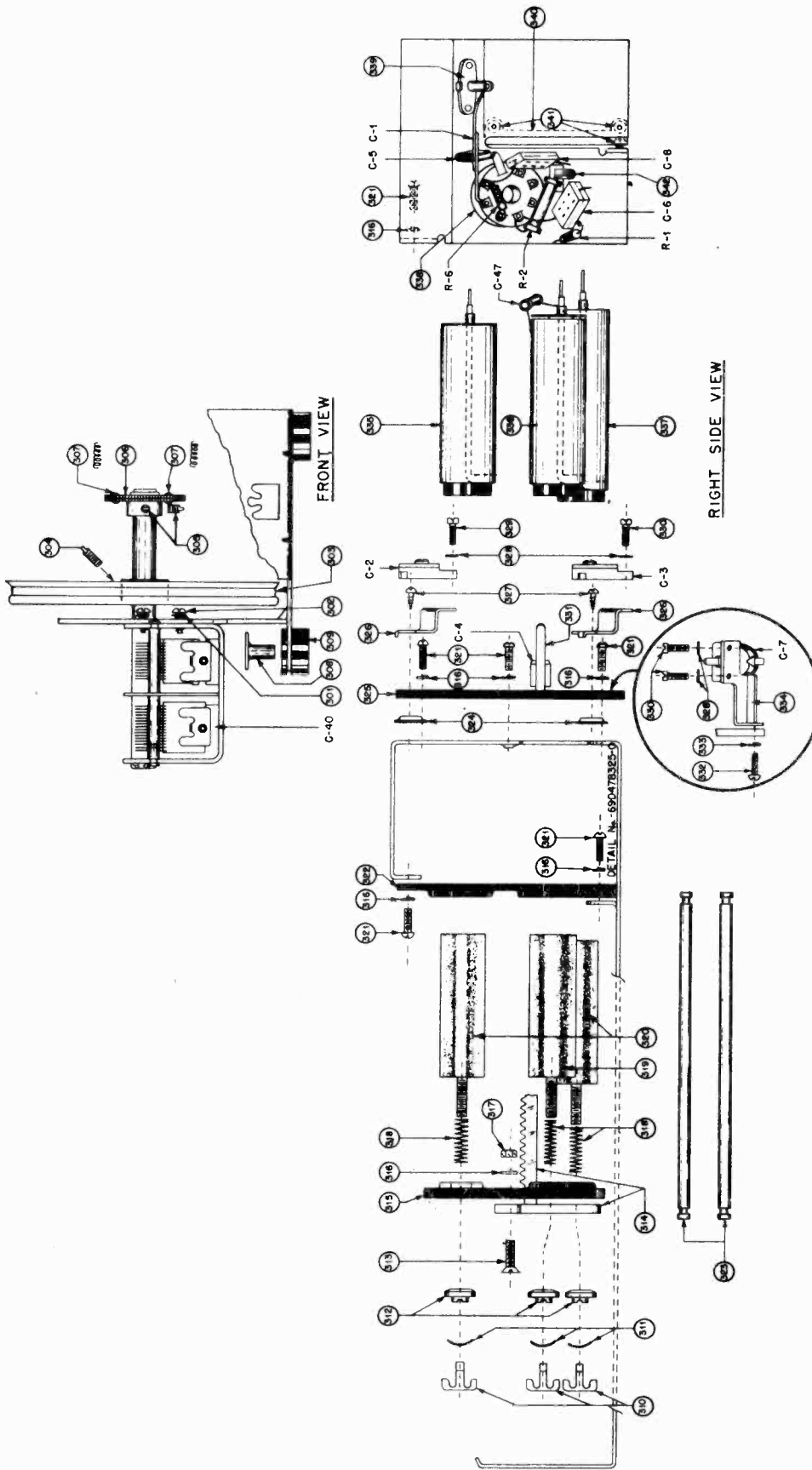


PARTS LOCATION - CABINET - 76F31

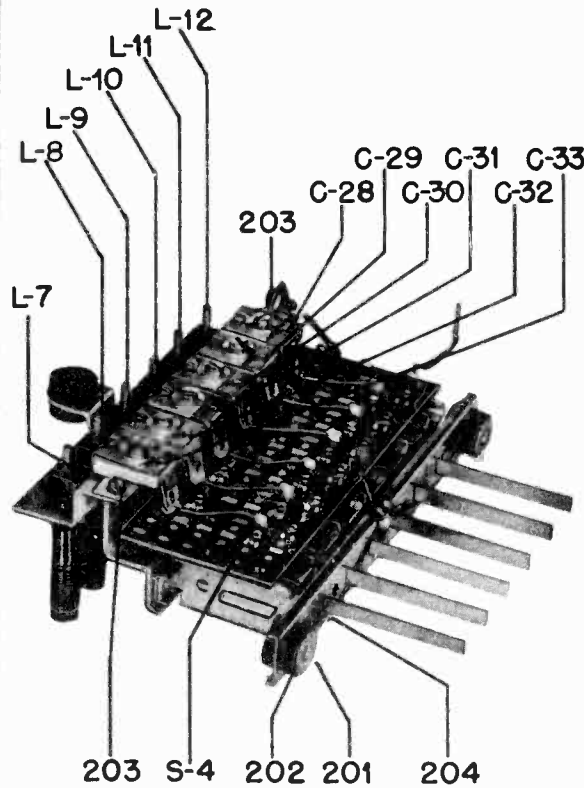
REPLACEMENT PARTS LIST  
FM-BC TUNER PT-10

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
<b>CAPACITORS</b>					
C-1	21A75479	Special: 1.3 mmf .....	315	64B72707	Plate, core mounting: bakelite .....
C-2	20A74939	Variable ceramic: 5-25 mmf. ....	316	4S2819	Lockwasher: #6 split .....
C-3	20K74940	Variable ceramic: 7-45 mmf. ....	317	2S7005	Nut: 6-32 x 1/4 hex .....
C-4	21A112247	Silver mica: 250 mmf .....	318	41A74880	Spring, core tension .....
C-5	21A112247	Silver mica: 250 mmf .....	319	48K76172	Core, iron (with paint dot) (osc.) .....
C-6	21R2729	Mica: 250 mmf 500V .....	320	46A71749	Core, iron (ant. & Var. IF) .....
C-7	20K74940	Variable ceramic: 7-45 mmf .....	321	3S7185	Screw: 6-32 x 3/8 slotted round head machine screw .....
C-8	21R2730	Mica: 500 mmf 500V .....			
C-40	19B72560	Variable: 2 gang .....	322	64B72704	Plate, front mounting: bakelite .....
C-47	21A76320	Ceramic: 16 mmf .....	323	47B72712	Rod, guide .....
<b>RESISTORS</b>					
R-1	6R2109	10 meg 1/2W Ins .....	324	2A74710	Nut, Tinnerman (#4 PKZ) .....
R-2	6R6013	15,000 1W NI .....	325	1X76388	Rear Mounting Plate & Lug Assembly: bakelite plate with soldering lug .....
R-6	6R3966	1.5 meg 1/2W Ins .....	326	7A74711	Bracket, trimmer mounting .....
			327	3S3356	Screw: #4 x 5/16 PKZ slotted round head sheet metal screw .....
301	4S7666	Lockwasher: #6 external .....	328	4A74884	Washer, trimmer: fibre .....
302	3S7156	Screw: 6-32 x 3/16 slotted binder head machine screw .....	329	3S2975	Screw: 3-48 x 5/16 slotted fillister head machine screw .....
303	1X76416	Pulley and Bushing Assembly .....	330	3S1525	Screw: 3-48 x 3/8 slotted fillister head machine screw .....
304	3S7114	Setscrew: 8-32 x 3/8 slotted slab head..	331	29R3005	Lug, soldering .....
305	3S7100	Setscrew: 8-32 x 5/16 slab head .....	332	3S1937	Screw: 4-40 x 5/16 slotted round head machine screw .....
306	1X76390	Split Gear & Bushing Assembly (small) ..	333	4S8412	Lockwasher: #4 split .....
307	41A76498	Spring, coil .....	334	7A74712	Bracket, trimmer mounting .....
308	5A12105	Eyelet, mounting .....	335	24C75492	Inductor, VHF (Ant.): 2-1/2" long .....
309	37K15125	Grommet, tuner mounting .....	336	24K75496	Inductor, VHF (Osc.): 2-5/8" long .....
310	42A72725	Clip, swivel nut .....	337	24K75494	Inductor, VHF (IF): 2-3/4" long .....
311	4A74936	Washer, spring .....	338	9K75544	Socket, tube: loctal .....
312	2A72726	Nut, swivel .....	339	9A54664	Receptacle, ferrule: 1 prong .....
313	3S7184	Screw: 6-32 x 1/2 slotted flat head machine screw .....	340	15A74714	Cover, tuner (rear) .....
314	44B72706	Rack, drive gear: die cast .....	341	3S8175	Screw: #4 x 3/16 PKZ slotted hex head sheet metal screw .....
			342	31A81399	Strip, terminal: 1 insulated lug; #1 mtg .....

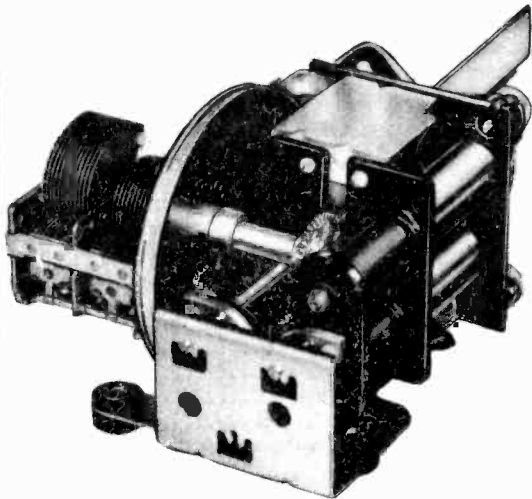




PARTS LOCATION - FM-BC TUNER PT-10



PARTS LOCATION -PUSH BUTTON TUNER PT-12



**FM-BC TUNER PT-10**

**THEORY OF THE FM TUNER**

Referring to the functional schematic diagram in Fig. 21, the triode T1 serves both as an oscillator and first converter, and triode T2 serves as the second converter. Oscillator voltage injection for the second converter is obtained through the coupling capacitor from the plate of T1. T1 and T2 are sections of the 7F8 twin-triode tube.

The frequency relationships are given in Fig. 21. The oscillator  $F_0$  beats with the incoming signal  $F_s$  to produce the first intermediate frequency  $F_1$ , which is variable.  $F_1$  then beats with the same oscillator frequency  $F_0$  in the second converter to produce the second inter-

**REPLACEMENT PARTS LIST  
PUSHBUTTON TUNER PT-12**

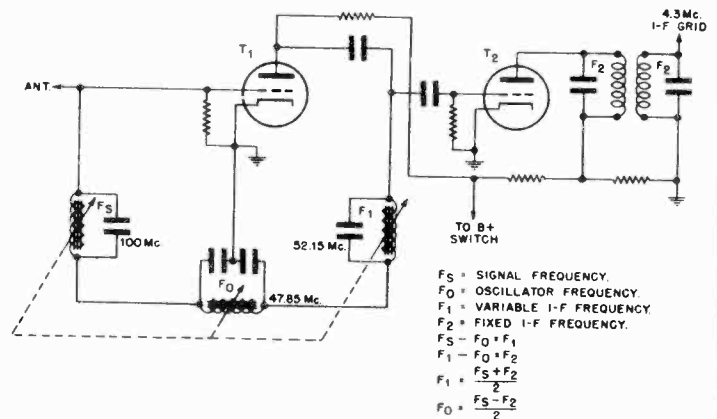
REF NO.	PART NO.	DESCRIPTION
200	1X76440	Permeability Tuner PT-12: complete .....
C-28 to C-33	20A72338	Trimmers and Mtg Strip Assembly: 6 trimmer capacitors on mtg strip; capacitors not replaceable separately .....
<b>COILS</b>		
L-7	1X72416	Coil, Core and Clip Assembly, push button oscillator: 540 to 930 Kc; brown dot (specify color of dot when ordering) ..
L-8	1X72417	Coil, Core and Clip Assembly, push button oscillator: 600 to 1050 Kc; red dot (specify color of dot when ordering) ..
L-9 and L-10	1X72418	Coil, Core and Clip Assembly, push button oscillator: 650 to 1200 Kc; orange dot (specify color of dot when ordering) ..
L-11	1X72419	Coil, Core and Clip Assembly, push button oscillator; 730 to 1350 Kc; yellow dot (specify color of dot when ordering) ..
L-12	1X72420	Coil, Core and Clip Assembly, push button oscillator: 900 to 1600 Kc; green dot (specify color of dot when ordering)...
<b>SWITCH</b>		
S-4	40K76439	Latch switch, push button .....

**MISCELLANEOUS**

201	5A70098	Eyelet, steel (tuner mtg) .....
202	5A70404	Grommet, rubber (tuner mtg) .....
203	3S7506	Screw: #6 x 1/4 PKZ plain hex head; cadmium plated .....
204	41A74429	Spring, tuner wiper .....

mediate frequency  $F_2$  which is 4.3 mc. With a 100 mc signal the oscillator frequency is 47.85 mc and the variable intermediate frequency is 52.15 mc.

This system of reception permits the oscillator to be resonated with a high capacitance, 250 micromicrofarads in this case. Consequently, changes in the tube characteristics during warm-up do not produce objectionable changes in oscillator frequency. This contributes materially to the stability of the system.



$F_s$  = SIGNAL FREQUENCY  
 $F_0$  = OSCILLATOR FREQUENCY  
 $F_1$  = VARIABLE I-F FREQUENCY  
 $F_2$  = FIXED I-F FREQUENCY  
 $F_s = F_0 + F_1$   
 $F_1 = F_0 + F_2$   
 $F_1 = \frac{F_s + F_2}{2}$   
 $F_0 = \frac{F_s - F_2}{2}$

FUNCTIONAL SCHEMATIC DIAGRAM OF THE FM TUNER

MODELS 75F31, 75F31A, 75F31B,  
76F31, CHASSIS HS-36, HS-36A, HS-98

MOTOROLA INC.

REF.  
NO. PART NO. DESCRIPTION  
CHASSIS HS-36, HS-36A & HS-98

REF.  
NO. PART NO. DESCRIPTION  
24K71598 Loop Assembly, BC: complete with frame  
connecting leads & trimmer (76F31) ...  
28K19871 Plug, 4 pin (loop plug) .....  
L-4 24A74822 SW Antenna .....  
L-5 24A74820 SW Oscillator .....  
L-6 24A74821 BC Oscillator: includes mtg bracket ...  
L-7 See Permeability Tuner PT-12 Parts List  
through  
L-12

**CAPACITORS**

C-1\* 21A75479 Special: 1.3 mf.....  
C-2\* 20A74939 Trimmer, ceramic: 5-25 mmf .....  
C-3\* 20K74940 Trimmer, ceramic: 7-45 mmf .....  
C-4\* 21A112247 Silver Mica: 250 mmf .....  
C-5\* 21A112247 Silver Mica: 250 mmf .....  
C-6\* 21R2729 Mica: 250 mmf .....  
C-7\* 20K74940 Trimmer, ceramic: 7-45 mmf .....  
C-8\* 21R2730 Mica: 500 mmf 500V .....  
C-9 8S9816 Paper: .05 mf 400V .....  
C-10 8S9801 Paper: .01 mf 100V .....  
C-11 8S9816 Paper: .05 mf 400V .....  
C-12 8S9809 Paper: .01 mf 400V .....  
C-13 21R6639 Mica: 500 mmf 500V .....  
C-14 8S9801 Paper: .01 mf 100V .....  
C-15 8S9816 Paper: .05 mf 400V .....  
C-16 8S9816 Paper: .05 mf 400V .....  
C-17 21R6642 Mica: 50 mmf 500V .....  
C-18 21R6642 Mica: 50 mmf 500V .....  
C-19 23K77635 Electrolytic: 10 mf 100V .....  
C-20 21R6639 Mica: 500 mmf 500V .....  
C-21 8S9813 Paper: .005 mf 600V .....  
C-22 8S9816 Paper: .05 mf 400V .....  
C-23 8S9813 Paper: .005 mf 600V .....  
C-24 8S9816 Paper .05 mf 400V .....  
C-25 8S9813 Paper: .005 m. 600V .....  
C-26 8S9813 Paper: .005 mf 600V .....  
C-27 21R6641 Mica: 100 mmf 500V .....  
C-28 Trimmer: See Permeability Tuner PT-12  
through Parts List  
C-33  
C-34 23A27718 Electrolytic: 30-30-20 mf/350-300V-25V..  
C-35 8S9816 Paper: .05 mf 400V .....  
C-36 21R6642 Mica: 50 mmf 500V .....  
C-37 20A71141 Trimmer: mica; 10-80 mmf .....  
C-38 20A75234 Trimmer, mica: 10-80 mmf; with mtg  
bracket .....  
C-39 21R6642 Mica: 50 mmf 500V .....  
C-40\* 19B72560 Tuning gang: 2 section .....  
C-41 20A71226 Trimmer, mica: 2-12 mmf; with mtg  
bracket (part of BC loop antenna)  
C-42 20A71141 Trimmer, mica: 10-80 mmf .....  
C-43 21R2724 Mica: 1000 mmf 5% 300V .....  
C-44 21A28020 Mica: 535 mmf 3% .....  
C-45 21R6639 Mica: 500 mmf 500V .....  
C-46 21R6638 Mica: 1000 mmf 500V .....  
C-47\* 21A76320 Ceramic: 16 mmf .....  
C-48 21R6661 Mica: .004 mf 10% 300V .....  
C-49 21R6661 Mica: .004 mf 10% 300V .....

**RESISTORS**

Note: All resistors 20% insulated carbon type unless  
otherwise specified.  
R-1\* 6R2109 10 Meg 1/2 W .....  
R-2\* 6R6013 15,000 1W NI .....  
R-3 6R6410 33,000 10% 1/2 W .....  
R-4 6R6313 22,000 10% 1W NI .....  
R-5 6R6477 15,000 10% 1/2 W .....  
R-6\* 6R3966 1.5 Meg 1/2 W .....  
R-7 6R6433 2.2 Meg 10% 1/2 W .....  
R-8 6R5588 39,000 10% 1W .....  
R-9 6R6301 1000 1/2 W .....  
R-10 6R6056 47,000 1/2 W .....  
R-11 6R6004 1 Meg 1/2 W .....  
R-12 6R6397 22,000 10% 1/2 W .....  
R-13 6R6398 150,000 10% 1/2 W .....  
R-14 6R6397 22,000 10% 1/2 W .....  
R-15 6R6320 10,000 10% 1/2 W .....  
R-16 6R6446 4.7 Meg 10% 1/2 W .....  
R-17 6R6001 68,000 1/2 W .....  
R-18 6R6032 470,000 1/2 W .....  
R-19 18A28062 Tone Control: 1 Meg; includes Phono-  
Radio Switch.....  
R-20 6R5621 10 10% 1/2 W .....  
R-21 6R6035 270 10% 1W NI .....  
R-22 18K74891 Volume Control: 1 Meg, includes  
On-Off Switch .....  
R-23 6R6410 33,000 10% 1/2 W .....  
R-24 6R6004 1 Meg 1/2 W .....  
R-25 6R3967 12,000 10% 3 W NI .....  
R-26 6R6032 470,000 1/2 W .....  
R-27 6R6028 22,000 1/2 W .....  
R-28 6R6270 220 10% 1/2 W .....  
R-29 6R6028 22,000 1/2 W .....  
R-30 6R6010 330 1/2 W .....  
R-31 17K77634 2.7 1/2 W wire wound .....

**SWITCHES**

S-1 40B75236 Bandswitch: 4 position .....  
S-2 - Phono-Radio Switch (part of tone control)  
S-3 - Power Switch (part of volume control)...  
S-4 - Latch Switch (See Permeability Tuner  
PT-12 Parts List) .....

**TRANSFORMERS**

T-1 24B75481 1st IF, 4.3 Mc: complete with iron cores  
and padding capacitors but less shield.  
T-2 24B75473 2nd IF, 4.3 Mc: complete with iron cores  
and padding capacitors, but less shield  
T-3 24B75456 Discriminator, 4.3 Mc: complete with  
iron cores and padding capacitors, but  
less shield .....  
T-4 24B75487 IF, 455 Kc: complete with iron cores  
and padding capacitors but less shield.  
T-5 24B70537 Diode, 465 Kc: complete with iron cores  
and padding capacitors but less shield.

**SPEAKER**

LS-1 50K75592 Electrodynamic: 10"; 3.2 ohm V.C;  
1000 ohm field .....

**PILOT LIGHT**

I-1  
I-2 65X11854 Bulb: 6.3V .15A; bayonet base;  
tubular; #47 .....

**COILS**

L-1 1X76326 Loop Assembly, FM Band: complete with  
leads .....  
30B75476 Cable, FM Loop Antenna .....  
L-2 24A74989 Filament Choke .....  
L-3 24K76322 Loop Assembly, BC: complete with frame,  
connecting leads & trimmer (75F31,  
75F31A & B .....

\* Part of PT-10 BC-FM Tuner

MOTOROLA INC.

MODELS 75F31, 75F31A, 75F31B,  
76F31, CHASSIS HS-36, HS-36A,  
HS-98

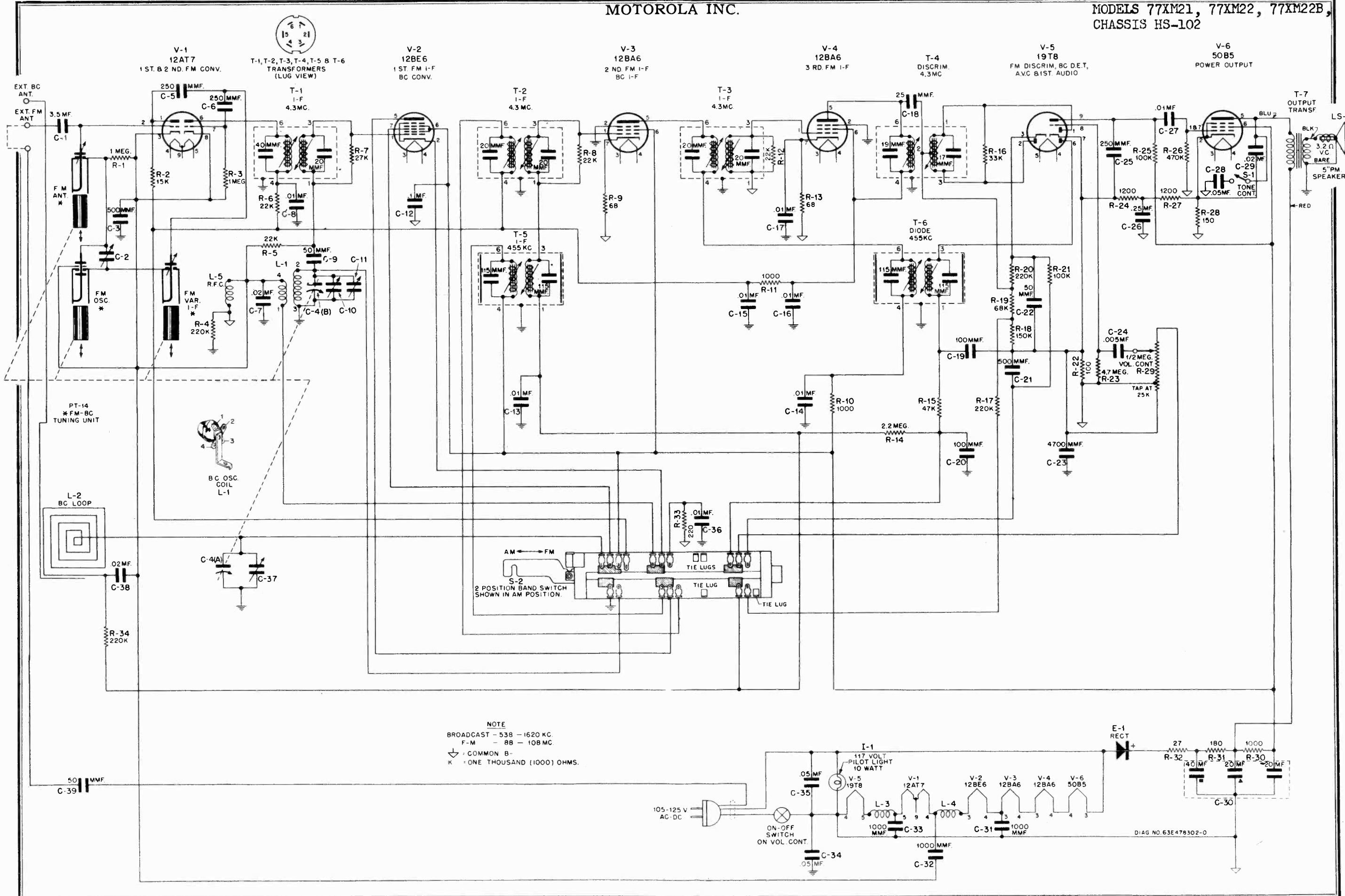
REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
T-6	25B75463	Output .....	41	3S7454	Screw: #8 x 1/4 PKZ plain-hex head sheet metal screw; cadmium plated (shaft bearing mtg, dial bracket assembly mtg, chassis mtg, bracket mtg and FM Tuner Cover mtg) .....
T-7	25B70598	Power .....			
1	7A72730	Bracket, band switch mtg .....			
	7B74671	Bracket, chassis mtg (HS-36 & HS-36A only)	42	3S7487	Screw: #8 x 3/8 PKZ plain hex head sheet metal screw; cadmium plated (power transformer mtg) .....
3	7A14684	Bracket, tuning shaft mtg .....			
4	1X76427	Bracket & Pulley Assembly (drive cord guide)			
5	42A5480	Clip, grid .....	43	3S7512	Screw: #8 x 1/2 PKZ plain hex head sheet metal screw; cadmium plated (PT-12 mtg)
6	11M8944	Cord, dial: 18 lb; black.....			
7	30K21859	Cord, line: with plug; 9 ft long .....	44	3S7481	Screw: #8 x 3/4 PKZ slotted hex head sheet metal screw; cadmium plated (PT-10 mtg)
8	1X76428	Dial Plate, Brackets and Pulley Assembly: complete but less pointer and dial scale			
9	5S1815	Eyelet, brass (FM Tuner Cover Mtg).....	45	1X76352	Shaft Assembly, tuning .....
10	5A12105	Eyelet, steel (chassis mtg) .....	46	26A26283	Shield, tube .....
11	37A4163	Grommet, rubber (FM Tuner Cover Mtg) ...	47	26B70107	Shield, coil (for T-1, T-2 & T-3) .....
12	37K15125	Grommet, rubber (chassis mtg) .....	48	1A71049	Shield and Sleeve Assembly (for T-4 & T-5)
13	1X76421	Lead Assembly, phono pick-up: with 1 pin plug; 24" long (HS-36 & HS-36A) .....	49	9A72747	Socket, pilot light .....
			50	9A6788	Socket, tube: molded; octal; plain type.
14	1X76356	Lead Assembly, phono pick-up: with 1 pin plug; 32" long (HS-98 only) .....	51	9A70165	Socket, tube: molded; shielded type; octal
			52	9A471015	Socket, tube: loctal.....
15	1X76366	Lead Assembly, speaker: includes receptacle 23" long (HS-36 & HS-36A) .....	53	41A14244	Spring, tension coil (drive & pointer cord spring) .....
16	1X471533	Lead Assembly, speaker: includes receptacle; 37-1/2" long (HS-98 only) .....	54	32A27678	Strip, band switch shaft bearing: fibre.
			55	37K21114	Strip, channel: rubber; 1" lg (dial scale mounting) .....
17	32A24815	Lock, line cord: fibre .....			
18	4S7650	Lockwasher: #8 internal; cadmium plated (FM Tuner Cover Mtg) .....	56	31K51251	Strip, terminal: 1 insulated #1 ground..
			57	31A15433	Strip, terminal: 1 large insulated lug, #2 mtg .....
19	4S7655	Lockwasher: 3/8 internal; cadmium plated (band switch mtg) .....	58	31A493	Strip, terminal: 2 insulated #2 mtg ....
20	29R5209	Lug, soldering: dumbbell shaped .....	59	31A75232	Strip, terminal: 4 insulated #3 mtg ....
21	2S1376	Nut: 3/8-32 x 1/2 hex; Cadmium plated (band switch mtg)....	60	31A75233	Strip, terminal: 7 insulated #1 & 9 mtg.
			61	39A24524	Wiper, tube base grounding .....
22	2S7051	Nut: 3/8-32 x 9/16 hex; Palnut; cadmium plated (volume & tone control mtg).	62	4S1719	Washer: 3/8 x .140 x .030 thick; cadmium plated (line cord lock mtg) .....
23	9A12705	Plate, electrolytic mtg: bakelite .....	63	4S7557	Washer: 3/8 x .171 x .033 thick; cadmium plated (power transformer mtg).....
24	28K71775	Plug, 1 pin (phono pick-up) .....			
25	52B74418	Pointer, dial .....			
26	49A23960	Pulley, cord: 1/4" groove (cord guide)..			
27	49A21741	Pulley, cord: 3/8" groove (cord guide)..			
28	9A30680	Receptacle, 3 prong (on phono motor lead)			
29	9K28049	Receptacle, 4 prong (BC loop antenna input connector)			
30	9A22367	Receptacle: 5 prong; 4 contacts (speaker receptacle)	64	7K71220	Bracket, loop mounting.....
31	5A12814	Rivet, shoulder: 5/32" long; nickel plated .....	65	35A75274	Bumper, rubber .....
32	5A71246	Rivet, shoulder: .187" long; nickel plated .....	66	38A10544	Button, plug: for 1/4 hole; copper oxide finish (for concealing shipping screw holes in record changer) .....
33	5S7707	Rivet: .122 x 5/32; nickel plated (tube socket mtg, terminal strip mtg, electrolytic clip mtg, and pulley bracket mtg) .....	67	38K471934	Button, plug: for 1/4 hole; painted green (for concealing shipping screw holes in record changer) .....
			68	1X477001	Button, push: walnut plastic; with insert spring (75F31, 75F31A) .....
			69	38K471946	Button, push: gray plastic; with insert spring (75F31B) .....
			70	16K471789	Cabinet, console: limed walnut (75F31B).
			71	16F76436	Cabinet, console: walnut (75F31 & 75F31A)
			72	55A72307	Catch, bullet .....
			73	42K76724	Clamp, cable (2 used as adjustable taps on FM loop) .....
34	5S7701	Rivet: .122 x 3/16; nickel plated (electrolytic mtg plate mtg, band switch mtg, trimmer capacitor mtg, and transformer mtg) .....	74	42K5528	Clip, Fahnestock: double .....
			75	42A75825	Clip, mounting (phono power connector mounting) .....
35	5S7703	Rivet: .122 x 7/32; nickel plated (tube socket).....	76	11M3447	Cloth, grille: 20" x 17" (Dazian #12317) 75F31 & 75F31A .....
36	4S7700	Rivet: .122 x 1/4; nickel plated (receptacle mtg) .....	77	35K471909	Cloth, grille: gray; 20" x 17" (Foster #5185) 75F31B .....
37	6S7708	Rivet: .122 x 9/32; nickel plated (line cord lock mtg) .....	78	13B72750	Escutcheon, dial .....
			79	13B70494	Escutcheon, push button: brown (75F31 & 75F31A) .....
38	34B74422	Scale, dial .....			
39	3S7506	Screw: #8 x 1/4 PKZ plain hex head, sheet metal screw; cadmium plated (coil mtg).	80	13K471929	Escutcheon, push button: gray plastic (75F31B) .....
40	3S7186	Screw: 6-32 x 3/8 slotted round head machine screw; cadmium plated (FM Tuner Cover Mtg) .....	81	13C76461	Grille, metal .....
			82	55K471693	Hinge, door: statuary bronze finish (75F31, 75F31A, 76F31) .....

\* Part of PT-10 BC-FM Tuner

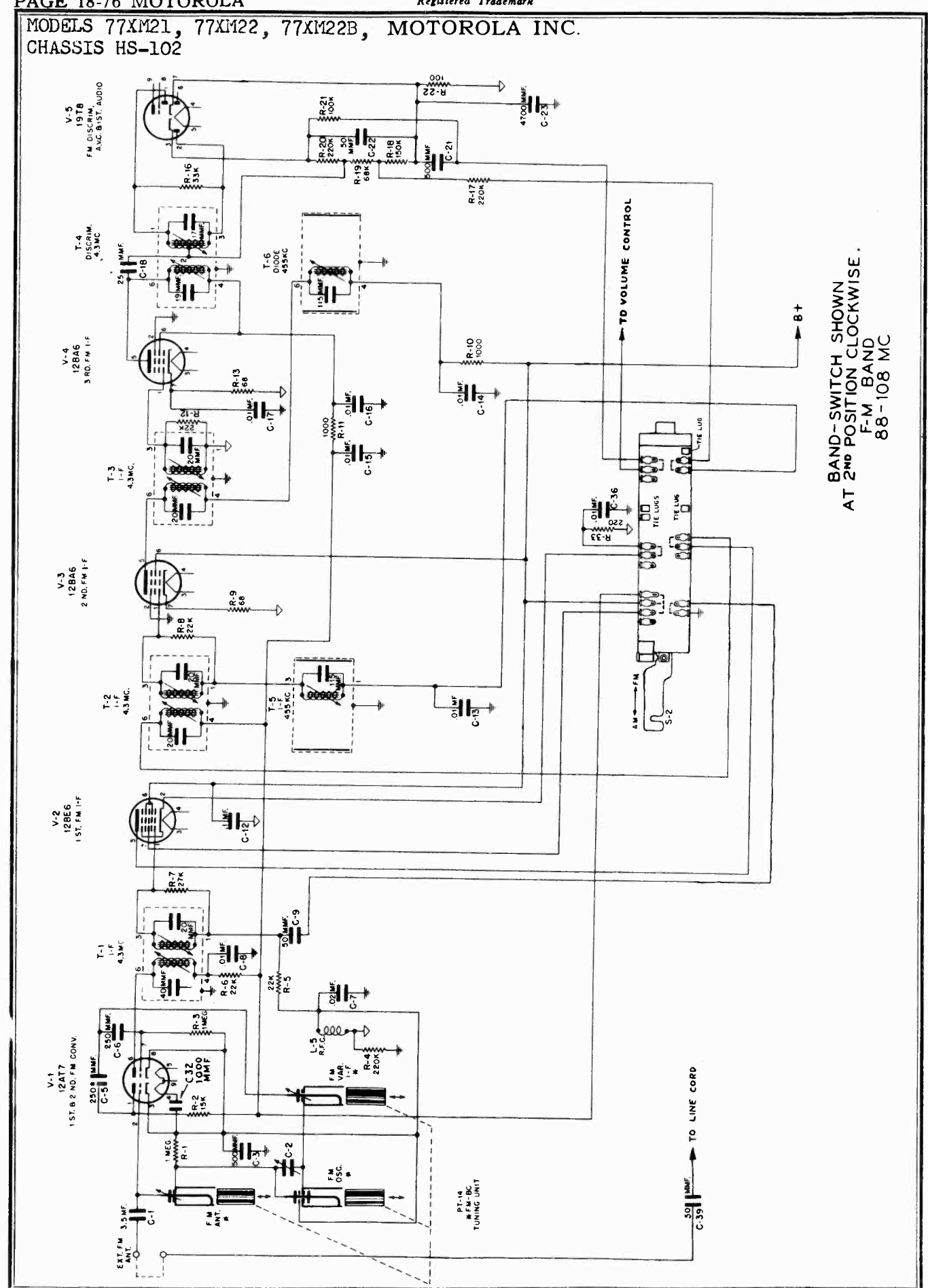
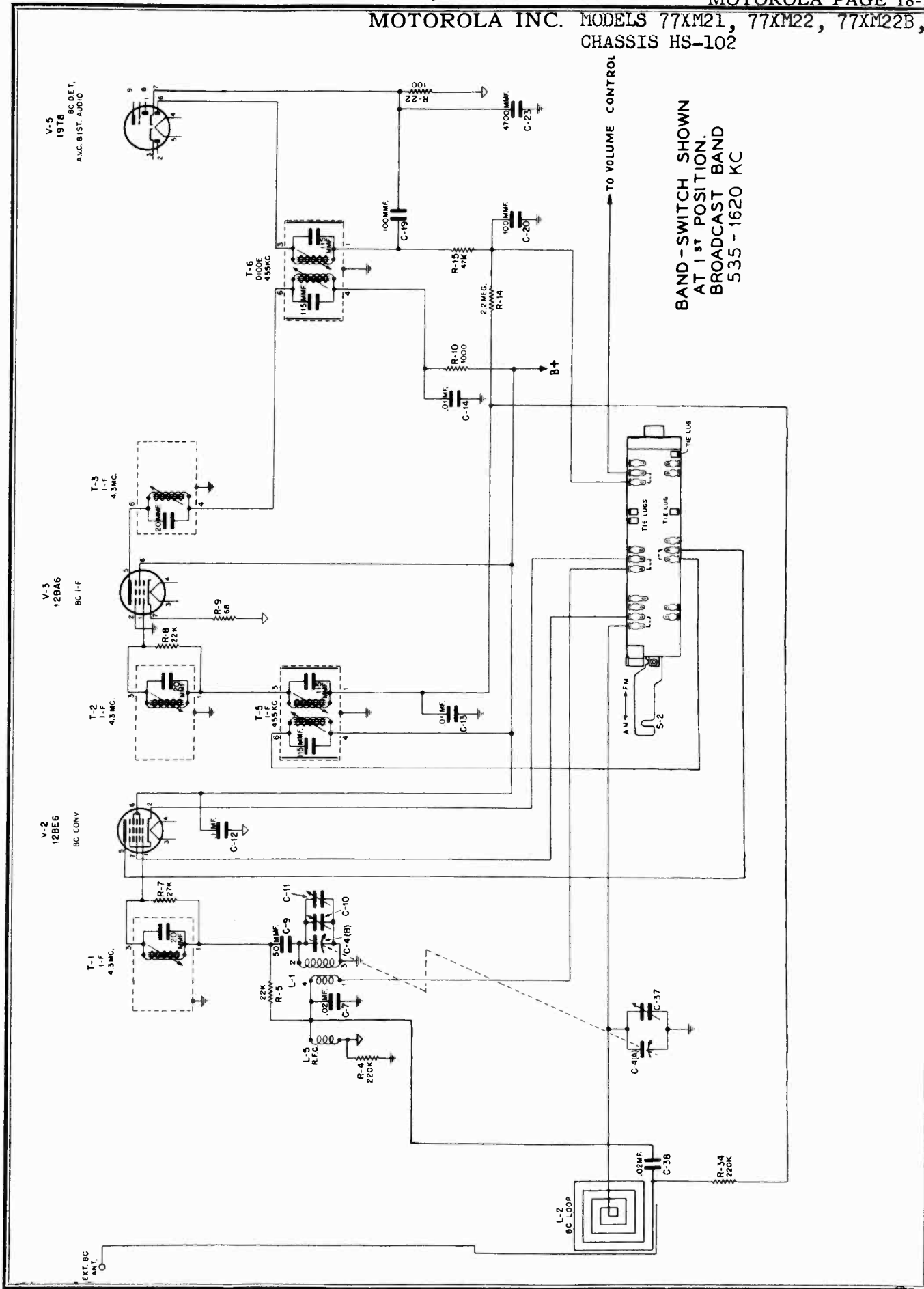
CABINET PARTS - MODELS 75F31, 75F31A & 75F31B

MODELS 75F31, 75F31A, 75F31B, MOTOROLA INC.  
76F31, CHASSIS HS-36, HS-36A, HS-98

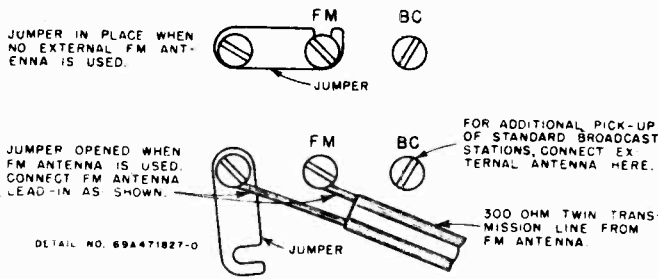
REF NO.	PART NO.	DESCRIPTION	REF NO.	PART NO.	DESCRIPTION
83	55K471692	Hinge, door: brass finish (75F31B) .....	123	5A70098	Eyelet: 23/64 x 7/32 ID x 1/2 dia head; cadmium plated (Chassis mtg) .....
84	55K76466	Hinge, lid .....	123A	13D471904	Grille, cabinet: antique English finish
85	55K76465	Hinge, lid .....	124	5A71130	Grommet, chassis retainer (used under mtg screw head - bottom) .....
86	14A75142	Insulator, FM loop mounting: bakelite ..	125	5A71092	Grommet, chassis mounting (chassis cushion - used on top) .....
87	36K70511	Knob (plain) .....	126	55K471593	Hinge, plain tip (on drop leaf) .....
88	36K70513	Knob (branded) .....	127	14A75142	Insulator, FM loop mounting: bakelite ..
89	4S7657	Lockwasher: #8 external (speaker mtg)...	128	55A471594	Key, escutcheon .....
90	2A72610	Nut, tee: 8-32 thread (chassis mtg).....	129	36K70511	Knob (plain) .....
91	2S7003	Nut: 8-32 x 5/16 hex; cadmium plated (speaker mtg) .....	130	36K70513	Knob (branded) .....
92	55K76464	Pull, door .....	131	4S7657	Lockwasher: #8 external; cadmium plated (speaker mtg) .....
93	3S1328	Screw: #2 x 3/8 Phillips oval head wood screw; brass plated (push button escutcheon mtg) .....	132	4S7003	Nut: 8-32 x 5/16 hex; cadmium plated (speaker mtg) .....
94	3S3367	Screw: #5 x 3/8 PKA slotted hex head sheet metal screw; antique copper finish (Fahnestock clip mtg) .....	133	64K471603	Panel, cabinet rear: mahogany .....
95	3S1320	Screw: #6 x 5/8 slotted round head wood screw; statuary bronze finish (lid support mounting) .....	134	55B471551	Pull, drawer: antique copper finish ....
96	3S1354	Screw: #6 x 1" slotted flat head wood screw; statuary bronze finish (hinge mtg) .....	135	22S1635	Pin, escutcheon: .066 x 3/8; statuary bronze finish (keep key escutcheon from turning) .....
97	3S2972	Screw: 8-32 x 15/16 slotted washer round head machine screw; statuary bronze finish (door pull mtg) .....	136	55C74786	Rail, support: right hand (record changer rail) .....
98	3S3365	Screw: #8 x 1 PKA slotted hex head wood screw; black finish (FM loop mtg).....	137	55K74787	Rail, support: left hand (record changer rail) .....
99	3S2963	Screw: 8-32 x 1-3/4 slotted hex head machine screw; cadmium plated (chassis mounting) .....	138	3S1328	Screw: #2 x 3/8 Phillips oval head wood screw; brass plated finish (push button escutcheon mtg) .....
100	3S7396	Screw: 10-32 x 2" slotted hex head machine screw; copper plated (record changer mounting) .....	139	3S3367	Screw: #5 x 3/8 PKA slotted hex head sheet metal screw; statuary bronze finish (phono connector clip mtg) .....
101	3K653	Screw: speaker mounting .....	140	3S3369	Screw: #6 x 3/8 PKA slotted hex head; antique copper finish (Fahnestock clip mounting) .....
102	55X11497	Silencer, dome (cabinet foot) .....	141	3S1344	Screw: #6 x 5/8 slotted flat head wood screw; statuary bronze finish (hinge & fall support mtg) .....
103	41A21807	Spring, cushion (bottom) (record changer mounting and cushion) .....	142	3S1314	Screw: #6 x 3/4 slotted round head wood screw; statuary bronze finish (record changer rail mtg) .....
104	41A28190	Spring, cushion (top) (record changer mounting & cushion) .....	143	3K471553	Screw: 8-32 x 5/8 washer head machine screw; antique copper finish (key escutcheon mtg) .....
105	55K72308	Strike, bullet .....	144	3S3365	Screw: #8 x 1 PKA slotted hex head sheet metal screw (FM loop mtg) .....
106	55X31509	Support, lid .....	145	3S3359	Screw: #8 x 1-5/8 PKA slotted hex head sheet metal screw (chassis mtg) .....
107	38C70588	Tabs, AM Call Letters & Instructions....	146	3S7396	Screw: 10-32 x 2 slotted hex head machine screw; copper plated (record changer mounting) .....
108	66A71008	Tool, push button tuner alignment.....	147	3A471799	Screw: tri-slot head; statuary bronze finish (drawer pull mounting) .....
109	4S7611	Washer: 1/2 x 7/32 x .048 thick; cadmium plated (record changer mtg) .....	148	3K653	Screw, speaker mounting .....
110	4S7629	Washer: 1/2 x 3/16 x .048 thick; cadmium plated (speaker mtg) .....	149	41A21807	Spring, cushion (bottom) (record changer mounting & cushion) .....
<b>CABINET PARTS - MODEL 76F31</b>			150	41A28190	Spring, cushion (top) (record changer mounting & cushion) .....
111	7K71220	Bracket, loop mounting.....	151	55K72308	Strike, bullet (record compartment door catch) .....
112	38A10544	Button, plug: for 1/4" hole; copper oxide finish (for concealing shipping screw holes in record changer) .....	152	55K471529	Support, fall: statuary bronze finish ..
113	1X477001	Button, push: walnut plastic; with insert spring .....	153	38C70588	Tabs, AM Call letter & instructions ....
114	16F471547	Cabinet, lowboy console: mahogany (76F31)	154	66A71008	Tool, push button tuner alignment .....
115	55A72307	Catch, bullet (on phono compartment door) .....	155	4S7611	Washer: 1/2 x 7/32 x .048 thick; antique copper finish (record changer mtg) ....
116	42K76724	Clamp, cable (2 used as adjustable tap on FM loop).....	156	4S7629	Washer: 1/2 x 3/16 x .048 thick; cadmium plated (speaker mtg) .....
117	42K5528	Clip, Fahnestock: double .....	157	4S7589	Washer: 7/8 x 9/32 x .027 thick; cadmium plated (chassis mtg) .....
118	42A75825	Clip, mounting (phono power connector mounting) .....			
119	13K471549	Clot..., grille: 15" x 17" (Textile Prod #2300-R MAH) (76F31) .....			
120	13B72750	Escutcheon, dial .....			
121	13B70494	Escutcheon, push button: brown .....			
122	5A71081	Eyelet, chassis mounting: 1/4 x 1/4 dia body 1/2 dia head; brass .....			



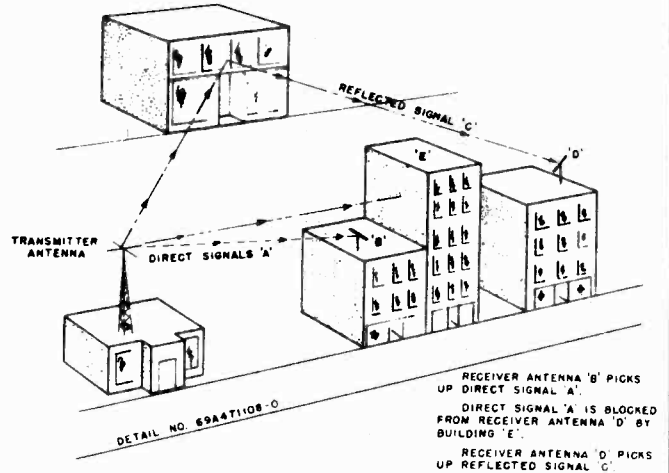
**NOTE**  
 BROADCAST - 538 - 1620 KC  
 F-M - 88 - 108 MC  
 ↙ - COMMON B-  
 K - ONE THOUSAND (1000) OHMS.



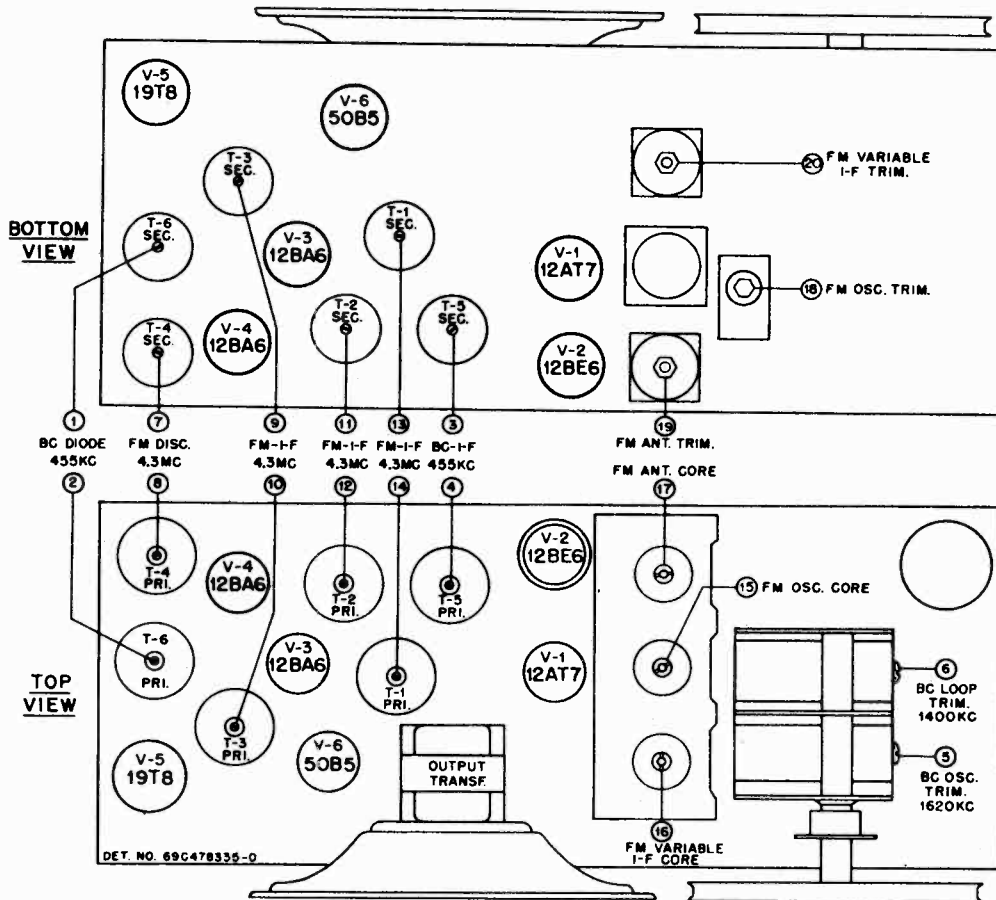
MOTOROLA INC. MODELS 77XM21, 77XM22, 77XM22B,  
CHASSIS HS-102



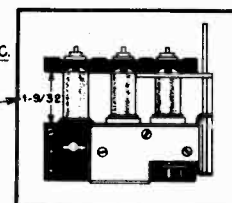
EXTERNAL ANTENNA TERMINALS



DIRECT & REFLECTED FM RECEPTION PATHS



METHOD OF SETTING TUNER TO 98 MC.  
TURN TUNING SHAFT UNTIL DISTANCE BETWEEN BAKELITE PIECES IS 1-9/32" AS SHOWN IN ILLUSTRATION.



TUBE & TRIMMER LOCATIONS



## MOTOROLA INC.

MODELS 77XM21, 77XM22, 77XM22B,  
CHASSIS HS-102

## ALIGNMENT

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

It is suggested that an isolation transformer be used between receiver and power line. If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator output to B- instead of the receiver chassis.

If set oscillates when aligning the broadcast band, connect receiver B- to receiver chassis. **CAUTION:** Don't forget to disconnect B- from receiver chassis after alignment.

Use an insulated wrench when adjusting the FM tuner trimmers. Order Motorola FM Alignment wrench part number 66A471864.

A special wrench for adjusting the slotted nuts on the tuner cores will be required also. You can easily fabricate one from a Motorola auto set Volume Control Shaft and Coupling Assembly (Part Number 1B70847, \$.30 list) by simply spreading out the forked ends and filing to fit. Solder the assembly together to make it rigid.

COMPLETE ALIGNMENT PROCEDURE  
USING AM SIGNAL GENERATOR

An AM (30% amplitude modulated) signal generator covering the frequencies shown in alignment Chart I, is used to align the broadcast and FM bands. A low range output meter, connected across the speaker voice coil, is used as an output indicator.

The broadcast alignment is conventional; instructions are given in the following alignment chart.

The FM band alignment can be satisfactorily performed by following the instructions in the chart. When properly aligned, the discriminator does not respond to amplitude modulation and since an AM type signal generator is used for aligning the FM circuits, it is necessary to detune the discriminator secondary and leave it that way until all of the FM circuits have been aligned. After completing the alignment of the FM circuits, proceed to align the discriminator secondary by applying a 4.3 Mc AM signal to the control grid (pin #7) of the 2nd FM converter tube and adjusting the discriminator secondary core for minimum audio output. No adjustment of the FM circuits should be attempted with AM after the discriminator secondary has been properly aligned.

ALIGNMENT PROCEDURE WHEN USING AM MODULATED SIGNAL  
GENERATOR AND STANDARD OUTPUT METER FOR COMPLETE RECEIVER ALIGNMENT

STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
<b>455 Kc IF CHANNEL ALIGNMENT</b>							
1.	1620 Kc	BC	.1 mf	12BE6 (V-2) BC Conv. Grid (Pin #1)	455 Kc	1,2,3 & 4	Adjust for maximum output.
<b>BROADCAST BAND ALIGNMENT</b>							
2.	1620 Kc (gang fully opened)	BC	.1 mf	12BE6 (V-2) BC Conv. Grid (Pin #1)	1620 Kc	5	This sets oscillator to dial. (Calibrate pointer by fully closing gang and noting position of pointer slider. Pointer slider should be in line with right hand hole in dial background bracket as shown in Figure 7.)
3.	1400 Kc	BC	None	Radiation loop*	1400 Kc	6	Tune in signal with receiver tuning knob, then peak trimmer 6.
<b>4.3 Mc IF CHANNEL ALIGNMENT</b>							
4.	-	-	-	-	-	7	Detune discriminator secondary by screwing core out as far as it will go.
5.	(extreme high frequency end)	FM	.001 mf	12AT7 (V-1) 2nd FM Converter Grid (#7 Pin)	4.3 Mc	8,9,10,11, 12, 13 & 14	Adjust for maximum output.
<b>FM BAND ALIGNMENT</b>							
6.	-	-	-	-	-	15	Check the position of the FM Osc. tuning core 15. Set spacing between the core and bakelite piece to which it is mounted, to two turns from tight by turning tuning core slotted nut.

MOTOROLA INC.

MODELS 77XM21, 77XM22, 77XM22B,  
CHASSIS HS-102

## ALIGNMENT (cont'd)

STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
7.	98 Mc	FM	None	FM Ant. terminal	98 Mc	18	Tuner is set to 98 Mc by moving cores out with tuning shaft until spacing between bakelite pieces is 1-9/32". See illustration. Peak 18 for maximum output
8.	90 Mc	FM	None	FM Ant. terminal	90 Mc	19 & 20	Tune in signal with receiver tuning knob, then adjust 19 and 20 for maximum output.
9.	105 Mc	FM	None	FM Ant. terminal	105 Mc	16 & 17	Tune in signal with receiver tuning knob, then adjust 16 and 17 for maximum output.
10.	-	-	-	-	-	-	Repeat steps 8 & 9 several times until further adjustment does not increase the output. Make the final trimmer adjustment at 105 Mc. (i.e., trimmers 19 & 20 at 105 Mc.)
11.	105 Mc	FM	None	Radiate signal (or use station after performing Step 12)	105 Mc	19	Adjust for maximum output with built-in antenna connected.
<b>ALIGN DISCRIMINATOR SECONDARY</b>							
12.	-	FM	.001 mf	12AT7 (V-1) 2nd FM Converter Grid (Pin #7)	4.3 Mc	7	Adjust discriminator secondary for minimum response. The correct adjustment is sharply defined minimum response point between the two peaks.

\* Connect output of signal generator to a 5" diameter, 3 turn loop and radiate signal into receiver loop. Minimum distance between loops should never be less than 12".

## ALIGNMENT PROCEDURE WHEN USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

## STEP

## OPERATION

455 Kc IF Channel Alignment

1. Same as Step 1 in Chart I (Use AM signal generator)

Broadcast Band Alignment

2. Same as Steps 2 & 3 in Chart I (Use AM signal generator)

4.3 Mc IF Channel Alignment-Use FM Signal Generator & Oscilloscope

3. (A) Discriminator

1. Connect the input terminals of the oscilloscope vertical amplifier to the high side of the receiver volume control and B-.
2. Connect the FM generator synchronizing voltage output terminals to a phase shifting network, consisting of a variable 1/2 megohm resistor in series with a .002 mf capacitor. The input to the oscilloscope horizontal amplifier is connected across the .002 mf capacitor. See Figure 5. (This phase shifting network may not work with every oscilloscope. Different values of R & C may be required.)
3. Apply an FM 4.3 Mc signal (125 Kc deviation) through a .001 mf capacitor to the control grid (pin #1) of tube V-4 in the third FM IF Amplifier stage.
4. Adjust discriminator primary (8) for maximum amplitude. The phase shifting network resistor is adjusted to give only one trace.

MODELS 77XM21, 77XM22, 77XM22B, MOTOROLA INC.  
CHASSIS HS-102

5. Adjust discriminator secondary (7) until a symmetrical pattern is obtained, with peaks occurring at about 100 Kc above and below 4.3 Mc and is substantially linear between peaks. The trace should pass through the intersection of the vertical and horizontal axis. The phase shifting network should be adjusted to give only a single pattern at all times. See Figure 6. It will be necessary to go over discriminator primary (8) and secondary (7) adjustments several times before a pattern of maximum amplitude and correct symmetry is obtained.

(B) 4.3 Mc IF Amplifiers

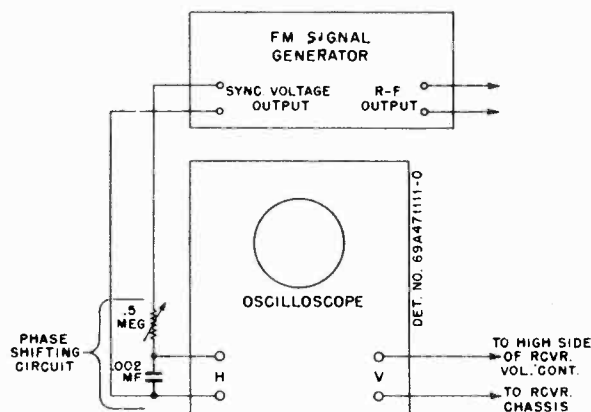
1. Apply an FM 4.3 Mc signal (100 Kc deviation) to the control grid (pin #1) of tube V-3 in the 2nd FM IF amplifier stage, through a .001 mf capacitor and adjust both primary and secondary cores (9 & 10) to get a symmetrical pattern as before, with peaks occurring at a slightly lower deviation.
2. Apply an FM 4.3 Mc signal (100 Kc deviation) to the control grid (pin #1) of tube V-2 and adjust both primary and secondary cores (11 & 12) until a symmetrical pattern substantially linear between peaks, is obtained.
3. Apply an FM 4.3 Mc signal (100 Kc deviation) to the FM antenna terminal and adjust both primary and secondary cores (13 & 14) until a symmetrical pattern substantially linear between peaks, is obtained.

FM Band Alignment - Use FM Signal Generator & Output Meter

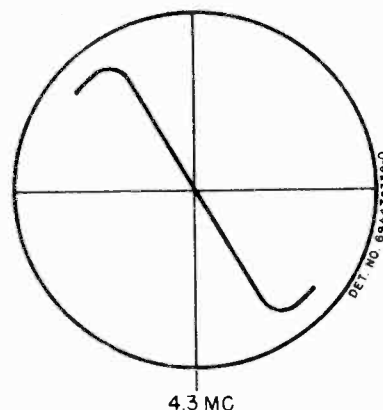
4. Check the position of the FM oscillator tuning core (15). Set the spacing between the core and the bakelite piece to two turns from tight by turning tuning core slotted nut.
5. Connect generator output directly to the receiver FM antenna terminal.
6. Set receiver tuner to 98 Mc by moving cores out with tuning shaft until spacing between bakelite pieces is 1-9/32". See Figure 4. Also set FM signal generator to 98 Mc. (22-1/2 Kc deviation). Adjust FM oscillator trimmer (18) for maximum output.
7. Set FM signal generator to 90 Mc (22-1/2 Kc deviation). Tune in signal with receiver tuning knob and then adjust FM variable IF & FM antenna trimmers (19 & 20) for maximum output.
8. Set FM signal generator to 105 Mc (22-1/2 Kc deviation). Tune in signal with receiver tuning knob and then adjust variable IF and antenna cores (16 & 17) for maximum indication on output meter.

Repeat steps 7 & 8 several times until further adjustment does not increase the output. Make the final trimmer adjustment at 105 Mc. (i.e., trimmers 19 & 20 at 105 Mc.)

9. Close FM antenna link on loop panel. Radiate an FM 105 Mc (22-1/2 Kc deviation) signal into FM antenna (line cord). Tune in signal with receiver tuning knob and then repeak FM antenna trimmer (19).

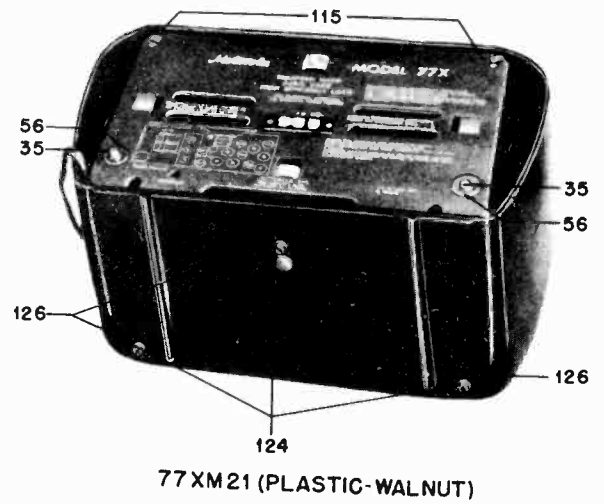
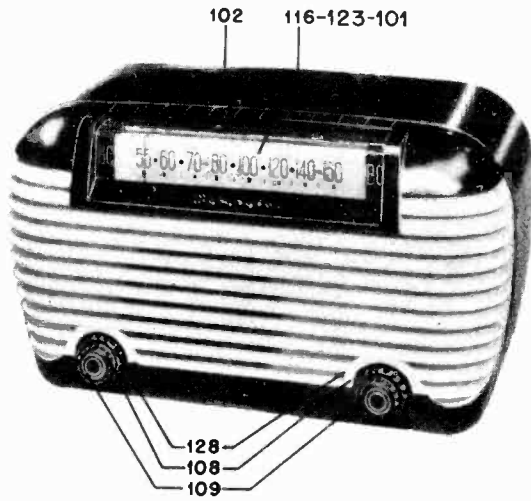


SIGNAL GENERATOR &  
OSCILLOSCOPE HOOK-UP

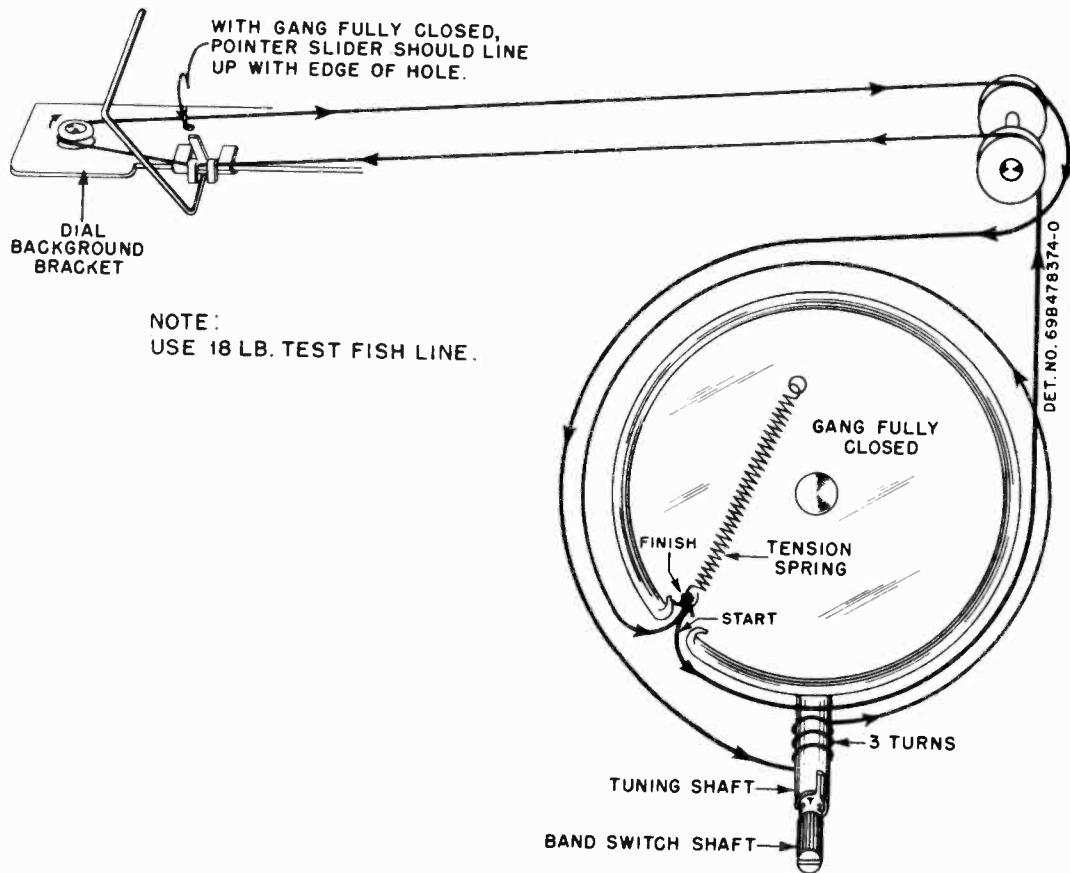


OSCILLOSCOPE PATTERN

MOTOROLA INC. MODELS 77XM21, 77XM22, 77XM22B,  
CHASSIS HS-102



PARTS LOCATION - CABINET



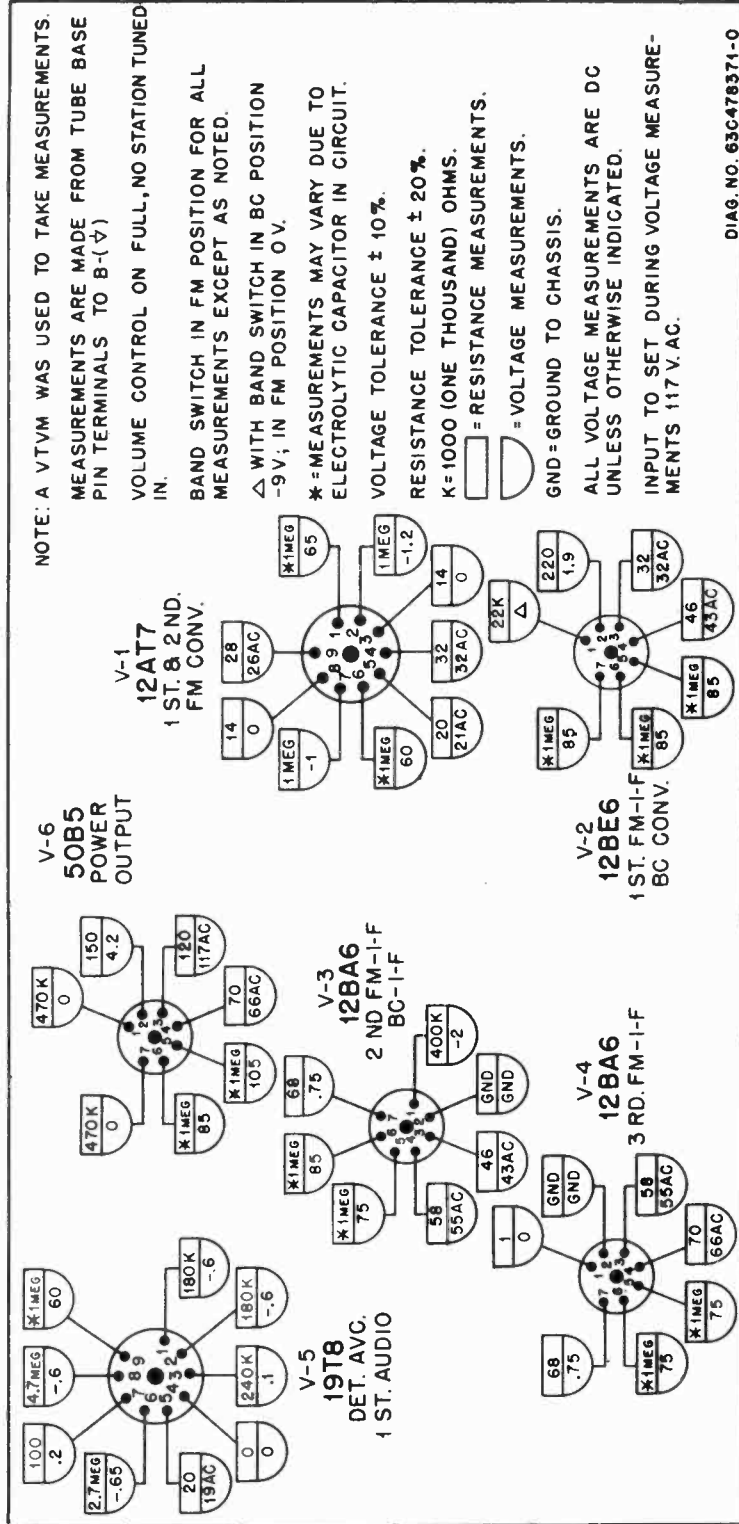
STRING DRIVE

POWER SUPPLY - 105-125 Volts AC-DC, 35 watts

MODELS 77XM21, 77XM22, 77XM22B,  
CHASSIS HS-102

MOTOROLA INC.

(FRONT OF CHASSIS)



NOTE: A VTVM WAS USED TO TAKE MEASUREMENTS. MEASUREMENTS ARE MADE FROM TUBE BASE PIN TERMINALS TO B(-V) VOLUME CONTROL ON FULL, NO STATION TUNED IN.

BAND SWITCH IN FM POSITION FOR ALL MEASUREMENTS EXCEPT AS NOTED.

△ WITH BAND SWITCH IN BC POSITION -9V; IN FM POSITION 0V.

\* = MEASUREMENTS MAY VARY DUE TO ELECTROLYTIC CAPACITOR IN CIRCUIT.

VOLTAGE TOLERANCE ± 10%.

RESISTANCE TOLERANCE ± 20%.

K = 1000 (ONE THOUSAND) OHMS.

□ = RESISTANCE MEASUREMENTS.

○ = VOLTAGE MEASUREMENTS.

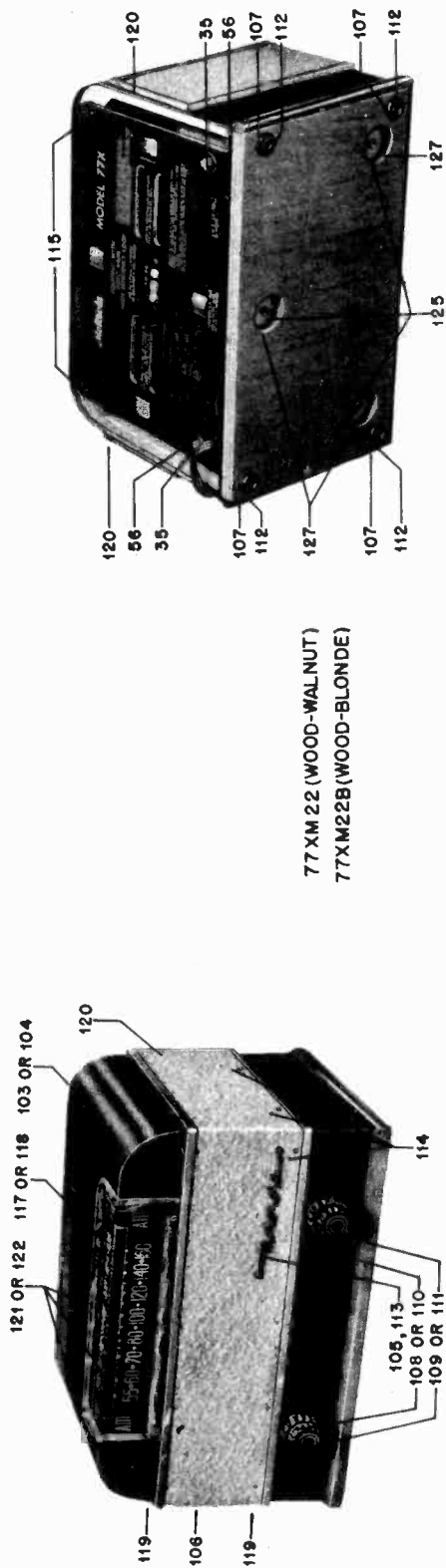
GND = GROUND TO CHASSIS.

ALL VOLTAGE MEASUREMENTS ARE DC UNLESS OTHERWISE INDICATED.

INPUT TO SET DURING VOLTAGE MEASUREMENTS 117 V. AC.

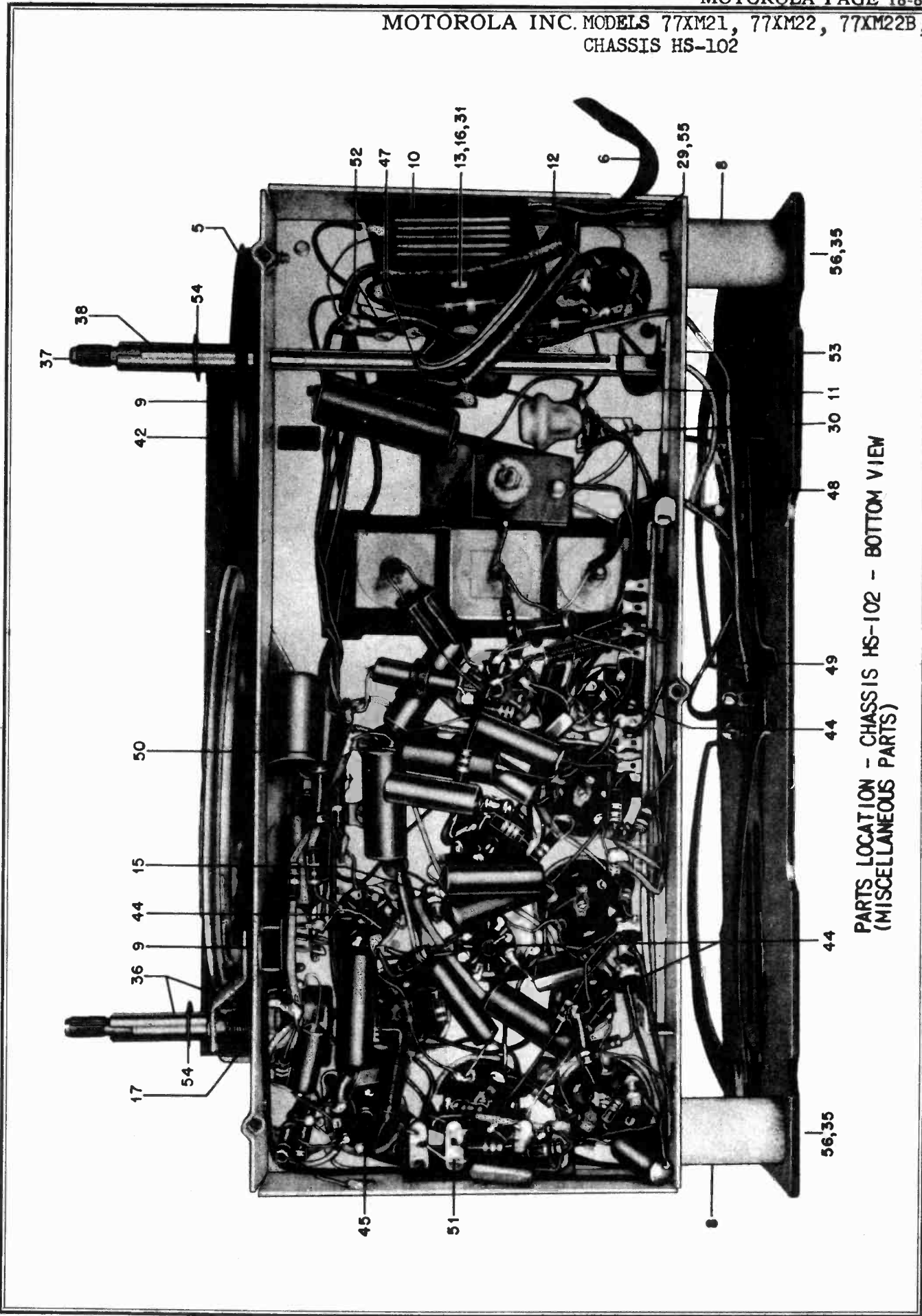
DIAG. NO. 633C478371-0

BOTTOM VIEW OF CHASSIS VOLTAGE & RESISTANCE DIAGRAM



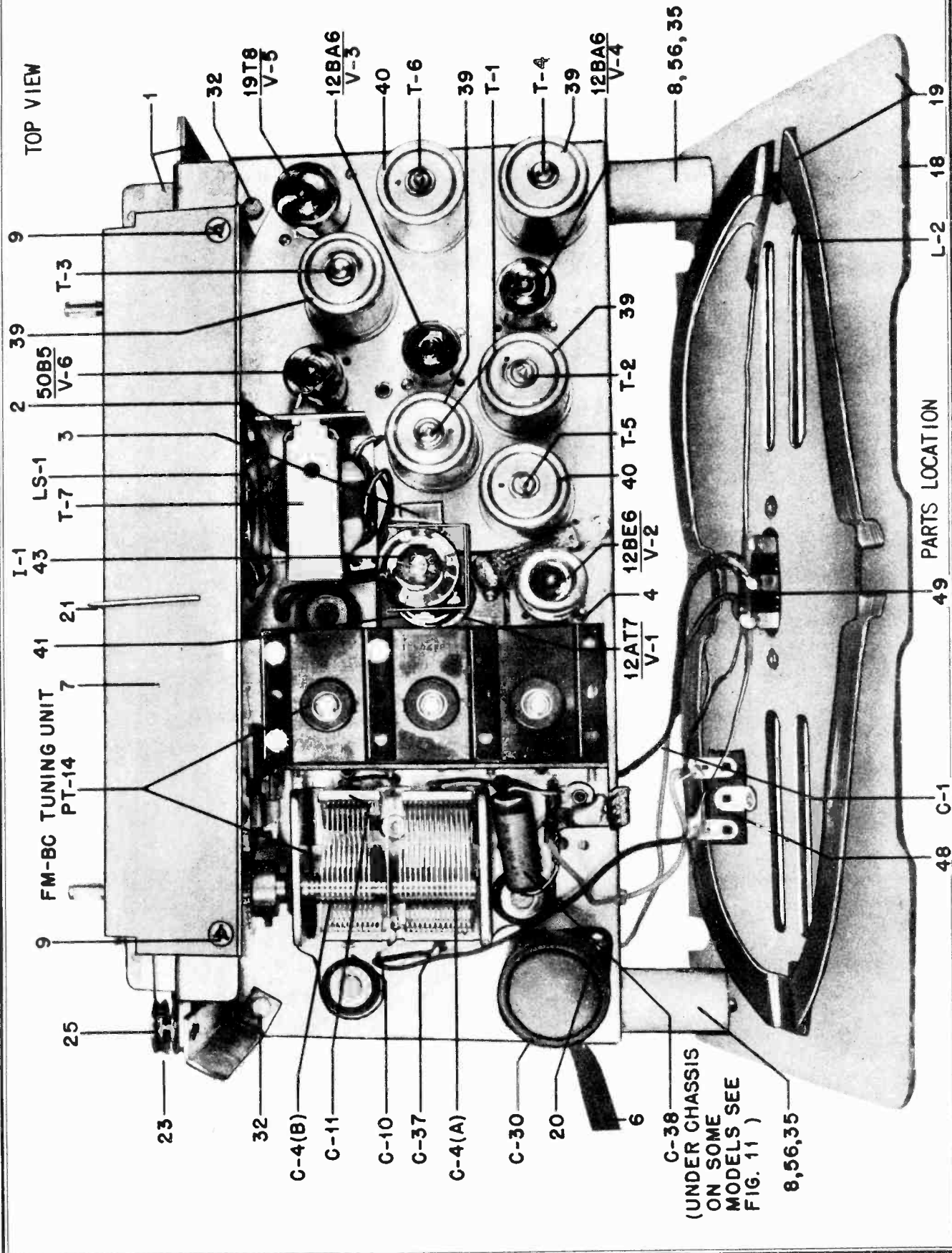
77XM22 (WOOD-WALNUT)  
77XM22B (WOOD-BLONDE)

MOTOROLA INC. MODELS 77XM21, 77XM22, 77XM22B,  
CHASSIS HS-102



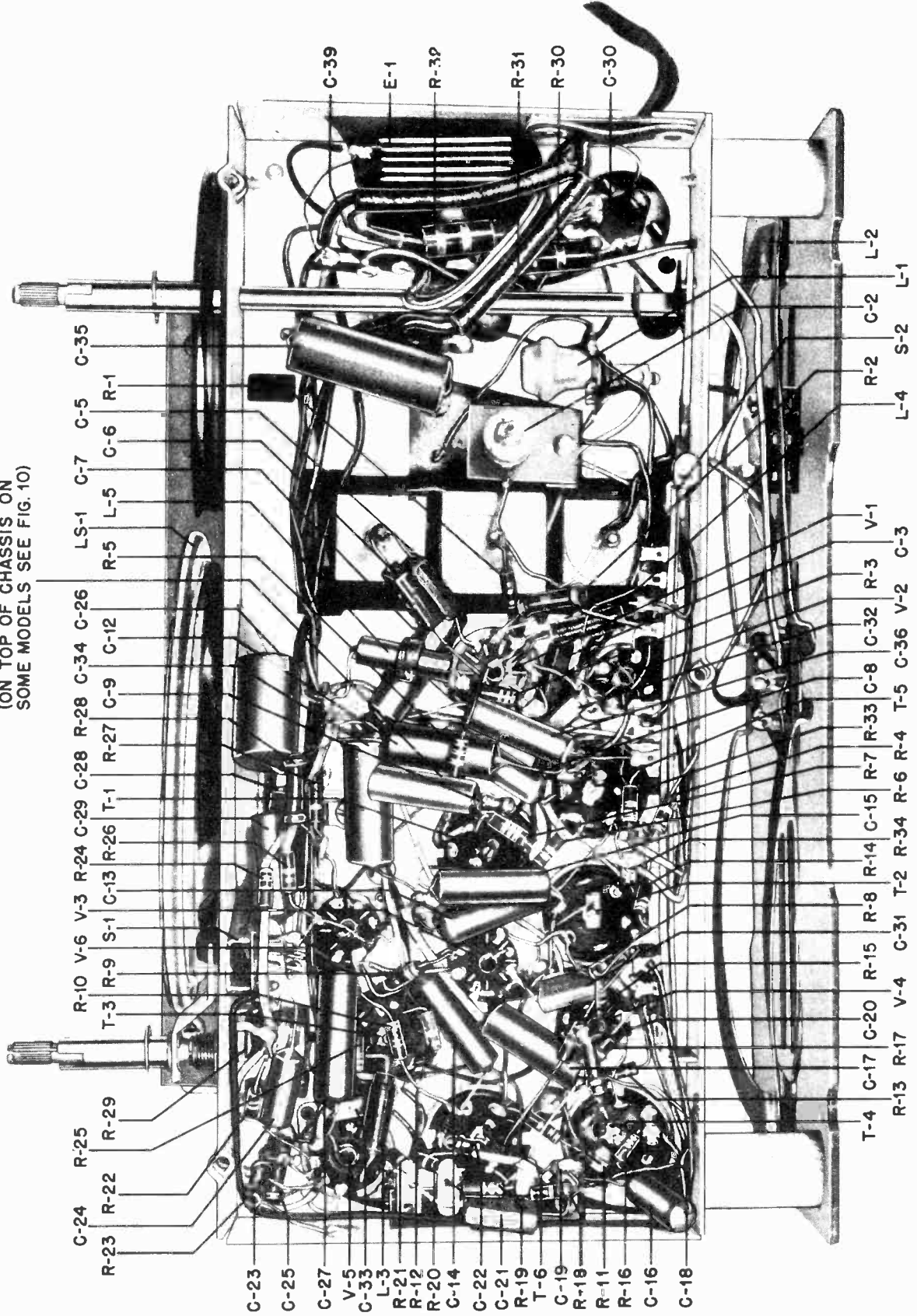
PARTS LOCATION - CHASSIS HS-102 - BOTTOM VIEW  
(MISCELLANEOUS PARTS)

MODELS 77XM21, 77XM22, 77XM22B. MOTOROLA INC.  
CHASSIS HS-102



MOTOROLA INC. MODELS 77XM21, 77XM22, 77XM22B,  
CHASSIS HS-102

C-38  
(ON TOP OF CHASSIS ON  
SOME MODELS SEE FIG. 10)

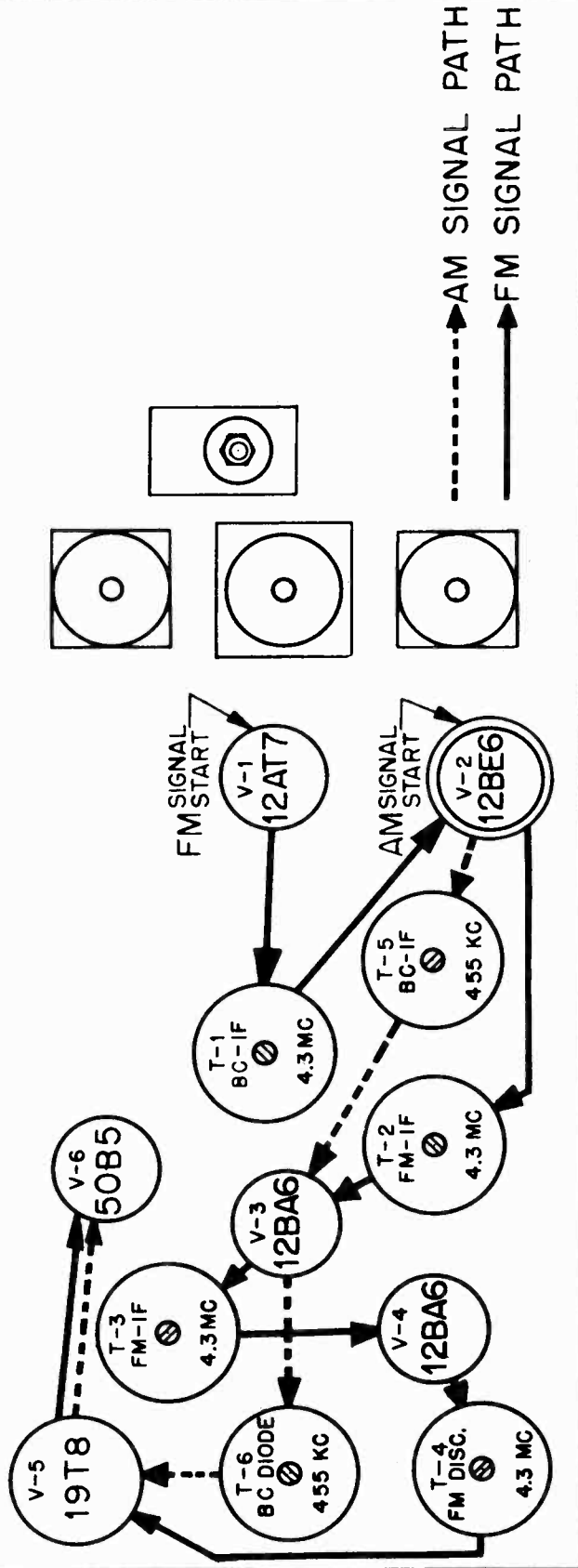


PARTS LOCATION - CHASSIS HS-102 - BOTTOM VIEW  
(CAPACITORS, RESISTORS, COILS, TRANSFORMERS, SWITCHES)

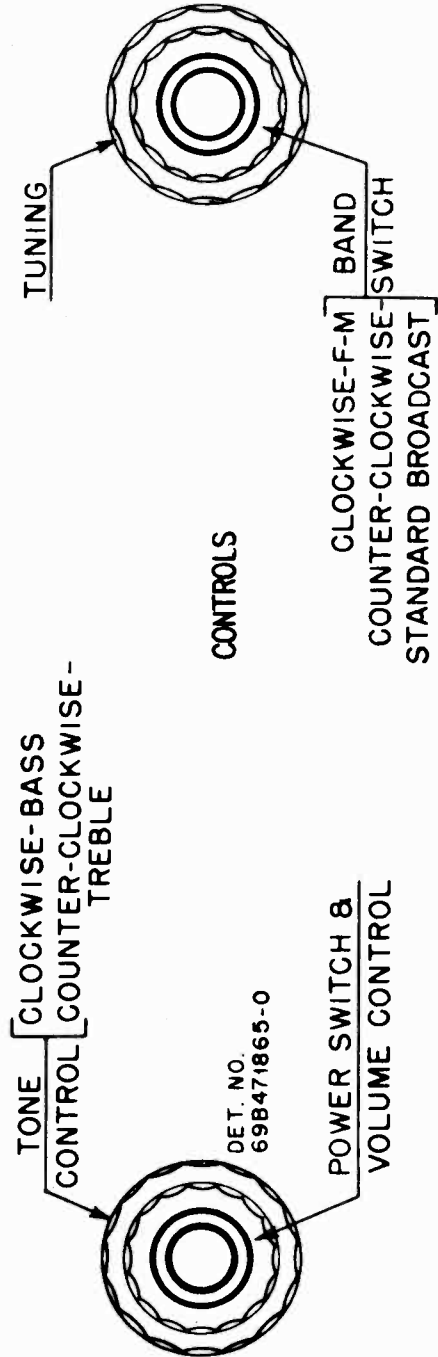


DETAIL NO. 69 B 478366-0

BC & FM SIGNAL PATHS THROUGH RECEIVER



BOTTOM OF CHASSIS



MOTOROLA INC.

MODELS 77XM21, 77XM22, 77XM22B,  
CHASSIS HS-102

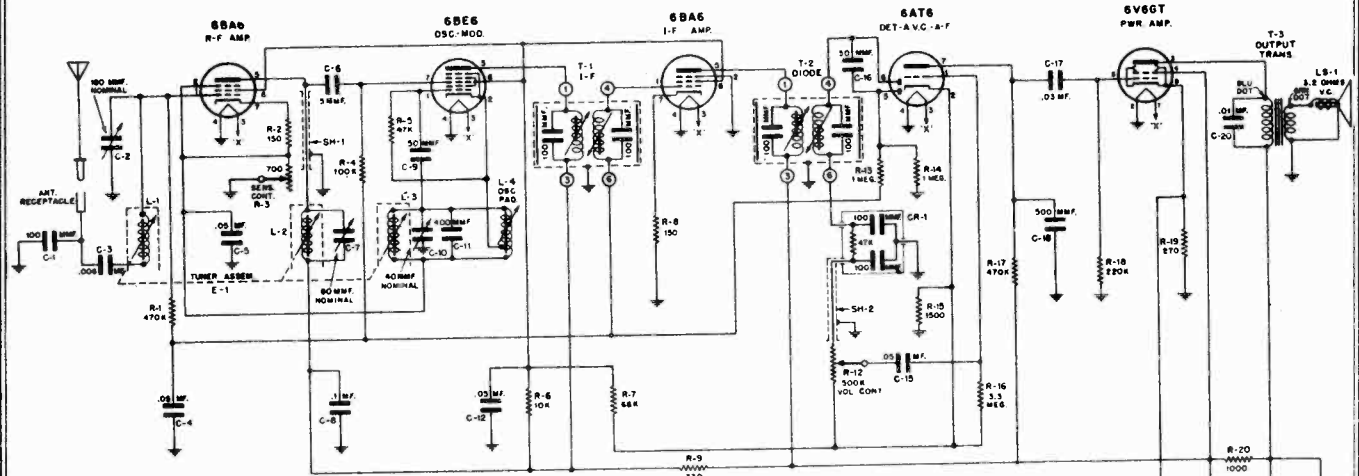
REF. NO.	PART NO.	DESCRIPTION
<b>CHASSIS PARTS HS-102</b>		
<b>CAPACITORS</b>		
C-1	21K470578	Special: 3.5 mmf .....
C-2	19A470426	Trimmer: variable air; 2.5 mmf to 30 mmf
C-3	21R2730	Silver Mica: 500 mmf 500V .....
C-4	19K75415	Variable: 2 gang; cut oscillator plates; with trimmers C-10, C-11 & C-37 .....
C-5	21R2729	Silver Mica: 250 mmf 500V .....
C-6	21R2729	Silver Mica: 250 mmf 500V .....
C-7	8S9802	Paper: .02 mf 400V .....
C-8	8S9825	Paper: .01 mf 200V .....
C-9	21K77373	Ceramic: 50 mmf 500V .....
C-10	-	Trimmer: Part of gang capacitor C-4 .....
C-11	-	Trimmer: Part of gang capacitor C-4 .....
C-12	8K471636	Paper: .1 mf 200V .....
C-13	8S9801	Paper: .01 mf 100V .....
C-14	8S9825	Paper: .01 mf 200V .....
C-15	8S9825	Paper: .01 mf 200V .....
C-16	8S9825	Paper: .01 mf 200V .....
C-17	8S9801	Paper: .01 mf 100V .....
C-18	21K28816	Ceramic: 25 mmf 500V .....
C-19	21B77286	Ceramic: 100 mmf 500V .....
C-20	21B77286	Ceramic: 100 mmf 500V .....
C-21	21R6639	Mica: 500 mmf 500V .....
C-22	21K77373	Ceramic: 50 mmf 500V .....
C-23	21B470567	Ceramic: 4700 mmf 500V .....
C-24	8A24966	Paper: .005 mf 100V .....
C-25	21K77375	Ceramic: 250 mmf 500V .....
C-26	8A470504	Paper: .25 mf 50V .....
C-27	8S9809	Paper: .01 mf 400V .....
C-28	8K471635	Paper: .05 mf 400V .....
C-29	8A471019	Paper: .02 mf 400V .....
C-30	23B470429	Electrolytic: 40 mf 200V, 20-20 mf 150V; includes insulating tube .....
C-31	21R6638	Mica: 1000 mmf 500V .....
C-32	21R6638	Mica: 1000 mmf 500V .....
C-33	21R6638	Mica: 1000 mmf 500V .....
C-34	8A471823	Paper: .05 mf 200V .....
C-35	8S9816	Paper: .05 mf 400V .....
C-36	8S9801	Paper: .01 mf 100V .....
C-37	-	Trimmer: Part of gang capacitor C-4 .....
C-38	8S9802	Paper: .02 mf 400V .....
C-39	21R6642	Mica: 50 mmf 500V .....
<b>RECTIFIER</b>		
E-1	48B90140	Selenium type: half wave .....
<b>DIAL LIGHT</b>		
I-1	65A470930	Lamp, incandescent: 117V, 10 watts; clear
<b>COILS</b>		
L-1	24A470556	BC Oscillator .....
L-2	24K470598	Loop Antenna: winding only .....
L-3	24A74989	Filament choke .....
L-4	24A74989	Filament choke .....
L-5	24A470505	RF Choke .....
<b>SPEAKER</b>		
LS-1	50K471004	5" PM; 3.2 ohm voice coil .....
<b>RESISTORS</b>		
Note: All resistors are 1/2 watt ± 20% insulated type, unless otherwise specified.		
R-1	6K6004	1 meg .....
R-2	6F3996	15,000 not insulated .....
R-3	6R6046	1 meg 10% .....
R-4	6F6015	220,000 .....

REF. NO.	PART NO.	DESCRIPTION
R-5	6R6028	22,000 .....
R-6	6R6028	22,000 .....
R-7	6R6434	27,000 10% .....
R-8	6R6028	22,000 .....
R-9	6R2039	68 10% .....
R-10	6R6301	1000 .....
R-11	6R6301	1000 .....
R-12	6R6028	22,000 .....
R-13	6R2039	68 10% .....
R-14	6F3927	2.2 meg .....
R-15	6F6056	47,000 .....
R-16	6R6410	33,000 10% .....
R-17	6F6015	220,000 .....
R-18	6K6182	150,000 .....
R-19	6K6001	68,000 .....
R-20	6R6015	220,000 .....
R-21	6R6075	100,000 .....
R-22	6K6018	100 .....
R-23	6F2122	4.7 meg .....
R-24	6F6393	1200 10% .....
R-25	6R6075	100,000 .....
R-26	6R6032	470,000 .....
R-27	6F6393	1200 10% .....
R-28	6F6293	150 not insulated .....
R-29	18A47042	Volume Control: .5 meg; tapped at 25,000 ohms; with SPST switch; grooved shaft .
R-30	6R476004	1000 2 watt .....
R-31	6R3968	180 10% 2 watt .....
R-32	6R3994	27 10% 2 watt .....
R-33	6R3933	220 .....
R-34	6R6015	220,000 .....
<b>SWITCHES</b>		
S-1	40K21758	Slider switch: SPDT .....
S-2	40B470432	Bandswitch .....
<b>TRANSFORMERS</b>		
T-1	24B471868	1st IF, 4.3 Mc; complete with iron cores and padding capacitors, but less shield
T-2	24B471870	2nd IF, 4.3 Mc; complete with iron cores and padding capacitors, but less shield
T-3	24B471672	3rd IF, 4.3 Mc; complete with iron cores and padding capacitors, but less shield
T-4	24B471674	Discriminator, 4.3 Mc; complete with iron cores and padding capacitors, but less shield .....
T-5	24B75487	IF, 455 Kc: complete with iron cores and padding capacitors, but less shield ...
T-6	24B471666	Diode: 455 Kc: complete with iron cores and padding capacitors, but less shield
T-7	25K471947	Output .....
<b>MISC. CHASSIS PARTS</b>		
1	1X77345	Background Support & Pulleys Assembly ..
2	7A471005	Bracket, output transformer mtg .....
3	7K470917	Bracket, pilot light mounting .....
4	26A24869	Base, tube shield .....
5	11M8944	Cord, dial: 18 lb; black .....
6	30K31258	Cord, line and plug: 3 conductor .....
7	35B77311	Dial Background: tan plastic; with reinforcing strip .....
8	57K470568	Dowel, back mounting: wood, 1-3/16" long
9	5S7805	Eyelet, snap-in (dial background mtg) ..
10	14A470428	Insulator, rectifier: armite .....
11	1X470545	Lever & Rivet Assembly (on band switch shaft) .....

MODELS 77XM21, 77XM22, 77XM22B,  
CHASSIS HS-102

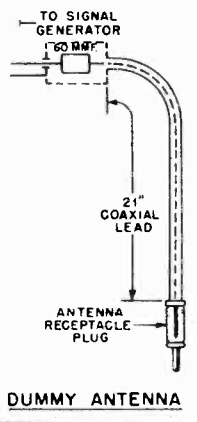
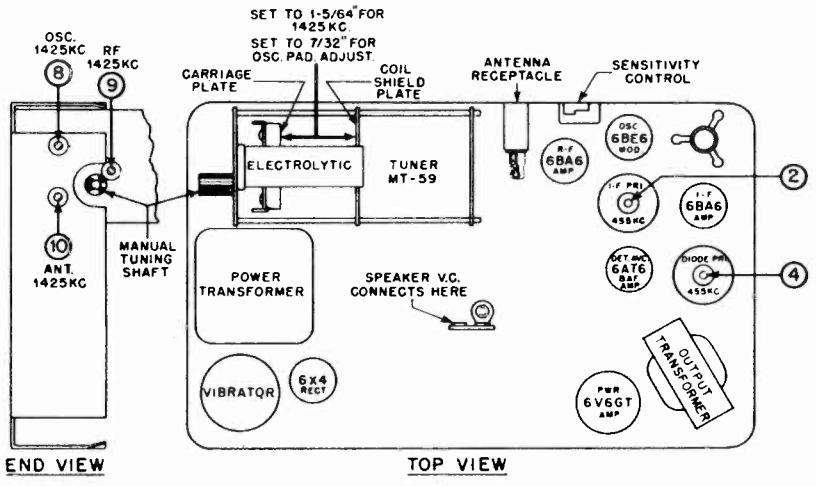
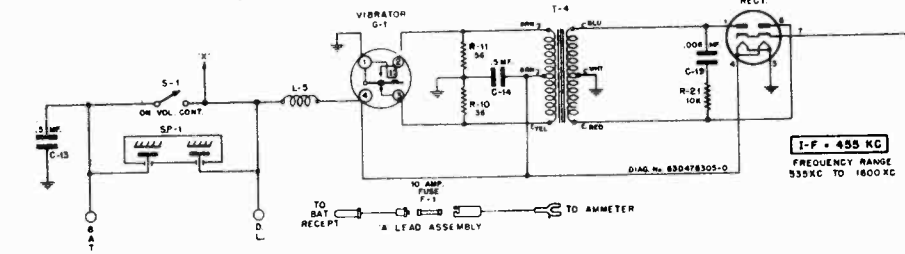
MOTOROLA INC.

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
12	32K31259	Lock, line cord: fibre .....	49	31A470403	Strip, terminal: 3 screw; with jumper (Ext Ant. terminals) .....
13	4S7650	Lockwasher: #8 internal (rectifier mtg).	50	31A471913	Strip, terminal: 4 insulated lugs, #2 ground .....
14	4S7657	Lockwasher: #8 external (speaker & output transformer bracket mtg) .....	51	31K75232	Strip, terminal: 4 insulated lugs, #3 mtg
15	29R5227	Lug, soldering: #6L; hot-tinned .....	52	31K22174	Strip, terminal: 4 insulated lugs, #4 mtg
16	2S7002	Nut: 6-32 x 5/16 hex; cadmium plated (rectifier mtg) .....	53	4A70015	Washer, "C" (band sw shaft retainer) ...
17	2S7051	Nut: 3/8-32 x 9/16-hex Painut; cadmium plated (volume control mtg) .....	54	4A73639	Washer, "C" (tuning & tone shaft retainer) .....
18	1X471711	Panel Assembly, cabinet back: less loop winding, but includes 3 screw terminal strip and 2 lug terminal strip .....	55	4S1719	Washer: 3/8 x .140 x .030 thick; steel; cadmium plated (line cord lock mtg) ...
19	24K471696	Panel & Loop Assembly, cabinet back: complete cabinet back panel, including loop winding .....	56	4S7613	Washer: 3/4 x 13/64 x .027 thick; steel; antique copper finish (back panel mtg).
<b>CABINET PARTS - MODELS 77XM21, 22 &amp; 22B</b>					
20	9A12705	Plate, electrolytic mounting: bakelite ..	101	7A77382	Bracket, dial scale mounting (77XM21) ..
21	52A77307	Pointer & Slider Assembly: painted red..	102	16K471767	Cabinet, table model: molded; walnut plastic (77XM21) .....
22	49A12646	Pulley, cord: 1/4 groove .....	103	1X470901	Cabinet Assembly, table model: wood; walnut (77XM22) .....
23	49A21552	Pulley, cord: 1/2 groove .....	104	1X478163	Cabinet Assembly, table model: wood; blonde finish (77XM22B) .....
24	5A71246	Rivet, shoulder: .187 long (cord pulley mounting) .....	105	42A71091	Clip, speed (logotype overlay mtg - 77XM22 & 22B) .....
25	5A15045	Rivet, shoulder: .437 long (cord pulley mounting) .....	106	35B470687	Cloth, grille: mounted on cardboard strip (77XM22 & 22B) .....
26	5S8497	Rivet: .088 x 1/8 steel; nickel plated (socket mtg) .....	107	37K15841	Foot, rubber (77XM22 & 22B) .....
27	5S7707	Rivet: .122 x 5/32 steel; nickel plated (tone sw & pilot light bracket mtg) ...	108	36A470602	Knob, control (large): walnut plastic (77XM21 & 22) .....
28	5S7701	Rivet: .122 x 3/16 steel; nickel plated (electrolytic plate mtg) .....	109	36A470604	Knob, control (small): walnut plastic (77XM21 & 22) .....
29	5S7708	Rivet: .122 x 9/32 steel; nickel plated (line cord lock mtg) .....	110	36K471712	Knob, control (large): mottled tan plastic (77XM22B) .....
30	3S7506	Screw: #6 x 1/4 PKZ plain hex head sheet metal screw; cadmium plated (BC Osc coil mtg) .....	111	36K471713	Knob, control (small): mottled tan plastic (77XM22B) .....
31	3S2927	Screw: 6-32 x 7/8 slotted hex head machine screw; cadmium plated (rectifier mtg) .....	112	22S7953	Nail, wire: .080 x 5/8 steel (cabinet foot mtg - 77XM22 & 22B) .....
32	3S7454	Screw: #8 x 1/4 PKZ plain hex head sheet metal screw; cadmium plated (background support bracket mtg) .....	113	62K76926	Overlay, logotype (77XM22 & 22B) .....
33	3S7163	Screw: 8-32 x 1/4 slotted hex head machine screw; cadmium plated (speaker output trans. brkt. mtg) .....	114	22S1633	Pin, escutcheon: brass, .066 x 3/8 (grille cloth mtg) .....
34	3S7481	Screw: #8 x 3/4 PKZ slotted hex head sheet metal screw; cadmium plated (tuner mtg) .....	115	38A25507	Plug, split: 5/8 long (for holding back panel to cabinet) .....
35	3S7530	Screw: #8 x 1-1/2 PKZ slotted hex head sheet metal screw; cadmium plated (back panel mtg) .....	116	34C470601	Scale, dial (77XM21) .....
36	1X470546	Shaft & Arm Assembly (tone control shaft)	117	34K470663	Scale, dial & escutcheon (77XM22) .....
37	47A470405	Shaft, band switch: grooved .....	118	34K471638	Scale, dial & escutcheon (77XM22B) ....
38	47A470404	Shaft, tuning: brass .....	119	64B470690	Strip, trim: long; brushed brass finish (77XM22 & 22B) .....
39	26B70107	Shield, coil (shield for T-1, T-2, T-3 and T-4) .....	120	64K471774	Strip, trim: end piece; brushed brass finish (77XM22 & 22B) .....
40	1X71049	Shield & Sleeve Assembly (shield for T-5 and T-6) .....	121	3S1317	Screw: #2 x 3/8 Phillips ovalhead wood screw; statuary bronze finish (escutcheon mtg - 77XM22) .....
41	28A478109	Shield, light & static (used behind dial light) .....	122	3S1328	Screw: #2 x 3/8 Phillips ovalhead wood screw; brass plated (escutcheon mtg - 77XM22B) .....
42	28A470805	Shield, speaker baffle & light: fibre...	123	3S7155	Screw: 6-32 x 3/16 slotted hex head machine screw; cadmium plated (77XM21 dial scale mtg) .....
43	9A470407	Socket, dial light & bracket .....	124	3S8117	Screw: #8 x 1 PKZ slotted hex head sheet metal screw; antique copper finish (77XM21 chassis mtg) .....
44	9A470506	Socket, tube: miniature, 7 prong; black bakelite .....	125	3S7526	Screw: #8 x 1-1/8 PKA slotted hex head sheet metal screw; cadmium plated (chassis mtg 77XM22 & 22B) .....
45	9K470425	Socket, tube: noval, 9 prong; black bakelite .....	126	32A20575	Washer: paper; 3/8 x .171 x .062 thick (used under 77XM21 chassis mtg screws to prevent cracking bakelite cabinet) ...
46	41A14244	Spring, tension coil (drive cord spring) .....	127	4S8204	Washer: 1" x .203 x .067 steel; copper plated (chassis mtg 77XM22 & 22B) ....
47	31K83993	Strip, terminal: 2 insulated lugs, #1 mtg	128	4K77702	Washer: paper; 1" x 1/2 x 1/32 thick; dark brown (used under control knobs on 77XM21)
48	31K15026	Strip, terminal: 2 insulated lugs, #2 mtg (on rear panel) .....			



T-1 & T-2 CONNECTIONS  
(BOTTOM VIEW)  
(TERMINALS 2 & 5 - DUMMY LEADS)

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



**ALIGNMENT**

**EQUIPMENT REQUIRED**

1. A special tool for adjusting the tuner cores. Use Alignment Tool, Motorola Part No. 68A76278.
2. A small screwdriver for IF & RF alignment.
3. An accurately calibrated AM modulated signal generator.
4. A low range output meter.
5. A special dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 1. The 21" coaxial lead needed in its construction is the same type as used for lead-in on Motorola car antenna.

**PROCEDURE**

1. Remove the front and rear housings. All adjustments are now exposed.
2. Connect a PM speaker (3.2 ohm VC) to VC terminal and chassis of receiver and connect the output meter across the voice coil. If the receiver internal speaker is used, ground receiver front housing to chassis.
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. Set receiver volume control at maximum.
4. SENSITIVITY CONTROL - This control must be set to provide  $2 \pm 1/2$  volts bias on the RF tubes before alignment is started. Measure this voltage between sensitivity control terminal and chassis.
5. For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.
6. IF ALIGNMENT
  - A. Connect high side of signal generator through .1 mf capacitor to 6BE6 grid (pin #7) and the low side to chassis. Set generator to 455 Kc and peak adjustments (1, 2, 3 & 4), in this order, for maximum output.
  - B. Check alignment by repeating procedure.

**7. RF ALIGNMENT**

- A. Connect signal generator to antenna receptacle through special dummy antenna (60 mmf capacitor in series with 21" coax lead).
- B. Move carriage plate (by turning manual tuning shaft) to extreme high frequency position and screw coil cores out so that at least 1-1/8" of all three cores shall be outside of the coil shield can. Set signal generator to 1605 Kc and peak trimmers (5, 6 and 7), in this order.
- C. Move the carriage plate (by turning manual shaft) so carriage plate is spaced exactly 1-5/64" from coil shield plate. Set signal generator to 1425 Kc and adjust coil cores (8, 9 & 10), in this order, for maximum output.
- D. Move carriage plate (by turning manual tuning shaft) so carriage plate is spaced approximately 7/32" from coil shield plate. Leave signal generator connected but turn signal generator power off. Peak oscillator padder core (11) for maximum noise. If the padder core must be moved more than 1/2 turn from its original position, the carriage plate should be moved to extreme high frequency position, the coil cores (8, 9 & 10) should be screwed out so that 1-1/8" of each core is exposed and steps 7A, B, C & D repeated until it is necessary to move the padder core less than 1/2 turn in this step.

**IMPORTANT:** Do not push in on the alignment tool when adjusting the tuner cores. The slightest inward pressure on the alignment tool may move the tuner carriage and result in inaccurate alignment.

8. SETTING THE SENSITIVITY CONTROL - After alignment is completed, set signal generator to 600 Kc and adjust its output to 1.3 microvolts. Adjust the sensitivity control to provide 1 watt output (1 watt = 1.79 volts on output meter).

9. ANTENNA TRIMMER ADJUSTMENT - Once steps 7A, B, C, D & 8 have been satisfactorily performed, no further adjustment of any alignment screws should be made except to align the antenna trimmer (7) to car antenna after receiver is installed in car. This adjustment should be made with antenna fully extended and receiver set to approximately 1400 Kc. Peak the trimmer for maximum volume of a weak station or background noise between stations.

MODEL 408

**HOUSING PARTS**

- 13D472890 Escutcheon (complete) .....
- 1X472751 Housing, front: includes 2 grounding wipers; less escutcheon .....
- 15D472547 Housing, rear .....
- 5S7730 Rivet: .122 x 1/8 steel; antique copper finish (grounding wiper mtg) .....
- 3S3394 Screw: #8 x 1/4 slotted hex head thread cutting type: cad. pl. (escutch.mtg) ..
- 3S7456 Screw: #8 x 1/4 PKA slotted acorn head sheet metal screw; antique copper finish (housing screws) .....
- 3S2696 Screw: #10 x 3/8 PKA plain hex washer head sheet metal screw; cad. pl. (spkr.mtg)
- 39K470032 Wiper, grounding .....

**ACCESSORIES**

- 3A51494 Bolt, "J" (receiver mtg) .....
- 8A4491 Capacitor, generator .....
- 1X74340 Lead Assembly, dial light: complete with bulb
- 9B473111 Lead Assembly, fuse: complete with 10 amp fuse
- 4S7653 Lockwasher: 5/16 int-ext; cadmium plated (receiver mtg) .....
- 3S2863 Nut: 5/16-18 x 9/16 hex; cad.pl (receiver mounting) .....
- 1K75148 Shaft, flexible: with hsg; 24" long ...
- 6X4141 Suppressor, distributor .....

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
<b>CHASSIS PARTS - ELECTRICAL</b>					
<b>CAPACITORS</b>					
C-1	21B77682	Ceramic: 100 mmf 500V .....	R-13	6R6004	1 Meg .....
C-2	20B472549	Trimmer, variable mica: range 50 to 180 mmf (on same bracket as C7 & C10 and sold only as assembly) .....	R-14	6R6004	1 Meg .....
C-3	8A4529	Paper: .006 mf 100V .....	R-15	6R6161	1,500 .....
C-4	8A13514	Paper: .05 mf 100V .....	R-16	6R2118	3.3 Meg .....
C-5	8A13514	Paper: .05 mf 100V .....	R-17	6R6032	470,000 .....
C-6	21K70720	Molded: 5mmf 500V.....	R-18	6R6016	220,000 .....
C-7	20B472549	Trimmer, variable mica: range 50 to 180 mmf (on same bracket as C2 & C10 and sold only as assembly).....	R-19	6R6336	270 10% 1W .....
C-8	8K13166	Paper: .1 mf 400V .....	R-20	6R478004	1,000 2W .....
C-9	21R6513	Mica: 50 mmf 300V .....	R-21	6R6054	10,000 .....
or	21K74661	Ceramic: 50 mmf 300V .....	<b>SWITCHES</b>		
C-10	20B472549	Trimmer, variable mica: range 30 to 80 mmf (on same bracket as C2 & C7 and sold only as assembly) .....	S-1		Power Switch (Part of volume control)
C-11	21A71872	Ceramic: 400 mmf 5% 500V .....	<b>SHIELD</b>		
C-12	8A14791	Paper: .05 mf 400V .....	SH-1 &		
C-13	8A17028	Paper: .5 mf 100V .....	SH-2	30K472998	Cable, shielded: 5' long, single conductor
C-14	8A19133	Paper: .5 mf 100V .....	<b>SPARK PLATE</b>		
C-15	8A13514	Paper: .05 mf 100V .....	SP-1	1X472741	Spark Plate Assembly .....
C-16	21R6513	Mica: 50 mmf 300V .....	<b>TRANSFORMERS</b>		
or	21K74661	Ceramic: 50 mmf 300V .....	T-1 &		
C-17	8A71911	Paper: .03 mf 400V .....	T-2	24B76553	Diode or IF, 455 Kc: complete with padding capacitors and tuning iron cores, but less shield .....
C-18	21R6639	Mica: 500 mmf 500V .....	T-3	25B70171	Output .....
C-19	8A12840	Paper: .006 mf 1800V .....	T-4	25B472533	Power .....
C-20	8K23690	Paper: .01 mf 400V .....	<b>TUNER</b>		
C-21	23A473015	Electrolytic: 30-30-20 mf/360-300-25V ..		1X472702	Manual Tuner MT-59 .....
<b>CAPACITOR-RESISTOR</b>					
CR-1	21A473040	Capacitor-Resistor: 100 mmf 47,000 ohms, 100 mmf .....	<b>CHASSIS PARTS - MECHANICAL</b>		
<b>FUSE</b>					
F-1	65A10266	10 Amp (3AG) .....	42A4215		Clip, vibrator grounding .....
<b>VIBRATOR</b>					
G-1	48B3333	Non-sync: 4 pin .....	58A480774		Coupling, tinnerman shaft (on vol. control)
<b>COILS</b>					
L-1 &			1X70646		Receptacle, antenna .....
L-2*	24B71861	RF & Antenna Coil: (Specify color of paint dots on old coil when ordering) .....	5S7771		Rivet: .088 x 3/16 steel; nickel plated (tube socket mtg) .....
L-3*	24B71879	Oscillator Coil (Specify color of paint dot on old coil when ordering) .....	5S7706		Rivet: .122 x 1/8 steel; nickel plated (terminal strip mtg and sensitivity control mtg) .....
L-4	24B70227	Oscillator padder coil: complete with iron tuning core .....	5S7707		Rivet: .122 x 5/32 steel; nickel plated (tube socket mtg) .....
L-5	24A472535	Choke, hash .....	5S7701		Rivet: .122 x 3/16 steel; nickel plated (vibrator grounding clip mtg and output transformer mtg) .....
<b>SPEAKER</b>					
LS-1	50B76582 or 50B473955	5-1/4" PM; 3.2 ohm VC .....	3S8140		Screw: #8 x 3/16 PKZ plain hex head sheet metal screw; cadmium plated (tuner mtg).
<b>RESISTORS</b>					
Note: All resistors are 1/2W, 20% insulated carbon type, unless otherwise specified.					
R-1	6R6032	470,000 .....	3S7454		Screw: #8 x 1/4 PKZ plain hex head sheet metal screw; cadmium plated (spark plate assembly & capacitor assembly mtg) ....
R-2	6R3992	150 .....	3S3397		Screw: #8 x 5/16 PKZ plain hex head sheet metal screw; cad. pl. (nwr.transf.mtg)..
R-3	18K77552	Sensitivity Control: 700 ohms .....	26A472747		Shield, hash .....
R-4	6R6075	100,000 .....	1A71049		Shield and Sleeve Assembly (for T-1 & T-2)
R-5	6R6056	47,000 .....	9A70208		Socket, tube: 4 prong (for vibrator) ...
R-6	6R476080	10,000 2W .....	9A472534		Socket, tube: miniature; 7 prong .....
R-7	6R6001	68,000 .....	9A6788		Socket, tube: octal .....
R-8	6R3992	150 .....	31K37504		Strip, terminal: 1 insulated lug, #1 mtg
R-9	6R6010	330 .....	31K66128		Strip, terminal: 2 insulated lugs, #2 mtg
R-10	6R5614	56 10% .....	31A472573		Strip, terminal: 2 insulated lugs, #2 mtg
R-11	6R5614	56 10% .....	7A472614		Support, vol. cont. shaft alignment ....
R-12	18A480773	Volume Control: 500,000; with SPST switch	4S7555		Washer: 1/4 x .128 x .033 thick; cadmium plated (output transf. mtg) .....

\*Part of Tuner MT-59

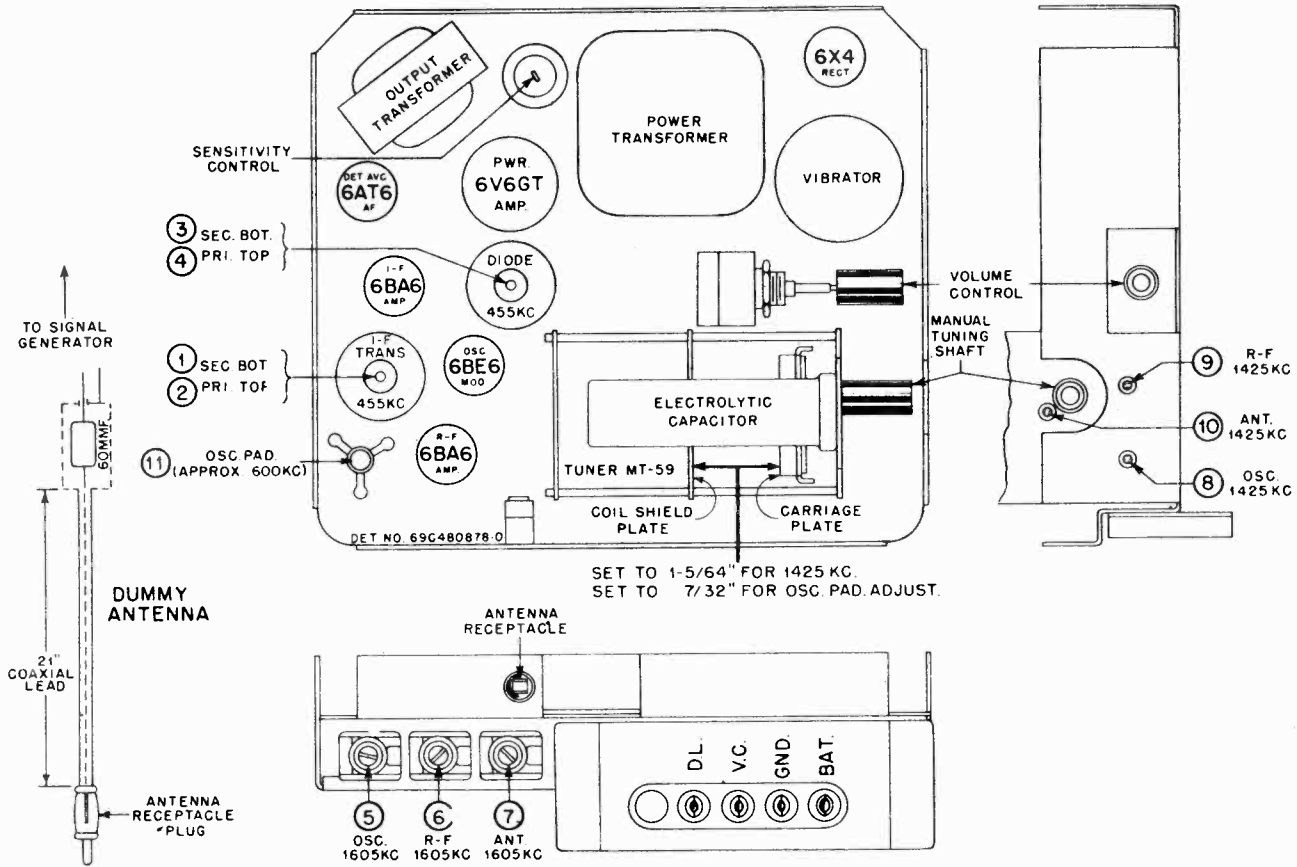


FIGURE 1. TUBE & TRIMMER LOCATIONS

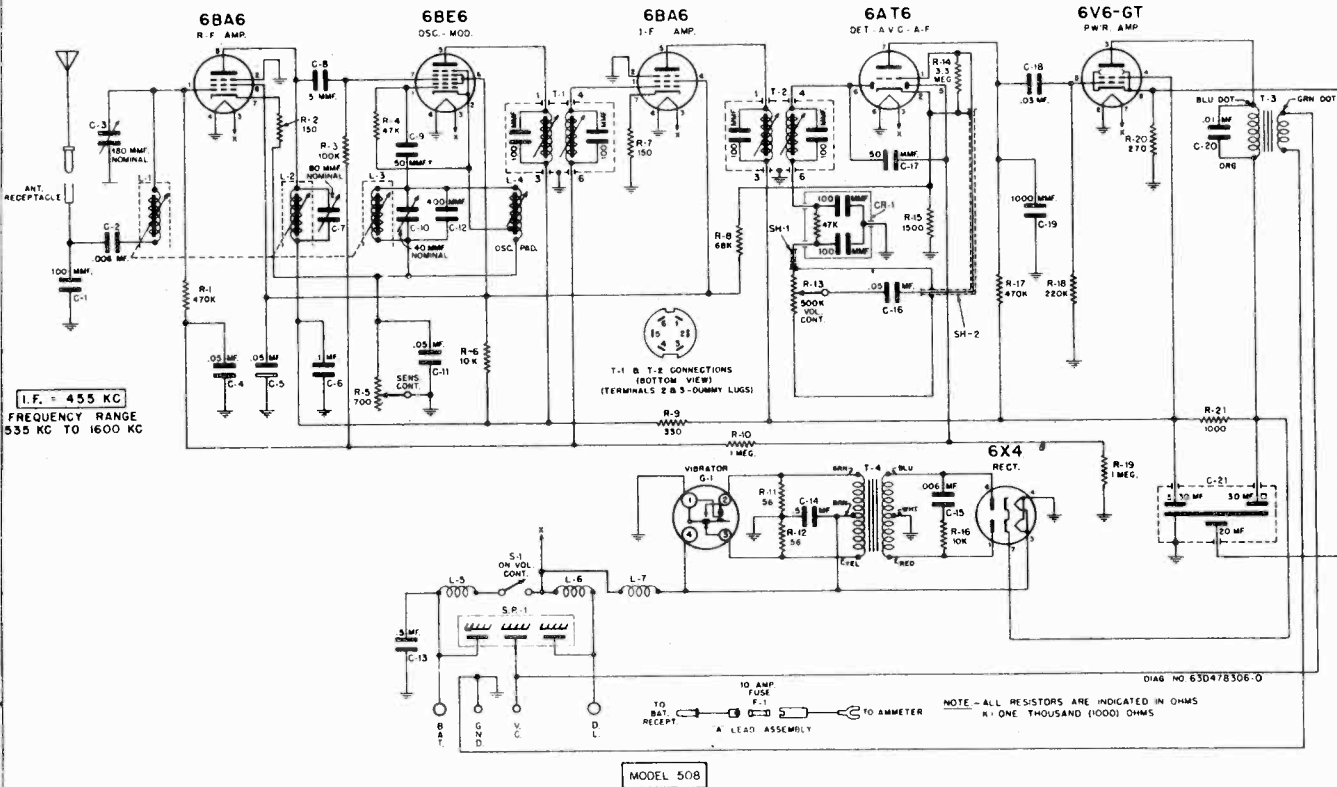


FIGURE 2. SCHEMATIC DIAGRAM

MOTOROLA INC.

MODEL 508

CHASSIS PARTS - ELECTRICAL

CAPACITORS

- C-1 21B77562 Ceramic: 100 mmf 500V .....
- C-2 8A4529 Paper: .006 mf 100V .....
- C-3 20B77538 Trimmer, variable: 50 to 180 mmf; on same bracket as C-7 and C-10 (sold only as assembly) .....
- C-4 8A13514 Paper: .05 mf 100V .....
- C-5 8A14791 Paper: .05 mf 400V .....
- C-6 8K13166 Paper: .1 mf 400V .....
- C-7 20B77538 Trimmer, variable: 50 to 180 mmf; on same bracket as C-2 and C-10 (sold only as assembly) .....
- C-8 21K70720 Molded: 5 mmf 500V .....
- C-9 21R6513 Mica: 50 kmf 300V .....
- or 21K74661 Ceramic: 50 mmf 300V .....
- 6-10 20B77538 Trimmer, variable: 30 to 60 mmf; on same bracket as C-2 and C-7 (sold only as assembly) .....
- C-11 8A13514 Paper: .05 mf 100V .....
- C-12 21A71872 Ceramic: 400 mmf 5% 500V .....
- C-13 8A17028 Paper: .5 mf 100V .....
- C-14 8A17028 Paper: .5 mf 100V .....
- C-15 8A12840 Paper: .006 mf 1600V .....
- C-16 8A13514 Paper: .05 mf 100V .....
- C-17 21R6513 Mica: 50 mmf 300V .....
- or 21K74661 Ceramic: 50 mmf 300V .....
- C-18 8A71911 Paper: .03 mf 400V .....
- C-19 21K478410 Ceramic: 1000 mmf 500V .....
- C-20 8K23690 Paper: .01 mf 400V .....
- C-21 23A473015 Electrolytic: 30-30-20 mf/350-300-25V ..

CAPACITOR-RESISTOR

- CR-1 21A472571 Capacitor-Resistor: 100 mmf - 47,000 ohms 100 mmf .....

FUSE

- F-1 65A10266 10 Amp (3AG) .....

VIBRATOR

- G-1 48B3333 Non-sync: 4 pin .....

COILS

- \*L-1,2 24B71861 RF & Antenna Coil (specify color of paint dots on old coil when ordering) .....

- \*L-3 24B71879 Oscillator Coil (specify color of paint dots on old coil when ordering) .....
- L-4 24B70227 Oscillator Padder Coil: complete with iron tuning core .....
- L-5,6 24K78026 Choke .....
- L-7 24A472535 Choke, hash .....

RESISTORS

Note: All resistors are 1/2W 20% carbon insulated type unless otherwise specified.

- R-1 6R6032 470,000 .....
- R-2 6R3982 150 .....
- R-3 6R6075 100,000 .....
- R-4 6R6056 47,000 .....
- R-5 18K77552 Sensitivity Control: 700 ohms .....
- R-6 6R478060 10,000 2% .....
- R-7 6R3982 150 .....
- R-8 6R6001 68,000 .....
- R-9 6R6010 330 .....
- R-10 6R6004 1 Meg .....
- R-11 6R5614 56 10% .....
- R-12 6R5614 56 10% .....
- R-13 1A472531 Volume Control: 500,000 ohms; includes SPST switch .....
- R-14 6R2118 3.3 Meg .....
- R-15 6R6181 1,500 .....
- R-16 6R6054 10,000 .....
- R-17 6R6032 470,000 .....
- R-18 6R6015 220,000 .....
- R-19 6R6004 1 Meg .....
- R-20 6R6336 270 10% 1W .....

- R-21 6R476004 1,000 2W .....

SWITCHES

- S-1 - Power (part of volume control) .....

SHIELD

- SH-1 30A77553 Cable, shield: 5" long .....
- SH-2 30K472991 Cable, shield 10" long .....

SPARK PLATE

- SP-1 1X78041 Spark Plate Assembly: mtg. brkt. included

-Part of Tuner MT-59



MODEL 508

MOTOROLA INC.

**TRANSFORMERS**

- T-1 & T-2 24B76553 Diode or IF, 455 Kc: complete with padding capacitors and tuning iron cores, but less shield
  - T-3 25B70171 Output Transformer
  - T-4 25B472533 Power Transformer
- TUNER**
- 1X472702 Manual Tuner MT-59

**CHASSIS PARTS - MECHANICAL**

- 42A13177 Clip, center post grounding
- 42A4215 Clip, vibrator grounding
- 1X70646 Receptacle, antenna
- 5S7771 Rivet: .088 x 3/16 steel; nickel plated (tube socket mtg)
- 5S7706 Rivet: .122 x 1/8 steel; nickel plated (terminal strip mtg, sensitivity control and center post grounding clip mtg)
- 5S7707 Rivet: .122 x 5/32 steel; nickel plated (tube socket mtg)
- 5S7701 Rivet: .122 x 3/16 steel; nickel plated (vibrator grounding clip and output transformer mtg)
- 3S8140 Screw: #8 x 3/16 PKZ plain hex head sheet metal screw; cad. pl. (tuner, capacitor bracket assembly and spark plate mtg)
- 3S3397 Screw: #8 x 5/16 PKZ plain hex head sheet metal screw; cad. pl. (power transformer mtg)
- 1A71049 Shield and Sleeve Assembly (for T-1 & T-2)
- 9A70208 Socket, tube: 4 pin; with grounding lug (vibrator socket)
- 9A472534 Socket, tube: miniature; 7 prong
- 9A6788 Socket, tube: octal
- 31C4079 Strip, terminal; 1 insulated lug, end mtg.

- 31A472573 Strip, terminal: 2 insulated lugs, #2 mtg
  - 31K16350 Strip, terminal: 3 insulated lugs, #3 mtg
- HOUSING PARTS**
- 42A472033 Clip, chassis retainer
  - 15C472812 Escutcheon, plastic
  - 1X78020 Housing and Bushing Assembly, rear
  - 15C77560 Housing, front; less escutcheon
  - 3S3394 Screw: #8 x 1/4 slotted hex head thread cutting screw; cad. pl. (escutcheon mounting)
  - 3S7456 Screw: #8 x 1/4 PKA slotted acorn head sheet metal screw; antique copper finish (housing screws)

**ACCESSORIES**

- 65X4151 Bulb, pilot light: 6-8V; clear; bayonet base
  - 8A4491 Capacitor, generator
  - 9B473111 Lead Assembly, fuse: complete with 10 amp fuse
  - 1X74340 Lead Assembly, dial light: complete with bulb
  - 1X76859 Lead Assembly, speaker: 2 conductor, 36" long, with pin terminals on one end
  - 4S7653 Lockwasher: 5/16 int-ext; cad. pl. (receiver mounting)
  - 2S2863 Nut: 5/16-18 x 9/16 hex; cadmium plated (receiver mtg)
  - 1K75148 Shaft, flexible: with housing; 24" long
  - 50B473118 or 50B473119 or 50B473686 or 50B473697 or 50B473783 Speaker: 6" PM; 3.2 ohm V.C; less speaker lead
  - 3A77542 Stud, receiver mtg
  - 6X4141 Suppressor, distributor
- Exchange

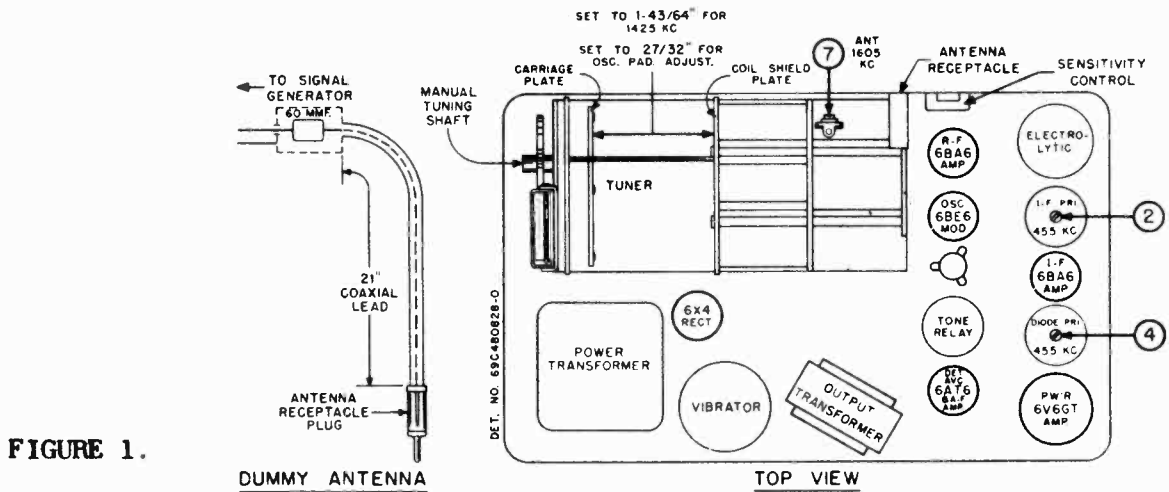


FIGURE 1.

DUMMY ANTENNA

TUBE & TRIMMER LOCATIONS

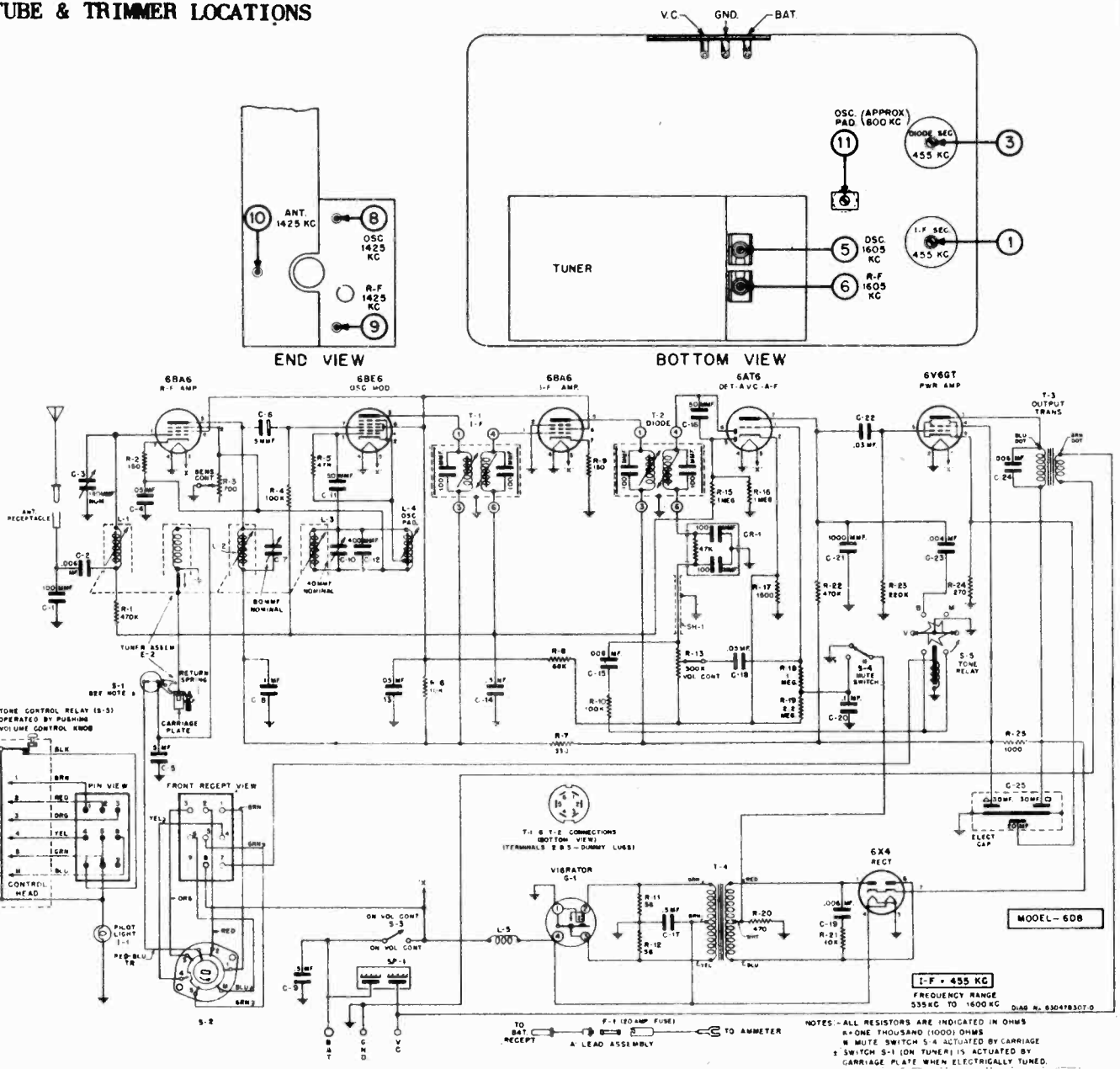


FIGURE 2. SCHEMATIC DIAGRAM

MODEL 608

MOTOROLA INC.

**ELECTRICAL CHASSIS PARTS**

**CAPACITORS**

- C-1 21B77562 Ceramic: 100 mmf 500V .....
- C-2 8A4529 Paper: .006 mf 100V .....
- C-3\* 20K472613 Trimmer, variable mica: range 50 to 180 mmf; with bracket .....
- C-4 8A13514 Paper: .05 mf 100V .....
- C-5 8A19153 Paper: .5 mf 100V .....
- C-6 21K70720 Molded: 5 mmf 500V .....
- C-7\* 20K472613 Trimmer, variable mica: range 50-180 mmf; with bracket .....
- C-8 8K15166 Paper: .1 mf 400V .....
- C-9 8A17028 Paper: .5 mf 100V .....
- C-10\* 20K472612 Trimmer, variable mica: range 30 to 60 mmf; with bracket .....
- C-11 21R6513 Mica: 50 mmf 300V .....
- C-12 21A71872 Ceramic: 400 mmf 5% 500V .....
- C-13 8A14791 Paper: .05 mf 400V .....
- C-14 8A13514 Paper: .05 mf 100V .....
- C-15 8A71910 Paper: .006 mf 400V .....
- C-16 21R6513 Mica: 50 mmf 300V .....
- C-17 8A19133 Paper: .5 mf 100V .....
- C-18 8A13514 Paper: .05 mf 100V .....
- C-19 8A12840 Paper: .006 mf 1600V .....
- C-20 8A472035 Paper: .1 mf 100V .....
- C-21 21K478410 Ceramic: 1000 mmf 500V .....
- C-22 8A71911 Paper: .03 mf 400V .....
- C-23 8A71909 Paper: .004 mf 400V .....
- C-24 8A71910 Paper: .006 mf 400V .....
- C-25 23A473015 Electrolytic: 30-30-20 mf/350-300-25V ..

**CAPACITOR-RESISTOR**

- CR-1 21A472571 Capacitor-Resistor: 100 mmf-47,000 ohms-100 mmf .....

**FUSE**

- F-1 65K4637 Fuse: 20 Amp (3AG) .....

**VIBRATOR**

- G-1 48B3333 Vibrator, non-sync: 4 pin .....

**COILS**

- L-1 & L-2\* 24B71861 RF & Antenna coil (specify color of paint dots on old coil when ordering) .....

- L-3\* 24B71879 Oscillator Coil (specify color of paint dots on old coil when ordering) .....
- L-4 24B70227 Osc. padder coil: complete with iron tuning core .....
- L-5 24A472535 Choke, hash .....

**RESISTORS**

NOTE: All resistors are 1/2 watt, 20% insulated, carbon type unless otherwise specified.

- R-1 6R6032 470,000 .....
- R-2 6R3982 150 .....
- R-3 18K77552 Control, sensitivity: 700 ohm .....
- R-4 6R6075 100,000 .....
- R-5 6R6056 47,000 .....
- R-6 6R476080 10,000 2W .....
- R-7 6R6010 330 .....
- R-8 6R6001 68,000 .....
- R-9 6R3982 150 .....
- R-10 6R6075 100,000 .....
- R-11 6R5614 56 10% .....
- R-12 6R5614 56 10% .....
- R-13 18A480773 Volume Control: 500,000; with SPST switch .....
- R-15 6R6004 1 meg .....
- R-16 6R6004 1 meg .....
- R-17 6R6161 1500 .....
- R-18 6R6004 1 meg .....
- R-19 6R3927 2.2 meg .....
- R-20 6R3949 470 .....
- R-21 6R6054 10,000 .....
- R-22 6R6032 470,000 .....
- R-23 6R6015 220,000 .....
- R-24 6R6336 270 10% 1W .....
- R-25 6R476004 1,000 2W .....

**SWITCHES**

- S-1\* 1B70944 Solenoid Switch: with mtg plate .....
- S-2\* 40B70962 Selector switch .....
- S-3 - Power Switch (part of volume control) .....
- S-4\* 40A472644 Mute Switch .....
- S-5 1X78040 Type MR6 Tone Relay .....

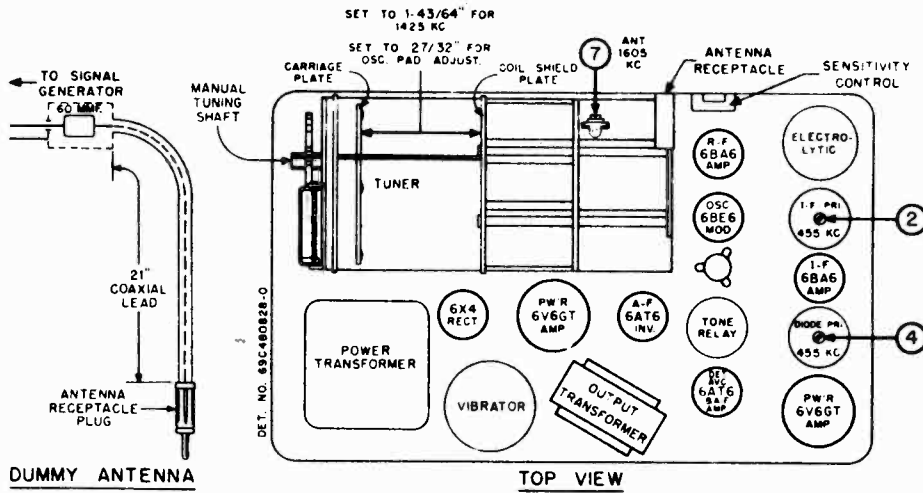
\*Part of Tuner ST-60



MODEL 708

MOTOROLA INC.

FIGURE 1.



TUBE & TRIMMER LOCATIONS

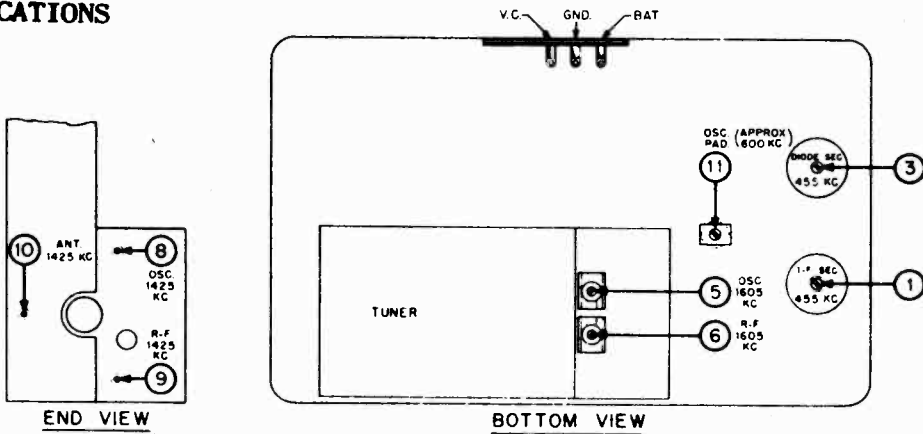


FIGURE 2. SCHEMATIC DIAGRAM

REF. NO.	PART NO.	DESCRIPTION
<b>CHASSIS PARTS - ELECTRICAL</b>		
<b>CAPACITORS</b>		
C-1	21B77582	Ceramic: 100 mmf 500V .....
C-2*	8A4529	Paper: .006 mf 100V .....
C-3*	20K472613	Trimmer, variable mica: 50 to 180 mmf; includes mounting bracket .....
C-4	8A13514	Paper: .05 mf 100V .....
C-5*	8A19133	Paper: .5 mf 100V .....
C-6	8A13514	Paper: .05 mf 100V .....
C-7*	20K472613	Trimmer, variable mica: 50 to 180 mmf; includes mounting bracket .....
C-8	21K70720	Molded: 5 mmf 500V .....
C-9	8K13166	Paper: .1 mf 400V .....
C-10*	20K472612	Trimmer, variable mica: 30 to 60 mmf; includes mounting bracket .....
C-11	21R6513	Mica: 50 mmf 300V .....
	or	
	21K74661	Ceramic: 50 mmf 300V .....
C-12	21A71872	Ceramic: 400 mmf 5% 500V .....
C-13	8A14791	Paper: .05 mf 400V .....
C-14	8A17028	Paper: .5 mf 100V .....
C-15	8A4529	Paper: .006 mf 100V .....
C-16	21R6513	Mica: 50 mmf 300V .....
	or	
	21K74661	Ceramic: 50 mmf 300V .....
C-17	8A13514	Paper: .05 mf 100V .....
C-18	8A472035	Paper: .1 mf 100V .....
C-19	8A19133	Paper: .5 mf 100V .....
C-20	8K15166	Paper: .007 mf 1600V .....
C-21	8A4736	Paper: .002 mf 400V .....
C-22	21R6639	Mica: 500 mmf 500V .....
C-24	8K71911	Paper: .03 mf 400V .....
C-25	8K71911	Paper: .03 mf 400V .....
C-26	8K13165	Paper: .003 mf 1000V .....
C-27	23A472570	Electrolytic: 30-20 mf/400-350V .....
<b>CAPACITOR-RESISTOR</b>		
CR-1	21A472571	Capacitor-Resistor: 100 mmf - 47,000 ohms 100 mmf .....
<b>FUSE</b>		
F-1	65K4637	Fuse: 20 Amp (3AG) .....
<b>VIBRATOR</b>		
G-1	48E3333	Vibrator, non-sync: 4 pin .....
<b>PILOT LIGHT</b>		
I-1	65X4151	Bulb: 6-8V, bayonet base; type #51 .....
<b>COILS</b>		
L-1 & L-2*	24B71881	RF & Antenna Coil (Specify color of paint dots on old coil when ordering) .....
L-3*	24B71879	Oscillator coil (Specify color of paint dots on old coil when ordering) .....
L-4	24B70227	Oscillator padder coil: complete with iron tuning core .....
L-5	24C473954	Choke, hash .....
<b>RESISTORS</b>		
Note: All resistors are 1/2 watt, 20%, insulated carbon type, unless otherwise specified.		
R-1	6R6082	470,000 .....
R-2	6R3982	150 .....
R-3	18K77552	Sensitivity Control: 700 ohms .....
R-4	6R6075	100,000 .....
R-5	6R6056	47,000 .....
R-6	6R6001	68,000 .....
R-7	6R476060	10,000 2W .....
R-8	6R6010	330 .....
R-9	6R6075	100,000 .....
R-10	6R3982	150 .....
R-11	6R5614	56 10% .....
R-12	6R5614	56 10% .....
R-13	18A480773	Volume Control: 500,000 ohms; with SPST Sw. 1 Meg .....
R-14	6R6004	1 Meg .....
R-15	6R6004	1 Meg .....
R-16	6R6004	1 Meg .....
R-17	6R6161	1500 .....
R-18	6R3927	2-.2 Meg .....
R-19	6R3949	470 .....
R-20	6R6054	10,000 .....
R-21	6R6089	2,200 10% .....
R-22	6R6015	220,000 .....
R-23	6R6015	220,000 .....
R-24	6R6015	220,000 .....
R-25	6R6389	220 10% 1W .....
R-26	6R6320	10,000 10% .....
R-27	6R476130	2,200 2W .....
R-28	6R6015	220,000 .....
*Part of Tuner S-T-60		

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

3S3397 Screw: #8 x 5/16 PKZ plain hex head sheet metal screw; cad. pl. (pwr.transf.mtg) .....

47B480768 Shaft & Coupling Assembly (for vol. cont)

1A71049 Shield and Sleeve Assembly (for T-1 & T-2)

9A470208 Socket, tube: 4 prong (for vibrator) .....

9A472534 Socket, tube: miniature; 7 prong .....

9A6788 Socket, tube: octal .....

31K86126 Strip, terminal: 2 insulated lugs, #2 mtg

31A472573 Strip, terminal: 2 insulated lugs, #2 mtg

7A472576 Support, volume control shaft alignment...

4S7555 Washer: 1/4 x .128 x .033; cadmium plated (output transf. mtg) .....

**HOUSING PARTS**

13D472778 Escutcheon .....

1X472758 Housing, front: includes 2 grounding wipers; less escutcheon .....

15K472584 Housing, rear .....

39A71874 Knob (automatic tuner station set-up): plastic; with clamp spring .....

5S7730 Rivet: .122 x 1/8 steel; antique cop. finish .....

3S3394 Screw: #8 x 1/4 slotted hex head thread cutting type; cad. pl. (escutch.mtg.)...

3S7456 Screw: #8 x 1/4 PKA slotted acorn head sheet metal screw; antique copper finish (housing screws) .....

39K470032 Wiper, grounding .....

**ACCESSORIES**

3A51494 Bolt, "J" (recvr mtg) .....

8A4491 Capacitor, generator .....

9K475161 Lead Assembly, fuse: complete with 20 amp fuse .....

1X76859 Lead Assembly, speaker: 2 conductor; 36" long; with pin terminals on one end ...

4S7653 Lockwasher: 5/16 int-ext; cad. plated (receiver mtg) .....

2S2863 Nut: 5/16-18 x 9/16 hex; cad. plated (receiver mtg) .....

1K75148 Shaft, flexible: with hsnf; 24" long ...

50B473118 or 50B473698 or 50B473897 or 50B473753 Speaker: 6" PM; 3.2 ohm VC; less spkr.lead Exch.

6X4141 Suppressor, distributor .....

**SWITCHES**

S-1\* 1B70944 Solenoid Switch .....

S-2\* 40B70952 Selector Switch .....

S-3 - Power Switch (part of volume control)

S-4\* 40A472644 Mute Switch .....

S-5 1X78040 Type MR6 Tone Relay .....

**SHIELD**

SH-1 30K472998 Cable, volume control: 5" long; single cond.

**SPARK PLATE**

SP-1 1X472824 Spark Plate Assembly .....

**TRANSFORMERS**

T-1 & T-2 24B76553 Diode or IF, 455 Kc: complete with padding capacitors and tuning iron cores, but less shield .....

T-3 25B472558 Output .....

T-4 25C472586 Power .....

**TUNER**

1X472634 Solenoid Tuner ST-60 .....

Exch.

**CHASSIS PARTS - MECHANICAL**

42A4215 Clip, vibrator grounding .....

58A480774 Coupling, tinnerman shaft (on volume cont.)

14A76883 Insulator, contact: fibre .....

4S7650 Lockwasher: #8 internal; cadmium plated (terminal strip mtg) .....

4S7657 Lockwasher: #8 external; cadmium plated (tone relay mtg) .....

2S7007 Nut: 9-32 x 1/4 hex; cadmium plated (tone relay mtg) .....

2S7051 Nut: 3/8-32 x 9/16 hex; cadmium plated; (volume control mtg) .....

1X70646 Receptacle, antenna lead-in .....

5S7771 Rivet: .088 x 3/16; steel; nickel plated (tube socket mtg) .....

5S7706 Rivet: .122 x 1/8; nickel plated (sensitivity control mtg) .....

5S7707 Rivet: .122 x 5/32; steel; nickel plated (tube socket mtg, terminal strip mtg)

5S7701 Rivet: .122 x 3/16; steel; nickel plated (tube socket mtg, output transf. mtg)

3S6140 Screw: #8 x 3/16 PKZ plain hex head sheet metal screw; cad. pl. (tuner mtg & vol. control shaft coupling setscrew) .....

\*part of Tuner ST-60

**SECTION 1. DESCRIPTION**

**1-1. General**

The NC-57 is a superhetrodyne Radio Receiver, having a complement of seven tubes plus a voltage regulator and rectifier, with a continuous frequency coverage of from 540 kilocycles to 55 megacycles. This Receiver is designed to provide reception of amplitude modulated voice or music and code telegraph signals throughout its entire frequency range. Operational controls mounted on the front panel are held to a minimum consistent with good operation and full utilization of the circuit features contained in the NC-57. The separate bandspread control knob and dial scale makes possible fine, vernier-type tuning for any portion of the frequency spectrum covered by the Receiver. The usefulness of this feature will be outstanding on crowded bands such as the amateur or foreign broadcast bands. The NC-57 employs a voltage regulator tube to assure a high order of stability in the high frequency and beat frequency oscillator circuits.

**1-2. Circuit**

A stage outline of the circuit employed in the NC-57 is given below together with the tube associated with each stage.

- R.F. Amplifier.....6SG7
- Converter.....6SB7-Y
- First I.F. Amplifier.....6SG7
- Second I.F. Amplifier.....6SG7
- Second Det. - A.V.C. - A.N.L.....6H6
- First audio - C.W.O.....6SN7GI/G
- Audio Output.....6V6GT/G
- Voltage Regulator.....OD3/VR-150
- Rectifier.....5Y3GT/G

**1-3. Tuning System**

The three-gang main tuning capacitor, the panel-mounted Trimmer control and five sets of coils are used to tune the frequency range of the Receiver in five tuning bands as shown on the following table. The main tuning capacitor and bandspread capacitor are connected in parallel on all bands.

BAND	FREQUENCY COVERAGE
A	35.0 - 55.0 Mc.
B	13.5 - 35.0 Mc.
C	4.65 - 13.5 Mc.
D	1.6 - 4.65 Mc.
E	0.54 - 1.6 Mc.

It will be noted that Band E encompasses the entire Standard Broadcast Band.

The Amateur bands tuneable by the NC-57 are listed below with their respective receiver band locations and are spread on the bandspread dial by means of the bandspread capacitor approximately as follows:

BAND	AMATEUR BAND	FREQUENCY	DIVISIONS
A	6	50.0 - 54.0 Mc.	37
B	10, 11	27.16- 29.7 Mc.	44
	15	21.0 - 21.5 Mc.	28
	20	14.0 - 14.4 Mc.	65
C	40	7.0 - 7.3 Mc.	47
	80	3.5 - 4.0 Mc.	60

The main dial has five 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 and Foreign Broadcast bands. These locating markers are identified by letters AM, P and F, respectively.

**1-4. Audio Output**

Two audio output circuits are provided:

(1) The loudspeaker in the NC-57 is a 5 inch PM type capable of faithfully reproducing the ample audio volume delivered by the Receiver. An output transformer is mounted on the loudspeaker to match the impedance of the output tube.

(2) A Phones jack is mounted on the front panel and is wired so as to silence the loudspeaker when headphones are used. The headphone load impedance is not critical permitting a wide range of headphones types, including crystal, to be used.



**1-5. Power Supply**

The NC-57 Receiver is designed for operation from a 105/130 volt, 50/60 cycle, source of supply. Normal power consumption is approximately 84 watts. The built-in power supply provides all voltages required by the heater and B supply circuits - 2.7 amperes at 6.3 volts and 100 milliamperes at 250 volts, respectively.

The NC-57 is readily adaptable to battery operation and instructions for using batteries are given in detail in Section 2.

**1-6. Accessory Connector Socket**

An octal type socket is mounted at the

rear of the NC-57 to permit convenient connection of external accessories. The Tuning Meter, SM-57, which is available for use with the NC-57, is fitted with a cable and plug to connect directly to this socket. Varied accessories such as a crystal calibrator or record player are readily connected to the socket. When a record player is connected to the NC-57, the R. F. GAIN control should be set at the extreme counterclockwise position. The drawing of the Accessory Connector Socket on the Schematic Diagram shows the various connections made to the pins of the socket and the voltages available. As will be noted B plus and filament voltages are available at pins 2 and 3, respectively.

**SECTION 2. INSTALLATION****2-1. Installation Procedure**

Carefully unpack the Receiver from its packing crate and proceed as follows:

(1) Make sure A.C. jumper plug, P-1, (at rear of Receiver) and all tubes are seated firmly in their sockets.

(2) Connect a good external ground to the terminal labeled G on the antenna ground strip at the rear of the Receiver. This connection is not absolutely required but in certain localities considerable reduction in interfering noise can be achieved by such a connection.

(3) Connect the antenna as recommended in Section 2-3.

(4) Connect the power cord, P-2,

to a 105/130 volt, 50/60 cycle, A.C. source of supply.

(5) Set controls as recommended in Section 3 for the reception of signals.

**NOTE**

Where the Receiver is located in the field of a transmitting station, as would be the case when the NC-57 is used as the Receiver in a transmitting station, it is advisable to provide some means of preventing damage to the receiver antenna coil. If a separate receiving antenna is used, a means for disconnecting the antenna from the Receiver or grounding the antenna during transmission periods should be provided.

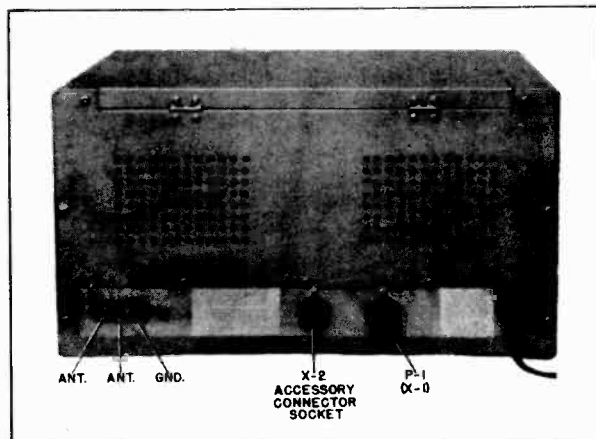


Figure No. 1. Rear View of Receiver

## 2-2. Battery Operation

The NC-57 Receiver is readily adaptable to portable or emergency service by connecting batteries to the terminals of the power socket, X-1, at the rear of the Receiver. The A.C. jumper plug, P-1, may be rewired for battery connection or if changeover operation is desired another octal plug should be obtained. Do not use the A.C. jumper plug, P-1, for battery operation without first removing the jumper wires. The battery plug used should be wired in accordance with the drawing shown on the schematic diagram. The voltage regulator tube should be removed during battery operation. A 6 volt heater supply (storage battery) should be connected to terminals 3 and 5 and 180 to 250 volt "B" supply connected to terminals 1 and 8. Current drain is approximately 70 milliamperes and 2.65 amperes at 180 and 6 volts, respectively. A suggested refinement is to include a switch in the A+ 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. The Send-Receive switch on the Receiver is operative with battery operation the same as for A.C. operation. The A.C. line switch on the front panel does not render the Receiver inoperative during battery operation.

The recommendations of Section 3, Operation, apply to the battery powered NC-57.

## 2-3. Antenna Recommendations

The antenna input circuit of the NC-57 is arranged for operation from either a single-wire type, doublet type antenna or

other types 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 50 to 100 feet is recommended although the length is not critical and any length between 25 and 200 feet may be used. In installations where the Receiver is tuned to one frequency or narrow band of frequencies optimum results will be obtained by designing the antenna for the operating frequency. In an installation where the Receiver is to be used as the receiving unit, in a transmitting station, the most efficient operation will usually result from use of the transmitting antenna as a receiving antenna also. For switching the antenna from transmitter to receiver, an antenna change-over relay with good high frequency insulation is recommended.

The method of connecting the various types of antennae to the antenna terminal strip at the rear of the Receiver is as follows:

- (1) Single-wire type -- Connect antenna to terminal A at the left of the strip and ground the unused A terminal by means of the metal link.
- (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 which, in turn, should be connected to the metal link.

## SECTION 3. OPERATION

### 3-1. Controls

This section on controls is presented prior to the actual operating instructions to give the operator of an NC-57 an understanding of the function of each control on the Receiver. All controls are clearly identified by front panel markings and are arranged in a manner to facilitate operation.

tion.

The R.F. GAIN control adjusts the sensitivity (ability to receive weak and distant stations) of the Receiver from a minimum at the extreme counterclockwise position of the knob to a maximum at the extreme clockwise position. This is accomplished by adjustment of the amplification of the R.F. and I.F. amplifier stages.

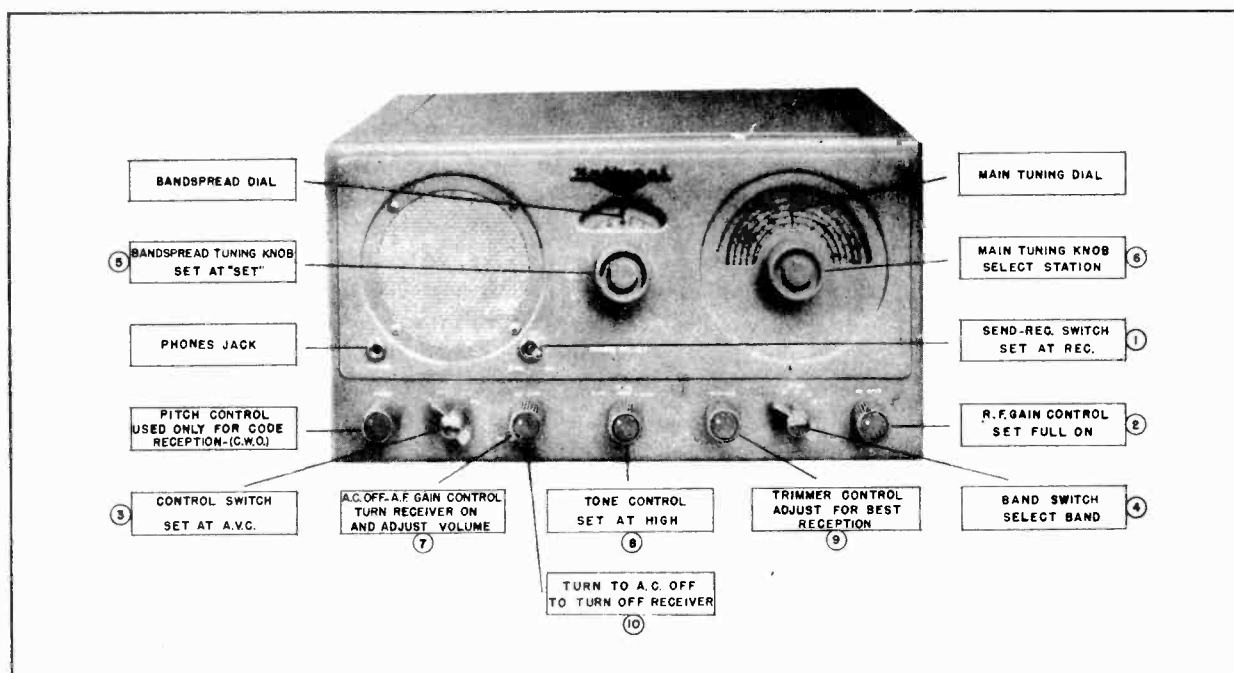


Figure No. 2. Simplified Operating Instructions

The BAND switch has five positions and serves to select the band of frequencies to be tuned by the Receiver. The five positions are marked with identifying band designations which correspond to the markings which appear on the main tuning dial.

The TRIMMER control operates a tuning capacitor trimmer which is connected across the first R.F. amplifier main tuning capacitor section. The trimmer control is used to tune the R.F. amplifier stage properly under a wide variety of antenna loading conditions.

The TONE control adjusts the tonal value of the audio output of the Receiver. The three positions select a tonal output as follows: High--normal receiver reproduction in which an average tonal output is achieved; Med--reproduction in which the higher tones are moderately attenuated; Low--in this position the higher tones are subdued emphasizing the lower tones.

The A.F. GAIN-A.C. OFF control is a dual purpose type. In the A.C. OFF position the Receiver is turned off; when the control knob is turned clockwise the A.C. line switch is closed, thus turning on the Receiver. The other function of this control is to adjust the audio output vol-

ume of the Receiver. Audio volume is progressively increased to a maximum when the knob is turned to the extreme clockwise position.

The control switch labeled C.W.O., M.V.C., A.V.C. and A.N.L. has four functions corresponding to the switch markings. In the A.V.C. position the automatic volume circuit is switched into the circuit to compensate for fluctuating volume due to fading. In the A.N.L. position the automatic noise limiter is switched on to effectively reduce interference caused by static, automobile ignition noise etc. Limiting action automatically takes place at a relatively high percentage modulation. The automatic volume control circuit remains operative in the A.N.L. position of the control switch. The M.V.C. position disables the A.V.C., C.W.O. and A.N.L. circuits. The C.W.O. position switches into the circuit the C.W. oscillator to permit reception of code telegraph signals.

The PITCH control is used in conjunction with the C.W.O. position of the control switch and has no effect on receiver performance with any other control switch setting. The PITCH control is used to adjust the beat note of the incoming code signal to an audio tone pleasing

to the operator. The C.W. oscillator is tuned to the Receiver's intermediate frequency mid-scale on the control knob. The range of the PITCH control is approximately  $\pm 3,000$  cycles.

The SEND-RECEIVE switch is used to quiet the Receiver during transmission periods or other times when it is desirable to be able to resume reception immediately after a period of silence (i.e. not having to wait for the tubes to warm up). The SEND-RECEIVE switch should not be used to shut off the Receiver. The Receiver should be turned off by turning the A.F. GAIN control to A.C. OFF position. The function of the SEND-RECEIVE switch may be duplicated at an external (remote) position by connecting a switch or relay to terminals 5 and 8 of the A.C. jumper plug (P-1). This is a parallel arrangement permitting the panel-mounted SEND-RECEIVE switch to remain operative.

The main tuning control knob and dial scale are used to tune the frequency range of the Receiver. The band of frequencies tuned at any one time is determined by the BAND switch setting. To maintain correct calibration when using the main tuning knob the bandsread dial pointer must be at the "set" mark (located at 100 on the bandsread dial scale).

The bandsread control knob and dial scale are used to spread out over a wide range any small portion of the frequency range of the Receiver. Bandsread tuning is accomplished by setting the main tuning dial pointer at the high-frequency limit of the band of frequencies to be spread (for example: to tune the amateur 10 meter band set the pointer at 29.7 megacycles on the B band) and rotate the bandsread knob in a clockwise direction.

### 3-2. Voice or Music Reception

After the NC-57 Receiver is properly installed, as outlined in Section 2, it is placed in operation by adjusting the receiver controls as follows:

1. Set the SEND-RECEIVE switch at Receive.
2. Turn the R.F. GAIN control to the extreme clockwise position.
3. Set the control switch at A.V.C.
4. Set the BAND switch at the

band of frequencies to be tuned. The Standard Broadcast Band is band E.

5. Set the bandsread dial pointer at the "Set" mark.

6. Set the main tuning dial pointer at the desired frequency.

7. Turn the A.F. GAIN-A.C. OFF control from the A.C. OFF position to the point providing the desired audio volume. Reset main tuning dial pointer if necessary.

8. Set the TONE control at High.

9. Set the TRIMMER control for maximum response. Maximum response is clearly indicated by use of the SM-57 Tuning Meter; the correct setting of the TRIMMER control is indicated by maximum deflection of SM-57 meter pointer. In order to secure a good aural indication of the correct TRIMMER setting, if the SM-57 is not used, it is recommended that the control switch be set at M.V.C. temporarily to adjust the TRIMMER control. In this case it may be necessary to retard the R.F. GAIN control if overload of the Receiver occurs, as will be indicated by excessive distortion. In the absence of signals the trimmer control may be "peaked" by setting it for maximum receiver background noise.

The settings given above are for the reception of signals of average strength. An improvement in the reception of exceptionally weak signals or signals accompanied by interfering noise pulses may be realized by modification of the above settings.

For improvement in the reception of weak signals set the control switch at M.V.C. and modify the other control settings as follows:

1. Set the A.F. GAIN control at approximately three-quarters rotation.
2. Adjust the audio volume by means of the R.F. GAIN control.

When a signal is accompanied by static peaks or noise pulses of high intensity and short duration, optimum noise-free reception will be had by setting the control switch at A.N.L. The resulting automatic limiting action will greatly reduce the interfering noise without noticeably affecting the signal. Best limiting action will be realized with the R.F. GAIN control

fully advanced; the audio volume should be adjusted by means of the A.F. GAIN control. A further improvement in noise reduction will be realized by setting the TONE switch at Med. or Low depending on the degree of noise.

### 3-3. Code Telegraphy Reception

The adjustment of the receiver controls for code reception is the same as that for voice or music except for the fol-

lowing:

1. Set the control switch at C.W.O.
2. Set the A.F. GAIN control at three-quarters rotation.
3. Adjust the audio volume by means of the R.F. GAIN control.
4. Adjust the PITCH control to secure an audio tone pleasing to copy.

The action of the TONE control is the same as that described in Section 3-2.

## SECTION 4. MAINTENANCE AND TEST DATA

### 4-1. General Maintenance Data

The NC-57 is designed and constructed to assure a long period of uninterrupted service. A few service hints are given below to aid in locating individual components which, due to age or weakness, cause faulty operation of the Receiver.

Vacuum tube failure may be evidenced by reduction in sensitivity, intermittent operation or an inoperative Receiver. Tubes may be checked in suitable tube testing equipment, or by replacement with tubes of proven quality. Care must be taken that tubes removed for checking are returned to their original sockets. Tubes of the same type will vary slightly in their individual characteristics and this fact should be borne in mind if replacement of the H.F. oscillator tube becomes necessary. A check of the dial calibration should be made if this tube is replaced to determine whether or not realignment is necessary.

Bypass or filter capacitors which become open may cause decreased sensitivity, oscillation, poor stability or complete failure of the Receiver. The defective unit can be located by temporarily connecting a good capacitor in parallel with each suspected capacitor. Leaky or short-circuited capacitors can be detected by an ohmmeter check; a zero resistance reading of the ohmmeter will indicate a shorted capacitor.

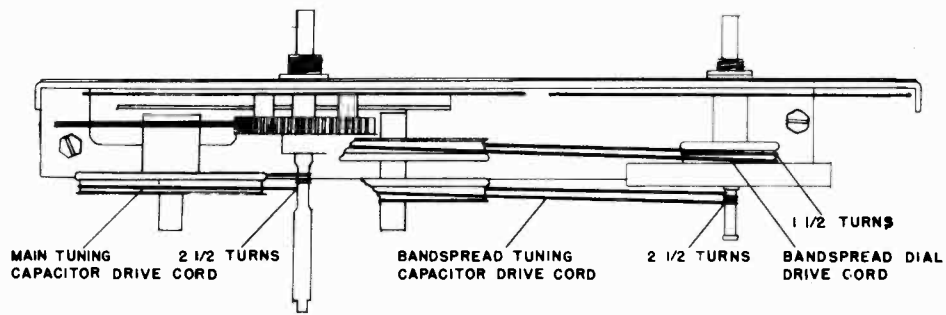
Defective resistors, sometimes caused by capacitor failure in associated circuits, can be definitely located by measuring the resistance of each resistor. The Schematic Diagram should be consulted to

ascertain that any particular resistor under test is not connected in parallel with some other circuit element which might produce a false measurement. An overloaded resistor may be located by visual inspection if the surface of the resistor becomes scorched due to excessive heating.

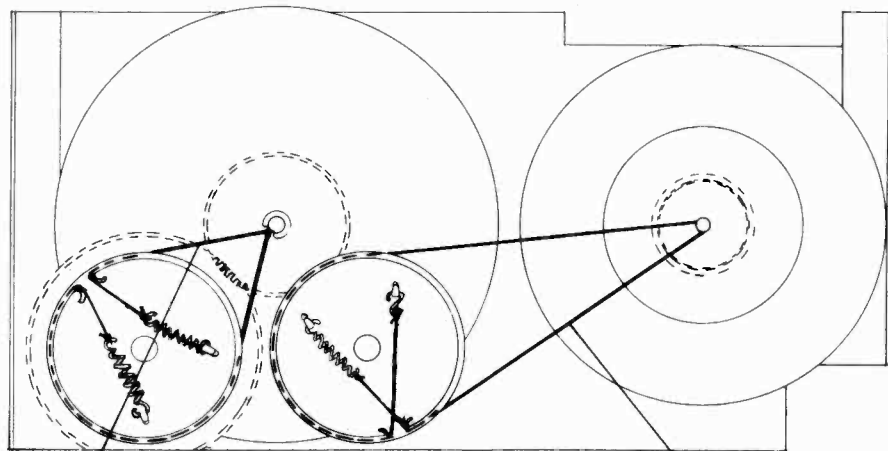
### 4-2. Dial Cord Replacement

The dial cords used on the NC-57 are a twisted type with a tensile strength of 52 lbs. and will give enduring service. There are three separate lengths of cord used and if replacement of any one of the three becomes necessary it is not necessary to disassemble the other dial cords. Complete instructions for the stringing of the dial cords are given on the following drawing. The two cords driving the main tuning and bandsread tuning capacitors, respectively, can be strung from the top inside of the cabinet. It is, however, necessary to remove the cabinet from the chassis in order to string the dial cord which drives the bandsread dial. Instructions for removing the cabinet are as follows:

1. Remove the top and back piece of the cabinet by releasing the ten drive screws at the back which fasten the piece to the chassis and cabinet wrap around.
2. Remove the bottom cover of the Receiver which is held in place by four drive screws.
3. Remove the four mounting feet at the bottom of the Receiver. These feet are fastened by means of a screw and speed nut arrangement.
4. Unsolder the two loudspeaker leads to the output tube (6V6GT/G). A red lead



TOP VIEW OF DIAL ASSEMBLY



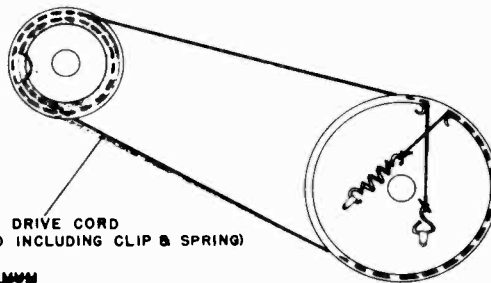
MAIN TUNING CAPACITOR DRIVE CORD  
LENGTH: 11 3/4" (MEASURED INCLUDING BOTH SPRINGS  
STRING AS FOLLOWS:

1. FASTEN ONE END TO PULLEY
2. WIND 2 1/2 TURNS COUNTERCLOCKWISE AROUND CAPSTAN
3. FASTEN OTHER END TO PULLEY

BANDSPREAD TUNING CAPACITOR DRIVE CORD  
LENGTH: 15" (MEASURED INCLUDING CLIP & SPRING)  
STRING AS FOLLOWS:

1. FASTEN CLIP END TO PULLEY
2. WIND 2 1/2 TURNS CLOCKWISE AROUND CAPSTAN
3. FASTEN SPRING END TO PULLEY

REAR VIEW OF DIAL ASSEMBLY



BANDSPREAD DIAL SCALE DRIVE CORD  
LENGTH: 18 5/8" (MEASURED INCLUDING CLIP & SPRING)  
STRING AS FOLLOWS:

1. SET CAPACITOR AT MINIMUM
2. FASTEN CLIP END TO PULLEY
3. SET SMALL PULLEY WITH CUTOUT AT TOP
4. WIND ONE TURN AROUND PULLEY & PASS CORD UNDER CUTOUT
5. SET DIAL AT SET MARK WITH COUNTERCLOCKWISE ROTATION
6. BRING CORD TO LARGE PULLEY & FASTEN SPRING END

FRONT VIEW OF BAND SPREAD DIAL DRIVE ASSEMBLY

Figure No. 3. Dial Cord Stringing Instructions

is soldered to pin 4 and a blue lead to pin 3.

5. Remove all knobs from the front of the Receiver. All knobs, with the exception of the main tuning and bandspread tuning knobs, are mounted on flatted shafts by clip springs. A notch in the knobs permits the insertion of a screwdriver, which, pressed on the spring releases the knob.

6. Remove the retaining nuts on the control switch, BAND switch, bandspread tuning control, main tuning control and the SEND-REC switch.

After completing the six steps above, the chassis can be withdrawn from the cabinet. After the dial cord has been strung, reassembly of the Receiver can be accomplished by following the disassembly procedure in reverse order.

#### 4-3. Voltage Tabulation

The measurements of voltage shown on the following table are tabulated using a high-impedance vacuum tube voltmeter with a line voltage of 115 volts. The control settings to be observed are as follows:

1. R.F. GAIN full on. (extreme clockwise position)
2. BAND switch at E.
3. Main tuning dial pointer at 1.5 mc.
4. Control switch at M.V.C. except as noted.

All voltages are measured between

specified terminal and chassis.

TUBE TERMINAL	PIN	VOLTS $\pm 15\%$
R. F. Amp. Cathode	3&5	1.6
R. F. Amp. Screen	6	145
R. F. Amp. Plate	8	225
H. F. Osc. Plate	3	250
First Det. Grid	4	100
H. F. Osc. Grid	5	-13.5
First I. F. Amp. Cathode	3&5	1.8
First I. F. Amp. Screen	6	60
First I. F. Amp. Plate	8	250
Second I. F. Amp. Cathode	3&5	2
Second I. F. Amp. Screen	6	140
Second I. F. Amp. Plate	8	250
Limiter Plate	3	.1*
Limiter Cathode	4	.4*
Second Detector Plate	5	-.4
First Audio Plate	2	200
First Audio Cathode	3	4
C. W. Oscillator Grid	4	-5.8**
C. W. Oscillator Plate	5	100**
Audio Output Plate	3	225
Audio Output Screen	4	250
Audio Output Cathode	8	14
Rectifier Fil.	2	280
Rectifier Plate	4	310 A.C.
Rectifier Plate	6	310 A.C.
Rectifier Fil.	8	280
Voltage Regulator Anode	5	150

\* Control Switch at A.N.L.  
\*\* Control Switch at C.W.O.

### SECTION 5. ALIGNMENT DATA

#### 5-1. General

The alignment of the NC-57 may be divided into two steps:

1. Intermediate Frequency Amplifier Alignment.
2. General Coverage Alignment.
  - a. H. F. Oscillator
  - b. First Detector and R. F. Amplifier.

The necessity for any realignment may be determined by checking the performance of the Receiver against its normal operation, as outlined in Section 3, and the dial calibration. It is recommended that, if tests indicate realignment is required,

the instructions given in this section are thoroughly read and understood before realignment is attempted. For alignment purposes the Receiver should be set up as specified in Section 2-1 except that the antenna should be disconnected. An output meter with a resistive load of 8 ohms should be connected to the Phones jack on the front panel of the Receiver.

#### 5-2. I. F. Amplifier Alignment

The intermediate frequency of the NC-57 Receiver is 455 kilocycles. The two I. F. transformers and the detector input transformer have permeability tuned iron-core inductors with screw adjustments for

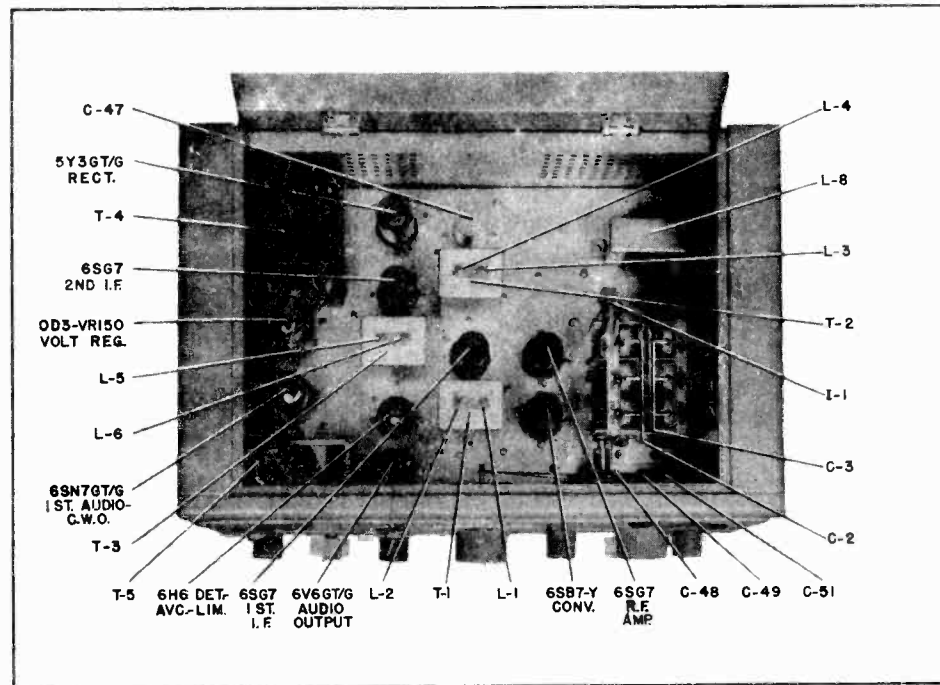


Figure No. 4. Top View of Receiver

alignment purposes. These adjustments are accessible from the top inside of the cabinet as shown on Figure No. 4.

The Alignment procedure is as follows:

1. Connect the "high" output lead of an accurately calibrated signal generator to the stator of the detector portion of the main tuning capacitor, C-2B, and the grounded lead to any convenient grounded point on the chassis. This is a direct connection, no dummy antenna being required. Set the signal generator at 455 kilocycles and turn the modulation on.

2. Set the control switch at M.V.C.

3. Set the R.F. GAIN control full on.

4. Set the TONE switch at High.

5. Set the A.F. GAIN full on.

6. Adjust the output attenuator of the signal generator to provide a signal of approximately 100 microvolts. 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.

7. Adjust the I.F. tuned inductors L-1 through L-6 for maximum gain, as indicated on the output meter. The order

in which these adjustments are made is not important.

At the conclusion of the I.F. amplifier alignment the tuning of the C.W. oscillator may be checked by turning the modulation of the signal generator off and setting the control switch at C.W.O. With this setting zero beat with the test signal should occur with the PITCH control set at mid-scale. If the above test indicates re-alignment of the C.W. oscillator is required proceed as follows:

1. Remove the bottom cover of the Receiver.

2. Loosen the set screw on the collar of the C.W. oscillator transformer shaft.

3. Without loosening the PITCH control knob on its shaft withdraw the knob and shaft from the cabinet.

4. The screw driver adjustment on the C.W. oscillator inductor, L-7, will then be accessible through the shaft opening in the cabinet. Adjust L-7 for zero beat with the test signal.

5. Replace the PITCH control knob and shaft so that the white dot on the knob is at mid-scale.

6. Position the collar so that the set screw is directly opposite ( $180^{\circ}$ ) from the stop and tighten the set screw making



sure that the position of the PITCH control knob does not change from mid-scale.

**5-3. General Coverage Alignment**

General coverage alignment and bandspread alignment are accomplished simultaneously, since the main tuning and bandspread tuning capacitors are connected in parallel on all bands. The Receiver should be set up as specified in Section 2-1 except that the antenna should be disconnected. Adjustment of the H.F. oscillator trimmers of the A, B and C bands can be made from the top inside of the cabinet as shown on Figure No. 4. All other trimmer and padder adjustments can be made through the holes in the bottom cover of the Receiver after removal of the small cover plate as shown on Figure No. 6. The preliminary alignment procedure is as follows:

1. Connect an accurate signal source (signal generator or crystal oscillator) to the antenna input terminals through a standard dummy antenna of 300 ohms.

2. Connect an output meter with a

resistive load of 8 ohms to the Phones jack.

3. Set the control switch at M.V.C.

4. Turn the R.F. GAIN control to full on.

5. Set the bandspread dial at the set mark.

The Alignment Chart in this section outlines the procedure for alignment of the H.F. oscillator, first detector and R.F. amplifier stages.

(a) H.F. Oscillator

Care should be taken when aligning the H.F. oscillator of any band to insure that the oscillator is aligned to the fundamental frequency and not the image. This can be checked by tuning the Receiver to the image frequency. On the A and B bands the image should appear 910 kilocycles above the fundamental signal. On the C, D and E bands the image should appear 910 kilocycles below the fundamental signal. If the image does not appear at its correct setting the H. F. oscillator trimmer should be adjusted for the correct calibration.

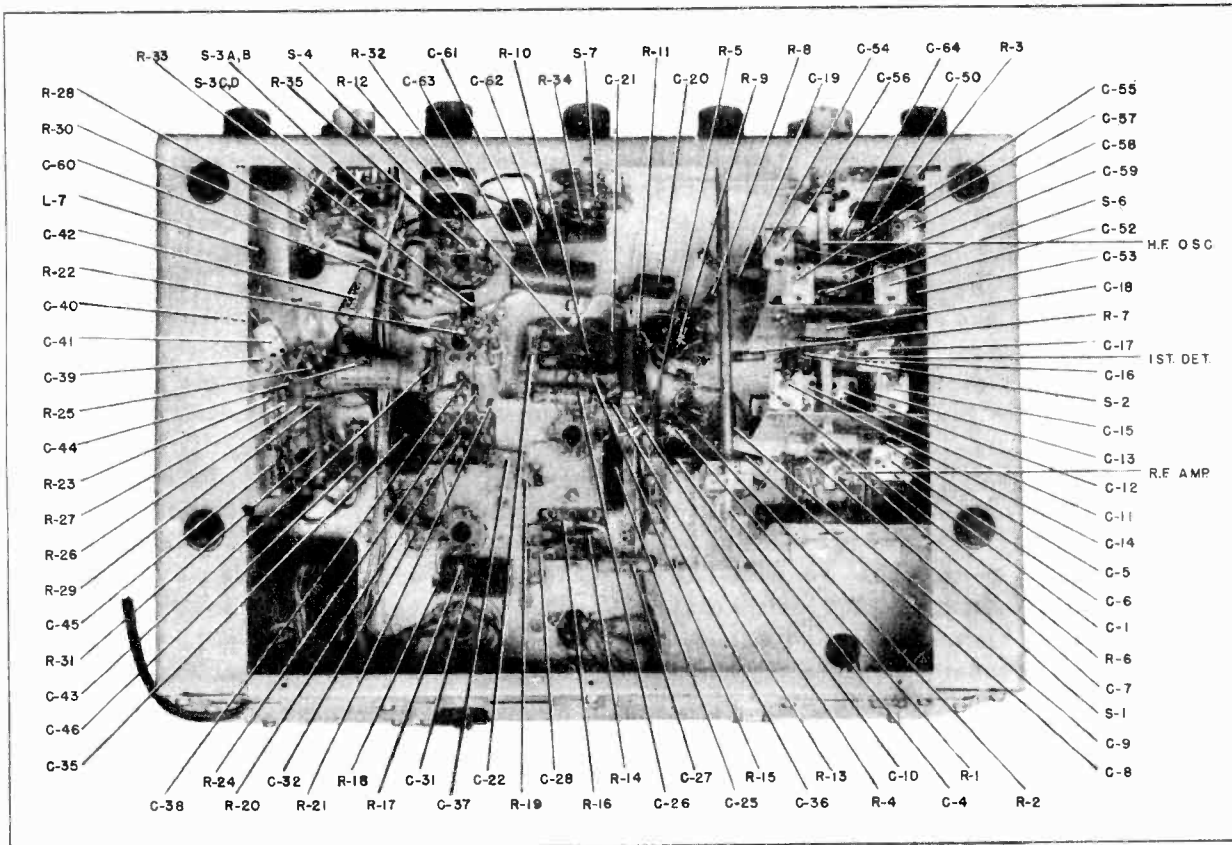


Figure No. 5. Bottom View of Receiver

ALIGNMENT CHART

(The bandspread dial must be at the Set mark)

Step	Band	Adjust Signal Source To:	Set Main Tun. Dial At:	Adjust To Receive Test Signal	Adjust For Maximum Output
1	A	54.0 Mc.	54.0 Mc.	C-48	C-11, C-4
2	A	36.0 Mc.	36.0 Mc.	C-58	C-17, C-6
3	A	54.0 Mc.	54.0 Mc.		Check Step 1. Repeat Steps 1, 2 and 3 if necessary.
1	B	34.0 Mc.	34.0 Mc.	C-49	C-12, C-4
1	C	13.0 Mc.	13.0 Mc.	C-51	C-13, C-4
1	D	4.4 Mc.	4.4 Mc.	C-52	C-14, C-4
1	E	1.5 Mc.	1.5 Mc.	C-55	C-15, C-4
2	E	0.6 Mc.	0.6 Mc.	C-56	
3	E	1.5 Mc.	1.5 Mc.		Check Step 1. Repeat Steps 1, 2 and 3 if necessary.

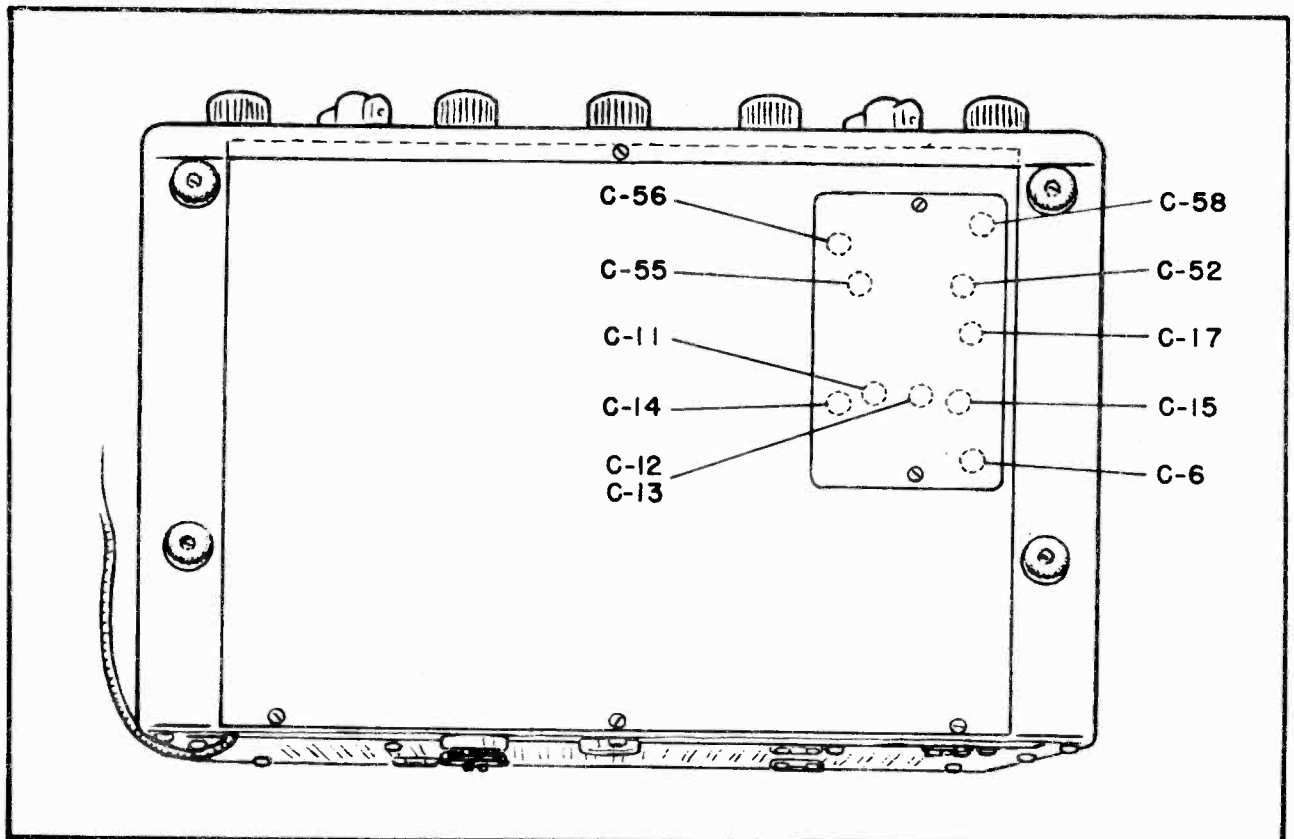


Figure No. 6. Alignment Trimmer Locations

## SECTION 6. SM-57 TUNING METER

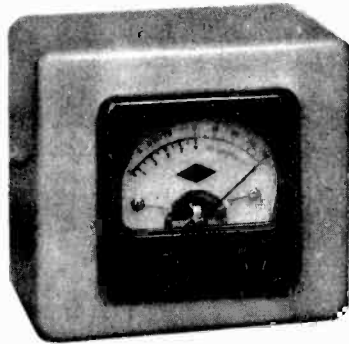


Figure No. 7. SM-57 Tuning Meter

**6-1. General**

The SM-57 Tuning Meter is available as an accessory for use with the NC-57 as a tuning indicator and relative signal strength indicator. The SM-57 is fitted with a cable and plug for connection to the Accessory Connector Socket at the rear of the NC-57 and is contained in a metal case finished to match the Receiver.

To utilize the SM-57 the following receiver control settings must be observed:

1. Control switch at A.V.C. or A.N.L.
2. R.F. GAIN control full on. (Retarding the R.F. GAIN control will reduce the sensitivity of the meter.)

The correct dial setting for any specific station on the dial is that setting which provides maximum deflection of the meter

pointer.

**6-2. Meter Adjustment**

Two adjustments are provided on the SM-57; one mechanical and the other electrical.

1. Mechanical -- With the Receiver turned off, the meter pointer should read 40 db. (the last scale marking). If it does not, correction is effected by the screw adjustment on the front of the meter.

2. Electrical -- With the Receiver turned on and controls adjusted for meter operation, the meter pointer should read zero (the first scale marking). This test must be made with no signal input to the Receiver. Correction of the zero setting, if required, is made by means of the screwdriver adjustment (R-101) at the rear of the meter case.

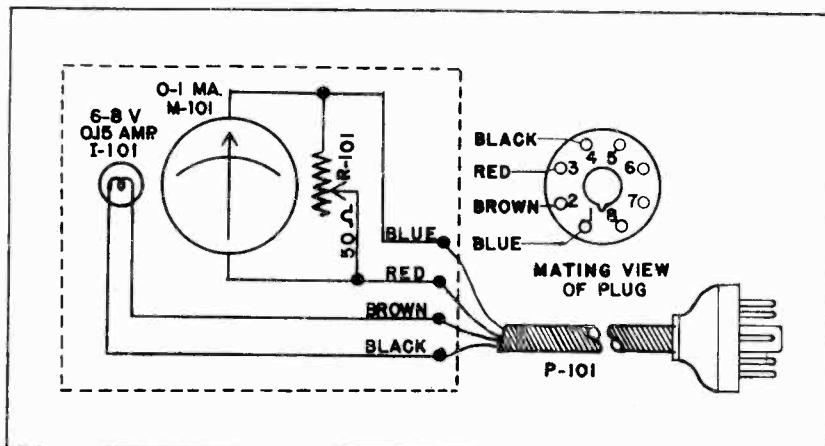


Figure No. 8. Schematic Diagram--SM-57 Tuning Meter

## NATIONAL COMPANY, INC.

MODEL NC-57

## SECTION 7.

## PARTS LIST

Symbol	Function	Type	Rating
<b>CAPACITORS</b>			
C-1	Antenna Coupling	Ceramic	100 Mmf., 500 VDCW
C-2	Bandsread Tuning	Air	Variable
C-2A	R.F. Bandsread Tuning	Air	Part of C-2
C-2B	1st. Det. Bandsread Tuning	Air	Part of C-2
C-2C	H.F. Osc. Bandsread Tuning	Air	Part of C-2
C-3	Main Tuning	Air	Variable
C-3A	R.F. Tuning	Air	Part of C-3
C-3B	1st. Det. Tuning	Air	Part of C-3
C-3C	H.F. Osc. Tuning	Air	Part of C-3
C-4	Trimmer Control	Air	Variable
C-5	A Band R.F. Amp. Padder	Ceramic	68 Mmf., 500 VDCW
C-6	A Band R.F. Amp. Padder	Mica	Variable
C-7	B Band R.F. Amp. Padder	Mica	0.0016 Mfd., 500 VDCW
C-8	R.F. Amp. Grid Coupling	Mica	100 Mmf., 500 VDCW
C-9	R.F. Amp. Cathode Bypass	Paper	0.01 Mfd., 400 VDCW
C-10	R.F. Amp. Screen Bypass	Paper	0.01 Mfd., 600 VDCW
C-11	A Band 1st. Det. Trimmer	Ceramic	Variable
C-12	B Band 1st. Det. Trimmer	Ceramic	Variable
C-13	C Band 1st. Det. Trimmer	Ceramic	Variable
C-14	D Band 1st. Det. Trimmer	Mica	Variable
C-15	E Band 1st. Det. Trimmer	Mica	Variable
C-16	A Band 1st. Det. Padder	Ceramic	68 Mmf., 500 VDCW
C-17	A Band 1st. Det. Padder	Mica	Variable
C-18	B Band 1st. Det. Padder	Mica	0.0013 Mfd., 500 VDCW
C-19	H.F. Osc. Grid Coupling	Mica	100 Mmf., 500 VDCW
C-20	1st. Det. Screen Eypass	Paper	0.01 Mfd., 400 VDCW
C-21	1st. Det. Plate Filter	Paper	0.01 Mfd., 600 VDCW
C-22	1st. I.F. Amp. Grid Filter	Paper	0.01 Mfd., 400 VDCW
C-23	T-1 Pri. Tuning	Mica	510 Mmf., 500 VDCW
C-24	T-1 Sec. Tuning	Mica	510 Mmf., 500 VDCW
C-25	1st. I.F. Amp. Cathode Bypass	Paper	0.1 Mfd., 400 VDCW
C-26	1st. I.F. Amp. Screen Bypass	Paper	0.01 Mfd., 600 VDCW
C-27	1st. I.F. Amp. Plate Filter	Paper	0.01 Mfd., 600 VDCW
C-28	2nd. I.F. Grid Filter	Paper	0.01 Mfd., 400 VDCW
C-29	T-2 Pri. Tuning	Mica	510 Mmf., 500 VDCW
C-30	T-2 Sec. Tuning	Mica	510 Mmf., 500 VDCW
C-31	2nd. I.F. Amp. Cathode Bypass	Paper	0.1 Mfd., 400 VDCW
C-32	2nd. I.F. Amp. Screen Bypass	Paper	0.01 Mfd., 400 VDCW
C-33	T-3 Pri. Tuning	Mica	510 Mmf., 500 VDCW
C-34	T-3 Sec. Tuning	Mica	510 Mmf., 500 VDCW
C-35	Limiter Cathode Filter	Paper	0.1 Mfd., 400 VDCW
C-36	A.V.C. Filter	Paper	0.01 Mfd., 400 VDCW
C-37	2nd. Det. Load	Mica	100 Mmf., 500 VDCW
C-38	C.W.O. Coupling		3 Turns Cov. Wire
C-39	C.W.O. Plate Coupling	Paper	0.01 Mfd., 600 VDCW
C-40	C.W.O. Tuning	Mica	220 Mmf., 500 VDCW
C-41	C.W.O. Grid Coupling	Mica	270 Mmf., 500 VDCW
C-42	Audio Coupling	Paper	0.01 Mfd., 600 VDCW
C-43	1st. Audio Plate Filter	Paper	250 Mmf., 600 VDCW

## PARTS LIST (Continued)

Symbol	Function	Type	Rating
<b>CAPACITORS (Continued)</b>			
C-44	1st. Audio Cathode Bypass	Elect.	10 Mfd., 50 VDCW
C-45	A. C. Line Bypass	Paper	0.01 Mfd., 600 VDCW
C-46	B Supply Filter	Paper	0.01 Mfd., 400 VDCW
C-47	Power Supply Filter	Elect.	10+10 Mfd., 450 VDCW
C-47A	Power Supply Filter	Elect.	Part of C-47
C-47B	Power Supply Filter	Elect.	Part of C-47
C-48	A Band H.F. Osc. Trimmer	Ceramic	Variable
C-49	B Band H.F. Osc. Trimmer	Ceramic	Variable
C-50	C Band H.F. Osc. Padder	Mica	0.0038 Mfd., 300 VDCW
C-51	C Band H.F. Osc. Trimmer	Ceramic	Variable
C-52	D Band H.F. Osc. Trimmer	Mica	Variable
C-53	D Band H.F. Osc. Padder	Mica	0.0018 Mfd., 500 VDCW
C-54	E Band H.F. Osc. Padder	Mica	515 Mmf., 500 VDCW
C-55	E Band H.F. Osc. Trimmer	Mica	Variable
C-56	E Band H.F. Osc. Padder	Mica	Variable
C-57	A Band H.F. Osc. Padder	Ceramic	68 Mmf., 500 VDCW
C-58	A Band H.F. Osc. Padder	Mica	Variable
C-59	B Band H.F. Osc. Padder	Mica	0.0018 Mfd., 500 VDCW
C-60	Audio Coupling	Paper	0.001 Mfd., 600 VDCW
C-61	Audio Output Cathode Bypass	Elect.	25 Mfd., 50 VDCW
C-62	Tone	Paper	0.1 Mfd., 400 VDCW
C-63	Audio Compensating	Paper	0.0022 Mfd., 400 VDCW
C-64	B Band H.F. Osc. Trimmer	Ceramic	10 Mmf., 500 VDCW
<b>RESISTORS</b>			
R-1	R.F. Amp. Grid Filter	Fixed	470,000 Ohms, 1/2 W.
R-2	R.F. Amp. Cathode	Fixed	100 Ohms, 1/2 W.
R-3	R.F. Gain Control	Variable	10,000 Ohms, 2 W.
R-4	B plus Bleeder	Fixed	58,000 Ohms, 2 W.
R-5	R.F. Amp. Screen Filter	Fixed	1,000 Ohms, 1/2 W.
R-6	R.F. Amp. Plate Filter	Fixed	4,700 Ohms, 1/2 W.
R-7	1st. Det. Grid	Fixed	15 Ohms, 1/2 W.
R-8	H.F. Osc. Grid	Fixed	33 Ohms, 1/2 W.
R-9	H.F. Osc. Grid Leak	Fixed	47,000 Ohms, 1/2 W.
R-10	1st. Det. Plate Filter	Fixed	1,000 Ohms, 1/2 W.
R-11	1st. Det. Screen Filter	Fixed	3,900 Ohms, 1/2 W.
R-12	1st. I.F. Amp. Grid Filter	Fixed	470,000 Ohms, 1/2 W.
R-13	1st. I.F. Amp. Cathode	Fixed	330/2,200 Ohms, 1/2 W.
R-14	1st. I.F. Amp. Plate Filter	Fixed	1,000 Ohms, 1/2 W.
R-15	1st. I.F. Amp. Screen Filter	Fixed	470,000 Ohms, 1/2 W.
R-16	2nd. I.F. Grid Filter	Fixed	470,000 Ohms, 1/2 W.
R-17	2nd. I.F. Amp. Cathode	Fixed	220 Ohms, 1/2 W.
R-18	2nd. I.F. Amp. Screen Filter	Fixed	2,200 Ohms, 1/2 W.
R-19	A.V.C. Filter	Fixed	2,200,000 Ohms, 1/2 W.
R-20	Limiter Filter	Fixed	1,000,000 Ohms, 1/2 W.
R-21	2nd. Det. Load	Fixed	33,000 Ohms, 1/2 W.
R-22	2nd. Det. Load	Fixed	47,000 Ohms, 1/2 W.
R-23	C.W.O. Plate Filter	Fixed	10,000 Ohms, 1/2 W.
R-24	Limiter Cathode	Fixed	1,000,000 Ohms, 1/2 W.
R-25	1st. Audio Grid	Fixed	470,000 Ohms, 1/2 W.
R-26	1st. Audio Cathode	Fixed	2,700 Ohms, 1/2 W.

NATIONAL COMPANY, INC.

MODEL NC-57

PARTS LIST (Continued)

Symbol	Function	Type	Rating
<b>RESISTORS (Continued)</b>			
R-27	C.W.O. Grid	Fixed	22,000 Ohms, 1/2 W.
R-28	S-Meter Dropping	Fixed	2,200 Ohms, 1/2 W.
R-29	1st. Audio Plate Filter	Fixed	100,000 Ohms, 1/2 W.
R-30	A.V.C. Bleeder	Fixed	220 Ohms, 1/2 W.
R-31	B plus Dropping	Fixed	3,900 Ohms, 2 W.
R-32	Audio Gain Control	Variable	500,000 Ohms
R-33	Audio Output Cathode	Fixed	330 Ohms, 2 W.
R-34	Tone	Fixed	4,700 Ohms, 1/2 W.
R-35	Audio Output Plate Load	Fixed	47,000 Ohms, 1/2 W.
<b>MISCELLANEOUS</b>			
I-1	Dial Lamp		0.15 Amp., 6-8 Volts
J-1	Phones Jack		Closed Circuit
L-1	T-1 Input Tuning	Variable	Iron-Core Inductor
L-2	T-1 Output Tuning	Variable	Iron-Core Inductor
L-3	T-2 Input Tuning	Variable	Iron-Core Inductor
L-4	T-2 Output Tuning	Variable	Iron-Core Inductor
L-5	T-3 Input Tuning	Variable	Iron-Core Inductor
L-6	T-3 Output Tuning	Variable	Iron-Core Inductor
L-7	C.W. Osc. Tuning	Variable	Iron-Core Inductor
L-8	Filter Choke		10 Henries
P-1	A.C. Jumper Plug	Octal	
P-2	A.C. Line Cord. & Plug		
S-1	B.F. Transformer Band Switch	Rotary	
S-1A		Part of S-1	D.P. 5 Position
S-1B		Part of S-1	S.P. 5 Position
S-1C		Part of S-1	S.P. 5 Position
S-2	1st. Det. Transformer Band Switch		
S-2A		Part of S-2	D.P. 5 Position
S-2B		Part of S-2	S.P. 5 Position
S-2C		Part of S-2	S.P. 5 Position
S-3	Control Switch	Rotary	
S-3A	C.W.O. Switch	Part of S-3	S.P. 4 Position
S-3B	Limiter Switch	Part of S-3	S.P. 4 Position
S-3C	S-Meter Switch	Part of S-3	S.P. 4 Position
S-3D	A.V.C. Switch	Part of S-3	S.P. 4 Position
S-4	A.C. Line Switch	Part of R-32	S.P.S.T.
S-5	Send-Rec. Switch	Toggle	S.P.S.T.
S-6	H.F. Osc. Transformer Band Switch	Rotary	
S-6A		Part of S-6	D.P. 5 Position
S-6B		Part of S-6	S.P. 5 Position
S-6C		Part of S-6	S.P. 5 Position
S-7	Tone Switch	Rotary	S.P. 3 Position
T-1	1st. I.F. Transformer		455 Kc.
T-2	2nd. I.F. Transformer		455 Kc.
T-3	Det. Input Transformer		455 Kc.
T-4	Power Transformer		115 Volts, 50/60 Cycles
T-5	Audio Output Transformer		5000/4 Ohms
X-1	Power Socket	Octal	
X-2	Accessory Connector Socket	Octal	
LS-1	Loudspeaker		5" P.M.

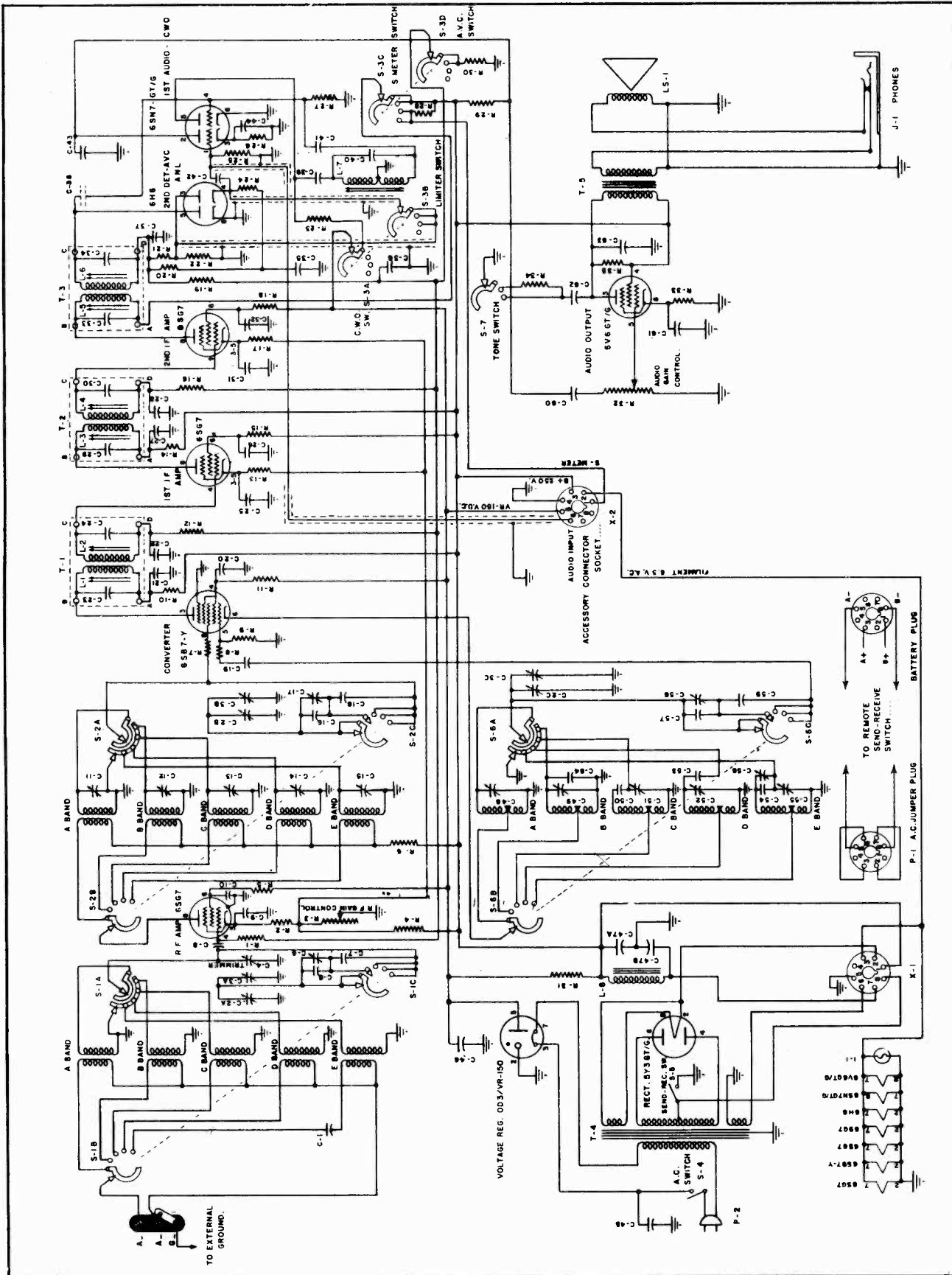
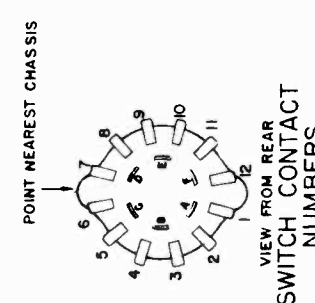
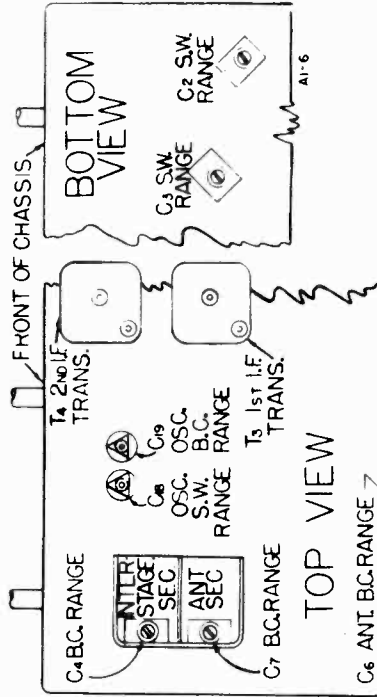
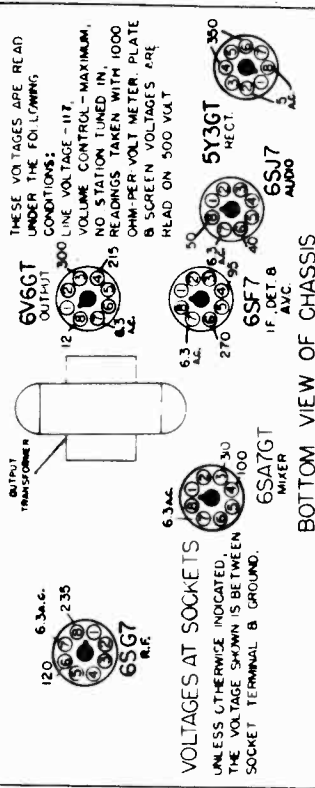
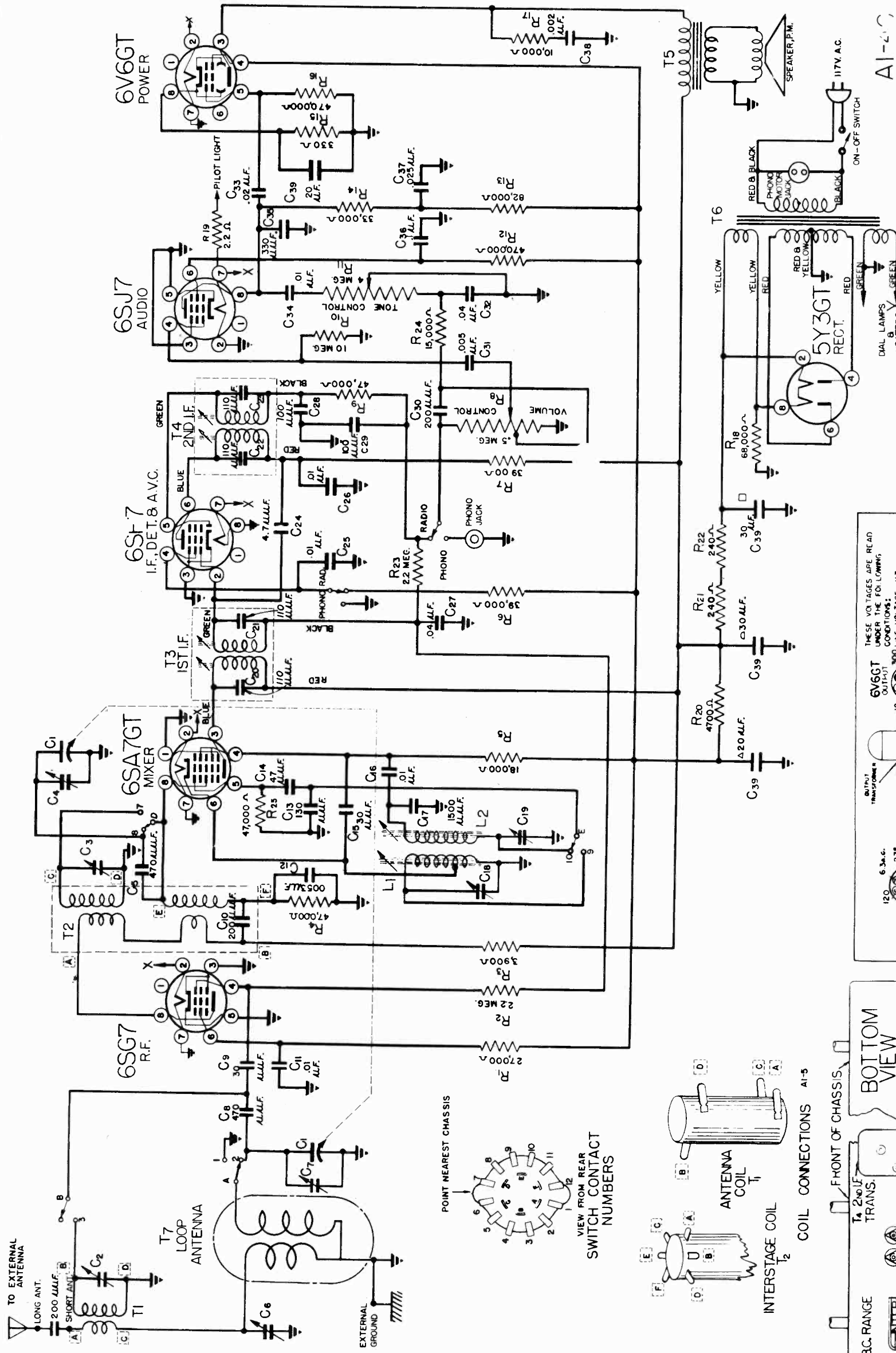


Figure No. 9. Schematic Diagram NC-57 Receiver





## INSTALLATION

### INSTALLING THE OUTSIDE ANTENNA

The built in loop antenna on your CO-OP Radio is highly efficient for the reception of local or nearby stations on the broadcast band. Short-wave reception will require some sort of an antenna connected to the set—5 to 15 ft. of wire stretched on the floor and connected to one of the antenna clips.

However, in locations where reception with the built in loop antenna is not satisfactory, a good outside antenna should be installed. The total length of the outside antenna, including the lead-in, should be from 50 to 80 ft. for good operation, and it should be as high as possible. Keep the antenna away from metallic objects such as other wires, gutters, grounded fire escapes, etc.

When the antenna is connected to a receiver, the antenna trimmer on the back of the chassis base must be readjusted. To do this, connect the antenna to one of the antenna terminals in the rear of the set; tune in a weak station near 600 kc. (60 on the dial); and adjust the trimmer screw with a screw driver until the signal is loudest. Antennas shorter than about 30 ft. should be connected to the SHORT ANT clip; those much longer than this will need to be connected to the LONG ANT clip. If in doubt which to use, try both adjusting the trimmer for each, and use the connection which gives the best performance.

A good ground connection should always be provided when an outside antenna is used, and sometimes it is useful in reducing noise even when no antenna is connected to the set. Connect a wire from the GND clip in the rear of the receiver to a convenient water pipe, radiator, or conduit. If none of these are available, a wire may be run to a metal stake or pipe driven into the ground to a distance of 4 to 6 ft.

### PREPARING RECORD CHANGER FOR OPERATION

The record changer has been mounted tightly to the cabinet shelf (or drawer bottom in the Con-

sole Model) to prevent damage in shipping. A string tied around the needle arm post holds the drawer closed in the Console Model. Cut this string BEFORE trying to open the drawer. Before attempting to use the phonograph, loosen the three mounting bolt nuts on the UNDER SIDE of the shelf or drawer until the record changer is floating on its spring shock absorbers. (These mounting bolts are located on top of the rectangular base.) Now, remove the two rubber bands that hold the pickup arm secure and remove the cardboard holder. Remove the cardboard disc from the turntable. Finally, remove the needle guard from the pick-up arm by grasping the guard with your thumb and forefinger at the rounded ends and pulling firmly but gently downward.

## OPERATION

**Broadcast Band (535 - 1620 Kilocycles):** The broadcast band is calibrated in channel numbers. Add a zero to the dial number to get the kilocycle number.

**Short-Wave Band (9 to 15.6 Megacycles):** The short-wave band is calibrated in megacycles.

**On-Off Switch and Volume Control:**

Turn on the radio by turning the volume knob to the right—a click will be heard. Wait about thirty seconds for the tubes to warm up. Continuing to turn the knob to the right will increase the volume. Turn off by turning the knob to the left until a click is heard.

**Tuning Knob:** Turn the tuning knob until the desired station is heard. Then slowly rotate the knob back and forth until the signal is clearest. If, at the clearest point, the signal is too strong, reduce it by means of the VOLUME CONTROL—NOT by using the tuning knob.

**Tone Control and Phono-Radio Switch:** Adjust the tone knob to desired tone AFTER the program is tuned in. The most natural and intelligible reception is obtained as the tone control is turned to the right. Turning the knob toward the left first increases the bass notes and then cuts the high treble notes as the left hand end is approached. The proper adjustments, in any case, will be determined by the amount of noise present and your personal preference.

Turning the knob all the way to the right throws a switch which cuts out radio reception and connects the phono-jack on the rear of the chassis base. Phonograph records may then be played through Model 6A47WT by connecting any record player to this jack. To restore radio reception, turn the tone knob all the way to the left to throw the switch back to the radio portion.

**Band Switch:** This knob has two positions. The position to the right (SW) switches the tuning to the short-wave band. The position to the left (BC) provides reception on the regular broadcast band.

### CONDITIONS AFFECTING RADIO RECEPTION

It is not always possible to obtain perfect reception from your radio. Often this is due to conditions entirely external to the receiver such as:

#### Atmospheric Static

Local interference caused by sparking in all kinds of electrical apparatus. This can be reduced by keeping the antenna's lead-in as far away from the electrical apparatus as possible, and by shielding and filtering the electrical apparatus causing the disturbance. It may, however, be necessary to call in your CO-OP Service Man or get in touch with your local power company if their apparatus is the cause.

**Fading** is a phenomenon that is noticeable when a distant station is being received. It manifests itself as a periodic change of signal strength and also as a periodic "mushing" or distortion of the signal. The automatic volume control incorporated in your CO-OP Radio tends to overcome the change of signal strength. However, change of signal strength may also be caused by a faulty antenna system or poor tubes.

The A.C. Line Voltage changes during the day and evening in some communities, particularly during peak load hours. This condition may reduce the life of some parts of any radio. Therefore, if this condition is prevalent, it is advisable to consult your local power company. If your electric lights flicker or vary, it may be an indication of this fluctuation of line voltage.

## CARE

If your radio does not operate satisfactorily, proceed as follows:

1. Be sure there is power at the outlet by connecting a lamp to the same outlet to which the radio is connected. Frequently it is necessary to bend the prongs of the plug if it does not fit properly into the outlet.

2. Be sure the tubes are in the correct sockets as shown in the diagram on the back of your radio chassis base. Also be sure the tubes are operating—glass tubes will light very dimly and metal tubes will be hot to the touch.

When it is necessary to replace a tube in your set, proceed as follows: If there is a back panel on your set (as on Model 6A47WT), pull out the studs around the edge of the panel and remove this panel first. Loosen and remove the four mounting screws on the under side of the board supporting the chassis. Pull off the dial knobs at the front of the cabinet and disconnect the phono-plugs. These plugs go into the sockets on the rear of the chassis base—one is a circular metal plug with three prongs and the other is a single-prong plug in the center of the rear panel of the chassis base. Remove the speaker plug—it is a single-prong plug located on top of the chassis base and next to the 6SG7 metal-covered tube. Now, slide the chassis out of the cabinet and replace any tubes that are not operating.

To remove the tubes in the 6A47WTR model it is necessary to remove the record changer first. To do this, remove the three mounting screws in the base of the changer. Disconnect all "plug-ins" as described. Lift the record changer out of the cabinet. Next, remove the three screws holding the metal cover in front of the changer and remove this cover. The tubes should now be easily accessible without removing the set from the cabinet. If not, proceed as described in the preceding paragraph and remove the chassis from the cabinet.

3. Check the antenna and ground. If an external antenna is being used, inspect the antenna system to be sure that it is not grounded at any point, and that all connections are in good condition.

NATIONAL COOPERATIVES, INC. MODELS 6A47WT, WTR, WTC;  
6AWC2, C3; 6AFMT; 6AMM

REPLACEMENT PARTS PRICE LIST  
CONDENSERS

Code No.	Specifications	Tolerances	
C24	4.7 mmf.	600 v.	.5%
C15, C4	30 mmf.	600 v.	10%
C14	47 mmf.	600 v.	10%
C13	130 mmf.	600 v.	5%
C10, C30	200 mmf.	600 v.	20%
C35	330 mmf.	600 v.	20%
C5, C8	470 mmf.	600 v.	3%
C17	1500 mmf.	600 v.	10%
C38	0.002 mfd.	600 v.	25%
C12	0.005 mfd.	400 v.	10%
C31	0.0053 mfd.	400 v.	5%
C11, C16,			
C25, C34	0.01 mfd.	400 v.	20%
C33	0.02 mfd.	400 v.	20%
C37	0.025 mfd.	400 v.	20%
C27, C32	0.04 mfd.	200 v.	20%
C36	0.01 mfd.	400 v.	20%
C26	0.01 mfd.	600 v.	20%
C39	4 sect. elec-trolytic		
	30 mfd.	450 v.	} +50% -10%
	30 mfd.	450 v.	
	20 mfd.	450 v.	
	20 mfd.	25 v.	

TRANSFORMERS & COILS

Part No.	Code No.	Description
TRX101	T6	Power Transformer
TRX102	T5	Output Transformer
TRX103	T3	1st I.F. Transformer
TRX104	T4	2nd I.F. Transformer
CLA102	T2	R.F. Interstage Coil
CLA101	T1	S.W. Antenna Coil
CLA107		Loop Antenna Assembly for 6A47WT
CLA115		Loop Antenna Assembly for 6A47WTR
CLA116		Loop Antenna Assembly for 6AWC2 & 6AWC3

KNOBS & CONTROLS

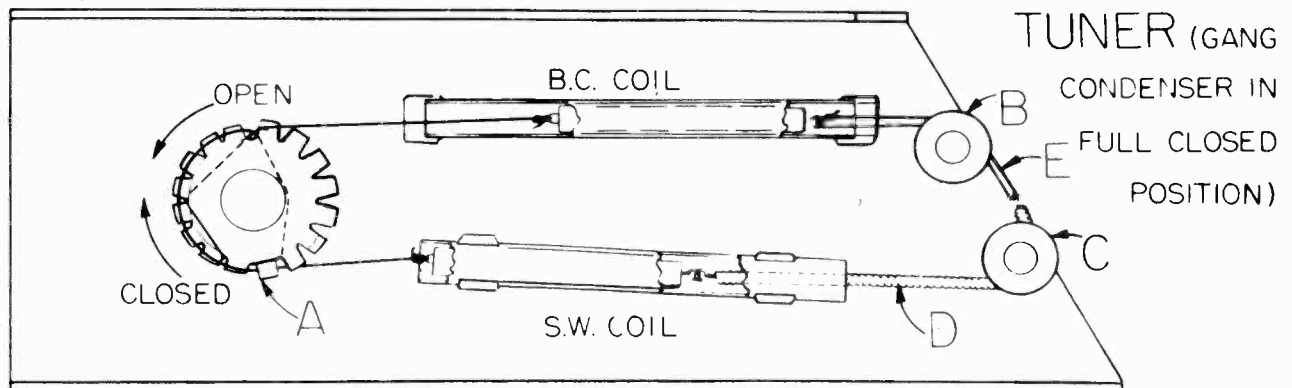
Part No.	Description
SWX101	Band Switch Assembly
KNX101A	Band Switch
KNX102	Tuning Knob
KNX103	Volume Control Knob
KNX104	Tone Control Knob
SHX100C	Tuning Shaft Assembly
PHX100A	Volume Control Assembly
PHX101	Tone Control Assembly

Part No.	Description
BEX103	Mounting Sleeve
BRA118	Tuner Assembly Complete
BRA123	Dial and Bracket Assembly Complete
DNX100	Glass Dial Plate
FHX101	A.C. Line Cord Lock
FSA100	Mounting Parts Assembly
PHA103	Complete Dial and Cord
PHA105	Speaker Assembly Complete - 6A47WT Model
PHA106	Speaker Assembly Complete - 6A47WTR Model
PHX102	Speaker - 6A47WT Model

Part No.	Description
PHX103	Speaker - 6A47WTR Model
PHX104	Speaker - 6AWC2 and 6AWC3 Models
RCX101	Aero-Record Changer - Model F
RIX105	Grommet for Mounting
RIX107	Washer for Mounting
RIX117	Mounting Screw
SMX146	Speaker Cover - 6A47WTR Model
SMX163	Loop Shield - 6AWC2 and 6AWC3 Models
SOX100	Socket - Octal
SOX103	Phono-Motor Socket - 3 Prong
SPX115	Dial Cord Spring
WCA103	Dial and Cord Assembly
WCX101	A.C. Line Cord with Plug
WCX102	Dial Cord

RESISTORS

Code No.	Specifications	Tolerances	
R10	10 meg.	1/2 w.	20%
R2, R23	2.2 meg.	1/2 w.	10%
R12			
R16	470,000 ohms	1/2 w.	10%
R13	82,000 ohms	1/2 w.	10%
R18	68,000 ohms	2 w.	20%
R3, R4	47,000 ohms	1/2 w.	10%
R6	39,000 ohms	1/2 w.	10%
R14	33,000 ohms	1/2 w.	10%
R1	27,000 ohms	1/2 w.	10%
R5	18,000 ohms	2 w.	10%
R24	15,000 ohms	1/2 w.	20%
R17	10,000 ohms	1/2 w.	10%
R20	4,700 ohms	2 w.	20%
R7, R3	3,900 ohms	1/2 w.	10%
R15	330 ohms	1 w.	10%
R21, R22	240 ohms	2 w.	10%
R19	2.2 ohms	1/2 w.	10%



MODELS 6A47WT, 6A47WTR, NATIONAL COOPERATIVES, INC.  
6A47WTC, 6AWC2, 6AWC3,  
6AFMT, 6AMM

## SERVICE DATA

### STRINGING THE DIAL DRUM

1. Turn the gang condenser to FULL CLOSED position.
2. Attach the looped end of the line cord assembly (Part #WCA103) to lug "D" as shown in the diagram.
3. String the cord through the opening on the rim of the pulley, upward and around the top of the pulley, down behind the dial and under the tuning shaft.
4. Take four turns around the shaft in a clockwise direction as viewed from the front of the chassis, progressing outward from the chassis. (Check to be sure that none of the turns lie on top of one another to avoid sloppy tuning.)
5. Continue stringing the cord from the tuning shaft up to and around the small pulley "C" at the upper left hand corner of the dial bracket (as viewed from the front of the chassis). In going from the shaft to pulley "C", be sure to lead the cord between the bracket mounting leg and the tone control shaft.
6. Now, string the cord along the upper edge of the dial bracket to pulley "B" at the upper right hand corner of the bracket. (As the cord passes along the top of the dial, be sure to thread it through the opened prongs on the dial pointer.)

7. String the cord over pulley "B", downward around pulley "A" (at the lower right hand corner of the chassis as viewed from the front), up through the opening on the rim of the dial pulley, and hook to the tension spring which has been hooked over lug "E" on the pulley.

The stringing is now completed. To fasten the pointer to the cord:

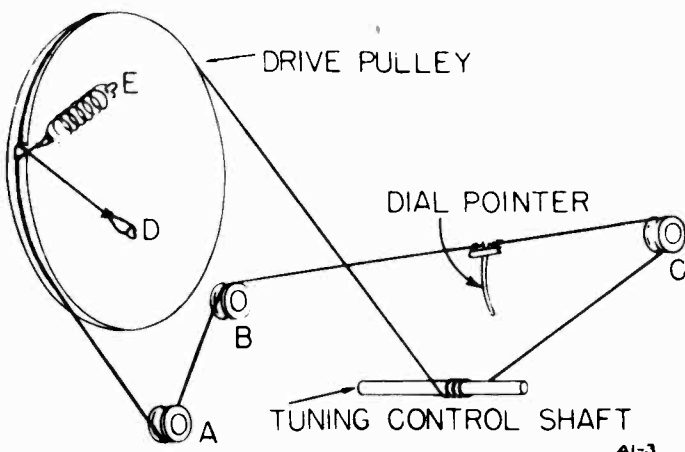
1. With the gang condenser still in CLOSED POSITION, slide the pointer to the last dot at the left hand end of the BC band (as viewed from the front of the chassis).
2. Pull the cord out from the prongs in the pointer and wrap a small piece of 1/4" tape around it at the point where the pointer prongs come.
3. Re-insert, and bend the two end prongs backward over the tape and middle prong forward. This fastens the pointer securely to the cord in the correct position, completing the stringing of the dial.

### STRINGING THE TUNER

In order to string the tuner, remove tuner assembly from the chassis and remove the dial drum from the condenser shaft with a soldering iron. In doing this, it is important to note the position of the dial drum relative to the condenser plates, in order to reassemble properly.

Part #WCA102--cord and core assembly is used for stringing the tuner. Proceed as follows:

1. Remove the S.W. coil from the fuse clip brackets.
2. Insert the S.W. core as shown in the diagram, attaching the tuner spring to loop "E", and allowing the spring to lie loose until it is to be stretched around the pulleys and connected to the right hand hook of the P.C. core.
3. Replace the S.W. coil in the fuse clips in the approximate position shown in the diagram.



AI-3

NATIONAL COOPERATIVES, INC. MODELS 6A47WT, 6A47WR,  
6A47WC, 6AWC2, 6AWC3,  
6AFMT, 6AMM

4. Rotate the gang condenser to FULL OPEN position (counterclockwise looking from above as in the diagram).

5. Pull the core by means of the cord fastened to the left hand hook, until the left end of the core is exactly 1/4" from the first tooth on the larger radius of the cam (tooth "A" with cam rotated 180° from position shown on the diagram).

6. Proceed with the stringing as shown in the diagram, making sure that the cord is not unduly stretched or left loose between any of the teeth on the cam.

When the stringing has been completed around the cam:

7. Lay the P.C. core, which has been attached to the other end of the cord, on the bracket and remove the BC coil from the clips that hold it.

8. Insert the B.C. core in the coil form and push it through (with a small wire) until the bare hook comes into view at the other end.

9. Replace the B.C. coil in the approximate position shown on the diagram.

10. Recheck the gang--it should be in FULL OPEN position.

11. Grasp the tuner shaft firmly to prevent it from rotating. String the cord loop with the spring attached, from the right end of the S.W. core, around pulley "P" only. Hook the spring to the right hand hook on the B.C. core. (The spring should be barely accessible at the right end of the B.C. coil.)

12. Release the gang condenser (being sure it is still in FULL OPEN position), and stretch the spring around the second pulley "C". Be careful not to damage the spring during this operation.

13. Adjust the B.C. coil to its correct position by sliding the coil to a point 1 1/2" from the right-hand end of the B.C. core to the beginning of the coil winding. The tuner is now strung and ready for adjustment of the S.W. coil position:

Turn the gang condenser to its FULL CLOSED position. Insert a piece of wire which has been marked 5/8" from one end into the coil form until it hits the S.W. core. The distance from the left end of the coil form to the left end of the core should be 5/8". If this measure is not within 1/32", there has been some error made during the stringing procedure or the

parts are defective. Carefully review the steps taken. If no apparent error is in evidence and the measure does not fall within this tolerance, get in touch with your local CO-OP dealer who will furnish you a complete tuner subassembly already strung.

If the final measure was within the tolerance, the tuner is properly strung and ready to be replaced on the chassis base. Solder the dial drum back on, making sure that you replace it in the same position with respect to the gang plates as it originally was.

**WARNING:** When removing the B.C. and S.W. coils from the fuse clips, be careful not to break the fine wires or loosen any soldered connections.

**NOTE:** The S.W. core is distinguished from the B.C. core in that the S.W. core has a somewhat lighter color and a more satiny surface.

## ALIGNMENT PROCEDURE

### I. F. ALIGNMENT

Whenever one or both I.F. transformers (T3 and T4) are changed, or the wiring associated with these transformers or with the 6SA7 or 6SF7 tubes is disturbed, it is imperative to realign the I.F. transformers. Proceed as follows:

1. Connect an output meter, a.c. voltmeter, or other suitable instrument across either primary or secondary of the output transformer, T5.

2. Turn the volume control to its maximum (clockwise); and turn the bandswitch to BC (counterclockwise).

3. Connect a signal generator from the input grid (pin 8) of the 6SA7 tube to ground, and feed in a modulated signal at 455 kc., using as small an input signal as possible yet maintaining a convenient deflection on the output meter.

4. Adjust each of the 4 screws on top the I.F. transformers for maximum output, at the same time decreasing the input from the signal generator to be sure to get a true maximum reading.

When this is completed, the I.F. transformers are in alignment.

MODELS 6A47WT, 6A47WTR, NATIONAL COOPERATIVES, INC.

6A47WTC, 6AWC2, 6AWC3,

6AFMT, 6AMM

## R. F. ALIGNMENT

When service operations of any sort have been performed on the antenna coil, interstage coils (T1, T2), loop antenna, gang condenser-oscillator assembly, 6SG7 tube, or circuits associated with any of these, it is important to realign the R.F. circuits for best performances.

**Shortened Alignment Procedure**--If the service operations have not involved the gang condenser-oscillator assembly or its associated capacitors (C18, C19, C13, C14), a shortened procedure may be used, as follows:

1. Connect the output meter and check the I.F. alignment.

2. Using broadcast stations as a guide, check the calibration of the broadcast and short-wave bands. (If no stations are available, use a signal generator--it is less likely to be accurate however, WWV time signals on 10 mc. and 15 mc. can sometimes be used to check the short-wave band calibrations). If the calibration is not reasonably close, the complete alignment procedure will be necessary. If satisfactory, proceed to connect the signal generator or multivibrator from GND terminal to the LONG ANT terminal on the loop frame.

3. Turn the band switch to BC, and set the dial to about 600 kc.

4. If a multivibrator is used, adjust the loop trimmer C6 for maximum output. If a signal generator is used, tune in the signal at about 600 kc. and adjust C6 for maximum output.

5. Turn to 1500 kc. and tune in a signal.

6. Adjust trimmers C7 and C4 for maximum output.

7. Go back to 600 kc. and disconnect the signal generator or multivibrator from the LONG ANT terminal, but leave the wire from the signal source in the vicinity of the antenna terminals. Turn up the signal source output so that the signal can be heard and readjust C6 for maximum output.

8. Reconnect the lead from the signal

source to the SHORT ANT terminal through a 600 ohm resistor.

9. Turn the band switch to SW and the dial to 15 mc. Tune in a signal from the signal source at this point. (Be sure you have the correct signal and not an image.)

10. Adjust trimmers C2 and C3 for maximum output, "rocking" the tuning control as you do so.

The receiver is now in alignment for reception with the loop antenna. If an external antenna is used, the loop trimmer C6 must be realigned with the actual antenna connected as described in the installation instructions.

**Complete R.F. Alignment Procedure:** It is strongly recommended that the receiver be returned to the factory for any repairs involving replacement or any adjustment of the gang condenser-oscillator assembly (tuner assembly) other than adjustment of trimmers C4 and C7. If, however, it has been necessary to replace the gang condenser-oscillator assembly or capacitors C18, C19, C13, or C14 in the field, the alignment procedure is as follows:

1. Set the dial pointer so that it lines up exactly with the left hand and mark when the gang is fully closed.

2. Connect the output meter. Turn the volume control to its maximum and the bandswitch to BC. Feed in the signal generator on the grid of the 6SA7 (pin 8 to ground).

3. Check the I.F. alignment. Set the signal generator to 1000 kc. and check the generator calibration against a broadcast signal in place of the generator. Adjust C19 so that the receiver is on calibration at this point.

4. Throw the bandswitch to SW. Set the signal generator to 12 mc. and adjust C18 so that the correct signal (the one which comes in at the higher frequency on the receiver dial) is right on the 12 mc. mark.

5. From here on, follow the shortened procedure until the alignment of the receiver is complete.

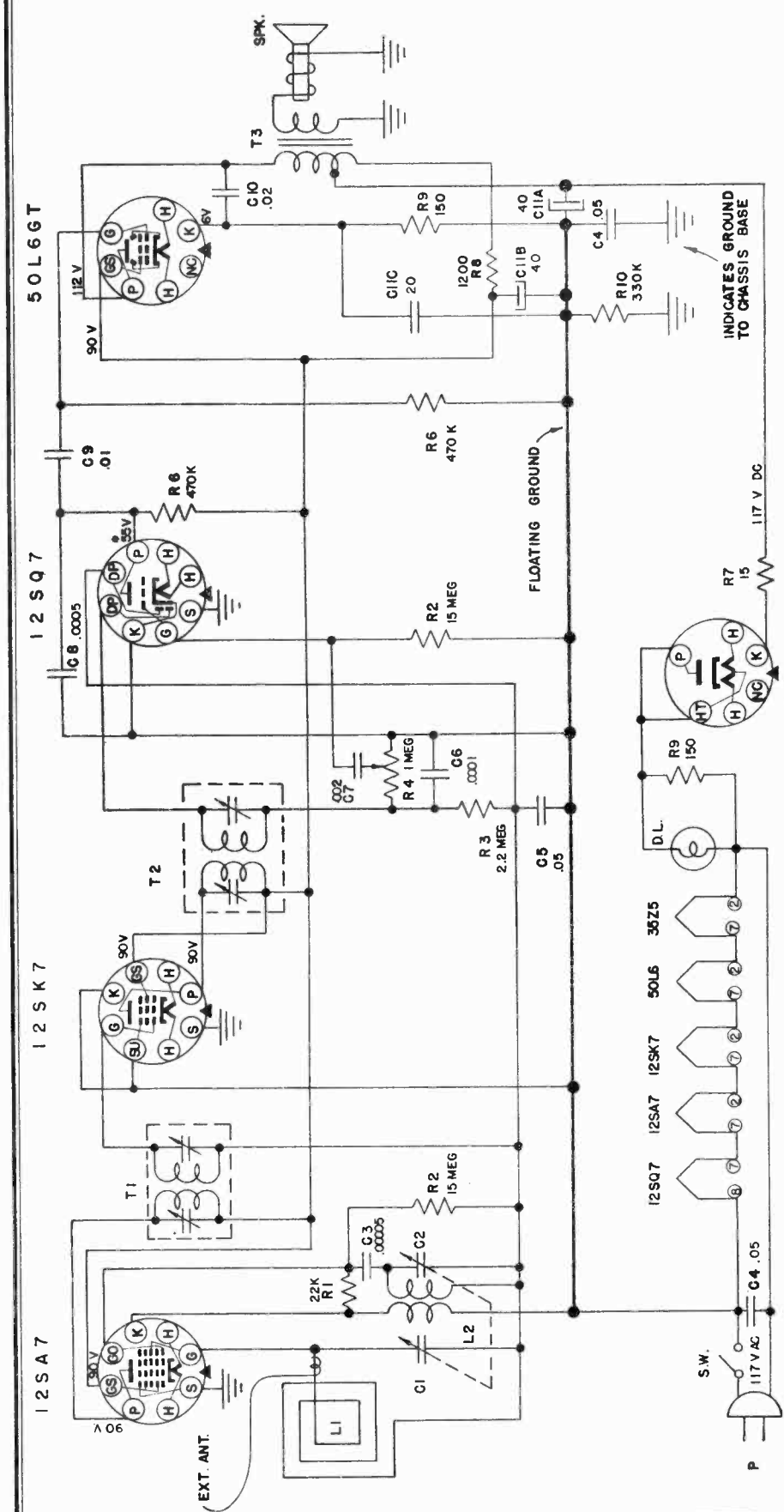
is the center one in which the signal is the clearest and strongest. If the signal is too strong, reduce it by means of the VOLUME CONTROL. **Antenna:** For reception of distant stations, and improved results in locations unfavorable to FM reception, install an outside FM dipole antenna, equipped with a 300 ohm flat lead-in. Disconnect the built-in antenna by removing the wires from terminals #1 and #3 on the tuner chassis. Connect the lead-in wires of the outside antenna to the same terminals.

**FM Tuner:** If your radio does not have an FM band, an FM tuner may be installed.

**SUPPLEMENT FM OPERATION**

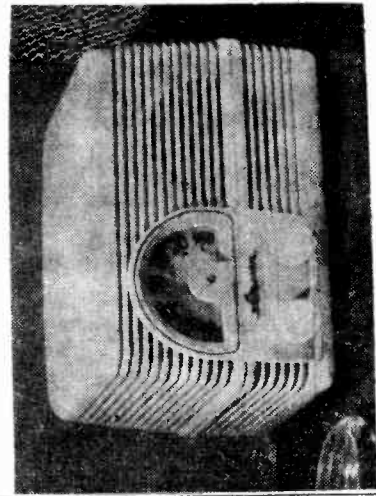
**FM Band** -- 88 to 108 megacycles: Turn the radio on by turning the volume control knob to the right. Turn the Frequency Modulation tuner on by turning the "FM On-Off" switch to the right. Wait a few seconds for the tubes to heat. Turn the tone control knob clockwise until a click is heard. The receiver will now be set for FM reception.

**FM Tuning Knob:** Turn the FM tuning knob until the station is heard. Rotate the knob slowly back and forth across the station desired. The station may be heard in three positions -- the correct position



**SPECIFICATIONS**

<b>FREQUENCY RANGE</b>	<b>TUBES AND FUNCTIONS</b>	<b>POWER SUPPLY</b>	<b>POWER OUTPUT</b>
Broadcast	12SA7	105-125 Volts, AC-DC, 35 Watts	8 Watts
IF	12SK7	455 kc	2.5 Watts
	12SQ7	Undistorted	2000 Ohms
	50L6	Maximum	
	35Z5GT	Plate load	
		<b>LOUD SPEAKER</b>	
		Type: Permanent magnet	
		Size: 4 Inch	
		Voice coil impedance	3.2 Ohms



### ALIGNMENT PROCEDURE

**PRELIMINARY:**

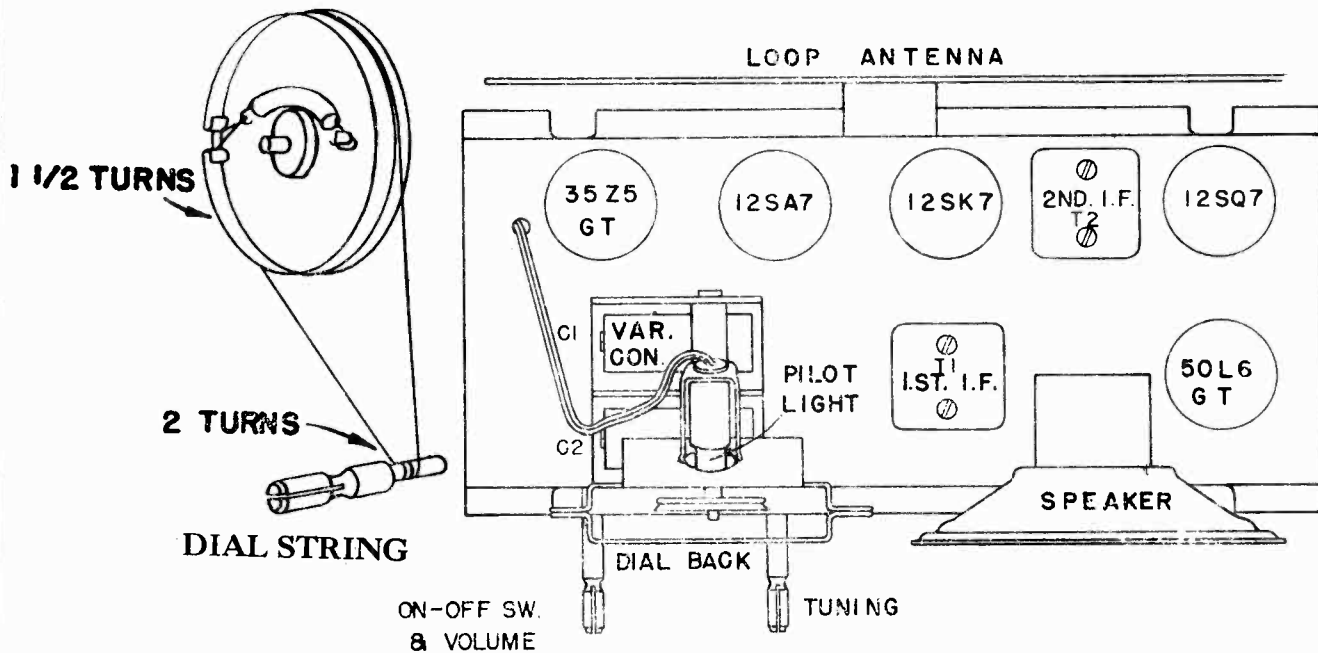
Output meter connection .....	Across loudspeaker voice coil
Output meter reading to indicate 200 milliwatts (standard output) .....	8 volts
Dummy antenna value to be used in series with generator output .....	See chart below
Connection of generator output lead .....	See chart below
Connection of generator ground lead .....	Floating ground
Generator modulation .....	30% 400 cycles
Position of volume control .....	Fully clockwise
Position of dial pointer with variable fully closed .....	Last mark at left end of dial

Position of Variable	Frequency of Generator	Dummy Antenna	Generator Output Connection	Trimmers Adjusted in Order Shown for Maximum Output	Function of Trimmer
Open	455	.05 mfd.	12SA7 Grid (Stator of C1)	Top of 2nd & 1st IF trans. T2 & T1	IF
1400	1400		*Test Loop*	C2; C1, Trimmers on Variable Condenser	Osc. Ant.
600	600		*Test Loop*	Check Point	

\*Standard Hazeltine Test Loop Model 1150 or 3 turns of wire about 6" in diameter, placed about one foot from the set loop.

The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the AVC action of the receiver ineffective.

### TUBE LAYOUT

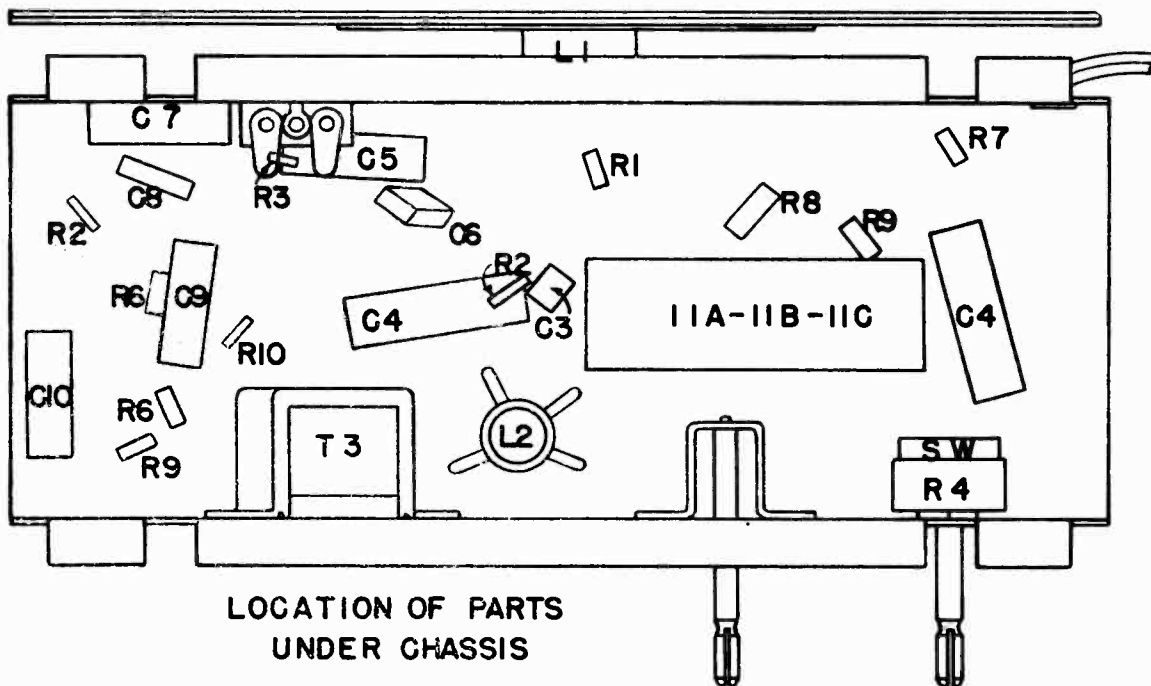


This receiver is designed to operate without a ground connection and no attempt should be made to use one.

Models 152-T and 153-T are identical except for cabinets. Model 152-T is in a walnut cabinet. Model 153-T is in an ivory cabinet.

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
R1	C20060-223	Resistor, 22,000 ohm, 1/4 watt	A20072-8Z	Rivet, for Mounting Dial Crystal (25)	
R2	C20060-156	Resistor, 15 megohm, 1/4 watt	A20222-1C	Speed Nut—for Mounting Dial Crystal (15)	
R3	C20060-225	Resistor, 2.2 megohm, 1/4 watt	A20216-1C	Speed Nut—for Mounting Name Plate (25)	
R4	C21511	Volume Control and Switch, 1 megohm	A19124	Snap-on Button—for Rear Cover (10)	
R6	C20060-474	Resistor, 470 K ohm, 1/4 watt	A21504	Carton with Fillers	
R7	C20060-150	Resistor, 15 ohm, 1/4 watt	A21482	Tuning Shaft	
R8	C20070-122	Resistor, 1200 ohm, 1 watt	C19926	Dial Scale	
R9	C20060-151	Resistor, 150 ohm, 1/4 watt	A20077-3	Grommet—Under Variable Condenser	
R10	C20060-334	Resistor, 330 K ohm, 1/4 watt	A19361	Hair Pin Clip	
C1-C2	C21481	Variable Condenser & Pulley Assembly	A19132	Dial Drive Cord	
C3	A21643	Capacitor, .00005, 350V	A19133	Spring—Dial Drive Cord	
C4	C20068-503	Condenser, .05, 400V	A19138-3	Spacer Eyelet	
C5	C20067-503	Condenser, .05, 200V	A19138-1	Spacer Eyelet—for Mounting Variable Condenser	
C6	C20065-101	Condenser, .0001, 500V (Mica)	A19141	Terminal Strip	
C7	C20068-202	Condenser, .002, 600V	A19205-3	Cap Mounting Clip	
C8	C20065-501	Condenser, .0005, 500V (Mica)	A21346-1	Socket—Dial Light	
C9	C20068-103	Condenser, .01, 400V	A19233-1	Socket—Tube	
C10	C20068-203	Condenser, .02, 400V	A18254-1	Socket—Tube	
C11	A21499	Electrolytic Condenser, 40-20 mfd., 150V, 20 mfd., 25V	AA21542-1	Dial Pointer Assembly	
L1	A21521-1	Antenna Loop Assembly	A21330	Name Plate	
L2	AC21492-1	Oscillator Coil Assembly			
T1	AC21495-1	1st I. F. Coil Assembly			
T2	AC21496-1	2nd I. F. Coil Assembly			
T3	AC21497-1	Output Transformer Assembly			
Spk	C21517	Speaker Assembly			
P	B20138-5	Line Cord and Plug Assembly			
DL	A19351	Dial Light Bulb			
	AA21877	Cabinet Assembly (Walnut)			
	AA21878	Cabinet Assembly (Ivory)			
	A21485	Dial Crystal			
	A21501-1	Knob (Walnut)			
	A21501-2	Knob (Ivory)			
	AC21696-1	Cabinet Rear Cover Assembly (152-T)			
	AC21696-2	Cabinet Rear Cover Assembly (153-T)			



LOCATION OF PARTS UNDER CHASSIS

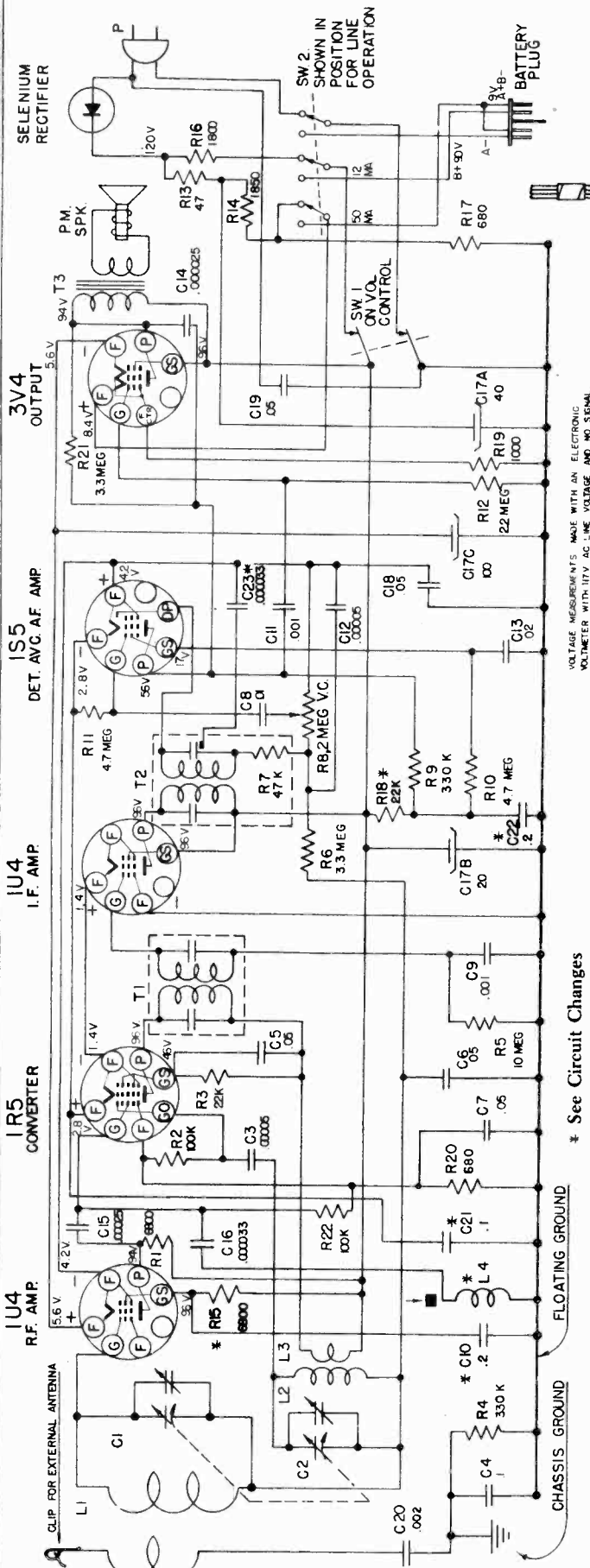
CIRCUIT CHANGES

Some sets were made with a 330 Ohm instead of a 150 Ohm resistor in shunt with the dial light, and the 15 ohm resistor R7 in the plate circuit of the 35Z5 tube instead of the Cathode Circuit.



MODEL 250P  
CHASSIS RE-248

NOBLITT-SPARKS INDUSTRIES, INC.



VOLTAGE MEASUREMENTS MADE WITH AN ELECTRONIC VOLTMETER WITH 117V AC LINE VOLTAGE AND NO SIGNAL.

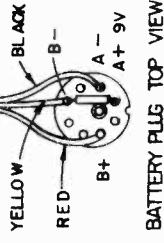
On battery operation, the B+ voltage measured to floating ground should be the sum of the A & B battery voltages or approximately 99 Volts with new batteries.

SERVICE HINTS AND CIRCUITS CHANGES:

- \* Any of the following battery packs can be used: General 60A-6F6-5; Eveready 753; Ray-O-Vac AB994; Burgess F6A60. The following changes were made after a pilot run of 100 sets. The schematic and parts location drawing in this bulletin are for the sets produced after the changes were made:
- 1. R15 - Resistor, 680 Ohms, 1/4 Watt, added in series with B+ lead to converter and RF Amp. tubes (across lugs 3 & 4 on RF Amp. socket).
- 2. C10 - Condenser, .1 uf., 400 Volts added from B+ to floating ground.
- 3. C21 - Condenser, 10 uf., 150 Volts added from RF Amp. B+ to floating ground.
- 4. L4 - Connection changed from AVC to floating ground.
- 5. R22 - Resistor connection changed from AVC to filament lug of 1R5 tube socket.

The following changes were made to reduce hum and hum modulation after a quantity of sets had been produced:

1. C10 - .2 uf., 200 V. connected from the screen grid of RF amplifier tube to floating ground, was .1 uf., 400 V. and was connected from B+ to floating ground.
2. C21 - .1 uf., 400 V. connected from positive side of filament of converter tube to floating ground was 10., 150 V. connected from B Supply of RF and converter tubes to floating ground.
3. R15 - 6800 ohm resistor connected from screen grid of RF amplifier tube to B Supply of RF amp. and converter tubes.
4. R18 - 22,000 ohm resistor and C22, .2 uf., 200 V. condenser; were added in the audio amplifier circuit. At the same time, C23, .000033 uf., 500 V. condenser was added in the diode filter circuit to improve the high frequency response.



SPECIFICATIONS

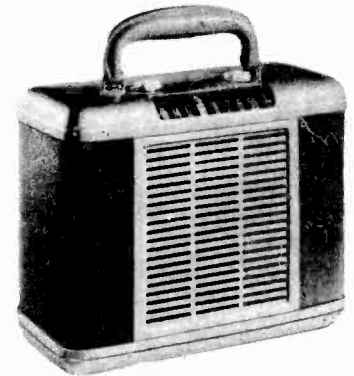
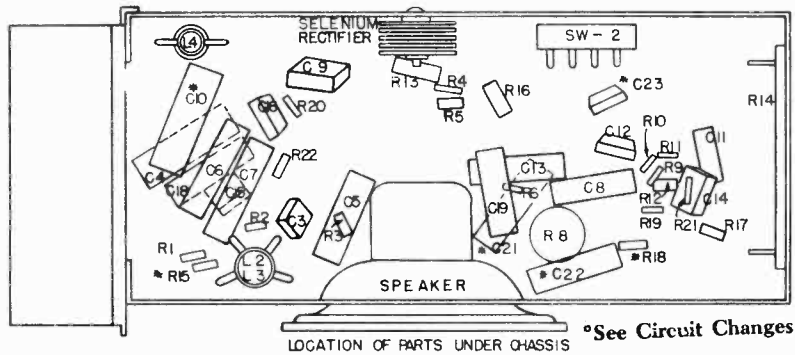
POWER SUPPLY  
115 Volts, AC-DC, 16 Watts (or)  
\*90V, B, 9V, A, Battery Pack  
Approx. Current Drain 12 MA "B" 50 MA "A"

POWER OUTPUT  
Undistorted ----- .25 Watts  
Maximum ----- .32 Watts  
Plate load ----- 10,000 Ohms

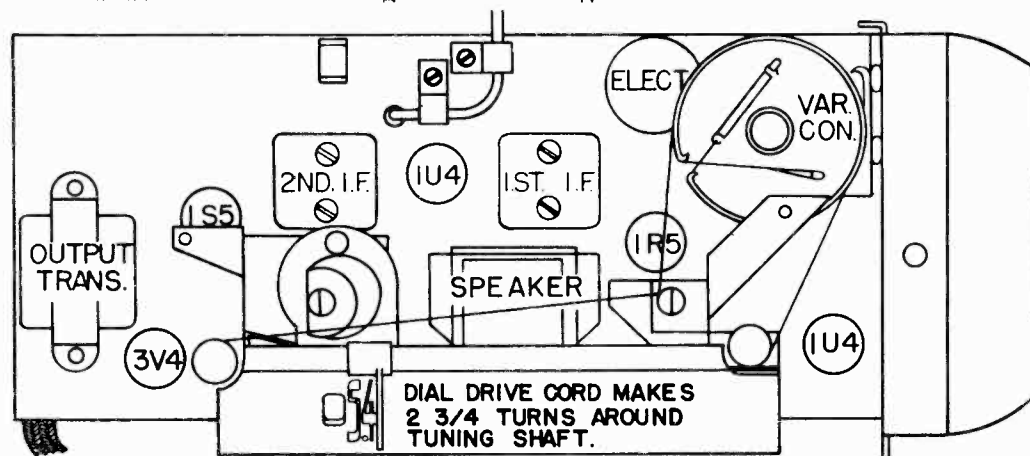
FREQUENCY RANGE  
Broadcast ----- 540-1600 kc  
IF ----- 455 kc

LOUD SPEAKER  
Type: Permanent magnet  
Size: 5 Inch  
Voice coil impedance ----- 3.2 Ohms

NOBLITT-SPARKS INDUSTRIES, INC.

MODEL 250P  
CHASSIS RE-248**ALIGNMENT.**

- A. Connect to 117 V., AC line and turn set on with volume control at full volume.
  - B. With variable condenser closed, set pointer to end mark on dial.
  - C. Connect signal generator high side through .05 uf or larger condenser to high side of loop or variable condenser. Connect low side of signal generator to floating ground. Connect output meter across speaker voice coil.
  - D. Open variable condenser.
  - E. With signal generator set at 455 Kc, increase output of generator until output is heard in speaker. Adjust all (4) IF trimmers until maximum output meter reading is obtained, reducing signal generator output as adjustment progresses so that final adjustment is made with lowest input consistent with good signal to noise ratio.
- NOTE: If no signal can be heard with signal generator connected as at C above, connect high generator lead to terminal 6 of IR5 tube, through condenser as at C, and proceed as before.
- E. With signal generator at 455 Kc and connected as in C above, adjust I. F. trap until output meter reading is a minimum. Final adjustment is to be made with high signal input so that an accurate adjustment can be made.
  - F. With signal generator connected to radiating loop and set to 1620 Kc adjust oscillator trimmers (C2) on variable condenser until output is maximum. Variable Condenser is to be fully opened during this adjustment.
  - G. Set signal generator to 1400 Kc and rotate variable condenser until output is maximum. Adjust R. F. trimmer (C1) on variable condenser until output increases to a new maximum. Rotate variable condenser slightly to obtain another maximum output. Re-adjust trimmer until output is again a maximum. Repeat this cycle until no further increase in output can be obtained. Final adjustment to be made with a signal generator output at lowest level consistent with good signal to noise ratio.
  - H. Set signal generator to 1000 Kc and tune radio to maximum output. Adjust variable condenser plates for maximum output.
  - I. Set signal generator to 600 Kc and proceed as in H above.
  - J. Set signal generator to 540 Kc and make sure that radio will tune to maximum output slightly before variable condenser is fully closed.
  - K. Recheck alignment and calibration at 1400, 1000, and 600 Kc, making any necessary readjustments.
  - L. Tune the variable Condenser through its entire range to make sure it is not shorted at any point.



TUBE LAYOUT

**MODEL 250P, CHASSIS NOBLITT-SPARKS INDUSTRIES, INC.**

RE-248

MODEL 250P

MODEL 240P, CHASSIS RE-243

**PARTS LIST**

Schematic Location	Part Number	Description	Schematic Location	Part No.	Description
R1	C20060-682	Resistor, 6800 Ohms, 1/4 W	T1	AC21810-1	1st IF Coil Assy.
R2, R22	C20060-104	Resistor, 100,000 Ohms, 1/4 W	T2	AC21812-1	2nd IF Coil Assy.
R3	C20060-223	Resistor, 22,000 Ohms, 1/4 W	T3	AC21893-1	Output Transformer Assy.
R4, R9	C20060-334	Resistor, 330,000 Ohms, 1/4 W	C	AC21814-1	Battery Cable Assy.
R5	C20060-106	Resistor, 10 Megohm, 1/4 W	P	B20169-1	Line Cord Assy.
R6, R21	C20060-335	Resistor, 3.3 Megohm, 1/4 W	Spk.	C21113	Speaker Assy.
R8	C21879	Volume Control & Switch, 2 Megohm, 2 Pole Switch	Sw-2	A21051	Slide Switch
R10, R11	C20060-475	Resistor, 4.7 Megohm, 1/4 W		*A21965	Cabinet Wrap Around Assy.
R12	C20060-225	Resistor, 2.2 Megohm, 1/4 W		*E21823	Cabinet Top Cover
R13	C20070-470	Resistor, 47 Ohms, 1 W		*C19932	Handle Mtg. Clip
R14	A21816	Resistor, 1850 Ohms, 10 W., + or - 10 %		AD21881	Cabinet Bottom Cover Assy.
R15	C20060-682	Resistor, 6800 Ohms, 1/4 W		C20098-43	Eyelet, #SE-95
R16	C20070-182	Resistor, 1800 Ohms, 1 W., + or - 10 %		E21824	Cabinet Wrap Around
R17, R20	C20060-681	Resistor, 680 Ohms, 1/4 W		*AA21966	Handle Assy., Including Loops
R18	C20060-223	Resistor, 22,000 Ohms, 1/4 W		A21330	Nameplate with Speed Nuts
R19	C20060-102	Resistor, 1000 Ohms, 1/4 W		A21190-1	Control Knob
C1, C2	C19822	Variable Condenser, 2 Gang		*C21210	Dial Crystal
C3, C12	C20065-500	Condenser, .00005 uf., 500 V., Mica		A21828	Carton, Complete with Fillers
C4, C21	C20068-104	Condenser, .1 uf., 400 V., P. T.		D21196	On-Off Indicator
C5, C6, C7	C20068-503	Condenser, .05 uf., 400 V., P. T.		C21808	Dial Scale
C18, C19				D21809	Dial Pointer
C8	C20068-103	Condenser, .01 uf., 400 V., P. T.		A21205	Tuning Shaft
C9	C20128-102	Condenser, .001 uf., 500 V., Mica		A19361	Hair Pin Clip for Tuning Shaft
C10, C22	C20067-204	Condenser, .2 uf., V., P. T.		A21916	Hair Pin Clip for Indicator Spindle
C11	C20069-102	Condenser, .001 uf., 600 V.		A19132	Dial Drive Cord
C13	C20068-203	Condenser, .02 ufd., 400 V., P.T.		A19295	Spring, Dial Cord
C14	C20065-250	Condenser, .000025 uf., 500 V., Mica		A20132-1	Socket, Tube
C15	C20065-251	Condenser, .00025 uf., 500 V., Mica		A20132-2	Socket, Tube
C16, C23	C20065-330	Condenser, .000033 uf., 500 V., Mica		A20207-1	Selenium Rectifier, 75 ma.
C17A, C17B	A21815	Condenser, Electrolytic, 40-20 uf., 150 V., 100 uf., 10 V.		A21852	Mounting Wafer for Electrolytic Condenser
C17C				A19344-1	Idler Pulley
Early C21 Production	A21811	Condenser, Electrolytic, 10 uf., 150 V.		A16695	Idler Pulley Stud
L1	AD21912-1	Antenna Loop Assy.		A21358	Cam for On-Off Indicator
L2, L3	AC20155-1	Oscillator Coil Assy.		AA21967	Antenna Terminal, Strip Assy.
L4	AC21813-1	IF trap Assembly		A21347	Spring for On-Off Indicator
				A19139	Terminal Strip
				A20227	Speed Clip, Tinnerman
				A19138-1	C-3382-022-1, on Vol. Control
					Spacer Eyelet for Mounting Variable Condenser
				A20077-3	Grommet, for Mounting Variable Condenser

\*Two eyelets, Parts # 20098-43 are required to replace these parts. These eyelets should be ordered separately, as they are not included with the parts.

**MODEL 240P**

**PARTS LIST**

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
R1	C20060-124	Resistor, 100,000 ohm, 1/4 watt		E21761-1	Cabinet, Front Sec. with Grille Cloths & Latch
R2	C20060-225	Resistor, 2.2 megohm, 1/4 watt		C21766	Handle
R3	C21782	Volume Control & Switch, 1 megohm		A21764-1	Knob
R4	C20060-106	Resistor, 10 megohm, 1/4 watt		A21798	Handle Reinforcement
R5	C20060-475	Resistor, 4.7 megohm, 1/4 watt		A21802	Spring, Hinge
R6	C20060-105	Resistor, 1 megohm, 1/4 watt		C21767	Spring Latch
R7	C20245-751	Resistor, 750,000 ohm, 1/4 watt, - 5%		A21803	Mounting Stud for Handle
C1, C2	C19822	Condenser, variable			Speed Nut for Mounting Handle
C3	C20067-503	Condenser, .05 uf., P. T., 200 volts		A20241-1A	(Set of two)
C4	C20065-101	Condenser, .0001 uf., Mica, 500 volts		A21838	Carton (Complete with Fillers)
C5	C20069-202	Condenser, .002 uf., P. T., 600 volts		A21785	Tuning Shaft
C6	C20068-103	Condenser, .01 uf., P. T., 400 volts		A20077-3	Grommet, Variable Condenser Mounting
C7	C20065-500	Condenser, .00005 uf., 500 volts, Mica		A19138-1	Eyelet, Spacer, Variable Condenser Mtg.
C8	C20069-502	Condenser, .005 uf., P. T., 600 volts		A19381	Hair Pin Clip for Tuning Shaft
C9	A21811	Condenser, Electrolytic, 10 mf., 90 volts		A19132	Dial Drive Cord
C10	C20069-102	Condenser, .001 uf., P. T., 600 volts		A21783-1	Pointer, Plastic
L1	AD21795-1	Cabinet Back Assembly, with Loop		A21792	Spring Clip, IF Coil Mounting
L2	AC21796-1	Oscillator Coil Assembly		A19133	Spring, Dial Cord
T1	C21797-1	1st I. F. Coil Assembly		A20243-3	Socket, Miniature, Shielded
T2	C21797-2	2nd I. F. Coil Assembly		A20243-1	Socket, Miniature, Unshielded
T3	AC21799-1	Output Transformer Assembly		A21351-1	Socket, Octal
Spk	C21768	Speaker, 4" P. M.		AC21791-1	Battery Clip Assembly
AP	A21861	"A" Battery Cable Terminal Strip			
BP	A21842	"B" Battery Cable & Terminal Strip			

NOTE: When ordering cabinets, parts for cabinets, dial backing plates, and pointers be sure to specify the color.

NOBLITT-SPARKS INDUSTRIES, INC.

MODEL 240P  
CHASSIS RE-243

ALIGNMENT PROCEDURE

PRELIMINARY:

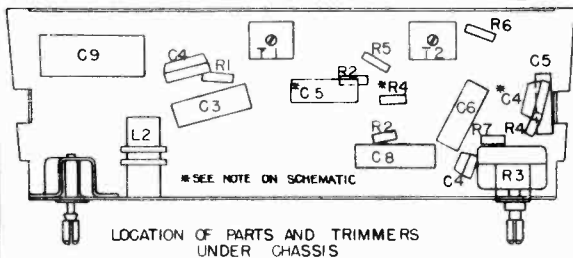
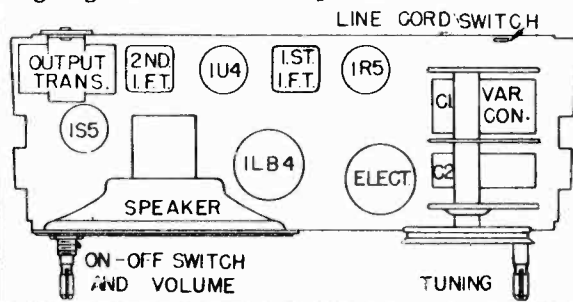
Output meter connection	-----	Across loudspeaker voice coil
Output meter reading to indicate 50 MW (Standard Output)	-----	1.4 volts
Dummy antenna value to be used in series with generator output	-----	See chart below
Connection of generator output lead	-----	See chart below
Connection of generator ground lead	-----	Floating ground
Generator modulation	-----	30% 400 cycles
Position of volume control	-----	Fully clockwise

With variable condenser closed, place top edge of pointer across center of top hole on dial backing plate.  
When adjusting C1, place the set loop the same distance from and in the same position with respect to the chassis and batteries, as it would be when mounted in the cabinet.

Position of Variable	Frequency of Generator	Dummy Antenna	Generator Output Connection	Trimmers Adjusted in Order Shown for Maximum Output	Function of Trimmer
Open	455	.05 mfd.	1R5 Grid (Stator of C1)	Top & Bottom of IF Trans. T2 & T1.	IF
1400	1400		*Test Loop	C2; C1, Trimmers on Variable Condenser	Oscillator Antenna
600	600		*Test Loop	**Check Point	

\* Standard Hazeltine Test Loop Model 1150 or 3 turns of wire about 6" diameter, placed about one foot from the set loop.  
\*\*If weak, adjust variable condenser plates for maximum output.

The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the AVC action of the receiver ineffective.



LOUD SPEAKER

Type: Permanent magnet ----- .68 Oz.  
Size: 1/2 Inch  
Voice coil impedance ----- 3.2 Ohms

FREQUENCY RANGE

Broadcast ----- 540-1600 kc  
IF ----- 455 kc

TUBES AND FUNCTIONS

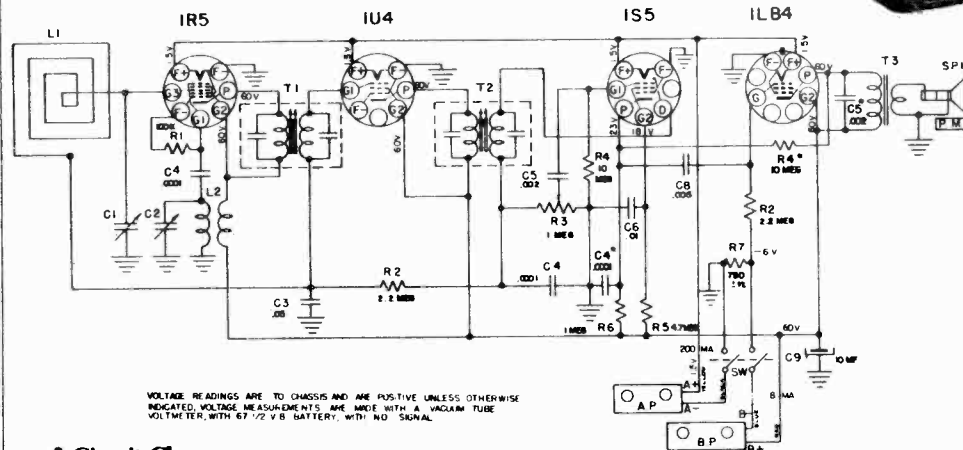
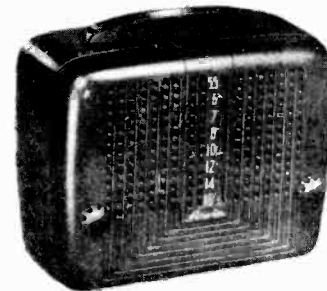
1R5 ----- Mixer-oscillator  
IU4 ----- IF Amp.  
IS5 ----- DET-AVC AF Amp.  
1LB4 ----- Output

POWER SUPPLY

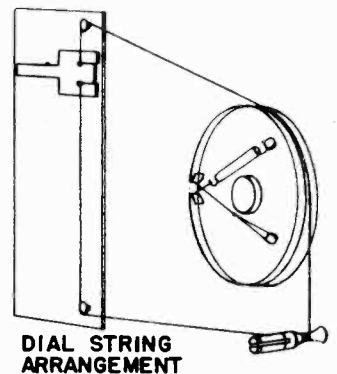
- 67 1/2 V. B Battery, Eveready Minimax, No. 467 or Equal.
3. 1 1/2 V. D Size Flashlight Cells

POWER OUTPUT

Undistorted ----- .05 Watts  
Maximum ----- .1 Watts  
Plate Load ----- 14,000 ohms



VOLTAGE READINGS ARE TO CHASSIS AND ARE POSITIVE UNLESS OTHERWISE INDICATED. VOLTAGE MEASUREMENTS ARE MADE WITH A VACUUM TUBE VOLTMETER, WITH 67 1/2 V. B. BATTERY, WITH NO SIGNAL.



\* Circuit Changes:

- The following circuit changes were made to improve the tone quality, after the first 7,000 sets were produced
- C4 Condenser, .0001 uf., from the plate of the 1S5 tube to ground was C7, .00005 uf.
  - C5 Condenser, .002 uf from plate to screen grid of the 1LB4 tube was C10, .001 uf.
  - R4 Resistor, 10 megohm, was added from the plate of the 1LB4 tube to the plate of the 1S5 tube.



## ALIGNMENT PROCEDURE

**A—IF ALIGNMENT—AM**

1. Turn the band switch to AM (To the left).
2. Connect the signal generator output lead to the converter grid, with an .05 uf. dummy and the generator ground lead to the receiver chassis.
3. Connect output meter across the speaker voice coil.
4. Tune the signal generator to 455 KC and adjust 455 KC IF slugs (1)-(2)-(3)-(4) for maximum output.

**B—IF ALIGNMENT—FM**

1. Turn the band switch to FM (To the right).
- \*2. Connect 10.7 megacycle FM signal generator output lead to 2nd IF grid and the generator ground lead to receiver chassis.
3. Connect a D. C. vacuum tube volt meter to the A. V. C. line and adjust slug no. (5) (primary, bottom of detector transformer) for maximum A. V. C. Voltage.
4. Connect the D. C. V. T. V. M. to the audio output of detector (high side of volume control) and adjust slug no. (6) (secondary, top of detector transformer), for zero voltage.
5. Connect 10.7 megacycle FM signal generator to the converter grid.
6. Connect D. C. V. T. V. M. to the A. V. C. line and adjust the 10.7 IF slugs (7)-(8)-(9)-(10) for maximum A. V. C. voltage.

**C—RF ALIGNMENT—AM**

1. Turn band switch to AM (To the left).
2. Connect signal generator to a standard Hazeltine test loop, Model 1150, placed 2' from the set loop, or three turns of wire about six inches in diameter placed about one foot from the set loop.
3. Tune the generator to 1620 KC and tune the receiver to the high frequency end of the dial.
4. Connect output meter across the speaker voice coil.
5. Adjust oscillator trimmer (11) on variable condenser for maximum output.
6. Tune signal generator to 1400 KC, and tune receiver to pick up this signal.
7. Adjust antenna trimmer (12) on variable condenser for maximum output.
8. Check tracking at 1000 KC and 600 KC.

**D—RF ALIGNMENT—FM**

1. Turn band switch to FM (To the right).
2. Connect FM signal generator to FM antenna terminals through a 220 ohm dummy.
3. Set signal generator to 88 megacycles, using 23 KC deviation.
4. Set receiver dial to 88 megacycles.
5. Adjust FM oscillator slug (13) for maximum signal.
6. Set signal generator to 108 M. C.
7. Set receiver dial to 108 M. C.
8. Adjust the FM oscillator trimmer (14) for maximum signal.
9. Repeat 3 to 8; check and recheck until proper coverage is obtained.
10. Set signal generator to 91 M. C., and adjust RF slugs (15) & (16) for maximum signal.
11. Set signal generator to 105 M. C. and adjust RF trimmers (17) & (18) for maximum signal.
12. Repeat 10 & 11 until proper tracking is obtained.

\*If a 10.7 MC.-F. M. generator is not available, an unmodulated signal of 10.7 M. C. from an accurately calibrated conventional AM type generator may be used.



NOBLITT-SPARKS INDUSTRIES, INC. MODELS 280TFM, 281TFM  
CHASSIS RE-253

APPROXIMATE VOLTAGE AND RESISTANCE MEASUREMENTS  
TUBE SOCKET LUGS TO CHASSIS GROUND

Tube	Function	Band Switch	VOLTAGE				RESISTANCE							
			Plate	Screen	Cathode	Grid	1	2	3	4	5	6	7	8
6C4	1st RF Amp	FM-AM	95	—	0	0	*	Inf.	51	46	*	0	0	
12BA6	2nd RF Amp	FM	100	100	.9	0	2meg	0	45	35	*	*	68	
		AM	100	100	.9	0	4meg	0	45	35	*	*	68	
12BE6	Oscillator Converter	FM	100	100	0	**	22 K	0	52	62	*	*	0	
		AM	100	100	0	***	22 K	0	52	62	*	*	3meg	
12BA6	1st IF Amp	FM	92	92	.9	0	1meg	0	62	72	*	*	68	
		AM	92	92	.9	0	3.2meg	0	62	72	*	*	68	
12BA6	2nd IF Amp	FM-AM	92	92	.9	0	.9	0	35	24	*	*	68	
6AQ6	AF Amp	FM	42	—	0	-0.6	6.8meg	0	0	10	Inf.	0	*	
	Det, AVC, AF Amp	AM	42	—	0	-0.6	6.8meg	0	0	10	1meg	0	*	
12H6	Det, AVC	FM	—	—	—	—	0	24	6800	1meg	1meg	*	10 6800	
		AM	—	—	—	—	0	24	6800	Inf.	Inf.	*	10 6800	
50L6	AF Output	FM-AM	115	105	7.5	0	Inf.	72	*	*	500K	1meg	100 220	

All voltage readings are positive unless otherwise indicated.

All voltage measurements are made with an electronic voltmeter with a line voltage of 117V. AC.

\*No reading given here, due to the wide variations in readings which would be obtained, due to the electrolytic condensers in the B+ circuit.

\*\*G3.0; G1 Varies from approx. -1.5V to -4V, depending on the setting of the variable condenser, variations in tubes, coils, etc.

\*\*\*G3.0; G1, Voltage varies from approx. -5V with variable condenser closed to approx. -7.5V with variable condenser open.

APPROXIMATE DC RESISTANCE OF COILS AND TRANSFORMERS

L1	Loop Antenna		.6 ohms	T2,3	IF	FM Pri Lugs 7 to 8	.9 ohms
L2,3,4	RF Chokes		.6 ohms		Trans-	AM Pri Lugs 1 to 2	15 ohms
6,13,14					formers	FM Sec. Lugs 3 to 4	.9 ohms
L11,12	RF Chokes		.2 ohms			AM Sec. Lugs 5 to 6	15 ohms
L9,10	AM Osc Coil	L9	5 ohms				
		L10	.5 ohms	T4	Detector	Pri Lugs 1 to 4	1 ohm
L15	B+ Filter Choke		220 ohms		Trans-	Sec Lugs 8 to 5	.1 ohm
					former	Lugs 8 to 6	.3 ohm
T5	Output Transformer (Pri)		110 ohms			Lugs 5 to 6	.3 ohm
	(Sec.)		.3 ohms				

All resistance measurements of coils were made with the coils wired in the circuit.

All coils and transformers not listed have a resistance too low to be measured with an ohmmeter.

FREQUENCY RANGE

Broadcast Band	540-1600 KC
AM-IF	455 KC
FM Band	88-108 MC
FM-IF	10.7 MC

TUBES & FUNCTIONS

6C4	1st RF Amp	FM
12BA6	2nd RF Amp	FM
12BE6	Oscillator Converter	AM-FM
12BA6	1st IF Amp	AM-FM
12BA6	2nd IF Amp	FM
6AQ6	Det. AVC. AF Amp	AM
	AF Amp	FM
12H6	Detector, AVC.	FM
50L6	AF Output	AM-FM

POWER OUTPUT

Undistorted	1.4 Watts
Maximum	2.5 Watts
Plate Load	2000 Ohms

POWER SUPPLY

105-125 Volts, AC-DC	45 Watts
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SPEAKER

Cone Size	5 1/4"
Cone Resonance in Air-Approx.	197 Cycles
Type	Permanent Magnet
Magnet Size	1.47 oz. Alnico V
Voice Coil Impedance	3.2 Ohms

OPERATING CONTROLS

Extreme Left Knob	Volume
Left Center	On-Off Switch, Tone Control
Right Center	AM-FM Band Switch
Extreme Right	Tuning

PHYSICAL DIMENSIONS

Length	14"
Height	8 1/2"
Depth	8 5/16"

APPROX. SENSITIVITIES

FM Converter Grid 10.7 M. C.	300 uv
FM Antenna Terminals 105 MC (23KC Deviation)	40 uv
AM Converter Grid 455 KC	150 uv
AM Loop 1400 KC	240 uv/m

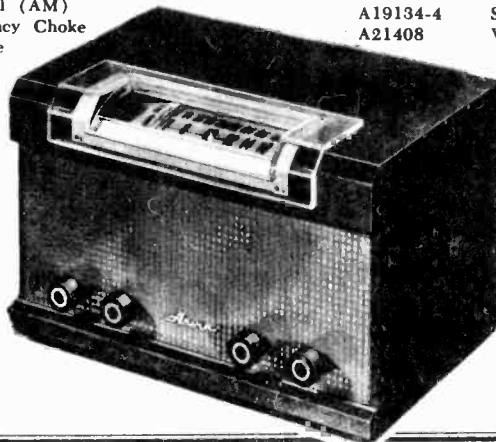


## MODELS 280TFM, 281TFM NOBLITT-SPARKS INDUSTRIES, INC.

## CHASSIS RE-253

## PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
R1-12-17	C20060-102	Resistor, 1000 ohm, 1/4 W	T1	AA21398.1	Antenna Coupling Transformer
R2-24	C20060-105	Resistor, 1 megohm, 1/4 W	T2	AC21390-1	1st I. F. Coil
R3-11-15	C20060-680	Resistor, 68 ohm, 1/4 W	T3	AD21391-1	2nd I. F. Coil
R4-7	C20060-331	Resistor, 330 ohm, 1/4 W	T4	AD21392-1	Detector Transformer
R6-13-20	C20060-223	Resistor, 22,000 ohm, 1/4 W	T5	AC21393-1	Output Transformer
R8	C20060-220	Resistor, 22 ohm, 1/4 W	Sw-2	C21406	Band Switch
R9	C20060-104	Resistor, 100,000 ohm, 1/4 W	Spk.	C21331	Speaker, 5 1/4" P. M.
R10	C20103-101	Resistor, 100 ohm, 1 W	Rect.	A20207-3	Rectifier, Selenium 150 MA
R14	C20060-334	Resistor, 300,000 ohm, 1/4 W	P	B20064-5	Line Cord & Plug Assy.
R16	C20060-685	Resistor, 6.8 megohm, 1/4 W	L	A19135	Dial Lamp, Mazda C7
R18	C20060-101	Resistor, 100 ohm, 1/4 W		R21379	Cabinet Assy., Mahogany
R19	C21404-1	Volume Control, 1 megohm		R21379-2	Cabinet Assy., Bleached Mahogany
R21-22	C20120-682	Resistor, 6800 ohm, 1/4 W		A21330	Name Plate, Brass
R23	C20060-225	Resistor, 2.2 megohm, 1/4 W		D21365	Escutcheon, Clear Lucite
R25	C21405-1	Tone Control and Switch, 500,000 ohm		C21428	Knob, Tuning
R26	C20060-221	Resistor, 220 ohm, 1/4 W		C21427	Knob, Volume
C1-C1A)				C21430	Knob, Tone
C2-C2A)	AC21401-1	Variable Condenser (With Trimmers)		C21429	Knob, AM-FM Switch
C3-C3A)				A21431	Carton Complete with Fillers
C4-C4A)				C21426	Speaker Grille
C5-C5A)				C21498	Grille Felt, on Front Cabinet Baffle
	D21409	Variable Condenser (Less Trimmers)		A20217	Socket, Antenna Loop
C3A-4A	A21440	Trimmer Condenser, 1.6-19 uuf. Compression Type		D21372	Dial Scale Backing Plate
C5A	A21439	Trimmer Condenser, 1-8 uuf, Glass		A21382	Tuning Shaft Insulator
C6-11-18-24	C20204-500	Condenser, .00005 uf, 500 V, Ceramic		A20196-2	Rivet, Tubular Shoulder (For Mtg. Idler Pulley) (Qty. of 5)
C7-20-30-31	C20204-101	Condenser, .0001 uf, 500 V, Ceramic		A20196-4	Rivet, Tubular Shoulder (For Mtg. Idler Pulley) (Qty. of 5)
C8--10	C20226-501	Condenser, .0005 uf., 350 V, Ceramic		A20202-2	Idler Pulley, 3/8" x 1/8" x 1/2" (Qty. of 5)
C9-13-14-22-45	C20226-102	Condenser, .001 uf., 350 V, Ceramic		A21422	Tuning Shaft
C12-16-44	C20204-100	Condenser, .00001 uf., 500 V, Ceramic		D21389	Dial Scale, .050 Clear Acetate
C15-23-27-29-32-33	C20226-502	Condenser, .005 uf., 350 V, Ceramic		A19132	Cord, Dial Drive
C17	C20206-201	Condenser, .0002 uf., 500 V., Mica		A19361	Hairpin Clip (On Tuning Shaft)
C19	C20205-2	Condenser, .0001 uf., 500., Ceramic		A19295	Spring, Dial Drive Cord
C21	C20204-270	Condenser, .000027 uf., 500 V., Ceramic		A21384	Terminal Strip, Double, L. H.
C25-34	C20249-503	Condenser, .05 uf., 400 V, P. T.		A19141	Terminal Strip, Double, Center Mtg.
C26	C20205-3	Condenser, .00002 uf., 500 V., Ceramic		A19140	Terminal Strip, Single, L. H.
C28A-B-C-D	A21402	Condenser, Electrolytic, 40-40-80 uf, 150 V, 20 uf., 25 V.		A21385	Terminal Strip, Triple with Center Lug Grounded
C35	C20249-103	Condenser, .01 uf., 400 V., P. T.		C21899	Acid Insulator for Bottom of Cabinet
C36-37	C20205-5	Condenser, .00005 uf., 500 V., Ceramic 10%, N750		A19236	Terminal Strip, Triple with Separate Mtg. Lug
C38	C20203-202	Condenser, .002 uf., 350 V, Ceramic		A21457	Insulator (Chassis Fibre, Mtg. Screw)
C39	A21403	Condenser, Electrolytic, 8 uf., 50 V		A20077-3	Grommet, Rubber (Under Variable Condenser)
C40	C20250-503	Condenser, .05 uf., 200 V, P. T.		A19138.1	Eyelet, Spacer (Under Variable Condenser)
C41	C20250-502	Condenser, .005 uf., 200 V., P. T.		A20218	Plug, 2-Prong (Chassis Back Flange-Interlock)
C42	C20065-251	Condenser, .00025 uf., 500 V., Mica		AC21377-1	Dial Pointer Assy.
C43	C20248-502	Condenser, .005 uf., 600V., P. T.		A21189	Terminal, Female (Qty. of 10)
L1	AE21395-1	Antenna Loop, Rear Cover & Line Cord Assy.		A21388	Control Shaft Insulator, Phenolic
L2-3-4-6-13-14	AA21445-1	High Frequency Choke		A21443	Tuning Shaft Insulator, Front, Phenolic (Qty. of 5)
L5	AC21399-1	1st R. F. Coil (FM)		A21225	Antenna Lead Insulator, Phenolic (Qty. of 5)
L7	AC21400-1	2nd R. F. Coil (FM)		A20118-1	Socket, Tube, Miniature, Molded Black)
L8	AC21397-1	Oscillator Coil (FM)		A20197-1	Socket, Tube, Miniature, Molded (Low Loss Bakelite)
L9-10	AC21396-1	Oscillator Coil (AM)		A18254-1	Socket, Tube, Plain, Wafer
L11-12	AA21444-1	High Frequency Choke		A19579	Socket, Speaker
L15	AC21394-1	B Filter Choke		A19134-4	Socket, Dial Lamp
				A21408	Washer, Insulating, 3/8" I.D. x 3/4" O.D. Phenolic (Qty. of 5)



## NORTHERN RADIO CO.

TYPE N600, MODELS AJ,  
BJ, CJ, EDJTYPE N600 TWO BAND COMMUNICATIONS RECEIVERS  
DESCRIPTION OF EQUIPMENT

Type N600 Receivers of the J Series are available in four different models for either direct or alternating current operation. Model AJ - 6 Volt DC Receiver and Model BJ - 12 Volt DC Receiver are designed for operation from storage batteries, where other sources of power are not available. Model CJ - 32 Volt DC Receiver is designed especially for operation from a ship's battery without the use of a built-in power supply. Model EDJ - 115 Volt AC-DC Receiver is designed for operation from either source, as implied, and is equally suited for marine or land installations.

The characteristics of the four models are similar, with the exception of the audio frequency system and power supply. The radio frequency components and controls are identical, thus the operation, alignment, servicing, etc., are the same. The following data is pertinent to the four models, describing them collectively where they are similar and individually where they are at variance.

One radio frequency stage of amplification employing a 6K7 eliminates the image frequency signal and insures an effective signal to noise ratio.

A separate oscillator employing a 6J5 reduces frequency drift to a minimum and improves the general stability of the receiver.

A 6L7 mixer converts the incoming signal to the intermediate frequency, where it is amplified by a second 6K7. By the use of iron core intermediate transformers sufficient gain and selectivity are obtained with a single stage.

Detection is accomplished by means of the diode in a type 6Q7. The rectified voltage is filtered and applied to the grids of the previous stages to provide automatic volume control.

The triode section of the 6Q7 amplifies the diode output, functioning as the first audio stage. In the Model AJ - 6 Volt DC Receiver and the Model BJ - 12 Volt DC Receiver the power amplifier is a 6F6G, which is driven directly by the first audio stage. The Model CJ - 32 Volt DC Receiver incorporates a 25L6G driver stage. This driver is excited by the first audio stage and, in turn, excites the power amplifier which consists of four 25L6G's connected in push-pull parallel. A single 25L6G power amplifier, driven directly by the first audio stage, is used in the Model EDJ - 115 Volt AC-DC Receiver.

A power output of approximately 2½ watts is obtained from the 6F6G power amplifier in the Model AJ - 6 Volt DC Receiver and the Model BJ - 12 Volt DC Receiver. The 25L6G push-pull parallel power amplifier in the Model CJ - 32 Volt DC Receiver has an output of approximately ½ watt, which provides ample volume from the built-in speaker. In the EDJ - 115 Volt AC-DC Receiver, an output of approximately 2 watts is obtained from the 25L6G power amplifier. The built-in speaker is of the permanent magnet dynamic type.

Plate power for the Model AJ - 6 Volt DC Receiver and the Model BJ - 12 Volt DC Receiver is obtained from a built-in power supply of the vibrator type. The Model CJ - 32 Volt DC Receiver has no built-in power supply, all power being obtained directly from the ship's battery. In the Model EDJ - 115 Volt AC-DC Receiver, plate power is obtained from a half-wave rectifier - filter system using a 25Z6G tube.

Controls

- (1) Power switch marked "POWER". This switch functions as the Off-On control for the receiver.
- (2) Band switch marked "BAND A-B". In position "A" the receiver is tuneable over the range between 1550 and 4200 kilocycles. In position "B" the receiver is tuneable between 550 and 1600 kilocycles.
- (3) Receiver tuning. A semi-circular dial with a five-to-one reduction drive mechanism is employed as the tuning control. The band A scale is calibrated in kilocycles and the band B scale in megacycles. The dial is illuminated from the rear. A vernier dial with 100 divisions is provided for accurate station logging.
- (4) Radio frequency gain control marked "SENSITIVITY". This control serves to limit the maximum sensitivity of the receiver.
- (5) Audio frequency gain control marked "VOLUME". This controls the audio amplification after detection and functions as the volume control for the receiver.
- (6) Tone control marked "TONE". This control reduces the high frequency response of the audio system and is used in receiving thru sharp high pitched noise.
- (7) Speaker - handset switch marked "SPEAKER" and "HANDSET". This switch connects the audio output of the receiver to the built-in speaker or to the receiver portion of the handset, as indicated.
- (8) Headphone jack marked "PHONES". When the phones are plugged into the jack, the built-in speaker is disconnected from the circuit.
- (9) Dial light switch marked "LIGHTS". This switch functions as the Off-On control for the dial lights, and is provided so that the lights may be turned off when it is necessary to darken the pilot house.

TYPE N600; MODELS AJ,  
BJ, CJ, EDJ

## NORTHERN RADIO CO.

## INSTALLATION

The receiver is usually mounted in the transmitter cabinet, or housed in a separate cabinet which is bolted to the transmitter to form a compact communication unit. When separately housed, the receiver may be mounted in any desired location.

Connections

(1) Power & Control. Power for the receiver is obtained thru the cable or cables at the rear of the chassis. When used in conjunction with a transmitter the proper cables are provided for connection to the power and receiver control circuits in that particular transmitter. If the receiver is used separately, wires may be connected to the cable terminal points for power and external control. If external control is not required, the plate supply line "B break" circuit must be closed and the voice coil line returned to ground on the panel. Refer to drawings for circuit data.

(2) Ground. The receiver is grounded in the usual installation thru connection to the transmitter and between cabinets. If used separately the ground should be connected to the cabinet. The receiver chassis is insulated from the panel and cabinet to permit a positive or negative ground in the D.C. Models, consequently a direct ground must not be connected to the chassis.

(3) Antenna. The regular receiver antenna connection is made thru the control cable and transmitter. If the receiver is used separately, connection may be made to the cable terminal marked "ANT". Refer to drawings for circuit data.

## OPERATION

The operation of the receiver is similar to any regular communications receiver with similar capabilities. The following suggestions will aid in obtaining the most satisfactory results.

Place the receiver in operating condition as follows: Throw the POWER switch to the On (up) position. Set the BAND switch to the band A or B position in which the desired frequency is located. Throw the SPEAKER-HANDSET switch to the SPEAKER position. Throw the LIGHTS switch to the On (up) position. Set the SENSITIVITY control for maximum sensitivity by turning in a clockwise direction to the end of the 270 degree rotation. Then adjust the VOLUME control until some noise is heard. The receiver is now ready for operation.

General Procedure

When tuning for a station it is necessary to tune slowly past the point where the station is expected. After having found the station tune on both sides of the best point in order to make sure its location. Operation to one side of the correct spot will result in distorted signals.

During periods when no phone signals are being received the AVC (Automatic Volume Control) will increase the volume to maximum (if the SENSITIVITY control is full on) and some noise will result. The incoming signal, however, reduces the amplification through the AVC action and consequently the noise level. If the prevailing noise level is high the SENSITIVITY control may be turned down to limit the maximum sensitivity of the receiver, or it may be similarly used to prevent very strong local signals from blocking the receiver.

The control to use for setting the signal volume at a comfortable room level is the VOLUME control. If the SENSITIVITY control is used for this purpose the AVC will not function properly.

Note: Data relative to the operation of any controls not mentioned in this section will be found under "Controls".

## MAINTENANCE

Receiver Alignment

(1) Before proceeding with the alignment, the #6 pin on the 7 prong control cable socket or plug must be connected to the panel to complete the voice coil circuit. It will also be necessary to provide a connection between the #4 and #5 pins to close the B break circuit.

(2) A signal generator set to 456 kilocycles should be used in aligning the intermediate frequency amplifier. Remove the grid clip from the 6L7 and connect the signal generator between grid and ground. If a signal generator is not available, tune in some convenient signal that is not too strong.

(3) For indication of correct tuning, an output meter or high resistance a.c. voltmeter should be connected between the power amplifier plate and chassis. A blocking condenser (.1 uf. or more) must be connected in series with the hot lead to the plate. If a low range meter (15 v. or less) is available, it may be plugged into the phone jack.

(4) Tune the trimmers on top of the I.F. transformers for maximum output meter deflection. It will be found best to experiment with the input level which gives the best indication.

NORTHERN RADIO CO.

TYPE N600; MODELS AJ,  
BJ, CJ, EDJ

(5) After having tuned the intermediate amplifier, the grid clip should be replaced on the 6L7, the band switch set for band A and a signal of approximately 3500 kilocycles applied to the antenna input. This can be the signal from a distant station or a standard signal generator. Adjust the oscillator trimmer (top right hole in osc. shield can) so the signal is properly tuned in. Then adjust the R.F. and Detector trimmers for maximum signal. These are accessible through the top right holes in the next two shield cans. Refer to drawings for parts location.

(6) The above procedure should be followed with the band switch set for band B and an input signal of 1400 kilocycles applied to the antenna input. The trimmers for this band are located in the bottom right side of the shield cans directly below the band A trimmers.

(7) The signal should now be set to 1800 kilocycles for band A or 600 kilocycles for band B and the receiver tuned to this frequency. The padding condenser for the band being aligned should be adjusted to give maximum output while rocking the tuning condenser slightly to locate the most favorable position. It is advisable to return to the aligning point and repeat the adjustments given for best results. Refer to drawings for parts location.

Servicing

Complete schematic circuit and parts layout drawings are included at the end of this circular, together with a parts list which corresponds with the drawings. Thus the function, location and value of any part may be readily found.

When the receiver has been removed from the cabinet for servicing, the #6 pin on the 7 pin control cable socket or plug must be connected to the panel to complete the voice coil circuit. It will also be necessary to provide a connection between the #4 and #5 pins to close the B break circuit.

First the power source should be checked to make sure that all tubes are receiving correct filament and plate voltages, then the tubes should be suspected and replaced with the spares one at a time as a check on their operation.

After checking tubes, testing should progress from the receiver output to the input stage by stage eliminating each as it is found to operate properly. Listening in the loud speaker while testing will help greatly. The usual voltmeter and/or ohmmeter tests should be used in isolating the trouble. It is always best to test each stage in a logical definite order, in order to determine the location of the defect. After having found the location of the trouble, it can be quickly eliminated.

CAUTION: The negative side of the power line is common to the chassis in the D.C. Models, but the chassis is insulated from ground (panel and cabinet) to permit operation from a power source with either a negative or positive ground. Consequently, if the positive side of the power line is grounded, the chassis becomes hot to ground and care must be used when removing same to avoid contact with the cabinet or a blown receiver fuse (F1) will result. Opening both sides of the incoming power line before removing the chassis will prevent this. In this connection it should be noted that all control shafts have an insulating washer between shaft, knob and panel which must not be removed in the event of knob replacement. If the negative side of the power line is grounded, no care need be used. Refer to drawings for circuit data.

Type N600 Receiver

Test Readings

Model BJ -12 Volts, DC

The following test readings indicate average normal operating conditions:

Stage	Tubes	Plate Volts	Screen Volts	Grid Volts	Cath. Volts	Fil. Volts
R.F.A.	6K7	185	145	*Var.	1.1	6
Mixer	6L7	184	145	x10 av.	1.6	6
Osc.	6J5	148	---	x19 av.	0	6
I.F.A.	6K7	168	145	*Var.	1.3	6
Det. &	6Q7	*Var.	---	---	0	6
1st A.F.	Same	50	---	0	0	Same
A.F.P.A.	6V6GT	171	185	0	8.0	6

Input voltage during test - 12 Volts.  
Total filament and vibrapack current - 2.6 Amps.  
Total plate current - 60 Ma.

\*Variable - dependent on signal and avc voltage. This also applied to the mixer (detector) control grid not listed above.

xAverage - mixer injection and oscillator grid voltages read with a VTVM having a d.c. input resistance of 11 megohms. These voltages vary over the frequency range.

Note: Normal readings may vary plus or minus 6% from the values given. The maximum variation should not exceed 10%. Readings are taken with the vibrapack voltage change switch set in the No. 1 (normal) position and with the SENSITIVITY (r.f. gain) control set at maximum. All voltages, except filament, are read between the circuit points and chassis. The meter should have a resistance of 1000 ohms per volt and a 300 volt (or higher) scale should be used where there is much resistance in the circuit, if comparative readings are to be obtained. Current values may be computed by dividing the voltage across resistors by their resistance. Refer to drawings and "Parts List" for data.

PARTS LIST N600BJ

Type N600 Receiver  
Model Bj - 12 Volts, D.C.

Condensers:

- C1 Antenna isolating
- C2.1 R.F. Amp. tuning
- C2.2 Detector tuning
- C3.1 Oscillator tuning
- C3.2 Out. trimmer - band A
- C4 Out. trimmer - band B
- C5 R.F. Amp. grid filter
- C6 R.F. Amp. cathode bypass
- C7.1 Screen bypass
- C7.2 R.F. trimmer - band A
- C8 R.F. trimmer - band B
- C9 Detector grid filter
- C10 Mixer cathode bypass
- C11.1 Plate bypass
- C11.2 Osc. trimmer - band A
- C12.1 Osc. padding - band A
- C12.2 Osc. padding - band B
- C12.3 Osc. padding - band B
- C13 Osc. grid blocking
- C14 Osc. plate bypass
- C15 Osc. Mixer coupling
- C16.1 First I.F.T. pri. tuning
- C16.2 First I.F.T. sec. tuning
- C17 I.F. Amp. grid filter
- C18 I.F. Amp. cathode bypass
- C19 I.F. Amp. plate filter
- C20.1 Second I.F.T. pri. tuning
- C20.2 Second I.F.T. sec. tuning
- C21 Diode Det. r.f. bypass
- C22 Diode Det. r.f. filter
- C23 A.V.C. filter
- C24 First A.F. plate bypass
- C25 First A.F. grid coupling
- C26 Pwr. Amp. grid coupling
- C27 Pwr. Amp. cathode bypass
- C28 Tone control
- C29 Plate pwr. filter
- C30 Plate pwr. filter
- C31 Pwr. Amp. plate bypass
- C32 Output circuit bypass

Inductances:

- L1.1 Ant. coil - band A
- L1.2 Ant. coil - band B
- L2.1 R.F. coil - band A
- L2.2 R.F. coil - band B
- L3.1 Osc. coil - band A
- L3.2 Osc. coil - band B
- L4 Plate power filter ch.

Resistors:

- R1 Sensitivity (R.F.) control
- R2 R.F. Amp. grid filter
- R3 R.F. Amp. cathode bias
- R4 Detector grid filter
- R5 Mixer cathode bias
- R6 Mixer grid leak
- R7 Oscillator grid leak
- R8 Oscillator plate dropping

- R9 I.F. Amp. grid filter
- R10 I.F. Amp. cathode
- R11 I.F. Amp. plate filter
- R12 Screen dropping
- R13 Diode dropping
- R14 A.V.C. filter
- R15 Volume (A.F.) control
- R16 First A.F. grid coupling
- R17 First A.F. plate coupling
- R18 Pwr. Amp. grid coupling
- R19 Pwr. Amp. cathode bias
- R20 Tone control
- R21 Handset - receiver shunt
- R22 Headphone shunt
- R23 6Q7 filament shunt
- R24 Pilot light dropping
- R25

Switches:

- S1.1 Ant. coils - primary
- S1.2 Ant. coils - secondary
- S2.1 R.F. coils - primary
- S2.2 R.F. coils - secondary
- S3.1 Osc. coils - plate
- S3.2 Osc. coils - grid
- S4 Power - 12 v. line
- S5 Speaker - Handset
- S6 Lights - dial

Transformers:

- T1 I.F. Amp. input
- T2 I.F. Amp. output
- T3 A.F. Pwr. Amp. output

Tubes:

- 6K7 R.F. Amplifier
- 6L7 Mixer
- 6J5 Oscillator
- 6K7 I.F. Amplifier
- 6Q7 Diode Det.-AVC - First A.F.
- 6V6GT A.F. Power Amplifier

Miscellaneous:

- Dynamic speaker
- Dial lights
- Dial light sockets
- 12 V. line fuse
- Fuse holder
- Headphone jack J1
- Band switch knob
- Control knobs
- Control cable plug CP1
- Control cable plugs
- \*Power cable plug CP2
- Tube sockets
- Tuning dial mechanism
- Tuning dial scale

\*Used only where power is not obtained thru the control cable.

Note: Metal tubes may be replaced with GT tubes, if necessary

- IRC BT 1/2 1 megohm 1/2 w.
- IRC BW 1/2 350 ohms 1/2 w.
- IRC BT 1/2 3000 ohms 1/2 w.
- IRC BT 1/2 10000 ohms 1/2 w.
- IRC BT 1/2 30000 ohms 1/2 w.
- IRC BT 1/2 5 megohm 1/2 w.
- Centralab A-130 .5 meg. pot.
- IRC BT 1/2 1 megohm 1/2 w.
- IRC BT 1/2 .25 megohm 1/2 w.
- IRC BT 1/2 4 megohm 1/2 w.
- IRC BT 2 250 ohms 2 w.
- Centralab AF-115 25000 ohm pot.
- IRC BW 1 10 ohms 1w.
- Ohmite BD 40 ohms 10 w.
- Ohmite BD 40 ohms 10 w.

- Centralab Part D 3P. 3 pos.
- Part of S1.1 assembly
- Centralab Part D 3P. 3 pos.
- Part of S2.1 assembly
- Centralab Part D 3P. 3 pos.
- Part of S3.1 assembly
- H&H #20902-Z D.P.S.T. 3A. tog.
- H&H #21189 S.P.S.T. 3A. tog.
- H&H #20992 S.P.S.T. 3A. tog.

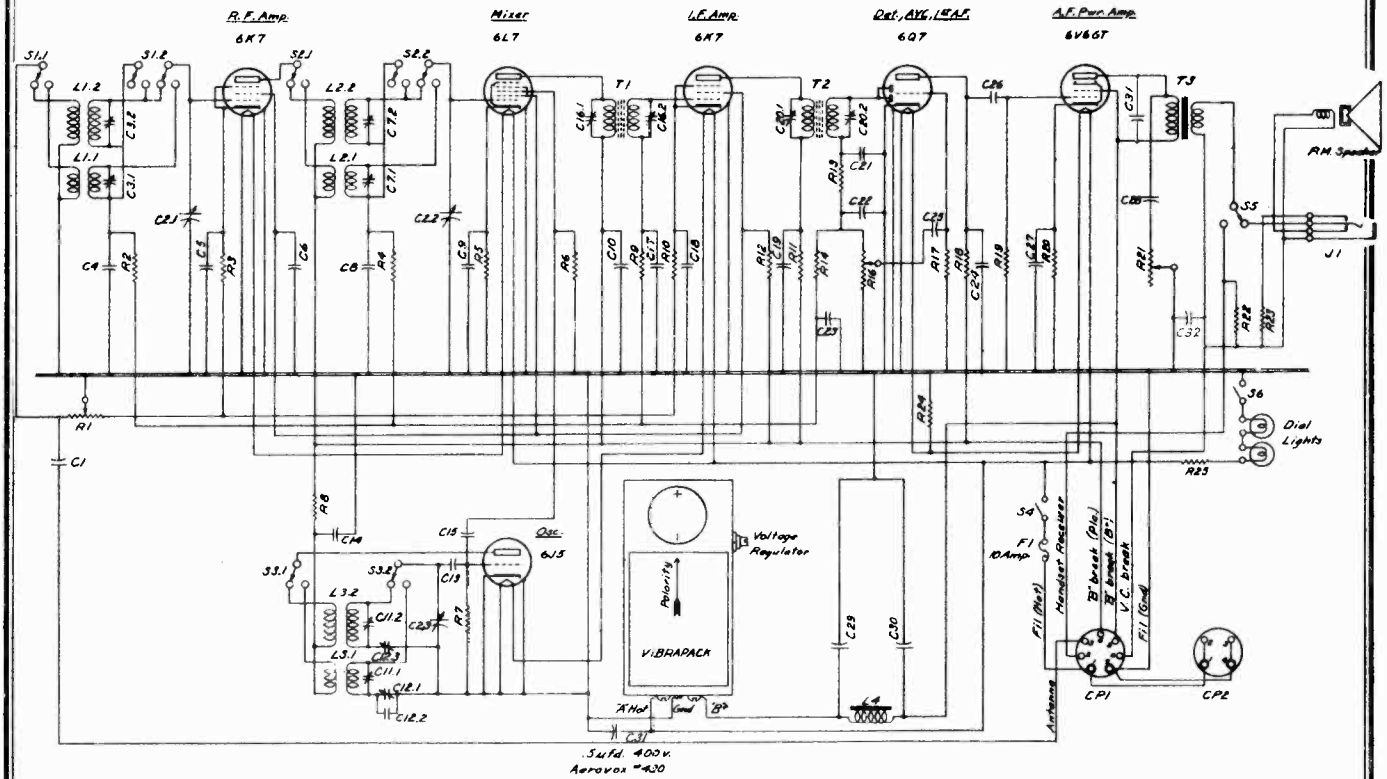
- Miller #612-C1 input
- Miller #612-C4 output - diode
- Jensen ZP-1021 adjust. imped.

- Sylvania or equiv. type 6K7
- Sylvania or equiv. type 6L7
- Sylvania or equiv. type 6J5
- Sylvania or equiv. type 6K7
- Sylvania or equiv. type 6Q7
- Sylvania or equiv. type 6V6GT
- See "Note" re metal tubes

- Jensen ST-445 or Utan 6P 6" PM
- Sylvania S-47 6-8 V. 150 Ma. m.b.b.
- Drake #20608 dial lig. bkts.
- Killark or equiv. 3AG 10 Amp.
- Littelfuse #241001 extractor post
- Mallory #703A Junior
- Croce #6144 1-1/8" rd. blk. pointer
- Croce #6122 1-1/8" rd. blk.
- Amphenol 61-CF7S 7 prong
- Amphenol PF7S & PM7S 7 prong
- Amphenol 61-CP4 4 prong
- Amphenol 38 8 prong
- Bud D-1729 vernier dial
- NRC #915-10 std. 2 band

NORTHERN RADIO CO.

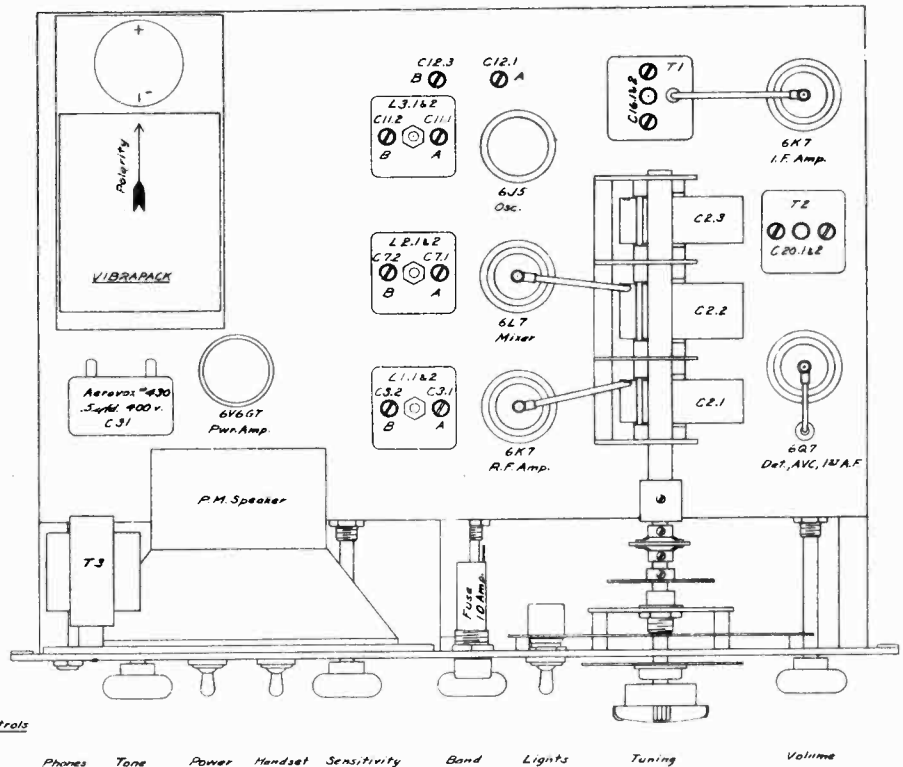
TYPE N600; MODEL BJ



Band A 1530 to 4200 Kc.  
 Band B 530 to 1600 Kc.  
 Intermediate Freq. 456 Kc.

Note:  
 Reverse Vibrator for operation  
 from power source with positive ground.

Note:  
 All band switches shown in Band B position.



Position of Controls

Phones Tone Power Handset Sensitivity Band Lights Tuning Volume

Type N600 Receiver  
Model CJ - 32 Volts, DC

Test Readings

The following test readings indicate average normal operating conditions:

Stage	Tubes	Plate Volts	Screen Volts	Grid Volts	Cath. Volts	Ofil. Volts
R.F.A.	6K7	30.0	30.0	*Var.	0.6	6
Mixer	6L7	29.5	30.0	x1.5 av.	0.1	6
Osc.	6J5	30.0	--	x2.8 av.	0	6
I.F.A.	6K7	29.5	30.0	*Var.	0.6	6
Det. &	6Q7	*Var.	--	--	0	6
1st A.F.	Same	5.5	--	0	0	Same
2nd A.F.	25L6GT	22.5	30.5	0	3.0	24
A.F.P.A.	4-25L6GT	30.5	32.0	0	2.8	24

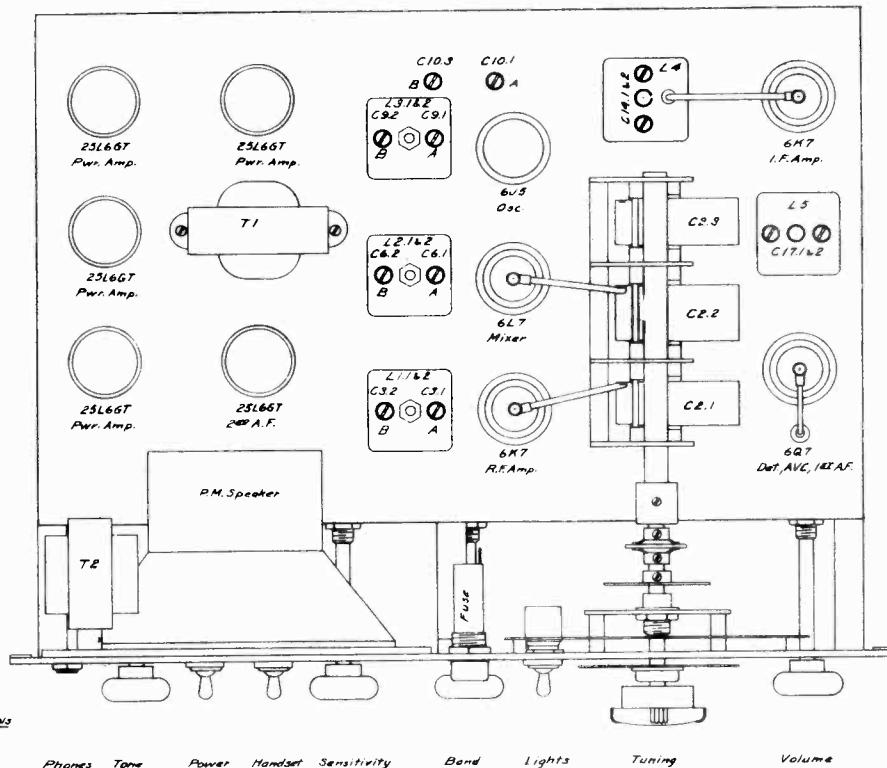
Input voltage during test - 32 volts  
Total filament current - 1.7 Amps.  
Total plate current - 36 Ma.

\*Variable - dependent on signal and avc voltage. This also applies to the mixer (detector) control grid not listed above.

xAverage - mixer injection and oscillator grid voltages read with a VTVM having a d.c. input resistance of 11 megohms. These voltages vary over the frequency range.

oFilament voltage readings taken with dropping resistor R23 adjusted for 30 volts across the series - parallel filament circuit.

Note: Normal readings may vary plus or minus 6% from the values given. The maximum variation should not exceed 10%. Readings are taken with the SENSITIVITY (r.f. gain) control set at maximum. All voltages, except filament, are read between the circuit points and chassis. The meter should have a resistance of 1000 ohms per volt and a 50 or 60 volt scale should be used, if comparative readings are to be obtained. Current values may be computed by dividing the voltage across resistors by their resistance. Refer to drawings and "Parts List" for data.



Position of Controls

NORTHERN RADIO CO.

TYPE N600; MODEL CJ

PARTS LIST N600CJ

Type N600 Receiver  
Model CJ - 32 Volts D.C.

Condensers:

- C1 Antenna isolating
- C2.1 R.F. Amp. tuning
- C2.2 Detector tuning
- C2.3 Oscillator tuning
- C3.1 Ant. trimmer - band A
- C3.2 Ant. trimmer - band B
- C4 R.F. Amp. Grid filter
- C5 R.F. Amp. cathode bypass
- C6.1 R.F. trimmer - band A
- C6.2 R.F. trimmer - band B
- C7 Det. Grid filter
- C8 Mixer cathode bypass
- C9.1 Osc. trimmer - band A
- C9.2 Osc. trimmer - band B
- C10.1 Osc. padding - band A
- C10.2 Osc. padding - band B
- C10.3 Osc. padding - band C
- C11 Osc. Grid blocking
- C12 Osc. mixer coupling
- C13 Plate & screen bypass
- C14.1 First I.F.T. pri. tuning
- C14.2 First I.F.T. sec. tuning
- C15 I.F. Amp. Grid filter
- C16 I.F. Amp. cathode bypass
- C17.1 Second I.F.T. pri. tuning
- C17.2 Second I.F.T. sec. tuning
- C18 Diode Det. r.f. filter
- C19 Diode Det. r.f. filter
- C20 A.V.C. filter
- C22 First A.F. Grid coupling
- C23 Second A.F. Grid coupling
- C24 Second A.F. cathode bypass
- C25 Tone control
- C26 A.F. Pwr. Amp. Grid bypass
- C27 Plate power filter - out
- C28 Plate power filter - in
- C29 32 Volt line bypass
- C30 Pwr. Amp. plate bypass
- C31 Output circuit bypass

Inductances:

- L1.1 Ant. coil - band A
- L1.2 Ant. coil - band B
- L2.1 R.F. coil - band A
- L2.2 R.F. coil - band B
- L3.1 Osc. coil - band A
- L3.2 Osc. coil - band B
- L4 First I.F. transformer
- L5 Second I.F. transformer
- L6 Plate power filter

Resistors:

- R1 Sensitivity (R.F.) control
- R2 R.F. Amp. Grid filter
- R3 R.F. Amp. cathode bias
- R4 Det. Grid filter
- R5 Mixer cathode bias
- R6 Osc. Grid leak
- R7 I.F. Amp. Grid filter
- R8 I.F. Amp. Grid filter

- IRC BW 100 ohms 1/2 w.
- IRC BT 1/2 5 megohm 1/2 w.
- IRC BT 1/2 30000 ohms 1/2 w.
- Centralab A-130 .5 meg. pot.
- IRC BT 1/2 1. megohm 1/2 w.
- IRC BT 1/2 .25 megohm 1/2 w.
- IRC BT 1/2 4 megohm 1/2 w.
- IRC BT 1/2 600 ohms 1/2 w.
- Centralab AF-115 25000 ohm pot.
- IRC BT 1/2 600 ohms 1/2 w.
- IRC BT 1/2 600 ohms 1/2 w.
- IRC BW 100 ohms 1/2 w.
- IRC BW 10 ohms 1w.
- IRC BW 10 ohms 1w.
- Ohmite #0361 3 ohms 25 w.
- IRC BW 150 ohms 1 w.
- Ohmite ED 250 ohms 10 w.

Switches:

- S1.1 Ant. coils - primary
- S1.2 Ant. coils - secondary
- S2.1 R.F. coils - primary
- S2.2 R.F. coils - secondary
- S3.1 Osc. coils - plate
- S3.2 Osc. coils - grid
- S4 Power - 32 V. line
- S5 Speaker-Handset
- S6 Lights - dial

Transformers:

- T1 A.F. Pwr. Amp. input
- Ts A.F. Pwr. Amp. output

Tubes:

- 6K7 R.F. Amplifier
- 6L7 Mixer
- 6J5 Oscillator
- 6Q7 I.F. Amplifier
- 25L6GT Diode Det. - AVC - First A.F.
- 25L6GT Second A.F. Amplifier
- 25L6GT A.F. Power amplifier

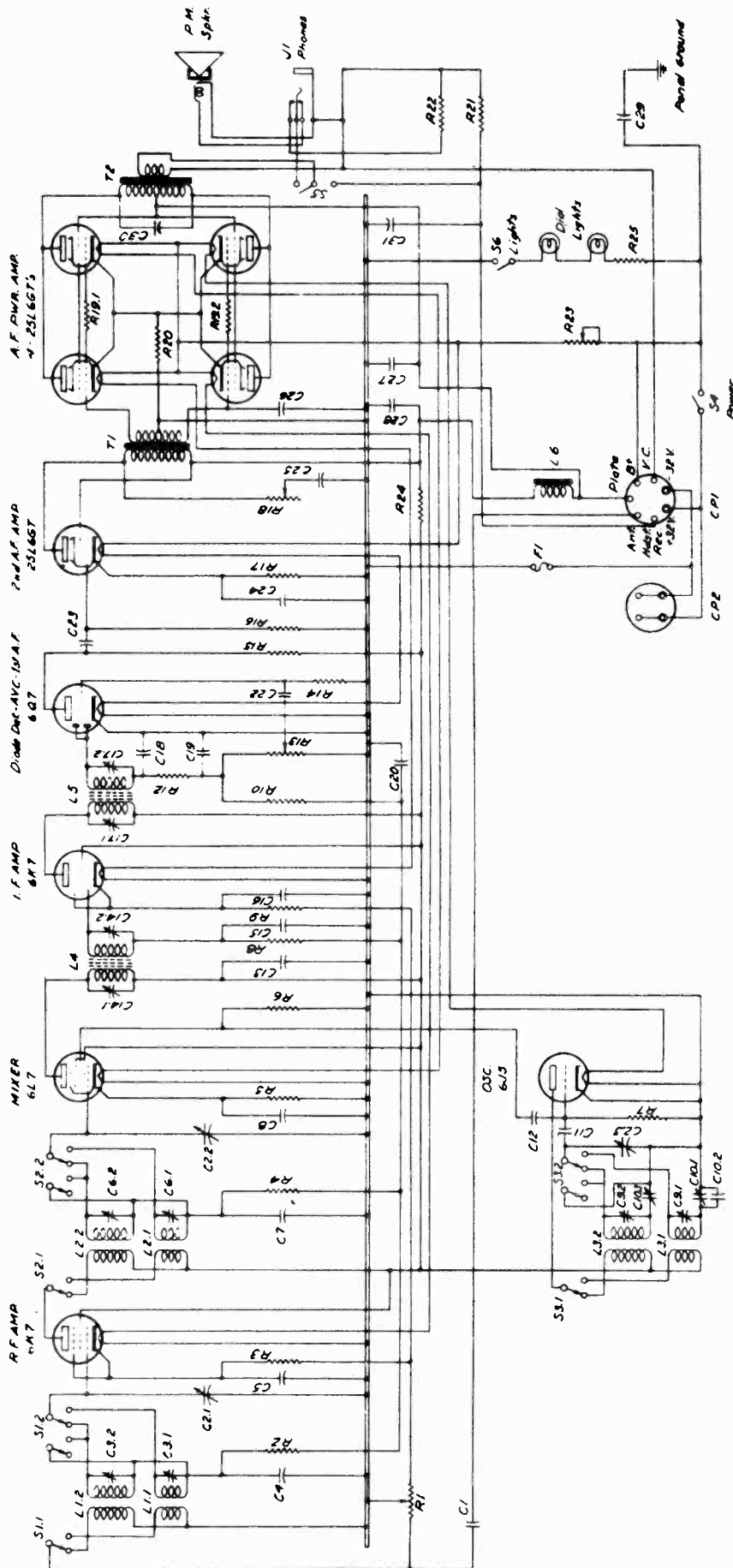
Miscellaneous:

- Dynamic speaker
- Dial lights
- Dial light sockets
- 32 Volt line fuse F1
- Fuse holder
- Headphone jack J1
- Control knobs
- Control cable plug CP1
- \*Power cable plug CP2
- Tube sockets
- Tuning dial mechanism
- Tuning dial scale

\*Used only where power is not obtained thru the control cable.

Note: Metal tubes may be replaced with GT tubes, if necessary.





Band A - 1500 to 4200 KC.  
 Band B - 350 to 1500 KC.  
 I.F. - 456 KC.

NOTE:  
 All band switches shown in 'B' position.



MODEL PQ61

OLYMPIC RADIO &amp; TELEV. INC.

MODELS 7-421V, 7-421W, 7-421X

MODEL PQ61

The intermediate frequency of this receiver is 455KC and should re-alignment be required, it will be necessary to slide the shelf (holding the chassis) partly out of the cabinet so that the trimmer screws can be reached. To do so, remove the two "push-on" type of knobs at the front and the two wood screws holding the shelf to the corner glueblocks.

**Alignment:** Set the signal generator to 455 kilocycles and connect the output via a .05 condenser to the grid of the 1R5 tube (connecting to the grid connection at the RF section of the variable will be found more convenient) and via a similar condenser to the chassis. Feed in this signal and adjust the four trimmer screws at the top of the IF transformers until maximum output is obtained, which may be indicated by an output meter connected directly across the voice coil.

Before aligning the antenna and oscillator trimmers rotate the station selector knob clockwise and when the condenser is at maximum capacity, note that the pointer is in a horizontal position.

Now couple the output of the signal generator to the terminals of a dummy loop about 6" dia. consisting of one turn of wire and placed about one foot away from the receiver loop and feed a 1500 KC signal from the generator. Adjust both the oscillator trimmer and antenna trimmer until maximum signal is obtained with minimum input of generator signal. During this alignment the volume control should be at maximum volume position.

**ELECTRIC OPERATION:**

When operating this receiver on electric power it will be necessary to remove the plug from its battery operating position on the chassis and insert same into the electric socket receptacle. This disconnects the receiver from its battery position and automatically adjusts all internal connections for electric operation.

**BATTERIES:**

The batteries recommended for this receiver are two #740 Eveready 4-1/2V and two 4B2 Eveready #45V batteries.

Before replacing batteries remove the loop by unscrewing the round head screw holding the loop to the receiver bracket.

**ANTENNA:**

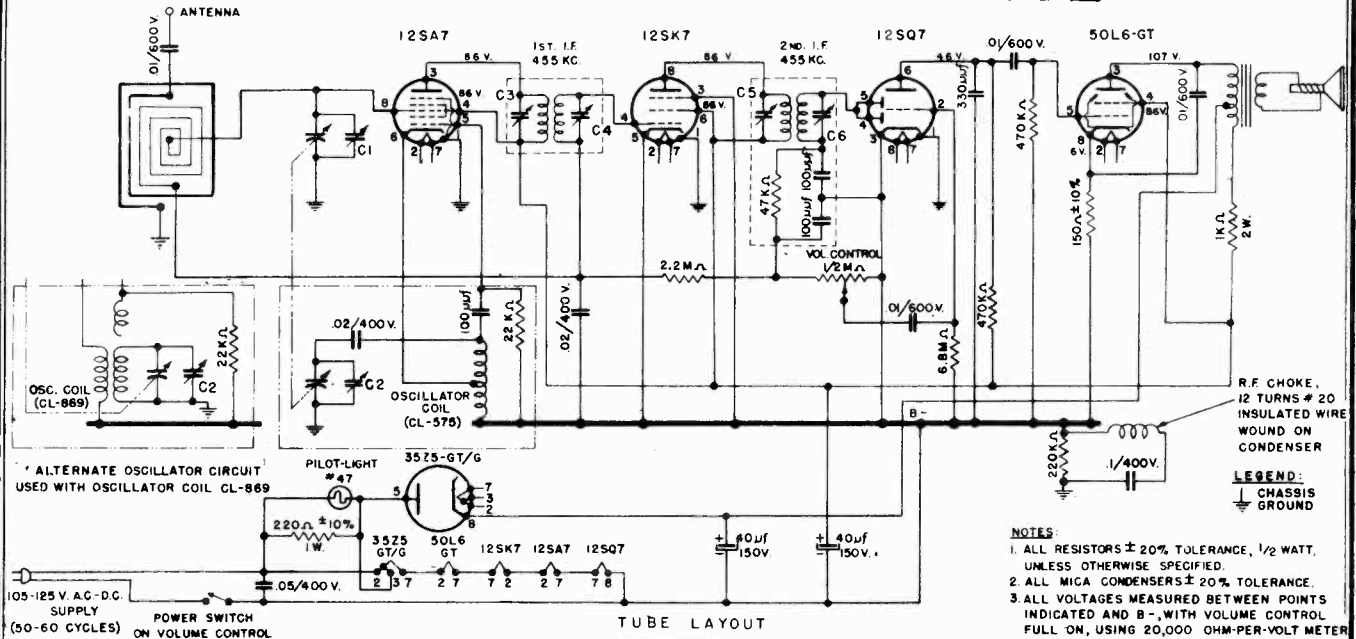
This receiver will operate satisfactorily in most locations without an aerial. However, in certain remote locations it may be necessary to provide additional pickup by connecting an aerial and ground to the two short leads soldered to the loop.

**MODELS 7-421V, 7-421W, 7-421X****REPLACEMENT PARTS LIST**

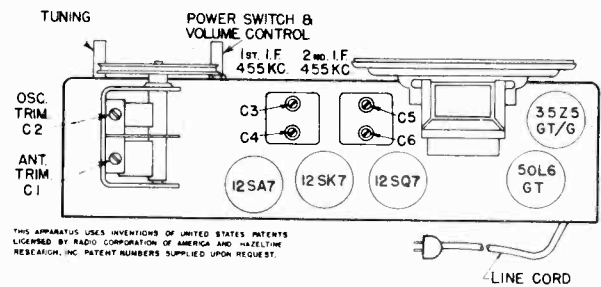
Part No.	Description	Part No.	Description
BU-187	Bulb—#47 Mazda pilot light bulb	RCP10W4203A	Condenser—.02/400 W.V. tubular paper condenser
CA-327W	Cabinet—walnut bakelite cabinet	RCP10W4503A	Condenser—.05/400 W.V. tubular paper condenser
CA-327V	Cabinet—ivory bakelite cabinet	RCP10W6103A	Condenser—.01/600 W.V. tubular paper condenser
CL-575	Coil—oscillator coil	REB-151K	Resistor—150 ohms + 10% 1/2 watt resistor
CO-107	Condenser—40/40/150 W.V. electrolytic condenser	REB-223M	Resistor—22,000 ohms + 20% 1/2 watt resistor
CV-801	Condenser—2 section variable condenser	REB-224M	Resistor—220,000 ohms + 20% 1/2 watt resistor
DL-457-1	Dial—molded lucite dial	REB-225M	Resistor—2.2 megohms + 20% 1/2 watt resistor
KN-352	Knob—walnut knob	REB-474M	Resistor—470,000 ohms + 20% 1/2 watt resistor
KN-353	Knob—ivory knob	REB-685M	Resistor—6.8 megohms + 20% 1/2 watt resistor
LP-163-1	Loop—loop antenna	REC-221K	Resistor—220 ohms + 10% 1 watt resistor
PO-259-V	Pointer—ivory pointer	RED-102M	Resistor—1000 ohms + 20% 2 watt resistor
PO-259-W	Pointer—walnut pointer	SK-838	Speaker—5" p.m. speaker
PT-102	Control—1/2 megohm volume control	SP-191	Spring—drive shaft retaining spring
RCM20A101M	Condenser—100 mmfd + 20% mica condenser	SP-295	Spring—dial drive spring
RCM20A331M	Condenser—330 mmfd + 20% mica condenser	ST-255-1	Back—cardboard back
RCP10W4104L	Condenser—.1/400 W.V. tubular paper condenser	TR-707	Transformer—455 k-c input I.F. transformer
		TR-708	Transformer—455 k-c output I.F. transformer

OLYMPIC RADIO & TELEV. INC.

MODELS 7-421V, 7-421W, 7-421X



- NOTES:**
1. ALL RESISTORS ± 20% TOLERANCE, 1/2 WATT, UNLESS OTHERWISE SPECIFIED.
  2. ALL MICA CONDENSERS ± 20% TOLERANCE.
  3. ALL VOLTAGES MEASURED BETWEEN POINTS INDICATED AND B - WITH VOLUME CONTROL FULL ON, USING 20,000 OHM-PER-VOLT METER. ALL VOLTAGE READINGS ± 10%, MEASURED WITH INPUT VOLTAGE OF 117 V., 60 CYCLES A.C.



Note:

In case of dial light failure, replace the lamp (Mazda # 47) as soon as possible to prevent damage to the 35Z5 tube

ALIGNMENT PROCEDURE CHART

STEP	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO -	SET SIGNAL GENERATOR TO -	TURN RECEIVER DIAL TO -	ADJUST THE FOLLOWING FOR MAXIMUM OUTPUT (KEEP SIGNAL FROM SIGNAL GENERATOR AS LOW AS POSSIBLE)
1	ANTENNA SECTION TUNING CONDENSER IN SERIES WITH .1 MFD. COND.	455 KC.	FULL CLOCKWISE POSITION (CONDENSER PLATES FULLY OPEN)	C6, C5, C4, C3 AND REPEAT IN SAME ORDER (1ST. AND 2ND. I.F. TRANSFORMERS)
2	ANTENNA TERMINAL	1700 KC.	1700 KC (170 ON DIAL)	C2 (OSCILLATOR)
3	OF ANTENNA LOOP IN SERIES WITH	1400 KC.	MAXIMUM SIGNAL (APPROX. 140 ON DIAL)	C1 (ANTENNA)
4	50 MMFD. COND.			REPEAT STEPS 2 AND 3

ALIGNMENT INSTRUCTIONS

Equipment Required:

Modulated R.F. signal generator; output meter; insulated screw-driver; two .1 mfd 400 volt condensers.

To insure proper alignment a radiated signal will be required during part of the alignment procedure. To radiate a signal connect a loop of about 6" to 8" diameter (one turn of #14 or #12 wire) across the output of the signal generator and place this loop parallel to the loop of the receiver to be aligned at a distance of about 8" or 10".

To align the receiver it is necessary to remove the chassis from the cabinet, check that the pointer is horizontal and coincides with the two horizontal reference lines on the dial. In this position the condenser should be completely closed. Connect the output meter and signal generator as follows:

Output meter — Connect across voice coil and turn volume control to maximum.

Signal generator — Connect the low side of the signal generator to the common B-bus thru a .1 mfd condenser and keep the output as low as possible, then proceed in the sequence shown on the alignment chart.

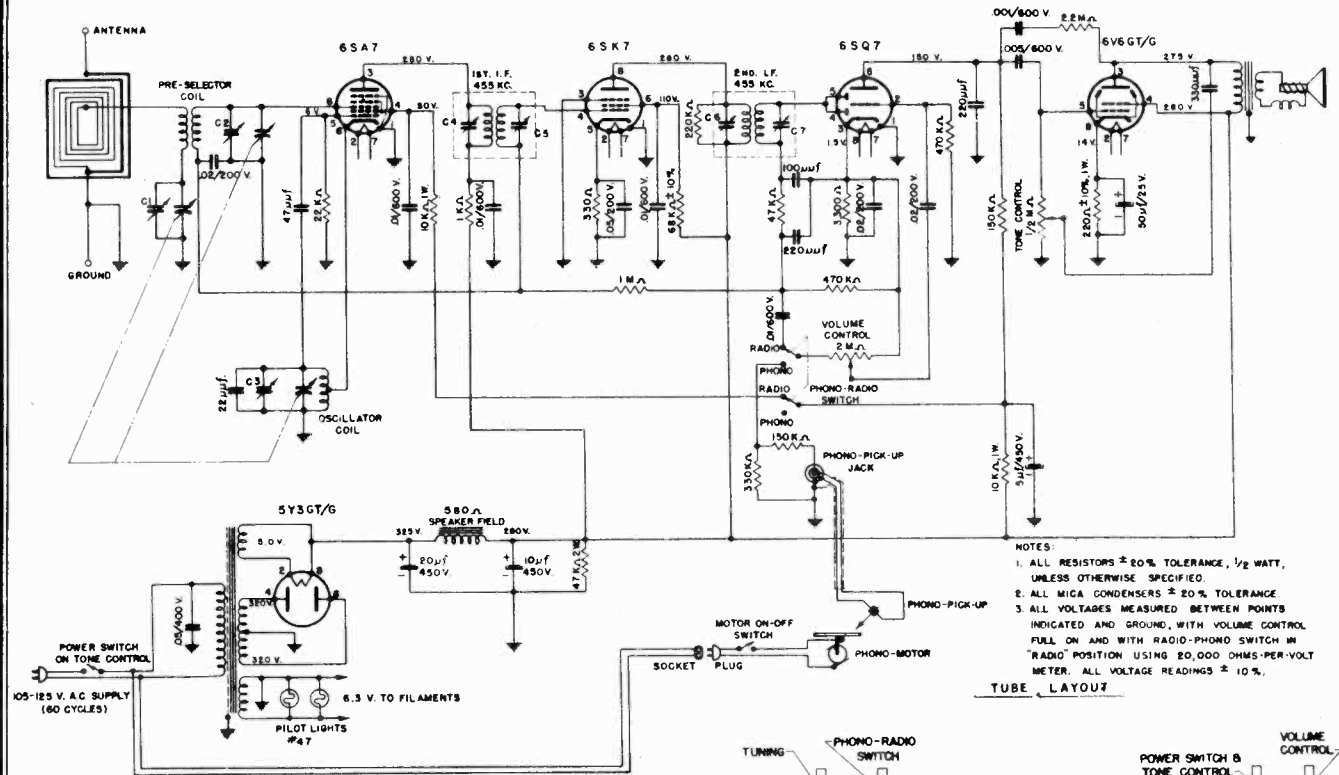
Models 7-421 W (Walnut), 7-421 V (Ivory), 7-421 X (Black)

- Frequency Range 535 — 1700 K.C.
- Power Requirement 105 — 125 volts alternating current 50-60 cycles or 105 — 125 volts direct current
- Power Consumption 30 watts



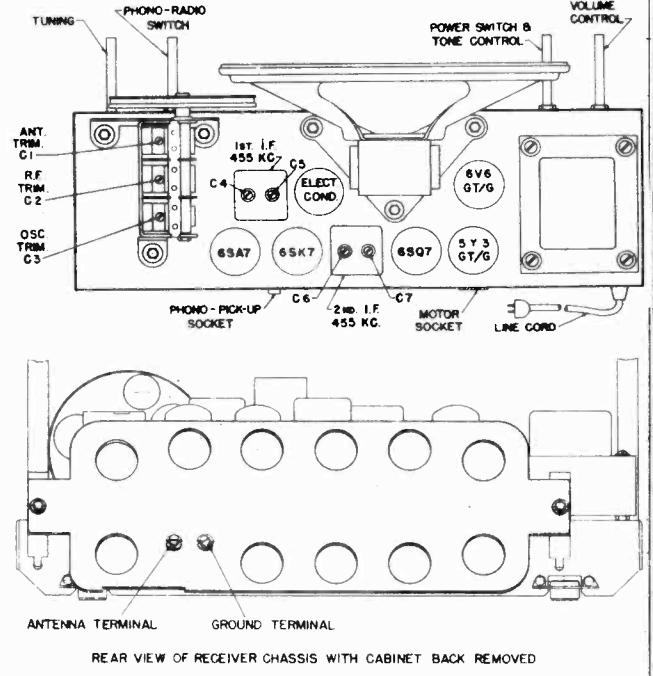
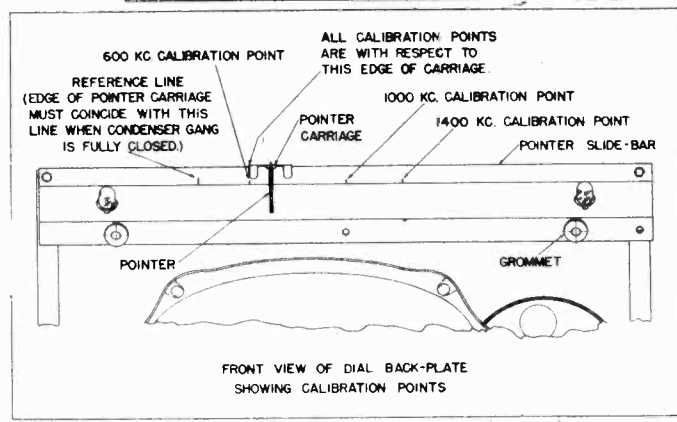
OLYMPIC RADIO & TELEV. INC.

MODEL 6-507



- NOTES:
1. ALL RESISTORS ± 20% TOLERANCE, 1/2 WATT, UNLESS OTHERWISE SPECIFIED.
  2. ALL MICA CONDENSERS ± 20% TOLERANCE.
  3. ALL VOLTAGES MEASURED BETWEEN POINTS INDICATED AND GROUND, WITH VOLUME CONTROL FULL ON AND WITH RADIO-PHONO SWITCH IN "RADIO" POSITION USING 20,000 OHMS-PER-VOLT METER. ALL VOLTAGE READINGS ± 10%.

TUBE LAYOUT



**Frequency Range:** 530 — 1700 K.C.  
**Power Requirement:** 105 — 125 volts a-c  
 60 cycles  
**Power Consumption:** Receiver 65 Watts  
 Receiver with Record-Changer 70 Watts

ALIGNMENT PROCEDURE CHART

STEP	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO-	SET SIGNAL GENERATOR TO-	TURN POINTER TO-	ADJUST THE FOLLOWING FOR MAXIMUM OUTPUT. (KEEP SIGNAL FROM SIGNAL GENERATOR AS LOW AS POSSIBLE.)
1	R.F. SECTION OF THE VARIABLE CONDENSER.	455 KC.	EXTREME RIGHTHAND POSITION. (CONDENSER PLATES FULLY OPEN.)	C7, C6, C5, C4 AND REPEAT IN SAME ORDER (1ST. AND 2ND. I.F. TRANSFORMERS.)
2	ANTENNA TERMINAL OF ANTENNA LOOP	1400 KC.	1400 KC. CALIBRATION POINT.	C3, C2, C1.
3	IN SERIES WITH 50 MMFD. COND.	600 KC.	RESONANCE	CHECK THAT POINTER EDGE AT RESONANCE COINCIDES WITH 600 KC. CALIBRATION POINT. IF DEVIATION IS TOO LARGE REPEAT STEP 2.

**SERVICE AND ALIGNMENT INSTRUCTIONS**

To service this receiver it is first necessary to remove the motorboard with the record changer and then remove the chassis through the top opening of the cabinet. To lift the entire motorboard with the changer, unfasten the six screws holding the motorboard in place, disconnect motor and pick-up plugs from chassis, and lift up. It is unnecessary to remove the screws holding the metal-shield in front. **CAUTION: WHEN REMOVING THE CHANGER BE SURE TO PLACE IT IN A POSITION WHEREBY THE CHANGER MECHANISM WILL NOT BE DAMAGED.**

**ALIGNMENT**

Equipment Required: Modulated r-f signal generator; output meter; insulated screw driver; one .1 mfd 400 volts and one 50 mmfd 400 volts condenser.

With the receiver removed from the cabinet, connect output meter across voice coil. Connect ground side of the signal generator to chassis; turn volume control fully on, and keeping the output of the signal generator as low as possible, proceed in the sequence as shown on the alignment chart.

To facilitate alignment of the receiver when removed from cabinet, calibration points are provided on the pointer slide bar (see drawing).

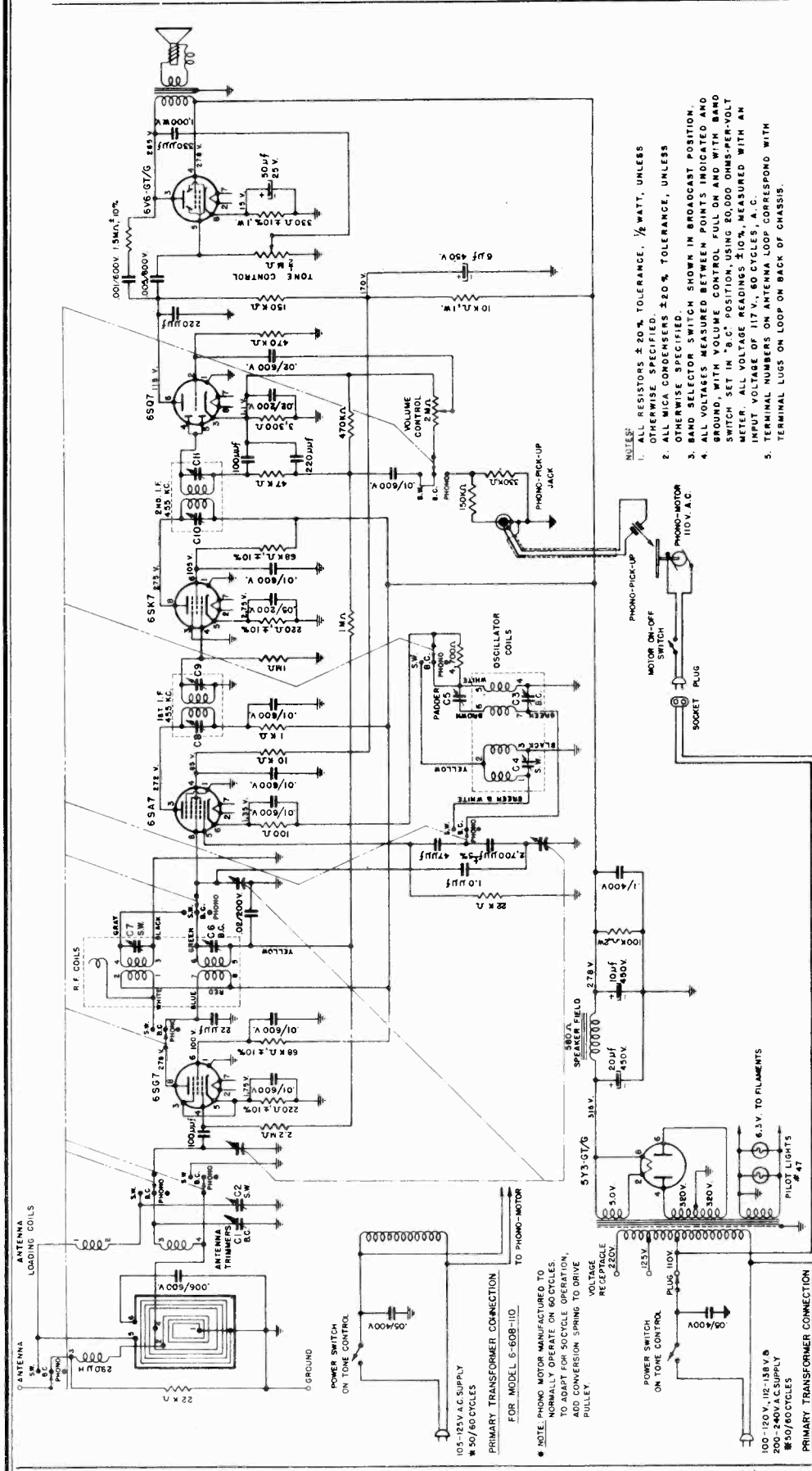
Before aligning, close the variable condenser fully counterclockwise (plates fully closed) and check that pointer carriage coincides with the "reference line" on the pointer slide bar.

**REPLACEMENT PARTS**

Part No.	Description	Part No.	Description
BU-187	#47 pilot light bulb 6.3V (#47 Mazda)	RCPI0W6103A	Condenser—.01/600WV tubular paper condenser
CL-160	Coil—preselector coil		
CL-210	Coil—oscillator coil	RCP10W6502A	Condenser—.005/600WV tubular paper condenser
CO-158	Condenser—20/10/5 450 WV & 50/25WV electrolytic condenser	REB102M	Resistor—1000 ohms $\pm 20\%$ 1/2 watt resistor
CV-145	Condenser—3-gang variable condenser	REB105M	Resistor—1 megohm $\pm 20\%$ 1/2 watt resistor
DL-366	Dial—glass dial scale	REB154M	Resistor—150 kilo-ohms $\pm 20\%$ 1/2 watt resistor
KN-418	Knob—Walnut knob marked "VOLUME"		
KN-419	Knob—Walnut knob marked "OFF-ON-TONE"	REB223M	Resistor— 22 kilo-ohms $\pm 20\%$ 1/2 watt resistor
KN-420	Knob—Walnut knob marked "PHONO-RADIO"	REB224M	Resistor— 220 kilo-ohms $\pm 20\%$ 1/2 watt resistor
KN-421	Knob—Walnut knob marked "TUNING"	REB225M	Resistor—2.2 megohm $\pm 20\%$ 1/2 watt resistor
LP-179	Loop	REB331M	Resistor—330 ohms $\pm 20\%$ 1/2 watt resistor
PO-181	Pointer	REB332M	Resistor—3300 ohms $\pm 20\%$ 1/2 watt resistor
PT-105	Control—2 megohm volume control	REB334M	Resistor—330 kilo-ohms $\pm 20\%$ 1/2 watt condenser
PT-106	Control—1/2 megohm tone control with power switch	REB473M	Resistor— 47 kilo-ohms $\pm 20\%$ 1/2 watt resistor
RCM20A220M	Condenser— 22 mmfd $\pm 20\%$ mica condenser	REB474M	Resistor—470 kilo-ohms $\pm 20\%$ 1/2 watt resistor
RCM20A101M	Condenser—100 mmfd $\pm 20\%$ mica condenser	REB683K	Resistor— 68 kilo-ohms $\pm 10\%$ 1/2 watt resistor
RCM20A221M	Condenser—220 mmfd $\pm 20\%$ mica condenser	REC103M	Resistor— 10 kilo-ohms $\pm 20\%$ 1 watt resistor
RCM20A331M	Condenser—330 mmfd $\pm 20\%$ mica condenser	REC221K	Resistor—220 ohms $\pm 10\%$ 1 watt resistor
RCM20A470M	Condenser— 47 mmfd $\pm 20\%$ mica condenser	RED473M	Resistor— 47 kilo-ohms $\pm 20\%$ 2 watt resistor
RCPI0W2203A	Condenser—.02/200WV tubular paper condenser	SK-325	Speaker—6" x 9" oval dynamic speaker 580 ohms field coil
RCPI0W2503A	Condenser—.05/200WV tubular paper condenser	SP-191	Spring—drive shaft retaining spring
RCPI0W4503A	Condenser—.05/400WV tubular paper condenser	SP-218	Spring—7/8" lg. pointer drive spring
RCPI0W6102A	Condenser—.001/600WV tubular paper condenser	ST-369	Back—cardboard back, printed
		SW-141	Switch—phono-radio switch
		TR-112	Transformer—power transformer
		TR-118	Transformer—I.F. transformer. 1st & 2nd

Note: Dial lights may, in case of failure, be replaced without removing chassis from cabinet. Remove the three bronze plated screws which hold the metal-front-shield to the motorboard and lift the shield. The two sockets holding the pilot lights will then be accessible for replacement of the bulbs.

The pick-up is of the low pressure crystal type and is equipped with a permanent type needle which will give about 4,000 playings before requiring replacement. When first used a pronounced needle scratch will be heard which will be greatly reduced after about twenty playings. This "breaking-in-period" is essential on all needles of the permanent type in order to permit the point to become polished.



- NOTES:
1. ALL RESISTORS ±20% TOLERANCE, 1/2 WATT, UNLESS OTHERWISE SPECIFIED.
  2. ALL MICA CONDENSERS ±20% TOLERANCE, UNLESS OTHERWISE SPECIFIED.
  3. BAND SELECTOR SWITCH SHOWN IN BROADCAST POSITION.
  4. ALL VOLTAGES MEASURED BETWEEN POINTS INDICATED AND GROUND, WITH VOLUME CONTROL FULL ON AND WITH BAND SWITCH SET IN "B" POSITION, USING 50,000 OHMS-PER-VOLT METER. ALL VOLTAGE READINGS 10%, MEASURED WITH AN INPUT VOLTAGE OF 117 V., 60 CYCLES.
  5. TERMINAL NUMBERS ON ANTENNA LEADS CORRESPOND WITH TERMINAL LUGS ON LOOP ON BACK OF CHASSIS.

The circuit diagram shows the power transformer connections for Model number 6-608-220. A separate drawing shows transformer connections for model number 6-608-110. The taps on the transformer drawing correspond to the various points on the voltage connector socket as shown.

Be sure your voltage selector socket connection corresponds to the prevailing line voltage before servicing. To insure proper alignment, it is suggested to use a radiated signal. To radiate a signal connect a loop of about 6" to 8" diameter 1 turn of #14 or #12 wire across the output of the signal generator and place this loop parallel to the loop of the receiver to be aligned at a distance of about 8" or 10".

To service this receiver it is first necessary to remove the motorboard with the record changer and then remove the chassis through the top opening of the cabinet. To lift the entire motorboard with the changer, unfasten the six screws holding the motor-board in place, disconnect motor and pick-up plugs from chassis, and lift up. It is unnecessary to remove the screws holding the metal-shield in front. **CAUTION: WHEN REMOVING THE CHANGER BE SURE TO PLACE IT IN A POSITION WHEREBY THE CHANGER MECHANISM WILL NOT BE DAMAGED.**





REPLACEMENT PARTS LIST

Part No.	Description
BU 187	Pilot light bulb 6.3V (#47 Mazda)
CL 211	Coil—Antenna loading coil
CL 212	Coil—Shielded oscillator coil
CL 224	Coil—Shielded r-f coil (BC & SW)
CO 158	Condenser—20/10/5/450 W.V. & 50/25 W.V. electrolytic condenser
CO 311	Condenser—1.0 mmfd $\pm 20\%$ fixed condenser
CT 389	Trimmer—dual 3-35 mmfd condenser
CT 440	Padder—350-780 mmfd condenser
CV 144	Condenser—3 gang variable condenser (with pulley)
DL 718	Dial—Olympic glass dial scale
KN 418	Knob—Walnut knob marked "VOLUME"
KN 419	Knob—Walnut knob marked "OFF-ON-TONE"
KN 421	Knob—Walnut knob marked "TUNING"
KN 736	Knob—Walnut knob marked "SW-BC-PH"
LP 213	Loop—Antenna
NE 322	Needle—Permanent needle
PO 181	Pointer
PT 105	Control—Volume control
PT 106	Control—Tone control & power switch
RCM20A101M	Condenser—100 mmfd $\pm 20\%$ mica condenser
RCM20A220M	Condenser—22 mmfd $\pm 20\%$ mica condenser
RCM20A221M	Condenser—220 mmfd $\pm 20\%$ mica condenser
RCM20A470M	Condenser—47 mmfd $\pm 20\%$ mica condenser
RCM30B272J	Condenser—2700 mmfd $\pm 5\%$ mica condenser
RCM40A331M	Condenser—330 mmfd $\pm 20\%$ 1000 W.V. mica condenser
RCPI0W2203A	Condenser—.02/200 W.V. tubular paper condenser
RCPI0W2503A	Condenser—.05/200 W.V. tubular paper condenser
RCPI0W4104L	Condenser—.1/400 W.V. tubular paper condenser
RCPI0W4503A	Condenser—.05/400 W.V. tubular paper condenser
RCPI0W6102A	Condenser—.001/600 W.V. tubular paper condenser
RCPI0W6103A	Condenser—.01/600 W.V. tubular paper condenser
RCPI0W6203A	Condenser—.02/600 W.V. tubular paper condenser
RCPI0W6502A	Condenser—.005/600 W.V. tubular paper condenser
RCPI0W6602K	Condenser—.006/600 W.V. tubular paper condenser
REB 101M	Resistor—100 ohms $\pm 20\%$ 1/2 watt resistor
REB 102M	Resistor—1000 ohms $\pm 20\%$ 1/2 watt resistor
REB 103M	Resistor—10,000 ohms $\pm 20\%$ 1/2 watt resistor
REB 105M	Resistor—1 megohm $\pm 20\%$ 1/2 watt resistor
REB 154M	Resistor—150,000 ohms $\pm 20\%$ 1/2 watt resistor
REB 155K	Resistor—1.5 megohms $\pm 10\%$ 1/2 watt resistor
REB 221K	Resistor—220 ohms $\pm 10\%$ 1/2 watt resistor
REB 223M	Resistor—22,000 ohms $\pm 20\%$ 1/2 watt resistor
REB 225M	Resistor—2.2 megohms $\pm 20\%$ 1/2 watt resistor
REB 332M	Resistor—3300 ohms $\pm 20\%$ 1/2 watt resistor
REB 334M	Resistor—330,000 ohms $\pm 20\%$ 1/2 watt resistor
REB 472M	Resistor—4700 ohms $\pm 20\%$ 1/2 watt resistor
REB 473M	Resistor—47,000 ohms $\pm 20\%$ 1/2 watt resistor
REB 474M	Resistor—470,000 ohms $\pm 20\%$ 1/2 watt resistor
REB 683K	Resistor—68,000 ohms $\pm 10\%$ 1/2 watt resistor
REC 103M	Resistor—10,000 ohms $\pm 20\%$ 1 watt resistor
REC 331K	Resistor—330 ohms $\pm 10\%$ 1 watt resistor
RED 104M	Resistor—100,000 ohms $\pm 20\%$ 2 watt resistor
SK 325	Speaker—6" x 9" oval dynamic speaker
SP 191	Spring—drive shaft retaining spring
SP 218	Spring—1/8" long pointer drive spring
SP 633	Spring—conversion spring 60 to 50 cycles for motor K228250
SP 634	Spring—conversion spring 60 to 50 cycles for motor K228131
ST 369	Back—masonite back
SW 140	Switch—Band/Phono switch
TR 112	Transformer—Power transformer (for 6-608-110 only) or
TR 523	Transformer—Power transformer (for 6-608-220 only)
TR 118	Transformer—1st & 2nd I.F. transformer (455 k-c)

ALIGNMENT

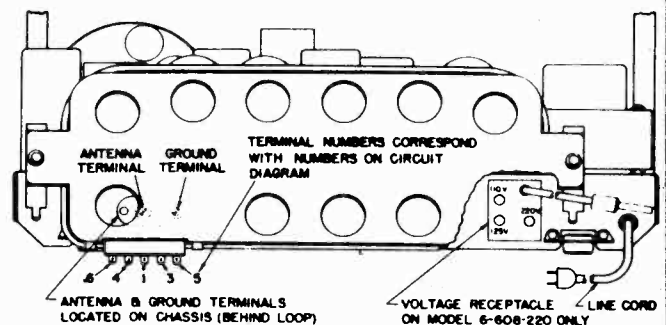
Equipment Required: Modulated r-f signal generator; output meter; insulated screw driver; one .1 mfd 400 volts and one 50 mmfd 400 volts condenser.

With the receiver removed from the cabinet, connect output meter across voice coil. Connect ground side of the signal generator to chassis; turn volume control fully on, and keeping the output of the signal generator as low as possible, proceed in the sequence as shown on the alignment chart.

To facilitate alignment of the receiver when removed from cabinet, calibration points are provided on the pointer slide bar (see drawing).

Before aligning, close the variable condenser fully counterclockwise (plates fully closed) and check that pointer carriage coincides with the "reference line" on the pointer slide bar.

REAR VIEW OF RECEIVER CHASSIS WITH CABINET BACK REMOVED



Frequency Range: 535-1700 kc and 5.7 18.4 mc

Power Requirement: for Model 6-608-110

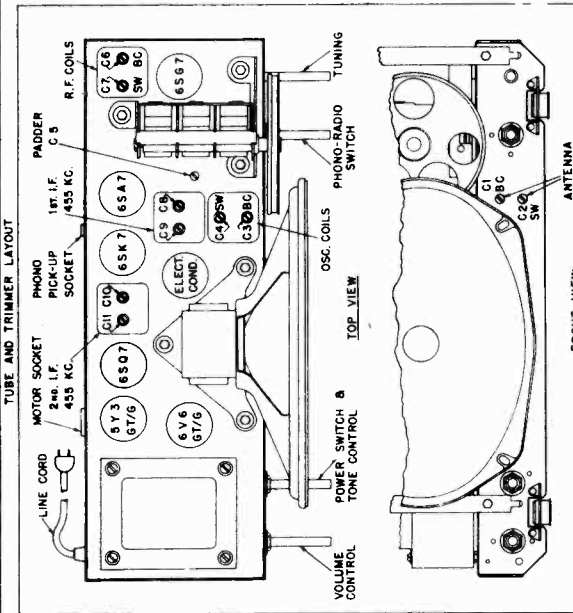
105-125 Volts a-c 50 or 60 cycles

for Model 6-608-220 100-120 Volts

112-130 Volts or 200-240 Volts a-c 50 or 60 cycles

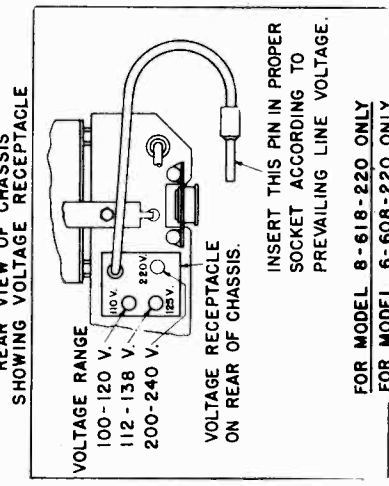
Power Consumption: Receiver 70 Watts

Record Changer 85 Watts



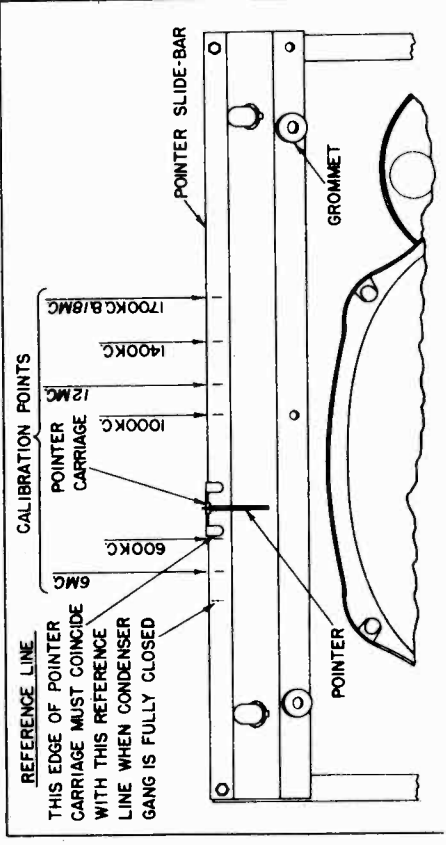
**NOTE:** In order to adjust the short wave oscillator trimmer accurately to the fundamental frequency and not to the image signal, turn the trimmer first to the maximum capacity position (fully tight). From this position loosen the trimmer through one peak indication on the output meter until a second peak is obtained. Adjust for maximum output on this second peak.

To check whether this procedure has been accurately performed, ascertain that an image signal can be received (much weaker) by tuning the signal generator to a frequency 910 kilocycles above the alignment frequency.



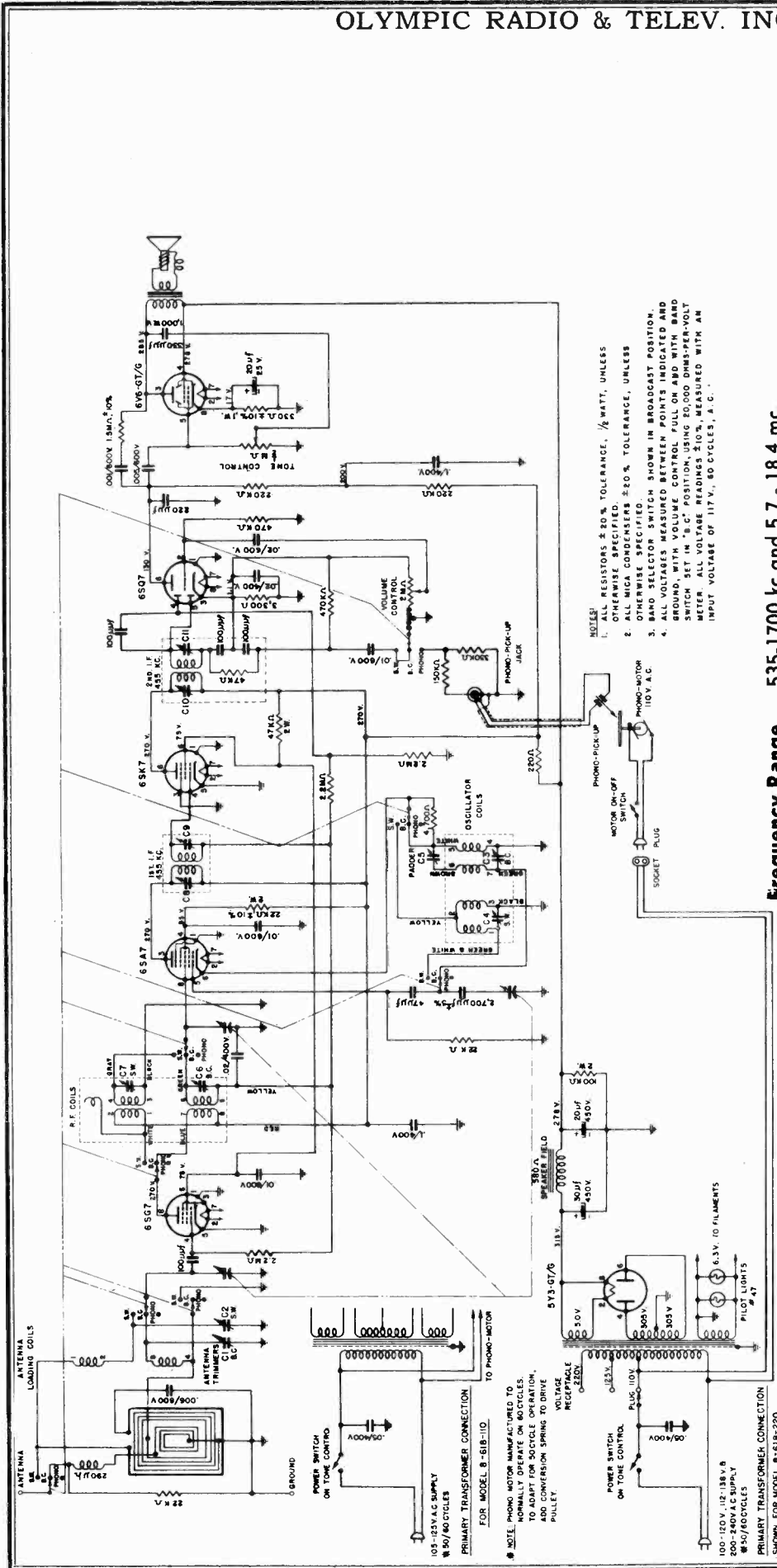
STEP	SET BAND SWITCH ON	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO-	SET SIGNAL GENERATOR TO-	TURN POINTER TO-	ADJUST THE FOLLOWING FOR MAXIMUM OUTPUT. (KEEP SIGNAL FROM SIGNAL GENERATOR AS LOW AS POSSIBLE).
1	B.C.	R.F. SECTION OF VARIABLE CONDENSER OR PIN 4 OF THE 6SK7 TUBE IN SERIES WITH A .1 MFD., 400 VOLT CONDENSER.	455 KC.	EXTREME RIGHT HAND POSITION. (CONDENSER PLATES FULLY OPEN).	C 11 AND C 10 (2nd. I.F. TRANSFORMER)
2	B.C.	R.F. SECTION OF VARIABLE CONDENSER OR PIN 8 OF THE 6SA7 TUBE IN SERIES WITH A .1 MFD., 400 VOLT CONDENSER.	455 KC.	EXTREME RIGHT HAND POSITION. (CONDENSER PLATES FULLY OPEN).	C 9 AND C 8 (1st. I.F. TRANSFORMER)
REPEAT STEPS 1 AND 2					
3	B.C.	USE SIGNAL	1700 KC.	1700 KC. CALIBRATION POINT ON DIFFUSER PLATE	C 3 (OSCILLATOR TRIMMER)
4	B.C.	RADIATED SIGNAL (CONNECT BOTH SIDES OF SIGNAL GENERATOR TO RADIATION LOOP).	1400 KC.	RESONANCE, APPROXIMATELY ON DIFFUSER PLATE.	C 6 AND C 1 (R. F. AND ANTENNA TRIMMERS)
5	B.C.		600 KC.	600 KC. CALIBRATION POINT ON DIFFUSER PLATE.	C 5 (PADDER)
6	B.C.			REPEAT STEPS 4, 5 AND 6	ROCK VARIABLE FOR MAXIMUM SIGNAL
7	B.C.				
8	S.W.		18 MC.	18 MC. CALIBRATION POINT ON DIFFUSER PLATE	C 4 (OSCILLATOR TRIMMER) SECOND PEAK FROM TIGHT POSITION. C 7 (R.F. TRIMMER) FIRST PEAK FROM TIGHT POSITION. C 2 (ANTENNA TRIMMER)
9	S.W.		6 MC.	RESONANCE	CHECK THAT POINTER (AT RESONANCE) COINCIDES WITH 6 MC. CALIBRATION POINT. IF NOT REPEAT STEP 8.
10	S.W.			REPEAT STEPS 8 AND 9	

FRONT VIEW OF DIAL BACK-PLATE SHOWING CALIBRATION POINTS.



**Note:** Dial lights may, in case of failure, be replaced without removing chassis from cabinet. Remove the three bronze plated screws which hold the metal-front-shield to the motorboard and lift the shield. The two sockets holding the pilot lights will then be accessible for replacement of the bulbs.

The pick-up is of the low pressure crystal type and is equipped with a permanent type needle which will give about 4,000 playings before requiring replacement. When first used a pronounced needle scratch will be heard which will be greatly reduced after about twenty playings. This "breaking in period" is essential on all needles of the permanent type in order to permit the point to become polished.



- NOTES:
1. ALL RESISTORS ± 20% TOLERANCE, 1/8 WATT, UNLESS OTHERWISE SPECIFIED.
  2. ALL MICA CONDENSERS ± 20% TOLERANCE, UNLESS OTHERWISE SPECIFIED.
  3. BAND SELECTOR SWITCH SHOWN IN BROADCAST POSITION.
  4. ALL VOLTAGES MEASURED BETWEEN POINTS INDICATED AND GROUND, WITH VOLUME CONTROL FULL ON, BAND SWITCH SET TO BROADCAST POSITION. VOLTAGE READINGS ± 10%, MEASURED WITH AN INPUT VOLTAGE OF 117 V., 60 CYCLES, A.C.

**Frequency Range** 535-1700 kc and 5.7 - 18.4 mc.

**Power Requirement** 105-125 volts 60 cycles a-c.

**Power Consumption** Receiver—70 watts. Receiver with Record Changer—85 watts.

**ALIGNMENT**

Equipment Required: Modulated r-f signal generator; output meter; insulated screw driver; one .1 mfd 400 volt condenser; one 400 ohm resistor, and one radiation loop.

With the receiver removed from the cabinet, connect output meter across voice coil. Connect ground side of the signal generator to chassis; turn volume control fully on, and keeping the output of the signal generator as low as possible, proceed in the sequence as shown on the alignment chart.

To facilitate alignment of the receiver when removed from cabinet, calibration points are provided on the pointer slide bar (see drawing).

Before aligning, close the variable condenser fully counterclockwise (plates fully closed) and check that pointer carriage coincides with the "reference line" on the pointer slide bar.

## REPLACEMENT PARTS LIST

PART NUMBER	DESCRIPTION	PART NUMBER	DESCRIPTION
BU-187	Bulb— $\neq$ 47 6.3 volt pilot light bulb	RCP10W6103A	Condenser—01/600 W.V. tubular paper condenser
CA-865	Cabinet—	RCP10W6203A	Condenser—02/600 W.V. tubular paper condenser
CL-211	Coil—antenna loading coil	RCP10W6502A	Condenser—005/600 W.V. tubular paper condenser
CL-212	Coil—oscillator coil	RCP10W6602K	Condenser—006/600 W.V. tubular paper condenser
CL-224	Coil—r-f coil	REB-154M	Resistor—150,000 ohms $\pm$ 20% 1/2 watt resistor
CO-715	Condenser—05/400 W.V. molded paper condenser	REB-153K	Resistor—1.5 megohms $\pm$ 10% 1/2 watt resistor
CO-768	Condenser—30 $\pm$ 20/450 W.V. & 20/25 W.V. electrolytic cond.	REB-221M	Resistor—220 ohms $\pm$ 20% 1/2 watt resistor
CT-389	Condenser—3.35 mmfd dual trimmer condenser	REB-223M	Resistor—22,000 ohms $\pm$ 20% 1/2 watt resistor
CT-440	Condenser—350.780 mmfd paddler condenser	REB-224M	Resistor—220,000 ohms $\pm$ 20% 1/2 watt resistor
CV-144	Condenser—3 section variable condenser gang	REB-225M	Resistor—2.2 megohms $\pm$ 20% 1/2 watt resistor
DL-718	Dial—glass dial scale	REB-332M	Resistor—3300 ohms $\pm$ 20% 1/2 watt resistor
KN-418	Knob—walnut knob marked "Volume"	REB-334M	Resistor—330,000 ohms $\pm$ 20% 1/2 watt resistor
KN-419	Knob—walnut knob marked "Off-On-Tone"	REB-472M	Resistor—4700 ohms $\pm$ 20% 1/2 watt resistor
KN-421	Knob—walnut knob marked "Tuning"	REB-474M	Resistor—470,000 ohms $\pm$ 20% 1/2 watt resistor
KN-736	Knob—walnut knob marked "SW-BC-PH"	REC-331K	Resistor—330 ohms $\pm$ 10% 1/2 watt resistor
LP-213	Loop—loop-antenna	RED-104M	Resistor—100,000 ohms $\pm$ 20% 2 watt resistor
PO-181	Painter—	RED-223K	Resistor—22,000 ohms $\pm$ 10% 2 watt resistor
PT-105	Control—2 megohm volume control	RED-473M	Resistor—47,000 ohms $\pm$ 20% 2 watt resistor
PT-106	Control—1/2 megohm tone control with Off-On switch	SK-325	Speaker—6" x 9" oval electrodynamic speaker
RCM20A101M	Condenser—100 mmfd $\pm$ 20% mica condenser	SO-189	Socket—pilot light socket assembly
RCM20A221M	Condenser—220 mmfd $\pm$ 20% mica condenser	SP-191	Spring—drive shaft retaining spring
RCM20A470M	Condenser—47 mmfd $\pm$ 20% mica condenser	SP-218	Spring—pointer drive spring
RCM30B272J	Condenser—2700 mmfd $\pm$ 5% mica condenser	ST-369	Back—masonite back
RCM40A331M	Condenser—330 mmfd $\pm$ 20% mica condenser (1000 W.V.)	SW-140	Switch—band switch
RCP10W4104L	Condenser—1/400 W.V. tubular paper condenser	TR-112	Transformer—95 mils power transformer for 110 V. operation
RCP10W4203A	Condenser—02/400 W.V. tubular paper condenser	TR-523	Transformer—power transformer for 220 V. operation
RCP10W6102A	Condenser—001/600 W.V. tubular paper condenser	TR-781	Transformer—455 kc input I.F. transformer
		TR-782	Transformer—455 kc output I.F. transformer

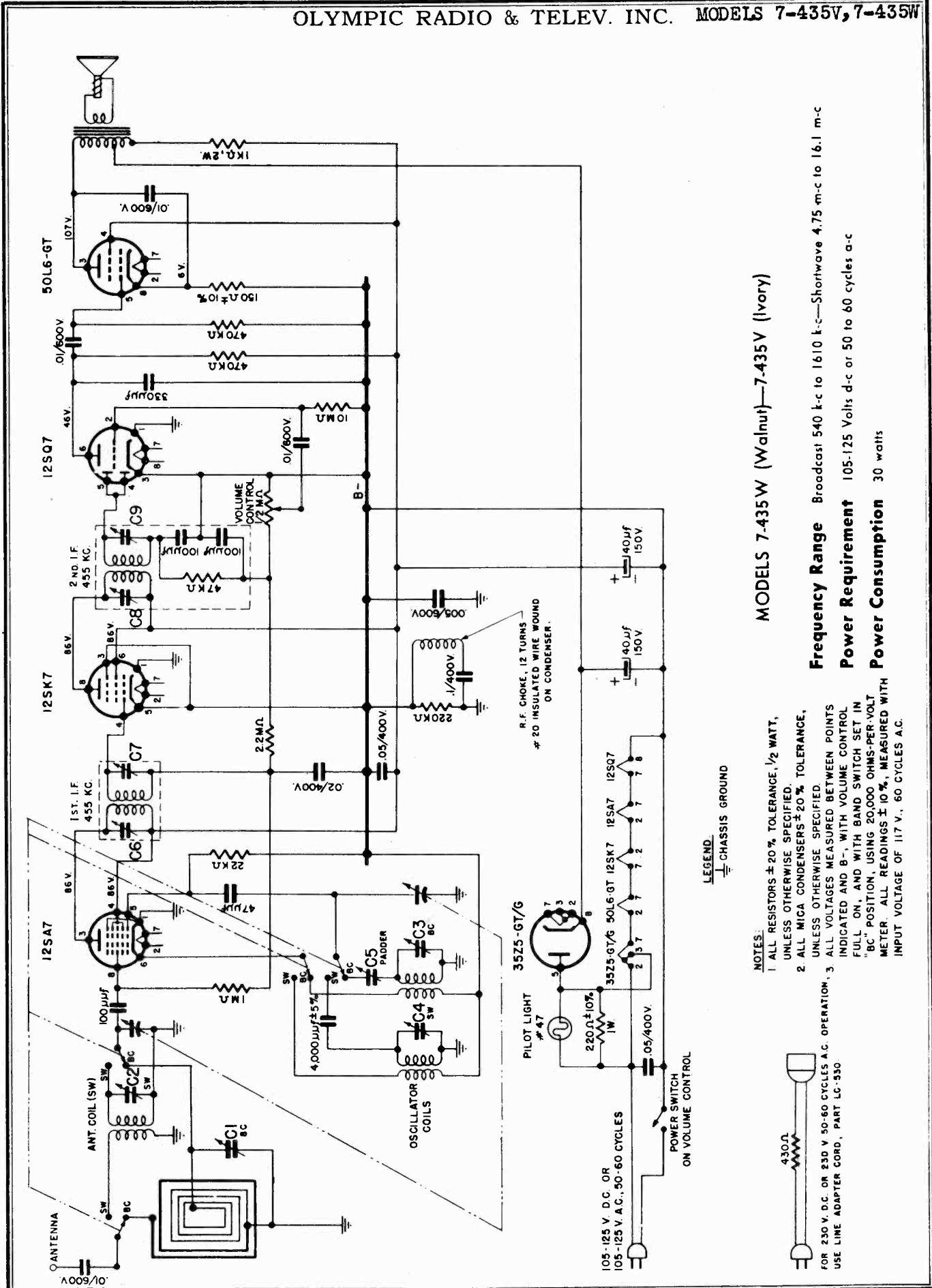
## SERVICE AND ALIGNMENT INSTRUCTIONS

To insure proper alignment a radiated signal will be required during part of the alignment procedure. To radiate a signal connect a loop of about 6" to 8" diameter 1 turn of #14 or #12 wire across the output of the signal generator and place this loop parallel to the loop of the receiver to be aligned at a distance of about 8" or 10".

To service this receiver it is first necessary to remove the motorboard with the record changer and then remove the chassis through the top opening of the cabinet. To lift the entire motorboard with the changer, unfasten the six screws holding the motorboard in place, disconnect motor and pick-up plugs from chassis, and lift up.

**CAUTION: WHEN REMOVING THE CHANGER BE SURE TO PLACE IT IN A POSITION WHEREBY THE CHANGER MECHANISM WILL NOT BE DAMAGED.**

OLYMPIC RADIO & TELEV. INC. MODELS 7-435V, 7-435W



MODELS 7-435W (Walnut)—7-435V (Ivory)

**Frequency Range** Broadcast 540 k-c to 1610 k-c—Shortwave 4.75 m-c to 16.1 m-c  
**Power Requirement** 105-125 Volts d-c or 50 to 60 cycles a-c  
**Power Consumption** 30 watts

- NOTES:**
1. ALL RESISTORS ± 20% TOLERANCE, 1/2 WATT, UNLESS OTHERWISE SPECIFIED.
  2. ALL MICA CONDENSERS ± 20% TOLERANCE, UNLESS OTHERWISE SPECIFIED.
  3. ALL VOLTAGES MEASURED BETWEEN POINTS INDICATED AND B+, WITH VOLUME CONTROL FULL ON, AND WITH BAND SWITCH SET IN "BC" POSITION, USING 20,000 OHMS-PER-VOLT METER. ALL READINGS ± 10%, MEASURED WITH INPUT VOLTAGE OF 117 V., 60 CYCLES A.C.

**LEGEND:**  
 CHASSIS GROUND

430Ω  
 FOR 230 V. D.C. OR 50-60 CYCLES A.C. OPERATION,  
 USE LINE ADAPTER CORD, PART LC-530

ALIGNMENT PROCEDURE CHART

STEP	SET BAND SWITCH ON	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO—	SET SIGNAL GENERATOR TO—	TURN RECEIVER DIAL TO—	ADJUST THE FOLLOWING FOR MAXIMUM OUTPUT (KEEP SIGNAL FROM SIGNAL GENERATOR AS LOW AS POSSIBLE).
1	B. C.	RF SECTION OF VARIABLE CONDENSER OR PIN 4 OF THE 12SK7 TUBE IN SERIES WITH A .1MFD. 400 VOLT CONDENSER	455 KC.	FULL CLOCKWISE POSITION (CONDENSER PLATES FULLY OPEN)	C8 AND C9 (2nd I.F. TRANSFORMER)
2	B. C.	RF SECTION OF VARIABLE CONDENSER OR PIN 8 OF THE 12SA7 TUBE IN SERIES WITH A .1MFD. 400 VOLT CONDENSER	455 KC.	FULL CLOCKWISE POSITION (CONDENSER PLATES FULLY OPEN)	C6 AND C7 (1st I.F. TRANSFORMER)
3	B. C.	REPEAT STEPS 1 AND 2			
4	B. C.	USE RADIATED SIGNAL (CONNECT BOTH SIDES OF SIGNAL GENERATOR TO RADIATION LOOP)	1600 KC. (160 ON DIAL)	1600 KC. (160 ON DIAL)	C3 (OSCILLATOR TRIMMER)
5	B. C.		1400 KC.	MAXIMUM SIGNAL (APPROX. 140 ON DIAL)	C1 (ANTENNA TRIMMER)
6	B. C.		600 KC.	MAXIMUM SIGNAL (APPROX. 60 ON DIAL)	C5 (PADDER) ROCK VARIABLE FOR MAXIMUM SIGNAL
7	B. C.	REPEAT STEPS 4, 5, AND 6			
8	S. W.	ANTENNA WIRE ON LOOP IN SERIES WITH A 400 OHM RESISTOR	15 MC.	15 MC. (APPROX. 15 ON DIAL)	C4 (OSCILLATOR TRIMMER) SECOND PEAK FROM TIGHT POSITION C2 (ANTENNA TRIMMER)
9	S. W.		5.5 MC.	RESONANCE (APPROX. 5.5 ON DIAL)	CHECK THAT POINTER (AT RESONANCE) COINCIDES WITH 5.5 MC. CALIBRATION POINT ON DIAL. IF NOT REPEAT STEP 8.

**ALIGNMENT INSTRUCTIONS**

Equipment required: Modulated r-f signal generator, output meter, insulated screw driver, two .1mfd. 400 V. Condensers, one 400 ohms resistor.

To align the receiver it is necessary to remove the chassis from the cabinet, check that the pointer is horizontal and coincides with the two horizontal reference lines on the dial. In this position the condenser should be completely closed. Turn volume control to maximum and connect the output meter across the voice coil.

Then connect the low side of the signal generator to the receiver chassis through a .1 mfd. condenser and keeping the output as low as possible proceed in the sequence as shown on the alignment chart.

To insure alignment a radiated signal will be required during part of the alignment procedure. To radiate a signal connect a loop of about 6" to 8" diameter, (one turn of #14 or #12 wire) across the output of the signal generator and place this loop parallel to the loop of the receiver to be aligned, at a distance of about 8" or 10".

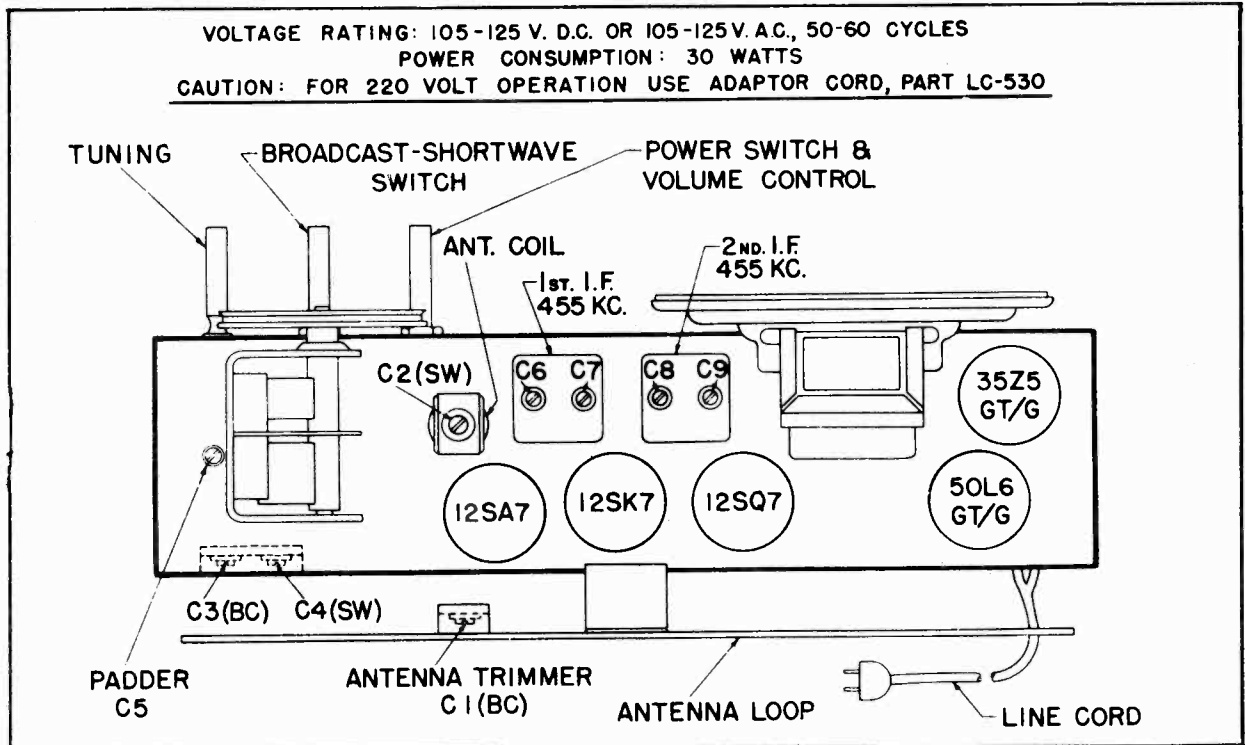
**REPLACEMENT PARTS**

Part No.	Description
BU-187	Bulb—#47 Mazda pilot light bulb
CA-327W	Cabinet—walnut bakelite cabinet
CA-327V	Cabinet—ivory bakelite cabinet
CL-933	Coil—broadcast and shortwave oscillator coil
CL-940	Coil—shortwave antenna coil
CO-107	Condenser—40/40/150 W.V. electrolytic condenser
CT-389	Condenser—3-35 mmfd. dual trimmer condenser
CT-440	Condenser—350-780 mmfd. padder condenser
CT-939	Condenser—3-35 mmfd. trimmer condenser
CV-772	Condenser—2 section ganged variable condenser
DL-934	Dial—dial scale
KN-1077	Knob—walnut knob marked "Off-On-Volume"
KN-1078	Knob—walnut knob marked "Tuning"
KN-1085	Knob—walnut knob marked "BC-SW"
KN-1103	Knob—ivory knob marked "Off-On-Volume"
KN-1104	Knob—ivory knob marked "Tuning"
KN-1105	Knob—ivory knob marked "BC-SW"
LP-937	Loop—loop antenna
PO-259W	Pointer—moulded pointer walnut
PO-259V	Pointer—molded pointer ivory
PT-102	Control—1/2 megohm volume control with off-on switch
RCM20A101M	Condenser—100 mmfd. ±20% mica condenser
RCM20A331M	Condenser—330 mmfd. ±20% mica condenser
RCM20A470M	Condenser—47 mmfd. ±20% mica condenser

Part No.	Description
RCM30B402J	Condenser—4000 mmfd. ±5% mica condenser
RCP10W4104L	Condenser—.1/400 W.V. tubular paper condenser*
RCP10W4203A	Condenser—.02/400 W.V. tubular paper condenser
RCP10W4503A	Condenser—.05/400 W.V. tubular paper condenser
RCP10W6103A	Condenser—.01/600 W.V. tubular paper condenser
RCP10W6502A	Condenser—.005/600 W.V. tubular paper condenser
REB-105M	Resistor—1 megohm ±20% 1/2 watt resistor
REB-106M	Resistor—10 megohms ±20% 1/2 watt resistor
REB-151K	Resistor—150 ohms ±10% 1/2 watt resistor
REB-223M	Resistor—22,000 ohms ±20% 1/2 watt resistor
REB-224M	Resistor—220,000 ohms ±20% 1/2 watt resistor
REB-225M	Resistor—2.2 megohms ±20% 1/2 watt resistor
REB-474M	Resistor—470,000 ohms ±20% 1/2 watt resistor
REC-221K	Resistor—220 ohms ±10% 1 watt resistor
RED-102M	Resistor—1000 ohms ±20% 2 watt resistor
SK-838	Speaker—5" p.m. speaker
SP-191	Spring—drive shaft retaining spring
SP-295	Spring—dial drive spring
ST-255-1	Back—cardboard back
SW-839	Switch—4 P.D.T. band switch
TR-707	Transformer—455 k-c I.F. input transformer
TR-708	Transformer—455 k-c I.F. output transformer

\*When ordering be sure to specify with r-f choke

**TUBE LAYOUT**



**TUNING**

To place this receiver in operation insert the line plug into a suitable electric outlet of 105-125 volts d-c or 50-60 cycles a-c. For operation on 220 volts d-c or 50-60 a-c an adapter cord our part number LC 530 must be inserted between the line plug and the electric outlet.



