

# MODELS E-53 & E-56

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

### Electrical Specifications

FREQUENCY RANGES		ALIGNMENT FREQUENCIES	
"Standard broadcast" (A).....	540-1,820 kc.	"Standard broadcast" (A).....	600 kc. (osc.), 1,700 kc. (osc., ant.)
"Short wave" (B).....	1,820-6,600 kc.	"Short wave" (B).....	None required
Intermediate Frequency.....	460 kc.		
RADIOTRON COMPLEMENT		(3) Type-75....	Second Det., A-F Amp. and A.V.C.
(1) Type-6A7.....	First Det.—Oscillator	(4) Type-42.....	Audio Power Amplifier
(2) Type-6D6.....	Intermediate Amplifier	(5) Type-80.....	Full-Wave Rectifier
Pilot Lamps (3).....	Mazda No. 46, 6.3 volts, 0.25 amperes		
POWER SUPPLY RATINGS			
Rating A.....	105-125 volts, 50-60 cycles, 80 watts		
Rating B.....	105-125 volts, 25-60 cycles, 80 watts		
POWER OUTPUT RATING		LOUDSPEAKER	
Undistorted.....	2.0 watts	Type.....	Electrodynamic
Maximum.....	4.5 watts	Voice Coil Impedance.....	2.2 ohms at 400 cycles

### Mechanical Specifications

CABINET DIMENSIONS	MODEL E-53	MODEL E-56
Height.....	11 $\frac{5}{8}$ inches	39 inches
Width.....	20 $\frac{3}{4}$ inches	24 $\frac{3}{8}$ inches
Depth.....	8 $\frac{5}{8}$ inches	12 inches
Weight (Net).....	23 pounds	55 pounds
Weight (Shipping).....	27 pounds	67 pounds
Chassis Base Dimensions.....	12 inches x 7 inches x 2 $\frac{1}{2}$ inches	
Over-all Chassis Height.....	7 $\frac{1}{2}$ inches	
Operating Controls.....	(1) Power Switch—Tone, (2) Tuning, (3) Volume, (4) Range Selector	
Tuning Drive Ratio.....	10 to 1	

### General Features

These receivers employ the same chassis and have many distinctive features. Model E-53 employs an 8-inch dynamic loudspeaker and Model E-56 employs a 12-inch dynamic loudspeaker. The superheterodyne circuit is used with such features of design as: magnetite core adjusted i-f transformers, improved core adjusted antenna wave-trap, aural compensated volume control, continuously variable tone control with music-voice switch, automatic volume control, resistance coupled audio system, phonograph terminal board, band selective illumination of dial scales, and a dust-proof loudspeaker.

Tuning is continuous through the "Standard broadcast" and "Short wave" bands (including 49 meters). The "Short wave" position of this extensive range also includes channels assigned for police, amateur, and aviation communication. Trimming adjustments are located at accessible points. Their number is reduced to the least that is consistent with efficient operation. The tuning dial ratio of ten to one permits ease of tuning, especially in the "Short wave" band.

### Circuit Arrangement

The first detector and oscillator functions are accomplished in a single tube, an Type-6A7. The input of this tube is coupled to the antenna through a tuned transformer. A shunt (magnetite core adjusted) wave trap is connected across the primary of

this transformer to prevent signals of intermediate frequency (460 kc.) from being introduced into the first stage as interference. The two-section gang condenser, which tunes the antenna transformer secondary and the heterodyne oscillator coil, has adjustable

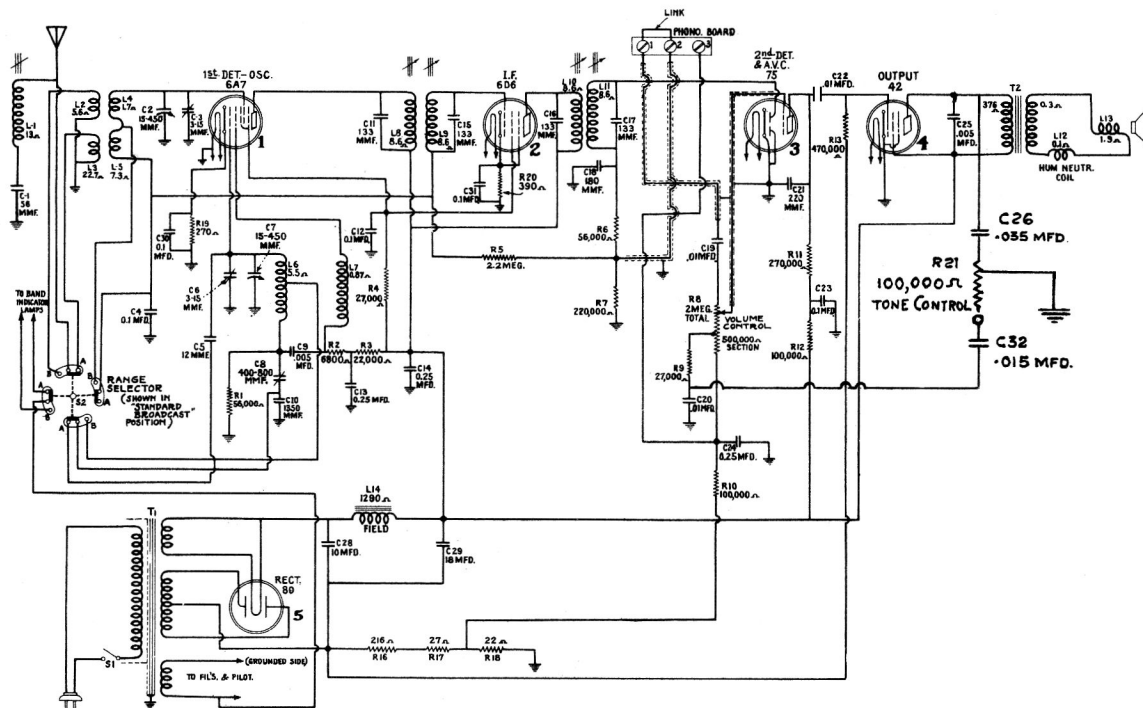


Figure 1—Schematic Circuit Diagram

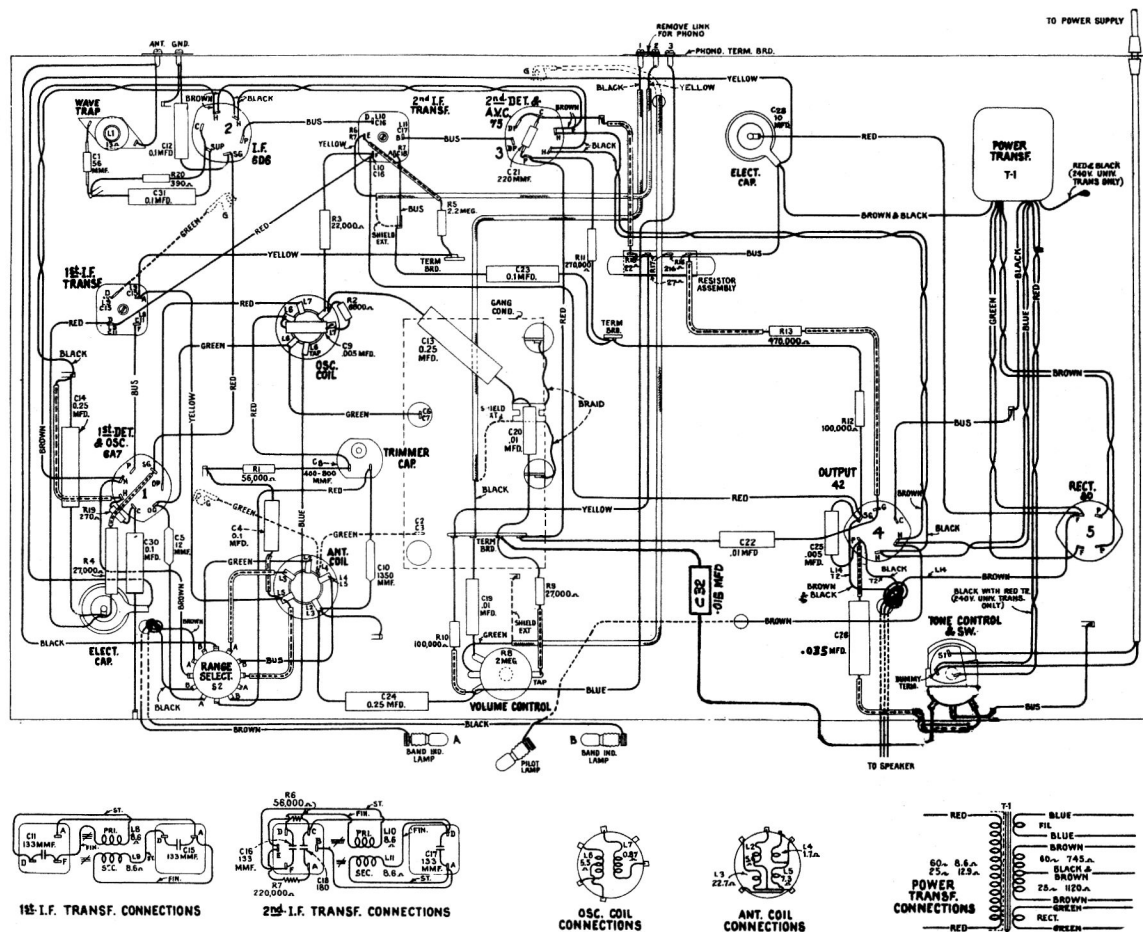


Figure 2—Chassis Wiring Diagram

trimmers for obtaining exact alignment. Each of these coils is tapped so that the range switch increases the range of tuning by decreasing the amount of inductance.

The intermediate frequency stage is coupled to the Type-6A7 and to the Type-75 by means of tuned transformers. These transformers resonate with fixed capacitors and are adjusted by molded magnetite cores to tune to 460 kc.

The modulated signal as obtained from the output of the i-f system is detected by one of the diodes of the Type-75 tube. Audio frequency secured by this process is passed on to the control grid of this same tube for amplification before final reproduction. The d-c voltage, which results from detection of the signal, is used for automatic volume control. This voltage, which develops across resistor R7, is applied as automatic control grid bias to the first detector and i-f tubes through a suitable resistance filter. Minimum operating bias for the Type-6A7 and Type-6D6 tubes is developed across resistors R19 and R20 respectively.

## SERVICE DATA

The various diagrams of this booklet contain such information as will be needed to isolate causes for defective operation if such develops. The ratings

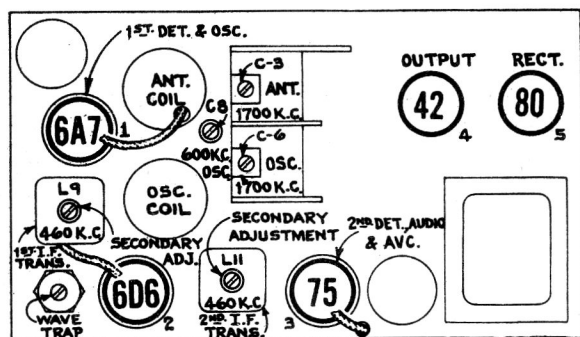


Figure 3—Radiotron, Coil, and Trimmer Locations

of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as R3, L2, C1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only. Ratings of less than one ohm are generally omitted.

## Alignment Procedure

There are three alignment trimmers provided in the antenna transformer and oscillator coil tuned circuits. The i-f transformer adjustments are made by means of screws attached to molded magnetite cores. All of these circuits have been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions or altered during servicing. Loss of sensitivity, improper

Manual volume control is effected by means of an acoustically tapered potentiometer connected as a variable coupling element between the output of the second detector and the first audio control grid. After amplification by the Type 75, the audio signal is transmitted by resistance-capacitance coupling to the input of the Type-42 power output stage, which, in turn, is transformer-coupled to the dynamic speaker.

Continuously variable tone control is effected by means of capacitor C26 and variable resistor R21 shunting the plate circuit of the output tube. Extreme clockwise rotation of this tone control disconnects the resistor R21 from the circuit and places an additional capacitor C32 in shunt with capacitor C20, thereby reducing the low-frequency response of the amplifier. This point is known as the "Speech" position and provides optimum intelligibility of speech.

The power supply system consists of an Type-80 rectifier tube which is supplied from an efficiently designed power transformer and which works into a suitable filter.

tone quality, and poor selectivity are the usual indications of improper alignment.

The correct performance of this receiver can only be obtained when the aligning has been done with adequate and reliable apparatus. The manufacturer of this receiver has available, for sale through its distributors and dealers, a complete assortment of such service equipment as may be needed for the alignment operation.

A test oscillator, such as the G.E. Stock No. 9595, is required as a source of the specified alignment frequencies. Visual indication of receiver output during the adjustment is necessary and should be accomplished by the use of an indicator such as the G.E. Stock No. 4317 Neon Output Indicator.

The procedure outlined below should be followed in adjusting the various trimmer capacitors and molded cores:

### I-F Core Adjustments

The four adjustment screws (attached to molded magnetite cores) of the two i-f transformers (one on top and one on bottom of each i-f transformer) are located as shown by figures 3 and 7. Each circuit must be aligned to a basic frequency of 460 kc. To do this, attach the output indicator across the loud-speaker voice coil or across the output transformer primary.

Connect the output of the test oscillator to the control grid of the Type-6A7 through a .05 mfd. capacitor. Connect the test oscillator ground terminal to the ground terminal of the receiver chassis. Range selector should be in "Short wave" position. Tune the oscillator to 460 kc. Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point, within its range, where no interference is encountered either from local broadcast stations or from the heterodyne oscillator. Increase the output of the test oscillator until a slight indication is present on the output indicator. Adjust

the two magnetite core screws of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two magnetite core screws of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. During these adjustments, regulate the test oscillator output so that the indication is always as low as possible. By doing so, broadness of tuning due to a.v.c. action will be avoided. It is advisable to repeat the adjustment of all i-f magnetite core screws to assure that the interaction between them has not disturbed the original adjustment.

### Wave-Trap Adjustment

Attach the output of the test oscillator to the receiver "Antenna" terminal through a 200 mmfd. (important) capacitor. The ground connections remain connected together. Leave the test oscillator adjusted to 460 kc. and range selector in "Short wave" position as before. Then adjust the wave-trap screw to the point which causes maximum suppression of the 460 kc. signal.

### R-F Trimmer Adjustments

Calibrate the tuning dial by setting the pointer to a horizontal position (53 on "Standard broadcast"

scale) with the two-gang tuning condenser in full mesh. The output indicator should be left connected to the system. Connections for the test oscillator remain the same as for "Wave-trap adjustment." Adjust the test oscillator to 1,700 kc. and set the receiver tuning control to a dial reading of 1,700 kc. Leave the volume control of the receiver at its maximum position. Make sure that the range selector is at its broadcast position. Regulate the output of the test oscillator until a slight indication is perceptible at the receiver output. Then adjust the two trimmers, C6 and C3, of the oscillator and antenna transformer coils (mounted on the variable condenser) so that each produces maximum (peak) receiver output. After this maximum has been accurately obtained, shift the test oscillator to 600 kc. Tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then, adjust the receiver oscillator series trimmer, C8, simultaneously rocking the tuning control backward and forward through the signal until maximum receiver output results from these combined operations. The adjustment at 1,700 kc. should then be repeated to correct for any change which may have been caused by the oscillator series trimmer adjustment.

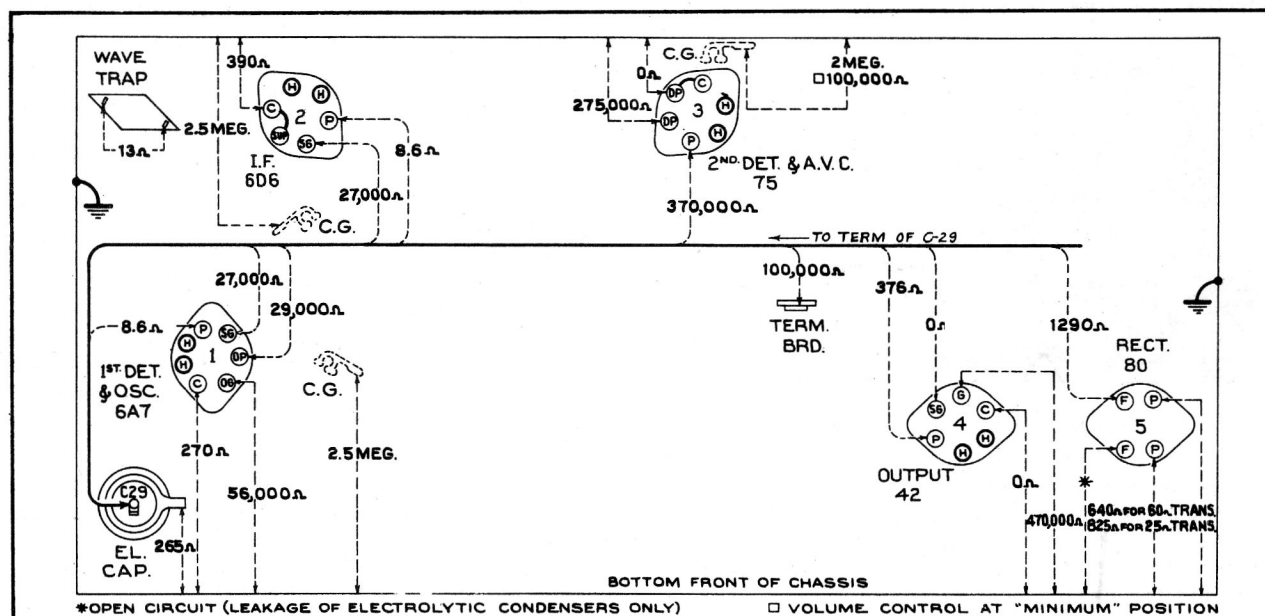


Figure 4—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full mesh—  
Volume control maximum

## Resistance Measurement

The resistance values shown between Radiotron socket contacts, grid caps, resistors, terminals, and receiver chassis ground, on figure 4, have been carefully selected so as to facilitate a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Chassis Wiring Diagram, figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within  $\pm 20\%$ . Variations in excess of this limit will usually be indicative of trouble in cir-

cuit under test. Resistance values were measured with the Radiotrons in sockets; tuning condenser in full mesh, and volume control set at maximum except where otherwise noted. In all cases of measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

## Phonograph Attachment

A terminal board is provided for connecting a phonograph into the audio amplifying circuit. Typical

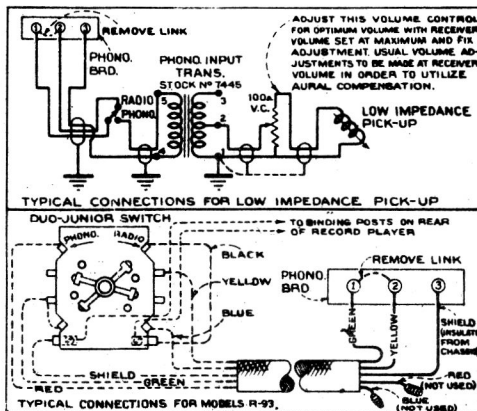


Figure 5—Pick-up Wiring

methods of connecting a low-impedance pick-up, or the Models R-93 and R-93X phonographs are shown on the schematic diagram (figure 5).

## Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers

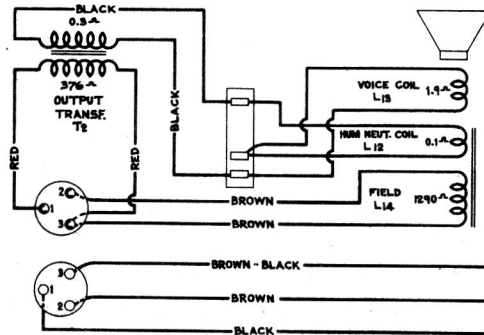
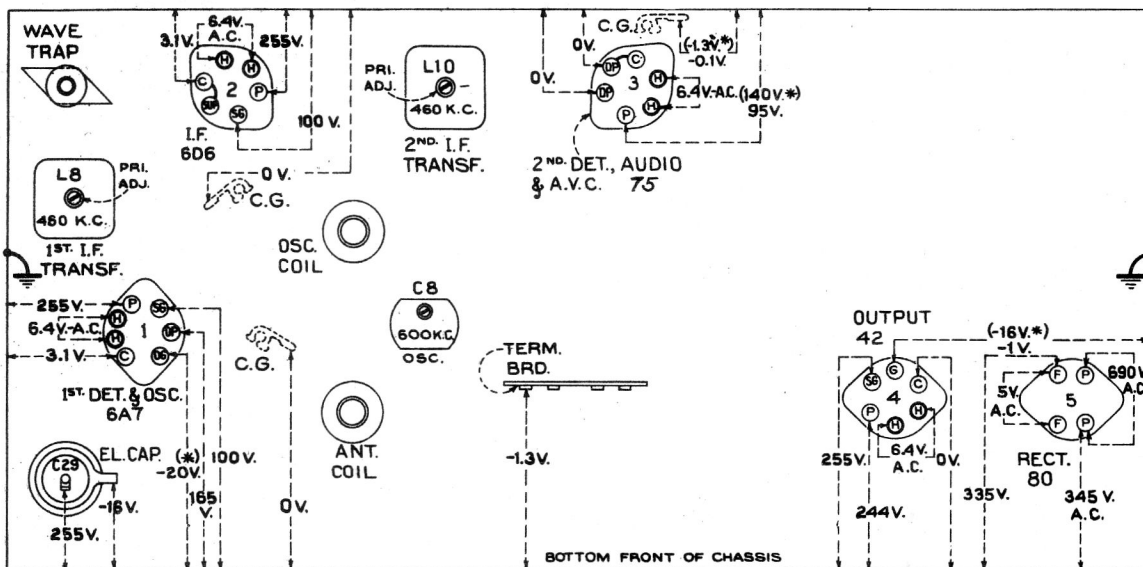


Figure 6—Loudspeaker Wiring

after first removing the front paper dust cover. This may be removed either permanently by cutting it away with a sharp knife, or by softening its cement with a very light application of acetone using care not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.





# REPLACEMENT PARTS—E-53 & E-56

STOCK No.	DESCRIPTION	STOCK No.	DESCRIPTION
<b>RECEIVER ASSEMBLIES</b>			
5237	Bushing-Variable condenser mounting bushing assembly-Package of 3.....	12650	Shield - Antenna coil shield.....
11591	Button-Chassis plug button.....	12735	Shield - Dial lamp shield - Package of 5.....
12118	Cap-Grid contact cap-Package of 5...	12607	Shield - First I.F. transformer shield top.....
11465	Capacitor-Adjustable capacitor (C8).	12008	Shield - First or second I.F. transformer shield.....
12659	Capacitor-12 Mmfd. (C5).....	12651	Shield - Oscillator coil shield.....
12661	Capacitor-56 Mmfd. (C1).....	12581	Shield - Second I.F. transformer shield top.....
12946	Capacitor-133 Mmfd. (C11,C15,C16, C17).....	51415	Shield - 6D6 Radiotron shield.....
12406	Capacitor-180 Mmfd. (C18).....	3682	Shield - 6A7 or 75 Radiotron shield..
12662	Capacitor-220 Mmfd. (C21).....	4794	Socket - 4-contact rectifier Radiotron socket.....
12660	Capacitor-1,350 Mmfd. (C10).....	4785	Socket - 6-contact 42, 75 and 6D6 Radiotron socket.....
4793	Capacitor-.005 Mfd. (C9,C25).....	4787	Socket - 7-contact 6A7 Radiotron Socket.....
4858	Capacitor-.01 Mfd. (C19,C20,C22)....	11199	Socket - Dial lamp socket.....
4792	Capacitor-.015 Mfd. (C32).....	12007	Spring - Retaining spring for core, Stock Nos. 12006 and 12664 - Package of 10.....
4791	Capacitor-.1 Mfd. (C4,C12,C23,C30, C31).....	12668	Tone Control and Switch (S1).....
51592	Capacitor-.25 Mfd. (C13,C24).....	13106	Transformer - First I.F. transformer, Complete (L8, L9, C11, C15).....
5170	Capacitor-.25 Mfd. (C14).....	12644	Transformer - Power transformer, 115 volt, 60-cycle (T1).....
12670	Capacitor-.035 Mfd. (C26).....	12645	Transformer - Power transformer, 115 volt, 25-cycle (T1).....
11240	Capacitor- 10 Mfd. (C28).....	13107	Transformer - Second I.F. transformer, complete (L10, L11, C16, C17, C18, R6, R7).....
5212	Capacitor- 18 Mfd. (C29).....	12654	Trap-Wave trap (L1).....
12648	Coil-Antenna coil-less shield (L2, L3,L4,L5).....	11237	Volume Control (R8).....
12649	Coil-Oscillator coil-less shield (L6,L7).....	<b>REPRODUCER ASSEMBLIES</b>	
12643	Condenser-2-gang variable tuning condenser (C2, C3, C6, C7).....	12641	Board - 3-contact reproducer terminal board.....
5119	Connector-3-contact female speaker cable connector.....	12640	Bracket - Output transformer mounting bracket.....
12006	Core-Adjustable core and stud assembly for I.F. transformer, Stock Nos. 12652 and 12653.....	12012	Coil - Field coil (L14).....
12664	Core-Adjustable core and stud assembly for wave trap, Stock No. 12654.	11469	Coil - Neutralizing coil (L12).....
12658	Dial-Station selector dial.....	12642	Cone - Reproducer cone and dust cap (L13), (Table Model).....
12656	Drive-Variable condenser drive shaft and pinion.....	12667	Cone-Reproducer cone and dust cap (L13), (Console Model).....
12657	Indicator-Station selector indicator	5118	Connector - 3-contact male speaker cable connector.....
5226	Lamp-Dial lamp-Package of 2.....	9699	Reproducer, complete (Table Model)...
12663	Mask-Dial light diffuser, complete with red and green colored screen..	9696	Reproducer, complete (Console Model).
12647	Range Switch (S2).....	11253	Transformer-Output transformer (T2)..
12206	Resistor-270 ohm, carbon type, 1/4 watt - (R19).....	11886	Washer-Spring washer to hold field coil securely-Package of 5.....
12261	Resistor - 390 ohm, insulated, 1/4 watt - (R20).....	<b>MISCELLANEOUS ASSEMBLIES</b>	
8070	Resistor - 22,000 ohm, carbon type, 1/2 watt - (R3).....	12639	Escutcheon - Station selector escutcheon and crystal assembly.....
11400	Resistor - 27,000 ohm, carbon type, 1/4 watt - (R9).....	12638	Knob - Station selector knob - Package of 2.....
12011	Resistor - 27,000 ohm, carbon type, 1 watt - (R4).....	11347	Knob - Tone control, volume control or range switch knob.....
11282	Resistor - 56,000 ohm, carbon type, 1/10 watt - (R6).....	11586	Screw - Chassis mounting screw No. 14x1 inc., Package of 10.....
5029	Resistor - 56,000 ohm, carbon type, 1/4 watt - (R1).....	11349	Spring - Retaining spring for knob, Stock Nos. 11347 and 12638 - Package of 5.....
11454	Resistor - 6,800 ohm, carbon type, 1/4 watt - (R2).....		
5145	Resistor - 100,000 ohm, carbon type, 1/4 watt - (R10,R12).....		
11398	Resistor - 220,000 ohm, carbon type, 1/10 watt - (R7).....		
11323	Resistor - 270,000 ohm, carbon type, 1/4 watt - (R11).....		
11172	Resistor - 470,000 ohm, carbon type, 1/4 watt - (R13).....		
11626	Resistor - 2.2 megohm, carbon type, 1/4 watt - (R5).....		
12004	Resistor - Voltage divider resistor-Comprising one 216 ohm, one 27 ohm and one 22 ohm sections (R16, R17, R18).....		