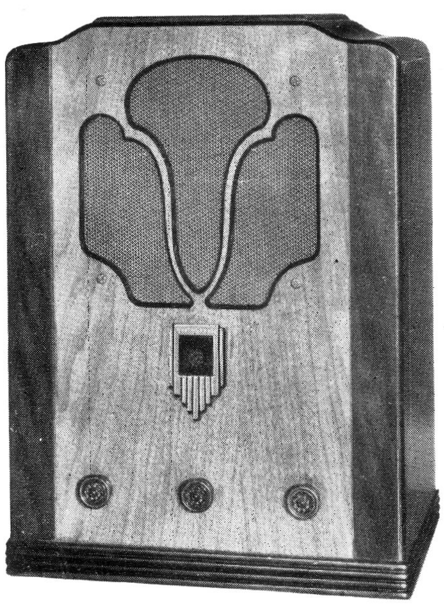
CANADIAN WESTINGHOUSE
RADIO
SERVICE MANUAL

SECTION RS-112

WESTINGHOUSE MODEL
801



CONTROLS
Left—"Volume Control"
Centre—"Station Selector"
Right—"Tone Control"

FIG. 1. FRONT VIEW

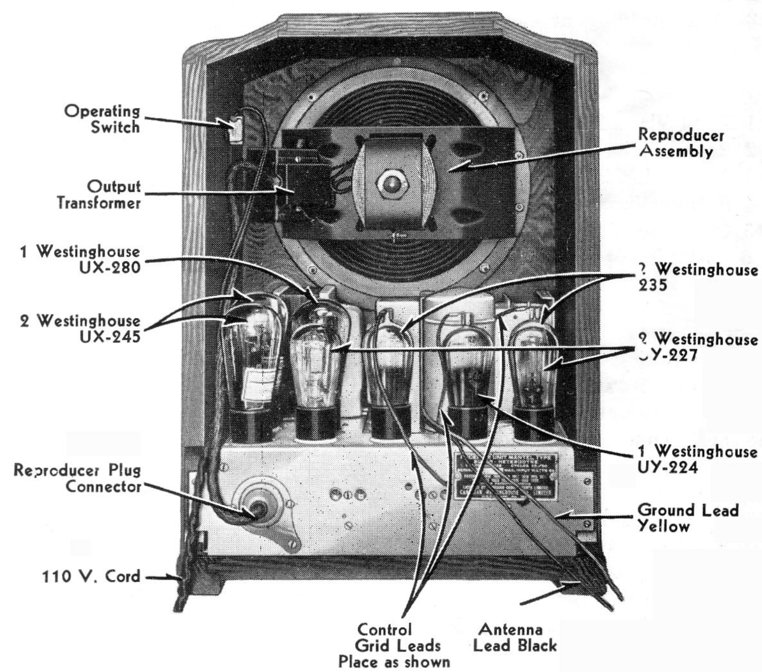


FIG. 2. REAR INTERIOR CABINET VIEW.

AUGUST, 1931

CANADIAN WESTINGHOUSE COMPANY, LIMITED
Service Department

CONTENTS

ELECTRICAL SPECIFICATIONS

Voltage Rating	105—125 Volts
Frequency Rating	25—60 Cycles
Power Consumption	100 Watts
Receommended Antenna Length	25—75 Feet
Type of Circuit	A.C. Screen Grid Super-Heterodyne
Type and Number of Radiotrons	2-235, 1 UY-224, 2 UY-227, 2 UX-245, 1 UX-280; Total 8
Number of Radio Frequency Stages	One
Type of First Detector	Tuned Input Grid Bias
Number of Intermediate Stage	One
Type of Second Detector	Power Grid Bias
Number of Audio Stages	One (Push-Pull)
Type of Rectifier	Full Wave, UX-280
Type of Loudspeaker	Dynamic
Wattage Dissipation in Loudspeaker Field	8.0 (100 Volts—80 M.A.)
Undistorted Output	3.0 Watts

PHYSICAL SPECIFICATIONS

Height	19½ inches
Depth	11¼ inches
Width	14 inches
Weight Alone	48 pounds
Weight (Packed for Shipment)	56 pounds
Packing Case Dimensions	17¼″x13¼″x22″

INTRODUCTION

Westinghouse Model 801 is a compact radio receiver employing the super-heterodyne circuit. The inherent sensitivity, selectivity and tone quality of the super-heterodyne is a feature of this receiver. The unit type of construction is used (both S.P.U. and receiver assembly incorporated in the same chassis) which together with the reproducer unit results in a compact receiver of excellent performance. The entire mechanism is enclosed in a cabinet of pleasing design. Figure 2 shows a rear interior view.

Two Westinghouse Radiotrons UY-227, two Westinghouse Radiotrons 235, two Westinghouse Radiotrons UX-245, one Westinghouse Radiotron UY-224 and one Westinghouse Radiotron UX-280 are used. The Radiotrons are shipped in their respective sockets.

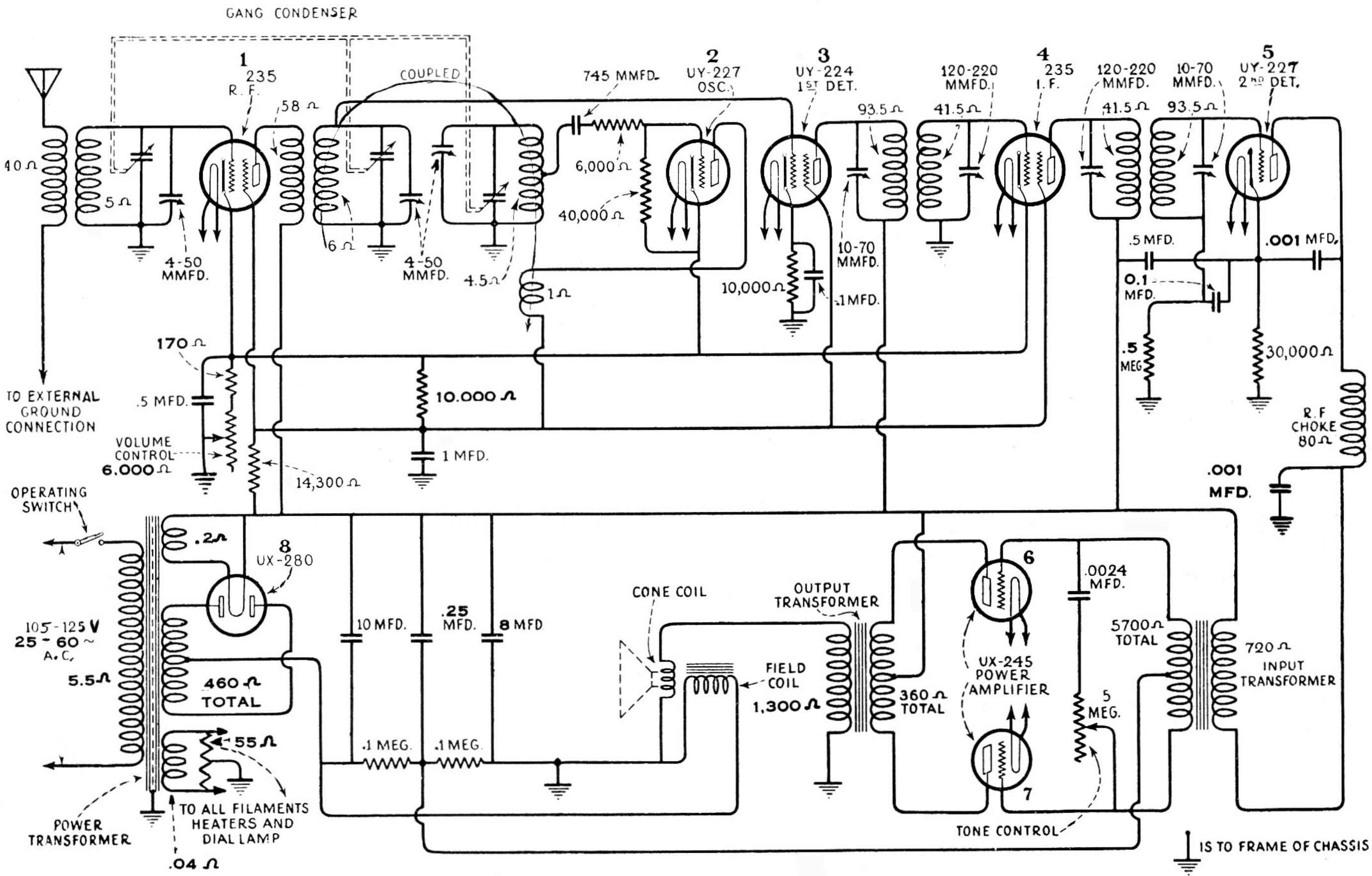


Fig. 3 Schematic Circuit Diagram

ELECTRICAL DESCRIPTION OF CIRCUIT

The schematic diagram is shown in Figure 3. Starting from the antenna circuit, we find the following action taking place in the various stages.

The antenna is coupled to the grid coil of the R. F. stage by means of a high inductance coil connected from antenna to ground. This inductance has a sufficiently high value so that variations in the antenna system have but little effect on the tuning of the adjacent circuit.

The Westinghouse Radiotron 235 used in the R.F. and I.F. stages is of particular interest. This radiotron is similar in appearance and general characteristics to Radiotron UY-224. It has, however, considerably different characteristics as regards its operation with various amounts of grid bias. Over a comparatively narrow range of applied signal voltage Radiotron UY-224 functions as a distortionless amplifier. If, however, this narrow range of voltages is exceeded by the application of a strong signal, distortion will occur. This is particularly noticeable when listening to a signal of only moderate strength on a broadcast channel, adjacent to a powerful local broadcast station. In this case, even though there are sufficient radio frequency stages to prevent the local broadcast signal from reaching the grid of the detector tube, the local signal may penetrate through one or two tuned circuits as far as the grid of the first radio frequency radiotron. If the first R.F. stage radiotron is a UY-224, it may be overloaded by the local signal, even when it is tuned to a more distant station on an adjacent channel. This overloading has the effect of allowing the local signal to distort the desired signal. The desired signal is then passed on in the usual manner in this distorted form and no amount of selectivity in further stages will eliminate this distortion. Radiotron 235 is designed to overcome this condition. It will operate as a distortionless radio frequency amplifier over a far wider range of signal voltages. Consequently the distortion of a desired signal by a nearby local signal (ordinarily called cross-modulation) does not occur. This characteristic also enables the variable grid bias method of volume control to be used.

At this point the oscillator should be considered as its output is also inductively coupled to the grid coil of the first detector. This is a tuned grid circuit oscillator using a Westinghouse Radiotron UY-227 and having a closely coupled plate coil, with sufficient feed back to provide stable operation. The grid circuit is tuned by a special section of the gang condenser, having less capacity than the other three sections, and by an oscillator coil which has considerably less inductance than the other radio frequency coils. The plates of the oscillator gang condenser section are so shaped that with the associated oscillator coil the frequency of the oscillations set up in this local circuit is always 175 kilocycles higher than the frequency to which the radio frequency circuits are tuned.

The next circuit to examine is the first detector. The circuit is tuned by means of one of the gang condensers to the frequency of the incoming signal. In the grid circuit there is present the incoming signal and the oscillator signal, the latter being at a 175 K.C. difference from the former. The first detector is biased so as to operate as a plate rectification detector and its purpose is to extract the difference or beat frequency, produced by combining the signal and oscillator frequencies. The beat frequency—175 K.C.—appears in the plate circuit of the first detector which is accurately tuned to 175 K.C. The tube used as a first detector is Westinghouse Radiotron UY-224.

The next circuit is the intermediate frequency stage which gives a very high degree of amplification. The grid and plate circuits of this stage, as well as the plate circuit of the first detector and the grid circuit of the second detector are tuned to 175 kilocycles. A Westinghouse Radiotron 235 is used in the intermediate stage.

The second detector is a high-plate voltage, grid-biased type detector which gives sufficient output to drive two Westinghouse Radiotrons UX-245 connected in push-pull without an intermediate audio stage. The purpose of the second detector is to extract the audio frequency component of the R.F. signal which represents the voice or musical modulations produced in the studio of the broadcasting station. The audio component is extracted and used to drive the power tubes while the R.F. current is by-passed and not used any further.

A filter circuit consisting of a 0.1 mfd. condenser and 0.5 megohm resistor is used in the second detector grid circuit. This further reduces the small A.C. hum voltages present in the detector stage.

The power stage comprises two Westinghouse Radiotrons UX-245 connected in push-pull. These tubes give a large undistorted output which is delivered to the cone coil of the dynamic type loudspeaker by means of a center-tapped primary step-down transformer connected in the plate circuit of the Radiotrons UX-245. The primary impedance is of a value to match the plate impedance of the two tubes, and the secondary of a value that matches the cone coil of the reproducer unit. Thus the full output of the two Radiotrons UX-245 is efficiently applied to the loudspeaker.

The rectifier is a Radiotron UX-280 which provides a full wave rectifying device of ample capacity for providing all plate and grid voltages used in the receiver and power amplifier, as well as power for the field of the reproducer unit. A specially designed filter system removes all ripple from the D.C. output of the rectifier. This results in a receiver having no A.C. hum or extraneous noise other than that picked up in the antenna system.

The filtering system used is of the "brute force" type, using large electrolytic condensers and two reactor coils. The second reactor coil is also the field coil of the reproducer unit. As the electrolytic type of condensers offer an appreciable impedance to the radio frequency current which must be by-passed through the voltage supply system, an additional one microfarad paper condenser is connected across the high voltage plate supply.

A tone control, consisting of a 0.0024 mfd. condenser in series with a 5 megohm variable resistor connected across the two grids of Radiotrons UX-245 is incorporated in this stage. The tone control functions to reduce the high frequency output as the resistance is reduced. At the extreme low position, the condenser and secondary of the A.F. transformer resonate at a low frequency and thereby further accentuate the bass response, thus partially compensating for the lack of a large speaker baffle surface.

PART I. INSTALLATION

(1) ANTENNA AND GROUND.

Instructions for erecting proper antenna and ground systems are covered in earlier Service Notes. The length recommended for use with Westinghouse Model 801 is from 25 to 75 feet. In localities remote from broadcasting stations a longer antenna may give better results.

In localities close to extremely powerful transmitters the use of a single pole, single throw switch, placed in series with the antenna may give improved results. This switch allows the antenna to be disconnected when receiving from powerful nearby stations, thereby improving the quality of output from the loudspeaker.

The antenna is connected to the black lead and the ground to the yellow lead.

(2) RADIOTRONS.

Figure 2 shows the location of the various Radiotrons when inserted in their proper sockets. Interchanging those of the same type, either Westinghouse 235 or Westinghouse UY-227 will sometimes give improved results.

(3) LOCATION.

Various locations should be tried before permanently installing the Westinghouse 801 as different parts of the room may give different acoustical results. However, the A.C. cord may prove a limiting factor if the A.C. outlet is not within its radius. An extension cord may be provided, however, and the receiver placed in the location that produces the best results. Placing the set within six inches of the wall will improve the low response.

PART II. SERVICE DATA

(1) NOISY VOLUME OR TONE CONTROL.

Noisy operation of the volume control is usually caused by dirt between the resistance element and the contact arm. Turning the volume control back and forth several times will usually clear up the trouble. If it does not, the cover must be removed and the resistance element cleaned. One of the various cigarette lighter fluids applied with a pipe cleaner will usually clear up the trouble. If it does not, the unit must be replaced.

(2) CONDENSER DRIVE.

The gang condenser is operated by means of a rugged cord in the same manner as a number of recent Westinghouse models. If it becomes necessary to replace this cord follow the arrangement shown in Figure 7. Figure 7, it should be noted, is shown with the station selector at the low frequency end of the scale. If it is desired to improvise a drive cord instead of using a standard replacing part it should be noted that the cord forms a closed loop which when stretched out measures 12½ inches.

(3) EXCESSIVE HUM.

Excessive hum may be caused by:

(a) Defective Radiotron UX-280.

(b) Defective power transformer.

(c) Shorted 0.1 mfd. condenser in second detector circuit.

(d) Defective 0.5 megohm resistor in the second detector circuit.

(e) Shorted field coil. As the field coil of the reproducer unit constitutes the reactor of the filter system, a failure in it will cause hum.

(f) Open filter condenser. An open in the condenser or connection of either the electrolytic or paper condenser used in the filter system will cause hum.

(g) Grounded or shorted by-pass condensers. Test all condensers and replace any found defective.

(h) Grounded heater lead. A ground heater lead at either the points of connection to the sockets or in the transformer will cause hum.

(4) ACOUSTIC HOWL.

Acoustic howl may be caused by:

(a) Loose part in chassis. Tighten any loose part.

(b) Defective rubber cushions. If the cushions on which the receiver chassis is supported have become aged or hardened, they should be replaced.

(c) Any defect in the support of the chassis that prevents it from being entirely supported by rubber may cause acoustic howl.

(d) Microphonic detector tube. A microphonic tube, while rare, in the detector socket may cause a howl. The remedy is to replace the tube or use it in another socket.

(5) LOW VOLUME.

Low volume may be caused by:

(a) Defective Radiotrons. Try interchanging all Radiotrons with others known to be in good condition.

(b) Poor antenna system. Install antenna as suggested in Part I, Section 1.

(c) Receiver not properly aligned. First—Replace the oscillator tube. Second—Adjust I.F. tuning condensers, and gang condenser as described in Part II, Section 9 and 10.

(d) Defective A.F. transformer. The A.F. transformers, the internal connections of which are shown in Figure 10, are in a metal container. All coils should be tested for continuity and if other defects are considered likely, the coils should be measured for D.C. resistance. Shorted turns may be disclosed by substituting an entirely new unit for the one in use.

(e) Low voltages from S.P.U. Measure all voltages and if low, replace tube (Radiotron UX-280) or any defective parts that are causing low voltages in S.P.U. Refer to Part III, Section 2.

(f) Opens, shorts, or grounds in receiver assembly. Test with continuity tests and make any repair or replacement necessary.

(g) Shorted field coil in reproducer unit. Any defect that reduces the strength of the magnetic field of the reproducer unit will reduce the output of the receiver. Check the current (80 M.A.) in the field and the voltage drop (100 volts) across it. An open field coil will cause the receiver to be inoperative.

(6) DISTORTED REPRODUCTION.

(Not due to failure in reproducer unit.)

Distorted reproduction may be caused by any of the following:

(a) Radiotrons. A defective Radiotron will cause distortion and can be defective even though it lights. Defects other than heater or filament failures are checked only by subtitution with a tube of known quality or by testing the tube. Check oscillator Radiotron.

(b) Defective A.F. transformers. An open in the secondary of the input transformer or shorted turns in any winding may cause distortion. Test by means of continuity or resistance measurement tests and make replacement if necessary.

(c) Oscillation in receiver assembly. Oscillation in the receiver assembly other than that of the oscillator will cause distortion to be experienced when tuning in a station. This distortion will be accompanied by a whistle when the station is tuned in. To remedy trouble of this character, refer to Part II, Section 8.

(d) Receiver improperly aligned. Improper alignment of the receiver in addition to affecting its sensitivity and selectivity, will cause distortion of any signal received. Realign the receiver as described in Part II, Sections 9 and 10.

(e) Incorrect tuning. If the receiver is not accurately tuned to the station being received, distortion will result. Follow the instructions given on the instructions accompanying each set when tuning.

(f) Heterodyne between stations too close in frequency. This is no defect in the receiver and, therefore, cannot be remedied except by shifting the frequencies of the transmitters.

(g) Strong local station. Check R.F. and first I.F. tubes. Shorten antenna. Place a switch in antenna lead.

(g) Open by-pass condensers or connections. Any failure that will cause a by-pass condenser not to function will result in distortion. Repair or replace any such defect.

(i) Defect in Receiver Assembly. Check by means of continuity tests and make any replacement necessary.

(7) AUDIO HOWL.

Audio howl may be caused by:

(a) Stations too close in frequency. This is a fault of the broadcasting stations and no fault of the receiver. Such a howl will be picked up on any type of receiver.

(b) Open by-pass condensers. An open of any of the by-pass condensers may cause an audio howl.

(c) Receiver oscillation. An oscillating receiver will give a whistle when a station is tuned in. Apply the remedies suggested in Part II, Section 8.

(d) Defective Radiotrons in push-pull or detector stage. A defective Radiotron in the push-pull or detector stage may cause the receiver to develop a howl. Replace any defective Radiotron.

(e) Vibrating elements in the receiver Radiotrons. A gradually developed howl may be due to the loudspeaker causing the receiver Radiotron elements to vibrate. Apply the remedies given in Part II, Section 4.

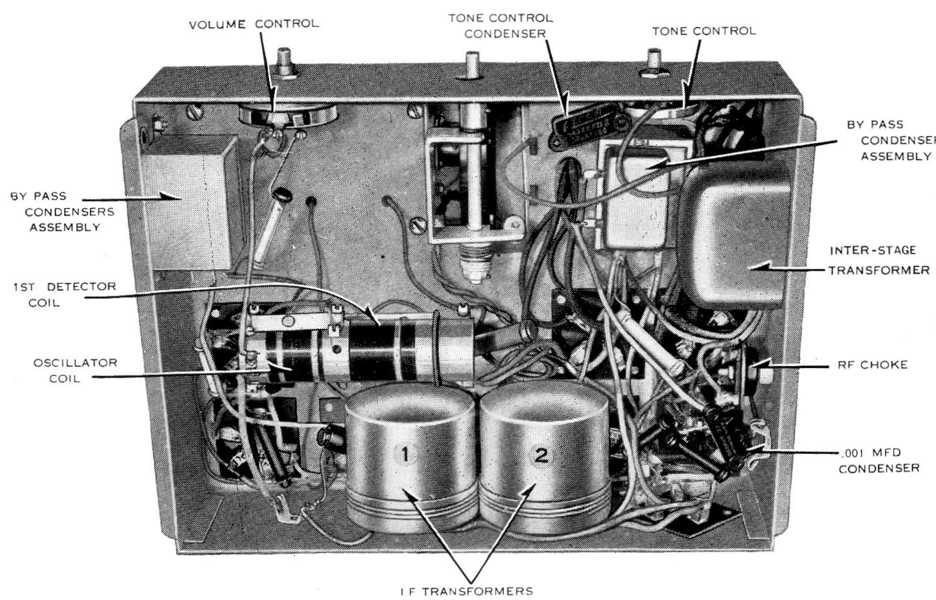


Fig. 4 Bottom View of Chassis

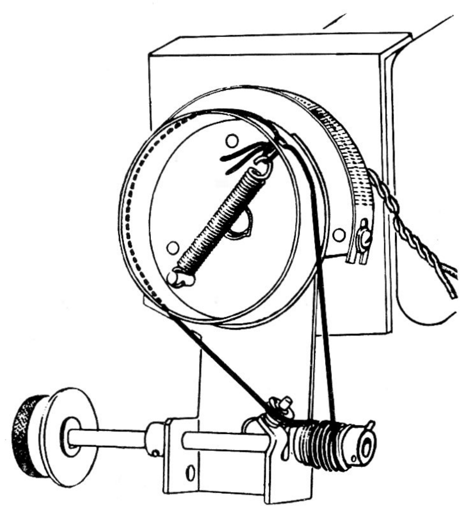


Fig. 5 Condenser Drive

(8) OSCILLATION.

Oscillation in the F.R. or I.F. stages may be due to:

(a) Failure of shielding of Radiotrons UY-224 or 235, or their control grid leads not in place. Make sure all shielding and leads are as originally intended. Any failure should be repaired.

(b) Open by-pass condensers in receiver assembly. Test and make any repair or replacement necessary.

(c) Defective Radiotron UY-224 or 235. A defective Radiotron UY-224 may cause oscillation and should be replaced by a Radiotron known to be in good operating condition.

(d) Ungrounded power line. Try connecting the ground to both the chassis and the ground lead.

(e) If the above remedy fails to clear up the oscillating condition it will usually be cleared up by adjusting the second I.F. transformer to give a slight flat top characteristic. This should be done as described in Radio Service Manual Section R.S. 111 covering Westinghouse Model 101. Part II, Section 10. This adjustment should not be carried to the same extent however as for the Model 101 as the receiver would become somewhat insensitive. A flat top 2 or 3 K.C. wide will be sufficient when making this adjustment.

(f) If the proper equipment is not available for the adjustment above, place a metal tube shield over the second detector radiotron. Westinghouse replacement part S. No. H-23612, may be used for this purpose and the lead attached thereto grounded to a convenient screw in the metal frame.

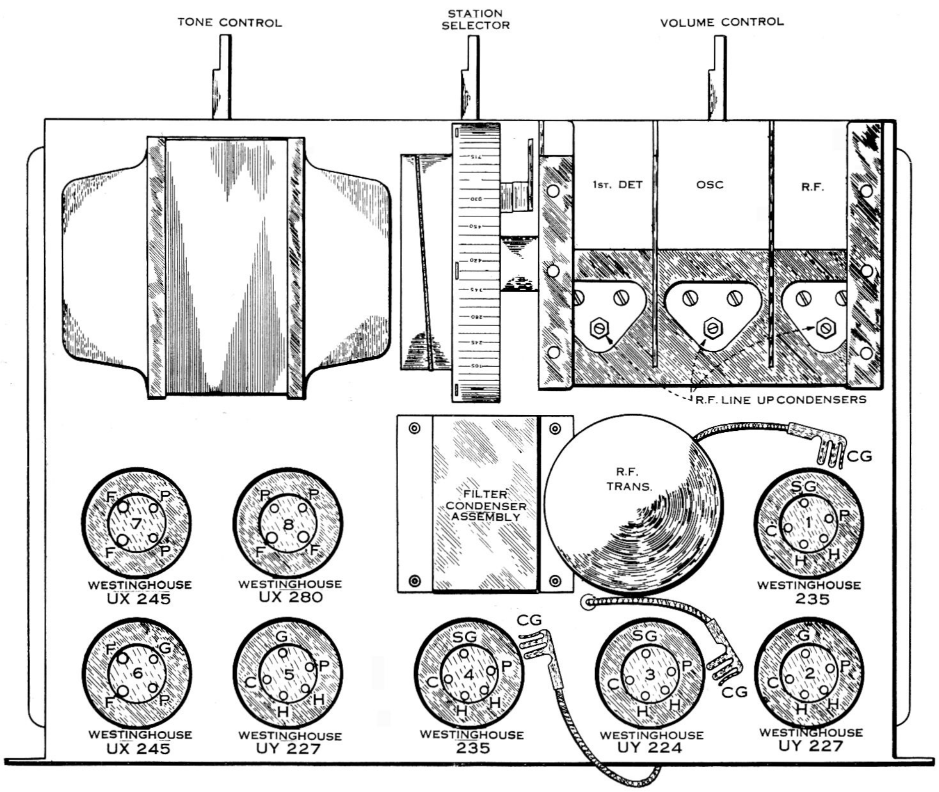


Fig. 6 R.F. Line-up Condensers and Tube Locations

(9) I.F. TUNING CONDENSER ADJUSTMENTS.

A single intermediate frequency amplifier stage is used in this receiver. Two transformers are used and all circuits are tuned to 175 K.C. The circuits are peaked and when alignment adjustments are made, the condensers are adjusted for maximum output.

A detailed procedure for making these adjustments follows:

(a) Procure a modulated R.F. oscillator giving a signal at 175 K.C. The General Radio Type 360 oscillator or the Type 320 to which 175 K.C. has been added, may be used. A non-metallic screw driver is also necessary. The use of Westinghouse Radio Service Oscillator S. No. H-25405 is recommended.

(b) Connect an output meter in the circuit. This may be a current squared thermo-galvanometer connected to the secondary of the output transformer instead of the reproducer unit cone coil, a 0-5 milliameter connected in series with the plate supply to the second detector or a low range A.C. voltmeter connected across the cone coil of the reproducer.

(c) Remove the oscillator tube, socket No. 2, and make a good ground connection to the chassis.

Place the service oscillator in operation and connect its ouput to the control grid cap of the first detector, socket No. 3. Adjust the service oscillator output or the receiver volume control until a deflection is obtained in the output meter.

(d) Now adjust the secondary and primary of the second and first I.F. transformers until a maximum reading is obtained in the output meter. Go through these adjustments a second time as a slight readjustment may be necessary. (See Fig. 7).

When the adjustments are made, the set should perform at maximum efficiency. However, due to the interlocking of the adjustments, it is a good plan to follow the I.F. adjustments with the gang condenser adjustments. The correct method of doing this is given in Part II, Section 10.

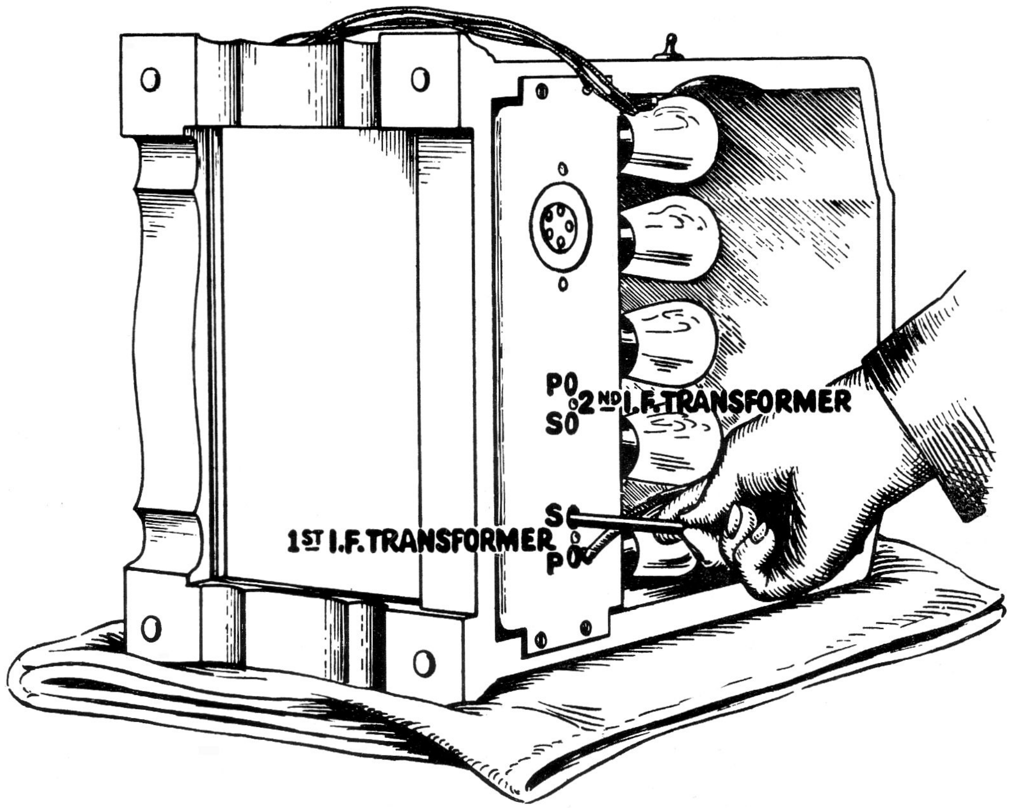


Fig. 7 I.F. Adjustment Screws

(10) LINE UP ADJUSTMENTS OF GANG CONDENSER.

The gang condenser used is of sturdy construction and little difficulty is apt to be encountered due to the gang condenser coming out of alignment but when adjustment is necessary the five vanes provided on the end plate of each section allow the gang condenser to be accurately aligned at six different test frequencies resulting in a practically perfect alignment over the broadcast range.

The following apparatus will be required.

1. A calibrated modulated oscillator covering the broadcast range.

2. A standard output meter of any one of the various types.

3. A dummy antenna either a standard General Radio type or the type illustrated in Radio Service Manual Section No. RS-103 on Westinghouse Models 90 and 110.

4. A small 4-40 socket wrench similar to that listed in Radio Renewal Parts Data under S. No. H-23714 (or non-metallic screw driver).

5. A single variable condenser having a maximum capacity of .0035 mfd. capacity or greater. This condenser should preferably have a metal shield or case and also should have a fairly low minimum capacity.

Proceed as follows:

(a) Remove the receiver assembly from the cabinet and place it in operation with the dummy antenna connected across the antenna and ground binding posts. The regular antenna should be disconnected but the receiver should be properly grounded. Turn the volume control to maximum and leave it there during the following adjustments.

(b) Connect the output meter in the standard manner to measure the output from the receiver.

(c) Place the modulated oscillator in operation and whenever necessary during the following adjustments adjust the coupling or output of the oscillator to give a readable deflection of the output meter without forcing it off scale.

(d) Place a dial indicator to read same numbers on dial when receiver is out of cabinet as normal indicator does, when in cabinet.

(e) Set the modulated oscillator at 1500 kilocycles and tune in the signal on the receiver. Note the number of kilocycles difference in reading between the modulated oscillator and the receiver dialing. Repeat this at the following five kilocycle settings of the modulated oscillator, 1250, 950, 730, 610, 550. Also note whether the receiver dial is off calibration by a constant distance at the six points. If there is a constant difference of calibration over the entire range or if all the differences between the modulated oscillator setting and the receiver dial setting are the same way (that is, if the oscillator kilocycle readings are either all higher or all lower than the corresponding receiver dial readings) adjust the position of the dial scale on the dial assembly or pilot lamp bracket to reduce the difference in modulated oscillator and receiver dial readings to a minimum value. If necessary to reduce the maximum difference in reading between the modulated oscillator and receiver dial adjust the dial scale until at some points the modulated oscillator frequency is higher than the receiver dial and at other points lower than the receiver dial.

(f) Unsolder the lead connected to the stator of the oscillator gang condenser section. Connect a lead from the grounded or shielded side of the external variable condenser to the receiver assembly frame. Bring a lead from the other binding post of the external variable condenser and leave it not connected but adjacent to the lead formerly connected to the oscillator gang condenser section. Place a small battery clip on the end of the lead which was formerly connected to the oscillator gang condenser section so that this lead may be clipped to its original position on the gang condenser or to the ungrounded lead from the external condenser

(g) Connect the above mentioned clip to the ungrounded lead from the external variable condenser.

(h) Set the modulated oscillator and receiver dial both to 1500 kilocycles. Adjust the external variable condenser to give maximum reading of the output meter. If necessary increase the modulated oscillator coupling or output to secure a reading in the output meter. With the socket wrench adjust the trimming condensers on the first, and third gang condenser sections to give maximum reading in the output meter.

It may be necessary to completely remove the adjusting nut from one or more trimming condensers and adjust capacity by "springing" out or in the movable plate.

(i) Leaving the gang condenser set in its last position move the clip from the external condenser lead to the stator of the oscillator gang condenser section. Adjust the trimming condenser on the second gang condenser section to secure a maximum reading in the output meter.

(j) Remove the clip from the second gang condenser section and clip on the to lead from the external condenser. Set both the modulated oscillator and the receiver dial to 1250 kilocycles. The first vanes of the end plates of the gang condensers will now be in mesh with the stator plates. Adjust the first vane on gang condenser sections one, and three to secure a maximum reading in the output meter, squeezing the vane in or out as may be required. If necessary to move the gang condenser away from the 1250 kilocycle setting return to the 1250 kilocycle setting and check the adjustments before proceeding further. Now leaving the gang condenser set at 1250 kilocycles place the clip lead on the third gang condenser stator and adjust the first vane on the oscillator gang condenser section to secure a maximum reading the output meter.

(k) Follow the same procedure at 950 kilocycles, 730 kilocycles, 610 kilocycles and 550 kilocycles adjusting the second, third, fourth and fifth sets of vanes. It is not absolutely necessary, of course, to have the receiver dial scale calibrated exactly. In many cases it will be found easier to allow a tolerance of 10 kilocycles in the accuracy of the dial setting. After going through the complete adjustment once it is advisable to start at the beginning and recheck as the later adjustments may have upset the earlier ones.

(l) After all adjustments have been completed disconnect the external variable condenser and resolder the lead to the oscillator gang condenser section. If after placing the receiver assembly in the cabinet the calibration is not correct it may be found that the dial screen on the cabinet or the pilot lamp bracket will require slight adjustments.

Meter Reading Service Data Chart

VOLUME CONTROL AT MAXIMUM — ANTENNA AND GROUND SHORTED

VOLTAGE CHARACTERISTICS	1 R.F.				2 OSC.			3 1st DET.				4 I.F.				5 2nd DET.			6 PWR.A.F.			7 PWR. A.F.			CAUSE OF INCORRECT READING
	C.G. Volts	S.G. Volts	Plate Volts	Plate M.A.	Grid Volts	Plate Volts	Plate Volts	C.G. Volts	S.G. Volts	Plate Volts	Plate M.A.	C.G. Volts	S.G. Volts	Plate Volts	Plate M.A.	Grid Volts	Plate Volts	Plate M.A.	Grid Volts	Plate Volts	Plate M.A.	Grid Volts	Plate Volts	Plate M.A.	
NORMAL	3.5	70	240	3.8	0	70	5.0	5.0	70	270	0.3	3.5	70	240	5.0	17	240	0.5	35	245	28	35	245	28	
No C.G. Voltage on Tube No. 1	0	70	240	9.0																					Open Secondary of R.F. Transformer
No. C. G. Voltage on Tube No. 3								0	70	270	1.5														Open 1st Det. Grid Coil
No. C. G. Voltage on Tube No. 4												0	70	240	9.0										Open Secondary of 1st I.F. Transformer
No. C. G. and Low Plate Voltage on Tube No. 5																0	165	4.0							Open Sec. of 2nd I.F. Trans or 0.5 Meg. Res.
Low Voltages on All Tubes	2.0	25	180	2.0	0	45	3.0	3.0	25	170	0	2.0	25	180	3.0	10	160	0.4	0	165	100	40	180	0	Open One-Half Secondary of Interstage Transformer
Low Voltages on All Tubes	2.0	25	180	2.0	0	45	3.0	3.0	25	170	0	2.0	25	180	3.0	10	160	0.4	40	180	0	0	165	100	Open One-Half Secondary of Interstage Transformer
No Voltages on Tube No. 2					0	0	0																		Open Oscillator Plate Coil
No. Plate Voltage on Tube No. 1	3.5	60	0	0																					Open R.F Plate Coil
No Plate Voltage on Tube No. 3								4.0	70	0	0														Open Primary of 1st I.F. Transformer
No Plate Voltage on Tube No. 4												3.5	60	0	0										Open Primary of 2nd I.F. Transformer
No Voltages on Tube No. 5																0	0	0							Open R.F. Choke or Primary of Input Transformer
No Plate Voltage on Tube No. 6																			20	0	0				Open One-Half Primary of Output Transformer
No Plate Voltage on Tube No. 7																						20	0	0	Open One-Half Primary of Output Transformer
No C. G. Voltage on Tubes Nos. 1 and 4	0	70	240	9.0								0	70	240	9.0										Shorted 0.5 Mfd. Condenser
No. C. G. Voltage on Tube No. 3								0	70	240	4.0														Shorted 0.1 Mfd. Condenser
No C. G. or S. G. Voltages on Tubes Nos 1, 2, 3 or 4	0	0	240	0	0	0	0	0	0	270	0	0	0	240	0										Shorted 1.0 Mfd. Condenser
Low Voltages on All Tubes	0.5	35	50	0.6	0	12	0.5	1.0	15	50	0	0.5	15	55	0.5	2.0	50	0	0	40	65	0	40	65	Shorted .25 Mfd. Condenser
No C. G. Voltages on Tube No. 5																0	180	30							Shorted 0.5 Mfd. Condenser
Low Plate Voltage on Tube No. 5																0	60	1.5							Shorted 0.1 Mfd. Condenser
No Plate Voltage on Tube No. 5																25	0	0							Shorted .001 Mfd. Condenser
Low Plate M.A. on Tubes Nos. 6 and 7																			50	260	10.0	50	260	10.0	Shorted 100,000 Ohm Resistor
Low Voltages on All Tubes	1.5	38	135	1.5	0	35	2.0	2.0	30	130	0	1.5	35	140	2.0	6.0	120	0.25	0	125	55	0	125	55	Shorted 100,000 Ohm Resistor
High C. G. Voltage on Tubes Nos. 1 and 4	200	0	0	0	0	0	0	20	200	275	0	200	0	0	0										Open Volume Control or 170 Ohm Resistor
High S. G. Voltages	4.5	120	275	7.5	0	100	12	14	120	275	1.0	4.5	100	275	6.0										Open 10,000 Ohm Resistor
No C. G. or S. G. Voltage on Tubes Nos. 1, 2, 3, and 4	0	0	250	0	0	0	0	0	0	240	0	0	0	250	0										Open 14,300 Ohm Resistor
No Voltages on Tube No. 3								0	0	0	0														Open 10,000 Ohm Resistor
No Plate Voltage on Tube No. 5																14	0	0							Open 30,000 Ohm Resistor

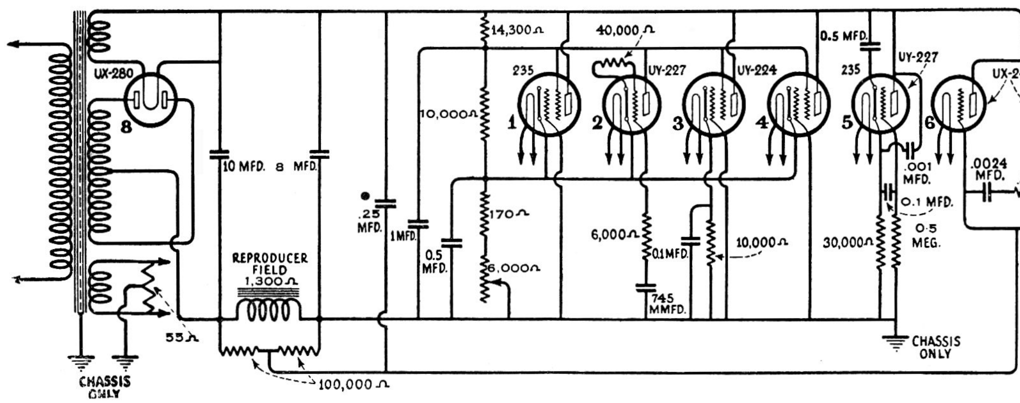


Fig. 8 Schematic Diagram of Voltage Supply System

PART IV. ELECTRICAL TESTS

(1) VOLTAGE SUPPLY SYSTEM.

Figure 7 illustrates the schematic diagram showing the voltage supply system together with the values of the various resistors. It will be noted that the series method of voltage supply is used except in the volume control circuit. This keeps the current drain on the rectifier tube at a minimum value.

(2) METER READING SERVICE DATA CHART.

The service data chart on page 11 provides a means of diagnosing trouble from socket voltage readings taken at Radiotron sockets with any of the usual set analyzers. A set of readings taken from the receiver under consideration checked against this chart will quickly disclose the cause of most difficulties.

(3) METER READINGS AT RADIOTRON SOCKETS.

The following readings taken at each radiotron socket with the receiver in operating condition should prove of value when checking with test sets such as the Weston Model 547 or others giving similar reading. The plate currents are not necessarily accurate for each tube as the cable in the test set will cause some circuits to oscillate due to its added capacity. Small variations of voltages will be caused by different tubes and line voltages. Considerable variation of some of the voltages will also be caused by a varying amount of received signal. Where two sets of readings are given the first reading is taken with the volume control at minimum setting. The second reading with the volume control at maximum setting, and the antenna and ground short-circuited. The readings given are taken with 120 volts line voltage. The numbers in the first column indicate the tube socket numbers shown in Figure 6.

Tube No.	Cathode or Filament to Control Grid Volts, D.C.		Cathode to Screen Grid Volts, D.C.		Cathode or Filament to Plate Volts, D.C.		Plate Current M.A.		Heater or Filament Volts	Screen Grid Current M.A.	
1	—40	— 3.5	63	70	235	275	0	3.8	2.35	0	0.7**
2	0	0	....	....	65	70	4.0	5.0	2.35	0	....
3	— 7.0	— 4.5	115	70	275	270	0.1	0.3	2.35	0	0
4	—40	— 3.5	63	70	235	275	0	4.5	2.35	0	0.7**
5	—17	—16.0	....	....	250	240	0.4	0.4	2.35	....	....
6 or 7	—35*	—35*	....	....	235	245	28	28	2.35	....	....

*Not true reading due to resistance in circuit.
**This reading may be + or — depending on age of tube.

(4) CONTINUITY TEST.

The tests on poge 15 will show complete continuity for the receiver assembly of this instrument. Disconnect the antenna and ground leads; and the A.C. supply cord at its outlet. Remove all Radiotrons and pilot lamp. Leave reproducer connected.

A pair of headphones with at least 4½ volts in series; or a voltmeter with sufficient battery to give a good deflection when connected across the battery terminals should be used in making these tests.

The resistance of the various circuits are shown in the column titled "Correct Effect". Checking the resistance of the circuits adds an additional cheek on their correct functioning.

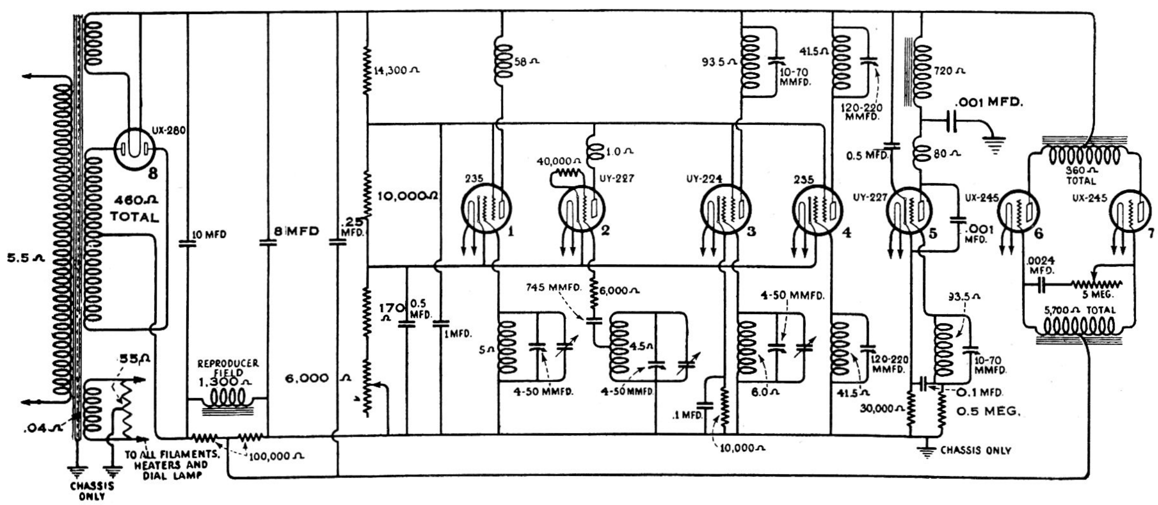


Fig. 9 Continuity Schematic Diagram

(5) TESTING FILTER AND BY-PASS CONDENSERS.

The by-pass condensers are in metal containers. The internal wiring diagram is shown in Figure 10.

The condensers can best be tested by charging them with approximately 200 volts D.C. and then noting their ability to hold the charge. After charging, short circuiting the condenser terminals with a screwdriver should produce a flash, the size of the flash depending on the capacity of the condenser and the voltage used for charging. A condenser that will not hold its charge, is defective and requires replacement of the entire unit.

The electrolytic condensers can best be tested by measuring their leakage current with a low range milliammeter. To make this test disconnect the receiver from the line, first making sure that the voltages are normal. Then remove both UX-245's. Connect the milliammeter in series with each electrolytic condenser in turn, by removing all wires from one terminal of the condenser and bridging the gap with the milliammeter. Short circuit the terminals of the milliammeter with a screw driver or equivalent while turning the operating switch "on". This supplies approximately 400 volt D.C. of correct polarity to the filter condensers. The leakage current of the 10 and 8 microfarad condensers should not be greater than 2.4 milliamperes and 2.0 milliampere respectively.

It should be noted that as indicated in Figure 10 the 10 Mfd. electrolytic filter condenser consists of an 8 Mfd. and a 2 Mfd. in parallel. If the 2 Mfd. section becomes defective a temporary repair may be made by cutting the blue lead and taping the exposed wires.

It should also be noted that in one metal container are located four condensers, the metal case serving as the common connection to ground. The capacities of these four condensers are as follows:

One section is .1 Mfd. Another section is .5 Mfd., and the two remaining sections which are not used are also .5 Mfd. In the case of failure of either the .1 Mfd. or the .5 Mfd., it is merely necessary to move the connection over to one of the unused terminals.

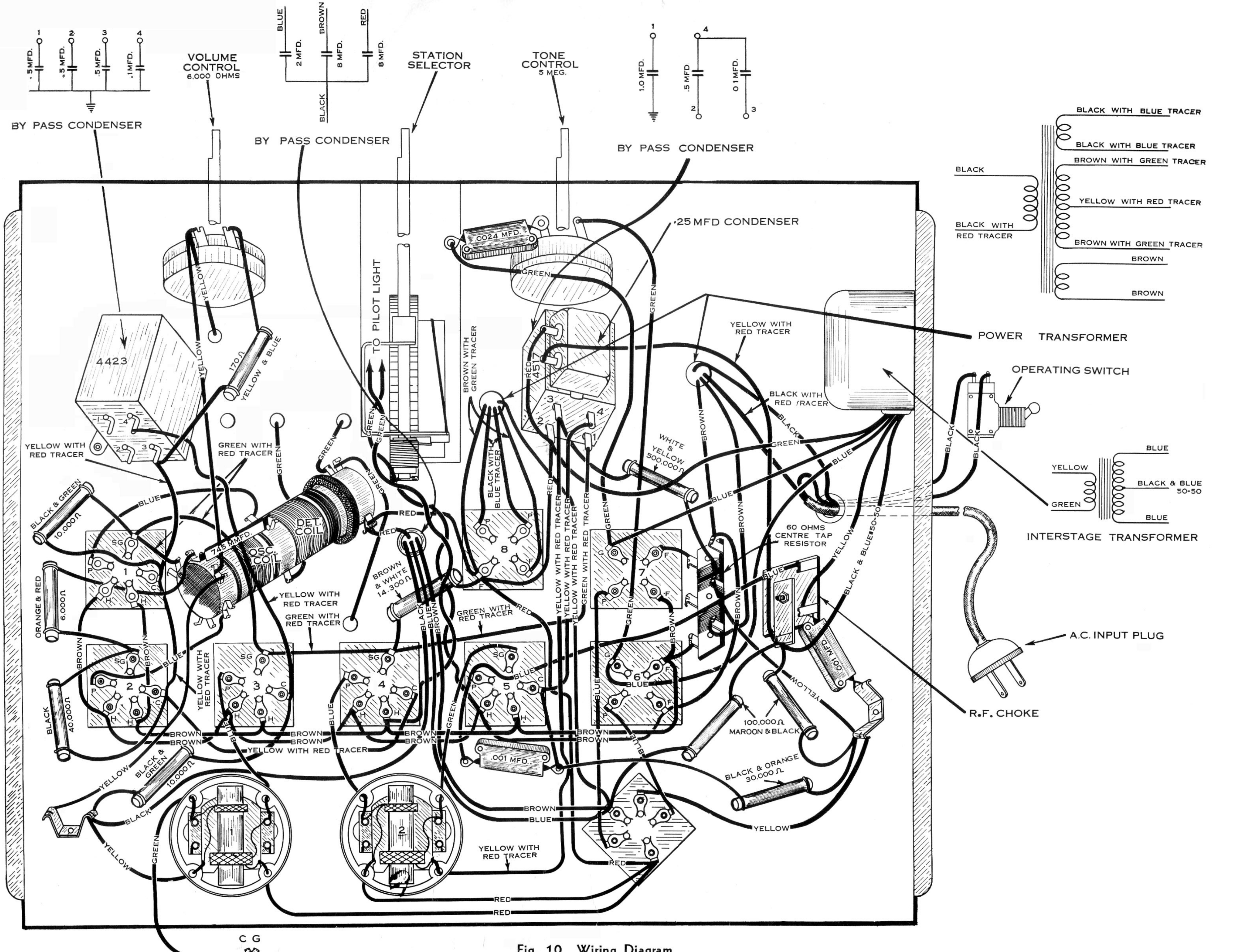


Fig. 10 Wiring Diagram

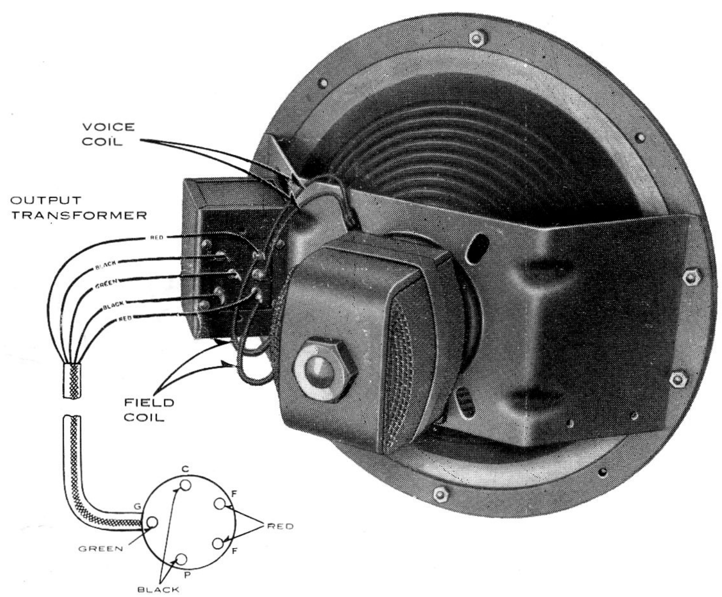
Continuity Tests

VOLUME CONTROL AT MAXIMUM

DISCONNECT 8 MFD. AND 10 MFD. CONDENSERS BEFORE MAKING FOLLOWING TESTS

Terminals	Correct Effect	Incorrect Effect	
		Indication	Caused By
Antenna lead to ground lead	Closed (40 ohms)	Open	Open antenna coupling coil
C1, 2 or 4 to Gnd. (Vol. Cont. at "Minimum")	Closed (6170 ohms)	Open Short	Open 170 ohm resistor or volume control Shorted .5 mfd. condenser
C1, 2 or 4 to Gnd. (Vol. Cont. at "Maximum")	Closed (170 ohms)	Open Short	Open volume control or 170 ohm resistor Shorted .5 mfd. condenser
CG1 to Gnd	Closed (5 ohms)	Open Short	Open grid coil of R.F. tube Shorted tuning or line-up condenser
SG 1, 3, 4, or P2 to Gnd.	Closed (10170 ohms)	Open Short	Open 10,000 ohm or 170 ohm resistor Shorted 1 mfd. condenser
P1 to Gnd.	Closed (24528 ohms)	Open 58 ohms 14,358 ohms	Open R.F. plate coil, 14300 ohm resistor, 10,000 ohm resistor or 170 ohm resistor. Shorted 8.0 mfd. condenser Shorted 1 mfd. condenser
CG2 to C2	Closed (40,000 ohms)	Open	Open 40,000 ohm resistor.
C3 to Gnd.	Closed (10,000 ohms)	Open Short	Open 10,000 ohm resistor Shorted .1 mfd. condenser
CG3 to Gnd.	Closed (6.0 ohms)	Open Short	Open 1st detector grid coil Shorted 1st detector tuning or line-up condenser
P3 to Gnd.	Closed (24,564 ohms)	Open 24,470 ohms 93.5 ohms 14,393.5 ohms	Open primary of 1st I.F. transformer, 14,300 ohm resistor, 10,000 ohm resistor or 170 ohm resistor. Shorted primary tuning condenser of 1st I.F. transformer. Shorted 8 mfd. condenser Shorted 1 mfd. condenser
CG4 to Gnd.	Closed (41.5 ohms)	Open Short	Open secondary of 1st I.F. transformer Shorted secondary tuning condenser of 1st I.F. transformer.
P4 to Gnd.	Closed (24,512 ohms)	Open 24,470 ohms 41.5 ohms 14,341.5 ohms	Open primary of 2nd I.F. transformer, 14,300 ohm resistor, 10,000 ohm resistor or 170 ohm resistor. Shorted primary tuning condenser of 2nd I.F. transformer Shorted 8 mfd. condenser Shorted 1 mfd. condenser
C5 to Gnd	Closed (30,000 ohms)	Open	Open 30,000 ohm resistor
C5 to CG5	Closed (530,094 ohms)	Open 94 ohms	Open 30,000 ohm resister or 0.5 meg resister or I.F. secondary. Shorted 0.1 mfd. condenser.
C5 to P5	Closed (55,270 ohms)	Open Short	Open R.F. choke or interstage transformer. Shorted .001 mfd. condenser.
CG5 to Gnd.	Closed (0.5 meg.)	Open Closed (30,000 ohms)	Open 0.5 meg. resistor Shorted 0.1 mfd.

Terminals	Correct Effect	Incorredct Effect	
		Indication	Caused By
P5 to Gnd.	Closed (25,270 ohms)	Open	Open R.F. choke, primary of A.F. transformer, 14,300 ohm resistor, 10,000 ohm resistor or 170 ohm resistor.
		800 ohms	Shorted 8 mfd. condenser
		15,100 ohms	Shorted 1 mfd. condenser
G6 to G7	Closed (5700 ohms)	Open	Open secondary of interstage transformer
		Short	Shorted .0024 mfd. condenser
P6 to P7	Closed (360 ohms)	Open	Open primary of output transformer
P8 to P8	Closed (460 ohms)	Open	Open UX-280 plate winding of power transformer
P8 to Gnd.	Closed (1530 ohms)	Open	Open field coil of reproducer or UX-280 plate winding
Across A.C. input plug	Closed (5.5 ohms)	Open	Open primary of power transformer



OUTPUT TRANSFORMER INTERNAL CONNECTIONS

Two red leads from cable connect to the two outside leads from transformer primary.

Green lead from cable connects to center-tap on transformer primary.

Black leads from voice coil connect to transformer secondary.

Fig. 11 Reproducer Unit

(6) MAGNETIC PICK-UP CONNECTION.

No provision has been made on Westinghouse Model 801 for connection of a magnetic pick-up. If it is desired to utilize the excellent tonal qualities of this receiver in connection with a magnetic pick-up to reproduce recorded selections, the following parts will be required:

A UY to UY adapter. This should be of the type resembling a radiotron tube base having five contacts to receive the five prongs from a UY-227 radiotron and five prongs to engage the contacts of a UY socket. The prongs should be connected to their corresponding contacts except that a flexible lead should be brought out from the grid contact and another flexible lead from the grid prong. The cathode prong should be connected to the cathode contact and a flexible lead should be brought out from the cathode prong. The magnetic pick-up with its associated volume control and appropriate audio transformer should be connected to these two leads from the grid prong and grid contact, these leads going to the secondary of the audio coupling transformer. The lead from the cathode prong should be connected to one end of a 5000 ohm carbon resistance. The other end of this resistance should be grounded to the frame of the receiver.