

MODEL E-157

Fifteen-Tube, Five-Band, A-C Superheterodyne Receiver

Electrical Specifications

FREQUENCY RANGES

"Long Wave" (X)	150-410 kc
"Standard Broadcast" (A)	530-1,800 kc
"Medium Wave" (B)	1,800-6,400 kc
"Short Wave" (C)	6,400-23,000 kc
"Ultra Short Wave" (D)	23,000-60,000 kc
Intermediate Frequency	460 kc

ALIGNMENT FREQUENCIES

"Long Wave" (X)	175 kc (osc.), 350 kc (osc., det., ant.)
"Standard Broadcast" (A)	600 kc (osc.), 1,500 kc (osc., det., ant.)
"Medium Wave" (B) ...	6,000 kc (osc., det., ant.)
"Short Wave" (C)	20,000 kc (osc., det., ant.)
"Ultra Short Wave" (D)	57,000 kc (osc., det., ant.)

RADIOTRON COMPLEMENT

(1) Type -6K7	R-F Amplifier	(9) Type -6C5	Audio Voltage Amplifier
(2) Type -6L7	First Detector	(10) Type -6C5	Audio Driver Amplifier
(3) Type -6J7	Oscillator	(11) Type -6L6	Power Output
(4) Type -6K7	First I-F Amplifier	(12) Type -6L6	Power Output
(5) Type -6K7	Second I-F Amplifier	(13) Type -5Z4	Rectifier
(6) Type -6H6	Second Detector and A.V.C.	(14) Type -5Z4	Rectifier
(7) Type -6K7	Tuning Tube I-F Amplifier	(15) Type -6E5	Tuning Tube
(8) Type -6H6	Tuning Tube Rectifier		
Pilot Lamps (4)			Mazda No. 46, 6.3 volts, 0.25 ampere

POWER SUPPLY RATINGS

Rating A	105-125 volts, 50-60 cycles, 165 watts
Rating B	105-125 volts, 25-60 cycles, 165 watts

POWER OUTPUT

Undistorted	20 watts
Maximum	30 watts

LOUDSPEAKER

Type	Electrodynamic
Impedance (v.c.)	11 $\frac{1}{4}$ ohms at 400 cycles

Mechanical Specifications

CABINET DIMENSIONS

Height	41 $\frac{1}{2}$ inches
Width	28 $\frac{1}{8}$ inches
Depth	16 $\frac{3}{8}$ inches

WEIGHTS

Net	115 pounds
Shipping	161 pounds
Chassis Base Dimensions	20 $\frac{3}{4}$ inches x 10 $\frac{1}{2}$ inches x 3 inches
Over-all Height of Chassis	9 $\frac{1}{4}$ inches
Operating Controls: (1) Music-speech—Power Switch, (2) Volume, (3) Tuning, (4) Range Selector, (5) Fidelity	
Tuning Drive Ratios	20 to 1 and 100 to 1

General Description

This receiver represents the result of thorough development, design, and substantial manufacture. Noteworthy technical improvements have been applied in achieving marked advantages of operation, and efficiency of performance.

Model E-157 is a fifteen-tube, console-type, "Sentry Box" superheterodyne receiver with a

twelve-inch electro-dynamic loudspeaker, and the newly developed "Tone Equalizer." Design features incorporated in this receiver include built-in doublet antenna coupler; "Sentry Box"; improved plunger-type air-dielectric adjustable trimming capacitors in the antenna, detector, and oscillator coil circuits; tuned r-f amplifier; high-efficiency first detector (converter) with

separate oscillator; two-stage i-f amplifier; selective "Cathode Ray Tuner"; push-pull beam-type power amplifier; magnetite core adjusted i-f transformers, low-frequency oscillator tracking, and wave-trap; range-selector sensitivity control; fidelity control; "Tone Equalizer"; three-point aural compensated volume control; music-speech switch; automatic volume control; phonograph terminal board; new selector dial; and a dust-proof aluminum voice-coil, electrodynamic loud-speaker.

Circuit Arrangement

The conventional type of superheterodyne circuit is used. It consists of an r-f amplifier stage, first detector (converter) stage, separate oscillator stage, two signal i-f amplifier stages, a tuning tube i-f amplifier and rectifier stages, a diode-detector—automatic-volume-control stage, an audio-voltage amplifier stage, an audio driver-amplifier stage, a push-pull beam-type power-amplifier stage, a tuning indicator "Cathode Ray Tuner", and a full-wave rectifier.

"Sentry Box"

The new "Sentry Box" is constructed as a separate, self-contained, completely shielded, five-band, oscillator-detector-antenna-tuning unit which plugs into the main chassis.

A single-wire antenna, or a doublet antenna, when connected to the proper input terminals of the receiver, is coupled to the control grid of the Type-6K7

Service convenience has been a controlling factor in the layout of the chassis parts and wiring. The assembly of these various elements is such that the number of conductors is minimized, with all important connections being readily accessible. Trimming adjustments are located at accessible points. A double tuning-knob arrangement permits the choice of either twenty-to-one or a hundred-to-one dial drive ratio. The latter permits ease of tuning, especially in the "Medium wave", "Short wave", and "Ultra short wave" bands.

L4 is provided to prevent interaction with L3 and L2 when operating receiver in "Short wave" band. In the "Ultra short wave" (D) band, L6, L5, L4, and L3 are shorted out and grounded, and secondary L14 is placed in shunt with L2. The latter connection prevents undesirable interaction of L2 with L14. This method of switching reduces the total number of coils and leads, and results in having a low-loss primary and secondary winding for each band with high efficiency of operation.

The band switching of the detector circuits is similar to that of the antenna circuits. Coils L15, L21, and L20 are always connected in series with the plate circuit of the Type-6K7 r-f amplifier tube. In the "Long wave" (X) band, L19, L18, L17, and L16 are connected in series as the secondary circuit. The ground of the coil system is at the low end of L19. L20 acts as the primary which transfers energy to the secondary L19. Capacitor C33 resonates primary L20 at the proper frequency. In the "Standard broadcast" (A) band, L18, L17, and L16 are connected in series as the secondary circuit. The ground of the coil system is now between L18 and L19. L19 is used as the primary and is resonated at the proper frequency by capacitors C34 and C35 which are in shunt with this coil. Capacitor C33 is connected to transfer energy to the primary coil L19. In the "Medium wave" (B) band, L17 and L16 are connected in series as the secondary. The ground of the coil system is now between L17 and L18. L18 is used as the primary and is resonated at the proper frequency by capacitor C34 which is in shunt with this coil. L19 is shorted by the range selector. Capacitor C33 transfers the r-f energy from the plate circuit to the primary L18. In the "Short wave" (C) band, L16 is the secondary. The ground of the coil system is now between L16 and L17. L17 is used as the primary and is resonated to the proper frequency by capacitor C34. In addition, L15 acts as a high-frequency primary which resonates above 20 mc and improves the gain at the high-frequency end of the "Short wave" band. Coils L19 and L18 are shorted by the range selector. L21 is effectively r-f bypassed in this position by capacitor C32. In the "Ultra short wave" (D) band, L22 is the secondary, or grid coil, and consists of approximately a single turn of silver plated strap around a 7/8-inch coil form. The primary coils, L21 and L15 are in series on this band, with L21 acting as a low-frequency primary and L15 as a high-frequency primary. L16 is shunted by L22 instead of being shorted di-

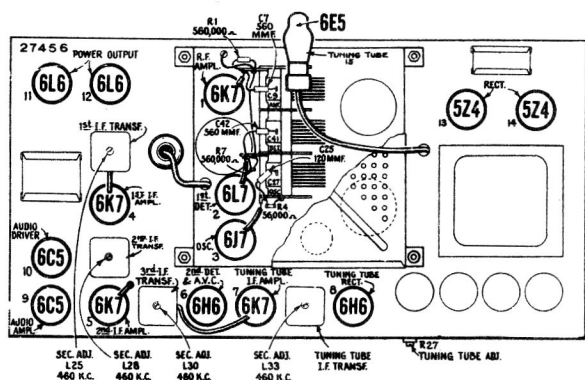


Figure 1—Radiotron and I-F Trimmer Locations

r-f amplifier tube through the tuned r-f transformer consisting of L6, L5, L4, L3, and L2 (except when range selector is in "Ultra short wave" position). The primary coil L13 of the "Ultra short wave" (D) band tuned r-f transformer remains in the antenna circuit at all times. A unique method of switching is used. In the "Long wave" (X) band, L6 becomes the primary with L5, L4, L3, and L2 as secondary. In the "Standard broadcast" (A) band, L5 becomes the primary with L4, L3, and L2 as secondary (L6 shorted out). In the "Medium wave" (B) band, L4 becomes the primary with L3 and L2 as secondary (L6 and L5 shorted out). In the "Short wave" (C) band, L3 becomes the primary with L2 as secondary (L6, L5, L4, and tap on L4 shorted out). The tap on

rectly by the range selector. Any inductive effect of L16 is thus eliminated. L19, L18, and L17 are shorted directly by the range selector.

Separate windings, with the exception of L23, are employed in the oscillator stage for each position of the range selector. L23 (inductively coupled to L11 and L12) is placed in the oscillator plate circuit to provide additional feed-back when operating receiver on the "Ultra short wave" (D) band. This coil is effectively r-f bypassed by capacitor C12, when range selector is in the "Short wave" (C) position, to prevent undesirable reactions. Its effect on the remaining bands is negligible. The inherent stability of the oscillator circuit provides minimum frequency drift which is especially advantageous for high-frequency reception. The locally generated signal is capacitance coupled to grid No. 3 of the Type-6L7 first detector.

The output of the "Sentry Box" is fed to the i-f amplifier through a plug-in cable. This cable also supplies all power required by the "Sentry Box" unit.

I-F Amplifier (Signal)

The intermediate-frequency amplifier consists of two Type-6K7 tubes in a two-stage, transformer-coupled circuit. The windings of all three i-f transformers are resonated by fixed capacitors, and are adjusted by molded magnetite cores (both primary and secondary) to tune to 460 kc. A third winding L26, in the first i-f transformer, is placed in series with the main secondary L25 when the fidelity control switch S4 is thrown to "broad" position (see figure 2), thereby increasing the coupling between the primary and secondary circuits with consequent broadening of the band width of the i-f amplifier. The increased band width of the i-f amplifier therefore causes less attenuation of the higher audio modulation side-band frequencies, permitting higher fidelity reception. A third winding L31 in the third i-f transformer supplies signal input to the tuning tube i-f amplifier.

Tuning Tube I-F Amplifier

The i-f signal voltage developed in L31 (third i-f transformer) is applied to the control grid of the Type-6K7 tuning tube i-f amplifier. The output of this tube is coupled through a sharply tuned transformer to the Type 6H6 tuning tube rectifier. All or a portion of the voltage which develops across resistor R27 (adjustable from back of chassis, see figure 1) is transferred from the movable arm to the grid of the Type 6E5 cathode-ray tuning tube through a suitable resistance-capacitance filter. The sharpness of this amplifier permits the receiver to be accurately tuned to the incoming carrier with the tuning tube Cathode-Ray Tuner while operating receiver with the fidelity control in extreme clockwise (broad) position.

Detector and A.V.C.

The modulated signal, as obtained from the output of the last i-f stage, is detected by an Type-6H6 twin-diode tube (No. 2 diode). The audio frequency secured by this process is transferred to the a-f sys-

tem for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistors R21 and R23, is applied, as automatic control-grid bias to the r-f, first-detector, and i-f tubes. The No. 1 diode of the Type-6H6 is used to supply residual bias to the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R22, R21, and R23, thereby maintaining the desired operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias diode ceases to draw current and the a.v.c. diode takes over the biasing function. The sensitivity of the receiver is increased in the "Ultra short wave" (D), "Short wave" (C), and "Medium wave" (B) bands by reducing the residual bias on the above mentioned controlled tubes with switch S7 which is operated by the range selector control.

Audio System

The manual volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector-diode and the input grid of the Type 6C5 audio voltage-amplifier tube. This control has a three-point tone-compensating filter connected to it so that the correct aural balance will be obtained at different volume settings. Phonograph terminals are provided to feed the output of an external phonograph pickup to the control grid of the audio amplifier through this aurally compensated volume control.

The output of the voltage amplifier is resistance-capacitance coupled to the control grid of the Type-6C5 driver tube. The output of this stage is transformer coupled to the control grids of the Type-6L6 push-pull power output tubes. The output of this stage is transformer coupled to the voice coil of the electro-dynamic speaker.

The "Music-speech" control consists of a switch S5 which is connected to two of the tone compensating filters. When this control is turned to its No. 1 (Music) position, maximum low audio-frequency response is obtained. When the control is turned to its No. 2 position, resistor R20 is placed in shunt with capacitor C63, giving greater attenuation of the lower frequencies. This position is a compromise between the "Music" and the "Speech" positions. In the No. 3 (Speech) position, operation is the same as No. 2 position except that capacitor C61 is shorted, giving additional low-frequency attenuation (minimum lows).

Fidelity Control

The fidelity control consists essentially of the combination of a conventional high audio-frequency tone control, including the combinations of capacitor C77 and a variable resistor R34, capacitor C78 and switch S6 in shunt with the secondary winding of transformer T2, and means for changing the band width of the i-f amplifier. It performs in the following manner:

When the fidelity control is in its extreme counter-clockwise (sharp) position, the resistance of R34 is

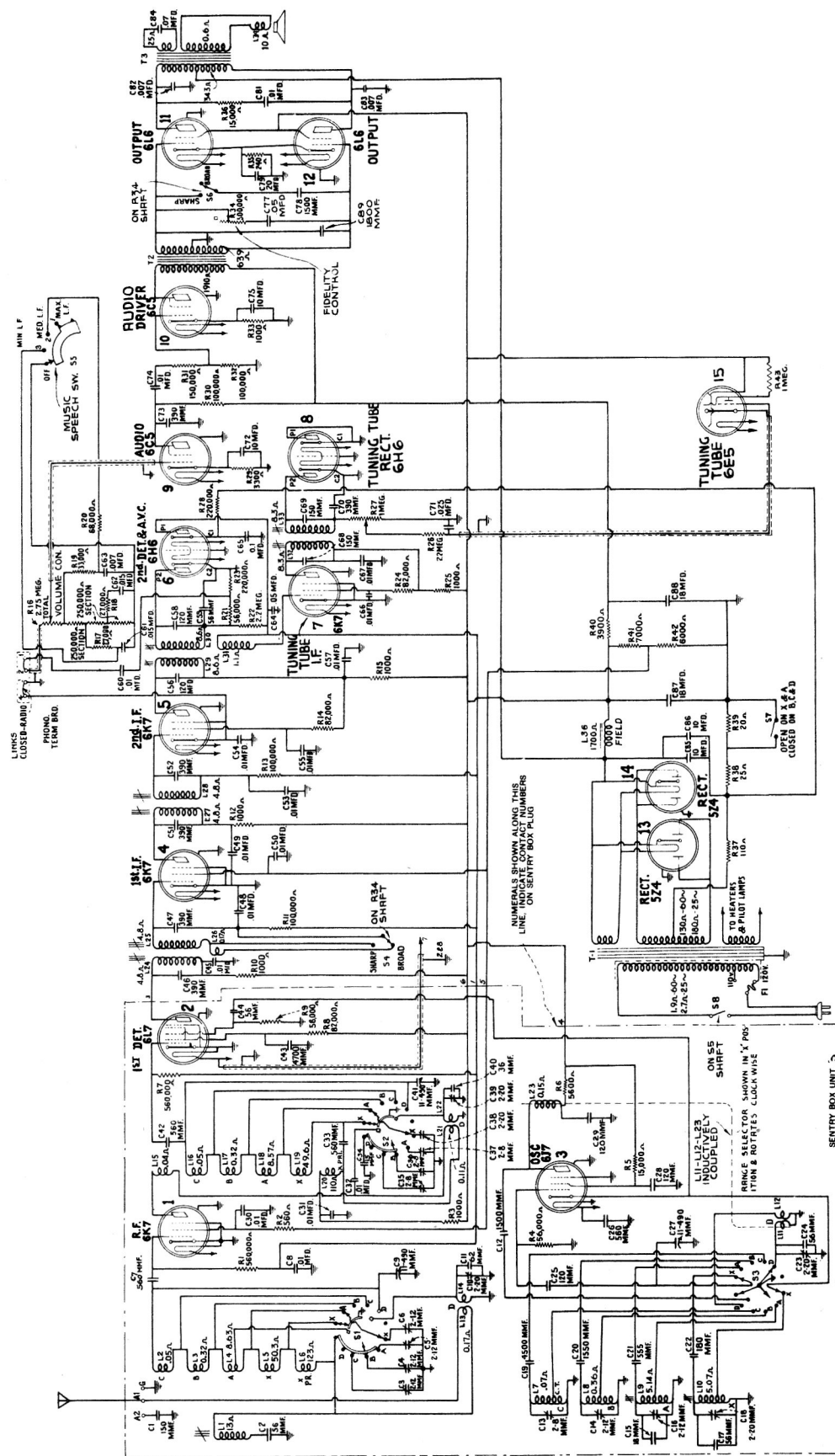


Figure 2—Schematic Circuit Diagram

minimum, capacitor C78 shunts the secondary of T2, and winding L26 is disconnected from the i-f circuit (S6 and S4 in sharp position, see figure 2). Capacitor C77 is most effective at this point causing maximum attenuation of the higher audio frequencies. As this control is turned clockwise, placing more resistance in series with capacitor C77, the capacitor becomes less and less effective, and the upper frequency range of the audio amplifier is extended. When the fidelity control nears its extreme clockwise position, resistor R34 is disconnected and switches S6 and S4 (operated by fidelity control shaft) respectively disconnect capacitor C78 from the audio circuit and place winding L26 (first i-f transformer) in series with L25 (S6 and S4 in broad position) thereby increasing the higher audio-frequency range of the audio amplifier and broadening the i-f amplifier simultaneously.

Selective "Cathode Ray Tuner"

An Type-6E5 cathode-ray tuning tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal. This tube

consists of an amplifier section and a cathode-ray section built in the same glass envelope. The adjustable arm of R27 selects the voltage used to actuate the grid of the amplifier section. Maximum voltage is applied to this grid when the receiver is tuned to resonance with an incoming carrier. This condition is evidenced by minimum width of the dark sector on the fluorescent screen.

"Tone Equalizer"

This receiver is designed with a cabinet incorporating the "Tone Equalizer." This is accomplished by having the rear of the speaker compartment completely enclosed by a tight-fitting back.

Five metal open-end pipes of equal diameter but of three different lengths are inserted in holes in the cabinet base and extend upward in the speaker compartment. The effect is to cause the lower-frequency waves, reaching the front of the cabinet through the pipes, to arrive approximately in-phase with the sound waves emitted from the front of the speaker giving extended low-frequency response without boominess, or cabinet resonance.

SERVICE DATA

The various diagrams in this booklet contain such information as will be needed to locate causes for defective operation if such develops. The values of the various resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagram. Identification titles, such as C1, L2, R1, 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 resistance only. Resistance values of less than one ohm are generally omitted.

Alignment Procedure

There are seventeen adjustments required for the alignment of the oscillator, first-detector, and antenna-tuned circuits; one adjustment for the wave-trap; and eight adjustments for the i-f system. Fifteen of these adjustments are made with plunger-type air trimming capacitors and require the use of an **GE Stock No. 12636 Adjusting Tool**. Each of these capacitors has a lock nut for securing the plunger in place after adjustment. The remaining eleven adjustments are made by means of screws attached to molded magnetite cores. These cores change the inductance of the particular coils in which they are inserted to provide exact alignment. All of these adjustments are accurately made during manufacture and should remain in proper alignment unless affected by abnormal conditions of climate or purported alterations for servicing, or unless altered by other means. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment. Such conditions will usually exist simultaneously. Correct performance of this receiver can only be obtained when these adjustments have been made by a skilled service engineer with the use of

adequate and reliable test equipment. The manufacturer of this receiver has such test equipment available for sale through its distributors and dealers.

The extensive frequency range of this receiver necessitates a more or less involved method of alignment. However, if the following directions are carefully applied in the sequence given, normal performance of the instrument will be obtained.

The plunger-type air trimming capacitors have their approximate plunger settings tabulated on figure 7. If the plungers have been disturbed from their original adjustments, they may be roughly set to the specified dimensions prior to alignment.

In performing services on the "Sentry Box", the leads should be restored to their original positions, since the lead-dress is important for proper operation and dial calibration.

Precautionary Dressing of Leads for "Sentry Box" Alignment

(Refer to Figure 4)

Band "X"

1. Keep blue lead A of S1 to antenna coil L4-5 dressed away from chassis, and from yellow lead X of S1 to antenna coil L5-6.
2. Bus lead from C10 to S1 should be as short as possible.
3. Keep blue lead A of S2 to detector coil L18-19 clear of chassis, coil shield, coil, and other leads.
4. Keep spaghetti lead C6 to X of S1 apart from spaghetti lead of C5 to A of S1, and from chassis.

Band "A"

1. Keep green lead terminal S1 to antenna coil tap L4 away from chassis, coil shield, and coil.
2. Keep spaghetti lead C5 to A of S1 apart from spaghetti lead C6 to X of S1 and from chassis.

Band "C"

Lead from C19 to oscillator coil L7 should be maintained as short and straight as possible.



Figure 4—"Sentry Box" Wiring Diagram

For alignment, the test-oscillator frequency should be quite accurate. A convenient and reliable means of accurately checking the frequency of test oscillators, receivers, etc., is the **GE Stock No. 9572 Crystal Calibrator**.

If the test-oscillator signal cannot be heard as the receiver (heterodyne) oscillator air-trimmer plunger is changed from its minimum-capacity to maximum-capacity position (receiver dial and test oscillator set

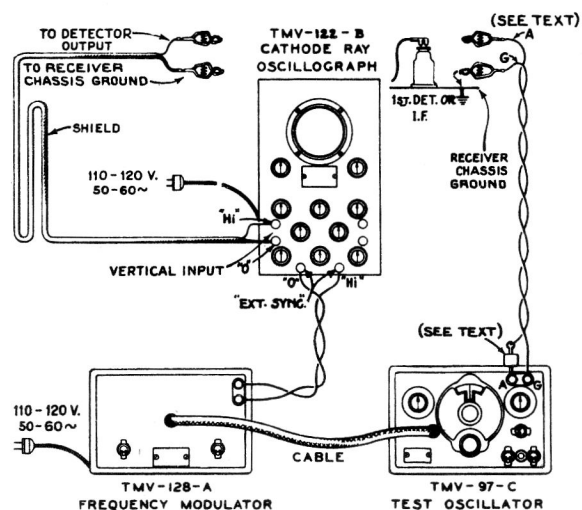


Figure 5—Alignment Apparatus Connections

to the specified frequencies, and the correct oscillator air-trimmer used) it may be an indication that the test-oscillator frequency is outside the range covered by the air-trimmer. Under such conditions, when a more accurate setting of the test oscillator cannot be determined, set the oscillator air-trimmer plungers to the approximate settings given on figure 7. Tune the test oscillator until the signal is heard in the speaker. Each of two test-oscillator settings (the fundamentals or the harmonics of which are 920 kc apart) produce a signal. The lower-frequency test-oscillator setting should be used as this places the test-oscillator (signal) frequency 460 kc below the frequency of the receiver heterodyne oscillator.

Holes are provided in the top of the r-f and antenna coil cans on some models to enable a tuning check with the **GE Stock No. 6679 Tuning Wand**. The hole in the top of the detector coil can has a cinch button which must be removed before insertion of the tuning wand. When the brass end of the wand is inserted in the coil, the inductance of the coil is decreased. If this results in an increase of output, the respective air-trimmer capacitance should be decreased (plunger pulled out). If inserting the iron end of the tuning wand causes an increase in output, resulting from an increase of inductance of the coil, the respective air-trimmer capacitance should be increased (plunger pushed in). If the range of the air trimmer is not sufficient to give the desired results, the lead-dress may be changed in the particular circuit being aligned, so as to cause the circuit to resonate within the range of the trimmer. An increase in the capacity-to-ground of the circuit will be required if the iron end of the tuning wand causes an

increase of signal output when the air-trimmer plunger is full-in, while a decrease in the capacity-to-ground will be required if the brass end of the tuning wand causes an increase in signal output when the air-trimmer plunger is full-out.

Two methods of alignment are applicable—one requires use of the cathode-ray oscillograph, and the other requires a voltmeter or glow-type indicator. The cathode-ray alignment method is advantageous in that the indication provided is in the form of a wave-image which represents the resonance characteristics of the circuit being tuned. This method is preferred because of the i-f characteristics of this receiver. This type of alignment is possible through use of apparatus such as the **GE Stock No. 9558 Frequency Modulator** and the **GE Stock No. 9545 Cathode-Ray Oscillograph**. If this equipment is not available, an approximate alignment may be performed by the output-indicator method with an instrument such as the **GE Stock No. 4317 Neon Glow Indicator** attached across the loud-speaker voice coil. Alignment by this method is similar to the cathode-ray method outlined below except that the receiver volume control should be at maximum, the trimmers adjusted to peak response (with the exception of the wave-trap) and the test-oscillator sweeping operations omitted. Either of these methods require the use of a reliable test oscillator such as the **GE Stock No. 9595**.

Cathode-Ray Alignment

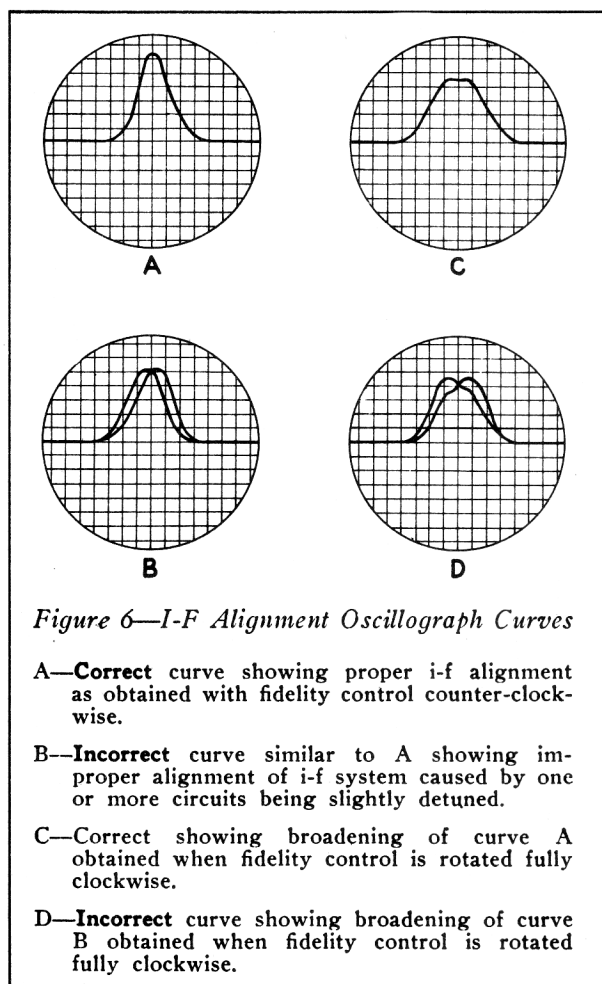
Make alignment apparatus connections shown on figure 5. Remove the plug of the frequency-modulator cable from the test-oscillator jack. Connect the receiver chassis to a good external ground. Connect oscillograph "Vertical" input terminals as indicated on figure 3. Set oscillograph power switch to "On" and adjust "Intensity" and "Focus" controls to give a clearly defined spot, or line, on the screen. Set oscillograph "Ampl. A" switch to "On," "Vertical gain" control full-clockwise, "Ampl. B" switch to "Timing," "Range" switch to No. 2 position, and "Timing" switch to "Int." Place the "Sync." control, "Freq." control, and "Horizontal gain" control to about their mid-positions. For each of the following adjustments, the test-oscillator output must be regulated so that the image obtained on the oscillograph screen will be of the minimum size for accurate observation. The receiver volume-control setting is optional.

I-F Adjustments

- Turn range selector to its "Standard broadcast" (A) position and tune receiver to a position of no extraneous signals near 600 kc. Set fidelity control to counter-clockwise position. Connect the "Ant." output of the test oscillator to the grid cap of Type 6K7 second i-f tube (with grid lead in place) through a .001-mfd. capacitor, with "Gnd." to receiver chassis. Tune the test oscillator to 460 kc and place its modulation switch to "On" and its output switch to "Hi."
- Turn on the receiver and test oscillator. Increase the output of the test oscillator until a

deflection is noticeable on the oscillograph screen. The figures obtained represent several waves of the detected signal, the amplitude of which may be observed as an indication of output. Cause the wave-image formed (400-cycle waves) to be spread completely across the screen by adjusting the "Horizontal gain" control. The image should be synchronized and made to remain motionless by adjusting the "Sync." and "Freq." controls.

- (c) Adjust the two magnetite core screws **L30** and **L29** (see figures 1 and 10) of the third i-f transformer (one on top and one on bottom) to produce maximum vertical deflection of the oscillographic image. This adjustment places the transformer in exact resonance with the 460 kc signal.
- (d) Turn tuning tube adjustment screw **R27** (see figure 1) to extreme clockwise position. Adjust output of test oscillator until the width of the dark sector on the fluorescent screen in the



Type-6E5 tuning tube is very narrow ("Cathode Ray" almost closed). Adjust the two magnetite core screws **L33** and **L32** (one on top and one on bottom, see figures 1 and 10) of the tuning tube i-f transformer until minimum

width of the dark sector on the fluorescent screen is observed. A decrease of the test-oscillator output may be necessary before the point of minimum width of the dark sector becomes apparent.

- (e) The sweeping operation should follow using the frequency modulator. Shift the oscillograph "Timing" switch to "Ext." Insert plug of frequency-modulator cable in test-oscillator jack. Turn the test-oscillator modulation switch to "Off." Turn on the frequency modulator and place its sweep-range switch to "Hi."
- (f) Increase the frequency of the test oscillator by slowly turning its tuning control until two separate, distinct, and similar waves appear on the screen. If only one wave appears, increase the "Freq." control on the oscillograph to obtain two waves. These waves will be identical in shape, totally disconnected, and appear in reversed positions. They will have a common base line which is discontinuous. Adjust the "Freq." and "Sync." controls of the oscillograph to make them remain motionless on the screen. Continue increasing the test-oscillator frequency until these forward and reverse curves move together and overlap, with their highest points exactly coincident. This condition will be obtained at a test-oscillator setting of **approximately 575 kc.**
- (g) With the images established as in (f), re-adjust the two magnetite core screws **L30** and **L29** on the third i-f transformer so that they cause the curves on the oscillograph screen to become exactly coincident throughout their lengths and have maximum amplitude.
- (h) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator to the grid cap of the Type-6K7 first i-f tube (with grid lead in place), through a .001-mfd. capacitor. Regulate the test-oscillator output so that the amplitude of the oscillographic image is approximately the same as used for adjustment (g) above.
- (i) The two second i-f transformer magnetite core screws **L28** and **L27** (one on top and one on bottom) should then be adjusted so that they cause the forward and reverse curves to become coincident throughout their lengths and have maximum amplitude.
- (j) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator to the input of the i-f system, i.e., to the grid cap of the Type-6L7 first-detector, (with grid lead in place) through a .001-mfd. capacitor. Regulate the test-oscillator output so the amplitude of the oscillographic image is approximately the same as used for adjustment (i) above.
- (k) The two first i-f transformer magnetite core screws **L25** and **L24** (one on top and one on bottom) should then be adjusted so that they cause the forward and reverse waves to become coincident throughout their lengths and have maximum amplitude.
- (l) Note width of oscillographic image at a point which is 50% of maximum amplitude. Turn re-

- (c) Re-tune receiver for maximum response at the 57,000 kc input signal (not image response) without disturbing test-oscillator adjustments. Change test oscillator to 6,800—14,000 kc range. Tune test oscillator until signal is heard in speaker (should occur at approximately 14,250 kc, fourth harmonic of test oscillator used). Two test-oscillator settings (230 kc apart) will produce a signal at this point. The lower frequency test-oscillator setting should be used as this places the test-oscillator harmonic 460 kc below the frequency of the receiver heterodyne oscillator. Tune receiver for maximum response at a dial setting of approximately 28,500 kc (image should tune in at a dial setting approximately 27,580 kc) without altering test-oscillator adjustment. Test oscillator second harmonic of 14,250 kc is used for the following check. Check calibration of receiver dial. A receiver-dial reading of less than 28,500 kc indicates that the inductance of the oscillator secondary coil L11 is too low and should be increased. If the receiver dial reading is greater than 28,500 kc, the inductance of L11 is too high and should be decreased. If it is necessary to change the inductance of L11, first remove bottom cover of "Sentry Box" and then set receiver dial pointer to 28,500 kc. To decrease inductance, move the

grounded ends (straps) of L11 and L12 (see figure 4) nearer chassis. Do not allow straps to touch chassis except where connected. To increase inductance, move the straps farther away from chassis. Adjust position of straps until maximum (peak) output results. The alignment of the detector tuned circuit should next be checked at 28,500 kc without changing either the receiver or test-oscillator adjustments. An increase of output when the brass end of a tuning wand is brought near L22 indicates that L22 is too high in inductance, while an increase when the iron end is brought near the coil indicates that the inductance is too low. The inductance of L22 may be varied by changing the spacing between the grounded end (strap) of L22 and the strap connected from C41 to contact on S2 (figure 4). An increase of spacing will increase the inductance, while a decrease of spacing will decrease the inductance. Adjust the spacing until maximum (peak) output results. Replace "Sentry Box" bottom cover and repeat adjustments in (b) prior to those of "Short wave" band.

"Short Wave" Band

- (d) Set the receiver range selector to its "Short wave" position and its dial pointer to 20,000 kc. Adjust the test oscillator to 20,000 kc. Adjust oscillator air-trimmer C13 until maximum (peak) output is reached. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust detector air-trimmer C35 until maximum (peak) output is reached, while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer C3 until maximum (peak) output is reached while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to 19,080 kc. The image signal should be received at this position indicating that the adjustment of C13 has been correctly made. No adjustments should be made while checking for the image signal.

"Medium Wave Band"

- (e) Place receiver range selector to its "Medium wave" position with its dial pointer set to 6,000 kc. Tune the test oscillator to 6,000 kc. Adjust oscillator air-trimmer C14 to produce maximum (peak) output as shown by the waves on the oscillograph. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust the detector air-trimmer C36 for maximum (peak) output while slightly rocking the gang tuning condenser back and forth

through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer C4 to produce maximum (peak) output. Tighten lock nut.

"Standard Broadcast" Band

- (f) Remove the 300-ohm resistor from beneath the test-oscillator "Ant." post and receiver antenna terminal "A1" and insert a 200-mmfd. capacitor in its place. Place receiver range selector to "Standard broadcast" position with receiver dial

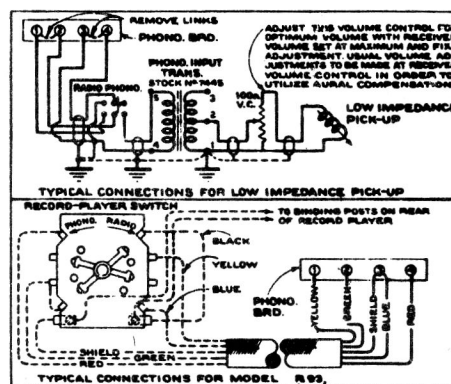


Figure 8—Pickup Wiring

pointer set to 600 kc. Tune the test oscillator to 600 kc. Adjust oscillator magnetite core screw L9 (top of large oscillator coil can) for maximum (peak) output as shown by the waves on the oscillograph screen.

- (g) Set receiver dial pointer to 1,500 kc. Tune test oscillator to 1,500 kc (1,500–3,100-kc range) and increase its output to produce a registration on the oscillograph screen. Carefully adjust the oscillator, detector, and antenna air-trimmers C16, C37, and C5, respectively, to produce maximum (peak) output as shown by the waves on the oscillograph screen. Shift the oscillograph "Timing" switch to "Ext." Place the frequency modulator sweep-range switch to its "Lo" position and insert plug of the frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of approximately 1,680 kc. Adjust air-trimmers C16, C37, and C5 again, setting each to the point which produces the best coincidence and maximum amplitude of the images.
- (h) Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Set oscillograph "Timing" switch to "Int." Tune test oscillator to 200 kc (200–400-kc range). Tune receiver for maximum response to this signal at a dial reading of approximately 600 kc. The third harmonic of the 200-kc signal is used for this adjustment. Shift oscillograph "Timing" switch to "Ext." Insert the plug of the frequency

modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen. This will occur at a test-oscillator setting of **approximately 230 kc.** Disregarding the fact that the two images may or may not come together, adjust the oscillator magnetite core screw L9 (top of large oscillator coil can) to produce maximum (peak) amplitude of the images. Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Repeat adjustments in (g) above to compensate for any changes caused by the adjustment of L9 core, tightening lock nuts on C16, C37, and C5, respectively, after each is adjusted.

"Long Wave" Band

- (i) Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Place receiver range selector to its "Long wave" position.

Set the receiver dial pointer to 175 kc. Tune the test oscillator to 175 kc and increase its output until a deflection is noticeable on the oscillograph screen. Adjust oscillator magnetite core screw L10 (located on top of small oscillator coil can) so that maximum (peak) amplitude of output is shown on the oscillograph screen.

- (j) Set receiver dial pointer to 350 kc. Tune test oscillator to 350 kc. Adjust the oscillator, detector, and antenna air-trimmers C18, C38, and C6 to produce maximum (peak) output as shown by the waves on the oscillograph screen. Without disturbing the connections, shift the oscillograph "Timing" switch to "Ext." Place the frequency-modulator sweep-range switch to its "Hi" position and insert plug of frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (decrease frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of **approximately 198 kc.** This setting places the test-oscillator frequency to 175 kc. The second harmonic is now used for the 350 kc adjustment. Adjust air-trimmers C18, C38, and

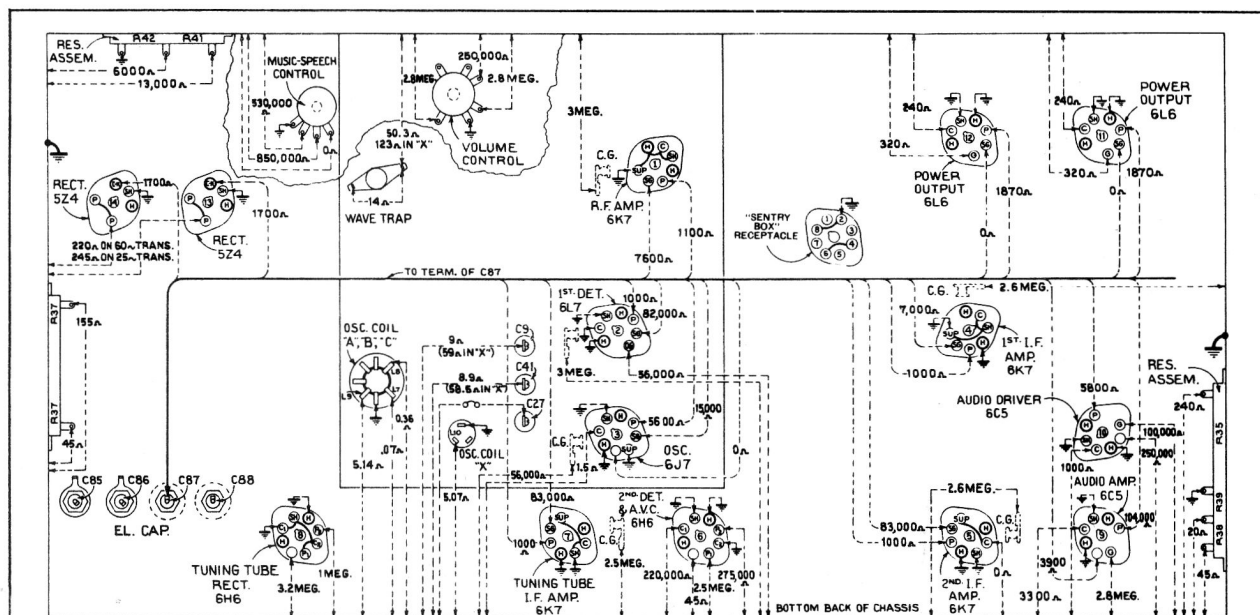


Figure 9—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full-mesh—Range selector in "Standard broadcast" position—Volume control maximum—Fidelity control optional—Music-speech Control Clockwise

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 9, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 2, and Wiring Diagrams, figures 3 and 4, 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 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.

C6, again, to produce maximum amplitude of the images where they best coincide throughout their lengths.

- (k) Re-tune the receiver to approximately 175 kc so that the forward and reverse waves appear on the oscillograph screen. Adjust the oscillator magnetite core screw L10 to produce maximum (peak) amplitude of the waves, disregarding the fact that the two images may or may not come together.
- (l) Shift the receiver dial setting to 350 kc without altering any other adjustments (frequency modulator still in operation). Adjust air-trimmers C18, C38, and C6, respectively, to produce maximum amplitude and best coincidence of the waves. These adjustments compensate for any changes caused by the adjustment of the magnetite core screw L10. Tighten lock nuts on C18, C38, and C6, respectively, after each is adjusted.

Tuning Tube Adjustment

An adjustment, R27, is provided on the rear apron of chassis (see figure 1) for regulating the sensitivity of the tuning tube ("Cathode Ray Tuner"). Adjust-

ment may be performed by first tuning in the strongest local station and then turning adjusting screw until the width of the dark sector on the fluorescent screen

Radiotron Cathode Current Readings

Measured with Milliammeter Connected at Tube Socket Cathode Terminals under Conditions Similar to Those of Voltage Measurements

(1) Type -6K7—R-F Amp.	6.2 ma.
(2) Type -6L7—1st Det.	4.0 ma.
(3) Type -6J7—Osc.	6.6 ma.
(4) Type -6K7—1st I-F Amp.	6.2 ma.
(5) Type -6K7—2nd I-F Amp.	7.5 ma.
(6) Type -6H6—2nd Det.—A.V.C.	—
(7) Type -6K7—Tuning Tube I-F Amp.	7.5 ma.
(8) Type -6H6—Tuning Tube Rect.	—
(9) Type -6C5—Audio Voltage Amp.	1.25 ma.
(10) Type -6C5—Audio Driver Amp.	6.4 ma.
(11) Type -6L6—Power Output	43.0 ma.
(12) Type -6L6—Power Output	43.0 ma.
(13) Type -5Z4—Rectifier	80 ma.*
(14) Type -5Z4—Rectifier	80 ma.*
(15) Type -6E5—Tuning Tube	3.0 ma.

(*Cannot be measured at socket)

in the Type-6E5 tuning tube is very narrow ("Cathode Ray Tuner" almost closed). No other adjustment is necessary.

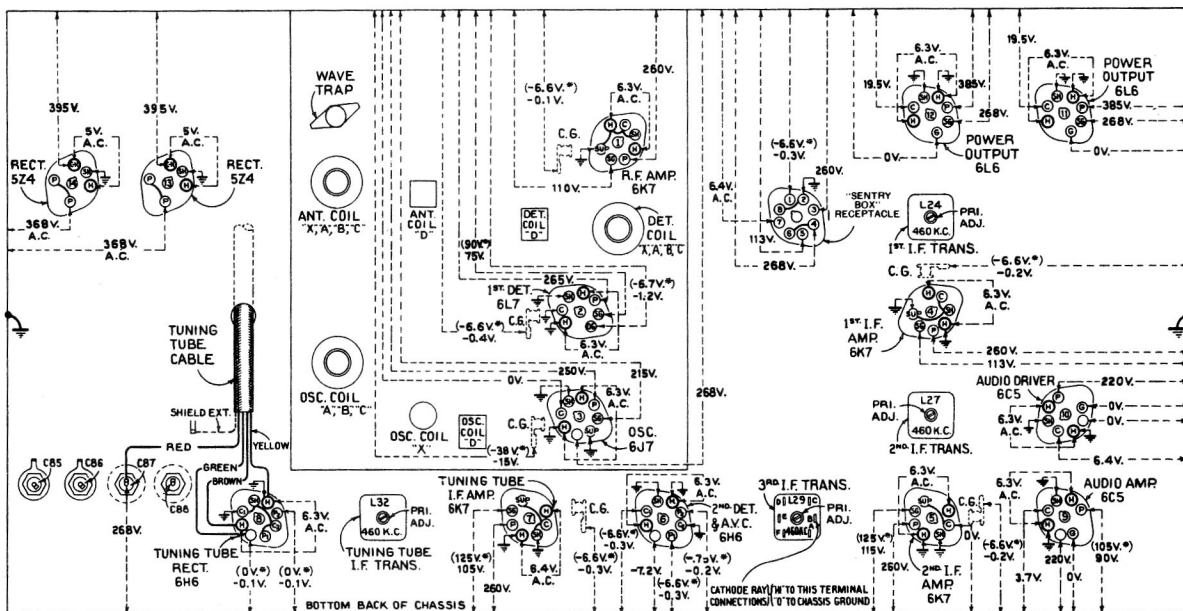


Figure 10—Radiotron Socket Voltages, Coil, and I-F Trimmer Locations

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc—No signal being received—Volume control minimum—Fidelity control optional

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 10 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, 500, and 1,000 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.

Phonograph Terminal Board

A terminal board is provided for connecting a phonograph into the audio amplifying circuit. Typical methods of connecting a low-impedance pickup, or Models R-93 and R93X Record Players are shown on the Schematic Diagram (figure 8).

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

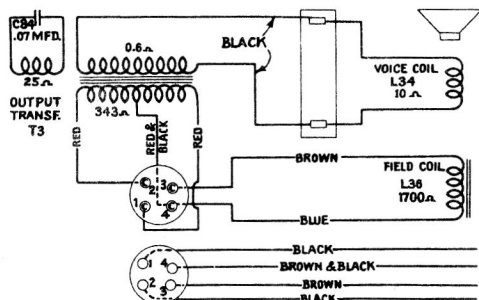


Figure 11—Loudspeaker Wiring

may be removed 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.

Antenna and Ground Terminals

These receivers are equipped with an antenna-ground terminal board having three terminals. These terminals are marked "A2," "A1," and "G," the latter being the ground terminal and should always be connected to a good external ground.

The transmission line leads of antenna systems having no receiver coupling units, should be connected to terminals "A2" and "A1". When receiver coupling units are supplied with antenna kits, they should be connected to terminals "A1" and "G". Connect a single wire antenna to terminal "A1".

Selector Dial

Figure 12 illustrates the relation of the various parts of the dial mechanism when in its "Standard broadcast" position with the range switch likewise turned

to its "Standard broadcast" position. In re-assembling the dial after repairs, see that the gears are meshed in accordance with the diagram, at the same time noting that the range switch is in its "Standard broadcast" position and the lever attached to the range-switch shaft placed in the position shown.

To adjust the dial mechanism, set the range switch to its "Standard broadcast" position. Place a straight-edge across the center of the dial so that its edge is even with the lower (end) marking at both the low-frequency and high-frequency ends of the dial. Under such conditions the straight-edge should be parallel with the top of the chassis base. If the straight-edge is not parallel with the top of the chassis base, loosen the nut on the rear of the roller link pivot stud and move the stud up or down until the link roller moves the dial to the desired position so that the end calibration marks obtain the position mentioned above. Tighten the nut on the roller link pivot stud.

Set the gang tuning condenser to its maximum capacity position. Adjust the dial pointer to the low-frequency (end) mark on "Standard broadcast" scale. This is a friction adjustment.

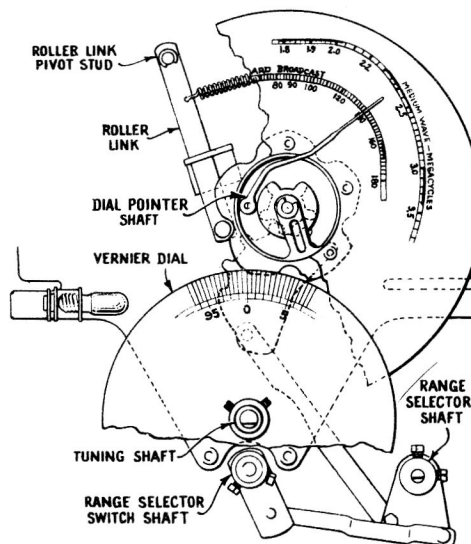


Figure 12—Selector Dial Change Mechanism

With the gang tuning condenser plates still in full mesh, loosen the two set screws on the vernier-dial hub. Rotate the vernier dial until the "0" marking is in a vertical plane above the center of the shaft. Tighten set screws.

REPLACEMENT PARTS

STOCK NO.	DESCRIPTION	STOCK NO.	DESCRIPTION
RECEIVER ASSEMBLIES			
12863	Board - Phonograph terminal board..	4427	Bracket - Volume control and L.F. tone control mounting bracket....
12987	Bracket - Mounting bracket for bias switch.....	13024	Cable - Tuning lamp cable and socket.....
		12511	Cap - Grid contact cap-Package of 5.

REPLACEMENT PARTS—E-157

STOCK NO.	DESCRIPTION	STOCK NO.	DESCRIPTION
12726	Capacitor - 56 Mmfd. (C59).....	13018	Resistor - Voltage divider comprising one 240 ohm, one 20 ohm and 25 ohm sections (R35,R38,R39)....
12404	Capacitor -120 Mmfd. (C56,C58).....	4669	Screw - No.8-32x5/32 set screw for link assembly Stk. No. 12868-Package of 10.....
13021	Capacitor -150 Mmfd. (C68,C69).....	12008	Shield - I.F. transformer shield for Stk. No. 12981, 12990, 13019 and 13020.....
13022	Capacitor -390 Mmfd. (C70).....	12581	Shield - Transformer shield top for 6E5 I.F. transformer.....
13034	Capacitor -390 Mmfd. (C73).....	12607	Shield - Transformer shield top for first or second I.F. transformer.....
13301	Capacitor -390 Mmfd. (C46,C47,C51,C52).....	13028	Shield - Transformer shield top for third I.F. transformer.....
12898	Capacitor -1500 Mmfd. (C78).....	11195	Socket - 5 contact 5Z4 Radiotron socket.....
13580	Capacitor -1800 Mmfd. (C89).....	11198	Socket - 7 contact 6K7 or 6L6 Radiotron socket.....
13033	Capacitor -.007 Mfd. (C82,C83).....	11196	Socket - 8 contact 6C5 or 6H6 Radiotron and Sentry Box power supply socket.....
4870	Capacitor -.025 Mfd. (C71).....	11381	Socket - Tuning lamp socket and cover.....
4858	Capacitor -.01 Mfd. (C53,C45,C48,C49,C50,C54,C55,C57,C60,C66,C67,C74).....	13095	Socket - Upper left or lower right hand dial lamp socket.....
4937	Capacitor -.01 Mfd. (C81).....	11222	Socket - Upper right or lower left hand dial lamp socket.....
4836	Capacitor -.05 Mfd. (C64,C77).....	12007	Spring - Retaining spring for core Stk. No. 12006 Package of 10.....
4791	Capacitor -0.1 Mfd. (C65).....	12986	Stud - Stud, nut and washer for connecting link assembly Stk. No. 12868 to sector gear and link Stk. No. 12910 - Package of 5.....
11203	Capacitor - 10 Mfd. (C85,C86).....	12988	Switch - Bias switch (S7).....
5212	Capacitor - 18 Mfd. (C87, C88).....	13015	Tone Control - Fidelity control (R34, S4, S6).....
12470	Capacitor - 20 Mfd. (C79).....	13013	Tone Control - Music-speech and power switch (S5,S8).....
13011	Capacitor - Compensating pack comprising two .015 Mfd., one .007 Mfd. capacitors and two 27,000 ohm, one 33,000 ohm, and one 68,000 ohm resistors (C61,C62,C63,R17,R18,R19,R20).....	12981	Transformer - First I.F. transformer complete (L24,L25,L26,C46,C47)... ..
13025	Capacitor - Pack comprising two 10 Mfd. sections (C72,C75).....	12990	Transformer - Second I.F. transformer complete (L27,L28,C51,C52).....
5040	Connector - 4 contact female connector for speaker cable.....	13019	Transformer - Third I.F. transformer complete (L29,L30,L31,C56,C58,C59,R21,R23).....
13016	Control - Tuning Tube control (R27)..	13023	Transformer - Driver transformer (T2).....
12006	Core - Adjustable core and stud for Stk. Nos. 12981, 12990, 13019 and 13020.....	13020	Transformer - 6E5 I.F. transformer complete (L32, L33, C68, C69, C70).....
5240	Cover - Fuse mounting cover.....	13008	Transformer - Power transformer 100-120 volts 50-60 cycles (T1)..
12870	Dial - Vernier dial scale.....	13009	Transformer - Power transformer 100-120 volts 25-50 cycles (T1)..
10907	Fuse - 3 Amp.-Package of 2-(F1)....	13014	Volume Control (R16).....
5226	Lamp - Dial lamp - 6.3 volts - Package of 2.....		
12868	Link - Range switch and band indicator operating link complete with set screws.....		
13012	Mounting - Fuse mounting 100-120 volt models only.....		
13027	Resistor - 110 ohm wire wound-used in 110 volt models only (R37).....		
13030	Resistor - 1,000 ohm Carbon type 1/10 watt -(R12,R25,R33).....		
5112	Resistor - 1000 ohm Carbon type 1/4 watt -(R10,R15).....		
13031	Resistor - 3300 Ohm Carbon type 1/10 watt-(R29).....		
13032	Resistor - 3900 ohm carbon type 1 watt-(R40).....		
5114	Resistor - 15,000 ohm Carbon type 1 watt-(R36).....		
11282	Resistor - 56,000 ohms Carbon type 1/10 watt-(R21).....		
11365	Resistor-82,000 ohm Carbon type 1/4 watt-(R14,R24).....		
11281	Resistor - 100,000 ohm Carbon type 1/10 watt (R11,R13,R32).....		
12263	Resistor - 100,000 ohm Insulated 1/4 watt-(R30).....		
12478	Resistor - 150,000 ohm Carbon type 1/10 watt-(R31).....		
12264	Resistor - 220,000 ohm Insulated 1/4 Watt-(R28).....		
11398	Resistor - 220,000 ohm Carbon type 1/10 watt-(R23).....		
12013	Resistor - 1 Meg Carbon type 1/10 watt-(R43).....		
5131	Resistor - 2.2 Meg Carbon type 1/10 watt-(R26).....		
12679	Resistor - 2.2 Meg Insulated 1/4 watt-(R22).....		
13017	Resistor - Voltage divider comprising one 7000 ohm and one 6000 ohm sections (R41,R42).....		
			SENTRY BOX UNIT ASSEMBLIES
		12806	Board - 3 contact antenna and ground terminal board.....
		5237	Bushing - Variable condenser mounting bushing assembly - Package of 3.....
		12886	Cable - Shielded power cable approx. 4 in. long complete with 8 contact male plug.....
		12511	Cap-Grid contact cap - Package of 5
		12714	Capacitor - Adjustable trimmer capacitor (C3,C4,C5,C6,C14,C16)..
		12807	Capacitor - Adjustable trimmer capacitor(C13,C35,C36,C37).....
		12884	Capacitor - Adjustable trimmer capacitor (C10, C18, C23, C38, C39).....

REPLACEMENT PARTS—E-157

STOCK No.	DESCRIPTION	STOCK No.	DESCRIPTION
12896	Capacitor - 15 Mmfd. (C34).....	12904	Bushing - Plate and bushing assembly for planetary drive mounting.....
12722	Capacitor - 18 Mmfd. (C15).....	12905	Coupling - Flexible coupling and shaft assembly complete.....
12891	Capacitor - 36 Mmfd. (C40).....	12909	Dial - Band indicating dial and cam assembly.....
12726	Capacitor - 56 Mmfd. (C24).....	12899	Drive - Variable tuning condenser drive complete including mounting bracket, drive, dial scale, and indicator less vernier dial
12895	Capacitor - 56 Mmfd. (C17).....		Stk. No. 12870 and link Stk. No. 12868.....
12723	Capacitor - 56 Mmfd. (C2,C44).....	12906	Gear - Anti-lash drive gear complete
13307	Capacitor - 62 Mmfd. (C11).....	12910	Gear - Sector gear and link assembly for band selector.....
12724	Capacitor - 120 Mmfd. (C25,C28,C29).....	12908	Indicator - Station selector indicator pointer.....
12725	Capacitor - 150 Mmfd. (C1).....	8051	Link - Link and roller assembly complete with springs.....
12894	Capacitor - 180 Mmfd. (C22).....	12911	Screen - Dial lamp screen and light diffuser.....
12727	Capacitor - 555 Mmfd. (C21).....	4669	Screw - Set screw for flexible coupling or gear stock Nos. 12905 and 12906 - Package of 10.....
12537	Capacitor - 560 Mmfd. (C7,C26,C33,C42).....	12901	Shaft - Direct drive shaft and pinion gear for planetary drive...
12898	Capacitor - 1500 Mmfd. (C12).....	12900	Shaft - Vernier drive shaft for planetary drive.....
12729	Capacitor - 1550 Mmfd. (C20).....	12903	Spring - Tension spring for planetary bearing - Package of 10.....
12728	Capacitor - 4500 Mmfd. (C19).....	12907	Spring - Tension spring for gear stock No. 12906 - Package of 10...
12897	Capacitor - 4700 Mmfd. (C43).....	8052	Spring - Tension spring for link stock No. 8051 - Package of 5.....
4858	Capacitor - .01 Mfd. (C8,C30,C31,C32)		REPRODUCER ASSEMBLIES
12879	Coil - Antenna coil and shield XABC bands (L2,L3,L4,L5,L6).....	8059	Board - Reproducer terminal board...
12888	Coil - Antenna coil "D" band (L13,L14).....	12640	Bracket - Output transformer mounting bracket.....
12880	Coil - Detector coil and shield XABC bands (L15,L16,L17,L18,L19,L20)....	12474	Cone - Reproducer cone and dust cap (L34).....
12709	Coil - Oscillator coil and shield ABC bands (L7,L8,L9).....	11577	Coil - Field coil, magnet and cone support (L36).....
12881	Coil - Oscillator coil and shield X band only (L10).....	5039	Connector - 4 contact male connector for reproducer leads.....
12890	Coil - Oscillator coil "D" band (L11,L12,L23).....	9719	Reproducer complete.....
12889	Coil - R.F. Coil "D" band (L21,L22)...	13007	Transformer - Output transformer (T3, C84).....
12877	Condenser - 3 gang variable tuning condenser (C9,C27,C41).....		MISCELLANEOUS ASSEMBLIES
12887	Connector - 8 contact male connector and cover for power cable Stk. No. 12886.....	11996	Bracket - Tuning tube mounting bracket and clamp.....
12664	Core - Adjustable core and stud for Stk. No. 12654.....	12915	Crystal - Station selector escutcheon and crystal.....
12800	Core - Adjustable core and stud for Stk. 12709.....	12742	Escutcheon - tuning tube escutcheon.....
12882	Core - Adjustable core and stud for Stk. 12881.....	12699	Knob - Large station selector knob.....
11324	Resistor - 560 ohms - Carbon type - 1/4 watt (R2).....	12700	Knob - Small (vernier) station selector knob.....
5112	Resistor - 1,000 ohms - Carbon type - 1/4 watt (R3).....	11347	Knob - Volume control, Fidelity control, music-speech and power switch, and range selector knob.....
11298	Resistor - 5,600 ohms - Carbon type - 1 watt (R6).....	11210	Screw - Chassis mounting screw and washer assembly - Package of 4....
3998	Resistor - 15,000 ohms - Carbon type - 1/4 watt (R5).....	12916	Shield - Sentry Box Shield
11282	Resistor - 56,000 ohms - Carbon type - 1/10 watt (R4,R9).....	4982	Spring - Retaining spring for knob Stock No. 12699 Package of 10.....
8064	Resistor - 82,000 ohms - Carbon type - 1/2 watt (R8).....	11349	Spring - retaining spring for knob Stock Nos. 11347, 12700 - Package of 5
11397	Resistor - 560,000 ohms - Carbon type - 1/10 watt (R1,R7).....		
12651	Shield - Coil shield for Stk. Nos. 12879 and 12880.....		
12710	Shield - Coil shield for Stk. No. 12709		
12883	Shield - Coil shield for Stk. No. 12881.....		
11198	Socket - 7 contact 6K7 Radiotron socket.....		
11279	Socket - 7 contact 6L7 Radiotron socket.....		
12885	Socket - 8 contact 6J7 Radiotron socket.....		
12007	Spring - Retaining spring for core Stk. Nos. 12664, 12800 and 12882 - Package of 10.....		
12878	Switch - Range switch and mounting nut (S1, S2, S3).....		
12654	Trap Wave trap complete (L1)		
	DRIVE ASSEMBLIES		
10705	Ball - 5/32 in. diameter steel ball for planetary drive - Package of 20		
10941	Ball - 1/8 in. diameter steel ball for planetary drive bearing - Package of 20.....		