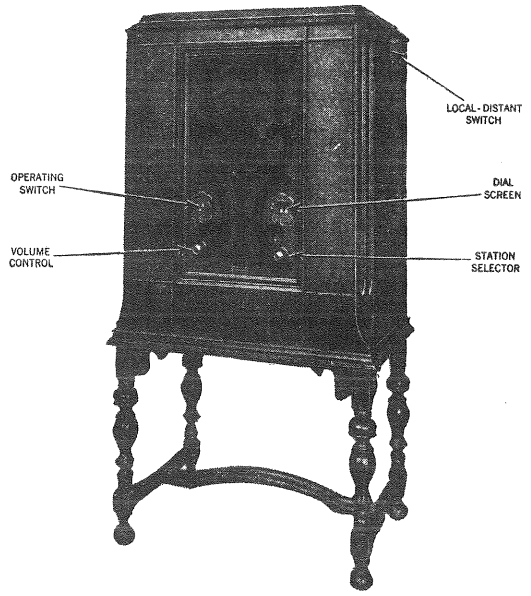
RCA
Radiola 66

SERVICE NOTES



RCA RADIOLA 66

First Edition—30M

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PREFACE

Service goes hand in hand with sales. The well-informed RCA Authorized Dealer renders service at time of sale in affording information as to proper installation and upkeep. Subsequent service and repair may be required by reason of wear and tear and mishandling, to the end that RCA Loudspeaker and Radiola owners may be entirely satisfied.

Obviously, this service can best be rendered by properly equipped service organizations having a thoroughly trained personnel with a knowledge of the design and operation of RCA Loudspeakers and Radiolas.

Such service organizations have been established by the RCA Distributors, and the RCA Authorized Dealers are advised to refer any major work or replacement to their selected Distributors. Minor replacements and mechanical and electrical adjustments may be undertaken by the RCA Dealer.

To assist in promoting this phase of the Dealer and Distributor's business the RCA Service Division has prepared a series of Service Notes—of which this booklet is a part—containing technical information and practical helps in servicing RCA Loudspeakers and Radiolas.

This information has been compiled from experience with RCA Dealers and Distributor's service problems and presents the best practice in dealing with them. A careful reading of these Service Notes will establish their value, and it is suggested they be preserved for ready reference.

In addition to supplying the Service Notes, the RCA Service Division maintains a corps of engineers who are qualified to render valuable help in solving service problems. These engineers call upon the trade at frequent intervals to advise and assist RCA Distributors in the performance of service work.

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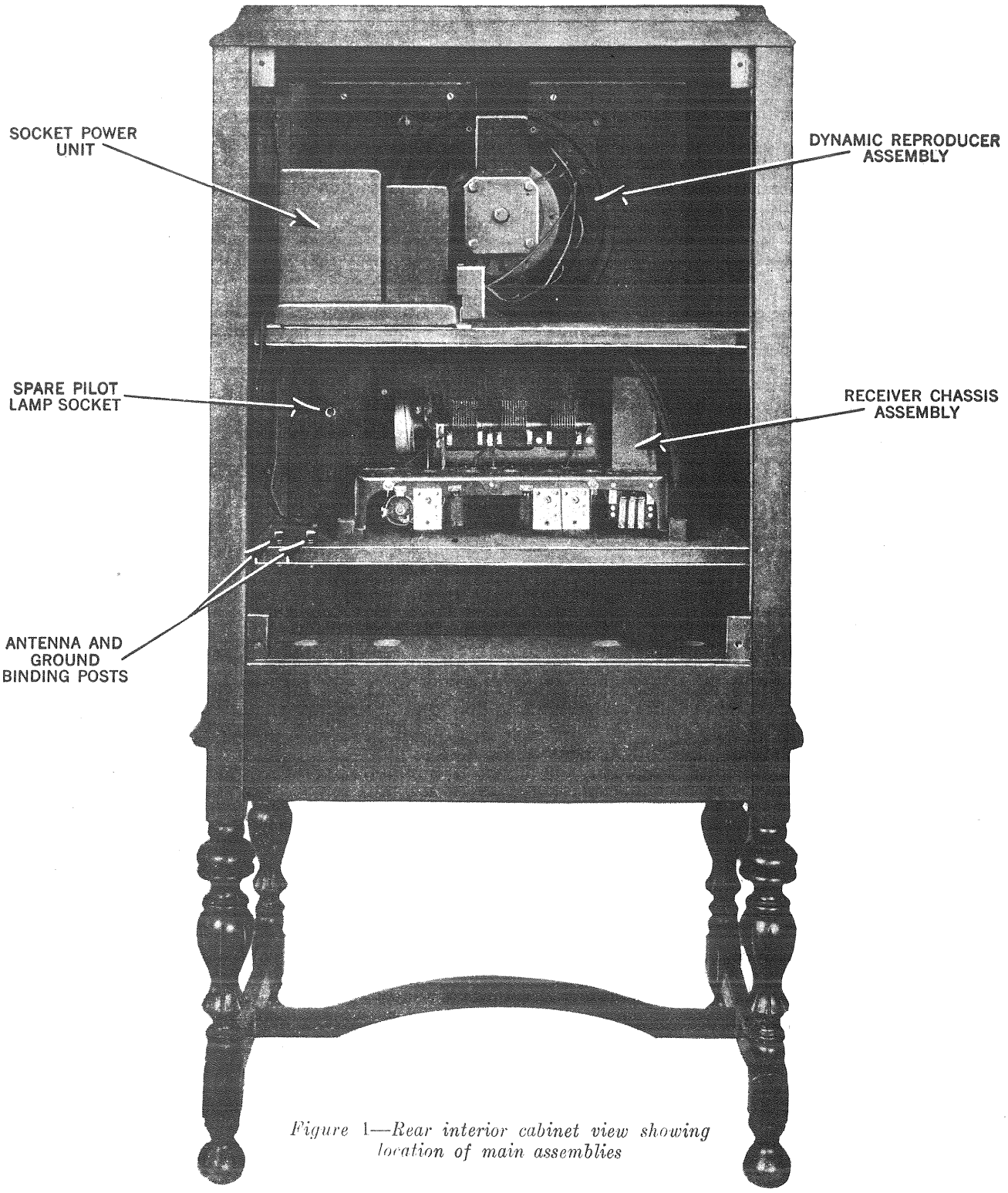


Figure 1—Rear interior cabinet view showing location of main assemblies

RCA RADIOLA 66

(105-125 Volts—50-60 Cycle A. C.—110 Watts)

SERVICE NOTES

Prepared by RCA Service Division

INTRODUCTION

RCA Radiola 66 is a seven-tube socket powered console cabinet model radio receiver utilizing the RCA Super-Heterodyne circuit in its highest development, and employing six UY-227 Radiotrons and the newly developed power amplifier Radiotron, UX-245. The Radiotron UX-280 is used in a socket power unit for supplying all plate, grid, and cathode voltages as well as supplying a high D.C. voltage for the newly developed high voltage, low current dynamic reproducer field used in the Radiola 66. Incorporated in this receiver are the latest developments in Super-Heterodyne engineering in addition to other perfected Radiola features such as one dial control, complete A.C. operation, power detection, single audio amplification stage, with overall balance in sensitivity, selectivity and tonal quality that can best be accomplished in a Super-Heterodyne. Figure 1 illustrates a rear view showing the principal parts. Figure 2 illustrates the top view of the receiver chassis, and Figure 3 is a view of the socket power unit.

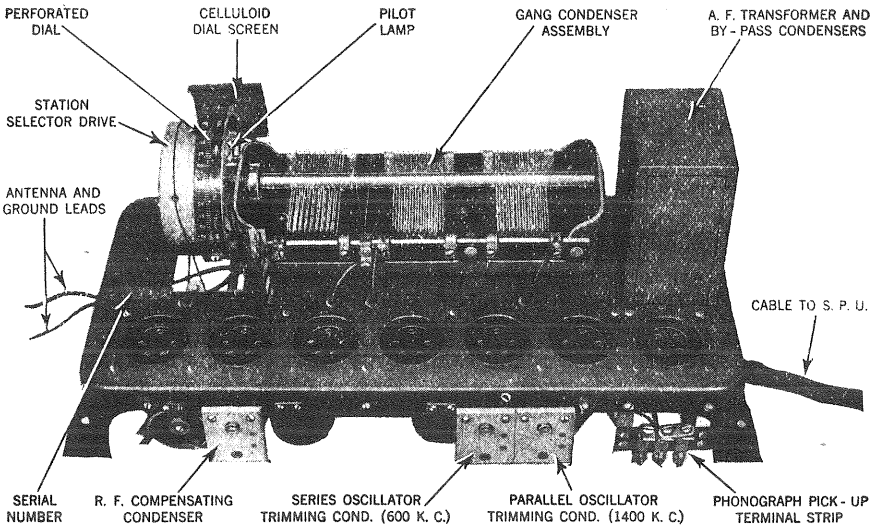


Figure 2—Top view of receiver chassis showing principal parts

Radiola 66 is designed to operate on alternating current of 105 to 125 volts, 50 to 60 cycles as used for house lighting. Connection to D.C. lines or to A.C. lines of different rating may damage this Radiola or the Radiotrons.

Radiola 66 is also made in models designed for alternating current operation of 105 to 125 volts, 25 to 40 cycles. In this model the power transformer is different from that used in the 50-60 cycle models. All other parts are identical in both models and the Service Notes apply to each equally well.

The following circuit characteristics are incorporated in the Radiola 66:

(a) The six UY-227 Radiotrons and one UX-245 Radiotron are connected in a seven-tube super-heterodyne circuit with a UX-280 Radiotron in the S.P.U. for plate, grid, and cathode voltage supply as well as high voltage, low current supply to the field of the new dynamic speaker.

The super-heterodyne circuit consists of one tuned R.F. stage; tuned first detector; two intermediate R.F. stages; an oscillator; a second, or power detector; and the single audio stage using the recently developed power amplifier Radiotron UX-245. The Radiotron sequence is shown in Figure 4.

(b) A "Local-Distant" antenna switch (see front cover) is incorporated in this receiver which permits better control of volume with less distortion, due to the natural condition of overloading on extremely loud local signals together with better selectivity on local stations. This feature with the use of a high impedance semi-tuned primary inductance of the tuned R.F. stage permits the use of a varying length of antenna without materially affecting the tuning of the receiver.

(c) The intermediate radio frequency which results from the mixing of the incoming modulated radio frequency current with that of the local oscillator is 175 K.C. The audio, or voice, modulation that is present in the radio frequency is carried on through the first detector and in the mixing is impressed on the I.F. After being

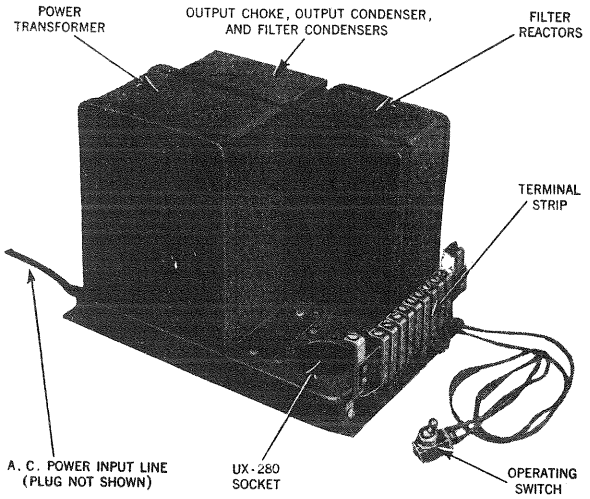


Figure 3—Socket power unit showing principal parts

amplified in two I.F. stages it is detected, or rectified, and further amplified in the audio amplifier stage using the new Radiotron UX-245. The use of 175 K.C. for the I.F. prevents serious harmonic disturbance around 550 K.C., which is a distinct asset. The super-heterodyne circuit owes its superior selectivity and sensitivity to tuned I.F. amplification, for no matter what the R.F. frequency may be to which the receiver may be tuned the most part of the over-all amplification is accomplished by the uniform amplification of the I.F. stages. These I.F. stages are also constantly neutralized for 175 K.C. Neutralization, or prevention of oscillation, is then independent of the broadcast frequency, which is practically the ideal condition for radio reception. The Radiola 66 I.F. transformers are sharply tuned to give improved over-all selectivity. The tonal quality is maintained by means of certain refinements in the circuit arrangement, especially at high frequencies.

(d) The second detector operates at 235 volts plate potential with proper grid bias. The high plate voltage used gives sufficient undistorted output to operate the single audio power stage using the UX-245 Radiotron directly from the second detector, thus eliminating any possible distortion that might be caused by an intermediate audio stage.

(e) Use of the UX-245 Radiotron with the new dynamic speaker permits an undistorted output which represents an over-all gain over previous receivers. It uses the same

voltage on its filament as the UY-227, and plate and grid voltages that fall within the supply limits of a UX-280.

(f) The volume control regulates the grid bias on the tuned R.F. stage and the first I.F. stage. When loud local signals are received the "Local-Distant" switch in the local position acts very effectively in allowing better control of volume near the maximum volume control setting without over-loading the receiver. The volume, when the over-loading point is reached, will, of course, distort and drop to a small value. This is entirely natural to the over-loading condition in a vacuum tube, as is also the two peaked tuning effect, which is obtained when the dial is detuned to either side of the normal peak setting with resultant less input and hence no over-loading.

(g) The use of a high voltage, low current field in the dynamic loudspeaker employing the 8-inch cone makes a sensitive reproducer with a field that is supplied by the total D.C. voltage output of the UX-280 in the S.P.U., drawing only approximately 46 milliamperes at about 300 volts. This load together with the receiver Radiotron load is much below the load limit of the UX-280. The voltages on the plates, as well as the grid voltages of the R.F. and I.F. Radiotrons, are purposely reduced to make no over-all difference in amplification, but permitting better S.P.U. regulation and stabler operation. Proper cathode voltages are supplied to all the UY-227 Radiotrons to secure quiet operation and insure average Radiotron life. For the most part,

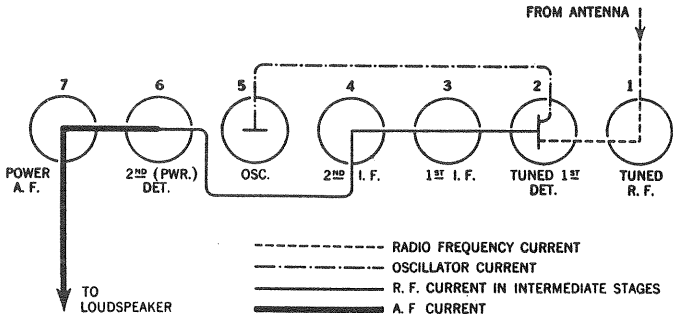


Figure 4—Radiotron sequence

the series or parallel resistance method of supplying voltages is used. The line voltage adjustment switch, common in most receivers, has been discarded to make necessary a more careful check of the supply line voltage before making any change. A tap has been provided in the power transformer primary, located under the S.P.U. for lower than 115-volt power supply to which a soldered connection can be made. This will prevent frequent change-over in the power supply and thus will lessen the application of excessive filament voltages.

Mechanical and electrical improvements in Radiola 66 not mentioned above are:—

(a) Use of "Isolantite" for I.F. transformer adjustable condenser and coil mounting, and also the R.F. compensating and oscillator trimming condenser mounting.
(b) Accessibility of I.F. adjustments. See Part II, Section 16.
(c) Electrostatic shielding between R.F. condensers of the gang tuning condenser and also between socket power unit and receiver chassis.
(d) Simplified construction of the S.P.U.
(e) Projection type of dial scale with kilocycle designation is distinctly a new feature.
(f) A terminal strip is provided for convenient use of a phonograph pick-up.

RADIOTRON SEQUENCE

Figure 4 illustrates the Radiotron sequence. Radiotron No. 1 is a stage of tuned radio frequency amplification. It is coupled to the antenna and ground by a high impedance primary inductive coil. It is tuned by the first of the gang condensers located at the right end facing the receiver from the front.

Radiotron No. 2 is the tuned heterodyne detector. It is tuned by the center of the gang condensers.

[4] GROUND

A good ground is quite as important as a good antenna. No specific recommendations can be given in this matter as conditions vary in different locations. Water and steam pipes usually make good grounds. Gas pipes usually make poor grounds and, as a rule, are to be avoided. If neither water nor steam pipes are available, a pipe or metal rod may be driven into the ground to a depth of several feet. The success of this type of ground depends upon the moisture present in the soil. The ground lead should be as short as possible and connected by means of an approved ground clamp to a section of pipe that has been scraped and thoroughly cleaned. The connection should be inspected from time to time to make certain that a clean and tight electrical contact exists between the clamp and pipe. The service man should experiment with various grounds, and employ the one giving the best results.

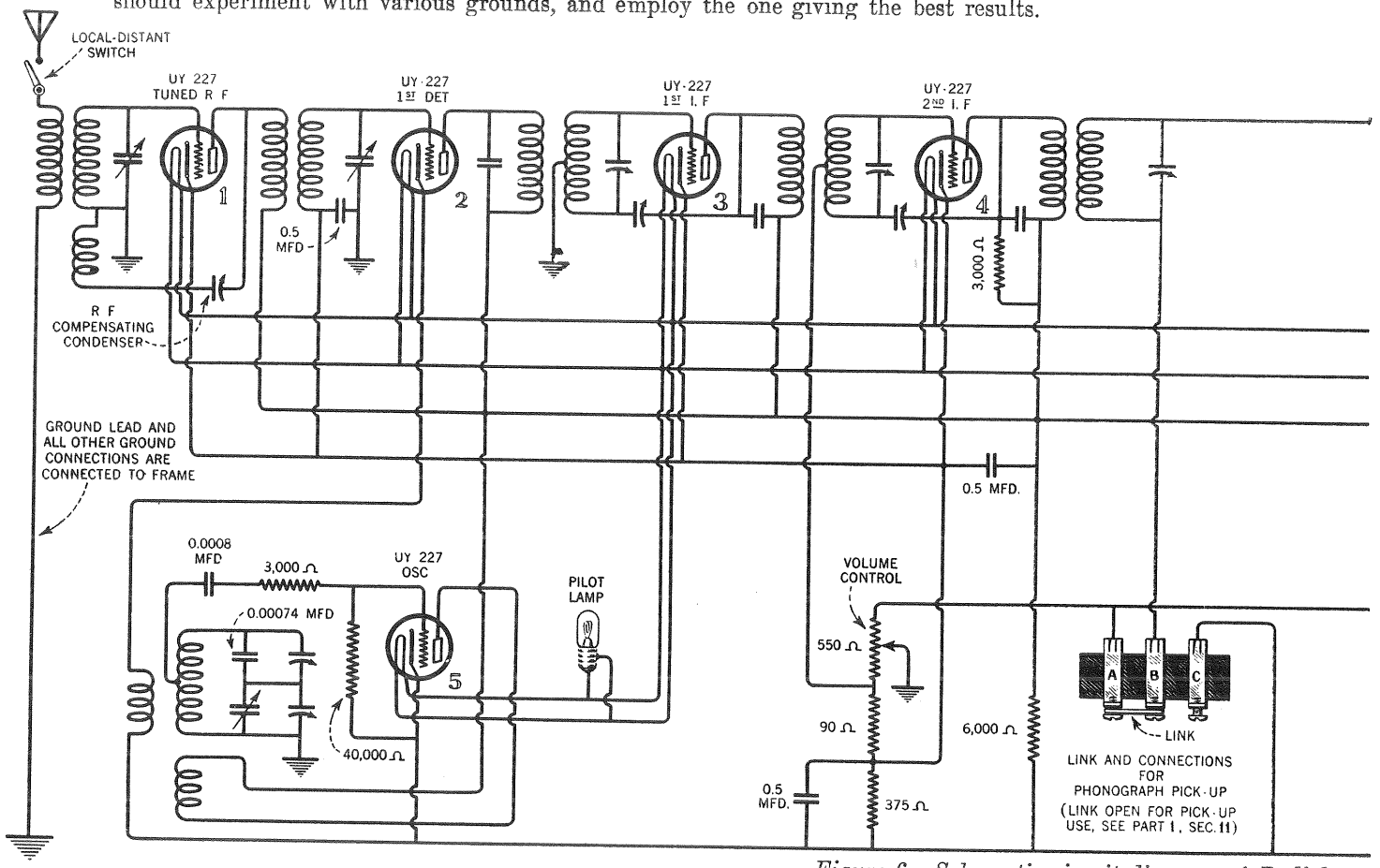


Figure 6—Schematic circuit diagram of Radiola **66**

[5] RADIOTRONS

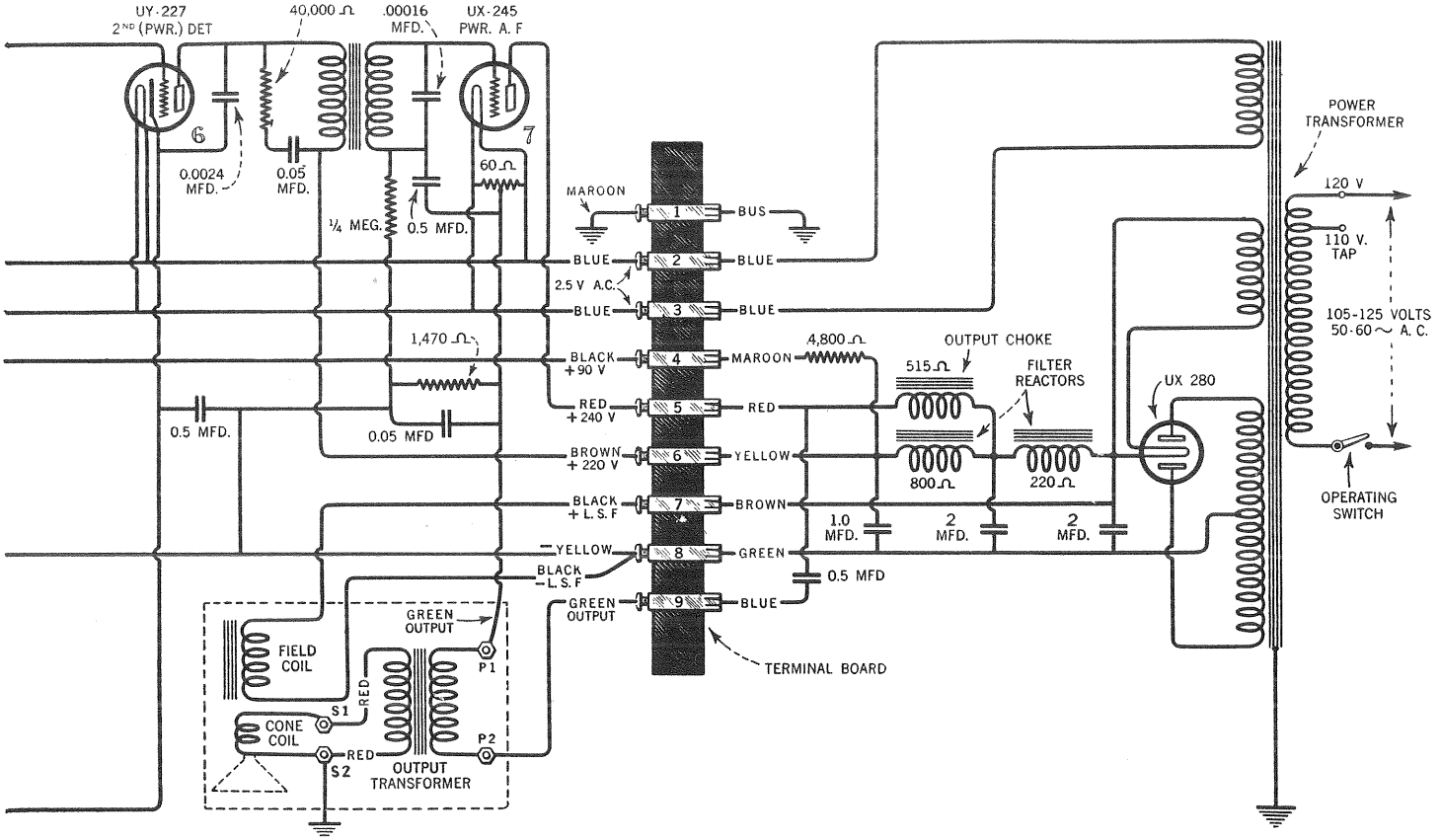
A guide shield is provided on all the receiver Radiotron sockets to facilitate the insertion of the Radiotrons. The six Radiotrons UY-227 are inserted in the five-contact sockets. The Radiotron UX-245 is placed in the four-contact socket in the receiver assembly, and the Radiotron UX-280 is placed in the socket power unit.

In placing Radiola 66 into operation, if no signals are heard when tuning to a station known to be broadcasting, examine the Radiotrons. Possibly one Radiotron has been damaged in transit. Interchanging with one or more of the same type known to be in operating condition will isolate the damaged one.

NOTE.—Socket No. 1 (Figure 4), the tuned R.F. stage, is the most critical for selection of the Radiotrons. Place in this socket the tube which gives the loudest signal and does not go into oscillation throughout the tuning range. If no tube is found that will not oscillate, a slight re-adjustment of the R.F. compensating condenser may be necessary, as described in Part II, Section 14.

Other stages somewhat critical are the oscillator and second detector, sockets No. 5 and No. 6, respectively. The remaining tubes should be interchanged until a tube is found for the oscillator that gives the loudest signal on a given station. The second detector Radiotron should be selected for its ability to handle large volume. Select the tube for this socket that will permit the volume control to be advanced and give the greatest undistorted output without overloading.

The I.F. stages, Radiotrons No. 3 and No. 4, should have tubes chosen for best amplification. When changing Radiotrons it is advisable to change one at a time, so that no unnecessary voltage unbalancing will result. Turn operating switch "Off" when changing UX-280.



including receiver assembly, socket power unit, and reproducer assembly

[6] RECEIVING LOUD LOCAL STATIONS

If excess volume control adjustment is used on local stations the signal will apparently have two peaks on the tuning dial. A further advance of the volume control will decrease the volume abruptly rather than increase it. This is entirely normal, and is caused by tube overloading. The correct method of tuning Radiola 66 on local stations is to reduce the volume control to the position where the station will be received at only one position on the station selector dial, and then adjust the volume control for the desired volume.

On some stations when tuned in with excessive volume distortion may be experienced. The remedy is to reduce the volume control until the distortion disappears. The "Local-Distant" switch serves a distinct purpose here also. See Part I, Section 8.

If a steady whistle occurs with a powerful local (not a heterodyne between two stations which is a natural condition and impossible to eliminate), it can usually be eliminated or reduced by slightly detuning the station selector. Interference from long wave stations is eliminated in most cases by the new antenna semi-tuned inductance.

This tuning procedure should be explained to the Radiola owner when an installation is made.

[7] ADJUSTMENT FOR LOW LINE VOLTAGES

A lead is provided under the S.P.U. for use when Radiola 66 is connected to lines, the voltage of which never exceeds 115 volts. A good plan is to allow the lead to remain as connected in manufacture unless unsatisfactory operation is experienced. Should it be determined by measuring the line voltage at intervals with a good A.C. voltmeter (as incorporated in Weston Test Set No. 537) that the line voltage never exceeds 115 volts adjustment may be made as follows:

(a) Remove S.P.U. as described in Part IV, Section 15.

(b) Connected to the operating switch will be found two soldered connections, one of which has a transformer lead (black with red tracer), connected to the switch. Unsolder this connection and tape up the transformer lead so that it will not ground or short to other parts.

(c) A black and red transformer lead will be found taped up and not used. Untape this lead. Clean the end for soldering and solder this lead to the switch connection from which the black with red tracer transformer lead has been removed.

(d) Replace S.P.U. in reverse manner.

The 110-volt tap of the transformer is now properly connected and the Radiola may be used on 105-115 volt lines with maximum efficiency. Figure 25 illustrates the changes to be made.

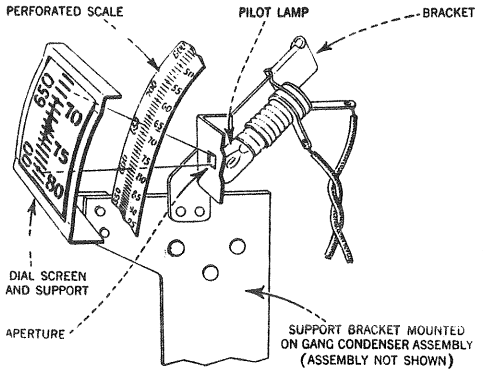


Figure 7—Dial screen, tuning scale and pilot lamp

[8] "LOCAL-DISTANT" SWITCH

A switch is provided in Radiola 66 termed the "Local-Distant" switch. This is an antenna switch, which disconnects the antenna from the receiver when in the local position. When closed it permits distant reception due to the proper normal antenna connection. The purpose of this switch is to prevent the strong carrier of a powerful local station from overloading the tubes, thereby causing distortion and also permit better radio frequency selectivity for local stations close to each other in kilocycle assignment. Keep the switch, as a general rule, at the local position unless sufficient pick-up is not obtained, when the switch may be thrown to the distant position. The "Local-Distant" switch may be located by referring to the illustration on the front cover page.

[9] JERKY ACTION OF STATION SELECTOR

Should operation of the station selector be stiff or jerky a little oil dropped on each condenser bearing will effectively remedy this condition. When experiencing this trouble it is also well to check the cable tension spring to make sure that suitable tension is being applied to the condenser drive cable.

[10] INSTALLATION OF PILOT LAMP

A projection type of dial lighted by a small concentrated filament lamp is used in Radiola 66. The lamp is mounted so that its rays pass through the pierced scale of the dial and then project the scale divisions on an amber window on the front of the cabinet. It is therefore important to mount the lamp so that its rays will pass through the correct openings to fully illuminate the scale readings on the window. Figure 7 shows the general arrangement of the pilot lamp and dial.

To install the pilot lamp proceed as follows:

Turn the station selector counter-clockwise to its extreme position so that the pilot lamp mounting will be accessible. Remove the socket clamp from its bracket and screw the lamp firmly into the socket. Replace the socket clamp on its bracket.

Now turn the power "On" at the operating switch. With the station selector in the extreme counter clockwise position adjust the socket clamp on its brackets until the zero mark on the scale projected on the dial screen is about ¼ inch below the index pointer.

To replace a bulb, pull the socket back from its position and remove the old bulb. Place the new one in the socket and screw in tightly. The socket is then pushed down until the front window is properly illuminated. There may be a slight variation in the centering of the filaments of various lamps which might tend to throw the light too much to one side of the window. If this happens pull the socket out and bend the metal arm that holds the socket to one side until the rays of the lamp properly illuminate the scale window. Now tune in a station, the dial setting of which is known. If the dial setting for the station tuned in is different from that formerly obtained pull the lamp back or push it forward until the dial reads the same as that previously obtained for that station. The lamp itself may be out of focus due to excessive or too little solder on the base tip connection. This can be remedied by replacing the lamp with the spare provided, taking away a little solder with a hot soldering iron.

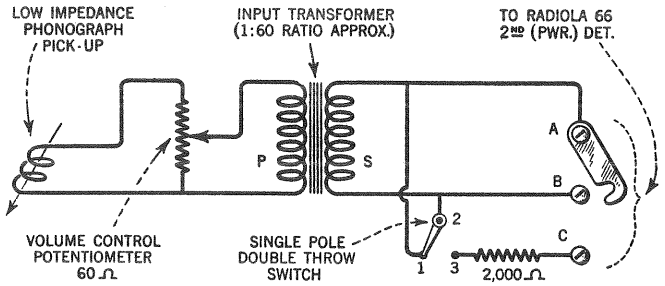


Figure 8—Schematic circuit diagram of phonograph pick-up connections

[11] PHONOGRAPH PICK-UP

Connecting lugs for a phonograph pick-up are provided and are shown specifically in the schematic diagram Figure 6. The proper arrangement of parts and connections for a low impedance type pick-up are schematically shown in Figure 8. If a high impedance type pick-up is used, as is most generally found in the open market, the 1 to 60 step-up input transformer as shown in Figure 8 should be changed to a 1:3 input transformer (Audio transformer RCA part number 5805), or that recommended by the individual manufacturer. The volume control potentiometer should also be changed to that recommended by the manufacturer. It is important to have the resistor connected as shown to the single-pole double-throw switch for changing over from the audio amplifying system for phonograph operation (close switch from contact 2 to contact 3), to that of radio reception (close switch from contact 2 to contact 1). Contacts and switch arrangements, as well as the necessary 2000-ohm resistor, are shown in Figure 8. For phonograph operation the Radiola 66 volume control should be at extreme minimum setting as well as "Local-Distant" switch in "Local" position. If a high pitched audio frequency whistle occurs with some types of phonograph pick-ups it is advisable to ground the lower end of the primary of the input transformer (end closest to letter P of diagram shown above) and pick-up suspension arm.

[12] LOCATION OF RADIOLA IN ROOM

As with other musical instruments, the location of Radiola 66 in the room should be chosen with care. Various positions should be tried until the most desirable reproduction is obtained. If this position is outside the radius of the connection cord to the A.C. outlet, an extension cord can be used.

[13] KNOBS

Radiola 66 uses an improved type of push knob on the station selector and volume control shafts. This knob is removed by simply pulling it off the shaft, and replaced by pushing it on. Very little trouble should be experienced, as no set screws or other parts that might give trouble are used. Spacers are provided on the shaft to keep the knobs at proper distance from the tapestry grill, and if removed, should be carefully replaced.

PART II—SERVICE DATA

[1] ANTENNA SYSTEM FAILURES

A grating noise may be caused by a poor lead-in connection to the antenna; or the antenna touching some metallic surface, such as the edge of a tin roof, drain pipe, etc. By disconnecting the antenna and ground leads the service man can soon determine whether the cause of complaint is within or external to the receiver and plan his service work accordingly.

[2] RADIOTRON SOCKETS

The sockets used in Radiola 66 are a six-gang UY socket assembly and two single UX sockets. One of the UX sockets is used in the socket power unit and is of the same design as that used in the receiver assembly.

The bakelite Radiotron guide shields used in the receiver assembly will prevent any possible shock from contact with high voltages in the socket when inserting the Radiotrons.

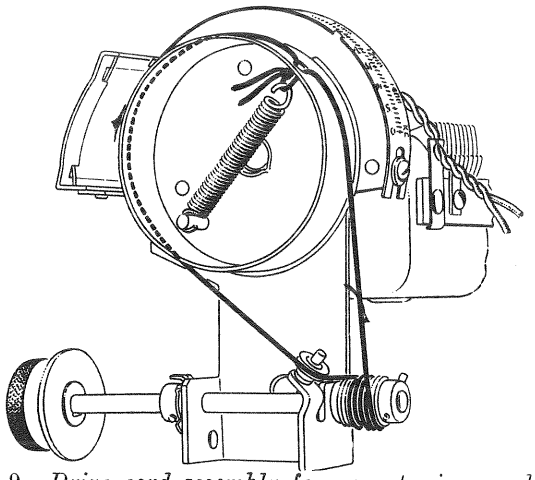


Figure 9—Drive cord assembly for gang tuning condensers

The prongs of the tubes fit into this shield opening very snugly and require only a twist until the prongs find the correct holes into which they fit. This is especially helpful when inserting the five-prong tubes into their sockets.

[3] RADIOTRON PRONGS

Dirty Radiotron prongs may cause noisy operation or change the resistance of the filament circuits sufficiently to cause a hum in the loudspeaker. They should therefore be cleaned with fine sandpaper periodically to insure good contact. The use of emery cloth or steel wool is not recommended. Before re-inserting the Radiotrons in their sockets wipe the prongs and base carefully to make certain that all particles of sand are removed.

If a Radiotron will not fit into a socket without considerable pressure, look for excessive solder on one or more of the prongs. Excessive solder on the prongs may be removed with a file or knife.

[4] LOOSE VOLUME CONTROL

A loose volume control arm may cause noisy or intermittent operation. It should be bent slightly so that it makes firm contact against the resistance strip. To do this it is necessary to remove the chassis from the cabinet as described in Part IV, Section 1. The volume control is then accessible. It can be released by removing the two screws that hold it to the metal frame, after unsoldering connections to its three terminals.

[5] BROKEN CONDENSER DRIVE CORD

The main tuning condensers are controlled by the station selector knob, the motion of which is transmitted by means of a rugged fish line to the drum on the end of the tuning condensers. Should this cord become broken, and a new one not be available, a temporary repair may be made by tying the two ends together by means of a square knot and then replacing the cord in its correct position as shown in Figure 9. The shortening caused by the

knot can be compensated for by untying the knot at the tension spring end and using a part of the spare length. The tying of the knot at the ends of the cord should be the last operation, because the correct amount of tension can then be obtained at the tension spring. Figure 9 shows the arrangement of the drive cord over the drums. This should be followed when replacing the cord. See Part IV, Section 5.

[6] RADIOTRONS FAIL TO LIGHT WHEN OPERATING SWITCH IS "ON"

Should all Radiotrons fail to light when the operating switch is "ON", look for:

(a) House current switched off; loose connection at convenience outlet; or open A.C. input leads.
(b) A.C. input plug to S.P.U. not in position.
(c) Operating switch not functioning properly.
(d) Line voltage tap not connected.
(e) Damaged power transformer in S.P.U.
(f) Burned-out filaments in Radiotrons not lighting.

The remedy for (a), (b), (c), (d), and (f) is apparent. Any external cause, such as D.C. supply, etc., of (e) should be located and eliminated before making replacements.

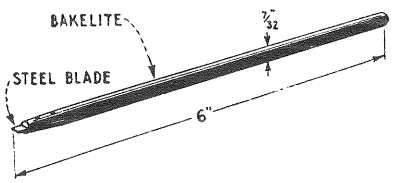


Figure 10—Dimensions of the non-metallic screw driver

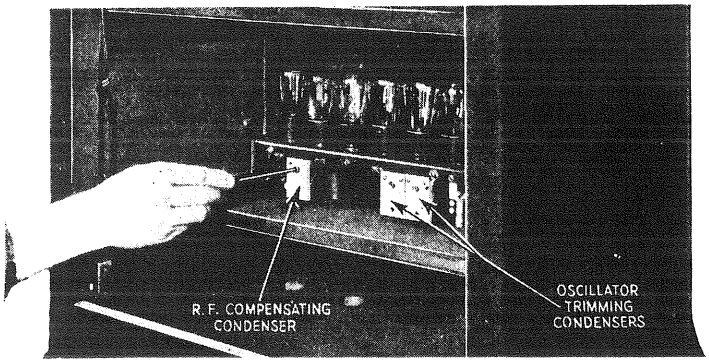


Figure 11—Method of adjusting compensating and oscillator trimming condensers in cabinet

[7] PLATES OF RADIOTRON UX-280 EXCESSIVELY HOT

Should the plates of Radiotron UX-280 become excessively hot, check the following:

(a) Shorted 2 mfd. filter condenser on high voltage side of filter reactor.
(b) Internal short in power transformer. Test for grounds to shield or to core, or short from one winding to another.

[8] NO SIGNAL—RADIOTRONS O. K.

If the Radiotrons appear to be functioning properly and no signals are heard from the loudspeaker with the volume control at maximum, check the following:

(a) Inoperative Radiotrons. Defects other than filament failure are not apparent until the tubes are tested. Inoperative Radiotron UX-280 may cause low voltages at the terminal strip, or at the Radiotron sockets. (See Part III, Sections 2 and 3, for voltage readings.)
(b) Antenna grounded or shielded, or some defectively grounded part.
(c) Open R.F. coils; I.F. transformers defective, etc. Check receiver wiring by inspection for poorly soldered joints, or grounds due to excessive soldering. Then resort to continuity tests and ground tests as outlined in Part III, Sections 5 and 9, to determine defective wiring, or open connections.
(d) Loose connections at S.P.U. terminal strip.
(e) Open movable coil on cone or defective output transformer on reproducer frame. (See Part III, Section 7.)
(f) Defective S.P.U. Check by means of continuity test.
(g) Open field coil in reproducer unit.

In Radiola 66 the receiver assembly, after the shipping blocks are removed, is mounted on rubber cushions to prevent any microphonic action. Should trouble of this kind be experienced, examine the rubber cushions in the cushion brackets to make sure the receiver assembly is fully resting on rubber. If this is O.K. the Radiotrons in the receiver should be interchanged until the howl is eliminated.

[13] DISTORTION IN REPRODUCER UNIT ONLY

Distortion in the reproducer unit may be due to any of the following causes:

(a) Cone out of alignment. Refer to Part II, Section 22.
(b) Leads from cone coil broken away from side of cone. Make these leads fast with a little shellac.
(c) Loose grill, grill cloth protector, or baffle board. Any loose part in the cabinet will cause a rattle. Tighten all loose parts.
(d) Foreign material in core space.
(e) Defective output transformer. Check continuity and resistance, Part II, Section 21.

[14] ADJUSTMENT OF R. F. COMPENSATING CONDENSER

The radio frequency compensating condenser should not be touched unless it is definitely ascertained that no other failure exists as a possible cause of receiver insensitivity, which is the most noticeable indication of the need for adjusting, providing different tubes have been tried as pointed out in Part I, Section 5.

An oscillating condition of the receiver may be caused by improper adjustment of this condenser.

A step by step procedure for making proper adjustment follows:

(a) Procure a long, thin, non-metallic screwdriver (See Figure 10).
(b) Place Radiola in operation in usual manner and tune in a weak station, preferably at the middle or upper wavelengths. If only a loud signal is available, place "Local-Distant" switch in "Local" position.
(c) Locate the position of the compensating condenser (See Figure 11).
(d) With the volume control at the position of maximum setting adjust the screw of the condenser until the Radiola goes into oscillation. This will cause a whistle whenever a station is tuned "in." Then turn the screw in the opposite direction until the set just goes out of oscillation and no howl is experienced when receiving loud local stations. Now tune in stations throughout the range of the receiver and note whether oscillations occur. If they do, it will be necessary to reduce the setting slightly. This is the correct adjustment for the radio frequency compensating condenser.

[15] DISTORTED REPRODUCTION CAUSED BY OTHER THAN REPRODUCER UNIT

Under normal conditions Radiola 66 will deliver a strong signal of excellent quality to the loudspeaker. The high sensitivity of Radiola 66 makes it undesirable to operate the set at full volume when receiving from nearby broadcasting stations. If the normal reproduction is poor, test the output from the receiver. A pair of phones may be used for this purpose. Poor quality or distortion may be due to any of the following causes, other than natural over-loading as explained in Part I, Section 6:

(a) Defective Radiotrons. Though the Radiola may be in operating condition a defective Radiotron in any stage will cause distortion. This is especially true of the second detector, audio stage and the rectifier tube.
(b) High or low plate and grid voltages from the Socket Power Unit or a defective resistor in the Receiver Assembly. In the Socket Power Unit distortion may be caused by a defective Radiotron UX-280 or resistance unit.
(c) Defective A.F. transformer. See Part II, Section 19. Check by means of continuity test and replace if necessary.
(d) Trimming condensers out of adjustment. Should the oscillator trimming condensers be out of adjustment the beat signal may not be exactly the frequency to which the intermediates are tuned. This will cause weak signals and distortion of those received. This condition may or may not be present throughout the tuning range of the receiver. Adjust as described in Part II, Section 17.

(e) Receiver oscillation. Should some circuit other than the oscillator be oscillating, distortion will be experienced when tuning in a station. This will be accompanied by a whistle or squeal when the carrier wave of the station is tuned in. To remedy trouble of this kind see Part II, Section 11.

(f) Intermediate transformers out of line or not properly matched or in themselves defective. This will have the effect of giving distorted reproduction and reduce the sensitivity of the receiver to a marked degree. Line up the entire I.F. transformer assembly as described in Part II, Section 16.

(g) Natural heterodyne between stations caused by being close in frequency. This is, of course, no fault of the receiver.

(h) Open by-pass condensers may cause distortion. Check larger ones by method outlined in Part III, Section 8. Smaller capacities should be replaced, if suspected, unless a capacity bridge is available.

(i) Defective connections. Check by continuity and ground tests as outlined in Part III, Sections 5, 6 and 9.

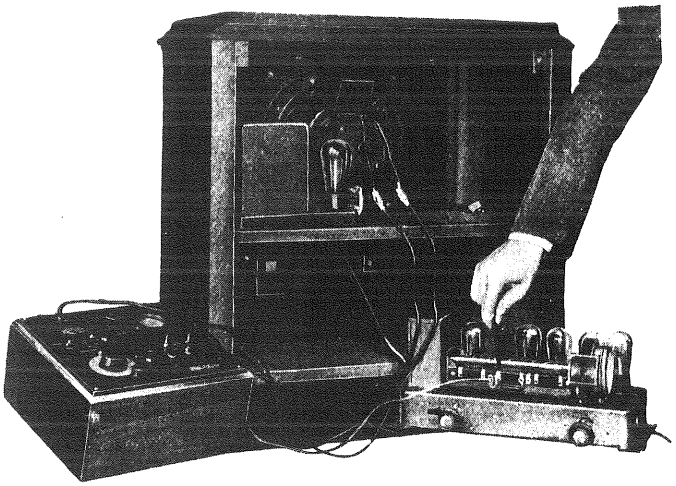


Figure 13—*Method of adjusting I.F. tuning condensers and neutralizing condensers*

While this and other adjustments may be made with the receiver chassis in the cabinet, better accessibility is obtained by removal from the cabinet.

[16] ADJUSTMENT OF I.F. TRANSFORMERS

The three I.F. transformers used in Radiola 66 are of the air core, tuned primary and tuned secondary type. The primary condenser is of the fixed type, while the secondary is adjustable. Also in I.F. transformers No. 1 and No. 2 an adjustable condenser is provided for neutralizing the I.F. stage. Figure 23 illustrates the internal connections of all the I.F. transformers.

Should a transformer burn out or its primary fixed condenser change in capacity it will be necessary to replace that particular transformer. The correct procedure for making such a replacement is contained in Part IV, Section 10.

A simple method of locating a shorted transformer is to use a resistance bridge or the resistance measuring method described in Part III, Section 7. The approximate transformer primary D.C. resistance is 20 ohms; secondary 100 ohms. Due to the circuit arrangement (See Figure 6) it will only be possible to get a reading of 50 ohms on the secondary as the end connection goes to the neutralizing condenser and the reading must be made at the center tap connection. This condition is true only of I.F. transformers No. 1 and No. 2. I.F. transformer No. 3 has no center tap in its secondary, and therefore can be measured for the full secondary resistance of approximately 100 ohms.

After replacing a defective I.F. transformer, or to make adjustments, the following tuning and neutralizing procedure must be followed for correctly lining up the various circuits. This is of utmost importance, as the entire performance of Radiola 66 is based on the correct functioning of its intermediate stages.

The following equipment is needed:

1. A Test Oscillator (Driver). See Figure 12.
2. A coupling lead for coupling the output of the Driver to the grid or stator of the first detector gang condenser (See Figure 13).
3. A non-metallic screw-driver.
4. A "dummy" Radiotron UY-227—A normal tube with one heater prong removed.

Preliminary steps to be taken before adjusting the tuning, neutralizing and trimming condensers:

(a) Remove receiver assembly as described in Part IV, Section 1, but leave all connecting lugs connected to the S.P.U. terminal strip (the terminal strip cover and insulator should be removed). Place the receiver in the position shown in Figure 13.

(b) Disconnect red leads from output transformer to cone coil binding posts (See Figure 22). To these should be clipped the meter terminal leads as shown in Figure 13. If it is desired to tune to resonance by ear as well as by sight of the meter (the latter, of course, should be used at all times for accurate settings), do not disconnect the red leads, but clip the meter leads to the cone coil binding posts on the loudspeaker frame. The switch under the meter of the "Driver" should be thrown to the dynamic ("Dyn") position. If a General Radio 180 K.C. "Test Driver," altered for 175 K.C., is used, the brown lead from the receiver should be released from Terminal No. 6 and the 0-2 D.C. milliammeter of the "Test Driver" inserted in series with correct polarities. If a separate meter is used a 0-5 D.C. milliammeter should be used, or a 0-2 D.C. milliammeter with 15,000 ohms in series.

(c) Now clip the coupling lead from the "Driver" on the center stator of the R.F. and oscillator gang condenser assembly. This places the output of the "Driver" into the I.F. stages through the first detector (See Figure 13). This connection is recommended for neutralizing with phones, as will be explained later. For the tuning procedure if too much pick-up is obtained the lead with the coupling coil should be placed under the center coil of the R.F. and oscillator assembly.

(d) Replace all Radiotrons except the oscillator, No. 5, and turn operating switch "On."

(e) Place "Driver" in operation by switching "On," and set switches and vernier condenser at 175 K.C. The note from the driver will then be heard in the loudspeaker if connected.

The I.F. transformer tuning condensers may now be adjusted as follows:

(f) Adjust the tuning condensers successively on the first, second and third I.F. transformers (Figure 14), for maximum signal in the loudspeaker and maximum reading on the milliammeter. If pointer should go off milliammeter scale reduce the volume control. After making one adjustment on the transformers it is a good plan to repeat, as slight changes may have occurred in tuning the other circuits. No signal, or a loud howl, indicates neutralizing condensers are out of adjustment and they should be readjusted. If meter swings abruptly off scale it is usually a good indication that the I.F. stages are in an oscillating condition. No further tuning should be attempted until the I.F. stages are correctly neutralized. A maximum reading, without the last mentioned condition, indicates correct tuning of the intermediate stages.

It is now necessary to check the neutralization of the I.F. stages as follows:

(g) Leave all adjustments and apparatus in position on completion of tuning, but substitute a pair of phones for the loudspeaker by disconnecting the red leads (black meter leads of "Driver" also), and connect the phone tips to these terminals by a clip or handy fastener for a good temporary connection. If greater response is desired in the phones, they may be connected to the green (See Figure 22), output transformer leads when removed from their binding posts. This connection is not generally satisfactory, as the A.C. hum for phones at this point is rather high to determine a good minimum neutralizing point. This connection may also be used for the meter of the "Driver" in the tuning procedure, with meter switch thrown to magnetic speaker position ("Mag"). Proceed then by placing the dummy Radiotron in first I.F. socket. Now adjust the neutralizing condenser on the first I.F. transformer for the position of minimum or no signal. This is easily identified and the adjustment is not critical.

(h) Replace the first I.F. tube and place "dummy" tube in second I.F. stage and adjust

the neutralizing condenser on the second I.F. transformer for position of minimum or no signal as described in the preceding paragraph (g). Figure 23 illustrates the internal connections of the I.F. transformers. The third transformer does not require neutralizing.

(i) It is good policy to re-check the tuning of the I.F. transformer stages after neutralization. See paragraph (f).

After the I.F. transformers are properly tuned and neutralized they should perform at their maximum efficiency. It is a good plan to check the adjustments of the two oscillator trimming condensers (See Figure 11) at this point. The correct method for doing this is indicated in Part II, Section 17.

Due to the increased sensitivity of the receiver it may be necessary to reduce the setting of the R.F. compensating condenser to prevent the tuned R.F. stage from oscillating. This can be ascertained by tuning in stations of different wavelengths and noting if the receiver oscillates at any point throughout its tuning range. (See Part II, Section 14.)

[17] ADJUSTMENT OF OSCILLATOR TRIMMING CONDENSERS

Two trimming condensers are provided for adjusting the oscillator circuit so that the beat note will always be 175 K.C. throughout the tuning range of the receiver.

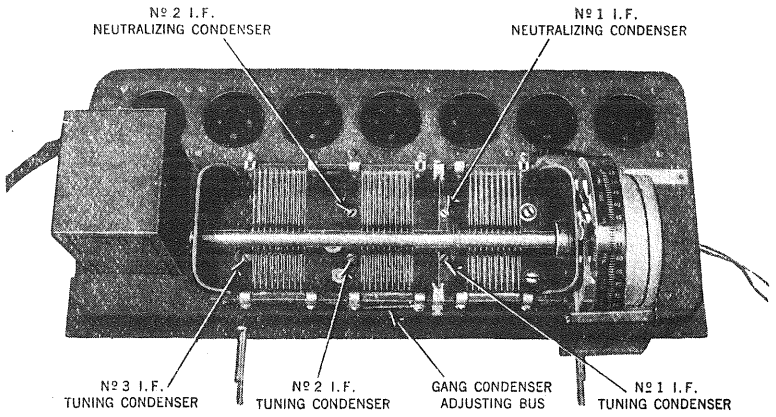


Figure 14—Condenser adjusting screws for I.F. transformers

The most noticeable symptom of the oscillator trimming condensers being out of adjustment is insensitivity of the Radiola in some sections or throughout the tuning range. To check the adjustment of the trimming condensers as a possible cause of any noticeable insensitivity in the receiver proceed in the following manner, making sure the I.F. stages are in correct adjustment (See Part II, Section 16).

(a) Procure the following equipment. A modulated oscillator giving signals at 1,400 and 600 Kilocycles. The Test Oscillator shown in Figure 12 is suitable for this purpose as it covers the broadcast band of frequencies 550-1,500 K.C.

A long thin non-metallic screwdriver. Such a screwdriver is shown in Figure 10 with its dimensions.

With the test oscillator shown, the two red output leads of the receiver chassis that normally go from the secondary of the output transformer to the cone coil (See Figure 22) should be removed and connected to the output or meter terminals of the oscillator with the clips provided and meter switch thrown to dynamic ("Dyn") position. If the test oscillator is not used, a 0-5 D.C. milliammeter or a 0-2 D.C. milliammeter with 15,000 ohms in series should be connected in series with the brown lead that connects to lug No. 6 (See Figure 22) on the terminal strip. This places the meter in series with the plate supply of the second detector and serves as a very good resonance indicator, as does also the other mentioned method. The speaker cone coil may be connected at any or all the time if the connection assists in any way in tuning to the modulated output of the test oscillator.

(b) Place the Radiola in operation with receiver raised by blocks or the rubber cushion supports provided, in order to simulate the conditions when mounted on the cabinet shelf. Then place the oscillator in operation at 1,400 K.C., and with the coupling lead twisted around the antenna lead, tune the Radiola by adjusting the station selector until a maximum deflection caused by the external oscillator is obtained in the meter, or resonance indicator. Always adjust the volume control so that the deflection is not beyond the scale of the meter.

(c) Now adjust the oscillator trimming condenser on the right, facing rear of Radiola (Figure 15) with the long, thin, non-metallic screwdriver until a maximum deflection is obtained in the milliammeter. The station selector should be moved slightly as adjustment is being made in order to keep correct tuning position, which is indicated by maximum deflection.

(d) Adjust oscillator for 600 K.C. Tune in the Radiola again carefully, but now for 600 K.C. with station selector and then adjust the trimming condenser to the left for maximum deflection of the milliammeter while tuning through signal.

(e) Now readjust at 1,400 K.C. as indicated in (b) and (c).

With this adjustment the trimming condensers are correctly adjusted for maximum efficiency, that is, so adjusted that the beat signal will be 175 K.C. throughout the tuning range.

(f) If the above fails to line up the trimming condensers, bearing in mind that the right trimmer is more critical than the left trimmer for usual correct adjustment, look for defective oscillator series condenser, or defective oscillator coil assembly. A two-peak effect of meter reading may be due to tuning through a broadcast station frequency that is being picked up. If the speaker is connected this can readily be determined.

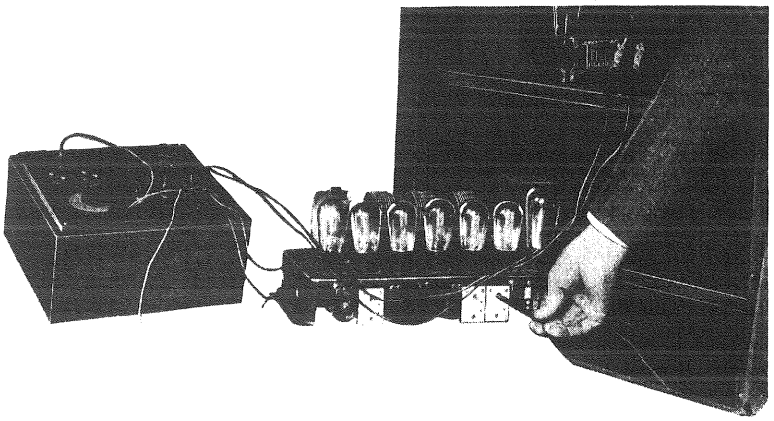


Figure 15—Method of adjusting oscillator trimming condensers

[18] TESTING ELECTRICAL ALIGNMENT OF TUNING CONDENSERS

Radiola 66 uses a three-gang tuning condenser, one condenser being used for the oscillator, one for the tuned radio frequency stage and one for the heterodyne detector. These condensers are accurately aligned electrically at the factory and it is important that they maintain this electrical alignment. Condensers not aligned will cause weak signals, broad tuning and generally unsatisfactory operation. The following procedure may be used for checking and aligning the condensers properly.

(a) A small tool such as illustrated in Figure 17 is necessary. This may be easily constructed from an old condenser plate, a piece of wire and a bakelite rod.

(b) Tune in a weak station or loud local with minimum volume control setting at the upper wavelengths. Then with the condenser end of the tester, touch the rotor plates, see Figure 16, and note if an increase or decrease of signal is obtained in the loudspeaker. Should touching the rotor plates and bringing the plate closer to the stator plates increase the signal, then either that particular condenser is low in capacity or the coil it tunes is low in inductance. Should the signal decrease in volume, then the condenser and coil is either normal or high in value.

(c) If it is desired to use the Test Oscillator to provide a signal, and its meter used to show the response, instead of broadcast signal as outlined in (b), this may be readily accomplished by connecting and using the Test Oscillator shown in Figure 12, and outlined in Part II, Section 17. Decrease in signal strength by using the tool mentioned above will be shown by a decrease in meter reading, after signal of oscillator has been properly tuned in.

(d) After checking at the upper wavelengths, the procedure should be repeated at the lower wavelengths.

To check against condensers or coils high in value the other end of the tester which has the wire ring should be placed inside of the coils or near the end of the coil. This reduces the inductance and should the coil be high in inductance or the condenser which tunes it high in capacity, the signal will increase in volume.

By thus checking each condenser and the coil it tunes, a positive check on the electrical alignment of the condensers and coils can be made. Should a circuit be found that is high, the end rotor plate of the particular condenser should be bent farther from the stator plates. The correct amount can be determined by checking as previously described. If the oscillator circuit should be out, a check must first be made of the adjustment of the trimming condensers. See Part II, Section 17.

Should it not be possible to align the circuits by bending the plates or the gang condenser adjuster (See Figure 16), then the R.F. and oscillator coil assembly is not properly matched. In this case this assembly must be replaced as described in Part IV, Section 2.

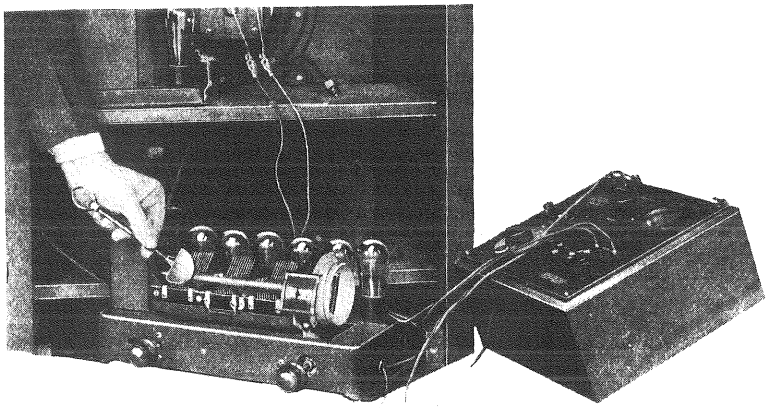


Figure 16—Aligning gang tuning condensers

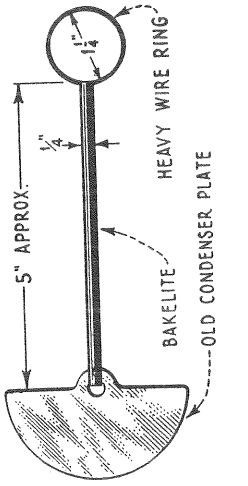


Figure 17—Aligning tool

[19] AUDIO TRANSFORMER AND RECEIVER BY-PASS CONDENSERS

Figure 20 shows the internal connection to external lugs of the single audio transformer and by-pass condensers as well as the correct color coding of the external leads with their correct internal connections.

(a) The transformer windings may be checked by the methods described in Part III, Section 7.

The primary resistance is about 1,000 ohms.

The secondary resistance is about 5,200 ohms.

(b) The by-pass condensers may be checked by the method outlined in Part III, Section 8. Although this method does not give any knowledge as to the exact capacity, it is a valuable, though rough, service check.

[20] OUTPUT CONDENSER, OUTPUT CHOKE, AND FILTER CONDENSERS

Figure 21 shows the internal connections to external lugs of the output condenser, output choke, and filter condensers, together with their respective values.

These should be checked by the methods outlined in Part III, Sections 7 and 8.

An open output condenser or an open or shorted choke will cause weak and distorted reproduction. A defective filter condenser is indicated by excessively hot plates, possibly showing color, in Radiotron UX-280. Shorted output condenser will cause distortion.

[21] REPRODUCER UNIT

Radiola 66 uses a new type eight-inch dynamic reproducer rendering excellent quality of reproduction. The field coil is a high-voltage, low-current type, being supplied from the UX-280 in the S.P.U. This field is efficient in operation and marks a distinct advance in dynamic reproducer design.

A check on the continuity of the cone coil or field can be made by disconnecting them from all other terminals and testing for continuity. An open of either coil will indicate a defect which must be remedied by replacing the entire cone or the field coil.

The output transformer also can be tested for continuity by applying methods as outlined in Part III, Sections 4 and 7. The connections for the above parts of the reproducer assembly are clearly shown in Figure 22.

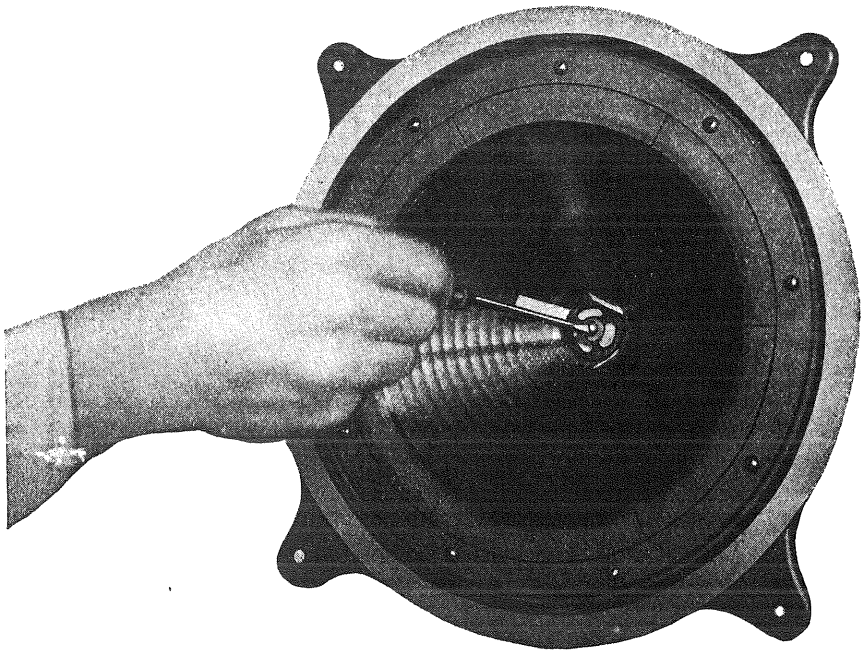


Figure 18—*Centering cone*

Testing the resistance of the cone coil should show approximately 10 ohms for normal condition. Similarly the output transformer primary resistance is 350 ohms, and secondary is 16 ohms. The field coil drain is about 46 milliamperes at 300 volts D.C.

[22] CENTERING CONE OF REPRODUCER UNIT

To properly center a new cone or one out of center use the following procedure:

(a) Remove reproducer unit from cabinet as outlined in Part IV, Section 13.
(b) Loosen center screw of cone, but do not remove it.
(c) Insert three cardboard strips about the thickness of a visiting card, 1½" x ¼" in size, through the center web of the cone into the space between the pole pieces and the cone (Figure 18). This will give the cone coil the same clearance on all sides of the pole piece.
(d) Tighten the center screw holding the web of the cone and remove the three strips. The cone is now properly centered.
(e) Replace reproducer unit in reverse order.

PART III—ELECTRICAL TESTS

[1] VOLTAGE SUPPLY SYSTEM

Figure 19 shows the method of obtaining the plate, grid, cathode and heater voltages and the high voltage field current from the main source. However, in order to give the service man a complete continuity picture of the voltage circuits it is not abridged, but drawn actually as it is found in the Radiola 66, so that the tracing of voltages and currents are actually done, through the various component parts affected, as shown schematically in a straight line manner.

By study of this schematic, the reason for no plate voltage on one I.F. socket with all others O.K. is readily apparent, namely, the primary coil of the I.F. in question must be open. A shorted primary condenser in an I.F. transformer means eliminating the resistance of the primary coil. These conditions as well as effects on voltages from shorted bias resistor condensers, etc., can be determined with study of this voltage supply schematic. The correct values of resistors, condensers, etc., are shown in the ordinary schematic diagram Figure 6

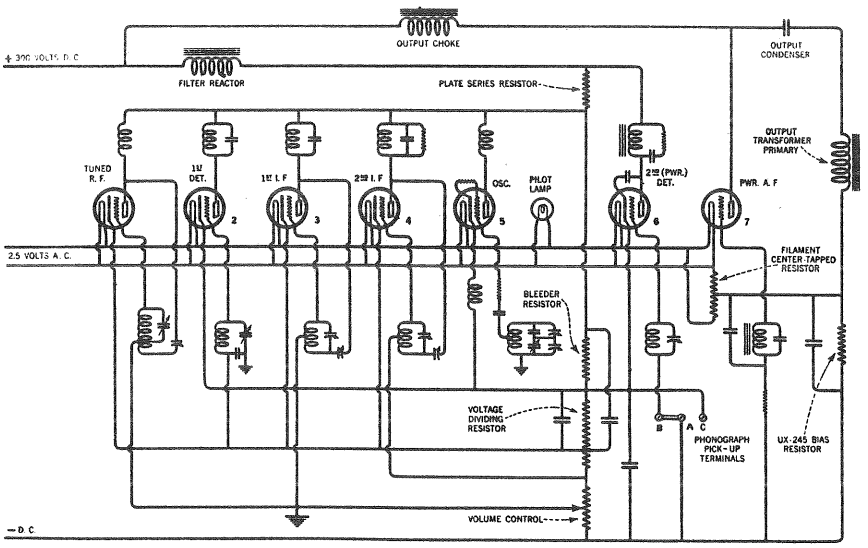


Figure 19—Schematic circuit diagram of the voltage supply system

[2] VOLTAGE READINGS AT TERMINAL STRIP

Use D.C. voltmeter with a 0-300 volt scale and at least 1,000 ohms per scale volt such as incorporated in Weston Model 537, Type 2, test set. Line volts—120 A.C.—Tap at 120 volt connection.

Terminals	*Volts*	*Terminals*	*Volts*
8 to 7	310	8 to 5	275
8 to 6	265	8 to 4	120

Use a 0-5 volt A.C. voltmeter for the following reading: Terminal 2 to 3, 2.7 volts A.C.

[3] VOLTAGE READINGS AT RADIOTRON SOCKETS

The following voltages 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 537, Type 2, or others giving similar readings. The plate currents shown 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. Therefore the following values must be taken as approximately those that will be found under varying conditions. The numbers in column 1 indicate the tube socket numbers shown in Figure 22.

VOLUME CONTROL AT ZERO

120-Volt Line. Tap at 120-Volt Connection

Tube No.	Cathode to Heater (D.C.) Volts	Cathode or Filament to Grid (D.C.) Volts	Cathode or Filament to Plate (D.C.) Volts	Plate (D.C.) Millamps	Filament or Heater (A.C.) Volts
1	—26	—20	+100	0	2.35
2	—17	— 9	+ 95	1.6	2.35
3	—26	—20	+100	0	2.35
4	—26	— 3	+100	7.3	2.35
5	—16	0	+ 90	8.7	2.35
6	—17	—29	+235	0.7	2.35
7	—	—16*	+225	31†	2.40

VOLUME CONTROL AT MAXIMUM
120-Volt Line. Tap at 120-Volt Connection

Tube No.	Cathode to Heater (D.C.) Volts	Cathode or Filament to Grid (D.C.) Volts	Cathode or Filament to Plate (D.C.) Volts	Plate (D.C.) Millamps	Filament or Heater (A.C.) Volts
1	—24	—3.0	+ 81	4.5	2.35
2	—17	—7.0	+ 77	1.5	2.35
3	—24	—3.0	+ 80	5.0	2.35
4	—24	—3.0	+ 81	4.9	2.35
5	—16	0	+ 75	6.6	2.35
6	—16	—29	+228	0.7	2.35
7	—	—16*	+225	30.5†	2.40

*The reading of 16 volts as herein found is correct. Actually this indicates a bias voltage of about 44 volts on the grid of the UX-245. The actual lower reading is due to the ¼ megohm (250,000 ohms) resistor naturally affecting the scale of the voltmeter.

†This reading is just off the scale of the 0-30 milliammeter used in the Weston 537, Type 2, test set. The 0-150 M. A. scale should be used in case of readings in excess of 30.

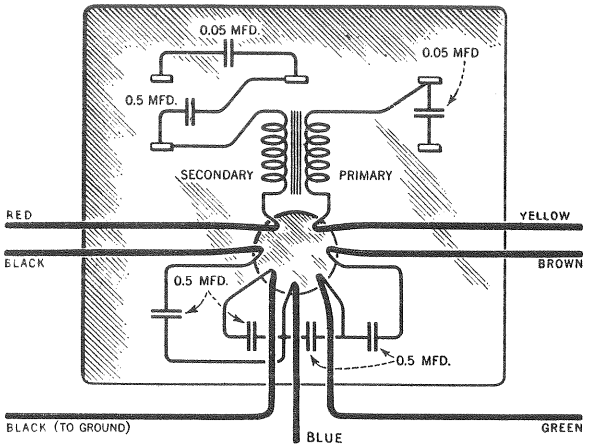


Figure 20—Internal connections of audio transformer and by-pass condensers

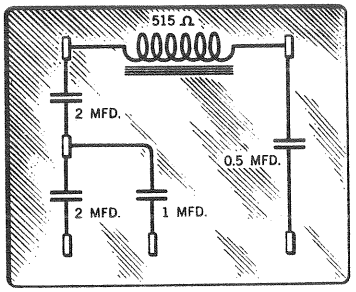


Figure 21—Internal connections of output choke, output condenser and filter condensers

[4] METHODS FOR CONTINUITY TESTS

In making a continuity test whether it be for the complete receiver, S.P.U., or individual parts, as the internal connections and windings of the A.F. transformer shown in Figure 20, or checking the continuity of the I.F. transformers by referring to Figure 23 for schematic representation, the following procedure is recommended:

Disconnect the antenna and ground leads; the cable connecting the socket power unit to the receiver and loudspeaker, and the A.C. supply cord at its outlet.

A pair of headphones with at least 4½ volts in series, or preferably a voltmeter with sufficient voltage to give a full scale deflection when connected across the battery terminals should be used in making these tests, for example, a 0-50 volt meter with a 45 volt "B" battery. The receiver Radiotron socket contacts, numbers and lugs used in these tests are shown in Figure 22. The receiver continuity wiring diagram is illustrated in Figure 23. The S.P.U. terminal numbers are shown in Figures 6 and 24. The voltage supply schematic (Figure 19) will also be a help in studying continuity.

Test leads should be of the flexible insulated type with partially insulated testing tips, so that false readings will not be obtained through contact with the hands. Similarly the hands should not touch the chassis or component parts.

The contacts of the test equipment should be placed across the terminals or leads indicated in the following test table under the column marked "Terminals." If the results are negative the cause of such negative effect will be found in the last column under the heading, "Incorrect Effect Caused By." The second column indicates the correct effect. The third column indicates the approximate correct resistance in ohms of most of the circuits tested.

The R.F. and oscillator coil winding lugs are coded (P) representing primary, (S) secondary, (S′) secondary center-tapped, and (T) tertiary or oscillator plate coil. Refer to Figure 23.

To test for grounded conditions refer to Part III, Section 9.

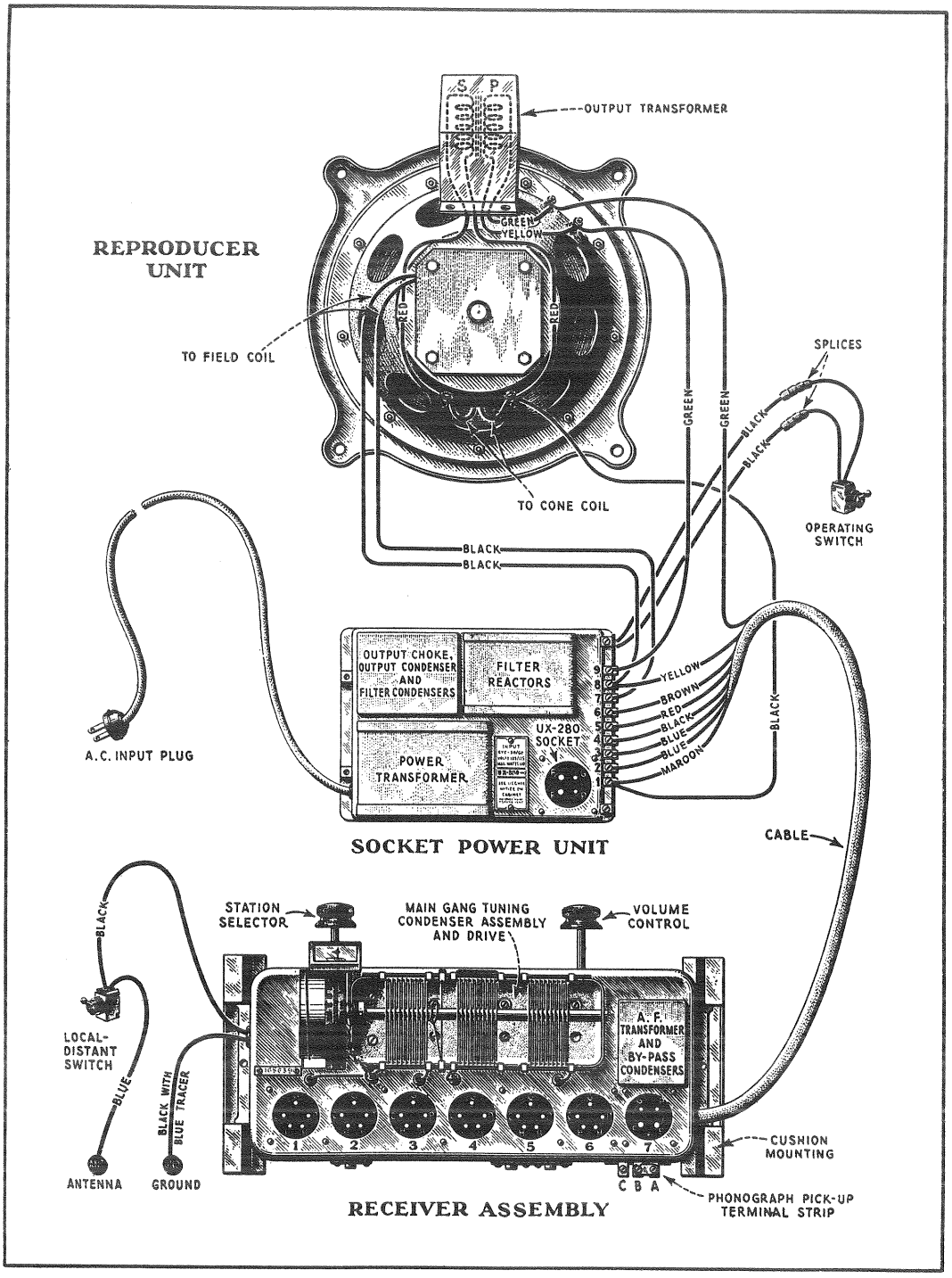


Figure 22—Radiola 66 cable connections, socket contacts, reproducer unit, socket power unit and receiver assembly

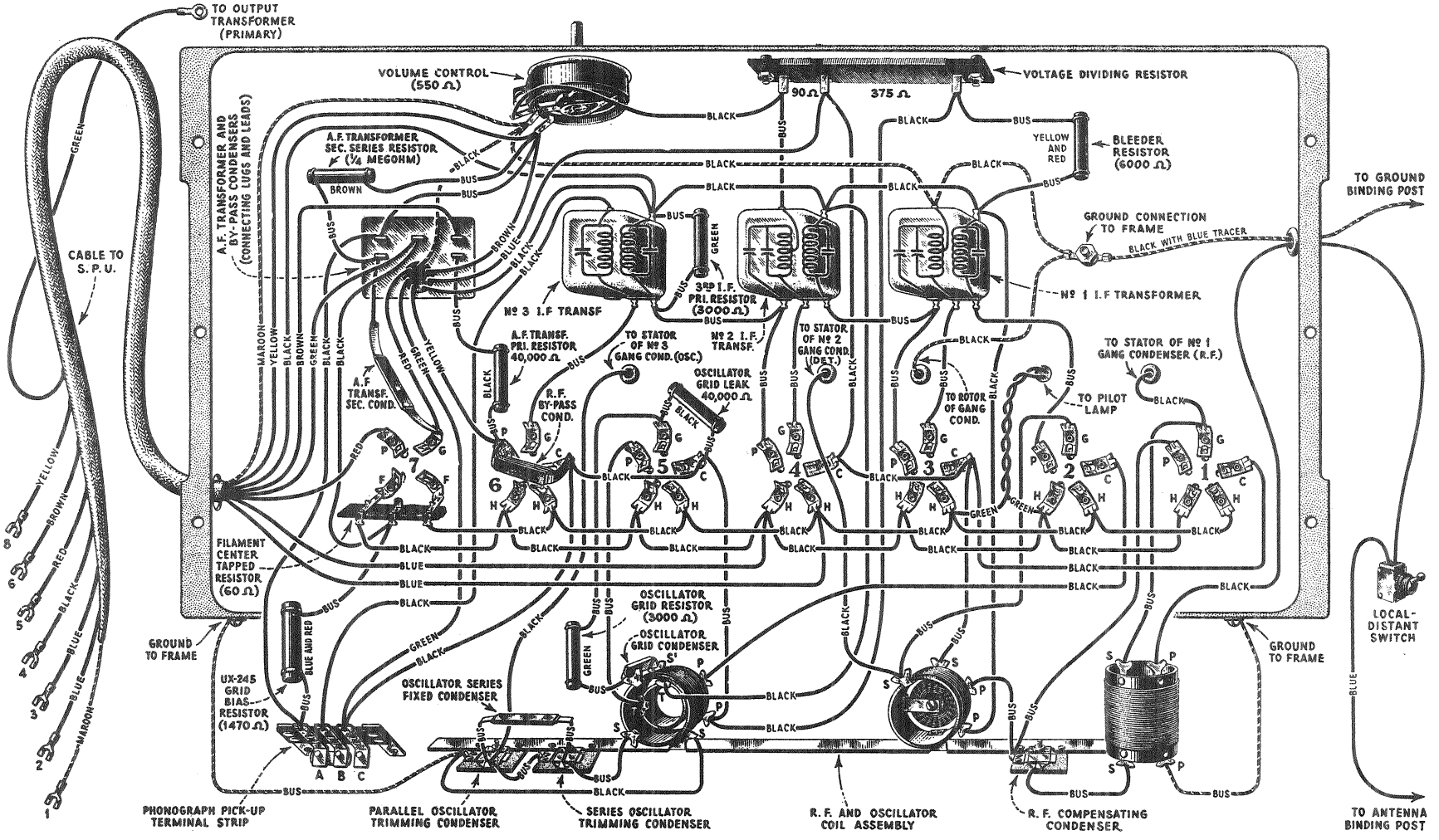


Figure 23—Continuity wiring diagram of receiver sub-chassis

[5] RECEIVER ASSEMBLY CONTINUITY TESTS

Remove all Radiotrons and disconnect cable at terminal strip. Remove all ground connections. Remove pilot lamp. See Figure 22 for cable lugs, terminals, and Radiotron socket contacts. For convenience coloring of lugs as well as numbers are shown. Code—Maroon (M), Black (Bla), Blue (Blu), Red (R), Brown (Br), Yellow (Y), Green (G).

First—Inspect all connections to observe any apparent faulty connection, rosin soldered joint, grounded or shorted lugs. Any connection removed or insulated as outlined below should be replaced before the next successive test.

Circuit	Terminals	Correct Effect	Resistance in ohms (Approx.)	Incorrect Effect Caused by
Antenna	Antenna post to ground post switch in "Distant" position	Closed	40	Open antenna inductance, or open "Local-Distant" switch
Grid	G1 to ground or Lug No. 1 (M)	Closed	5	Open secondary of 1st R. F. transformer, or open connection
	G2 to C1	Closed	5	Open secondary of 2nd R. F. transformer, or open connection
	G2 to ground {Insulate volume control arm. See P. III, S. 9.	Open	—	Shorted 0.5 mfd. condenser
	G3 to ground	Closed	50	Open one-half secondary of 1st I. F. transformer
	G4 to Lug 8 (Y)	Closed	600	Open one-half secondary of 2d I. F. transformer or open volume control
	G4 to C4	Closed	140	Open one-half secondary of 2d I. F. transformer, or 90-ohm portion of voltage dividing resistor
	G5 to C5	Closed (Weak)	40000	Open grid leak or connection
	G5 to ground {Insulate volume control arm. See P. III, S. 9.	Open	If 3000	Shorted oscillator grid condenser
	G6 to terminal A or Lug 8 (Y) (Link closed)	Closed	100	Open secondary of 3rd I. F. transformer or open connection
	G7 to Lug 8 (Y)	Closed (Weak)	255,000	Open secondary of A. F. transformer, ¼ megohm resistor, or connection
Plate	P1 to ground {Insulate volume control arm. See P. III, S. 9.	Open	—	Shorted compensating condenser, or grounded 1st detector primary, or connection
	P1 to Lug 4 (Bla)	Closed	44	Open primary of 2nd R. F. transformer or connection
	P2 to Lug 4 (Bla)	Closed	20	Open 1st I. F. transformer primary coil, or connections
	P3 to Lug 4 (Bla)	Closed	20	Open 2d I. F. transformer primary, or connections
	P6 to Lug 6 (Br)	Closed	If 1050 1023 40000 Open	Normal A. F. Primary condenser shorted A. F. primary condenser shorted and primary winding open A. F. primary winding open
	P5 to Lug 4 (Bla)	Closed	1.5	Open plate coil (Tertiary) of oscillator or connections
	P4 to Lug 4 (Bla)	Closed	If 20 3000 0 Open	Normal Open primary coil of 3rd I. F. transformer (Resistance O. K.) Shorted primary condenser Open primary of 3rd I. F. transformer and resistor
Cathode and Filament	Cathodes 1, 3 and 4 to terminal "C"	Closed	375	Open connection, or 375-ohm section of the voltage dividing resistor. If low resistance then 0.5 mfd. condenser is shorted.
	Cathodes 2, 5 and 6 to Terminal "C"	Closed	—	Open pick-up winding of oscillator coil, or connections
	One filament contact of Socket 7 to Lug 8 (Y)	Closed	1500	Open one-half of center tapped resistor, or UX-245 bias resistor, or shorted condenser (across biasing resistor) if resistance is low
	Other filament contact of Socket 7 to Lug 8 (Y)	Closed	1500	Open other half of center tapped resistor, or UX-245 bias resistor, or shorted condenser (across biasing resistor) if resistance is low
	UNSOLDER ONE END OF FILAMENT CENTER TAPPED RESISTOR			
	Lug 2 (Blu) to one filament contact Socket 7	Closed	—	Open connections
	Lug 3 (Blu) to other filament contact Socket 7	Closed	—	Open connections
	Lug 2 (Blu) to one heater contact of Sockets 1, 2, 3, 4, 5 and 6	Closed	—	Open connections
	Lug 3 (Blu) to other heater contact of Sockets 1, 2, 3, 4, 5 and 6	Closed	—	Open connections
Misc.	G3 to P3 (Disconnect bleeder resistor)	Open	—	Shorted 1st I. F. neutralizing condenser
	G4 to P4 (Disconnect bleeder resistor)	Open	—	Shorted 2nd I. F. neutralizing condenser
	G7 to output transformer Lug (G)	(Closed) (Weak)	257,000	Open resistors, or if closed strong, shorted 0.5 mfd. condenser
	Terminal "C" to Lug 8 (Y) (Open connection between volume control and voltage dividing resistor)	Open	—	Shorted 0.5 mfd. condenser
	P6 to C6	Open	—	Shorted 0.5 mfd. condenser
	C2 to C5	Closed	—	Open oscillator pick-up coil
	Lug No. 4 (Bla) to Terminal "C"	Closed	6000	Open bleeder resistor

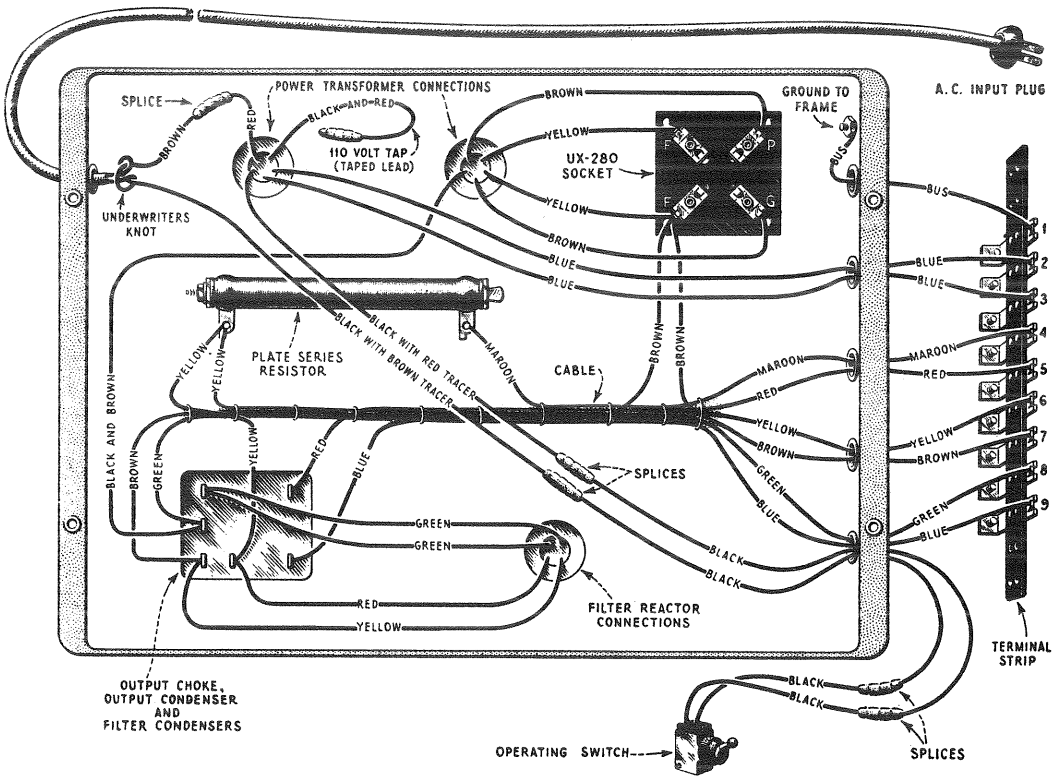


Figure 24—Continuity wiring diagram of socket power unit

[6] SOCKET POWER UNIT CONTINUITY TESTS

Remove Radiotron UX-280—Disconnect Cable at Terminal Strip

Refer to Figure 24

Terminals	Correct Effect	Resistance in ohms (Approx.)	Incorrect Effect Caused by
G to P of UX-280 socket	Closed	240	Open high voltage winding of power transformer
Across filament contacts of UX-280 socket	Closed	—	Open UX-280 filament winding of power transformer
Terminal 2 (Blu) to Terminal 3 (Blu)	Closed	—	Open 2.5 volt filament winding
Terminal 4 (M) to Terminal 6 (Y)	Closed	4800	Open resistor
Terminal 5 (R) to Terminal 7 (Br)	Closed	735	Open output choke one filter reactor or connections
Terminal 5 (R) to Terminal 6 (Y)	Closed	1315	Open output choke, other filter reactor, or connections
Terminal 1 to ground	Closed	—	Open connection
Terminal 7 (Br) to Terminal 8 (G)	Open	—	Shorted one or more filter condensers
Terminal 9 (Blu) to Terminal 5 (R)	Open	—	Shorted output condenser
Across A. C. input plug terminals (operating switch on)	Closed	—	Open primary winding of power transformer, defective switch, or connection

[7] CHECKING RESISTANCE VALUES

The values of the various resistance units of RCA Radiola 66 are shown in the schematic diagram, Figure 6. When testing a receiver for defects the various values of resistance should be checked. This may be done by a resistance bridge; the voltmeter-ammeter method shown in previous Service Notes; or by the following method, the results depending upon the care exercised in using the prescribed method.

For resistances of low value, 5000 ohms or less, use a voltmeter not greater than 100 ohms per volt. The rating of 100 ohms per volt means that a meter with 50 volts maximum scale reading, has a total resistance of 50 times 100, or 5000 ohms, when the 50-volt scale is used. For high values of resistance use a meter of 1000 ohms or more per volt. The Weston Meters, Type 301 and 280, each have a resistance of 62 ohms per volt and are satisfactory for low values. For very low resistances below 100 ohms, it is best to use a dry cell—1½ volt—with the 3-volt scale of a Weston, Model 280. For higher resistances up to 5000 and above use sufficient battery to give a good deflection on the meter, for example, a 45-volt "B" for a 0-50 unit meter. Then take two readings, one of the battery alone, and one of the battery with the unknown resistance in series.

Then apply the following formula:

$$\left(\frac{\text{Reading obtained of battery alone}}{\text{Reading obtained with resistance in series}} - 1 \right) \text{Resistance of meter in ohms} = \text{Unknown Resistance in ohms}$$

Example—Using a Weston, Type 301, 30-volt scale, 22½-volt "B" battery. Resistance of meter equals 30x62 or 1860 ohms.

$$\left(\frac{22.5}{8.45} - 1 \right) 1860 = 3091, \text{ or unknown resistance in ohms approx.}$$

The above method may be used in checking the resistance values of the correct closed circuits as shown in the Continuity Test Tables in Part III, Sections 5 and 6.

[8] TESTING BY-PASS CONDENSERS

Proper testing of the 2 mfd., 1 mfd., ½ mfd., or 0.25 mfd. condensers is accomplished by charging them with a handy D.C. voltage, as from "B" batteries connected to give 90 to 157½ volts. If sparking occurs as the charge is applied the condenser is shorted. After a few seconds wait, a strong spark (the strength of the spark being greater, of course, for the 2 mfd. than the .25 mfd.), should appear when the condenser is discharged by shorting the terminals with a screwdriver. If no spark appears the condenser is probably open. If a slight spark occurs the condenser is probably leaky. A condenser having one side normally grounded, as shown in the schematic Figure 6, and tested with the unit in the receiver, if the opposite terminal is defectively grounded, the test will show a false short.

Smaller by-pass condensers as used in the Radiola 66, in the order of .05 or .0024 mfd. or less, cannot be successfully tested by the above method except for a shorted condition. For other suspected defects, if unable to measure the capacity, simple trial replacement is the best method.

[9] TESTING FOR GROUNDED PARTS IN RECEIVER ASSEMBLY

Grounded parts may cause various effects, as weak signals or no signals, wrong or no voltages at Radiotron sockets, etc.

The correct and necessary ground leads in the receiver are shown in Figure 6.

In testing for grounds that occur due to defective wiring or assembly, it is necessary to remove all the correct grounding connections in order to discover the wrong grounded part. This can readily be done by temporarily freeing the grounded leads to the frame as indicated by the broken line in the wiring diagram Figure 23, and insulating the rotating arm of the volume control by slipping a bit of paper between the arm contact and the resistance strip.

Testing for a ground then may be accomplished by using the continuity testing methods—preferably the method using a D.C. voltmeter with a battery in series. A defective ground will be truly indicated by a closed continuity test between the frame (ground) and a terminal of the suspected unit.

PART IV—MAKING REPLACEMENTS

The various assemblies and parts of Radiola 66 are readily accessible and replacements can be easily made. Figure 5 is a sub-chassis view of the receiver. The following detailed procedure outlines the simplest method to be used in making replacements:

[1] REPLACING THE VOLUME CONTROL

(a) Remove the knobs on the volume control and station selector. These are of the push type, and they are removed by simply pulling them off the shafts. Between each knob and the cabinet will be found a metal spacer. These spacers must also be removed. To replace, merely push the knob on to the shaft, first matching the knob socket with its flat spring to the shaft, after replacing spacers.

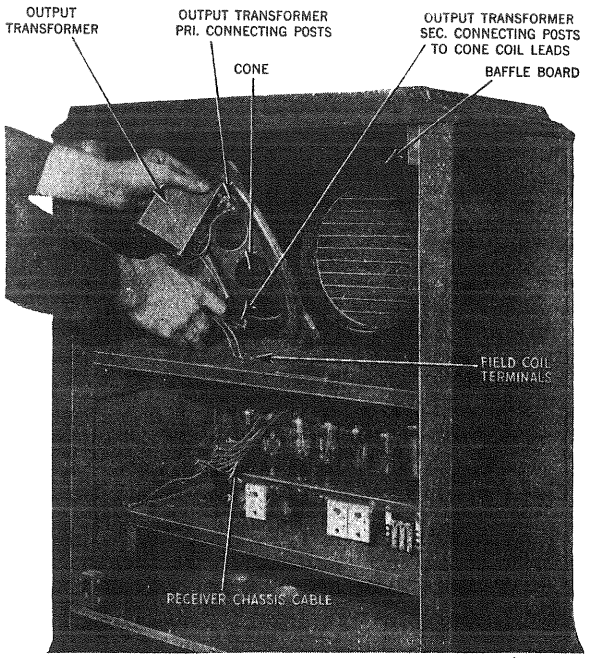


Figure 25—Removing reproducer from cabinet

(b) Remove rear grill by removing the wing nuts holding it in place.

(c) Remove the shield and insulating cover that are over the terminal strip. Then remove all cable connections to strip as well as connection to output transformer.

(d) Carefully remove the clamps that hold the cable and antenna wire to the side of the cabinet.

(e) Remove the antenna and ground wires from their binding posts, and "Local-Distant" Switch.

(f) Pull cable, antenna and ground leads from the shelf until all leads are clear.

(g) Remove the rear two screws and loosen the front two screws that hold the receiver cushion supports to the shelf.

(h) The receiver assembly may now be lifted clear of the supports and removed from the cabinet. See Figure 26.

(i) Place the volume control up and remove the two screws and nuts that hold it in place. The soldered connections must also be removed from the three terminal lugs.

(j) Remove the old volume control and fasten the new one in position by means of the two machine screws and nuts, and resolder the connections. The correct connections of these leads are shown in Figure 23.

(k) Return receiver assembly to cabinet and replace all cables and leads in the reverse manner of that used to remove them and be sure receiver assembly rests on rubber supports properly.

(l) Test Radiola and if O.K. return shield and insulator to their original position.

[2] REPLACING R.F. TRANSFORMER AND OSCILLATOR ASSEMBLY

The two radio frequency transformers and the oscillator coils are mounted on a metal strip, together with three small adjustable condensers and two fixed condensers.

This assembly must be replaced as a unit—the matching of the coils being an important point in the operation of the receiver. Use the following procedure:

(a) Remove receiver chassis from cabinet as described in Part IV, Section 1.

(b) Turn chassis on side and unsolder all leads to the assembly being replaced.

(c) Remove the three machine screws and lock washers that hold the supporting strip to the receiver frame.

(d) The assembly may now be removed and the new assembly fastened in position with the three machine screws and washers previously removed.

(e) Resolder all connections in their correct position on the assembly. This is shown in Figure 23.

(f) The receiver assembly may now be returned to the cabinet in the reverse manner of that used to remove it.

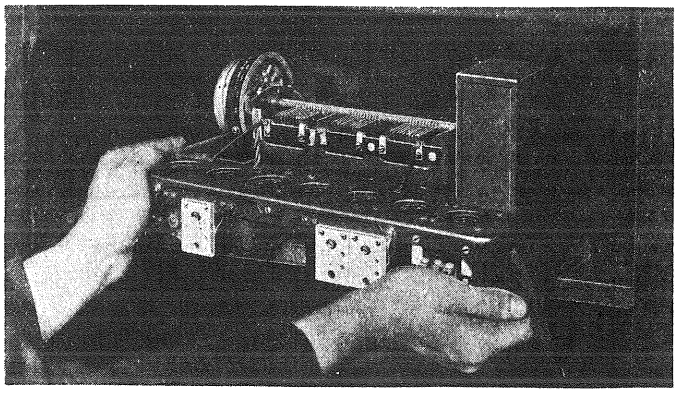


Figure 26—Removing receiver chassis from cabinet

[3] REPLACING RADIOTRON GANG SOCKETS

One socket assembly on the receiver chassis is of the gang variety, the other being a single unit. Both are held in place, together with their shields, by means of rivets which clamp them on the metal chassis frame. Use the following procedure when replacing these sockets:

(a) Remove the receiver assembly from the cabinet as described in Part IV, Section 1.

(b) Unsolder all connections to the particular socket or assembly being removed. The R.F. transformer assembly should be removed as a unit to provide room for replacing the six-gang Radiotron sockets.

(c) Drill out the rivets holding the Radiotron sockets to be replaced. In the case of the single UX or the gang UY the shield overlaps and will be held in place by the socket not removed.

(d) Remove the old Radiotron socket and fasten the new one in position by means of screws, nuts and washers. Resolder all connections and replace the R.F. assembly if removed. The correct connections are shown in Figure 23.

(e) Fasten receiver assembly in cabinet, connect cable and test. If O.K., replace shield over terminal strip and return Radiola to normal operation.

[4] REPLACING MAIN TUNING CONDENSERS AND DRIVE

The main tuning condensers and drive are replaced in one unit as follows:

(a) Remove receiver assembly from cabinet as described in Part IV, Section 1.

(b) Remove pilot lamp and lead wires from condenser assembly. Remove the three screws, nuts and lock washers that hold the condenser assembly to the metal frame.

(c) Now pull the condensers as far forward as possible and unsolder the four leads connected at the rear. Remove the entire assembly by tilting slightly and pulling clear.

(d) Place the new assembly in the position occupied by the old one and solder the four leads to their proper connections.

(e) Fasten the three screws, nuts and lock washers in their proper position. Make sure that the screw that holds the ground connection on the under side of the chassis makes firm contact. Replace pilot lamp socket and lead wires.

(f) Return the receiver to the cabinet and replace all connections in the reverse order of that used to remove them.

[5] REPLACING CONDENSER DRIVE CORD

Considerable use may wear and break the condenser drive cord.

(a) To replace this cord it will be necessary to remove the gang condenser assembly and drive as explained in Part IV, Section 4.

(b) By following the diagram in Figure 9 tie the two ends of the new cord together to form a square knot; the finished looped length should be 10¾ inches approximately.

(c) Set the station selector so it will be at the minimum (all rotor plates out) position against the stop. This position should not be allowed to change or slip in the following procedure:

(d) Place cord with knot near the hole on the drum, holding the cord with the fingers of the left hand.

(e) By following the drive cord arrangement shown in Figure 9 the cord may be replaced. The cord should be started in the first groove left of center on the drive cord worm as viewed in Figure 9.

(f) When properly threaded, and with the drum still in its minimum position, the portion of the cord near the hole in the drum should be pulled through, and caught with the spring. This will hold the cord in its proper tension.

(g) Rotate station selector to insure cord knot has been set to run clear.

(h) Replace gang condenser and drive assembly in the reverse manner removed.

[6] REPLACING R.F. COMPENSATING AND OSCILLATOR TRIMMING CONDENSERS

The R F. compensating and oscillator trimming condensers may require replacement. The R.F. compensating condenser and the series oscillator trimming condenser are identical, electrically and mechanically, but the parallel oscillator trimming condenser, located at the right end when viewed from rear, is different electrically.

To replace use the following procedure:

(a) Unsolder connections from unit to be removed.

(b) Remove the two small machine screws, fiber washers and nuts holding unit to R.F. and Oscillator Coil Assembly metal support.

(c) Mount the new unit in reverse manner, soldering connections correctly as shown in Figure 23.

NOTE.—Care should be used in tightening the bolts holding the "Isolantite" mounting, as uneven or excessive pressure may break the "Isolantite." "Isolantite" has very desirable electrical qualities and should be handled with care to prevent breakage. Be sure to replace the fibre washers removed in (b) above.

[7] REPLACING THE AUDIO TRANSFORMER AND BY-PASS CONDENSERS

Radiola 66 employs one audio transformer and necessary by-pass condensers, located at the left side of the receiver assembly facing the front of the Radiola. Should a replacement become necessary use the following procedure:

(a) Remove receiver assembly as described in Part IV, Section 1.

(b) Place the receiver chassis on its side and unsolder all connections to the audio transformer and by-pass condenser leads and lugs.

(c) Now turn up the six tabs that hold the transformer in place and remove it. The new one is then fastened in position.

(d) Resolder the leads from the new transformer and by-pass condensers to their correct points of connection as indicated in Figure 23.

(e) Fasten the receiver assembly in the cabinet in the reverse order of that used to remove it.

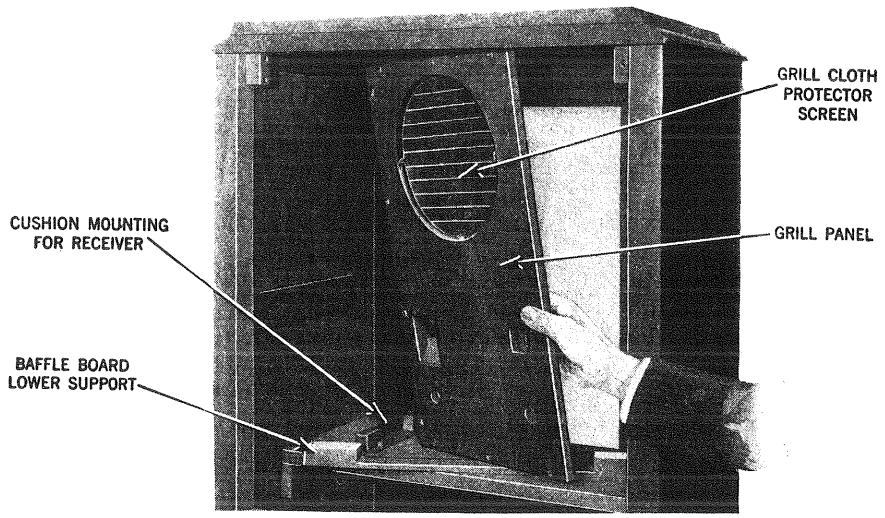


Figure 27—Removing grill panel from cabinet

[8] REPLACING PERFORATED DIAL SCALE

A step-by-step procedure to make replacement follows:

(a) Open rear grill of Radiola 66.

(b) Turn dial so that the two screws that hold the dial in place are toward the rear.

(c) Loosen screws, washers and nuts that hold dial in place.

(d) The old dial may now be pulled clear and the new one placed in the position occupied by the old one. Examine dial screen with pilot lamp lighted from the front of the Radiola to see that the numbers on the dial are in their correct position.

(e) Tighten screws holding dial in place after adjusting image correctly as outlined in Part I, Section 10. Replace rear grill.

[9] REPLACING POWER CABLE

A laced cable is used in Radiola 66 for connecting the S.P.U. to the receiver assembly and the reproducer unit. Should it be necessary to replace this cable use the following procedure:

(a) Remove receiver assembly from cabinet as described in Part IV, Section 1.
(b) Turn assembly bottom side up and unsolder all connections to the cable.
(c) Remove old cable and connect up the new cable as indicated in Figure 23, soldering all connections.
(d) Return assembly to cabinet in reverse order of that used to remove it.

[10] REPLACING INTERMEDIATE TRANSFORMERS

Radiola 66 has three intermediate frequency transformers. No. 1 and No. 2 are similar mechanically and electrically, but No. 3 is different. See Figure 23. These transformers are mounted on "Isolantite" support board which has very desirable electrical qualities and therefore should be protected against all damage as mentioned in Part IV, Section 6.

A step-by-step replacement procedure follows:

(a) Remove receiver assembly from cabinet as described in Part IV, Section 1.
(b) Remove tuning condenser assembly as described in Part IV, Section 4.
(c) Unsolder the connections of the transformer being replaced. Then turn up the metal tabs on the upper side of the receiver chassis. The old transformer may now be replaced by the new one. Turn over the metal tabs to hold it in place and resolder all connections. These are shown in Figure 23. Be careful not to heat any connection more than necessary to make a good joint, as excessive heat may change the capacity of the primary fixed condenser, thus rendering the entire transformer assembly defective.
(d) After returning the main tuning condensers to the receiver chassis in the reverse order used in removal, it will be necessary to tune and neutralize the transformer just connected in position. The correct procedure for doing this is contained in Part II, Section 16.
(e) The entire receiver may then be tested and a check made on the adjustment of the oscillator trimming condensers as described in Part II, Section 17. After all tests and adjustments are completed the receiver assembly should be returned to the cabinet in the reverse order of that used to remove it.

[11] REPLACING TAPPED RESISTANCE UNIT IN RECEIVER ASSEMBLY

A tapped resistance unit in the receiver assembly of Radiola 66 provides the various grid and cathode voltages. To replace this tapped resistance unit proceed as follows:

(a) Remove receiver assembly as described in Part IV, Section 1.
(b) Unsolder all connections to the tapped resistance unit.
(c) Remove the two screws, nuts and washers that hold the resistance unit in place. This will release the unit and the new one can be fastened in place with the screws, nuts and washers previously removed.
(d) Solder all the leads to their correct connections. (See Figure 23.)
(e) Return receiver assembly to cabinet in the reverse order used to remove it.

[12] REPLACING MISCELLANEOUS PARTS IN RECEIVER ASSEMBLY

The parts such as the UX-245 grid bias resistor, center tapped filament resistor, oscillator resistor, second detector plate to cathode by-pass condenser, etc., may be easily removed by unsoldering the connections of the parts themselves.

By observing the wiring diagram in Figure 23 and the photograph in Figure 5, location and wiring of any particular part is readily ascertained for purposes of removal and replacement.

[13] REPLACING CONE OF REPRODUCER UNIT

To replace a cone, remove the entire reproducer unit from the cabinet, using the following procedure:

(a) Remove S.P.U. from upper shelf as outlined in Part IV, Section 15.
(b) Disconnect cable lead to output transformer primary.
(c) Remove the four bolts that hold the reproducer to the baffle board, at the same time supporting the reproducer by hand to prevent it falling. Place the unit in position convenient for work.

(d) Remove the nine nuts and machine screws that hold the cone ring in place. Remove this ring and washers.

(e) Remove the screw and washer that centers the cone. The cone may now be removed and the new one placed in the position occupied by the old one.

(f) Return the centering screw, the ring, washers and nine screws and nuts to position, but do not tighten. The cone should now be centered as described in Part II, Section 22, and all screws tightened.

(g) The unit should now be returned to the cabinet in the reverse manner of that used to remove it.

[14] REPLACING OUTPUT TRANSFORMER

Should it be desirable to replace the output transformer, use the following procedure:

(a) Remove complete reproducer unit as outlined in Part IV, Section 13.

(b) Disconnect output transformer leads from their respective parts on the reproducer frame.

(c) Unscrew the three small bolts and nuts holding the transformer to frame and the unit will be free from the reproducer.

(d) Replace and connect in the reverse manner (See Figure 22).

[15] REPLACING FILTER CONDENSERS. OUTPUT CONDENSER, AND OUTPUT CHOKE

The filter condensers, output condenser and output choke are enclosed as a unit in a metal container. Should replacement be necessary, use the following procedure:

(a) Remove the shield and all connections from the Socket Power Unit terminal strip.

(b) Remove the four machine screws that hold the S.P.U. to the cabinet. The S.P.U. may now be lifted clear of the cabinet.

(c) To prevent damaging the series plate resistor remove it as described in Part IV, Section 18.

(d) Unsolder all connections to the unit being replaced.

(e) Bend up the tabs that hold the unit to the S.P.U. base. Remove the old unit and fasten the new one in position by bending the tabs down so that it is held tightly to the S.P.U. base.

(f) Replace and solder all connections. The correct connections are shown in Figure 24.

(g) Return the S.P.U. to the cabinet in the reverse order of that used to remove it. Replace all connections and test. If O.K., replace shield over terminal strip and return Radiola to normal operation.

[16] REPLACING POWER TRANSFORMER OR FILTER REACTOR

The power transformer and filter reactors are both held in place by means of tabs which form a part of their case, being turned over on the under side of the S.P.U. base. A step-by-step replacement procedure follows:

(a) Remove S.P.U. from cabinet as described in Part IV, Section 15.

(b) To prevent damaging the series plate resistor remove it as described in Part IV, Section 18.

(c) Unsolder all connections to unit being replaced.

(d) Bend up the tabs that hold the unit to the S.P.U. base.

(e) The old unit may now be removed and the new one placed in position. Bend over the tabs on the new one so that it is fastened tightly to the S.P.U. base.

(f) Solder all connections as shown in Figure 24.

(g) Fasten the S.P.U. in the cabinet in the reverse order of that used to remove it.

[17] REPLACING TERMINAL STRIP ON S.P.U. OR RECEIVER ASSEMBLY

Should the terminal strip on the S.P.U. or phonograph pick-up terminal strip require replacement use the following procedure:

(a) Remove the S.P.U. or receiver assembly from cabinet as described in Part IV, Section 1 and Section 15.

(b) Unsolder all leads to the terminal strip.

(c) Release two screws holding strip to S.P.U. base, or receiver assembly.

(d) The strip may now be removed and replaced by a new one.

(e) Fasten new strip in position by means of two machine screws, lock washers and nuts previously removed.

(f) Solder all leads to terminal strip. The color scheme and correct connections are shown in Figures 23 and 24.

(g) Return S.P.U. or receiver assembly to cabinet in the reverse order, and connect cable properly (See Figure 22).

[18] REPLACING MISCELLANEOUS PARTS IN S.P.U.

The plate supply resistor and UX-280 socket in Radiola 66 may require replacement. The following general outline will apply to these units:

(a) Remove S.P.U. from cabinet as described in Part IV, Section 15.

(b) Unsolder leads from defective unit.

(c) The series plate supply resistor may be easily removed by removing the nut and lock washer holding the resistor to the brackets (riveted to S.P.U. base) by a threaded rod. The UX-280 socket should be removed by drilling out the rivets and replaced as is explained in Part IV, Section 3.

(d) Solder leads to new unit as indicated in Figure 24.

(e) Return S.P.U. to cabinet in reverse order of that used to remove it.

[19] REPLACING FRONT GRILL PANEL OR CLOTH

Should it be necessary to replace the front grill panel or cloth the procedure below should be followed:

(a) Remove S.P.U. as outlined in Part IV, Section 15.

(b) Remove reproducer unit as outlined in Part IV, Section 13.

(c) Remove receiver assembly as outlined in Part IV, Section 1.

(d) Remove upper shelf by removing the wood screws holding shelf to cabinet. Save screws and keep separate, as different length screws are used in this procedure.

(e) Remove reproducer baffle board by removing the wood screws holding it in place.

(f) Remove lower baffle support (See Figure 27) by removing wood screws holding unit.

(g) The front grill panel or board, which carries the grill cloth, grill cloth protector, and escutcheons, may now be removed after removing the wood screws holding it in place.

(h) New cloth may be replaced by using clamps or tacks to hold it in place temporarily while glue is applied to frame and the cloth lined up square and smoothed out to make a permanent job.

(i) Replace front grill panel in reverse manner.

SERVICE DATA CHART

Before using the following Service Data Chart, when experiencing no reception, low volume, poor quality, noisy or intermittent reception, howling and fading, first look for *defective tubes, or a poor antenna system.* If imperfect operation is not due to these causes the "Service Data Chart" should be consulted for further detailed causes. Reference to Part No. and Section No. in the "Service Notes" is also noted for further details.

Indication	*Cause*	*Remedy*
No Reception	Defective operating switch	Repair or replace switch
	Loose volume control arm	Tighten volume control arm, P. II, S. 4
	Defective power cable	Replace power cable, P. IV, S. 9
	Defective R.F. transformer	Replace R.F. and oscillator coil assembly, P. IV, S. 2
	Defective I.F. transformer	Replace I.F. transformer, P. IV, S. 10
	Defective A.F. transformer	Replace A.F. transformer, P. IV, S. 7
	Defective Oscillator coil	Replace R.F. and oscillator coil assembly, P. IV, S. 2
	Defective by-pass condensers	Replace by-pass condensers, P. IV. S. 7
	Defective socket power unit	Check socket power unit by means of continuity test, and make any repairs or replacements necessary, P. III, S. 6
	Defective output transformer	Replace output transformer, P. IV, S. 14
	Open cone coil of reproducer unit	Check cone coil and if open replace cone, P. IV, S. 13
Low Volume	Compensating condenser out of adjustment	Adjust compensating condenser correctly, P. II, S. 14
	Trimming condensers out of adjustment	Adjust trimming condensers, P. II, S. 17
	I.F. transformers not correctly aligned	Align I.F. transformers correctly, P. II, S. 16
	Defective power cable	Repair or replace cable, P. IV, S. 9
	Defective R.F. transformer	Replace R.F. and oscillator coil assembly, P. IV, S. 2
	Defective I.F. transformer	Replace I.F. transformer, P. IV, S. 10
	Defective A.F. transformer	Replace A.F. transformer, P. IV, S. 7
	Dirty prongs of Radiotrons	Clean prongs with fine sandpaper, P. II, S. 3
	Defective by-pass condensers	Replace defective by-pass condensers, P. IV, S. 7
	Defective main tuning condenser	Replace defective tuning condensers, P. IV, S. 4
	Low voltages from socket power unit	Check socket power unit voltages with high resistance D.C. voltmeter and A.C. voltmeter, P. III, S. 2
	Defective socket power unit	Check socket power unit by means of continuity tests and make any repairs or replacements necessary, P. III, S. 6
Poor Quality or Noisy Reception	Defective A.F. transformer	Replace A.F. transformer, P. IV, S. 7
	Defective by-pass condenser	Replace defective by-pass condenser, P. IV, S. 7
	Dirty contact arm of volume control	Clean contact arm on volume control, P. II, S. 4
	Dirty prongs on Radiotrons	Clean prongs with fine sandpaper, P. II, S. 3
	Volume control advanced too far	Reduce setting of volume control, P. I, S. 6
Howling	Compensating condenser out of adjustment	Adjust compensating condenser correctly, P. II, S. 14
	I.F. Neutralizing condenser out of adjustment	Align and adjust I.F. transformers correctly, P. II, S. 16
	Defect in audio system	Check and repair any defect, P. II, S. 11
	Open grid circuit in any stage	Check circuit and repair defect, P. III, S. 5
	Microphonic Radiotrons	Interchange Radiotrons
Excessive Hum	Defective center tapped resistance unit	Replace defective resistance unit, P. IV, S. 12
	Socket plug position	Reverse socket plug
	Line voltage low	Solder line tap for low line voltage, P. I, S. 7
	Defective S.P.U.	Check S.P.U. by continuity tests, P. III, S. 6
Radiotrons Fail to Light	Operating switch not "On"	Turn operating switch "On"
	Defective operating switch	Replace operating switch
	Defective input A.C. cord	Repair or replace A.C. input cord
	Defective power transformer	Replace power transformer, P. IV, S. 16
	No. A.C. line voltage	Turn A.C. line voltage "On"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