

MODELS M-51, M-51A, M-56 & M-56A

Five-Tube, Two-Band, A-C Superheterodyne Receivers

ELECTRICAL SPECIFICATIONS

Voltage Rating.....	105-125 Volts
Frequency Rating.....	25-60 and 50-60 Cycles
Power Consumption (All Frequencies).....	85 Watts
Number and Types of Radiotrons.....	1 G.E.-6A7, 1 G.E.-6D6, 1 G.E.-6B7, 1 G.E.-41, 1 G.E.-80—Total, 5
Undistorted Output.....	1.9 Watts
Maximum Output.....	3.5 Watts
Tuning Frequency Ranges.....	540 K. C.—1720 K. C.—5400 K. C.—18,000 K. C.
Line-up Frequencies.....	460 K. C., 600 K. C., 1720 K. C. and 18,000 K. C.

PHYSICAL SPECIFICATIONS

	<i>Model M-51</i>	<i>Model M-56</i>
Height.....	17 ⁵ / ₈ Inches....	40 Inches
Width.....	14 ³ / ₈ Inches....	23 ¹ / ₂ Inches
Depth.....	9 ³ / ₄ Inches....	9 ¹ / ₈ Inches

This receiver is a five-tube, two-band A.C. operated superheterodyne having tuning ranges that cover both the standard and short-wave broadcasting bands. Features include an "Airplane" type dial, two-point tone control, double reduction vernier drive, dynamic type loudspeaker and excellent performance in all respects. The entire mechanism is housed in a cabinet of pleasing design.

A special feature of this receiver is the accessibility of all parts for inspection and repair. This will be of interest to the service man, as the removal and replacement of any part can be quickly and easily done. All parts are rigidly held in place, thus preventing the rigors of handling and transportation from damaging the receiver.

DESCRIPTION OF ELECTRICAL CIRCUIT

The circuit is of the superheterodyne type and consists of a combined oscillator and first detector, an I. F. stage, a combined second detector and automatic volume control and a Pentode output stage. A G.E.-80 is used as a rectifier for providing grid and plate power to all other tubes.

The signal enters the receiver through the antenna system and is applied through a tuned circuit to the grid of the first detector. Combined with the signal is the local oscillator signal, which is at a constant frequency difference (460 K. C. higher) throughout the tuning range. The combined signals after passing through the first detector produce the I. F. signal, which is 460 K. C. The G.E.-6A7 is the combined detector and oscillator.

The I. F. amplifier consists of a single G.E.-6D6 and two transformers, having a total of four tuned

circuits. The high I. F. frequency (460 K. C.) is used to reduce image frequency response and to improve the short-wave performance.

The output of the I. F. amplifier is then applied to the diode sections of the G.E.-6B7, which is a combined second detector, automatic volume control and A. F. amplifier. The direct current component of the rectified signal produces a voltage drop across resistor R-9. The full voltage drop constitutes the automatic bias voltage for the first detector while a tap is provided for the I. F. voltage. These automatic bias voltages for the detector and I. F. give the automatic volume control action of the receiver. The volume control selects the amount of audio voltage that is applied to the grid of the G.E.-6B7 and thereby regulates the audio output of the entire receiver.

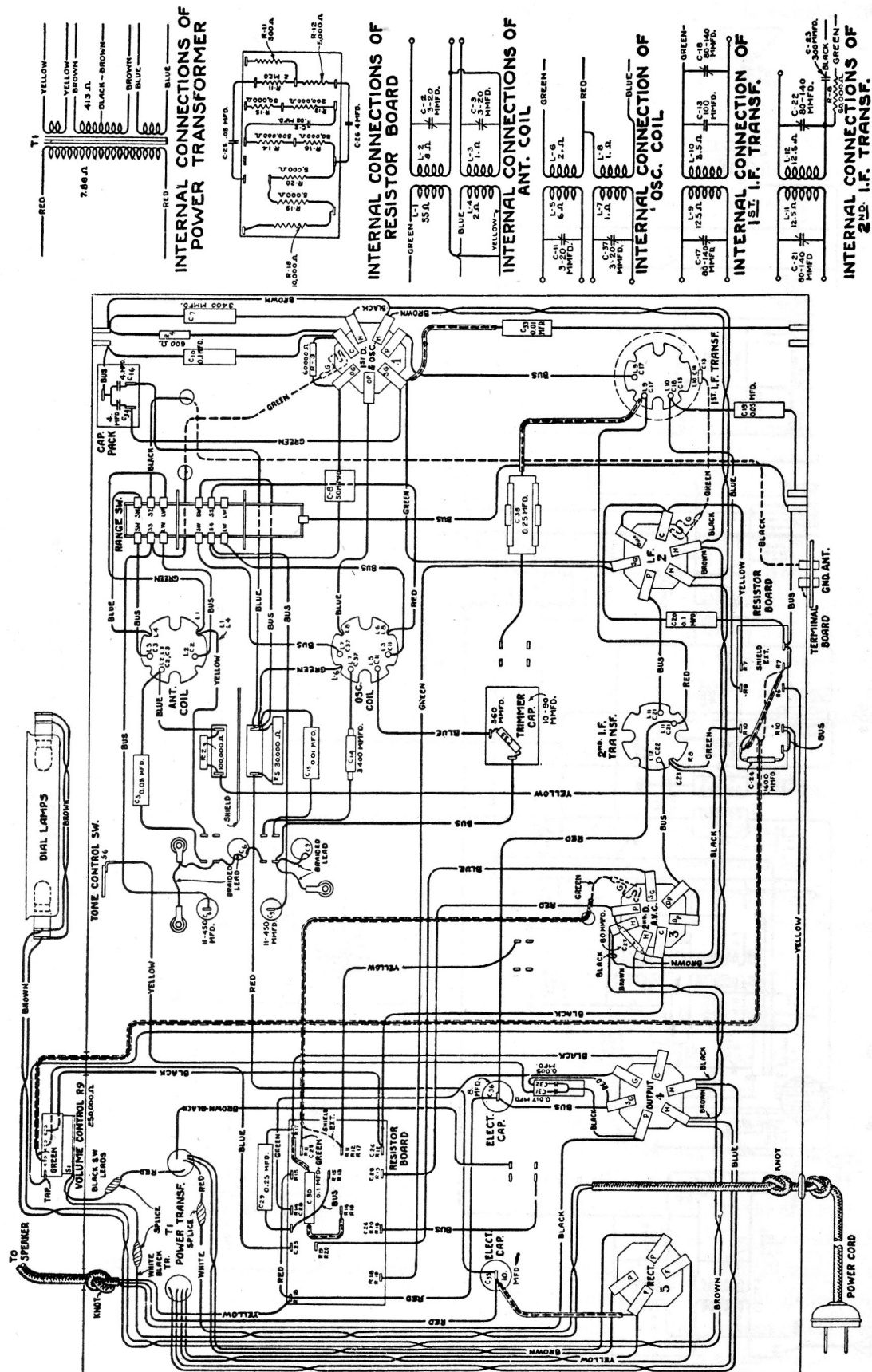


Figure 2—Wiring Diagram

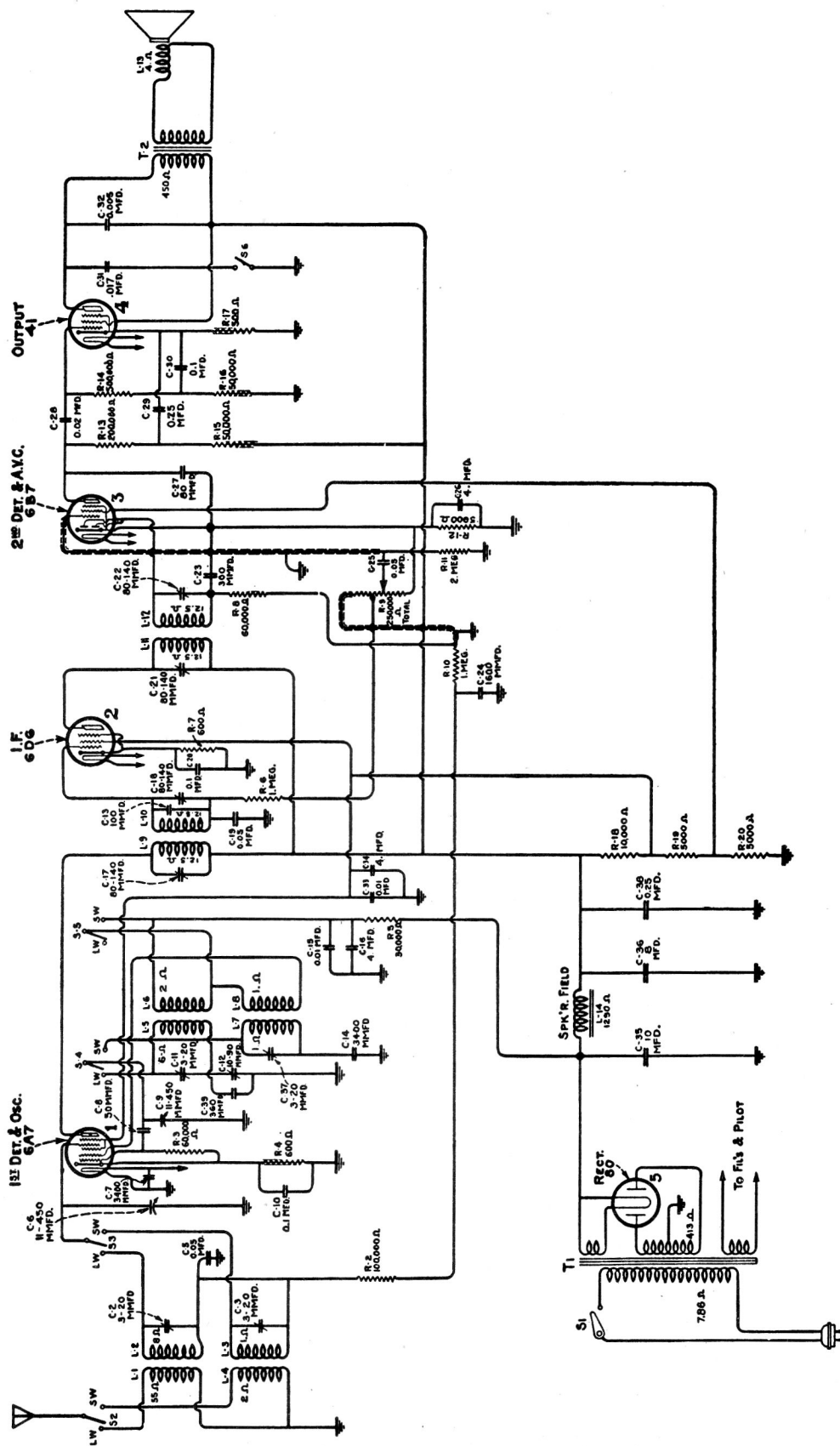


Figure 1—Schematic Circuit Diagram

The output of the G.E.-6B7 is resistance coupled to the grid of the G.E.-41 tube, which is the power output amplifier. This tube is operated as a Pentode and provides high audio gain and satisfactory output power. The plate circuit of the output stage is matched to the cone coil of the reproducer by means of a step-down transformer.

The tone control consists of a 0.017 mfd. capacitor connected from the plate of the output tube to

ground through a single pole switch. Closing the switch reduces the high-frequency output of the receiver.

Plate and grid voltages for all tubes are supplied from the output of the rectifier-filter system. A G.E.-80 is used as a rectifier and a suitable network of capacitors and resistors gives the necessary filtering and voltages. The loudspeaker field is used as a filter reactor.

SERVICE DATA

(1) Line-Up Capacitor Adjustments:

To properly align this receiver, it is essential that a modulated R. F. oscillator, such as Stock No. 9050, an output indicator and an alignment tool (Stock No. 4160) be available. Figure 5 shows the location of the various line-up capacitors.

I. F. Tuning Adjustments:

Two transformers comprising four tuned circuits are used in the intermediate amplifier. These are tuned to 460 K. C. and the adjustment screws are accessible as shown in Figure 6. Proceed as follows:

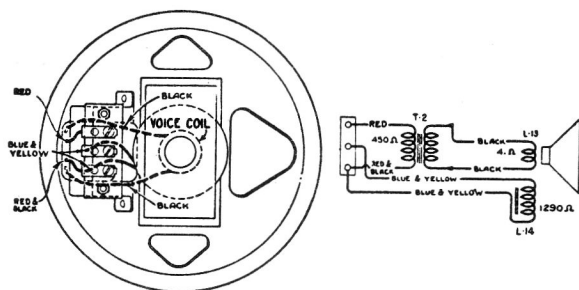


Figure 3—Table Model Loudspeaker Wiring

- (a) Short-circuit the antenna and ground terminals and tune the receiver so that no signal is heard. Set the volume control at maximum and connect a ground to the ground terminal.
- (b) Connect the test oscillator output between the first detector control grid and chassis ground. Connect the output meter across the voice coil of the loudspeaker and adjust the

oscillator output so that, with the receiver volume control at maximum, a slight deflection is obtained in the output meter.

- (c) Adjust the secondary and primary of the first and then the second I. F. transformers until a maximum deflection is obtained. Keep the oscillator output at a low value so that only a slight deflection is obtained on the output meter at all times. Go over these adjustments a second time, as there is a slight interlocking of adjustments. This completes the I. F. adjustments.

R. F. and Oscillator Adjustments.

The R. F. line-up capacitors are located at the bottom of the coil assemblies instead of their usual position on the gang capacitor. They are all accessible from the bottom of the chassis except the 600 K. C. series capacitor, which is accessible from the top of the chassis. Proceed as follows:

- (a) Connect the output of the oscillator to the antenna and ground terminals of the receiver. Check the position of the indicator pointer when the tuning capacitor plates are fully meshed. It should be coincident with the radial line adjacent to the dial reading of 540. Then set the Test Oscillator at 1720 K. C., the dial indicator at 1720 and the oscillator output so that a slight deflection will be obtained in the output meter when the volume control is at its maximum position.

- (b) With the Range Switch at the "in" position, adjust the two trimmers under the two R. F. coils, designated as BC in Figure 6, until a maximum deflection is obtained in the output meter. Then shift the Test Oscillator fre-

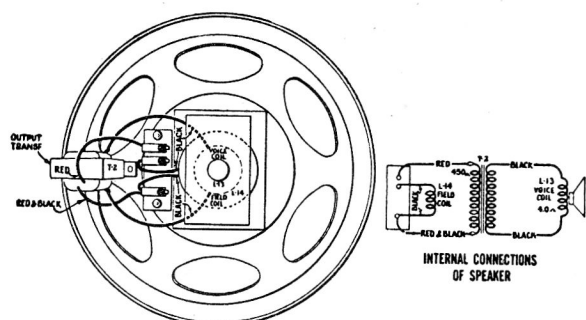


Figure 4—Console Model Loudspeaker Wiring

quency to 600 K. C. The trimmer capacitor, accessible from the top of the chassis, should now be adjusted for maximum output while rocking the main tuning capacitor back and forth through the signal. Then repeat the 1720 K. C. adjustment.

- (c) Now place the Range Switch at the "out" position, shift the Test Oscillator to 18,000 K. C. and set the dial at 18M. Adjust the two trimmer capacitors designated as SW

in Figure 5 for maximum output, beginning with the oscillator trimmer. It will be noted that the oscillator and first detector trimmers will have two positions at which the signal will give maximum output. The position which uses the lower trimmer capacitance, obtained by turning the screw counter-clockwise, is the proper adjustment for the oscillator, while the position that uses a higher capacitance is correct for the detector. The detector trimmer *must* be adjusted for maximum output while rocking the main tuning capacitor back and forth through the signal. Both of these adjustments must be made as indicated irrespective of output.

The important points to remember are the need for using the minimum oscillator output to obtain a deflection in the output meter with the volume control at its maximum position and the manner of obtaining the proper high frequency oscillator and detector adjustments.

(2) Radiotron Socket Voltages:

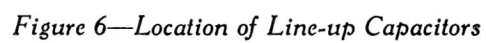
The following voltages are those at the various tube sockets while the receiver is in operating condition. No allowance has been made for currents drawn by the meter, and if lower resistance meters are used, such allowances must be made:

RADIOTRON SOCKET VOLTAGES

115-Volt, A. C. Line—Maximum Volume Control—No Signal

Radiotron No.		Cathode to Ground Volts, D. C.	Screen Grid to Ground Volts, D. C.	Plate to Ground Volts, D. C.	Plate Current, M. A.	Heater Volts, A. C.
G.E.-6A7	Detector	6.0	105	265	3.5	6.3
	Oscillator		—	220	4.5	
G.E.-6D6 I. F.		6.0	105	265	9.0	6.3
G.E.-6B7 2nd Det. AVC		3.0	50*	90*	0.7	6.3
G.E.-41 Power		16.5	265	245	30.0	6.3
G.E.-80 Rectifier		—	—	690 (Plate to Plate)	64.0	5.0

*Voltage calculated from 265 V+B.



REPLACEMENT PARTS—M-51, M-51A, M-56 & M-56A

KEY No.	STOCK No.	DESCRIPTION	KEY No.	STOCK No.	DESCRIPTION
RECEIVER ASSEMBLIES					
R-14	S-1067	Resistor—500,000 ohms—Carbon type— $\frac{1}{4}$ watt.	C-33	4444	Capacitor—0.01 mfd.
R-13	S-1151	Socket—6 contact Tube Socket.	4446		Screw—Chassis mounting screw assembly—4
R-2	S-1280	Resistor—200,000 ohms—Carbon type— $\frac{1}{2}$ watt.	C-7	4471	Screws, 4 Lockwashers, 4 Washers, 4 Spacers,
C-12	S-1354	Resistor—100,000 ohms—Carbon type— $\frac{1}{4}$ watt.	4504		8 Cushions—Per set.
	S-1360	Capacitor—Adjustable Trimmer Capacitor.	C-27	4509	Capacitor—3,400 mmfd.
	S-1429	Cap—Contact cap—Package of 2.	R-11	6242	Condenser—2 gang variable tuning condenser.
	S-1431	Capacitor—0.05 mfd.	6300		Capacitor—80 mmfd.
C-25			6318		Resistor—2 meg.—Carbon type— $\frac{1}{4}$ watt.
C-16	S-1435	Capacitor Pack—Two 4.0 mfd. capacitors.	R-18	6672	Socket—4 Contact Tube Socket.
C-34	2240	Resistor—30,000 ohms—Carbon type—1 watt.	6318		Resistor—10,000 ohms—Porcelain type.
R-5	3033	Resistor—1 meg.—Carbon type— $\frac{1}{4}$ watt.	6672		Screen—Translucent Screen for dial lamps—
R-6	3114	Resistor—50,000 ohms—Carbon type— $\frac{1}{4}$ watt.	C-31	6787	Package of 3.
R-10	3218	Resistor—600 ohms—Carbon type— $\frac{1}{4}$ watt.	C-32	7487	Capacitor pack—One .005—One .017 mfd. capa-
R-16	3529	Socket—Dial Lamp Socket.	7790		citors.
R-4	3572	Socket—7 Contact Tube Socket.	C-35	7800	Shield—I. F. Radiotron Shield.
R-7	3594	Resistor—50,000 ohms—Carbon type— $\frac{1}{2}$ watt.	9511		Capacitor—10 mfd.
R-15	3597	Capacitor—.25 mfd.	9512		Shield—Antenna, Oscillator or I. F. Transformer
C-38	3602	Resistor—60,000 ohms—Carbon type— $\frac{1}{4}$ watt.	10194		Coil Shield.
R-3	3632	Resistor—500 ohms—Carbon type—1 watt.			Transformer—105-125 Volt—50-60 Cycle.
R-17	3796	Capacitor—4.0 mfd.			Transformer—Power—105-125 Volt—25-40
C-26	3877	Capacitor—0.1 mfd.			Cycle.
C-20	3888	Capacitor—0.05 mfd.			Ball—Steel Ball for condenser drive assembly—
C-30	3891	Resistor—5,000 ohms—Carbon type—1 watt.			Package of 10.
C-19	3942	Shield—First detector and Oscillator Radiotron	REPRODUCER (CONSOLE)		
R-19		tube shield.	T-2	S-1397	Coil—Field Coil—Magnet and Cone Support...
R-20	4413	Capacitor—360 mfd.	4472		Transformer—Output Transformer.
C-39	4415	Capacitor—0.1 mmfd.	4473		Board—Reproducer Terminal Board.
C-10	4417	Capacitor—0.05 mfd.	8935		Cone—Reproducer Cone.
C-5	4422	Clutch—Condenser Drive Clutch Assembly—	9527		Reproducer complete.
		Complete.	REPRODUCER (TABLE)		
S-6	4426	Switch—Tone Control Switch.	4447		Shield—Terminal Board Shield.
C-36	4427	Bracket—Volume Control Mounting Bracket.	4473		Board—Reproducer Terminal Board.
R-9	4428	Capacitor—8 mfd.	4505		Transformer—Output Transformer.
L-1	4429	Volume Control.	9492		Cone—Reproducer Cone.
L-2			9514		Reproducer complete.
L-3			9531		Coil—Field Coil and Cone Support.
L-4	4430	Coil—Antenna Coil.	MISCELLANEOUS PARTS		
L-5			4256		Lamp—Pilot Lamp.
L-6	4431	Transformer—First I. F. Transformer.	4363		Pointer—Station selector indicator pointer—
L-7			4445		Console.
L-8	4432	Coil—Oscillator Coil.	4449		Cable—3 Conductor reproducer cable.
C-11					Knob—Station Selector, volume control, tone
C-37	4433	Transformer—Second I. F. Transformer.			control or range switch knob—Package of 2.
	S-1438	Drive—Tuning Condenser Drive Assembly—	S-1436		Dial—Station Selector Dial—Console.
		Complete.	S-1437		Dial—Station Selector Dial—Table.
C-28	4435	Capacitor—0.02 mfd.	4475		Pointer—Station Selector Indicator Pointer—
R-12	4436	Resistor—5,000 ohms—Carbon type— $\frac{1}{4}$ watt.	4613		Table.
S-2			S-1442		Screw—8-32— $\frac{1}{2}$ " Headless Set Screw for Knob—
S-3	4437	Switch—Range Switch.			Package of 10.
S-4			S-1443		Bezel—Station Selector Dial Bezel—Table
S-5	4438	Shield—2nd Det. AVC Radiotron Tube Shield.	S-1444		Model.
C-14	4439	Capacitor—3,400 mmfd.	S-1443		Glass—Station Selector Dial Glass—(Table)
C-24	4441	Capacitor—1,600 mmfd.	S-1444		Escutcheon—Outer escutcheon for retaining
C-8	4442	Capacitor—50 mmfd.	S-1441		dial glass.
C-15	4443	Capacitor—0.01 mfd.	S-1439		Glass—Station Selector Dial Glass—(Console)
			S-1440		Escutcheon—Outer escutcheon for retaining
					dial glass.
					Bezel—Station Selector dial bezel—Console.