

# MODELS A-70 & A-75

## Seven-Tube, Three-Band, A-C Superheterodyne Receivers

### Electrical Specifications

#### FREQUENCY RANGES

Band A.....	540- 1,625 kc.
Band B.....	1,625- 5,700 kc.
Band C.....	5,700-18,000 kc.

#### ALIGNMENT FREQUENCIES

Band A....	600 kc. (osc.), 1,400 kc. (osc., det., ant.)
Band B.....	None required
Band C.....	18,000 kc. (osc., det., ant.)

Intermediate Frequency ..... 460 kc.

#### RADIOTRON COMPLEMENT

- (1) Type-6K7.....Radio-Frequency Amplifier
- (2) Type-6A8.....First Detector-Oscillator
- (3) Type-6K7.....Intermediate Amplifier
- (4) Type-6H6.....Second Detector-A.V.C.

- (5) Type-6F5.....Audio Voltage Amplifier
- (6) Type-6F6.....Audio Power Amplifier
- (7) Type-80.....Full-Wave Rectifier
- (8) Type-6E5.....Tuning Indicator

#### POWER SUPPLY RATINGS

Rating A.....	105-125 Volts, 50-60 Cycles, 100 Watts
Rating B.....	105-125 Volts, 25-60 Cycles, 105 Watts

#### POWER OUTPUT

Undistorted.....	2.25 Watts
Maximum.....	5.0 Watts

#### LOUDSPEAKER

Type.....	Electrodynamic
Voice Coil Impedance.....	2.25 ohms at 400 cycles

### Mechanical Specifications

Tuning Drive Ratios.....	10-to-1 and 50-to-1
Chassis Base Dimensions.....	13 <sup>7</sup> / <sub>8</sub> inches x 7 <sup>5</sup> / <sub>8</sub> inches x 2 <sup>1</sup> / <sub>2</sub> inches

#### MODEL A-70

#### MODEL A-75

Height.....	19 <sup>3</sup> / <sub>8</sub> inches.....	38 inches
Width.....	15 <sup>3</sup> / <sub>8</sub> inches.....	24 inches
Depth.....	9 <sup>3</sup> / <sub>8</sub> inches.....	11 inches
Weight (Net).....	30 <sup>1</sup> / <sub>2</sub> pounds.....	49 <sup>1</sup> / <sub>2</sub> pounds
Weight (Shipping).....	36 pounds.....	64 pounds

Operating Controls.....(1) Volume, (2) Tuning, (3) Range Selector, (4) Power Switch-Tone

### General Features

These two models each employ the same seven-tube chassis. They have the new metal tubes. The tuning range is from 540 to 18,000 kc. The coverage includes domestic broadcast, police, aircraft and amateur services and also the important foreign short-wave broadcast bands at 49, 31, 25, 19, and 16 meters. Chassis features include automatic volume control, 3-point tone control, antenna wave trap, and audio tone compensation. A high level of output is available from the receiver for reproduction by the electrodynamic loudspeaker. The table model (A-70) uses an 8-inch dynamic speaker and the console model

(A-75) uses an improved 12-inch dynamic speaker. The tuning dial is an illuminated semi-airplane type. Each band is distinctively marked with a separate color for each band. Positions of the range selector knob are plainly marked on the control panel with letters indicating each band position placed over color strips corresponding to the band colors on the dial. The tuning control is of the dual-ratio type, which permits fast tuning through a 10-to-1 drive ratio and vernier tuning through a 50-to-1 drive ratio. The latter is especially advantageous for accurate tuning of the short-wave stations.



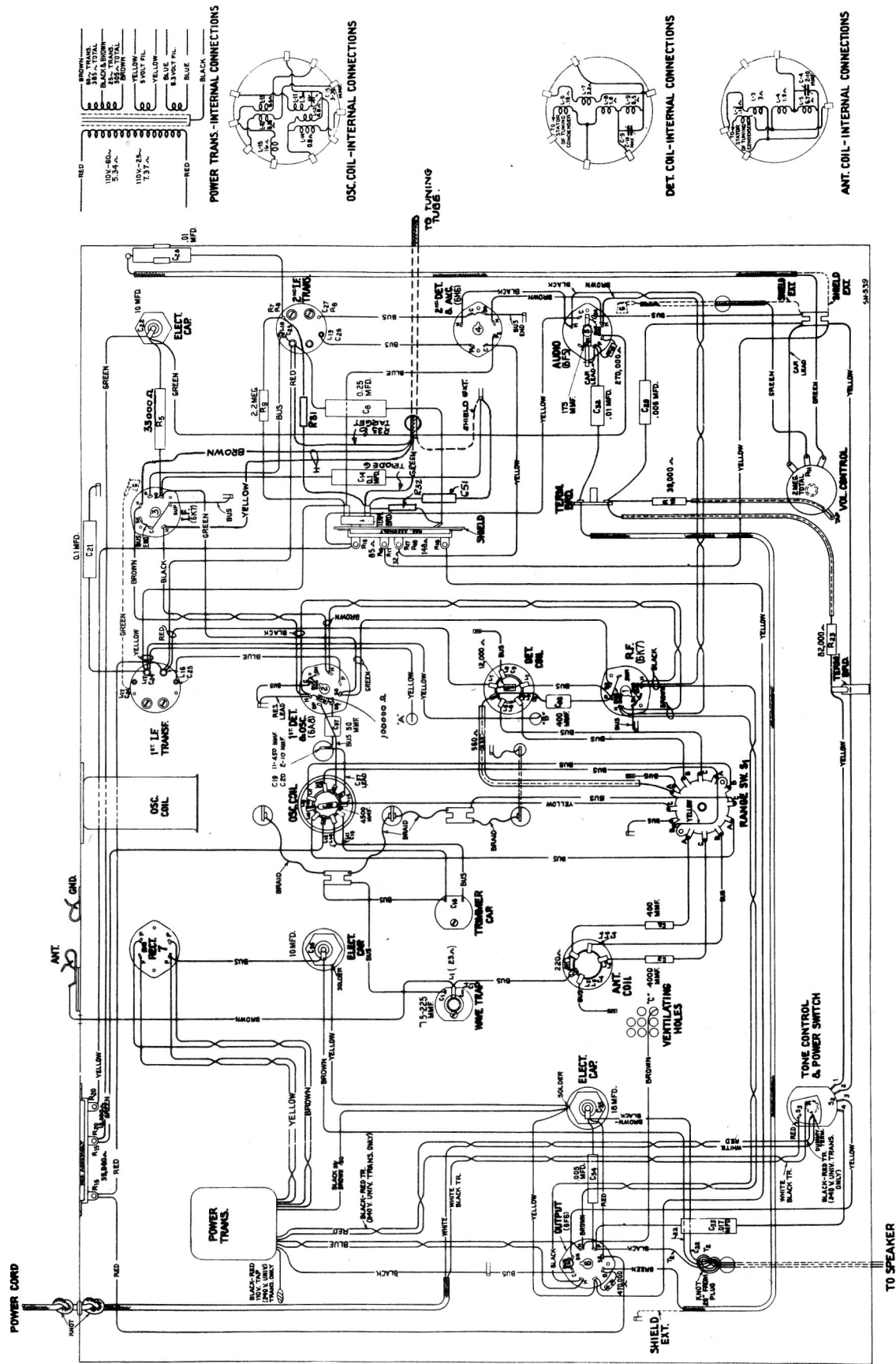


Figure 2—Chassis Wiring Diagram

## Circuit Arrangement

The conventional Superheterodyne type of circuit, consisting of an r-f stage, a combined first-detector-oscillator stage, a single i-f stage, a diode-detector-automatic-volume-control stage, an audio voltage amplifier stage, an audio power output stage and a high-voltage rectifier power-supply stage, is used.

A cathode-ray tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal. This tube is of new design and comprises an amplifier section and a cathode-ray section built in the same glass envelope. The cathode-ray section consists of a conically shaped luminescent screen, upon which a pattern is formed by an effect of the detected signal after said effect has been amplified by the amplifier section which is fed from the detector diode circuit. The size of the pattern is determined by the strength of the signal voltage, so that any change of tuning may be readily observed in order to facilitate tuning to exact resonance.

### Tuned Circuits

The antenna coil system and the detector coil system each consist of a single primary and three series-connected secondary windings to provide the three ranges of tuning. The oscillator coil system is similarly wound on a single form. A range selector switch (S-1) is used for connecting the various sections of these three coil systems into the circuit to provide operation on the band desired. The coils are tuned by a variable three-section gang condenser having trimmer capacitors in shunt with each section. There are additional trimmer capacitors across the section of each coil used for Band "A." A series trimmer is also associated with the Band "A" oscillator coil.

The intermediate frequency amplifier system consists of a Type -6K7 in a transformer-coupled circuit. This stage operates at a basic frequency of 460 kc. Each winding of both i-f transformers (input and output) is tuned by an adjustable trimmer.

### Detector and A.V.C.

The modulated signal as obtained from the output of the i-f stage is detected by a Type -6H6 twin-diode tube. The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for auto-

matic volume control. This voltage, which develops across resistor R-8, is applied as automatic control-grid bias to the r-f, first-detector, and i-f tubes through a suitable resistance filter circuit. The second (auxiliary) diode of the Type -6H6 is used to supply residual bias for the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R-8 and R-9, thereby maintaining the desired minimum 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.

### 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 audio-voltage-amplifier tube. This control has a tone compensating filter connected to it so that the correct aural balance will be obtained at different volume settings.

Resistance-capacitance coupling is used between the first audio stage and the power output stage. The output of the power amplifier is transformer-coupled into the dynamic loudspeaker. High-frequency tone control is effected by a capacitor across the plate circuit of the output tube. Speech-music control is effected by a resistor connected to the compensated volume control circuit. Control of tone is obtained by means of the switch (S-2).

### Rectifier

The power required for operation of this receiver is supplied through transformer T-1. This transformer has an efficient electrostatic shield between its primary and secondary windings. This shield prevents interference which is on the power-supply circuit from entering the receiver and conversely reduces the tendency of the receiver to re-radiate into the power circuit. A Type -80 furnishes the d-c voltages necessary for plate, screen, cathode, and grid potentials. The field winding of the loudspeaker is used as a reactor in the filter circuit from which it simultaneously receives its magnetizing current. The heaters of all Radiotrons are supplied from a low voltage (6.3 volt) winding on the power transformer. One side of this winding is at ground potential.

## SERVICE DATA

The various diagrams of this bulletin contain such information as will be needed to isolate causes for defective operation when such a condition develops. Values of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as R-3, L-2, C-1, etc., are provided for reference between the diagrams and the replacement parts list. Locating of the parts in the schematic circuit is facilitated by the fact that the numerical titles increase from left to right on the diagram. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only. Resistances of less than one ohm are generally omitted.

## Alignment Procedure

Precise alignment is vital to the proper functioning of this receiver. There are four trimming adjustments provided in the i-f system, three in the oscillator coil system, two in the detector coil system, and two in the antenna coil system. Each of these trimmers has been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions of climate or have been altered for service purposes. Incorrect alignment is usually evidenced by loss of sensitivity, improper tone quality, and poor selectivity. These indications will generally be present together.

The correct performance of the receiver can only be obtained when the alignment is performed with adequate and reliable test apparatus. The manufacturer of this instrument has a complete assortment of such service equipment available. This equipment, illustrated and described on a separate page of this booklet, may be purchased from authorized distributors and dealers.

An oscillator (signal generator) is required as a source of the specified alignment frequencies. Visual indication of the receiver output during the adjustments is necessary to enable the serviceman to obtain an accuracy of alignment which is not possible by listening to the signal. The General Electric Stock No. 9595 Full-Range Oscillator and the General Electric Stock No. 4317 Neon Output Indicator are especially suitable and fulfill the above requirements.

The following procedure should be followed in adjusting the various trimmer capacitors:

### I-F Trimmer Adjustments

The four trimmers of the two i-f transformers are located as shown by Figure 4. Each must be aligned to a basic frequency of 460 kc. To do this, attach the Output Indicator across the voice coil circuit or across the output transformer primary. Connect the output of the test oscillator between the control-grid of the Type 6A8 first detector tube and chassis-ground. 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 the heterodyne oscillator. Increase the output of the test oscillator until a slight indication is apparent on the output indicator. Then adjust the two trimmers, C-25 and C-26, of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two trimmers, C-23 and C-24, 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 trimmers a second time to assure that the inter-action between them has not disturbed the original adjustment.

### R-F Trimmer Adjustments

The seven trimmers associated with the r-f, first detector, and oscillator tuned circuits have their locations shown by Figure 3. The three trimmers which are at all times directly in shunt with the variable tuning condenser necessitate that the high-frequency range (Band C) be aligned first. The range selector switch should, therefore, be turned to its Band C position for the first adjustment. The Output Indicator should be left connected to the output system. Attach the output terminals of the test oscillator to the antenna and ground terminals of the receiver.

Calibrate the dial by rotating the tuning control until the variable condenser plates are in their full

mesh (maximum capacity) position and adjusting the dial pointer so that its end points to the *horizontal* graduation (530 kc.) at the low frequency end of the Band A scale.

Proceed further as follows:

- (a) Adjust the test oscillator to 18,000 kc. and set the receiver tuning control to a dial reading of 18,000 kc.
- (b) Regulate the output of the test oscillator until a slight indication is perceptible at the receiver output. Then adjust the trimmer, C-20, on the oscillator section of the variable condenser to the point at which it produces maximum indicated receiver output. Two points may be found, each of which produces such a maximum. The one of *maximum trimmer capacitance* is correct and should be used (The oscillator will be 460 kc. below the signal frequency at this adjustment point.)
- (c) Adjust the trimmer, C-12, of the detector section of the variable condenser, simultaneously rocking the receiver tuning control backward and forward through the 18,000 kc. input signal, until maximum receiver output results

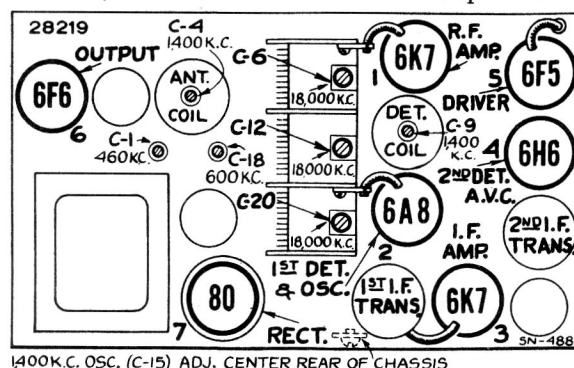


Figure 3—Radiotron and Coil Locations

from these combined operations. Rocking of the variable condenser will prevent inaccurate adjustment which would otherwise be caused by the inter-action between the heterodyne oscillator circuit and the detector tuned circuit.

- (d) With the receiver tuning control set to 18,000 kc. adjust the trimmer, C-6, on the antenna section of the variable condenser to the point which produces maximum (peak) indicated receiver output.
- (e) Change the receiver range selector to its Band A position and set the receiver tuning control to a dial reading of 1,400 kc. Tune the test oscillator to 1,400 kc. and regulate its output to produce a slight indication on the receiver output indicating device.
- (f) Adjust the high frequency trimmers of the Band A oscillator, detector, and antenna coils, C-15, C-9, and C-4 respectively, to the points at which each produces maximum indicated receiver output.
- (g) Shift the test oscillator frequency to 600 kc. and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received.



- (h) Tune the low frequency trimmer, C-18, of the oscillator Band A coil, simultaneously rocking the tuning control of the receiver backward and forward through the signal, until maximum indicated receiver output results from these combined operations. The adjustment of C-20, C-12, and C-6 should be corrected at 18,000 kc. as in (b), (c), and (d); also C-15, C-9, and C-4 should be corrected at 1,400 kc. as in (f) to compensate for any changes caused by the adjustment of the low frequency oscillator coil trimmer.

## Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts to chassis on Figure 4 will assist in the location of causes for faulty operation. Each value as specified should hold within  $\pm 20\%$  when the receiver is normally operative at its rated supply voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. The voltages given are actual operating values and do not allow for inaccuracies which may be caused by the loading effect of a voltmeter's internal resistance. This resistance should be duly considered for all readings. The amount of circuit resistance shunting the meter during measurement will determine the accuracy to be obtained, the error increasing as the meter re-

sistance becomes comparable to or less than the circuit resistance. For the majority of readings, a meter having an internal resistance of 1000 ohms per volt will be satisfactory when the range used for each reading is chosen as high as possible consistent with good readability.

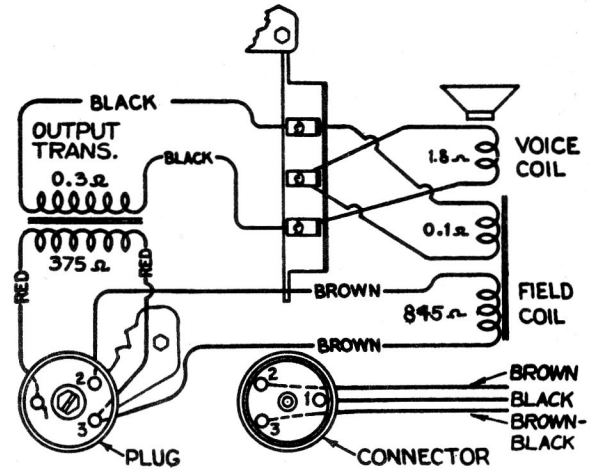


Figure 5—Loudspeaker Wiring

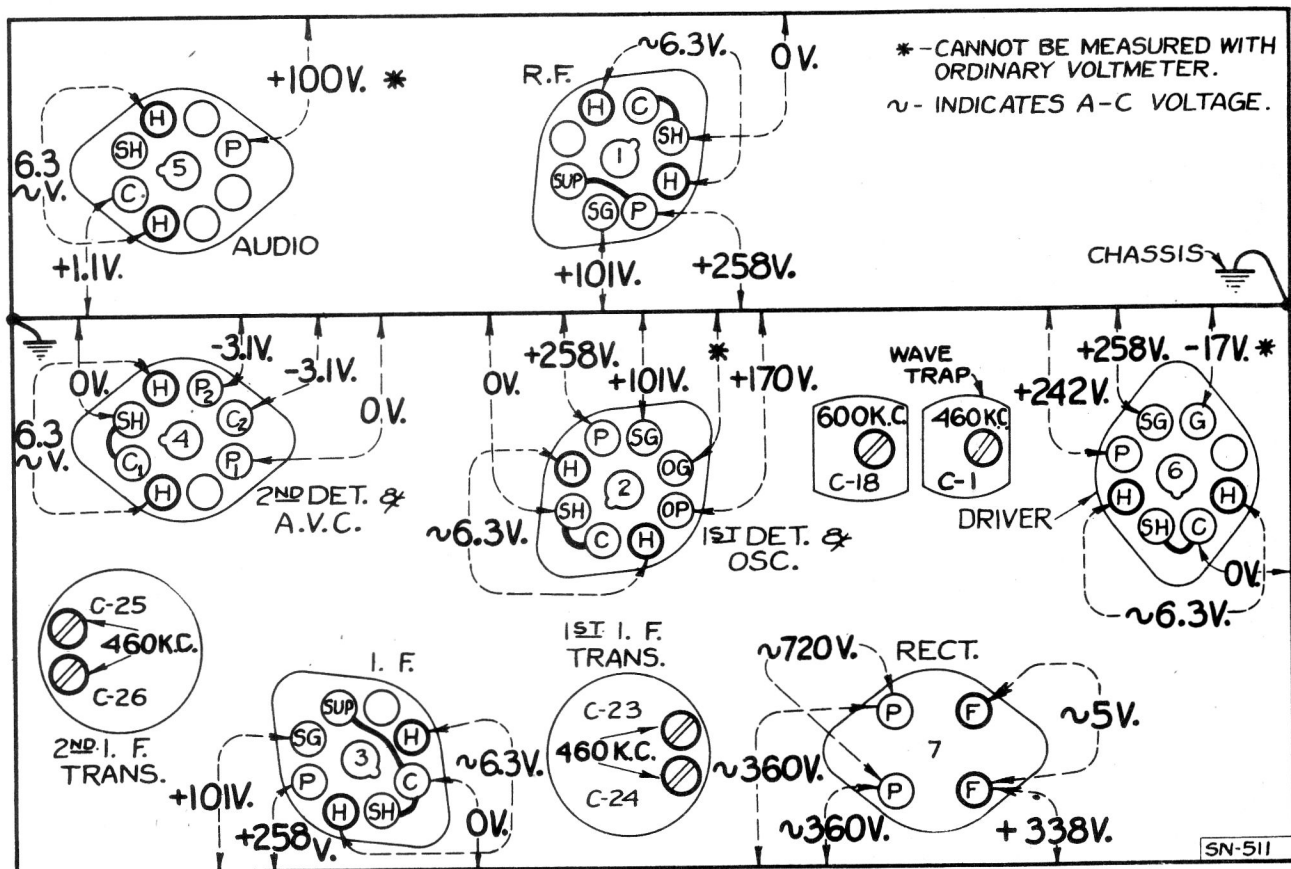


Figure 4—Radiotron Socket Voltages

Measured at 115 volts, 60 cycles—No signal input

## Wave-Trap Adjustment

With the receiver in operation using its normal antenna, tune station selector to the point at which the intermediate frequency interference is most intense. Then adjust the wave trap trimmer to the point which causes maximum suppression of the interference. This trimmer is adjusted to 460 kc. during manufacture, however, local conditions may require a readjustment, depending upon the interfering frequency.

## NOTES

(1) Beat notes or heterodyning (whistles) may be encountered in some instances on these receivers due to excessive antenna capacitance. This condition may be corrected by reducing the size of the antenna or by inserting a 150 mmfd. capacitor in series with the antenna lead. This may be accomplished in the receiver by removing the bus lead which connects from the antenna terminal to the wave trap inductance L-1 and inserting the condenser between these points.

## REPLACEMENT PARTS

STOCK NO.	DESCRIPTION	STOCK NO.	DESCRIPTION
<b>RECEIVER ASSEMBLIES</b>			
5237	Bushing - Variable tuning condenser mounting bushing assembly - Package of 3.....	11172	Resistor - 470,000 Ohms - Carbon type - 1/4 Watt (R14).....
11350	Cap - Contact Cap - Package of 5..	11397	Resistor - 560,000 Ohms - Carbon type - 1/10 Watt (R2,R4).....
11465	Capacitor - Adjustable capacitor (C18).....	11151	Resistor - 2.2 megohms - Carbon type - 1/4 Watt (R9,R32,R31).....
11289	Capacitor - 50 MMfd. (C37).....	11603	Shield - Antenna or detector coil shield.....
5116	Capacitor - 175 MMfd. (C31).....	11604	Shield - Shield - Oscillator coil shield.....
11290	Capacitor - 400 MMfd. (C2,C7,C13,C38).....	11383	Shield - Rectifier Radiotron shield
11401	Capacitor - 4000 MMfd. (C3).....	11390	Shield - Intermediate frequency transformer shield.....
4868	Capacitor - .005 Mfd. (C29, C34).	11199	Socket - Dial lamp socket.....
4906	Capacitor - .017 Mfd. (C33).....	4794	Socket - 4-Contact rectifier Radiotron socket.....
11395	Capacitor - .01 Mfd. (C28).....	11198	Socket - 7-Contact 6K7,6F5 or 6H6 Radiotron socket.....
4858	Capacitor - .01 Mfd. (C32,C51).....	11196	Socket - 8-contact 6A8 or 6F6 Radiotron socket.....
4791	Capacitor - 0.1 Mfd. (C14).....	11386	Switch - Range Switch (S1).....
4841	Capacitor - 0.1 Mfd. (C21).....	11392	Switch - Tone control and power switch assembly (S2,S3).....
5170	Capacitor - 0.25 Mfd. (C8).....	11388	Transformer - First intermediate frequency transformer (L16,L17,C23,C24).....
11240	Capacitor - 10 Mfd. (C36).....	11389	Transformer - Second intermediate frequency transformer (L18,L19,C25,C26,C27,R7,R8).....
11387	Capacitor - 10 Mfd. (C22).....	11384	Transformer - Power transformer - 105-125 volts, 50-60 cycles (T1).
5212	Capacitor - 18 Mfd. (C35).....	11725	Transformer - Power transformer - 105-125 volts, 25-50 cycles.....
5238	Clip - Antenna terminal board with clip, insulating strip and rivets	11391	Trap - Wave trap (L1,C1).....
11600	Coil - Antenna coil (L2,L3,L4,L5,C4,R1).....	11237	Volume Control (R11).....
11601	Coil - Detector coil (L6,L7,L8,L9,C9,R3).....	<b>MISCELLANEOUS ASSEMBLIES</b>	
11602	Coil - Oscillator coil (L10,L11,L12,L13,L14,L15,C15,C16).....	11376	Escutcheon - Station selector escutcheon and crystal.....
11385	Condenser - Three gang variable tuning condenser (C5,C6,C11,C12,C19,C20).....	11191	Bracket - Radiotron tuning lamp mounting bracket - Less clamp....
11673	Dial - Station selector dial.....	11192	Clamp - Radiotron tuning lamp mounting clamp - Less bracket....
11394	Foot - Chassis foot assembly - Package of 2 .....	11276	Escutcheon - Radiotron tuning lamp escutcheon.....
11396	Indicator - Station selector indicator pointer.....	11382	Resistor - 1 megohm - Carbon type - 1/10 Watt - Used in tuning tube socket.....
5226	Lamp - Dial Lamp - Package of 2...	11381	Socket - Radiotron tuning tube socket and cover.....
11393	Resistor - Voltage divider resistor - comprising one 3,500 ohm and one 13,000 ohm sections - (R15,R20).....	11582	Knob - Range switch knob - Package of 2.....
11329	Resistor - Voltage divider resistor - comprising one 148 ohm, one 32 ohm and one 85 ohm sections (R16,R17,R18).....	11610	Knob - Station selector knob assembly - comprising one small and one large knob.....
11369	Resistor - 12 Ohms - flexible type complete with contact cap (R22)...	11347	Knob - Volume control or tone control knob - Package of 2.....
11324	Resistor - 560 Ohms - Carbon type - 1/4 watt (R24).....	11210	Screw - Chassis mounting screw assembly - Console Model - Package of 4.....
8072	Resistor - 33,000 Ohms - Carbon type - 1/2 Watt (R5) .....		
11322	Resistor - 39,000 Ohms - Carbon type - 1/4 Watt (R10).....		
3118	Resistor - 100,000 Ohms - Carbon type - 1/4 Watt (R19) .....		
11365	Resistor - 82,000 Ohms - Carbon type - 1/4 Watt (R23).....		
11323	Resistor - 270,000 Ohms - Carbon type - 1/4 Watt (R13).....		

# REPLACEMENT PARTS—MODELS A-70 & A-75

STOCK NO.	DESCRIPTION	STOCK NO.	DESCRIPTION
11377	Screw - Chassis mounting screw assembly - Table Model - Package of 4 .....	11253	Transformer - Output transformer (T2).....
11349	Spring - Retaining spring for knobs, Stock No. 11347, No. 11582 and small knob in Stock No. 11610 - Package of 5.....	11230	Washer - "Binders board" "C" washer - used to hold field coil securely - Package of 5.....
4982	Spring - Retaining spring for large knob in Stock No. 11610 - Package of 10.....		<b><u>REPRODUCER ASSEMBLIES</u></b>
	<b><u>REPRODUCER ASSEMBLIES</u></b>		(Console Model)
	(Table Model)		
11232	Board - Terminal board with two lead wire clips.....	11232	Board - Terminal board assembly with two lead wire clips.....
11231	Bolt - Yoke and core assembly bolt and nut.....	11231	Bolt - Reproducer yoke and core assembly bolt and nut.....
8060	Bracket - Output transformer mounting bracket.....	8060	Bracket - Output transformer mounting bracket.....
11257	Clamp - Cone center suspension clamping nut and screw assembly - Package of 5.....	11257	Clamp - Cone center suspension clamping nut and screw assembly - Package of 5.....
11254	Coil - Field coil (L22).....	11254	Coil - Field coil (L22).....
11233	Coil - Neutralizing coil (L21)....	11233	Coil - Neutralizing coil (L21)....
11235	Cone - Reproducer cone (L20).....	11258	Cone - Reproducer cone (L20).....
5119	Connector - 3-contact female connector for reproducer cable.....	5118	Connector - 3-contact male connector for reproducer.....
5118	Connector - 3-contact male connector for reproducer.....	5119	Connector - 3-contact female connector for reproducer cable.....
9618	Reproducer - Complete.....	9619	Reproducer - complete.....
		11253	Transformer - Output transformer (T2).....
		11230	Washer - "Binders board" "C" washers - used to hold field coil securely - Package of 5.....