

MODELS A-63 & A-68

Six-Tube, Two-Band, A-C Receivers

ELECTRICAL SPECIFICATIONS

Voltage and Frequency Ratings.	(105-125 Volts, 50-60 Cycles (105-125 Volts, 25-60 Cycles
Power Consumption85 Watts
Radiotrons and Functions.	(1) Type-6A7 Oscillator and First Detector (2) Type-6K7 I.F. Amplifier (3) Type-6K7 I.F. Amplifier (4) Type-6B7 Detector A.F. Amplifier and A.V.C. (5) Type-6F6 Power Output (6) Type-80 Rectifier
Tuning Frequency Ranges.	540 K.C.-1720 K.C. and 5400 K.C.-18,000 K.C.
Alignment Frequencies	460 K.C. (I.F.), (W.T.), 600 K.C. (Osc.), 1720 K.C. (Osc. and Det.) and 18,000 K.C. (Osc. and Det.)
Undistorted Output	1.75 Watts
Maximum Output	3.5 Watts

PHYSICAL SPECIFICATIONS

	Model A-63	Model A-68
Height	17-7/16 Inches	38 - Inches
Width.	14-3/16 Inches	24-1/8 Inches
Depth.	10-5/16 Inches	11-1/4 Inches

These six-tube, two-band receivers employ identical chassis assemblies, which are designed for frequency coverage of the standard broadcast band and the more important short-wave bands now in use for trans-oceanic broadcast work.

A variable ratio drive is used in combination with an "airplane" type dial to simplify the accurate tuning necessary for proper reception of the short-wave signals. An automatic volume control system is incorporated in the circuits of the receiver which stabilizes the output when atmospheric fluctuations cause fading. This feature is of prime importance when receiving short-wave signals.

Reproduction of good quality is obtained from a pentode output tube operating into a uniformly efficient loudspeaker. Tone control is provided in the power output stage so that by operating a double throw switch, the high fre-

quency response may be reduced by a predetermined amount.

Service convenience has been an especial requirement in the layout and construction of this receiver. A plug-connector attachment is used in the chassis to speaker cable which will allow ready removal of either unit without disturbing the other. Trimmer adjustments are located at accessible points, their number is reduced to the least that is consistent with efficient operation.

These models have been manufactured using both glass and metal tubes. Those models using glass tubes, the tube complement is as follows: 1 Type 6A7, 2 Type 6D6, 1 Type 6B7, 1 Type 41, 1 Type 80. In those models employing metal tubes, a 6K7 was replaced by a 6K7G, these two tubes are interchangeable and 6K7G can be substituted by 6K7.

DESCRIPTION OF ELECTRICAL CIRCUIT

The circuit embodied in this receiver is of the superheterodyne type. Its layout is shown schematically in Figure 3. Two ranges of tuning are provided by two separate sets of coils. A tuned transformer is employed to couple the antenna system into the first detector tube which is a Type-6A7. This tube also serves, by the coordinate arrangement of its elements, to generate the local oscillation required for superheterodyne operation. The local oscillation is modulated with the incoming signal by the mutual effect of the tube elements on the electron flow. The difference beat frequency of these two signals is amplified by this same tube and delivered to the i-f amplifier system. There are two Type 6K7 tubes used for i-f amplification. Three transformers intercouple these tubes. The primaries and secondaries of two of these transformers are resonated to the intermediate frequency (460 kc.). The third i-f transformer has no adjustable capacitors; its natural tuning is such as to obtain the desired selectivity and efficiency. Diode detection is performed in a Type-6B7 tube, a duplex diode pentode. The signal from the i-f system is applied to one of the diodes of the tube, where detection takes place. The remaining diode is tied solidly to ground.

A voltage having the character of an audio wave superimposed upon a constant d-c is developed by the detection process across the manual volume control resistor R14. The d-c portion of this voltage, which is dependent upon the strength of the carrier of the signal being received, is used to automatically regulate the

control grid bias voltages of the first-detector and the i-f amplifier stages. Maximum control is used on the detector and first i-f, while a reduced amount of control is applied to the second i-f. A portion of the audio component of the detected voltage appearing across the manual volume control is carried through the variable arm and a blocking condenser to the control grid of the Type-6B7, which simultaneously functions to provide audio amplification. The audio signal is conducted from the detector - a-f amplifier - a.v.c. stage to the power-output tube through a resistance-capacitance network. At this point there is provision for changing the audio response of the receiver, so that proper results will be obtained in both the long-wave and the short-wave bands. As shown on the schematic, the switch S7 operates so that for long-wave reception the resistor R25 and condenser C32 are in series with the plate resistor R17, while for short-wave reception the resistor-condenser combination is shorted out. The output tube delivers a high-level high-quality signal to the electro-dynamic loudspeaker through an efficiently designed matching transformer. A two-point tone control consisting of a small capacitor and a single pole switch is connected in the plate circuit of the Type-41 output tube.

Direct current voltages required are obtained from a full-wave rectifier system. The electro-dynamic speaker receives its magnetization current from the rectifier tube, a Type-80. It is connected into the circuit so that it will function as a reactor for filtering of the plate currents.

SERVICE DATA

(1) LINE-UP ADJUSTMENTS

Maximum efficiency and best quality of performance will only be obtained when the circuits are in the proper alignment. "Trimmer capacitors are provided at accessible locations on the receiver chassis for accurately realigning the circuits when they have deviated from normal. Incorrect alignment is usually evidenced by low sensitivity, poor quality and irregular double-peaked tuning.

It is important in re-adjusting the line-up trimmers to use proper oscillator and indicator apparatus. Certain standard service instruments, which are useful in making these adjustments, have been devised and made available to the service man by the manufacturer of this receiver. They are illustrated and described on page 2.

Preliminary Tests

Before making any adjustments, it is wise to determine the correctness of the existing alignment. This may be done by supplying a signal to the circuit (r-f, oscillator or i-f) from the "Full-Range Oscillator", and inserting the "Tuning Wand" into the coils involved. The "Tuning Wand" consists of a bakelite rod having a brass cylinder attached to one end, and a small core of finely divided iron compacted into the opposite end. By inserting the brass cylinder end into the center of a particular coil, through

the opening provided in the top of the shield as shown in Figure 1, the inductance of the coil is lowered, and therefore, the resonant frequency is increased. Placing the other end (iron filing core) into the coil raises the inductance and conversely decreases the resonant frequency. Thus it is apparent, that if the circuits are in exact resonance with the standard signal of the "Full-Range Oscillator", the insertion of either end of the wand will cause a reduction of receiver output; whereas if the circuits are not

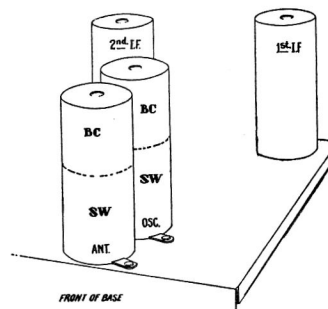


Figure 1—Locations of Coils

in tune or resonance with the incoming signal, one end will bring about an increase of the signal, and the other end will cause a decrease.

When an increase in signal is obtained with the iron filled end of the wand, an increase of the inductance and decrease in frequency of resonance is indicated. The trimmer condenser associated with the circuit under test will therefore require adjustment so as to increase its capacitance. The reverse occurs when a gain in signal is obtained when using the brass cylinder end of the wand.

Changes Indicated by Wand

Wand	Signal	Trimmer
(Brass Decrease)		None
(Iron Decrease)		
(Brass Increase)		Decrease
(Iron Decrease)		
(Brass Decrease)		Increase
(Iron Increase)		

and the following procedure should be applied:

I-F TUNING ADJUSTMENTS

The four i-f trimmer screws shown on Figure 2 must be tuned to 460 kc., as explained below:-

- Short circuit the antenna and ground terminals of the receiver to prevent external signal pick-up. Set the volume control to maximum and attach a good ground connection to the receiver.
- Feed the test oscillator output to the control grid of the first-detector. Connect an output indicator to the voice coil circuit. Regulate the oscillator output con-

trol so that a slight indication occurs on the indicating instrument.

- Adjust the secondary and primary trimmers of the second i-f transformer for maximum (peak) output. Then tune the first i-f transformer in a similar manner. The oscillator output should be maintained at as low a level as will give a good output indication. This will keep the signal from being affected by the a.v.c. action of the receiver. A slight improvement in line-up may be obtained by repeating the above procedure, since there is an interlocking effect between the several tuned circuits.

R-F AND OSCILLATOR ADJUSTMENTS

The trimmer capacitor locations for the r-f and oscillator stages are indicated on Figure 2. There adjustments should be performed as follows:

- Attach the oscillator output to the antenna-ground terminals of the receiver.
- Check the dial pointer and correct its position if necessary. It should be coincident with the dial marking adjacent to 540 when the gang condenser plates are in full mesh.
- With the external oscillator tuned to 1720 kc., and its output adjusted for the critical minimum at full volume control, set the station selector to the 1720 scale marking. Turn the range switch to its right position and adjust the trimmers C10 and C11 on Figure 2 to give maximum

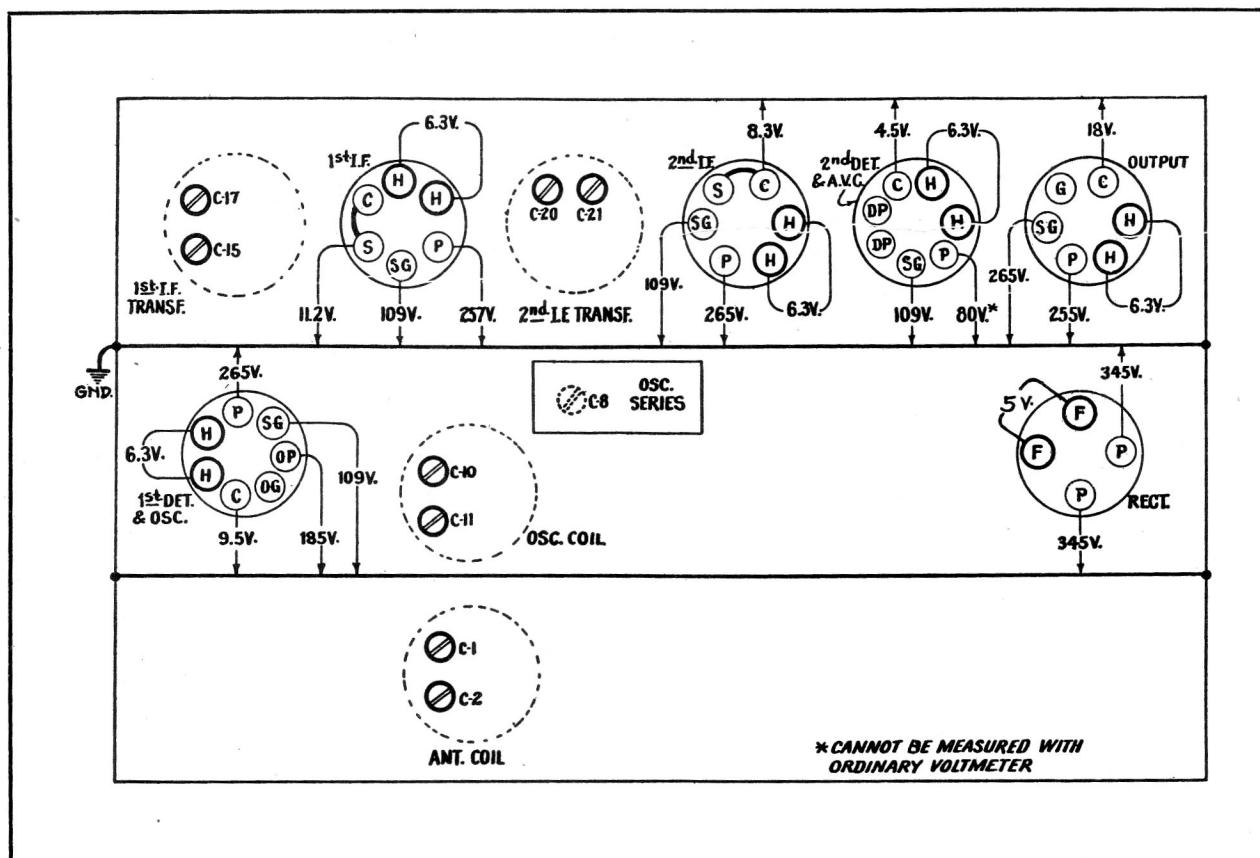


Figure 2—Trimmer Locations and Radiotron Socket Voltages to Ground
(Measured at 115-volt A.C. Supply—Maximum Volume Control—No Signal)

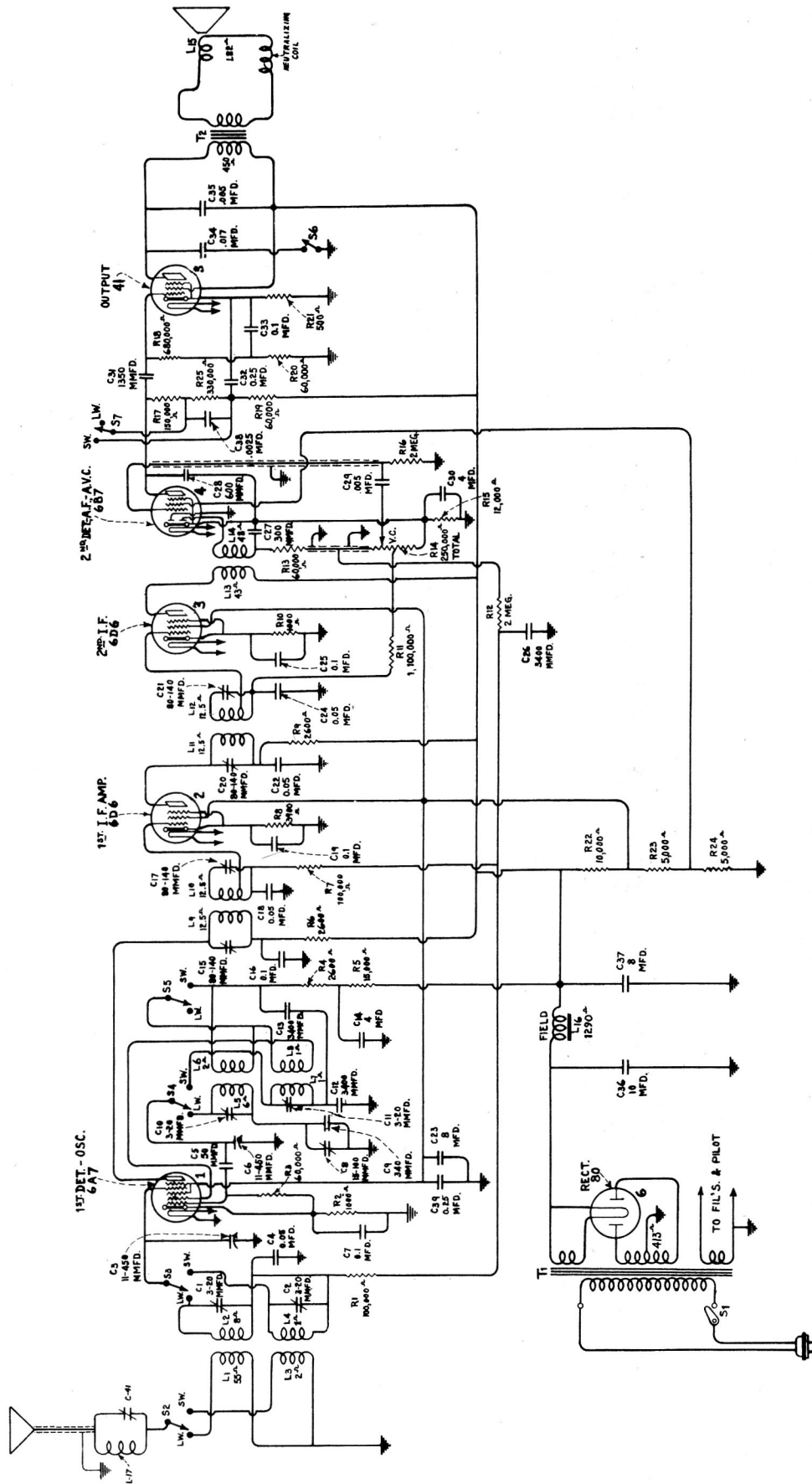


Fig. 3. - Schematic Circuit Diagram of receiver using Glass Tubes.

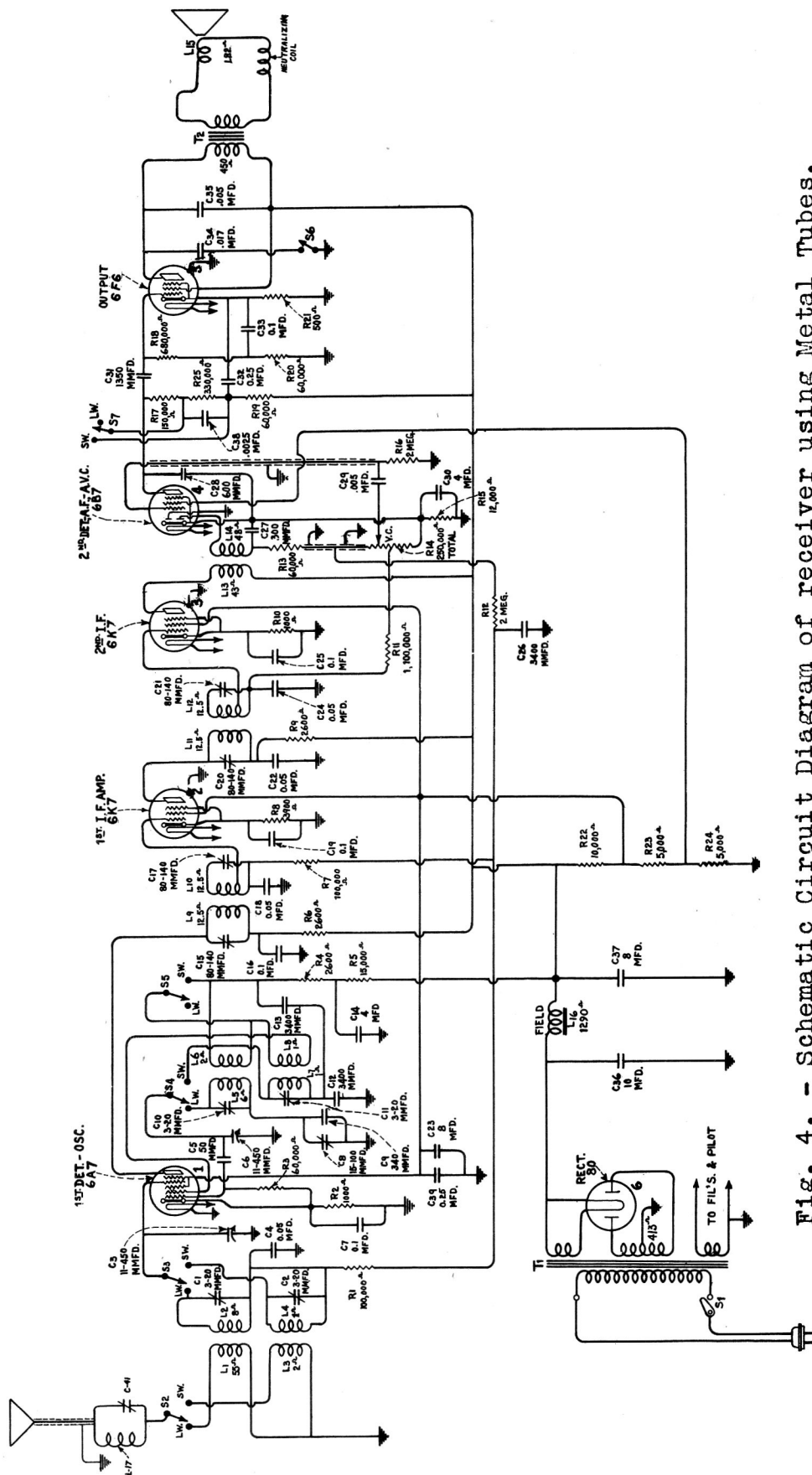


Fig. 4. - Schematic Circuit Diagram of receiver using Metal Tubes.

(peak) receiver output. Then shift the oscillator frequency to 600 kc., and tune in this signal to the receiver. Adjust the oscillator trimmer, C8, simultaneously rocking the tuning condenser slowly through the signal until the maximum output obtainable results from the two combined operations. The dial calibration should be disregarded for this adjustment. The oscillator trimmer C10 should be retuned at 1720 kc. to correct for any change caused by the 600 kc. adjustment.

- (d) Turn the receiver range switch to its left (short-wave) position and set the station selector at the 18 megacycle dial marking. Turn the test oscillator to 18,000 kc. and regulate its output to produce a noticeable indication at the receiver output. Adjust C2 and C11 of the antenna and oscillator coils for maximum receiver output. There will be two positions of the trimmers which give maximum signal. On the oscillator, the position of minimum capacitance is correct; whereas the position of maximum capacitance is proper on the antenna trimmer. The latter should be made while slowly rocking the variable tuning condenser through the signal.

It is important in making the foregoing adjustments to have the receiver operating at maximum sensitivity and using as low an input as will give an accurate output indication. This procedure will obviate the broadness of tuning apparent from the effect of automatic volume control.

(2) CIRCUIT VOLTAGES

Refer to Figure 2. The voltages indicated at the various socket contacts are measured to the chassis. They represent the values which apply to a receiver in normal operating condition at the specified supply voltage. At other voltages, a consistent difference will be perceptible for all readings. Such a general

deviation, due to line voltage, should not be judged as a sign of defective circuit conditions, but rather the erratic measurement used as a basis for the circuit analysis.

Accuracy of the voltage measurements will be a function of the internal resistance of the voltmeter used. It is advisable to employ a meter having at least 1000 ohms per volt and for each reading use the highest range which will give an acceptably accurate reading.

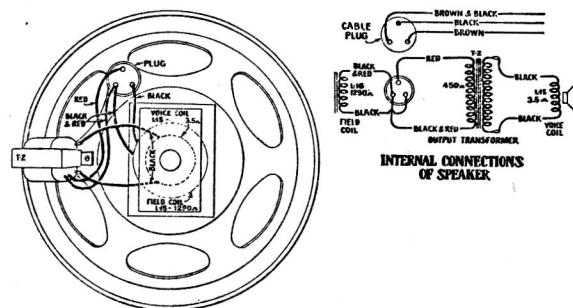


Figure 6—Loudspeaker Wiring—Console Model

(3) WAVE TRAP ADJUSTMENTS

To eliminate code interference in localities near high powered radio telegraph stations operating at frequencies in the vicinity of 460 K.C., a wave trap consisting of a parallel resonant circuit is incorporated in these receivers.

With receiver in operation using its normal antenna, tune the station selector to the point at which the intermediate-wave interference is most intense. Then adjust the wave-trap trimmer to the point which cause maximum suppression of the interference.

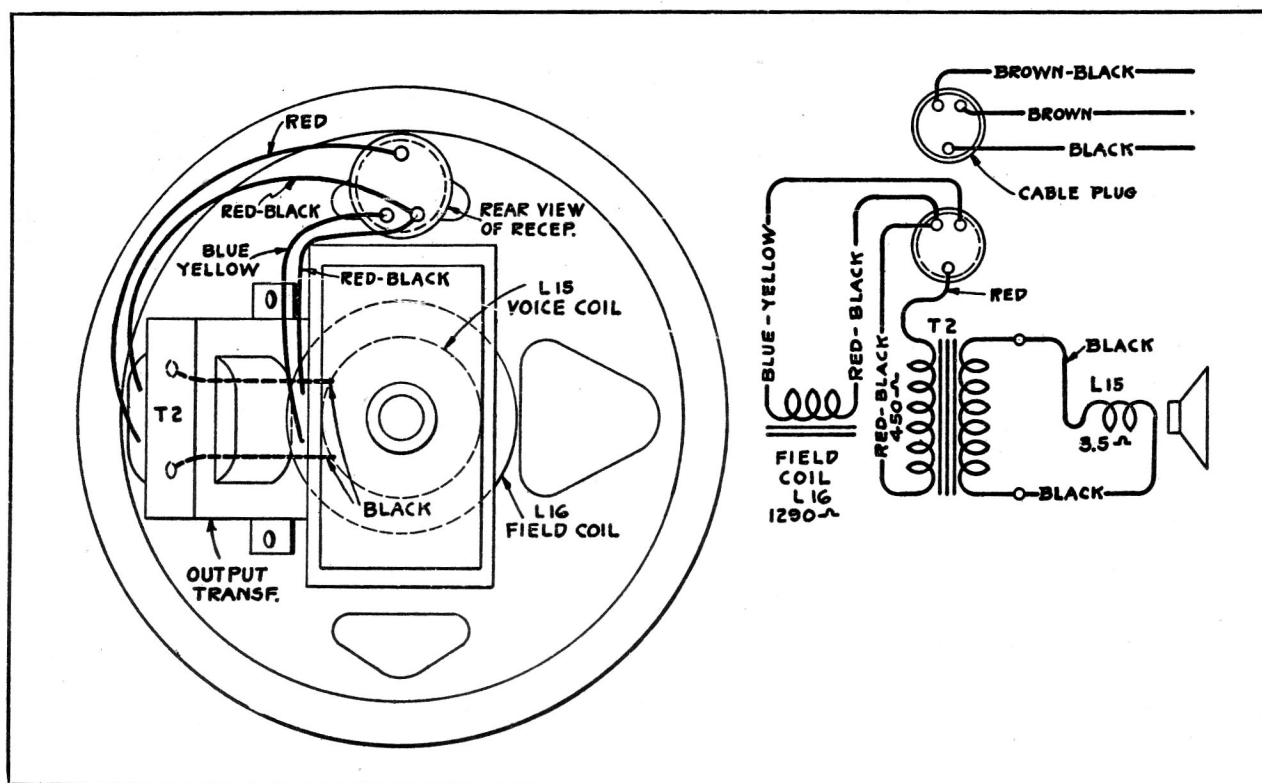


Figure 7—Loudspeaker Wiring—Table Model

RADIOTRON SOCKET VOLTAGES (Referred to ground)

Maximum Volume Control—No Signal—115 Volts A. C. Input

Radiotron		Plate to Ground Volts, D.C.	Screen Grid to Ground Volts, D.C.	Cathode to Ground Volts, D.C.	Plate Current	Heater Volts
Type-6A7	Oscillator	185	--	--	4.5	--
	Detector	265	109	9.5	1.6	6.3
Type-6K7 First I.F.		257	109	11.2	2.2	6.3
Type-6K7 Second I.F.		265	109	8.3	6.6	6.3
Type-6B7 Second Det.		80*	109	4.5	0.3	6.3
Type-6F6 Power		225	265	18.0	30.0	6.3
Type-80 Rectifier		345/345	--	--	68.0	5.0

* Calculated from $\frac{1}{2}$ B.

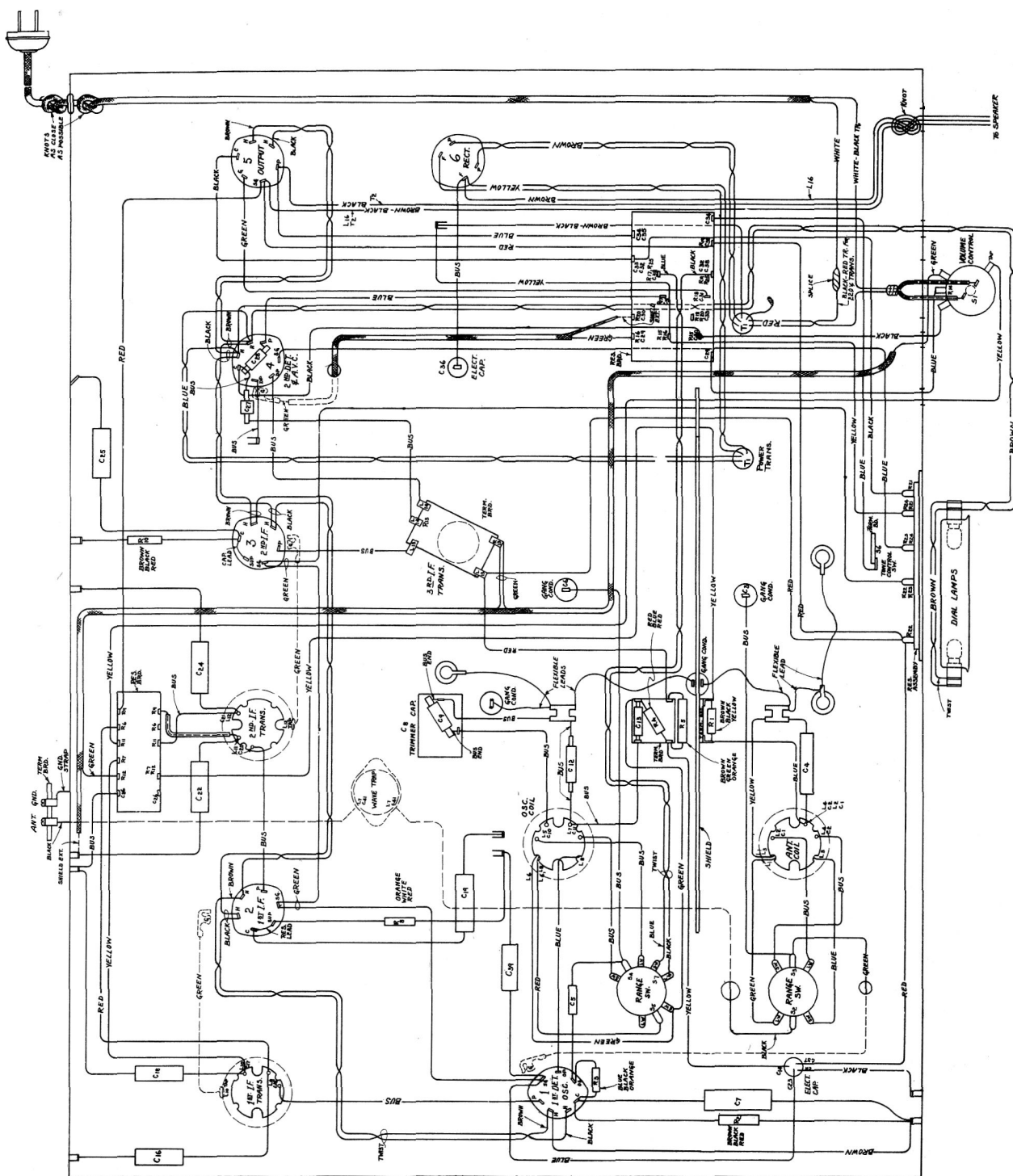


Fig. 5. - Chassis Wiring Diagram of Receiver Using Glass Tubes.

REPLACEMENT PARTS—A-63 & A-68

STOCK NO.	DESCRIPTION	STOCK NO.	DESCRIPTION
	RECEIVER ASSEMBLIES		
4427	Bracket - Volume control mounting bracket.	11425	Cap - 6K7G tube shield cap. . .
4358	Bracket - Electrolytic capacitor bracket for Capacitor No. 7790 .	4784	Socket - 4-contact Radiotron socket.
S-1360	Capacitor - Adjustable trimmer capacitor (C-8).	4785	Socket - 6-contact Radiotron socket.
4442	Capacitor - 50 mmfd. (C-5).	4786	Socket - 6-contact Radiotron socket.
3981	Capacitor - 300 mmfd. (C-27).	4787	Socket - 7-contact Radiotron socket.
4811	Capacitor - 340 mmfd. (C-9).	11198	Socket - Metal tubes
11317	Capacitor - 600 mmfd. (C-28).	4379	Strip - Terminal strip - Engraved "ANT-GND".
5115	Capacitor - 1350 mmfd. (C-31).	5100	Switch - Range Switch (S-2,S-3,S-4,S-5,S-7).
4439	Capacitor - 3400 mmfd. (C-12).	5052	Switch - Tone control switch (S-6).
4881	Capacitor - 3400 mmfd. (C-13,C-26)	9512	Transformer - Power transformer - 105-125 Volts - 25-40 Cycles
5107	Capacitor - 0.0025 mfd. (C-38).	9511	Transformer - Power transformer - 105-125 Volts - 50-60 Cycles (T-1).
4793	Capacitor - 0.005 mfd. (C-29).	5102	Transformer - First intermediate frequency, transformer (L-9, L-10,C-15,C-17).
4868	Capacitor - 0.005 mfd. (C-35).	5103	Transformer - Second intermediate frequency transformer (L-11, L-12,C-20,C-21).
4906	Capacitor - 0.017 mfd. (C-34).	5105	Transformer - Third intermediate frequency transformer (L-13, L-14,R-13).
5170	Capacitor - 0.25 mfd. (C-39).	4790	Volume Control. (R-14,S-1) . .
4836	Capacitor - 0.04 mfd. (C-4,C-18,C-24).	S-1560	Wave Trap Assembly.
4886	Capacitor - 0.05 mfd. (C-22).		
4841	Capacitor - 0.1 mfd. (C-7,C-19,C-25,C-33).		CONDENSER DRIVE ASSEMBLIES
4885	Capacitor - 0.1 mfd. (C-16).		
3597	Capacitor - 0.25 mfd. (C-32).	4422	Drive - Clutch Drive Assembly
3796	Capacitor - 4.0 mfd. (C-30).	4475	Indicator - Station selector (pointer) indicator - Table Model.
7790	Capacitor - 10.0 mfd. (C-36).	4363	Indicator - Station selector (pointer) indicator - Console Model.
5105	Capacitor Pack - Comprising two 8 mfd. and one 4 mfd. Sections (C-14,C-23,C-37).	4256	Lamp - Dial Lamp - Package of 2
5087	Coil - Antenna Coil (L-1,L-2,L-3,L-4,C-1,C-2).	6672	Screen - Translucent screen for dial light - Package of 3. . .
5089	Coil - Oscillator coil (L-5,L-6,L-7,L-8,C-10,C-11).	3529	Socket - Dial lamp socket . . .
4504	Condenser - 2-gang tuning condenser (C-3,C-6).		
5112	Resistor - 1000 ohms - Carbon type - 1/4 Watt (R-2,R-10). . . .		REPRODUCER ASSEMBLIES
4812	Resistor - 2600 ohms - Carbon type - 1/4 Watt (R-4,R-6,R-9). . .		TABLE MODEL
5113	Resistor - 3900 ohms - Carbon type - 1/4 Watt (R-8).	5085	Cable - 3-conductor reproducer cable complete with female connector.
5109	Resistor - 12,000 ohms - Carbon type - 1/4 Watt (R-15).	9587	Coil - Field coil, magnet and cone support (L-16).
5114	Resistor - 15,000 ohms - Carbon type - 1 Watt (R-5).	11235	Cone - reproducer cone (L-15) .
2563	Resistor - 60,000 ohms - Carbon type - 1 Watt.	5118	Plug - 3-contact plug - Male section for reproducer cable .
3602	Resistor - 60,000 ohms - Carbon type - 1/4 Watt (R-3,R-19,R-20). .	5119	Plug - 3-contact plug - Female section for reproducer cable..
3118	Resistor - 100,000 ohms - Carbon type - 1/4 Watt (R-1,R-7).	S-1567	Reproducer - Complete.
5027	Resistor - 150,000 ohms - Carbon type - 1/4 Watt (R-17).	11253	Transformer - Output transformer (T-2).
5108	Resistor - 330,000 ohms - Carbon type - 1/4 Watt (R-25).		REPRODUCER ASSEMBLIES
5110	Resistor - 680,000 ohms - Carbon type - 1/4 Watt (R-18).		CONSOLE MODEL
4783	Resistor - 1,100,000 ohms -Carbon type - 1/4 Watt (R-11).	5085	Cable - 3-conductor reproducer cable complete with female connector.
6242	Resistor - 2 megohms - Carbon type - 1/4 Watt (R-12,R-16). . . .		
4721	Resistor - Tapped - One 500, one 10,000 and two 5000 ohms sections (R-21,R-22,R-23,R-24). . .		
7800	Shield - Antenna, I.F. or oscillator coil shield.		
3942	Shield - First detector and output radiotrons shield.		
3782	Shield - Second detector Radiotron shield.		
7487	Shield - I.F. Radiotrons shield .		
11416	Shield - 6K7G tube shield less cap.		

REPLACEMENT PARTS—A-63 & A-68

STOCK NO.	DESCRIPTION	STOCK NO.	DESCRIPTION
S-1564	Coil - Field coil, magnet and cone support (L-16)	S-1556	Dial - Station Selector Dial - Console Model.
11258	Cone - Reproducer cone. (L-15) . .	S-1557	Bezel - Station Selector Dial Bezel & Glass - Table Model. .
5118	Plug - 3-contact plug - Male section for reproducer cable.	4944	Bezel - Station Selector Dial Bezel & Glass - Console.
5119	Plug - 3-contact plug - Female section for reproducer cable.	4449	Knob - Station selector, volume control, or tone control knob - Package of 2.
S-1563	Reproducer - Complete.	S-1559	Knob - Band Switch knobs.
11253	Transformer - Output transformer (T-2)		
MISCELLANEOUS ASSEMBLIES			
S-1555	Dial - Station Selector Dial - Table Model.		