

MODELS E-53X & E-56X

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

Electrical Specifications

FREQUENCY RANGES

"Standard broadcast" (A) 530-1,900 kc
 "Short wave" (C) 5,800-21,600 kc

ALIGNMENT FREQUENCIES

"Standard broadcast" (A)
 600 kc (osc.), 1,700 kc (osc., ant.)
 "Short wave" (C) 20,000 kc

Intermediate Frequency 460 kc

RADIOTRON COMPLEMENT

(1) Type-6A7 First Det.—Oscillator
 (2) Type-6D6 Intermediate Amplifier

(3) Type-75 .. Second Det., A-F Amp. and A.V.C.
 (4) Type-42 Audio Power Amplifier
 (5) Type-80 Full-Wave Rectifier

Pilot Lamp (1) Mazda No. 46, 6.3 volts, 0.25 ampere

POWER SUPPLY RATINGS

Rating A 105-125 volts, 50-60 cycles, 75 watts
 Rating B 105-125 volts, 25-60 cycles, 75 watts

POWER OUTPUT RATING

Undistorted 2.0 watts
 Maximum 4.5 watts

LOUDSPEAKER

Type Electrodynamic
 Voice Coil Impedance 2.2 ohms at 400 cycles

Mechanical Specifications

Cabinet Dimensions

	MODEL E-53X	MODEL E-56X
Height	10 $\frac{1}{4}$ "	38 $\frac{1}{4}$ "
Width	21 $\frac{3}{4}$ "	23 $\frac{3}{8}$ "
Depth	8 $\frac{1}{2}$ "	11 $\frac{3}{8}$ "
Weight (Net)	23 lbs.	55 lbs.
Weight (Shipping)	27 lbs.	67 lbs.
Chassis Base Dimensions	12 inches x 7 inches x 3 inches	
Over-all Chassis Height	7 $\frac{3}{4}$ inches	
Operating Controls	(1) Volume, (2) Tuning, (3) Range Selector, (4) Power Switch—Tone	
Tuning Drive Ratio	10 to 1 and 50 to 1	

General Features

These receivers employ the same chassis and have many distinctive features. Model E-53X employs an 8-inch dynamic loudspeaker and Model 56X 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 range includes the "Standard broadcast" (A) and "Short wave" (C) bands. The "Short wave" (C) position of this extensive range includes channels assigned for amateur, and international short-wave broadcast on 49, 31, 25, 19, 16 and 13 meters. 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 10 to 1, with a 50 to 1 vernier, 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. A two-section gang condenser tunes the antenna transformer secondary and the heterodyne oscillator coils. These coils are

shunted by improved plunger-type, air-dielectric, adjustable trimming capacitors, for obtaining exact alignment.

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 R6, is applied as automatic control grid bias to the first-detector and i-f tubes through a suitable resistance filter.

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 C22 and variable resistor R18 shunting the plate circuit of the output tube. Extreme clockwise rotation of this tone control disconnects the resistor R18 from the circuit and places an additional capacitor C36 in shunt with capacitor C16, thereby reducing the low-frequency response of the amplifier. This point is known as the "Speech" position and provides optimum intelligibility of speech.

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 of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as L1, C2, R1,

tributors and dealers, a complete assortment of such service equipment as may be needed for the alignment operation.

A test oscillator, such as the **GE 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 **GE Stock No. 4317 Neon Output Indicator**.

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

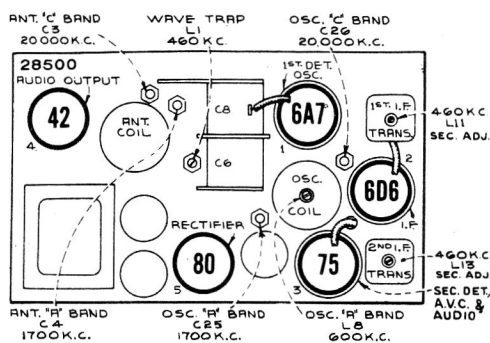


Figure 3—Radiotron, Coil, and Trimmer Locations

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 five alignment trimmers provided in the antenna transformer and oscillator coil tuned circuits. The i-f transformer and wave-trap 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 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 dis-

I-F 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 6. 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.

Connect the output of the test oscillator to the control grid of the Type-6A7 through a .001 mfd. capacitor. Connect the test oscillator "Gnd" terminal to the ground terminal of the receiver chassis. 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 from local broadcast stations or from the local (heterodyne) oscillator. To eliminate signals from the local oscillator short stator of C6 to chassis-ground. 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 L13 and L12 to produce maximum (peak) indicated receiver output. Then adjust the two magnetite core screws L11 and L10 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.

R-F Adjustments

Calibrate the tuning dial by adjusting the scale pointer to the extreme end calibration mark (beyond 55 on dial) while the two-gang tuning condenser plates are in full mesh.

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 tuned to 460 kc. Adjust range selector to "Short wave" (C) position. Then adjust the wave-trap screw to the point which causes maximum suppression (minimum received) of the 460 kc signal.

"Standard Broadcast" Band

(a) Adjust range selector to "Standard broadcast" (A) position. Reduce output of test oscillator to a minimum. Tune the test oscillator to 600 kc and set receiver dial pointer to 600 kc. Adjust output of test oscillator until a slight indication of output is visible

- (b) Adjust the oscillator magnetite core screw L8 (top of oscillator coil) so that maximum (peak) indicated output results.
- (c) Set receiver dial pointer to 1,700 kc. Tune the test oscillator to 1,700 kc. Carefully adjust the oscillator and antenna trimmers C25 and C4 respectively so that each brings about maximum (peak) indicated output.
- (d) Tune the test oscillator to 600 kc. Adjust the receiver to pick up this signal disregarding the dial reading at which it is best received. Adjust oscillator magnetite core screw L8 (top of oscillator coil) for maximum (peak) output while rocking gang tuning condenser. After completing this adjustment, the trimmers C25 and C4 should be re-adjusted as in (c) to correct for any change in the oscillator high-frequency tuning which has been caused by the preceding adjustment.

"Short-Wave" Band

- (e) Connect the "Ant." output of the test oscillator to the "Antenna" terminal through a 300-ohm resistor, leaving the "Gnd." of the oscillator connected to the receiver chassis.
- (f) Adjust range selector to its "Short wave" (C) position. Set receiver dial pointer to 20,000 kc.

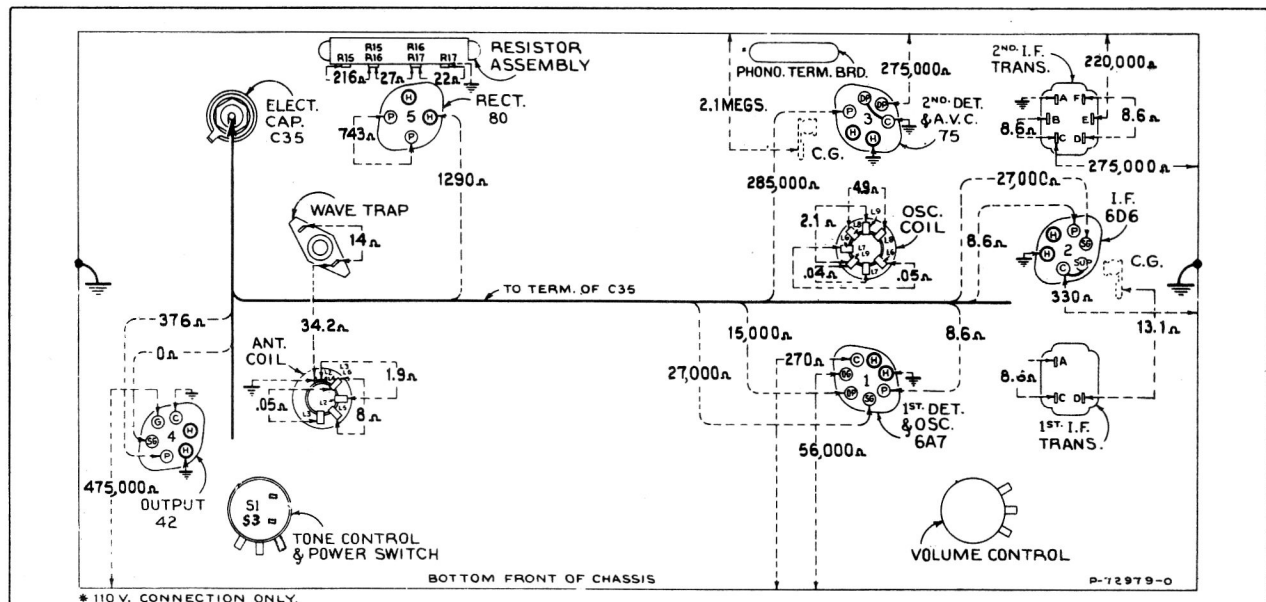


Figure 4—Resistance Diagram

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

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis-ground or other pertinent point on figure 4, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and 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

± 20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. When 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.

Radiotron Plate Current Readings

Measured with Milliammeter Connected at Tube
Socket Plate Terminals Under Conditions Similar
to Those of Voltage Measurements

- | | | |
|--|------|-----|
| (1) Type-6A7—1st Det.—Osc. | 11.0 | ma. |
| (2) Type-6D6—I. F. Amp. | 10.0 | ma. |
| (3) Type-75—2nd Det., A.V.C. and A. F. . . | 0.22 | ma. |
| (4) Type-42—Power Amp. | 42.0 | ma. |
| (5) Type-80—Rectifier | — | |

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed by softening its cement with a very

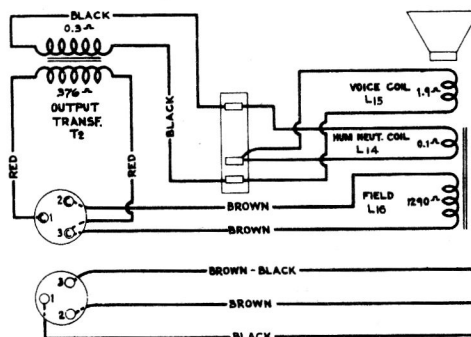


Figure 5—Loudspeaker Wiring

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.

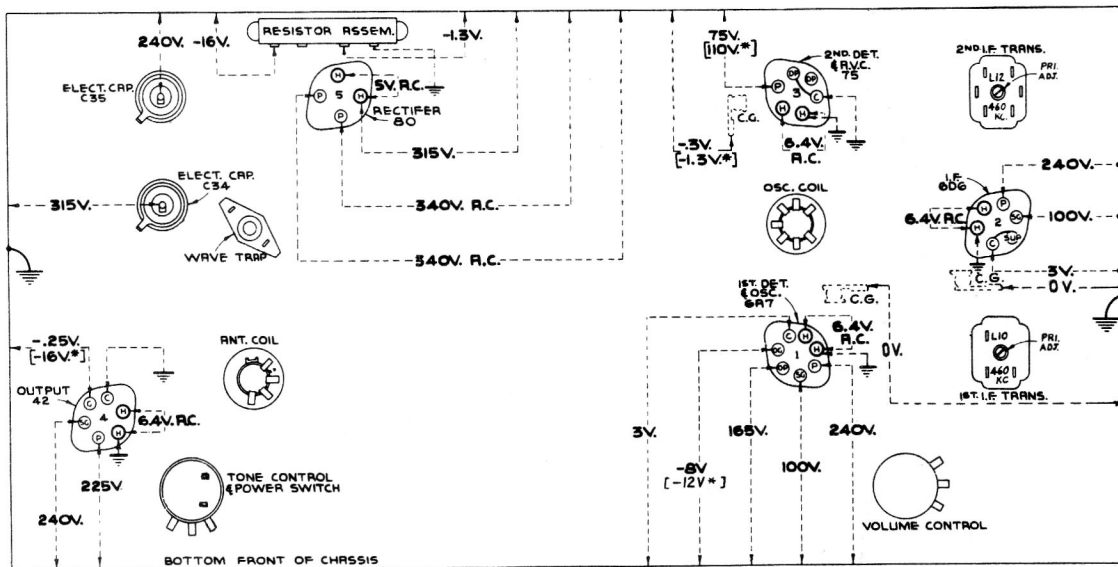


Figure 6—Radiotron Socket Voltages, Coil and Trimmer Locations.

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc ("Standard broadcast")—
No signal being received—Volume control minimum

Radiotron Socket Voltages

Note: Two voltage values are shown for some readings. The value shown in parentheses with asterisk () indicates operating conditions without voltmeter loading. The other value (generally lower) is the actual measured voltage and differs from the value shown in parentheses because of the additional loading of the voltmeter through the high series circuit resistance.*

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 6 will assist in

locating cause of faulty operation. Each value as specified should hold within $\pm 20\%$ when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, and 500 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.

REPLACEMENT PARTS—E-53X & E-56X

STOCK No.	DESCRIPTION	STOCK No.	DESCRIPTION
RECEIVER ASSEMBLIES			
13216	Board-Antenna and ground terminal board.....	12651	Shield-Antenna coil shield.....
12717	Board-Phonograph terminal board....	13311	Shield-Chassis end shield and rubbing mounting foot assembly-package of 2
5237	Bushing-Variable condenser mounting bushing assembly-Package of 3....	12607	Shield-First I.F. transformer shield top.....
12118	Cap-Grid contact cap-Package of 5..	12008	Shield-I.F. transformer shield.....
12714	Capacitor-Adjustable trimmer (C3, C4,C25).....	12799	Shield-Oscillator coil shield.....
12807	Capacitor-Adjustable trimmer (C26)..	12581	Shield-Second I.F. transformer shield top.....
12973	Capacitor-5.6 Mmfd. (C24).....	3682	Shield-6A7 or 75 Radiotron shield...
12723	Capacitor-56 Mmfd. (C2).....	3950	Shield-6D6 Radiotron shield.....
12629	Capacitor-56 Mmfd. (C11).....	4794	Socket-4-contact 80 Radiotron socket
13394	Capacitor-82 Mmfd. (C7).....	4786	Socket-6-contact 6D6, 42 or 75 Radiotron socket.....
12724	Capacitor-120 Mmfd. (C19).....	4787	Socket-7 contact 6A7 Radiotron socket
12404	Capacitor-120 Mmfd. (C10,C13,C14)..	11199	Socket-Dial lamp socket.....
12406	Capacitor-180 Mmfd. (C15).....	12007	Spring-Retaining spring for Stock Nos. 12006 and 12664-Package of 10
12812	Capacitor-450 Mmfd. (C28).....	12796	Switch-Range switch (S2).....
12811	Capacitor-3,600 Mmfd. (C27,C29)....	12668	Switch-Tone control and power switch (S1,S3).....
4868	Capacitor-.005 Mfd. (C23).....	12801	Transformer-First I.F. transformer complete, (L10,L11,C10,C11).....
5148	Capacitor-.007 Mfd. (C16).....	12653	Transformer-Second I.F. transformer complete, (L12,L13,C13,C14,C15, R5,R6).....
4792	Capacitor-.015 Mfd. (C36).....	13392	Transformer-Power transformer, 105-125 volts, 50-60 cycles (T1)...
4883	Capacitor-.01 Mfd. (C17,C20,C30)...	13566	Transformer-Power Transformer, 105-125 volts, 25-60 cycles (T1)...
4840	Capacitor-0.25 Mfd. (C18).....	12654	Trap-Wave-trap complete (L1).....
5170	Capacitor-0.25 Mfd. (C32).....	13144	Volume Control (R8).....
12670	Capacitor-0.035 Mfd. (C22).....	REPRODUCER ASSEMBLIES	
4791	Capacitor-0.1 Mfd. (C5,C9,C12,C21, C33).....	12641	Board-3-contact reproducer terminal board.....
11240	Capacitor-10 Mfd. (C34).....	12640	Bracket-Output transformer mounting bracket.....
5212	Capacitor-18 Mfd. (C31,C35).....	12012	Coil-Field coil (L16).....
12797	Coil-Antenna coil and shield (L2, L3,L4,L5).....	11469	Coil-Neutralizing coil (L14).....
12798	Coil-Oscillator coil and shield (L6,L7,L8,L9).....	12642	Cone-Reproducer cone and dust cap (L15),(Table Model).....
S-1663	Condenser-2-gang variable tuning condenser, (C6,C8).....	12667	Cone-Reproducer cone and dust cap (L15),(Console Model).....
5119	Connector-3-contact female connector for speaker cable.....	5118	Connector-3-contact male speaker cable connector.....
12006	Core-Adjustable core and stud for Stock Nos.12653 and 12801.....	9699	Reproducer-complete (Table Model)...
12664	Core-Adjustable core and stud for Stock No. 12654.....	9696	Reproducer-complete (Console Model).
13313	Dial-Station selector dial.....	11253	Transformer-Output transformer (T2).
12702	Drive-Vernier drive for variable condenser.....	11886	Washer-Spring washer to hold field coil securely - Package of 5.....
13314	Indicator-Station selector indicator pointer.....	MISCELLANEOUS ASSEMBLIES	
5226	Lamp-Dial lamp, 6.3 volts-Package of 2.....	12785	Crystal - Station selector escutcheon and crystal.....
13310	Resistor-Voltage divider comprising one 216-ohm, one 27-ohm and one 22-ohm sections (R15,R16,R17)....	12699	Knob - Large station selector knob.....
6135	Resistor-270 ohms, carbon type, 1/4 watt (R2).....	12700	Knob-Small (vernier) station selector knob.....
11296	Resistor-330 ohms, carbon type, 1/4 watt (R4).....	11347	Knob-Volume control, tone control or range switch knob-Package of 2....
12759	Resistor-15,000 ohms, carbon type, 1/2 watt, (R13).....	11377	Screw-Chassis mounting screw and washer assembly-Package of 4.....
12011	Resistor-27,000 ohms, carbon type, 1 watt (R14).....	4982	Spring-Retaining spring for knob, Stock No. 12699-Package of 10.....
11364	Resistor-33,000 ohms, carbon type, 1/4 watt (R7).....	11349	Spring-Retaining spring for knob, Stock Nos. 11347 and 12700-Package of 5.....
5029	Resistor-56,000 ohms, carbon type, 1/4 watt (R1).....		
11282	Resistor-56,000 ohms, carbon type, 1/10 watt, (R5).....		
11365	Resistor-82,000 ohms, carbon type, 1/4 watt (R12).....		
5145	Resistor-100,000 ohms, carbon type, 1/4 watt (R9).....		
11398	Resistor-220,000 ohms, carbon type, 1/10 watt (R6).....		
11323	Resistor-270,000 ohms, carbon type, 1/4 watt (R10).....		
11847	Resistor-390,000 ohms, carbon type, 1/4 watt (R11).....		
11626	Resistor-2.2 meg., carbon type, 1/e watt (R3).....		