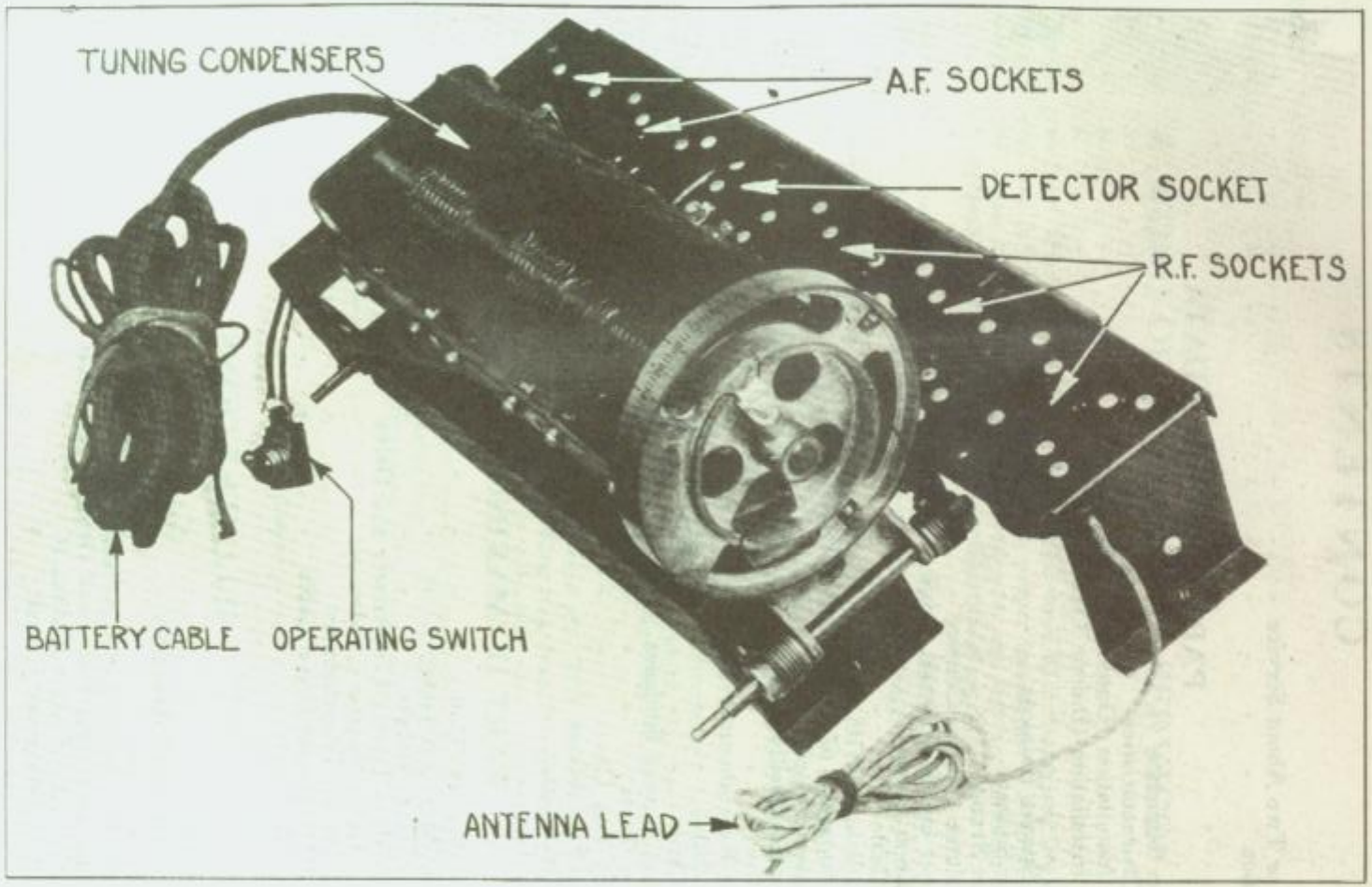


Figure 1—Top view of chassis showing the simple arrangement and rugged construction of the three-gang condensers, gang sockets and tuning control

RCA RADIOLA 16

SERVICE NOTES

Prepared by

RCA SERVICE DIVISION

INTRODUCTION

RCA Radiola 16 is a tuned radio frequency receiver employing five Radiotrons UX-201A and one Radiotron UX-112A. The tuning range of Radiola 16 extends from 550 to 1400 Kilocycles or 546 to 214 meters approximately. This amply covers the broadcast band of wavelengths. The utmost in simplified tuning is provided by having but two controls, one for the selection of stations and one for the adjustment of volume. Radiola 16 is designed to operate without the use of vernier tuning condensers or adjustable rheostats. Excellent quality of reproduction is obtained by the use of properly designed audio transformers and a power amplifier Radiotron easily capable of handling the signal delivered to the last audio amplifier.

Service work in conjunction with RCA Radiola 16 should be small, since all construction is of a simple character (See Figure 1) and of fool-proof design. However, for the guidance of those called upon to locate and remedy any trouble that may occur the following notes are presented.

PART I—SERVICE DATA

(1) RADIOTRON SEQUENCE

Figure 2 illustrates the sequence of the Radiotrons as applied to the path of the incoming signal. 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 and is not tuned in any way.

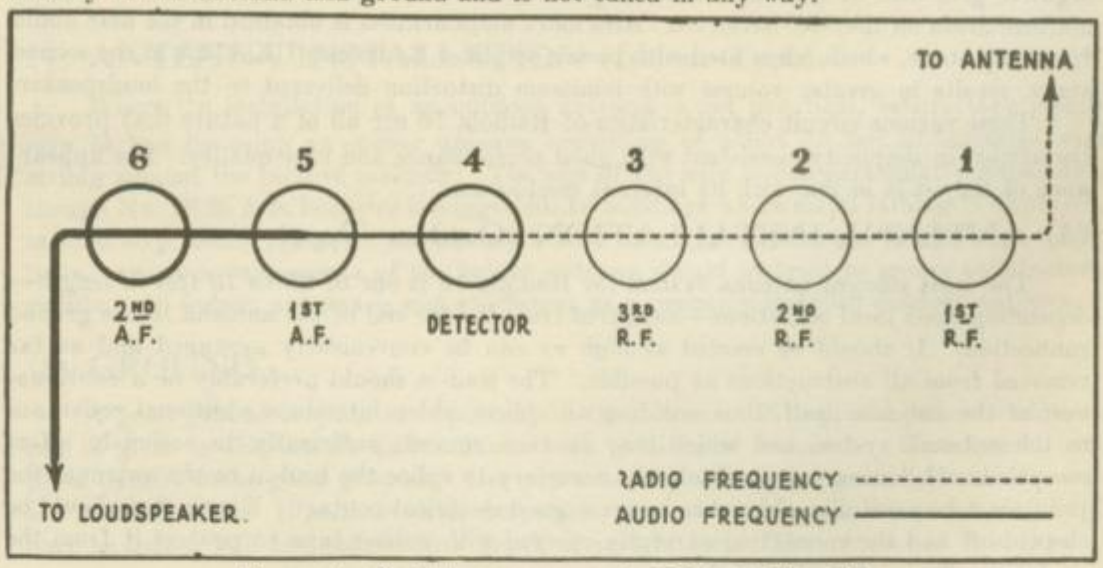


Figure 2—Radiotron sequence in RCA Radiola 16

Radiotron No. 2 is a stage of tuned R. F. amplification employing a grid resistance to prevent oscillation. It is tuned by means of the first of the three-gang condensers.

Radiotron No. 3 is the second stage of tuned R. F. amplification. It also employs a grid resistance for the purpose of stabilizing or preventing self oscillation in the circuit. It is tuned by the second of the main tuning condensers.

Radiotron No. 4 is the tuned detector. This circuit employs a tapped resistance across the filament leads for the purpose of improving tone quality.

Radiotrons No. 5 and No. 6 are respectively the first and second stages of audio frequency amplification. The last stage, Radiotron No. 6, employs power amplifier Radiotron UX-112A.

(2) CIRCUIT CHARACTERISTICS

The following principles are incorporated in the circuit design of Radiola 16.

1. A three-gang condenser, employed to tune two radio frequency and the detector circuits, provides one tuning control.

2. An aperiodic antenna circuit, or 1st R. F. circuit, eliminates the necessity for a separate antenna tuning control or a vernier across the antenna tuning condenser.

3. A plate voltage of 67 volts is used on all radio frequency stages without a "C" battery. This provides simplicity in battery circuits without any loss of sensitivity or tone quality.

4. The volume control regulates the filament voltage of the three radio frequency amplifiers. This gives a smooth control of volume with minimum distortion.

5. No neutralizing condensers are employed. Grid resistances in the radio frequency amplifier circuit effectively prevent any self oscillation that might occur. This is a simple and effective method of overcoming any oscillating tendency of the radio frequency amplifiers.

6. A fixed resistor is used in the filament circuit instead of a variable rheostat. This eliminates an extra control on the panel and safeguards the filaments of the Radiotrons against excessive voltage.

7. A plate voltage of 135 volts is used on both audio stages in conjunction with a negative grid bias of 9 volts. This simplifies battery connections and provides a more uniform drain on the "B" batteries. Also more amplification is obtained in the first audio frequency stage, which, when used with power amplifier Radiotron UX-112A in the second stage, results in greater volume with minimum distortion delivered to the loudspeaker.

These various circuit characteristics of Radiola 16 are all of a nature that provides the utmost in simplicity consistent with good performance and tone quality. The appearance of the set is in line with its internal mechanism.

(3) ANTENNA INSTALLATION (Outdoor Type)

The most efficient antenna system for Radiola 16 is one of 25 to 75 feet in length—depending upon local conditions—measured from the far end of the antenna to the ground connection. It should be erected as high as can be conveniently arranged and as far removed from all obstructions as possible. The lead-in should preferably be a continuation of the antenna itself, thus avoiding all splices which introduce additional resistance to the antenna system and which may in time corrode sufficiently to seriously affect reception. If, however, it is absolutely necessary to splice the lead-in to the antenna, the joint must be carefully soldered to insure a good electrical contact. Excess flux should be cleaned off and the connection carefully covered with rubber tape to protect it from the oxidation effects of the atmosphere.

The antenna and lead-in should be supported by high grade glass or porcelain insulators. At no point should the antenna or lead-in wire come in contact with any part of the building. The lead-in wire should be brought through the wall or window frame and insulated therefrom by a porcelain tube.

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 antenna. It is desirable to keep the lead-in a foot or more from the building where possible. When an outdoor antenna is used it should be protected by means of an approved lightning arrestor, in accordance with the requirements of the National Fire Underwriters' Code.

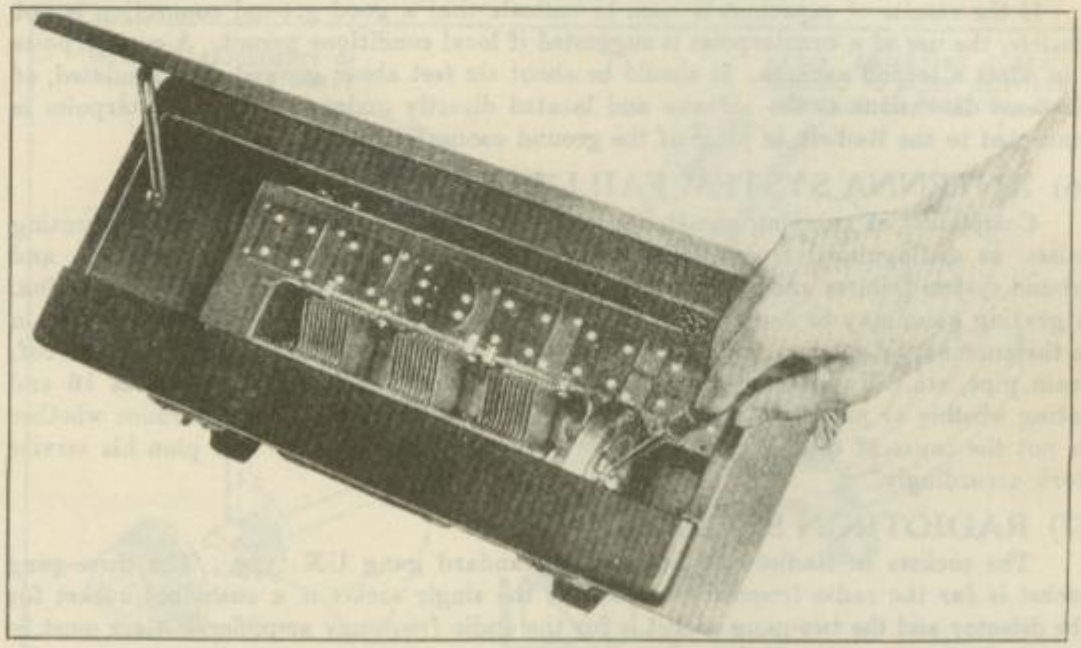


Figure 3—Turning the cable adjusting screw to take up slack in condenser control cable

(4) ANTENNA INSTALLATION (Indoor Type)

Where the installation of an outdoor antenna is not practical, satisfactory results may be had by using an indoor antenna consisting of about 50 feet of insulated wire strung around the picture molding. The size of the wire is not particularly important, though No. 18 B. & S. bell wire is suggested. 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.

(5) 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.

It is recommended that the service man experiment with various grounds, and employ the one giving the best results. Radiola 16 is capable of receiving over good distances when connected to an efficient antenna and a low resistance ground. A poor ground connection may not be apparent on local reception, but it is an important factor in distant reception and it may also cause oscillation.

If the results of experiments seem to indicate that a good ground connection is not possible, the use of a counterpoise is suggested if local conditions permit. A counterpoise is in effect a second antenna. It should be about six feet above ground, well insulated, of the same dimensions as the antenna and located directly under it. The counterpoise is connected to the Radiola in place of the ground connection.

(6) ANTENNA SYSTEM FAILURES

Complaints of swinging signals, or of intermittent reception with probable grating noises, as distinguished from fading effects, are generally the result of antenna and ground system failures and to this, therefore, the service man should give his first attention. A grating noise may be caused by a poor battery connection, a poor lead-in connection to the antenna, or antenna touching some metallic surface, such as the edge of a tin roof, drain pipe, etc. By disconnecting the antenna and ground leads from Radiola 16 and noting whether or not the grating continues, the service man can soon determine whether or not the cause of complaint is within or external to the receiver and plan his service work accordingly.

(7) RADIOTRON SOCKETS

The sockets in Radiola 16 are of the standard gang UX type. The three-gang socket is for the radio frequency amplifiers; the single socket is a cushioned socket for the detector and the two-gang socket is for the audio frequency amplifiers. Care must be exercised when inserting Radiotrons in the 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 must be replaced.

(8) RADIOTRON PRONGS

Dirty Radiotron prongs may cause noisy operation. They should be cleaned occasionally with a piece of fine sand paper. The use of emery cloth or steel wool is not recommended. Before re-inserting Radiotrons in the sockets, wipe the prongs and base carefully to make certain that all particles of sand are removed.

In placing Radiotrons in the gang sockets care should be exercised to make certain that the two large pins and two small pins of the Radiotrons match the socket holes. If a Radiotron will not fit into a socket without considerable pressure being applied, the trouble is probably due to excessive solder on one or more of the prongs. This may be removed with a file or knife. Never try to force one in. These sockets are so designed that the prongs of the Radiotrons will fit in snugly without force being applied. If sufficient force is applied it might be possible to insert the prongs in the wrong holes, resulting in a filament burnout.

(9) LOOSE VOLUME CONTROL CONTACT

A loose volume control contact may cause noisy or intermittent operation and should be remedied. If the contact arm is loose, the remedy is to bend it slightly so that it makes firm contact against the resistance strip. In order to do this it is necessary to remove the chassis from the cabinet as described in Part II, Sec. 1. The volume control is then readily accessible. By removing the two screws that hold it to the metal frame it may be completely removed. After adjusting the contact, replace the mounting screws and return the chassis to the cabinet. Replace screws and control knobs.

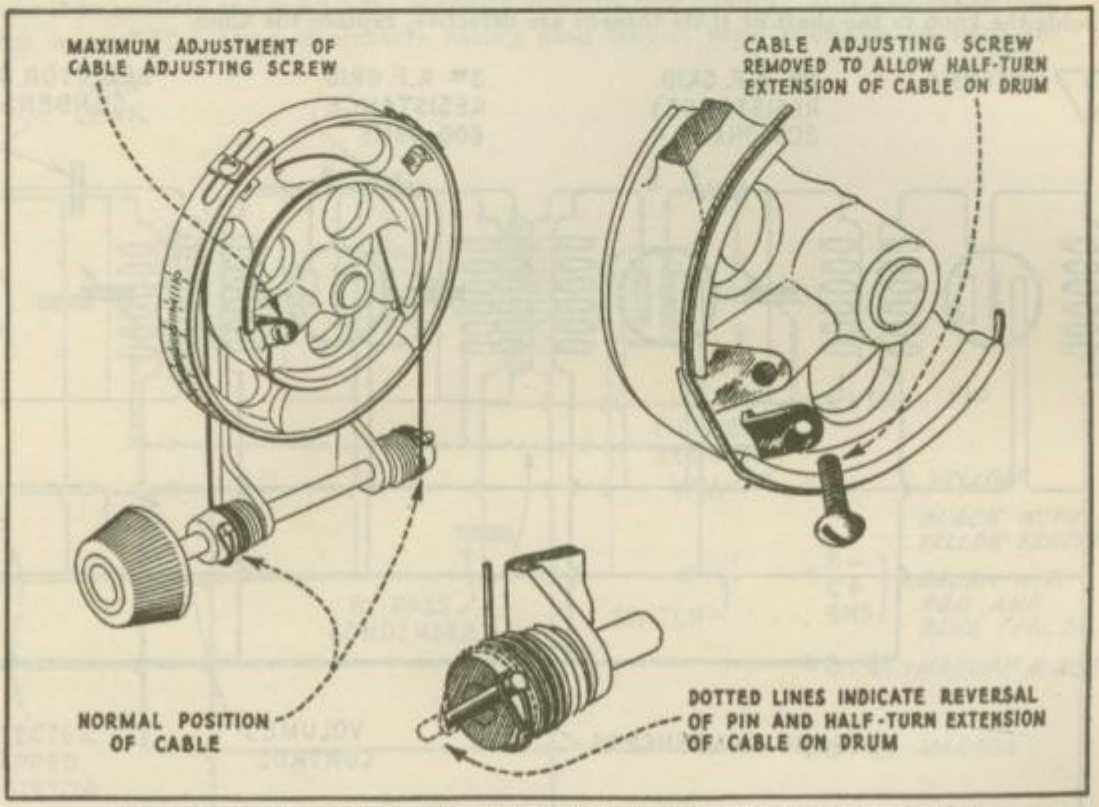


Figure 4—Three-gang condenser cable and drum operating mechanism

(10) ADJUSTMENT FOR SLACK DRUM CABLE

The main tuning condensers are controlled by a cable and drum arrangement giving a smoothly acting vernier movement that has no back lash. See Figure 1.

After considerable wear, or extreme changes of temperature the cable may become slack. To take up this slack open lid of cabinet and turn the cable adjusting screw with clamp until the cable is taut—See Figure 3. In extreme cases as might occur after considerable use and several adjustments this screw may become seated thus allowing no further tightening of the cable. When this condition occurs it will be necessary to slip the cable a half turn on the grooved drum. To make this adjustment it is necessary to remove the chassis from the cabinet as described in Part II Section 1. Remove the cable adjusting screw and clamp—See Figure 4. The cable will then have approximately one inch slack. By removing the tapered pin holding the front grooved drum to its shaft and replacing it on the opposite side (180 degrees) the one-inch slack in the cable can be taken

up by using the new position of the pin for anchoring the cable. Figure 4 illustrates this operation. It will be noted that the tapered pin in the new position cannot be inserted as far as originally. However it can be inserted far enough to lock the grooved drum to the control shaft and clear the metal housing. If the cable again is stretched to the maximum adjustment of the cable adjusting screw the tapered pin can be returned to its original position and a half turn slipped on the drum which will provide for taking up all slack. Sufficient grooves are provided on the drum for this purpose.

(11) TUNING KNOB LOOSE

If the panel control knob becomes loose on the shaft, tighten the small set screw that holds the knob to the shaft or if its threads are defective, replace the knob.

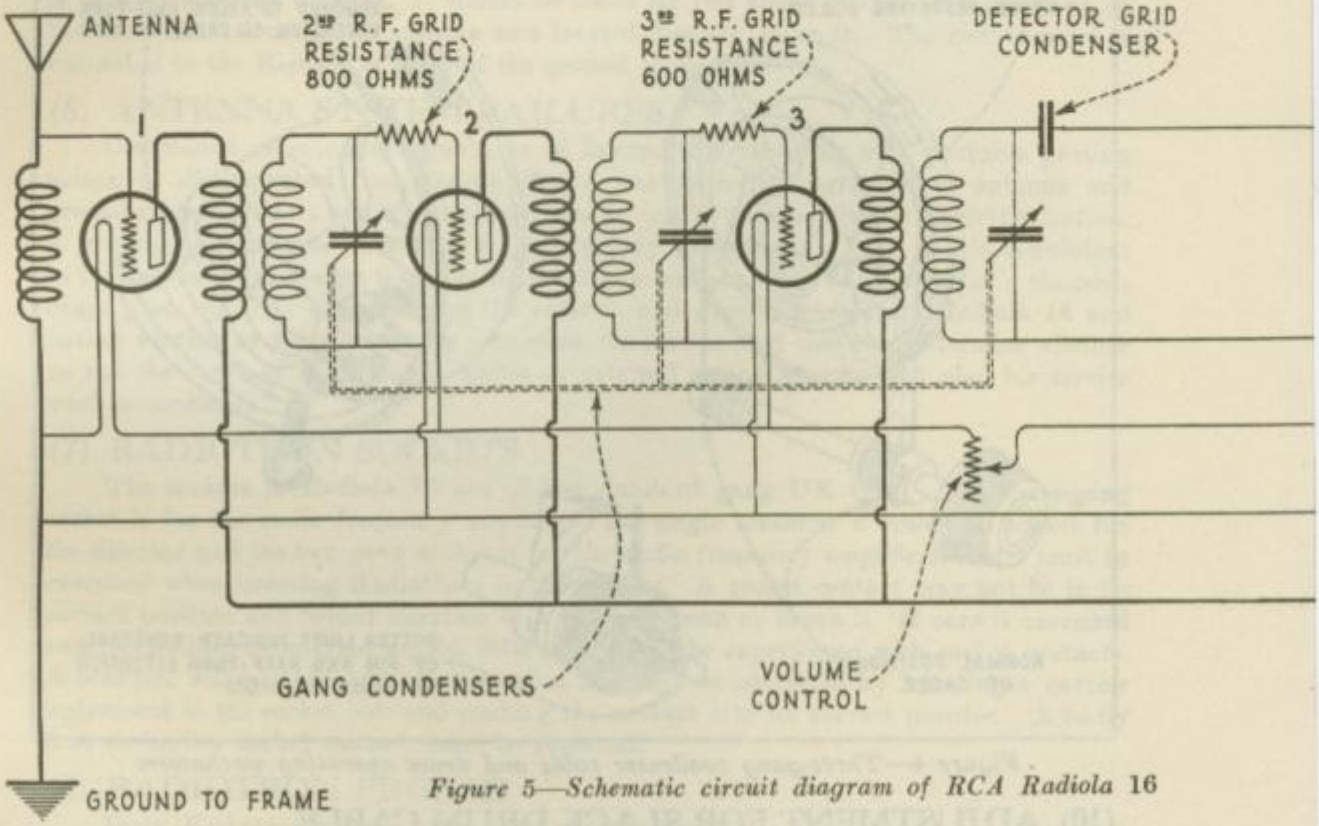


Figure 5—Schematic circuit diagram of RCA Radiola 16

(12) BROKEN CABLE

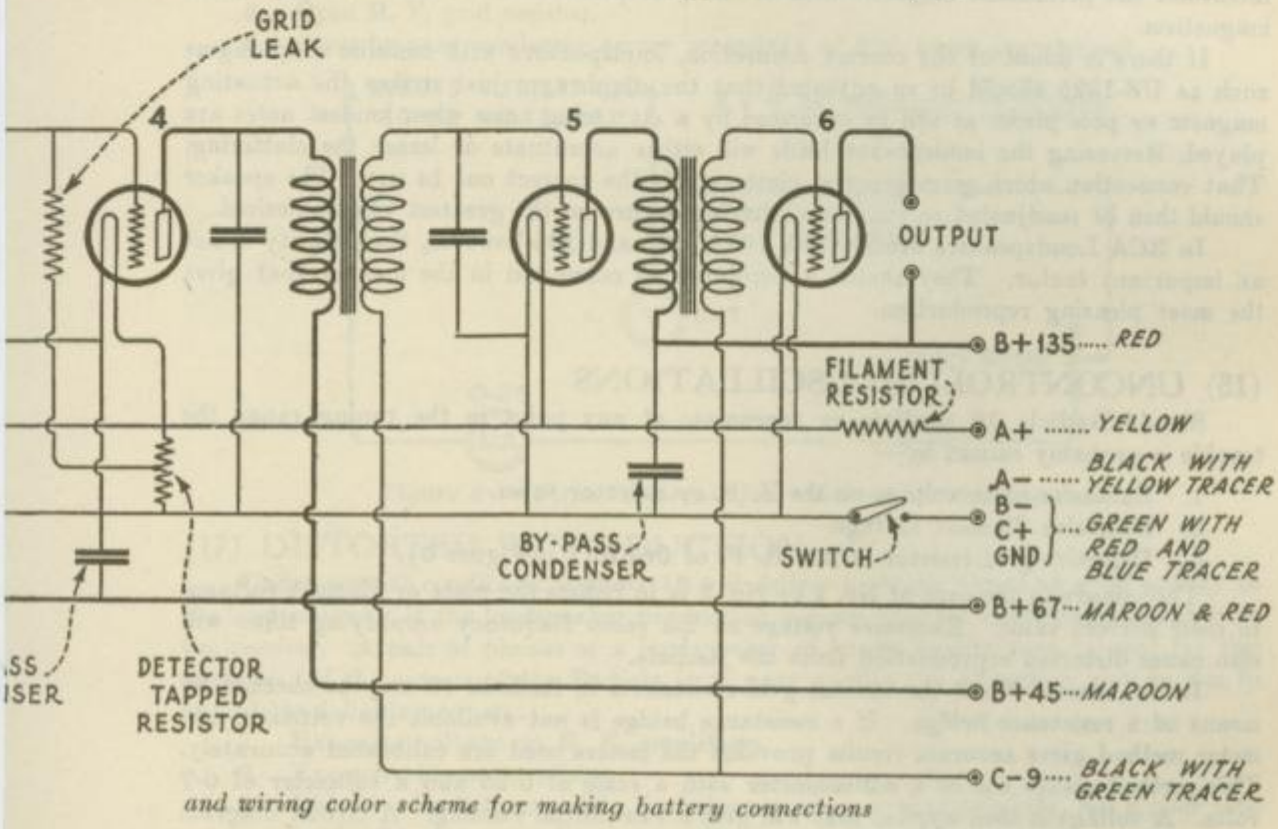
Should a cable become broken due to considerable use or excessive tightening, the proper remedy is to replace the cable. The procedure for making this replacement is described in Part II, Section 7. However if a new cable is not immediately available a temporary repair may be made in the following manner provided the break in the cable is not in that section that passes over the small grooved drums.

The two ends should be spliced together and then soldered. Splicing consists of interweaving the strands as with rope and not just twisting the cable ends together as in an electrical wiring splice. Splicing gives greater strength and results in a smaller body being formed on the cable. When soldering, use plenty of flux and a small amount of solder. Heat sufficiently long for the solder to adhere to all the small strands of the

cable. Placing the splice in an alcohol or bunsen flame affords sufficient heat and allows any excess solder to drip away. It is to be understood that this is but a temporary repair and should be used only until a new cable can be procured and installed.

(13) USING RADIOLA 16 WITH RCA "B" BATTERY ELIMINATOR OR SIMILAR DEVICES NOT SUPPLYING 67 VOLTS PLATE VOLTAGE

Radiola 16 uses a plate voltage of 67 volts for the radio frequency amplifiers and it is important that this voltage is not exceeded. (See Figure 5). A higher voltage may cause it to oscillate and in all cases seriously affect its tone quality. It is imperative that, when using "B" battery eliminators having fixed 90-volt taps, provision be made for



and wiring color scheme for making battery connections

reducing them to 67 volts. Off hand it would seem that a series resistance could be used to drop the voltage, but when we realize the plate voltage varies in practically all of these devices except in the case of the RCA "B" Eliminator (Duo-Rectron) and similar devices a fixed resistor would give a varying voltage depending on the device.

A potentiometer having sufficiently high resistance (at least 18,000 ohms) shunted across the +45V and +90V taps with the contact arm connected to the 67-volt lead from the receiver will give a variable voltage between 45 and 90 volts for this lead. By taking a high resistance voltmeter and connecting from —B to this arm, it may be adjusted for 67 volts. A drop of solder will make a permanent connection between the arm and resistance element and prevent a possible change in voltage. The General Radio Potentiometer No. 371 (18,000 ohms) is recommended for this purpose.

(14) LOUDSPEAKER POLARITY

In Radiolas employing Radiotron UX-112A in the last audio amplification stage it is very important to have the loudspeaker so connected that the magnetic field generated by the relatively large plate current from the 135-volt B battery will not oppose the permanent magnetic field of the speaker pole pieces. In Radiola loudspeakers of the horn type the solid brown lead should be connected to the left jack when facing the front of Radiola 16 and the black lead with brown tracer to the right jack. If speakers, similar to the UZ-1325, are incorrectly connected they will soon lose their sensitivity through a weakening of the permanent magnetism of the pole pieces. When the leads are properly connected, the magnetic field generated by the steady plate current in the speaker coils intensifies the permanent magnetic field of the pole pieces and maintains the permanent magnetism.

If there is doubt of the correct connection, loudspeakers with metallic diaphragms such as UZ-1325 should be so adjusted that the diaphragm just strikes the actuating magnets or pole pieces as will be evidenced by a clattering noise when loudest notes are played. Reversing the loudspeaker leads will either accentuate or lessen the clattering. That connection which gives greatest clattering is the correct one to use. The speaker should then be readjusted so that no clattering occurs on the greatest volume desired.

In RCA Loudspeakers Models 100, 100A, 102 and 104 however, the polarity is not an important factor. They should accordingly be connected in the manner that gives the most pleasing reproduction.

(15) UNCONTROLLED OSCILLATIONS

Should Radiola 16 oscillate or regenerate at any point in the tuning range the trouble is probably caused by—

1. Excessive plate voltage on the R. F. or detector tubes.
2. Excessive filament voltage.
3. Defective grid resistor in 2nd R. F. or 3rd R. F. (Figure 5).

The remedy in the case of No. 1 or No. 2 is to reduce the plate or filament voltages to their correct value. Excessive voltage on the radio frequency amplifying tubes will also cause distorted reproduction from the Radiola.

In the case of No. 3 the various grid resistances in Radiola 16 may be checked by means of a resistance bridge. If a resistance bridge is not available the voltmeter-ammeter method gives accurate results provided the meters used are calibrated accurately. This method makes use of a milliammeter with a scale of 0-25 and a voltmeter of 0-7 volts. A voltage is then applied that will give a substantial reading. A circuit diagram of this method is shown in Figure 6.

The resistance may then be calculated by the use of Ohms law.

$$R = \frac{E}{I}$$ (Where R equals ohms, E equals volts and I equals amperes)

$$\text{or } 1000 \frac{\text{Volts}}{\text{Milliamperes}}$$

Since the current reading is taken in milliamperes (or $\frac{1}{1000}$ ampere) it is necessary to multiply by 1000 to get the resistance value in ohms.

The values of the various resistances are shown in the schematic diagram Figure 5.

In some cases with certain antennas, the Radiola may oscillate even though everything is O. K. The remedy in this case is to interchange the Radiotrons or to reduce the volume control a slight amount.

(16) AUDIO HOWL

An audio howl is generally caused by some defect in the audio amplifying system. One of the following defects may be the cause of this howl.

1. Defective Radiotron.
2. Defective "B" battery.
3. Open audio by-pass condensers.
4. Defective grid leak or open grid of any tube in the Radiola.
5. Open R. F. grid resistor.
6. Open by-pass condenser across secondary of first audio transformer.

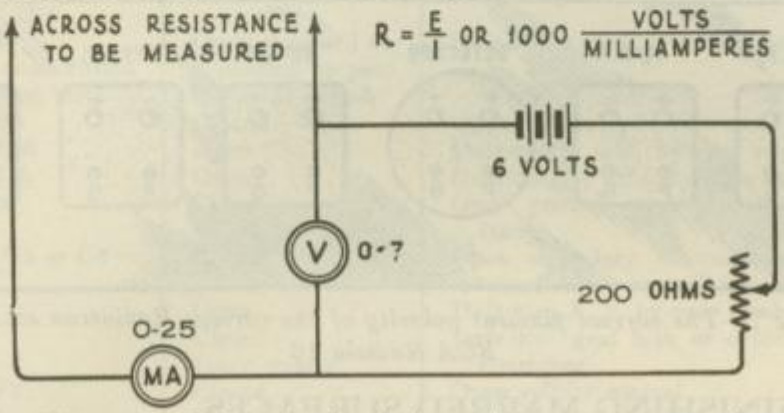


Figure 6—Schematic circuit for resistance measurement

(17) DISTORTED REPRODUCTION

Under normal conditions Radiola 16 will deliver a strong signal of good quality to the loudspeaker. If the loudspeaker production is poor, test the loudspeaker input from the receiver. A pair of phones or a loudspeaker of known quality may be used for this purpose. If the output of the Radiola is of poor quality the distortion may be due to any of the following causes:

1. Excessive voltage on R. F. amplifiers.
2. Excessive filament voltage.
3. Defective Radiotrons. The Radiola may be operating properly, but a poor tube in the detector or audio stages will cause distortion.
4. An open audio transformer may cause distortion.

(18) ACOUSTIC HOWL

This is caused by a microphonic Radiotron, or the Loudspeaker being too close to the Radiola. The sound waves from the loudspeaker striking a Radiotron may cause the Radiotron elements to vibrate, which in turn, produces an amplified howl in the output of the loudspeaker.

The remedy lies in interchanging the Radiotrons. Counting from left to right the third Radiotron is the most susceptible to this microphonic condition. Interchanging it, with one of the R. F. amplifiers or placing the Loudspeaker at a greater distance from the receiver will generally remedy this condition. In some cases both may be necessary.

(19) BATTERY CABLE

Radiola 16 has one battery cable consisting of six conductors and a separate cord for the antenna connection (See Figure 1). The color scheme for the connections is shown on a small card attached to the cable. This color scheme is as follows:

Antenna	Blue (Separate from the main cable)
+A 6V	Yellow
—A	Black with yellow tracer
—B+C Gnd.	Green with red and blue tracers
+B 45V	Maroon
+B 67V	Maroon and Red
+B 135V	Red
—C 9V	Black with green tracer

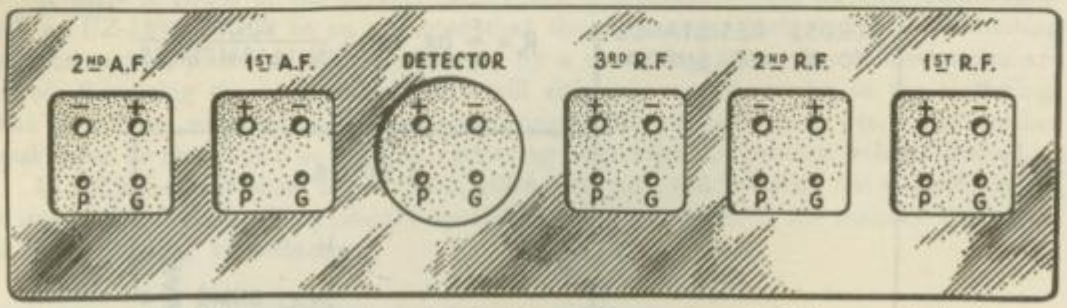


Figure 7—The correct filament polarity of the various Radiotron sockets in RCA Radiola 16

(20) REFINISHING MARRED SURFACES

The chassis assembly of Radiola 16 is finished in a dark bronze color that gives it a pleasing appearance and protection against rust or corrosion. When service work is being performed this surface is likely to become scratched, making a poor appearing job.

The RCA will supply to dealers and distributors through its service stations, small bottles or cans of refinishing paint, which together with a camel's hair brush should be a part of the service man's kit when servicing Radiola 16.

This bronze paint can also be used on the RCA 100A Loudspeaker.

(21) CONTINUITY TESTS

The following tests will show complete continuity for the circuits of Radiola 16.

The volume control should be adjusted so that half its resistance is in the circuit, the antenna lead disconnected and the battery cable disconnected from all batteries and placed so that none of its leads will make contact with any other lead. Close operating switch.

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 battery terminals should be used in making this test. This arrangement will be found to be very sensitive in checking voltage drop in various circuits.

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 designation "P" and "G" refer to the plate and grid contacts of the socket indicated by the number following. For example G2 would indicate the grid contact of the second socket, P6 would indicate the plate contact of the sixth tube socket.

Polarity of the various Radiotron sockets are not alike. Figure 7 illustrates the correct polarity of the filament terminals for each socket in addition to the location of the plate and grid terminals.

CONTINUITY TEST CHART

Terminals	*Correct Effect*	*Incorrect Effect Caused By*
+A to +F1, 2, and 3	Closed	Open volume control, filament resistor, or wiring
+A to +F4, 5 and 6	Closed	Open filament resistor or wiring
—A to —F1, 2, 3, 4, 5 and 6	Closed	Open switch, defective cable or wiring
—A to —F6 (Open and close switch while making test)	Open or closed according to position of switch	Defective switch or connections
—F4 to +F4	Closed	Open detector grid resistance
—B to +135B	Open	Defective 1 mfd. by-pass condenser
—B to +67½	Open	Defective ½ mfd. by-pass condenser
—B to frame	Closed (Switch closed)	Open ground connection to chassis frame
—B to G1, G2 or G3	Closed	Open secondary of radio-frequency transformers or grid resistances
—B to P4	Open	Defective A. F. by-pass condenser
—B to G4	Closed (very weak)	Defective grid leak or detector grid resistance
+F4 to +F3	Closed	Open volume control
+F6 to +A	Closed	Open filament resistor
+67½ to P1	Closed	Open primary 1st R. F. Transformer
+67½ to P2	Closed	Open primary 2nd R. F. Transformer
+67½ to P3	Closed	Open primary 3rd R. F. Transformer
+45 to P4	Closed	Open primary 1st A. F. Transformer
+135 to P5	Closed	Open primary 2nd A. F. Transformer
+135 to Output	Closed	Open Connection
P6 to Output	Closed	Open Connection
—9C to G5	Closed	Open secondary of first audio trans.
—9C to G6	Closed	Open secondary of second audio trans.
Antenna to frame	Closed	Open antenna inductance or connections
G1 to frame	Closed	Open antenna inductance or connections
Stator condenser No. 1 to G2	Closed	Open grid resistance No. 1
Stator condenser No. 2 to G3	Closed	Open grid resistance No. 2

(22) IMPORTANT PRECAUTIONS

1. As a fixed resistor is used in the filament circuit, it is important that all the Radiotrons be in place before turning on the operating switch. This is to protect the Radiotrons from excessive filament voltage when the total load is not in the circuit.

2. The main tuning condensers are electrically and mechanically aligned at the factory. Tampering with or handling of any kind that may affect the alignment of these condensers is to be avoided. The screws on the side of the assembly should not be touched because any movement, even though slight, may seriously affect the overall efficiency of the Radiola. This would be especially noticeable on weak signals.

PART II—MAKING REPLACEMENTS

(1) REPLACING ANTENNA COIL

The following procedure should be used when replacing the antenna coil:

(a) Remove five screws holding wooden back panel to cabinet.
(b) Remove knobs on "Station Selector" and "Volume control."
(c) Unscrew threaded round collar from front of battery switch.
(d) Remove four screws holding chassis in place to bottom of cabinet.

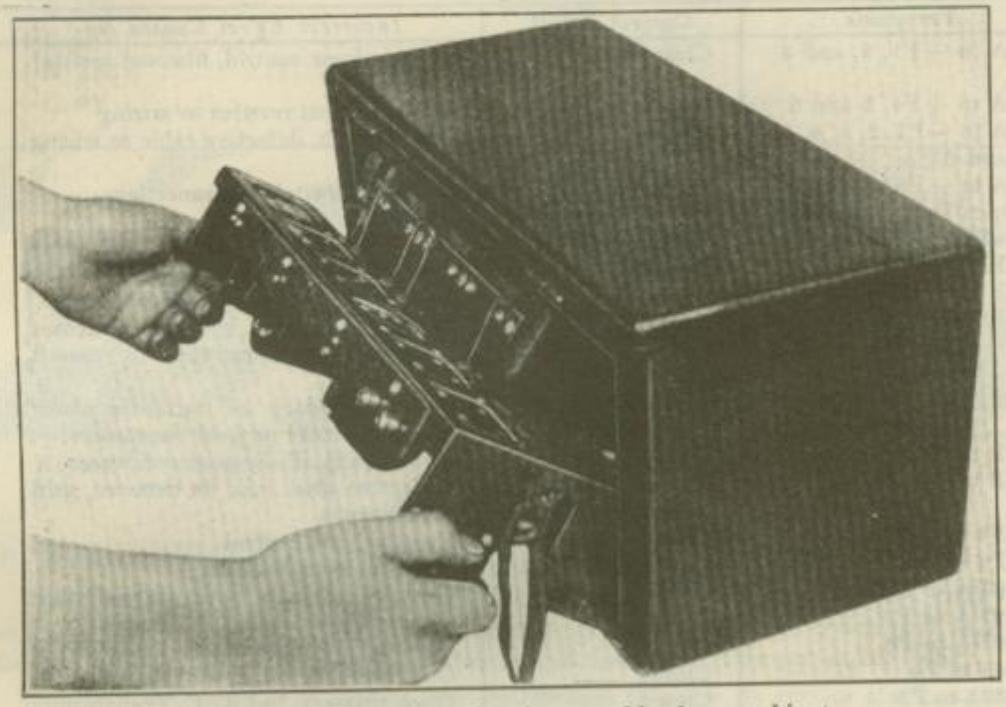


Figure 8—Removing chassis assembly from cabinet

The chassis assembly may now be removed by slightly rocking it in the cabinet and slipping it out of the rear opening. See Figure 8. This brings the complete chassis into view, allowing an easy examination of all parts.

The antenna coil is located at the left end viewed from the rear of the cabinet—the end that has the condenser drum and scale. See Figure 9. To remove the coil unsolder the two leads and remove screw and nut that passes through center of coil. The new coil is then placed in the position occupied by the old one. The nut and screw are replaced and the Radiola is reassembled in the reverse of the foregoing order. Before being replaced in the cabinet it should be given an operating test.

(2) REPLACING RADIO FREQUENCY COILS

The three radio frequency transformers together with a mounting strip and two pin jacks are stocked as one complete unit.

A step by step procedure for replacing this assembly is as follows:

1. Remove chassis from cabinet as described in Part II, Section 1.
2. Unsolder and carefully tag all connections to the three transformers and the two pin jacks.

3. Remove four screws that hold mounting strip to metal chassis. The entire assembly can now be released. The new assembly should be placed in the same position occupied by the one just removed.
4. Replace the four screws that hold mounting strip to metal chassis.
5. Replace and resolder all leads to the three transformers and two pin jacks as indicated by the tags previously attached to them.

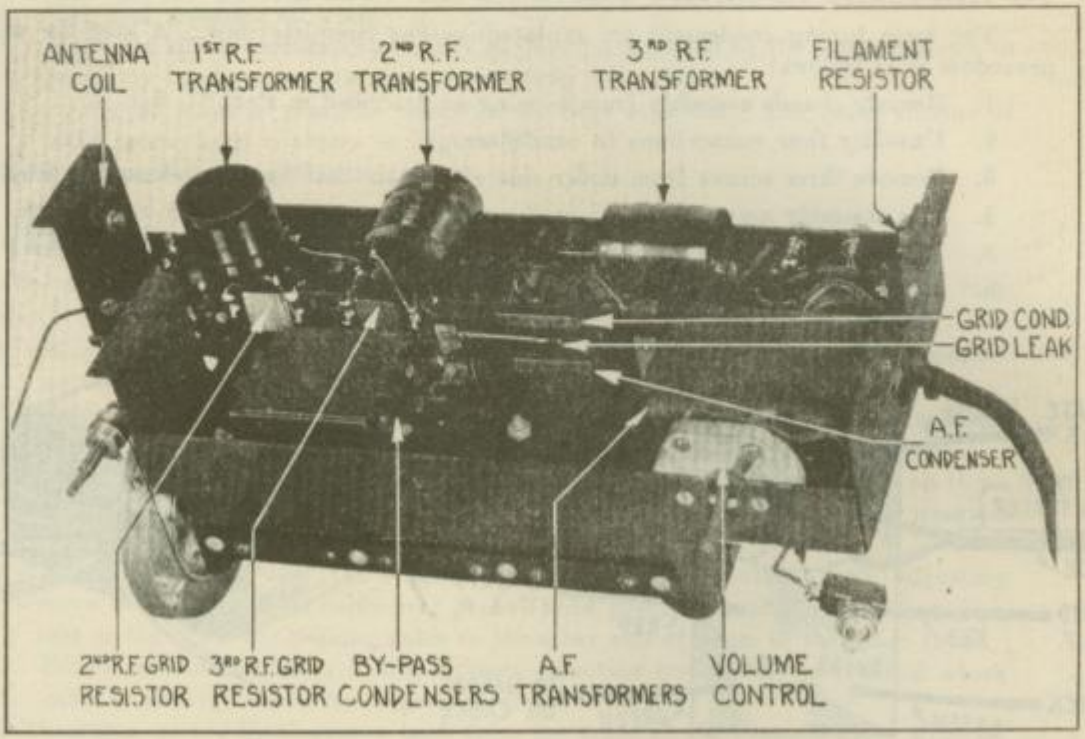


Figure 9—Sub-chassis assembly showing antenna coil, radio frequency coils, by-pass condensers, resistances and audio frequency transformers

6. Give Radiola an operating test before replacing in cabinet to determine that replacement has been properly made.
7. Return chassis assembly to cabinet and replace all screws and control knobs.

(3) REPLACING GANG SOCKETS

The sockets of Radiola 16 are of the gang variety, using one detector socket, a two-gang A. F. socket strip, and one three-gang socket strip for the radio frequency amplifier tubes.

These sockets are riveted to the metal chassis. To replace these sockets drill out the old rivets and use screws, nuts and lock washers for securing the new sockets. A step by step procedure for making replacements of this kind is as follows:

1. Remove chassis assembly from cabinet as described in Part II, Sec. 1.
2. Remove and tag all leads to the terminals of the sockets being removed.
3. Drill out rivets holding sockets to metal chassis frame.
4. The socket assembly may now be removed and the new one placed in the position occupied by the old one.

5. Fasten new socket in place by using small round head machine screws, nuts and lock washers in place of the rivets previously drilled out.
6. Resolder all connections to terminals of new sockets.
7. Test Radiola and replace in cabinet.

(4) REPLACING MAIN TUNING CONDENSERS AND DRIVE

The main tuning condensers are replaced as one complete unit. A step by step procedure is as follows:

1. Remove chassis assembly from housing as described in Part II, Sec. 1.
2. Unsolder four connections to condenser.
3. Remove three screws from under side of chassis that holds condenser assembly.
4. The assembly may now be removed and the new assembly placed in position.
5. Replace three screws that hold assembly in place and resolder the four leads.
6. Replace chassis assembly in cabinet.

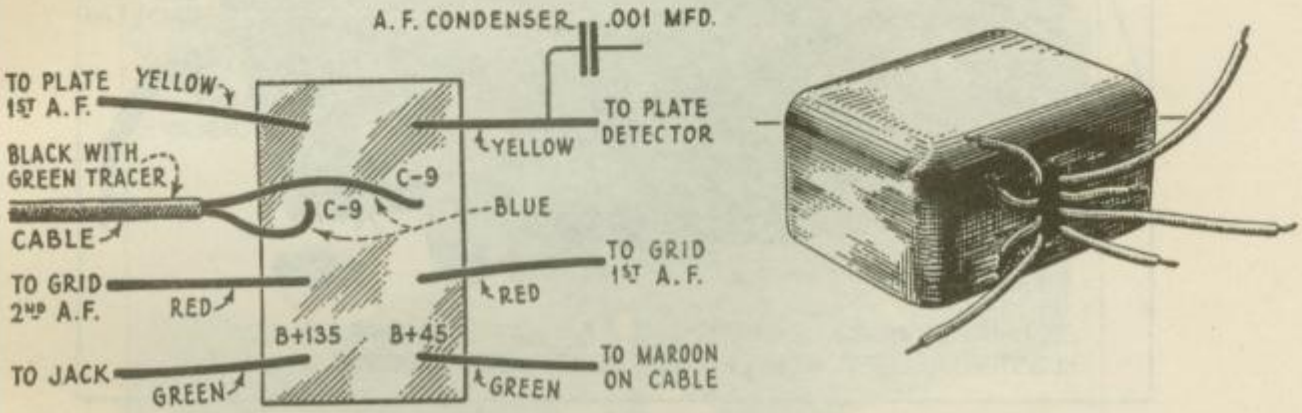


Figure 10—Audio frequency transformers and color scheme of connections

(5) REPLACING LARGE BY-PASS CONDENSERS

These condensers, located on the under side of the chassis frame, are held together by means of clamps that form part of the condenser case fastened to the frame. A step by step procedure when making replacement is as follows:

1. Remove chassis from cabinet as described in Part II, Sec. 1.
2. Remove condenser assembly as described in Part II, Sec. 4.
3. The tabs of the condensers may now be bent up, by using a screw driver.
4. The two condensers are released as a unit from the chassis frame. Separate them by turning up the tab that holds them together.
5. Unsolder the leads of the condenser that is to be replaced. Insert the new condenser in the place occupied by the old one and resolder the leads to it.
6. Fasten the condensers together as a unit by binding over the tabs provided for that purpose. Fasten to frame by inserting the tabs of the condenser into their respective slots and bending the tabs over on the top side of the frame.
7. Replace condenser assembly as described in Part II, Section 4, and then replace chassis assembly in cabinet as described in Part II, Section 1.

(6) REPLACING AUDIO TRANSFORMERS

The audio transformers of Radiola 16 are built together as a unit. In making a replacement the following procedure should be used.

1. Remove chassis from cabinet as described in Part II, Section 1.
2. The audio transformer case is held by metal tabs, bent over on the upper side of the chassis. Turn these up to release the transformer assembly.
3. Tag and unsolder all leads.
4. Place the new transformer assembly in position occupied by the old and fasten to frame by bending over metal tabs that hold it in place.
5. Solder all leads in place as indicated by tags attached. The color scheme of these connections is shown in Figure 10.
6. Replace chassis assembly in cabinet.

(7) REPLACING CONDENSER DRIVE CABLE

The condenser drive cable of Radiola 16 is made of phosphor bronze and is very rugged. If replacement becomes necessary the following procedure should be used.

1. Remove chassis from cabinet as described in Part II, Section 1. Place chassis on table in normal position with controls to the front.
2. Release the cable adjusting screw and clamp, and remove old cable from large drum and grooved drums completely.
3. Starting from the rear grooved drum place eye of cable over pin, wind on three complete turns, and then bring cable up to large drum. The pin in the grooved drum should be nearly horizontal and on the right side of the drum.
4. Now bring cable over the large drum. Turn drum so that cable adjusting screw is on top. Pass cable over groove until point is reached where there is a slot in the drum for passing cable to the other side of drum to the other track.
5. Follow on around other track in same direction until point is reached where cable is directly above front grooved drum.
6. Starting on the third groove back from the front of the grooved drum wind on two and a half turns and slip eye over pin.

The cable is now in the correct position, although probably slack.

The cable adjusting screw and clamp that were previously removed to allow the cable to pass along the groove are replaced. By slipping the clamp over the cable and gradually turning up on the cable adjusting screw, the cable may be tightened until there is no lost motion in any of the controls. Care should be taken not to take up too much as the cable may be stretched or possibly broken.

(8) REPLACING DIAL SCALE

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

1. Open lid of cabinet of Radiola.
2. Turn dial so that the two screws that hold the dial in place are on top.
3. Remove screws, washer and nuts that hold dial in place.
4. Replace old dial with new one and replace screws, but do not tighten.
5. Examine new dial from front of Radiola to see that numbers on dial are not upside down and the maximum and minimum figures are in their correct places.
6. Tighten screws holding dial in place and close lid of cabinet.

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, defective batteries, wrong battery connections and a poor antenna system. If imperfect operation is not due to the above causes the "Service Data Chart" should be consulted for further detailed causes.

Indication	*Cause*	*Remedy*	See Service Notes	
			Part I	*Part II*
No Signals	Defective operating switch	Replace switch	—	—
	Loose volume control arm	Tighten volume control arm	Sec. 9	—
	Defective battery cable	Replace battery cable	Sec. 19	—
	Defective antenna coil	Replace antenna coil	—	Sec. 1
	Defective R. F. transformer	Replace R. F. transformer assembly	—	Sec. 2
	Defective A. F. transformer	Replace A. F. transformer assembly	—	Sec. 6
	Defective By-pass condenser	Replace By-pass condenser	—	Sec. 5
Weak Signals	Defective cable	Replace cable	Sec. 19	—
	Defective antenna coil	Replace antenna coil	—	Sec. 1
	Defective R. F. transformer	Replace R. F. transformer assembly	—	Sec. 2
	Defective A. F. transformer	Replace A. F. transformer assembly	—	Sec. 6
	Dirty prongs of Radiotrons	Clean Radiotron prongs	Sec. 8	—
	Defective By-pass condenser	Replace defective By-pass condensers	—	Sec. 5
	Defective main tuning condenser	Replace main tuning condenser assembly	—	Sec. 4
Poor Quality	High plate voltage on R. F. amplifiers	Reduce plate voltage to 67 on R. F. amplifiers	Sec. 13	—
	Defective A. F. transformer	Replace A. F. transformer assembly	—	Sec. 6
	Defective By-pass condenser	Replace defective condenser	—	Sec. 5
Noisy or Intermittent Reception	Dirty Radiotron prongs	Clean Radiotron prongs with fine sand paper	Sec. 8	—
	Loose volume control arm	Tighten volume control arm	Sec. 9	—
	Socket contacts bent or broken	Repair or replace defective contact	Sec. 7	—
Howling	High plate voltage on R. F. amplifiers	Reduce plate voltage on R. F. amplifiers to 67	Sec. 13	—
	Open grid resistors	Check and replace grid resistors	Sec. 21	—
	Defect in audio system	Check and repair defect in audio system	Sec. 16	—
	Acoustic howl caused by microphonic Radiotrons or loudspeaker too close to Radiola	Interchange Radiotrons or increase distance of loudspeaker from Radiola	Sec. 18	—
	Open grid circuit in any stage	Check circuits and repair defect	Sec. 21	—
Radiotrons fail to light	Operating switch not "On"	Turn switch "On"	—	—
	Defective operating switch	Replace operating switch	—	—
	Defective volume control	Correct defect or replace volume control	Sec. 9	—
	Defective cable	Repair or replace cable	Sec. 19	—
Play in station selector	Loose knob	Tighten or replace knob	Sec. 11	—
	Slack cable	Take up on cable at adjusting screw	Sec. 10	—