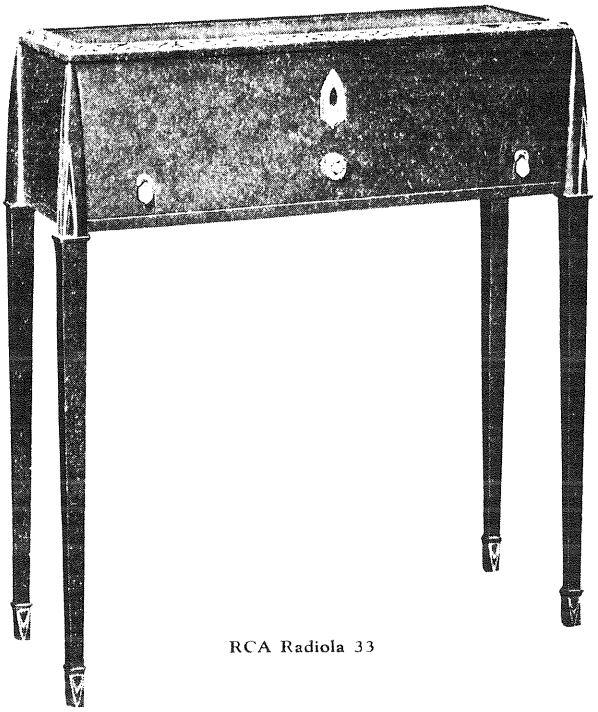
RCA
Radiola 33
SERVICE NOTES



RCA Radiola 33

Second Edition—2M
March, 1931

RCA Victor Company, Inc.
RADIOLA DIVISION
Camden, New Jersey
REPRESENTATIVES IN PRINCIPAL CITIES

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 RCA Distributors, and 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 Distributors' 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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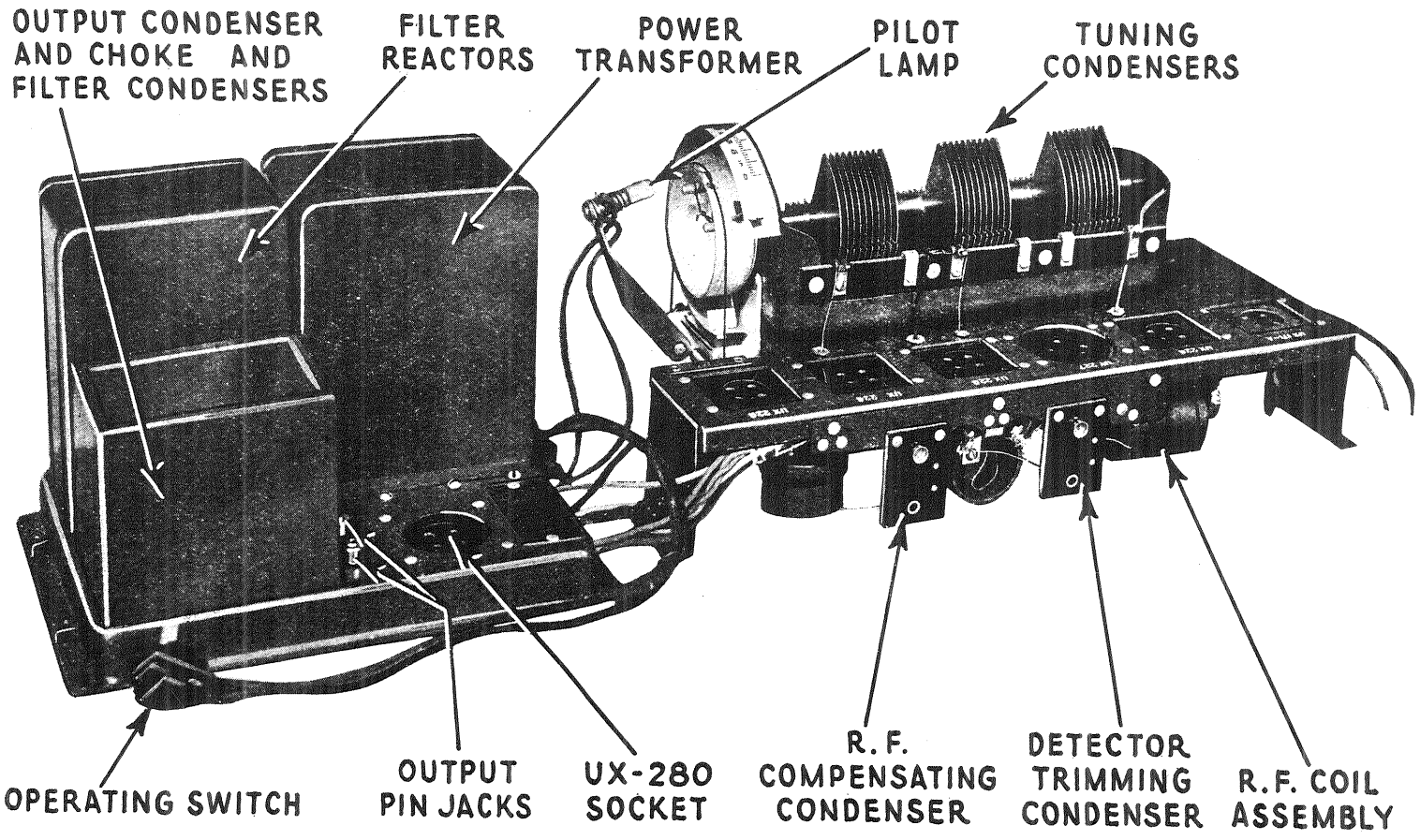


Figures 2 and 3—Top view of receiver assembly and socket power unit showing location of parts

RCA RADIOLA 33

(105-125 Volts, 50-60 Cycle A. C.)

SERVICE NOTES

Prepared by RCA Service Division

INTRODUCTION

RCA Radiola 33 is a socket powered six-tube, tuned radio frequency receiver utilizing RCA Radiotrons UX-226, UY-227, UX-171A and the full wave rectifier Radiotron UX-280 in the Socket Power Unit. It operates on 105-125 volts, 50 to 60 cycle A.C. lines. Radiola 33 is also supplied in models designed for 105-125 volts, 25-40 cycle A.C. lines. The difference between this model and the 50-60 cycle is the power transformer. The service Notes apply to both models. Figure 1 illustrates a front view of the cabinet and Figures 2, 3, 4 and 5 a top and bottom view of the various units in the Receiver Assembly and the Socket Power Unit.

The following principles are incorporated in the circuit design—See Figure 6.

(a) A single control, three-gang condenser is employed to tune two of the radio frequency circuits and the detector circuit.

(b) An aperiodic antenna or first R.F. circuit, eliminates the necessity for a separate antenna tuning control.

(c) The volume control regulates the input grid voltage to the first R.F. amplifier stage. This is the most practical method of volume control for use with A.C. Radiotrons and gives a smooth control of volume without distortion.

(d) Raw A.C. of the correct voltage is used for filament heating of all Radiotrons.

(e) The three R.F. stages and the first audio stage receive a plate voltage of 135 volts in conjunction with a negative grid bias of 9 volts. The detector receives 30 volts plate supply. The last audio stage receives a plate voltage sufficient to provide ample loudspeaker output. The plate and grid voltages are supplied by means of a built-in "B" and "C" power supply unit using Radiotron UX-280 as the rectifying device.

Figure 7 illustrates the sequence of the Radiotrons in the receiver, omitting Radiotron UX-280 in the socket power unit. From right to left, when facing the front of the Radiola, the Radiotron sequence is as follows:

Radiotron No. 1 is an untuned stage of radio frequency amplification. It is coupled directly to the antenna and ground.

Radiotron No. 2 is a stage of tuned radio frequency amplification, and is tuned by the first of the gang condensers.

Radiotron No. 3 is the second stage of tuned radio frequency amplification. It is tuned by the second of the gang condensers.

Radiotron No. 4 is the detector and is tuned by the third of the gang condensers.

Radiotrons Nos. 5 and 6 are respectively, the first and second stages of audio frequency amplification. The last stage, Radiotron No. 6, employs power amplifier Radiotron UX-171A. An ouput filter protects the loudspeaker windings from any D.C.

The following notes are published for the guidance of those called upon to locate and remedy any trouble that may occur. The text is divided into four parts, Part I—Installation; Part II—Service Data; Part III—Electrical Tests, and Part IV—Making Replacements.

PART I—INSTALLATION

(1) ANTENNA (Outdoor Type)

Due to the high sensitivity of Radiola 33 the antenna length need only be approximately 25 to 50 feet. It should be erected as high as possible and be removed from all obstructions. The lead-in should be a continuation of the antenna itself, thus avoiding all splices which

might introduce additional resistance and in time corrode sufficiently to seriously affect reception. If it is absolutely necessary to splice the lead-in to the antenna, the joint must be carefully soldered to insure a good electrical contact. Clean off all excess flux and tape the connection to protect it from the oxidation effects of the atmosphere.

High grade glass or porcelain insulator supports are required and at no point should the antenna or lead-in wire come in contact with any part of the building. Bring the lead-in wire through a porcelain tube insulator to the inside of the house for connection to the receiver.

The antenna should not cross either over or under any electric light, traction or power line and should be at right angles to these lines and other antennas. An outdoor antenna should be protected by means of an approved lightning arrester, in accordance with the requirements of the National Fire Underwriters' Code.

(2) ANTENNA (Indoor Type)

Where the installation of an outdoor antenna is not practical, satisfactory results may generally be obtained by using an indoor antenna of about 20 to 40 feet of insulated wire strung around the picture moulding or placed under a rug. In buildings where metal lathing is employed, satisfactory results are not always possible with this type of antenna. Under such conditions various arrangements of the indoor antenna should be tried to secure satisfactory results. An indoor antenna is not as efficient as a properly installed outdoor antenna.

(3) GROUND

A good ground is quite as important as the 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 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.

(4) RADIOTRONS

Four Radiotrons UX-226, one UY-227, one UX-171A and one UX-280 are used. The locations of these Radiotrons are plainly designated on each socket. Be careful not to insert a Radiotron UX-226 in the UX-171A socket, as immediate filament burn-out will result when the current is turned "ON."

Connect the loudspeaker to the output pin terminals and insert the A.C. input plug into a socket outlet of correct voltage and frequency. Turn "ON" the operating switch. After about 30 seconds the Radiotron UY-227 will glow dimly, indicating that the receiver is in operating condition. 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 known to be in operating condition will isolate the damaged one.

If there is an excessive hum present during operation:

(a) Reverse the A.C. input plug at the socket outlet.

(b) Interchange the Radiotrons UX-226 in the R.F. stages with the one in the first A.F. stage, and use the combination that gives least hum. Then interchange the three in the R.F. stages for the best results while tuned to a broadcast station.

(5) ADJUSTMENT FOR LOW LINE VOLTAGES

A lead is provided on the side of the S.P.U. for use when Radiola 33 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 such adjustment be necessary, however, proceed as follows:

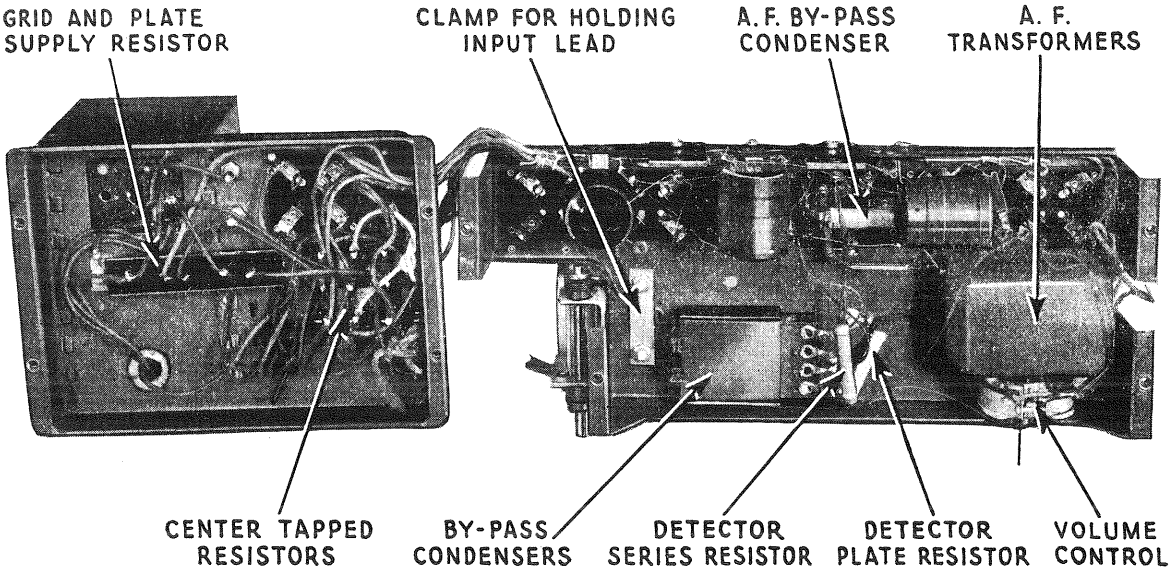
(a) Remove top from metal cabinet.

(b) Connected to the operating switch will be found two taped connections, one of which has a transformer lead (black with red tracer) connected to a black switch lead. Untape and unsolder this connection and then tape up the black with red tracer lead so that it will not ground or short to other parts.
(c) A black and red lead will be found taped up and not used. Untape this lead and clean the end for splicing.
(d) Splice this lead just untaped to the black lead from the switch that has been released. Solder and tape securely.

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 15 illustrates these changes to be made.

(6) ATTACHING LEGS TO RADIOLA 33

Four legs are provided with Radiola 33 that must be attached by the dealer or the purchaser of the Radiola.



Figures 4 and 5—Sub-chassis view of receiver and socket power unit showing location of parts

The following step-by-step procedure may be used:
(a) Place Radiola 33 upside down on a soft blanket or rug in a place convenient for work, Figure 8.
(b) Mount a leg (all legs are alike and interchangeable) at one corner so that the designs on the cabinet and leg match and the leg is square against the wooden cabinet base.
(c) Place one of the wood screws in the hole closest to the leg and screw it tightly in place, making sure while starting the screw that the leg is not displaced from its setting.
(d) Place the two other screws in their holes and screw in tightly.
(e) Repeat this procedure on all legs. After all of the legs are tightly in place, carefully lift the Radiola and place on its feet.

(7) REFINISHING MARRED SURFACES

Should the surfaec of the Radiola 33 cabinet become scratched or marred either when installing or after use, it may be easily refinished in the same manner that wood is refinished. In other words, it may be stained, lacquered, varnished and polished.

(8) KNOBS

Radiola 33 uses an improved type of push knob on the station selector similar to that used on the Radiola 60 and two pendant type push knobs on the operating switch and volume control. These knobs may be removed by simply pulling them from their shafts and replaced by pushing them on. Care should be taken when replacing the knobs to make sure the small dielecto spacing washers are placed over the shaft before the knob is put on so the knob will not bind against the cabinet.

(9) RADIOLA 33 WAVE TRAP

Due to wide variations in broadcast receiving conditions in different sections of the country, the performance of any radio receiver in any given location depends upon the local receiving conditions existing at that point.

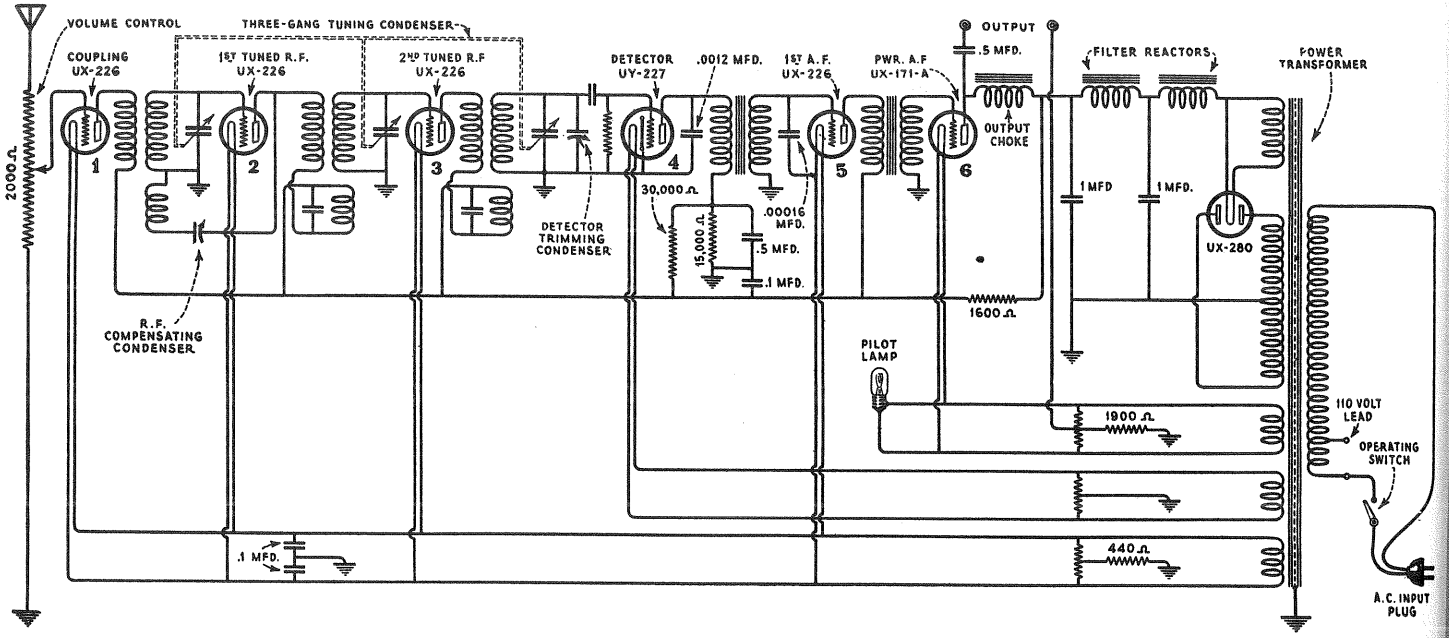


Figure 6—Schematic circuit diagram of receiver and socket power unit—all grounds are connected to frame and metal cabinet

Receivers located in the vicinity of powerful broadcasting stations receive the signal from such stations with great intensity over a large number of scale divisions of the receiver. If it is desired to receive a relatively distant station whose frequency assignment is comparatively close to that of the local station, it is impossible to do so without interference.

To satisfy the Radiola 33 user located in districts where bad receiving conditions exist, the Radiola 33 Wave Trap has been designed and will be carried in stock by RCA as an accessory.

The function of the wave trap is to absorb a large portion of the energy of the powerful local signal picked up by the Radiola 33 antenna, thereby reducing the effect of the powerful local signal to a value comparable with that of more distant stations.

This wave trap is very efficient in design, is neat in appearance, and is simple to install and adjust. It may be adjusted to absorb a strong signal at any point on the Radiola 33 dial scale. After it has once been adjusted to absorb the strong local signal causing interference at a particular location, it needs no further adjustment or attention.

It is intended that the Radiola 33 Wave Trap shall be located on the top of the chassis frame at the extreme left end viewing the set from the front. Installation can be made in five or ten minutes without removing the chassis from the cabinet. Complete installation and adjustment instructions accompany each unit.

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 in Radiola 33 are the standard gang UX and UY type. Care must be exercised when inserting Radiotrons in their sockets. A socket contact may not be in its correct position and forced insertion of a tube will bend or break it. If care is exercised and the Radiotron inserted gently, little trouble will be experienced with socket contacts. A bent one will be noticeable on inspection and may be corrected by inserting a narrow instrument in the socket hole and pushing the contact into its correct position. A badly bent or broken socket contact should be replaced.

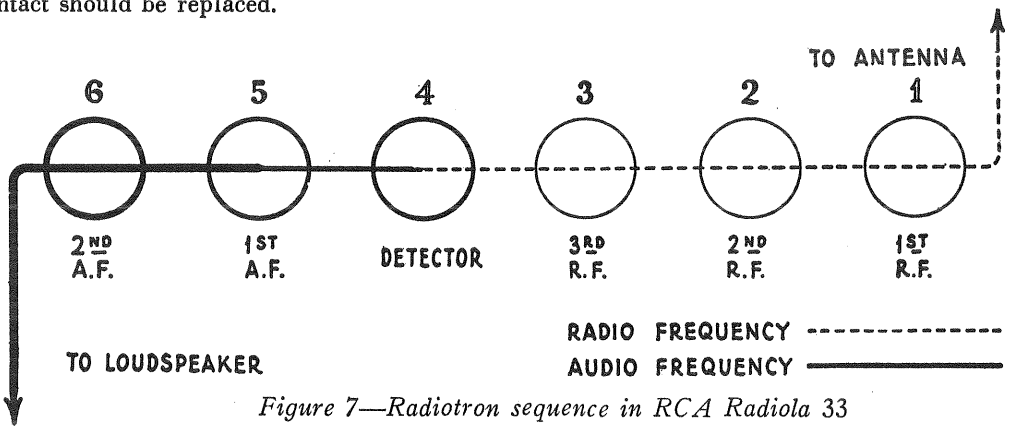


Figure 7—Radiotron sequence in RCA Radiola 33

The bakelite Radiotron guide shields used in Radiola 33 will prevent any possible shock from contact with high voltages in the socket when inserting the Radiotrons.

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.

(3) RADIOTRON PRONGS

Dirty Radiotron prongs may cause noisy operation or change the resistance of the filament circuit 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 reinserting Radiotrons in their sockets wipe the prongs and base carefully to make certain that all particles of sand are removed.

Care should be exercised to see that the two large pins and two small pins of the Radiotrons match the socket holes. The UY-227 Radiotron has five prongs, all of the same size, and will fit in the socket only one way. 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 AND LOW VOLUME

A loose volume control contact 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 receiver assembly and S.P.U. 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.

Low volume even on local stations may be due to one of the following causes:

(a) Defective antenna and ground system. A poor antenna and ground system or one in a shielded locality may cause weak signals. The suggestions given in Part I, Sections 1, 2 and 3 should be followed if trouble of this kind is experienced.

(b) R.F. compensating condenser out of adjustment. If this condenser is badly out of adjustment it will have the effect of making the Radiola very insensitive. To adjust correctly refer to Part II, Section 10.

(c) Defective R.F. transformers. Should the R.F. transformers become damaged so that they do not properly match, weak signals may be the result.

(d) Defective A.F. transformer. An open or short in the A.F. transformers may cause weak signals and distorted reproduction.

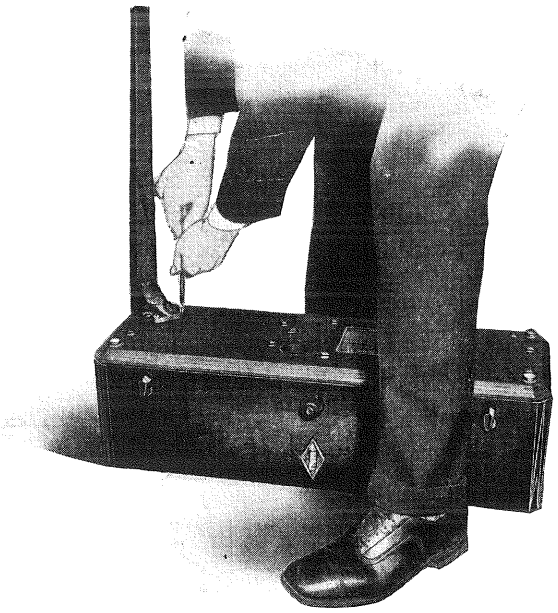


Figure 8—Placing legs on cabinet

(5) TUNING CONDENSERS OUT OF ALIGNMENT

If the tuning condensers are out of alignment, line up as follows:

(a) Procure or construct a tool as illustrated in Figure 9.

(b) Remove the receiver assembly and S.P.U. from the cabinet as described in Part IV, Section 1, and place in operating condition. Tune in a signal, either broadcast or a modulated oscillator of about 1400 K.C. and adjust the volume control so that the signal is very weak.

(c) With the condenser plate end of the tool touch the rotor of each of the three tuning condensers and note if an increase of signal is experienced. If the condensers are in alignment the signal should decrease. If the signal increases, that particular condenser is slightly low in capacity, which can be corrected by bending the two end rotor plates toward their adjacent plates slightly until the test with the "paddle" gives a decrease rather than an increase in signal.

(d) After checking the condenser for low capacity they may be checked for high capacity by taking the ring of the tool and inserting it successively in the center of the three R.F. coils. This should give a decrease of signal. If it increases then the end rotor plate of the condenser that tunes the coil should be bent away from its adjacent

rotor plate. This should be bent until inserting the ring in the coil will give a decrease of signal rather than an increase. The detector tuning condenser is provided with a small trimming condenser for aligning this circuit. Instead of bending the plate of the condenser adjustment should be first attempted at the trimming condenser. In most cases this will cover all aligning adjustments required in the detector stage.

(e) After checking at 1400 K.C. a station or oscillator signal about 600 K.C. should be tuned in and the condensers completely checked at this frequency. Any additional necessary adjustments should be made.

(f) After completion of all tests, return the receiver to its cabinet in the reverse manner of that used to remove it.

(6) HUM

Part I, Section 4 describes the method to eliminate ordinary hum in Radiola 33 when making an installation. If a pronounced hum develops during operation check the following:

(a) Low emission Radiotron UX-280. A low emission rectifying tube will cause excessive hum and unsatisfactory operation.

(b) Shorted filament condenser. There are two .1 mfd. condensers hooked in series across the UX-226 filaments with the center tap grounded. A short of either of these condensers will cause loud hum and imperfect operation of the Radiola.

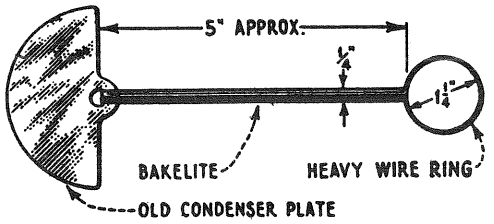


Figure 9—Tool for testing electrical alignment of gang tuning condensers

(c) Defective center tapped resistance. A short or open in any of the center tapped resistances connected across the various filament supplies will cause a loud hum.

(d) Any open of the several grounding connections in the Radiola or defective voltage supply resistances may cause a certain amount of hum. These defects will have a pronounced effect on the general operation of the Radiola which will be more noticeable than the additional hum. Check by means of the continuity test given in Part III, Section 3.

A mechanical hum caused by vibration of loose laminations in the power transformer may be corrected by removing the power transformer from the S.P.U. as described in Part IV, Section 10, and heating it in a slow oven. The open end should be kept up and the compound heated sufficiently to allow it to adhere to the laminations of the transformer. After heating, the transformer should be allowed to cool for at least 24 hours and then returned to the S.P.U.

(7) LOUDSPEAKER POLARITY

The use of an output filter in Radiola 33 makes unnecessary any adjustment for polarity of the output current. Any type of loudspeaker (either horn, magnetic type cone or dynamic type cone) can be connected in the manner that gives the most pleasing reproduction.

(8) AUDIO HOWL

Audio howl may be caused by:

(a) Open A.F. condenser connections. An open connection to either of the A.F. condensers, one connected from plate to cathode of the detector and the other from grid to filament of the first A.F. tube, may cause a howl.

(b) Open by-pass condensers. An open .5 mfd. by-pass condenser connected across the detector plate resistor connection may cause a howl.
(c) Vibrating elements in receiver Radiotrons. A gradually developed howl is probably due to the loudspeaker causing the receiver Radiotron elements to vibrate. To overcome this condition, interchange the Radiotrons in the receiver or change the relative angle between the loudspeaker and the Radiola. In extreme cases it will be necessary to increase the distance between the Radiola and the loudspeaker.

(9) UNCONTROLLED OSCILLATION

Uncontrolled oscillations in any part of the tuning range may be caused by:
(a) Poor ground. Install ground system as indicated in Part I, Section 3.

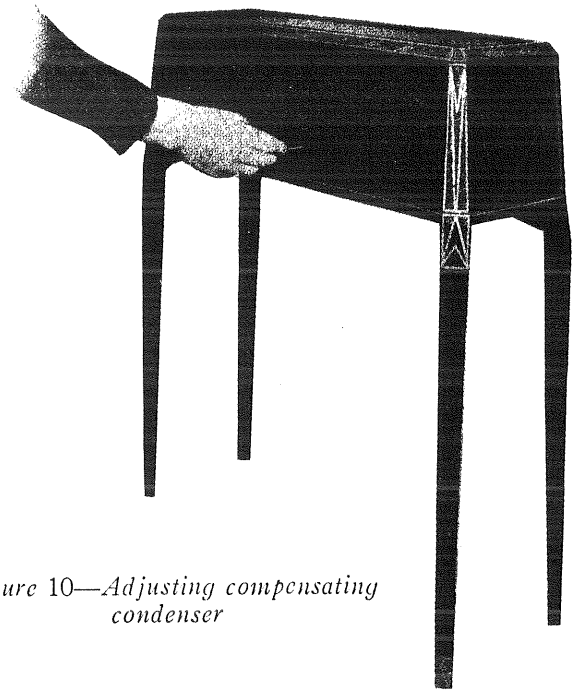


Figure 10—Adjusting compensating condenser

(b) An open connection in any of the several ground leads in the Radiola.
(c) Poorly soldered or corroded joints. Any high resistance joint throughout the Radiola may cause oscillation.
(d) A defect in the R.F. coil system. A short in any of the concentrated primary coils or the condenser shunted around them may cause the receiver to oscillate.
(e) Incorrect adjustment of compensating condenser. The correct procedure for adjusting the compensating condenser is given in Part II, Section 10.

(10) ADJUSTMENT OF R. F. COMPENSATING CONDENSER

The R.F. compensating condenser in Radiola 33 is provided to allow adjustment of the receiver to compensate for variations of tube characteristics and thereby allow the receiver to function in its most sensitive condition. Before readjusting this condenser, the Radiotrons should be interchanged and satisfactory operation secured by this means if possible. The interchanging of tubes should be made with the idea of getting a tube in socket No. 2 that will not go into oscillation and gives the loudest signal on a weak station. If satisfactory sensitivity cannot be secured by this means an adjustment of the compensating condenser may be made as follows:

(a) Put receiver in operation in usual manner and tune in a station preferably at the middle or upper wave lengths.

(b) Locate the position of the compensating condenser adjusting screw at the rear of the receiver assembly. (See Figure 10.)

(c) With the volume control at the position of maximum intensity, turn the screw to the right until the set goes into oscillation. Then turn the screw to the left until all oscillation and howl is eliminated with the volume control at maximum. In some cases interchanging the tubes in the R.F. stages will facilitate this adjustment.

(d) Tune in stations with maximum volume and note if the receiver goes into oscillation at any wavelength. If it does, turn the screw still further to the left.

(e) When the adjusting screw has been turned to the right as far as possible without oscillation occurring at any wavelength, the correct adjustment has been found for best sensitivity.

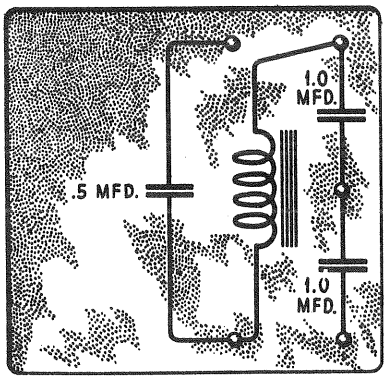


Figure 11—Internal connections of output condenser and choke and filter condensers

(11) DISTORTED REPRODUCTION

Under normal conditions Radiola 33 will deliver a strong signal of good quality to the loudspeaker. The high sensitivity of Radiola 33 makes it undesirable to operate the set at full volume when receiving from a nearby broadcasting station. The volume control should be adjusted to secure best quality, with the desired volume. If the loudspeaker reproduction is poor, test the loudspeaker output from the receiver. A pair of phones or loudspeaker of known quality may be used for this purpose. If the loudspeaker is O. K. poor quality or distortion may be due to any of the following causes:

(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 detector, 1st and 2nd audio stages and the rectifier tube.

(b) High or low plate and grid voltages from the Socket Power Unit. The cause may be a defective Radiotron UX-280 or resistance unit. Replace the Radiotron UX-280 with one of known quality and check the various resistances for a possible short or open.

The cause of noisy operation and intermittent signals with periods of hum or no reception may be traced in the following manner:

(a) Disconnect the antenna and ground leads. If the Radiola becomes quiet and signals from local stations, though weak, are received the trouble is in the antenna system, or is caused by nearby interfering electrical apparatus. In the first case repair the antenna system and in the second case place radio frequency chokes on any offending nearby apparatus. The location of interfering electrical machinery will require patience, skill and experimenting.

(b) If disconnecting the antenna and ground does not eliminate the noise, the trouble is in the Radiola. A defective tube, one having poorly welded elements will cause a disturbance of this kind, and this point should be checked by interchanging the Radiotrons in the Radiola with others of the same type. If it is definitely established that the Radiotrons are O. K. the Radiotron prongs and the socket contacts should be examined for dirt or poor contact. The volume control should be examined for poor contact between the contact arm and the resistor strip.

(12) PILOT LAMP

Radiola 33 is equipped with a small pilot lamp operating from the UX-171A filament winding. Its purpose is to illuminate the tuning dial and act as a current supply indicator. The latter use is quite important because the time required for Radiotron UY-227 to develop normal operation, which is approximately 30 seconds, can be checked.

The pilot lamp is mounted on a small lever that can be pulled clear of the dial for inserting the lamp and then pushed in place to give proper illumination to the translucent dial. If the lamp is not in its proper place, insufficient illumination of the dial will be experienced.

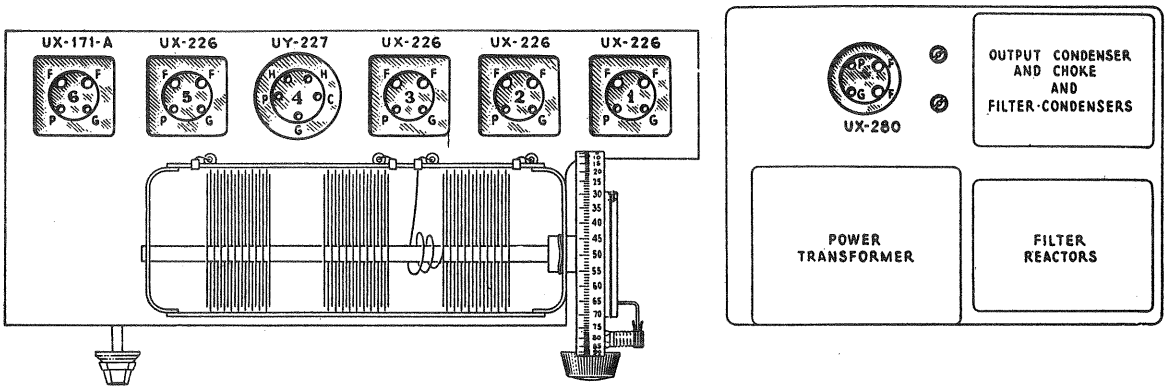


Figure 12—Diagram showing location of Radiotron socket contacts

(13) FILTER CONDENSER, AND OUTPUT CONDENSER AND CHOKE

The output choke and condenser and the two filtering condensers are located in one container in the S.P.U. Figure 11 shows the internal connections. The procedure for testing this unit is to "click test" the choke for an open, and charge and discharge the condensers individually by shorting their terminals with a screwdriver. A condenser that will not retain its charge is defective. Approximately 200 volts D.C. should be used when making this test.

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.

PART III—ELECTRICAL TESTS

(1) VOLTAGE READINGS

Voltage readings of Radiola 33 may best be checked at individual tube sockets with a Weston Model 537, Type 2, test set or others giving similar readings. The following readings taken at the sockets are correct for Radiola 33 when connected to a 120-volt A.C. line. There is no voltage between the detector heater and cathode in Radiola 33.

Tube No.	*Filament to Grid Volts*	*Filament or Cathode to Plate Volts*	*Plate Current Milliamperes*	*Filament Voltage*
1	9	130	4.5	1.5
2	9	130	4.5	1.5
3	9	130	4.5	1.5
4	—	30	2.0	2.5
5	9	130	4.5	1.5
6	30	135	17.0	5.0

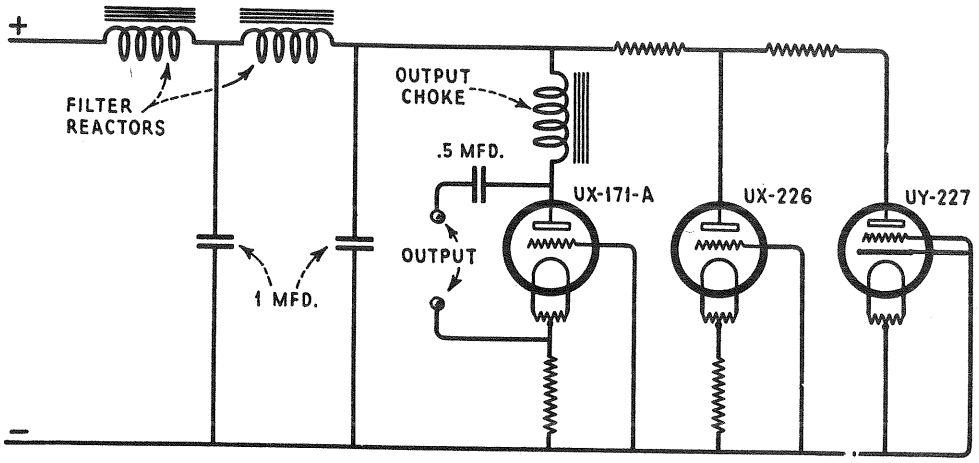


Figure 13—*Schematic circuit diagram of voltage supply system*

(2) VOLTAGE SUPPLY SYSTEM

It is well to understand the various voltage supply systems incorporated in Radiola 33 as they differ somewhat from the systems normally used. Generally speaking, Radiola 33 uses what is known as the series resistance method of obtaining its various voltages. This series arrangement makes it possible to use small filter condensers. Figure 13 shows the schematic circuit. The grid bias voltages are obtained by using the drop across a resistance connected in the plate return lead.

With this arrangement the correct grid or plate voltage is dependent on the Radiotrons being in good condition. A low emission tube will cause the voltage to rise on all tubes. It is important to note that when interchanging Radiotrons all tubes should be in their respective sockets before turning "on" the current supply.

(3) RADIOLA 33 CONTINUITY TESTS

The following tests will show complete continuity for the receiver assembly (Figure 14) and the Socket Power Unit (Figure 15). Disconnect the antenna and ground leads and the A.C. supply cord at its outlet.

A pair of headphones with at least 4½ volts in series or a voltmeter with sufficient voltage to give a full scale deflection when connected directly across the battery terminals should be used in making these tests. The receiver sockets, numbers and lugs used in these tests are shown in Figure 12. The S.P.U. terminals are shown in Figure 15.

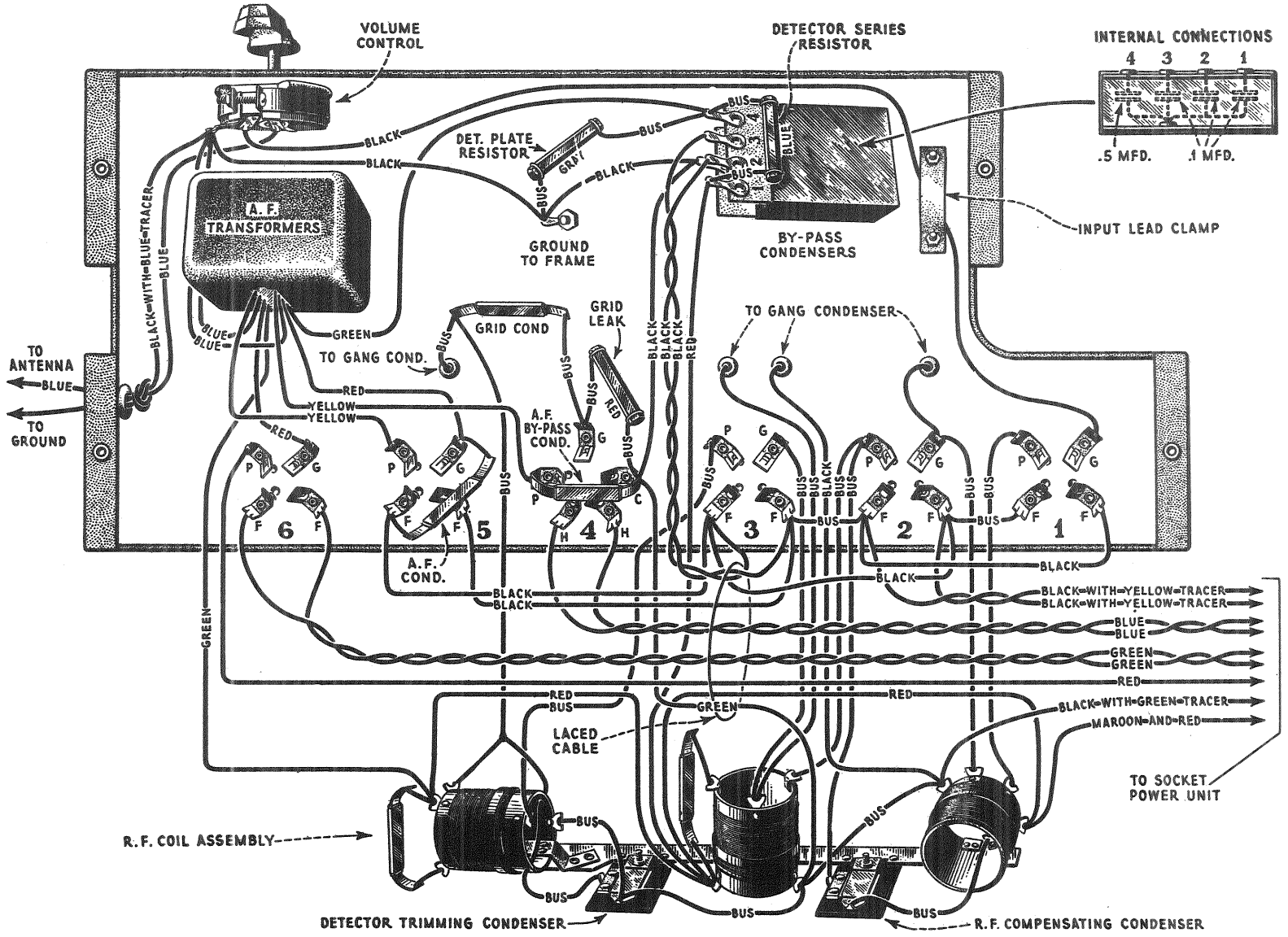


Figure 14—Wiring diagram of receiver assembly—grid leak in some models is connected from grid of socket No. 4 to ground connection of frame instead of as shown

RECEIVER ASSEMBLY AND S. P. U. CONTINUITY TESTS

Remove All Radiotrons and Disconnect A. C. Input Plug

Circuit	*Terminals*	*Correct Effect*	*Incorrect Effect Caused by*
Grid	Antenna to ground	Closed	Open volume control
	Antenna to G1	Closed	Open volume control or contact arm
	G2 to Gnd.	Closed	Open secondary of 1st R.F. transformer
	G3 to Gnd.	Closed	Open secondary of 2d R.F. transformer
	Stator condenser No. 3 to Gnd.	Closed	Open secondary of 3d R.F. transformer
	G4 to Gnd.	Closed (Very Weak)	Open grid leak or if loud, shorted grid condenser
	G5 to Gnd.	Closed	Open secondary of 1st A.F. transformer
	G6 to Gnd.	Closed	Open secondary of 2d A.F. transformer
Plate	P1 to P6	Closed	Open primary of 1st R.F. transformer, 1,600 ohm resistor or output choke
	P2 to P6	Closed	Open primary of 2d R.F. transformer, concentrated primary coil, 1,600 ohm resistor or output choke
	P3 to P6	Closed	Open primary of 3d R.F. concentrated primary coil, 1,600 ohm resistor or output choke
	P4 to P6	Closed	Open primary of 1st A.F. transformer, 30,000 ohms resistor or output choke
	P4 to Ground	Closed	Open primary of 1st A.F. transformer or 15,000 ohm plate resistor
	P5 to P6	Closed	Open primary of 2d A.F. transformer, 1,600 ohm resistor or output choke
	P6 to either UX-280 filament contact	Closed	Open output choke, filter reactor UX-280 filament winding
Filament	Across filament contacts of sockets Nos. 1, 2, 3 and 5*	Closed	Open UX-226 filament winding of power transformer and center tapped resistor or wiring
	Across heater contacts of socket No. 4*	Closed	Open UY-227 heater winding of power transformer and center tapped resistor or wiring
	Across filament contacts of socket No. 6*	Closed	Open UX-171A filament winding of power transformer and center tapped resistor or wiring

* In making these tests if the filaments light, the center tapped resistances should be checked by releasing all connections to them. An open center tapped resistor is generally indicated by excessive hum.

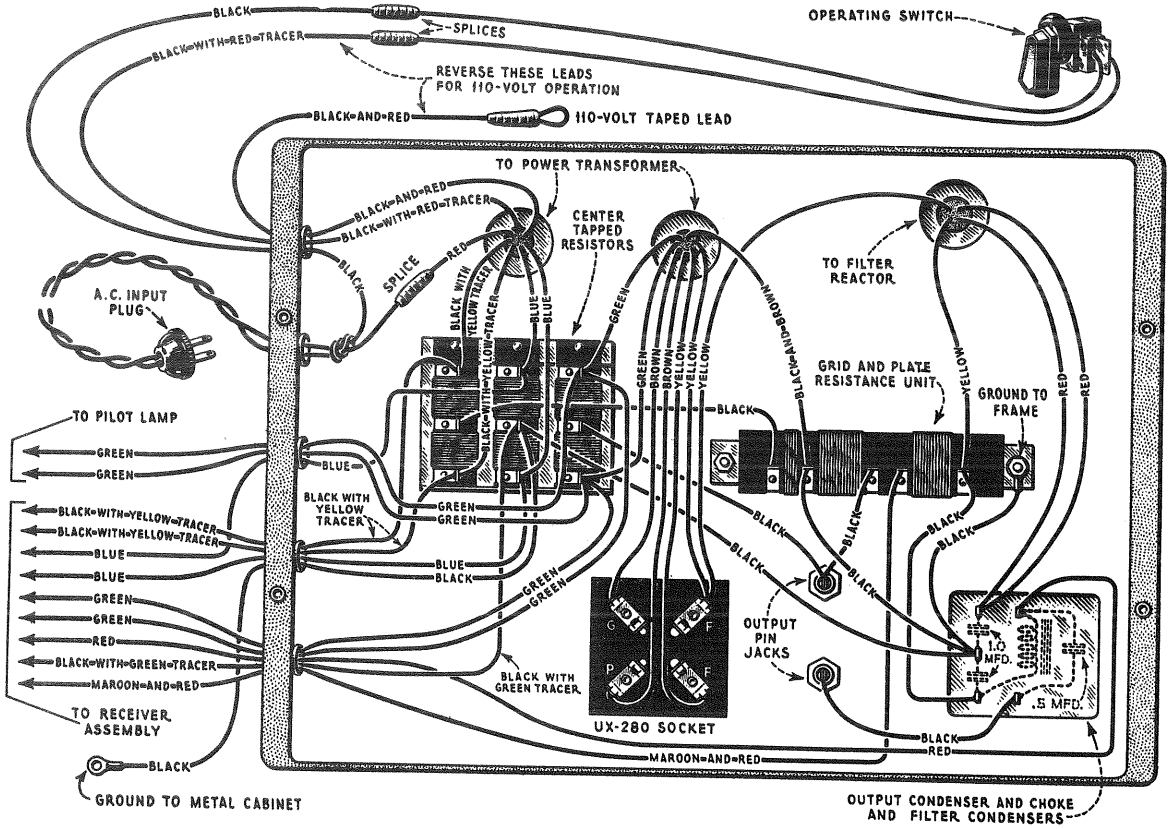


Figure 15—Wiring diagram of socket power unit

RECEIVER ASSEMBLY AND S.P.U. CONTINUITY TESTS—Cont'd

Circuit	*Terminals*	*Correct Effect*	*Incorrect Effect Caused by*
	Across UX-280 filament contacts	Closed	Open UX-280 filament winding
	Across A.C. input plug with operating switch "On"	Closed	Open primary of power transformer
S.P.U.	G. to P of UX-280 socket	Closed	Open high voltage winding of power transformer
	Either F5 to Ground	Closed	Open 440-ohm bias resistance
	Either F6 to Ground	Closed	Open 1900-ohm bias resistance
	P6 to one output pin terminal (next to rear of cabinet)	Open	Shorted .5 mfd. output condenser

PART IV—MAKING REPLACEMENTS

The various assemblies and parts of Radiola 33 are easy of access and replacements can be made quickly.

(1) REPLACING VOLUME CONTROL

The following procedure should be used when replacing the volume control.

(a) Remove the left front leg and remove the screw under it that holds the receiver assembly. Then replace the leg temporarily.

(b) Remove the seven other screws that hold the receiver assembly and S.P.U. to the bottom of the cabinet.

(c) Remove the metal lid and release the screw holding the ground lead to the back of the cabinet.

(d) Remove the three control knobs. All the knobs are of the push type and can be removed by simply pulling off.

(e) Remove the collar that holds the switch to the front of the cabinet. The switch should now be pulled clear of the cabinet.

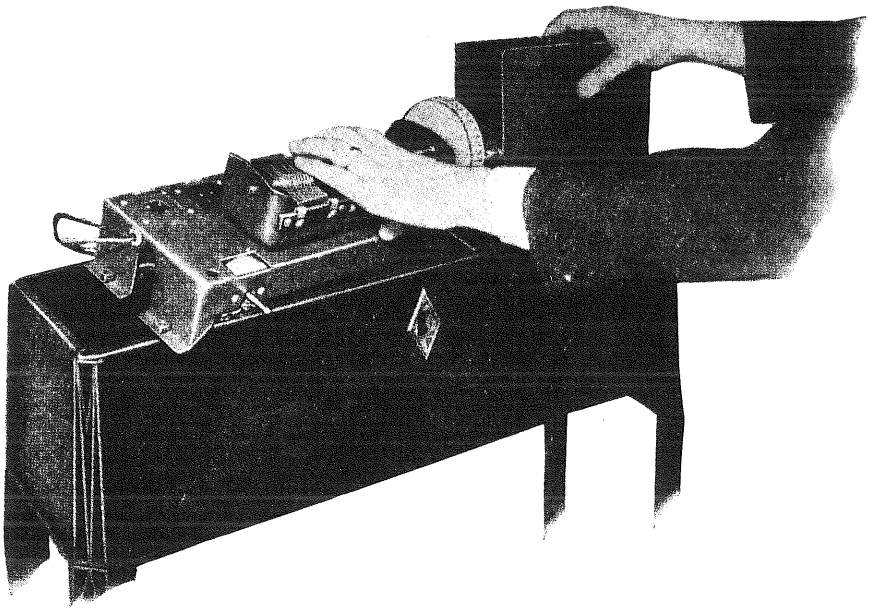


Figure 16—Removing receiver chassis and socket power unit from cabinet in one operation

(f) Pull the input A.C. cord through the large hole in the bottom of the cabinet and let it hang over the cabinet side so that it will be clear when the receiver assembly and S.P.U. are removed. Pull the antenna and ground leads clear.

(g) Grasping the receiver assembly by the tuning condenser assembly and the S.P.U. by the power transformer or filter reactor, lift the two assemblies clear of the cabinet—See Figure 16. The S.P.U. can be lifted straight up, but the receiver assembly must first be pulled back slightly so the volume control and tuning control clear the front of the cabinet. Place the two assemblies on a suitable support for work.

(h) Unsolder the leads to the volume control.

(i) Remove the two screws that hold the volume control to the metal chassis. It may now be removed and the new one fastened in place. The connections should be soldered to the new volume control. These connections are shown in Figure 14.

(j) The Radiola is now reassembled in the reverse manner of that already given.

(2) REPLACING RADIO FREQUENCY COILS

The three radio frequency transformers together with small fixed condensers across the concentrated primary coils and R.F. compensating and detector trimming condensers are mounted on one strip and must be replaced as a unit. The following procedure is used:

(a) Remove the chassis assembly from the cabinet as described in Part IV, Section 1.
(b) Unsolder all connections to the three transformers.
(c) Remove the three screws that hold the mounting strip to the metal chassis. The entire assembly can now be removed. The new assembly is placed in the position occupied by the old one.
(d) Replace the screws that hold the mounting strip to the metal chassis.
(e) Replace and resolder all leads to the three transformers. These connections are shown in Figure 14. When making this replacement be careful not to disturb the

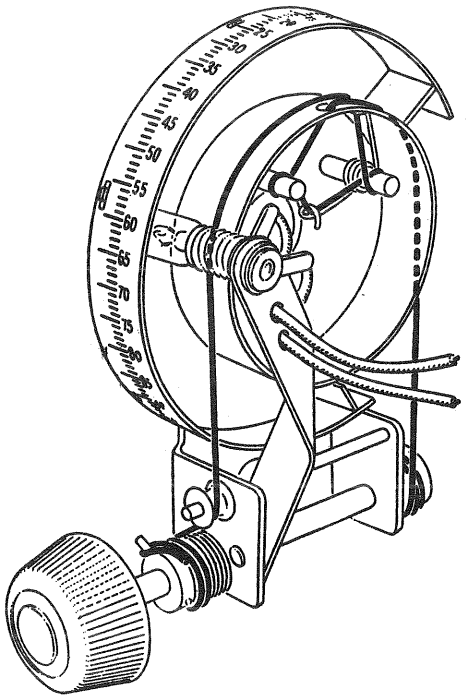


Figure 17—Gang tuning condenser drive mechanism and cable

two condensers connected across the concentrated coils. Placing these condensers closer to the coils than their normal position will affect the inductance of the coil with a resulting decrease of sensitivity.
(f) Return chassis assembly to cabinet and replace all screws and knobs. Adjust the compensating condenser to the correct position as indicated in Part II, Section 10. Also adjust the detector trimming condenser as described in Part II, Section 5.

(3) REPLACING RADIOTRON GANG SOCKETS

The Radiotron sockets of Radiola 33 are of the gang variety, using one detector socket; two A.F. socket strips, and one three-gang socket strip for the radio frequency amplifying tubes. There is a small Bakelite shield placed over all sockets. This shield is supplied separately and does not come with the socket. The sockets are riveted to the metal chassis. To replace them, drill out the old rivets and use screws, nuts and lock washers for securing the new sockets. A step by step procedure follows:

(a) Remove chassis assembly from cabinet as described in Part IV, Section 1.
(b) Remove all leads to the terminals of the sockets.
(c) Drill out the rivets holding the sockets to the metal chassis frame. In some cases it may be necessary to loosen the R.F. transformer assembly in order to slip the socket strips out.
(d) The socket assembly is now removed and the new one placed in the position occupied by the old one.
(e) Fasten new socket in place by using small round head machine screws, nuts and lock washers in place of the rivets previously removed.
(f) Replace connections as indicated in Figure 14 for the correct socket connections.
(g) Return chassis to cabinet.

(4) REPLACING MAIN TUNING CONDENSERS AND DRIVE

The main tuning condensers and the driving mechanism are replaced as one complete unit. The step by step procedure follows:

(a) Remove chassis assembly from housing as described in Part IV, Section 1.
(b) Unsolder four connections to condensers.
(c) Remove three screws, nuts, lock washers and insulating strip on under side of chassis that holds the assembly to the frame.
(d) The assembly may now be removed and the new assembly placed in the position occupied by the old one. Be sure and connect the ground wire previously connected under the nut and washer to one screw.
(e) Replace the three screws, nuts and lock washers and resolder the leads.
(f) Replace chassis assembly in cabinet.

(5) REPLACING BY-PASS CONDENSER

This condenser, located on the under side of the chassis frame is held in place by four metal tabs that are a part of the condenser case and are bent over on the upper side of the metal chassis. A step by step procedure for making this replacement follows:

(a) Remove chassis from cabinet as described in Part IV, Section 1.
(b) Remove tuning condenser assembly from chassis as described in Part IV, Section 4.
(c) Unsolder the leads and resistor connected to the defective condenser.
(d) The four tabs holding the condenser to the chassis may now be bent up with a screw-driver and the old condenser replaced by the new one. Insert the tabs in the holes and bend them over on the upper side of the chassis assembly. Resolder the leads and resistors to their correct terminals. The connections are shown in Figure 14.
(e) Replace the tuning condenser assembly as described in Part IV, Section 4.
(f) Return chassis assembly to cabinet in reverse order of that used to remove it.

(6) REPLACING AUDIO FREQUENCY TRANSFORMERS

The audio transformers of Radiola 33 are built together in one unit. In making a replacement the following procedure should be used:

(a) Remove chassis from cabinet as described in Part IV, Section 1.
(b) Unsolder all leads to the audio transformers.
(c) Use a screw-driver to turn up the tabs that hold the transformer assembly to the chassis frame and remove it.
(d) Place the new transformer in the position occupied by the old one, bend over the tabs and resolder all connections. The correct connections are shown in Figure 14.
(e) Replace chassis in cabinet in the reverse order of that used to remove it.

(7) REPLACING CONDENSER DRIVE CABLE

The condenser drive cable of Radiola 33 is of rugged fishline and should give good service. If replacement becomes necessary proceed as follows:

(a) Remove the chassis from the cabinet as described in Part IV, Section 1. Place chassis on table with controls to the front.

(b) Remove the old cable from large drum and grooved drums completely.

(c) By referring to Figure 17 the new cable may be placed in the position occupied by the old one.

(d) Re-assemble the Radiola in the reverse manner of that used to disassemble it.

(8) REPLACING TUNING DIAL

After considerable use a tuning dial may become dirty or illegible and a new scale desired. A step by step procedure for making replacement follows:

(a) Open lid of cabinet of Radiola.

(b) Turn dial so that the small clamp that holds the dial in place is on top.

(c) Remove the clamp and pull the dial clear.

(d) Replace old dial with new one and clamp in place.

(e) Close lid of cabinet.

(9) REPLACING FILTER CONDENSER, OUTPUT CHOKE AND CONDENSER ASSEMBLY

The filter condensers, together with the output choke and condenser, are all contained in one metal container and must be replaced as a unit. The replacement procedure follows:

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

(b) Unsolder the connections to the filter condenser unit.

(c) Turn up the tabs that hold this unit to the S.P.U. base with a screw-driver. The entire assembly may now be removed and the new one placed in the position occupied by the old one.

(d) Clamp the assembly in place by turning the tabs over on the under side of the base. Solder the connections as indicated in Figure 15.

(e) Return the S.P.U. to the cabinet and re-assemble in the reverse order of that used to remove it.

(10) REPLACING EITHER POWER TRANSFORMER OR FILTER REACTOR

The power transformer and the filter reactor are each encased in a metal container. Either unit may be replaced in the following manner:

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

(b) Unsolder the leads of the unit being replaced.

(c) Bend up the tabs holding the unit to the base. It may be necessary to remove the resistance unit in order to bend all the tabs. The particular assembly being replaced may now be removed and the new assembly placed in the position occupied by the old one.

(d) The tabs on the new assembly should be bent so as to properly fasten the unit to the S.P.U. base.

(e) Connect all the leads from the assembly to the points of connection as in Figure 15 which should be followed exactly when any S.P.U. parts are replaced.

(f) Return to cabinet in the reverse order, and connect to receiver assembly.

SERVICE DATA CHART

Before using the following Service Data Chart, when experiencing no signals, weak signals, 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 Signals	Defective operating switch	Repair or replace switch
	Loose volume control arm	Tighten volume control arm, P. II, S. 4
	Defective R.F. transformer	Replace R.F. transformer assembly, P. IV, S. 2
	Defective A.F. transformer	Replace A.F. transformer assembly, P. IV, S. 6
	Defective By-pass condenser	Replace By-pass condenser, P. IV, S. 5
	Defective socket power unit	Check socket power unit by means of continuity test and make any repairs or replacements necessary, P. III, S. 3
Weak Signals	Compensating condenser out of adjustment	Adjust compensating condenser correctly, P. II, S. 10
	Defective R.F. transformer	Replace R.F. transformer assembly, P. IV, S. 2
	Defective A.F. transformer	Replace A.F. transformer assembly, P. IV, S. 6
	Dirty prongs of Radiotrons	Clean prongs with fine sandpaper, P. II, S. 3
	Defective By-pass condenser	Replace defective By-pass condenser, P. IV, S. 5
	Defective main tuning condensers	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. 1
	Defective socket power unit	Check socket power unit by means of continuity test and make any repairs or replacements necessary, P. III, S. 3
Poor Quality	Defective A.F. transfomer	Replace A.F. transformer assembly, P. IV, S. 6
	Defective By-pass condenser	Replace defective By-pass condenser, P. IV, S. 5
	Dirty prongs on Radiotrons	Clean prongs with fine sandpaper, P. II, S. 3
	Defective output condenser or choke	Replace output condenser and choke, P. IV, S. 8
Howling	Compensating condenser out of adjustment	Adjust compensating condenser correctly, P. II, S. 10
	Defect in audio system	Check and repair any defect, P. II, S. 3
	Open grid circuit in any stage	Check circuit and repair defect
	Receiver in oscillation	Correct cause of oscillation, P. II, S. 9
Excessive Hum	Defective center tapped resistance unit	Replace defective resistance unit
	Socket plug position	Reverse socket plug, P. I, S. 4
	Line voltage low	Reconnect transformer for low line voltage, P. I, S. 5
	Defective filter condenser	Replace defective condenser
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. 10
	No A.C. line voltage	Turn A.C. line voltage "On"

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