

MODELS A-64 & A-69

Six-Tube, Three-Band, A-C Superheterodyne Receivers

Electrical Specifications

RADIOTRON COMPLEMENT

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

- (4) Type-6F5.....Audio Voltage Amplifier
- (5) Type-6F6.....Audio Power Amplifier
- (6) Type-80.....Full Wave Rectifier

FREQUENCY RANGES

Band A..... 540— 1625 kc.
Band B..... 1625— 5700 kc.
Band C..... 5700—18000 kc.

ALIGNMENT FREQUENCIES

Band A..... 600 kc. (osc.), 1400 kc. (osc., ant.)
Band B..... None required
Band C..... 18000 kc. (osc., ant.)

Intermediate Frequency **460 kc.**

POWER SUPPLY RATINGS

Rating A..... 105—125 volts, 50—60 cycles, 85 watts
Rating B..... 105—125 volts, 25—60 cycles, 90 watts

POWER OUTPUT

Undistorted..... 2.0 watts
Maximum..... 4.5 watts

LOUDSPEAKER

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

Mechanical Specifications

Chassis Base Dimensions..... 12 inches x 7 inches x 2½ inches
Tuning Drive Ratio..... 10 to 1 and 50 to 1

MODEL A-64

Height 20 inches
Width 13⅝ inches
Depth 8¾ inches

Weight (Net) 20½ pounds
Weight (Shipping) 23½ pounds

MODEL A-69

Height 38½ inches
Width 20⅞ inches
Depth 11½ inches

Weight (Net) 43 pounds
Weight (Shipping) 56 pounds

General Features

These two models each employ the same six-tube chassis. They have the new metallic 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 shortwave broadcast bands at 49, 31, 25, 19 and 16 meters. Chassis features include automatic volume control, high frequency 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-64)

uses an 8-inch dynamic speaker and the console model (A-69) uses an improved 12-inch dynamic speaker. The tuning dial is an illuminated semi-airplane type. Positions of the range selector knob are marked on the control panel to show which tuning band is in use. The tuning control is of the dual-ratio type, which permits rough tuning through a 10-1 drive ratio and vernier tuning through a 50-1 drive ratio. The latter is especially advantageous for accurate tuning of the short-wave stations.

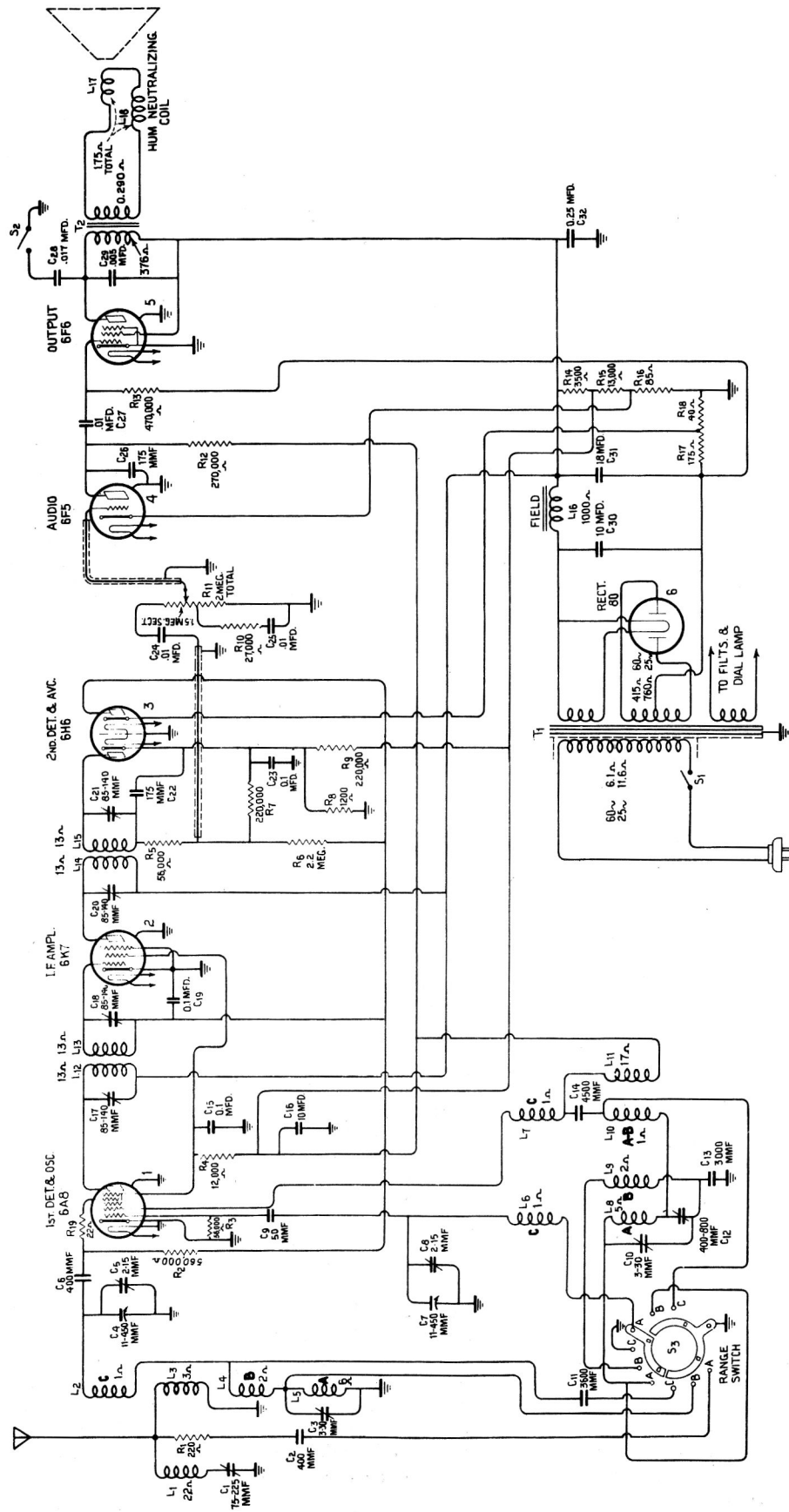


Figure 1—Schematic Circuit Diagram

On some instruments, R-8, R-9 and C-23 are omitted and the Type-6H6 first Cathode is directly grounded.

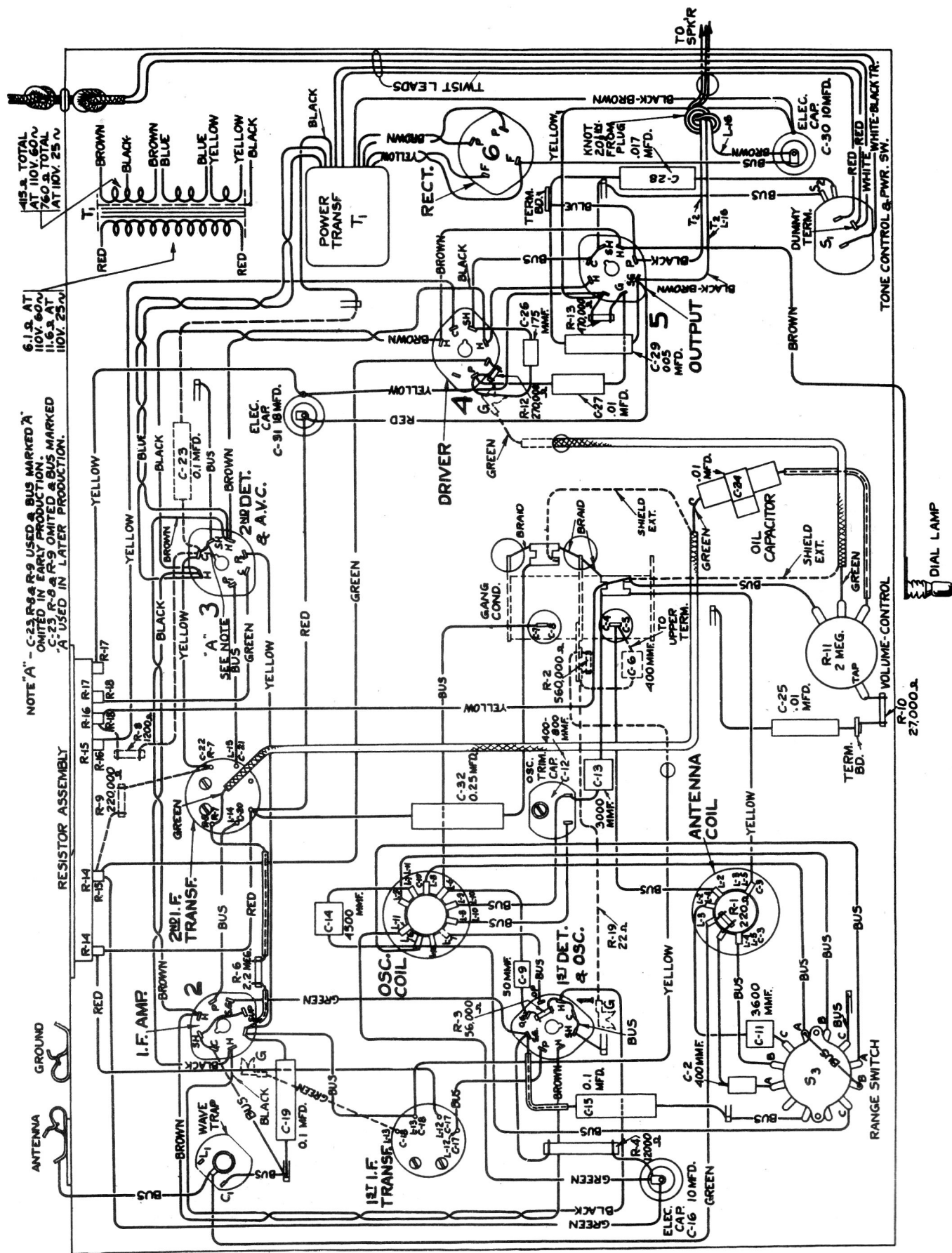


Figure 2—Chassis Wiring Diagram

Circuit Arrangement

The conventional Superheterodyne type of circuit, consisting of 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.

Tuned Circuits

The antenna coil system consists 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-3) is used for connecting the various sections of these two coil systems into the circuit to provide operation on the band desired. The coils are tuned by a variable two-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 double 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 automatic volume control. This voltage, which develops across resistor R-7, is applied as automatic control grid bias to the 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-6, R-7 and R-8, 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. The cathode and anode of the signal-a.v.c. diode have positive potential in respect to chassis-ground and cathodes of the a.v.c. controlled tubes when no signal is being received. (The cathode of the second detector diode is being grounded on later production to simplify manufacture and to minimize the number of component parts required. Two resistors, R-9 and R-8, and one condenser, C-23, of the first production models have accordingly been eliminated as is noted on the schematic and chassis wiring diagrams.)

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. This capacitor may be cut in or out of the circuit as desired by means of a switch (S-2).

Rectifier

The power required for operation of this receiver is supplied through transformer T-1. This transformer has an efficient static 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 high voltage necessary for plate, screen, cathode and grid potentials through a brute-force filter. The field winding of the loudspeaker is used as a reactor in this 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. Ratings 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 re-

sistances only, and when the resistance is less than one ohm, no rating is given.

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 and two in the antenna coil system. Each of these trimmers have 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 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 receiver output during the adjustment is necessary to enable the serviceman to obtain an accuracy of alignment which is not possible by listening to the signal. The G. E. Stock No. 9595 Full Range Oscillator and the G. E. 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 of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two trimmers 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 interaction between them has not disturbed the original adjustment.

R-F Trimmer Adjustments

The two 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 input.

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 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 of the antenna section of the variable condenser, simultaneously rocking the receiver tuning control backward and for-

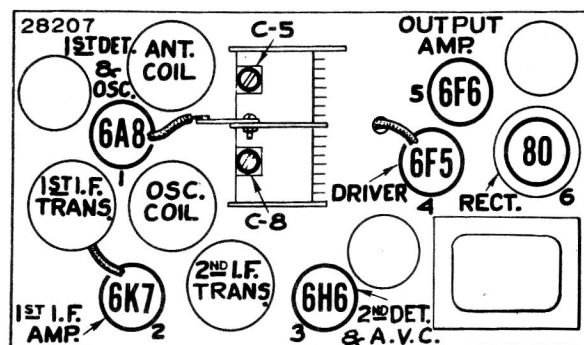


Figure 3—Radiotron and Coil Locations

ward through the 18,000 kc. input signal, until maximum receiver output results 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 antenna tuned circuit.

- (d) Change the receiver range selector to its Band A position and set the receiver tuning control to a dial reading of 1400 kc. Tune the test oscillator to this same frequency and regulate its output to produce a slight indication on the receiver output indicating device.
- (e) Adjust the high frequency trimmers of the Band A oscillator and antenna coils, C-10 and C-3 respectively, to the points at which each produces maximum indicated receiver output.
- (f) 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.
- (g) Tune the low frequency trimmer, C-12, of the oscillator Band A coil, simultaneously rocking the tuning control of the receiver backward and forward through the signal, until maxi-

cuit 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.

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 resistance becomes comparable to or less than the cir-

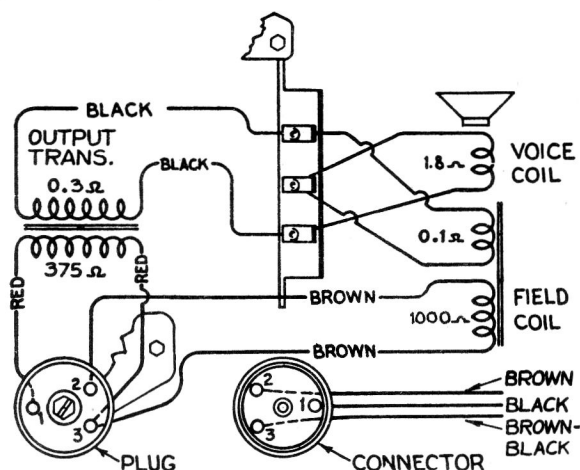


Figure 5—Loudspeaker Wiring

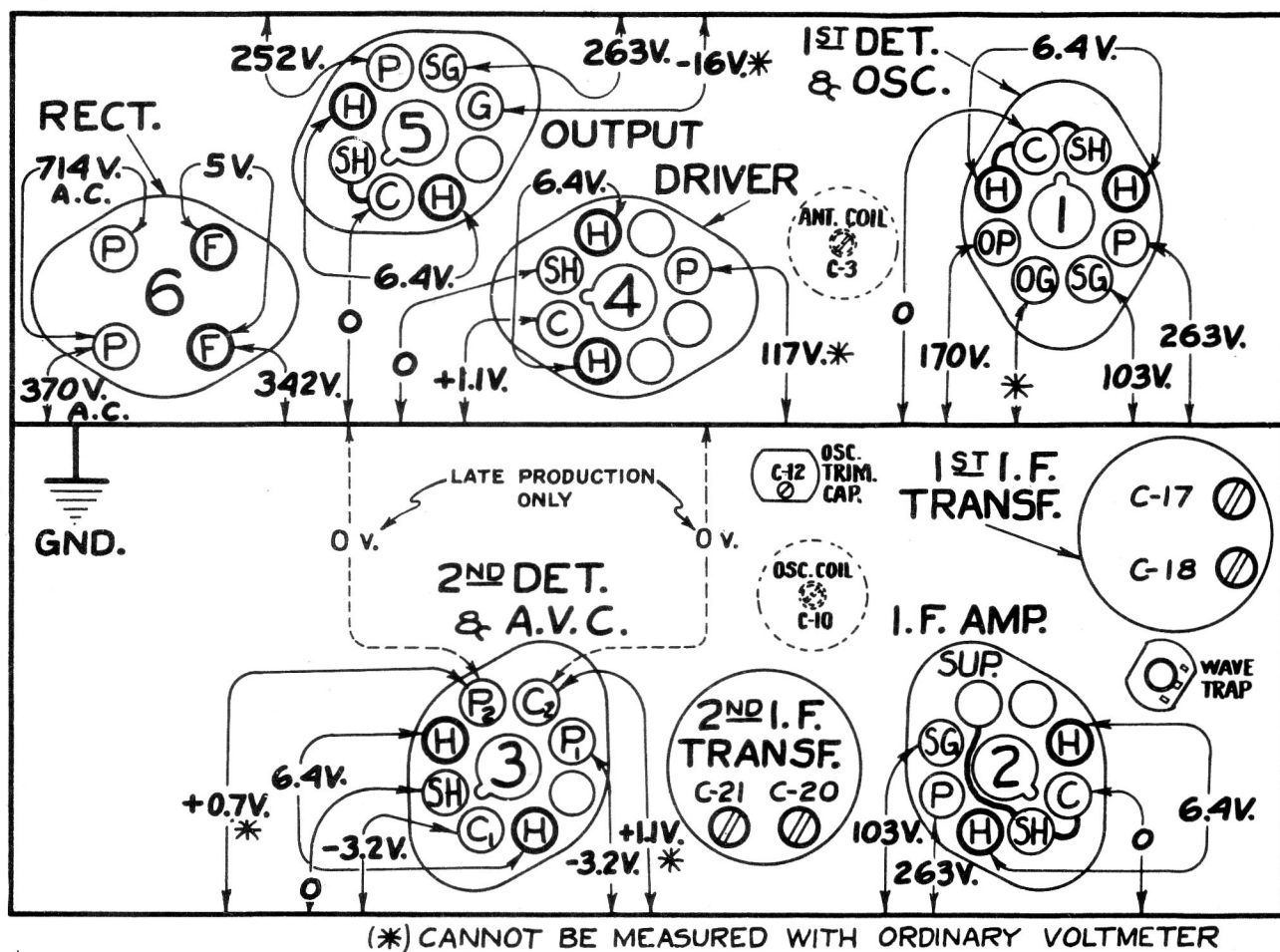


Figure 4—Radiotron Socket Voltages
Measured at 115 volts, 60 cycle supply—No signal being received

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.

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.

A-64 and A-69

REPLACEMENT PARTS

STOCK NO.	DESCRIPTION	STOCK NO.	DESCRIPTION
RECEIVER ASSEMBLIES			
5237	Bushing - Variable tuning condenser mounting bushing - Package of 3.....	5158	Resistor - 220,000 Ohms - Carbon type - 1/4 watt (R9).....
11455	Capacitor - Adjustable capacitor (C12).....	11453	Resistor - 270,000 Ohms - Carbon type - 1/10 watt (R12).....
11289	Capacitor - 50 MMfd. (C9).....	11452	Resistor - 470,000 Ohms - Carbon type - 1/10 watt (R13).....
11623	Capacitor -175 MMfd. (C26).....	11397	Resistor - 560,000 Ohms - Carbon type - 1/10 watt (R2).....
11290	Capacitor -400 MMfd. (C2,C6).....	11626	Resistor - 2.2 Megohms - Carbon type - 1/4 watt (R6).....
11622	Capacitor-3000 MMfd. (C13).....	11603	Shield - Antenna or Oscillator coil shield.....
11621	Capacitor-3600 MMfd. (C11).....	11390	Shield - Intermediate frequency transformer shield.....
11287	Capacitor-4500 MMfd. (C14).....	11383	Shield - Rectifier Radiotron shield.....
4868	Capacitor-.005 Mfd. (C29).....	11199	Socket - Dial lamp socket.....
11395	Capacitor -.01 Mfd. (C24).....	4794	Socket - 4 contact rectifier radiotron socket.....
4858	Capacitor -.01 Mfd. (C25,C27)....	11198	Socket - 7 contact radiotron socket.....
4906	Capacitor -.017 Mfd. (C28).....	11196	Socket - 8 contact radiotron socket.....
4841	Capacitor -.01 Mfd. (C19,C23)....	S1573	Knob - Range switch knob - Package of 2.....
11414	Capacitor -.01 Mfd. (C15).....	11610	Knob - Station selector knob assembly comprising one small and one large knob.....
5170	Capacitor -.025 Mfd. (C32).....	S1574	Knob - Volume control or tune control knob - Package of 2.....
11387	Capacitor - 10 Mfd. (C16).....	11616	Switch - Range Switch (S3).....
11240	Capacitor - 10 Mfd. (C30).....	11460	Switch - Tone control and power switch - (S1, S2).....
5212	Capacitor - 18 Mfd. (C31).....	5238	Terminal - Antenna terminal board with clip.....
11617	Coil - Antenna Coil (L2,L3,L4,L5, C3,R1).....	11388	Transformer - First intermediate frequency transformer(L12,L13, C17,C18).....
11618	Coil - Oscillator Coil (L6,L7,L8, L9,L10,L11,C10).....	11389	Transformer - Second intermediate frequency transformer (L14,L5, C20,C21,C22,R5,R7).....
11612	Condenser - Two-gang variable tuning condenser (C4,C5,C7,C8)...	11458	Transformer - Power transformer - 105-125 Volts - 50-60 Cycles (T1).....
11615	Dial - Station selector dial.....	11585	Transformer - Power transformer - 102-125 Volts - 25-50 Cycles....
11376	Escutcheon - Station selector escutcheon and crystal.....	11391	Trap - Wave trap (L1,C1).....
11619	Foot - Chassis mounting foot and bracket assembly - Package of 2..	11237	Volume Control (R11).....
11396	Indicator - Station selector indicator pointer.....	REPRODUCER ASSEMBLIES	
5226	Lamp - Dial Lamp - Package of 2...	Console Models	
11466	Resistor - Voltage divider resistor - comprising one 3500 ohm, one 13000 ohm, one 85 ohm, one 40 ohm, and one 175 ohm sections(R14, R15,R16,R17,R18).....	11232	Board - Terminal Board assembly...
11624	Resistor - 22 ohms - Flexible type - complete with contact cap(R19).		
11620	Resistor - 220 Ohms - Carbon type - 1/10 watt(R1).....		
11283	Resistor - 1200 Ohms - Carbon type - 1/4 watt (R8).....		
3066	Resistor - 12,000 Ohms - Carbon type - 1 watt (R4*).....		
11400	Resistor - 27,000 Ohms - Carbon type - 1/4 watt (R10).....		
5029	Resistor - 56,000 Ohms - Carbon type - 1/4 watt (R3*).....		

REPLACEMENT PARTS—A-64 & A-69

STOCK NO.	DESCRIPTION		STOCK NO.	DESCRIPTION	
11231	Bolt - Yoke and core assembly bolt and nut.....			<u>REPRODUCER ASSEMBLIES</u>	
8060	Bracket - Output transformer mounting bracket.....			<u>Table Model</u>	
11257	Clamp - Cone center suspension clamping nut and screw assembly - Package of 5.....		11232	Board - Terminal board assembly...	
11470	Coil - Field coil (L16).....		11231	Bolt - Yoke and core assembly bolt and nut.....	
11469	Coil - Neutralizing coil (L18)....		8060	Bracket - Output transformer mounting bracket.....	
11258	Cone - Reproducer cone (L17).....		11257	Clamp - Cone center suspension clamping nut and screw assembly - Package of 5.....	
5118	Connector - Three contact male connector for reproducer.....		11470	Coil - Field coil (L16).....	
5119	Connector - Three contact female connector for reproducer cable...		11469	Coil - Neutralizing coil (L18)....	
9622	Reproducer - Complete.....		11235	Cone - Reproducer Cone (L17).....	
11253	Transformer - Output transformer (T2).....		5118	Connector - Three contact male connector for reproducer.....	
11230	Washer - Binders board "c" washer - used to hold field coil assembly - Package of 5.....		5119	Connector - Three contact female connector for reproducer cable...	
			9621	Reproducer - Complete.....	
			11253	Transformer - Output transformer (T2).....	
			11230	Washer - Binders Board "c" washer - used to hold field coil assembly - Package of 5.....	

* Used on some models:-

3118 - Resistor 100,000 Ohms - Carbon type 1/4 Watt R3

8072 - Resistor 33,000 Ohms - Carbon type 1/2 Watt R4