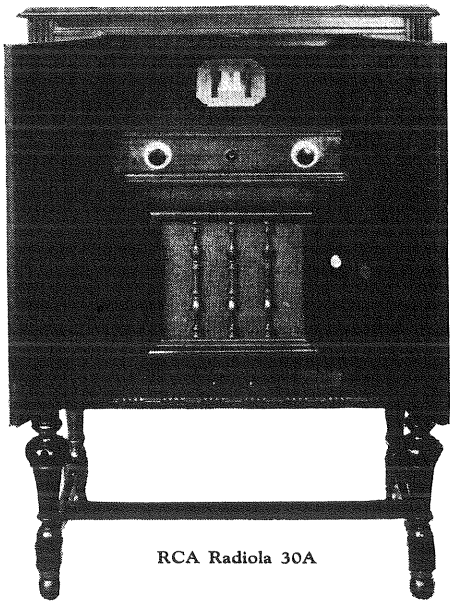
RCA
Radiola 30A

SERVICE NOTES



RCA Radiola 30A

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Radio Corporation of America

233 BROADWAY, NEW YORK CITY

DISTRICT SERVICE STATIONS

BROOKLYN, N. Y.
Bld. No. 19—168 - 39th St.

CHICAGO, ILL.
2001 West Pershing Road

SAN FRANCISCO, CAL.
274 Brannan St.

DALLAS, TEX.
Santa Fe Bldg., Unit No. 2

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A WORD OR TWO ABOUT SERVICE

Service goes hand in hand with sales. The well informed RCA 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 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 Dealer 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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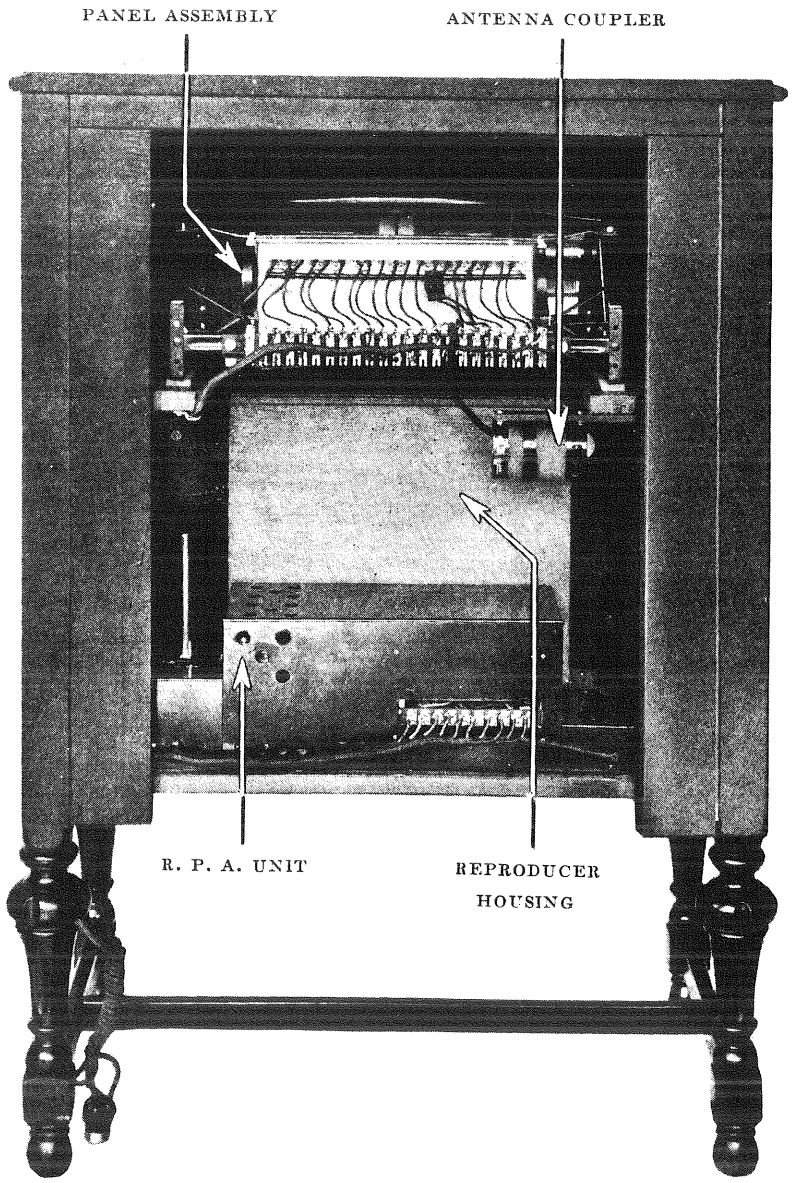


Figure 1—*Rear view of Radiola* 30A (*doors removed*) *showing the panel assembly, antenna coupler, R.P.A. unit and reproducer housing*

RCA RADIOLA 30A

SERVICE NOTES

Prepared by RCA Service Division

INTRODUCTION

Radiola 30A is a cabinet radio broadcast receiver, utilizing the well-known eight-tube super-heterodyne circuit, together with RCA 100A Loudspeaker unit as reproducer (Figure 1). It is designed for socket power operation—either A.C. or D.C. These notes cover A.C. type only. Very little service work should be required on Radiola 30A. However, the following information has been prepared for the guidance of those called upon to locate and remedy any trouble that may occur.

The notes are divided into four parts, namely: Part I, Panel assembly (Figure 2); Part II, Reproducer Unit; Part III, R.P.A. Unit; Part IV, Making Replacements. The particular part referring to the service work at hand should be consulted for any necessary information.

PART I—PANEL ASSEMBLY

(1) RADIOTRON SEQUENCE

Facing the panel and counting from left to right, the input is brought into the third Radiotron, which is a stage of tuned radio frequency amplification.

The output of the third Radiotron then goes to the first tube on the left, which is the frequency combining tube or first detector. The output of the fifth Radiotron, which is the oscillator, is also fed into the first Radiotron, the resultant combining of frequencies forming an intermediate frequency.

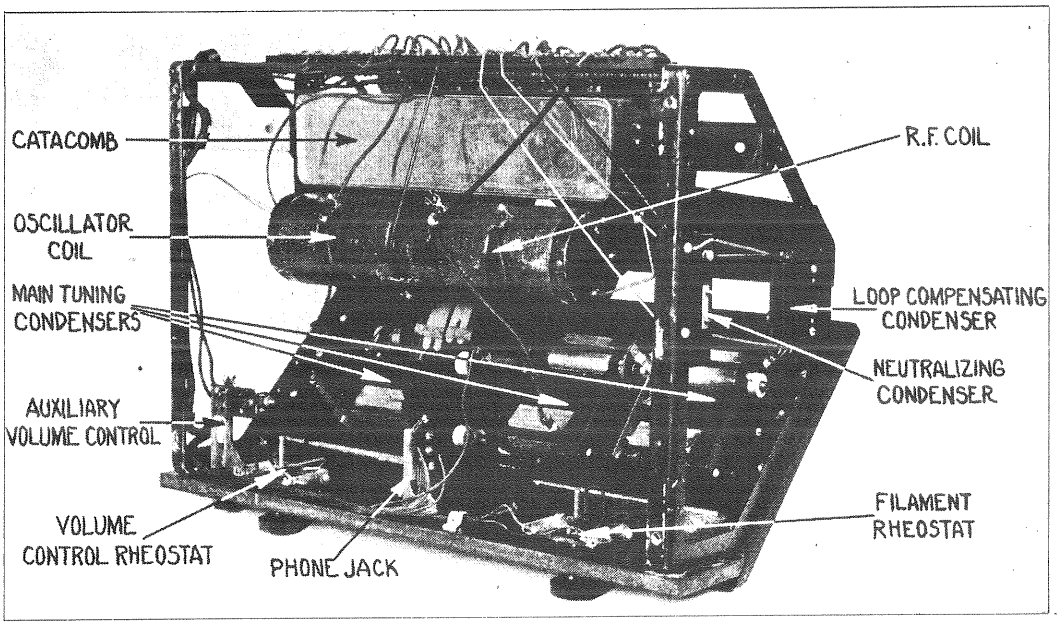


Figure 2—Rear view of panel assembly

The intermediate frequency signal now passes through tube No. 2, which is the first stage of I. F. amplification, then skipping tube No. 3, it passes through tube No. 4, which is the second I. F. stage.

From Radiotron No. 4 the signal is fed into No. 6, which is the second detector. The audio frequency current is now fed through Radiotron No. 7 and Radiotron UX-171 in the R.P.A. unit. Figure 3 illustrates the Radiotron sequence and the path of the different currents through them.

(2) ANTENNA COUPLER

Radiola 30A is designed for use with an antenna. An antenna coupler is provided for coupling the antenna inductively to the receiver in an efficient manner.

The antenna system necessary for satisfactory operation of Radiola 30A need not be elaborate. A small piece of insulated wire, approximately 25 feet long, placed under a rug or around the picture moulding will give sufficient pick-up for most locations. A ground to the radiator or cold water pipe will function satisfactorily.

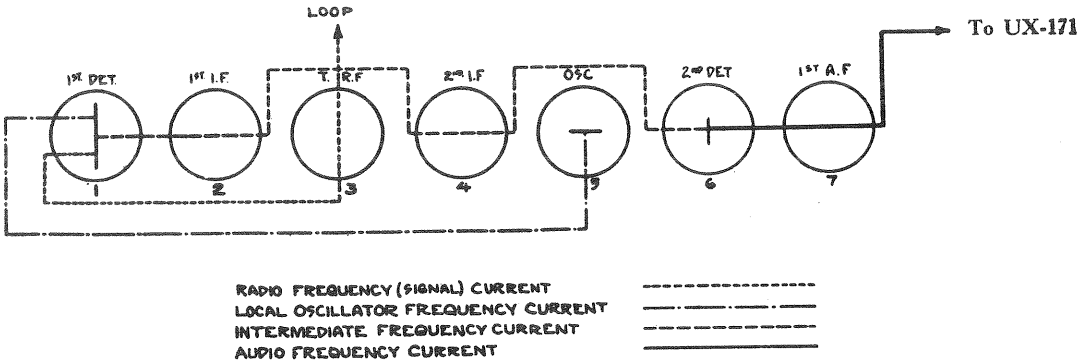


Figure 3—Radiola 30A Radiotron sequence and path of the different currents

In some shielded localities, especially in houses where metal lathing is used, satisfactory results cannot be secured with an indoor antenna. Conditions of this kind will necessitate an outdoor antenna of approximately 75 feet in length, measured from the far end of the antenna to the ground connection. It should be erected as high as can be conveniently arranged and away from any obstruction, if 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 may corrode and affect reception. It is desirable to keep the lead-in a foot or more from the building, where possible. An outdoor antenna should be protected by a lightning arrester designed in accordance with the requirements of the National Fire Underwriters' Code.

(3) RADIOTRON SOCKETS

In placing Radiotrons in their respective sockets, care should be exercised to make certain that the two large and two small pins of the Radiotrons are placed into the two large holes and two small holes, respectively. If a Radiotron will not fit into a socket without considerable pressure being applied, examine it for excessive solder on one or more of the prongs. This may be removed with a file or knife. Never try to force a Radiotron into its socket, because it is designed to fit in snugly with very little pressure. It might be possible, by exerting considerable pressure, to force the prongs into the wrong holes, resulting in a filament burn-out when the current is switched on in the set.

(4) RADIOTRON PRONGS

Dirty Radiotron prongs may cause noisy operation. This can be avoided by cleaning the prongs occasionally with a piece of fine sandpaper. The use of emery cloth or steel wool is not recommended. Before re-inserting the Radiotrons wipe the prongs and base carefully, to make certain that all particles of sand are removed.

(5) LOOSE RHEOSTAT CONTACTS

To get at the rheostat contacts, release the panel assembly by removing the four bolts that hold the panel in position, and pull it out of the rear of the cabinet. First, however, the wire which is threaded through each bolt must be removed by unsoldering it at

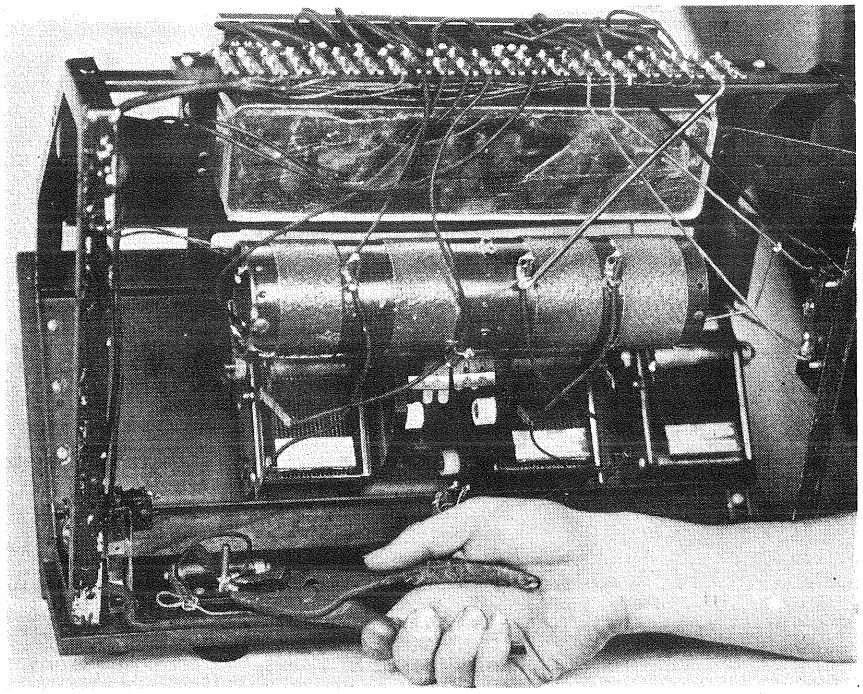


Figure 4—Adjusting contact arm on rheostat

its splice. With the bolts removed, the terminal strip cable disconnected and dropped to prevent interference, the removal of the panel assembly is easily accomplished and examination of the rheostats made possible.

The square-head set screw holding the contact arm to the shaft of the rheostat may now be loosened (Figure 4), and the contact arm readjusted or removed and bent, so that it will make positive contact with the resistance strip, making certain that the resistance strip is clean where contact is made. When this adjustment has been completed tighten the set screw and slip panel assembly back into cabinet, taking care to see that the panel is supported on the rubber strips and does not touch any part of the cabinet, including the apron hanging from the top of the cabinet. When viewed from the front, this apron appears to touch the top front panel, but actually it does not. If it should touch, serious microphonic trouble may result. After ascertaining that the panel is in its proper position, the four bolts, washers and lock wire should be returned to their original position.

(6) OUTER EDGE OF DRUM CONTROL SCRAPING AGAINST ESCUTCHEON PLATE OF PANEL

The adjustment of control drums touching the escutcheon plate on the panel is attended by noisy reproduction in the loudspeaker, and may be due to either or both of the following causes:

(a) Warped drum control. Check by placing a straight-edge on the outer flat surface of the knurled drum control, and note any irregularity of movement by slowly rotating the drum. If the drum control is badly warped it will be necessary to replace it.

(b) Condenser improperly aligned. To correct a poorly aligned condenser, remove the panel assembly, as previously instructed, and adjust the mounting screws of

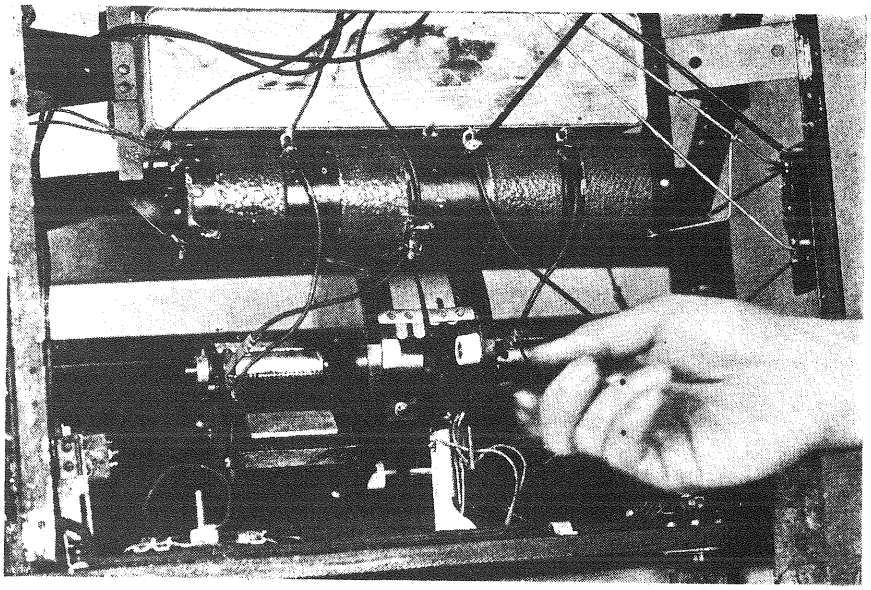


Figure 5—Adjusting friction shaft clutch tension screw inside of tuning drum assembly

the condenser. The two mounting screws that hold the back end plate of the condenser pass through elongated holes in the metal frame, thus allowing a degree of play sufficient for adjustment purposes.

(7) DRUMS FAIL TO HOLD POSITION

When adjustment is necessary to correct slipped tuning drums the following procedure should be used:

(a) Remove panel assembly from cabinet and re-adjust the friction shaft clutch tension screw located inside of the tuning drum assembly (Figure 5). This screw controls the pressure of the friction clutch against the shaft of the opposite condenser. If one drum turns too hard when the other is held, release the tension screw slightly.

(b) Should the frequency range be off calibration, ascertain whether or not the drum control is in proper relation to the condenser plates. When the drum control is set for minimum frequency the rotor plates of the condenser should be entirely inside the stator plates.

(8) NOISY RECEPTION CAUSED BY SCRAPING DIALS

Occasionally noisy reception is encountered which cannot be traced to electrical causes. A close inspection of the dials will show the cause of this trouble.

The tuning drums may be out of alignment, causing the metal dials to scrape against each other. This scraping, while not in any way connected with the electrical circuits, affects the characteristics of the circuits and results in distorted sound reproduction from the loudspeaker. The remedy consists in adjusting the drum set screws to provide the necessary clearance between the dials. If adjusting the set screws does not provide the necessary clearance the points on the dials that touch should be filed until clear. Care should be taken to prevent scratching the dials.

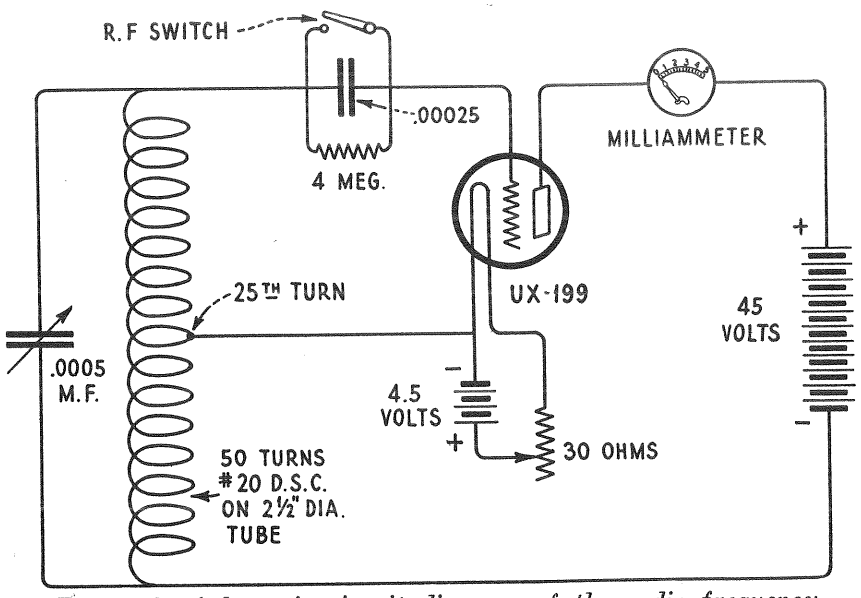


Figure 6—Schematic circuit diagram of the radio frequency and audio frequency oscillator

(9) ANTENNA COUPLER COMPENSATING CONDENSER

The antenna coupler compensating condenser is connected in shunt to the grid circuit of the antenna coupler to compensate the coupler for any increased distributed capacity in the radio frequency windings. It is adjusted at the factory to properly balance the coupler and should, therefore, not be tampered with unless proper facilities are available for correctly adjusting it.

The most noticeable need for readjusting the compensating condenser occurs when the Radiola seems to have lost its ability for distant reception. Having made certain that the trouble does not lie elsewhere, the following method should be employed to determine if adjustment of this condenser is necessary. The necessary equipment consists of a calibrated R. F. oscillator and a non-metallic screwdriver at least 8 in. long. The circuit diagram of the oscillator is shown in Figure 6. The coil consists of 50 turns of No. 20 D.S.C. wire wound on a 2½ in. tube with a tap taken off at the 25th turn and connected to the negative leg of the filament. The variable condenser has a capacity of .0005. This oscillator will cover the frequency range of 550 to 1,500 K.C. (200 to 546 meters) very efficiency. The grid condenser and leak will modulate the output when the oscillator is

used, where modulation is necessary The meter is a standard 0-5 milliampere meter. A 4-megohm grid leak and .00025 grid condenser is used. A 45-volt "B" battery for plate supply and a UX-199 Radiotron will be found to have ample power output. This oscillator will be found useful in servicing all types of receivers, adjusting compensating condensers and neutralizing other Radiolas of this type and neutralizing Radiola 20. It will amply repay the dealer for the small outlay of material and labor required.

To determine if adjustment of the antenna coupler compensating condenser is necessary proceed as follows:

(a) Remove tubes from Radiola catacomb.

(b) Disconnect the three antenna coupler leads from terminals 6, 8 and 9 of the catacomb terminal strip.

(c) Place oscillator into operation at 1,500 K.C. with the exploring coil in an inductive relation to the tuned R. F. coil of the panel assembly. (Left end of long coil facing panel from the front.)

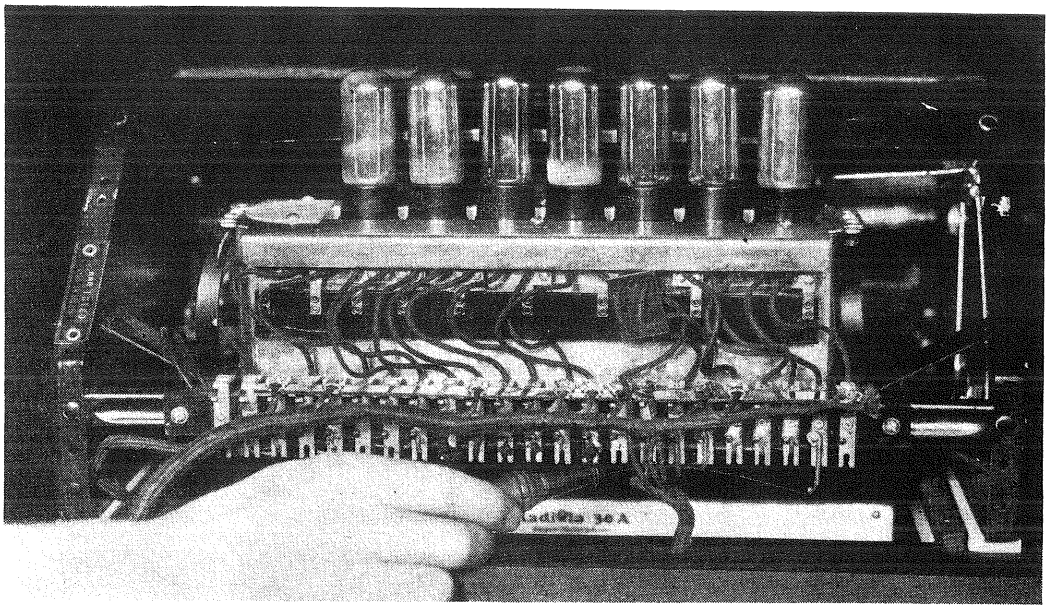


Figure 7—Adjusting neutralizing condenser

(d) Now move the left tuning drum, leaving the right one at the extreme low frequency end, until a dip is noted in the meter. Adjust this drum for maximum deflection.

(e) Now without disturbing the setting of the oscillator, move it to an inductive relation to the antenna coupling coil. Reconnect the three leads of the antenna coupler to the terminal strip.

(f) If the circuit is properly compensated, there will be a deflection obtained with the antenna coupler connected to the terminal strip and the oscillator in its new position.

(g) If no deflection is obtained under these conditions it will be necessary to adjust the compensating condenser until a maximum deflection is obtained with the left tuning control in the position for the maximum deflection previously obtained with the oscillator at the R. F. coil.

(h) Set oscillator at 550 K.C. and repeat entire procedure. Make any re-adjustment that may be necessary.

The compensating condenser is now properly adjusted.

This method of adjusting these circuits by use of a milliammeter in the plate circuit of an R.F. oscillator is much more accurate than any method that uses an audible indication of resonant points. The reason for this is, that a meter is much more sensitive to small variations of current than the human ear is to small changes of sound intensity.

(10) OSCILLATION

Radiola 30A may oscillate over portions of the tuning scale or throughout its entire range. When this trouble is encountered, it may be due to one of the following causes:

(a) Defective neutralizing condenser inside of the catacomb. The remedy in this case is to replace the entire catacomb. However, before assuming this to be the trouble all other possible causes should be check.

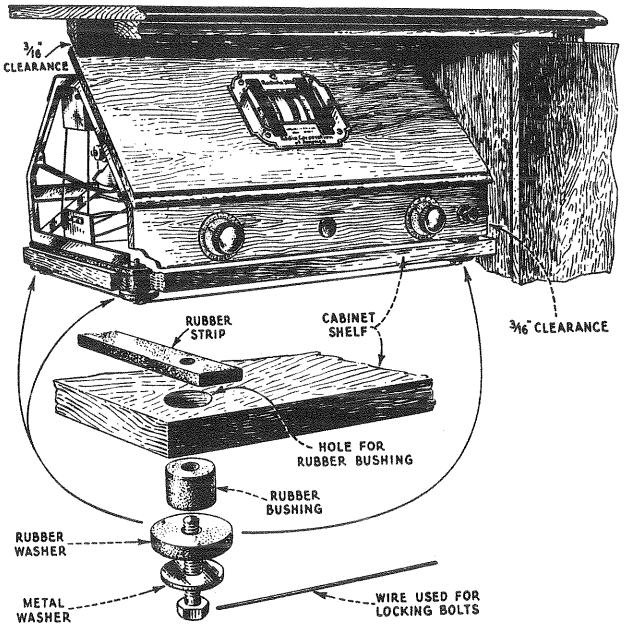


Figure 8—Panel assembly supports with rubber insulation to prevent microphonic action

(b) The antenna coupler neutralizing condenser connected across terminals 7 and 8 of the catacomb terminal strip may be out of adjustment. A procedure for properly adjusting this condenser follows: The necessary equipment is a modulated oscillator (described in Part I, Section 9); a "dummy" Radiotron; made by removing one filament prong of an otherwise O.K. Radiotron UX-199; a long non-metallic screwdriver and a 50-ohm compensating resistance.

1. Place modulated oscillator into operation at 1,000 K.C. about 20 feet from Radiola.
2. Tune in signal from oscillator in usual manner, adjusting all controls for loudest signal.
3. Now remove Radiotron No. 3, counting from left to right facing the front of the Radiola, and replace with the "dummy" Radiotron. Also connect the

50-ohm compensating resistance across terminals 3 and 4 of the catacomb resistance strip.

4. With the foregoing changes the oscillator signal should be very weak or should not be heard at all. If it is heard, even though weak, break the wax seal of the neutralizing condenser adjusting screw and alter the condenser capacity (Figure 7) until there is a minimum signal heard in the reproducer unit. If the volume control is reduced so that the neutralizing adjustment will cause the signal to just disappear, a proper adjustment has been found, and the adjusting screw should be again sealed with ordinary sealing compound, to prevent any change.
5. The "dummy" Radiotron and compensating resistance are now removed and the set is returned to normal operation.

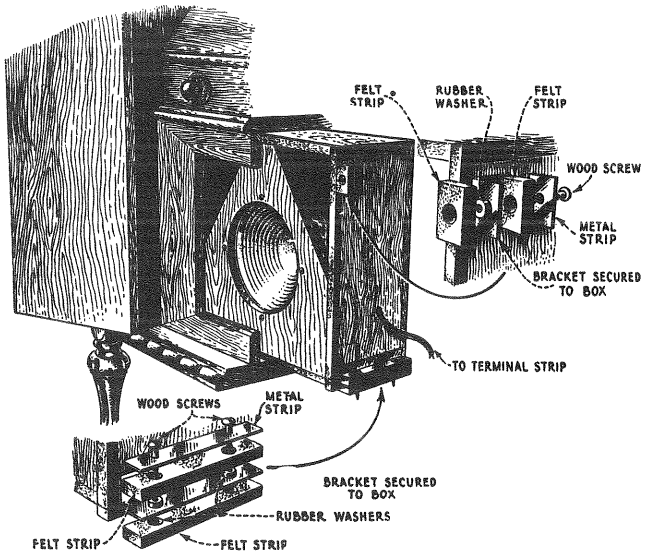


Figure 8A—Method of insulating reproducer unit from cabinet to prevent microphonic action

(11) HOWLING

Howling may be caused either by a microphonic Radiotron in the catacomb, or some part of the panel assembly touching the cabinet.

In the case of a microphonic Radiotron UX-199 in the catacomb, the sound waves from the reproducer set the Radiotron elements into vibration, which in turn, produces an amplified howl in the loudspeaker output. Conditions being favorable, the howl will increase in intensity. The remedy is to interchange the Radiotrons, remembering that Radiotrons 1, 3 and 6 are the most sensitive to microphonic conditions.

If interchanging the Radiotrons does not remedy the condition, an inspection must be made of the insulating supports of the panel assembly (Figure 8). The panel assembly rests on rubber strips. The bolts holding the frame are provided with large rubber washers. The panel assembly resting on the rubber strips should be free-floating within the cabinet. The front panels should be carefully examined to see that they do not touch either side of the cabinet or the apron hanging from the top of the cabinet. Any contact of the panel assembly or the loudspeaker assembly with the cabinet will be sufficient to

cause the Radiola to develop a howl. Figure 8A illustrates method of insulating the reproducer unit from cabinet to prevent microphonic action.

(12) RESISTANCE STRIP TESTS

The resistance of the strip mounted directly behind the catacomb can best be checked by a Resistance Bridge. If this is not available the voltmeter-ammeter method can be applied. A milliammeter with a scale of 0-500 should be used and a voltage applied that will give a substantial reading. A circuit diagram of this method is shown in Figure 9.

The resistance may then be calculated by the use of Ohm's law.

$$R = \frac{E}{I}$$ where R equals ohms, E equals volts and I equals amperes

$$\text{or ohms} = 1{,}000 \frac{\text{volts}}{\text{milliamperes}}$$

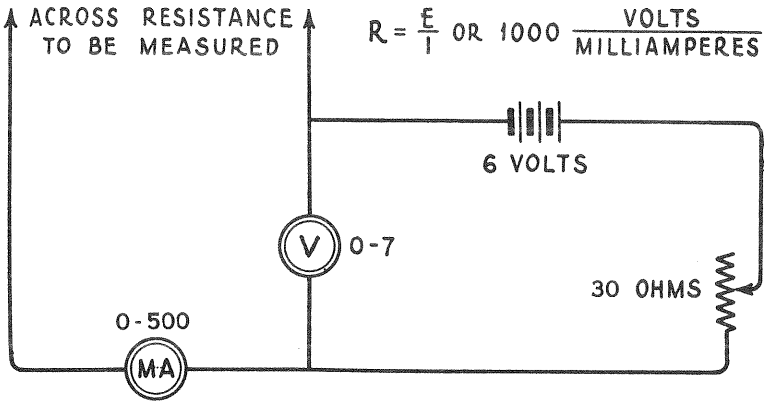


Figure 9—Schematic circuit diagram for resistance measurement

Since the current reading is taken in milliamperes (or $\frac{1}{1{,}000}$ ampere) it is necessary to multiply by 1,000 to get the resistance value in ohms.

The allowable values in ohms for the different sections of the resistance strips in Radiola 30A are tabulated below:

Terminals	*Lower Limit*	*Normal*	*Upper Limit*
1-2	260	271	282
2-3	Open	Open	Open
3-4	230	236.5	243
4-5	191	197	203
5-6	176	183.5	191
6-7	146	154.5	163
7-8	137	145.5	154
8-9	45	50	55

(13) CATACOMB AND PANEL CONTINUITY TEST

Both filament control and volume rheostats should be adjusted so that half the resistance is in the circuit, the antenna coupler connections removed and the power supply cable disconnected from the terminal strip at the rear of the catacomb.

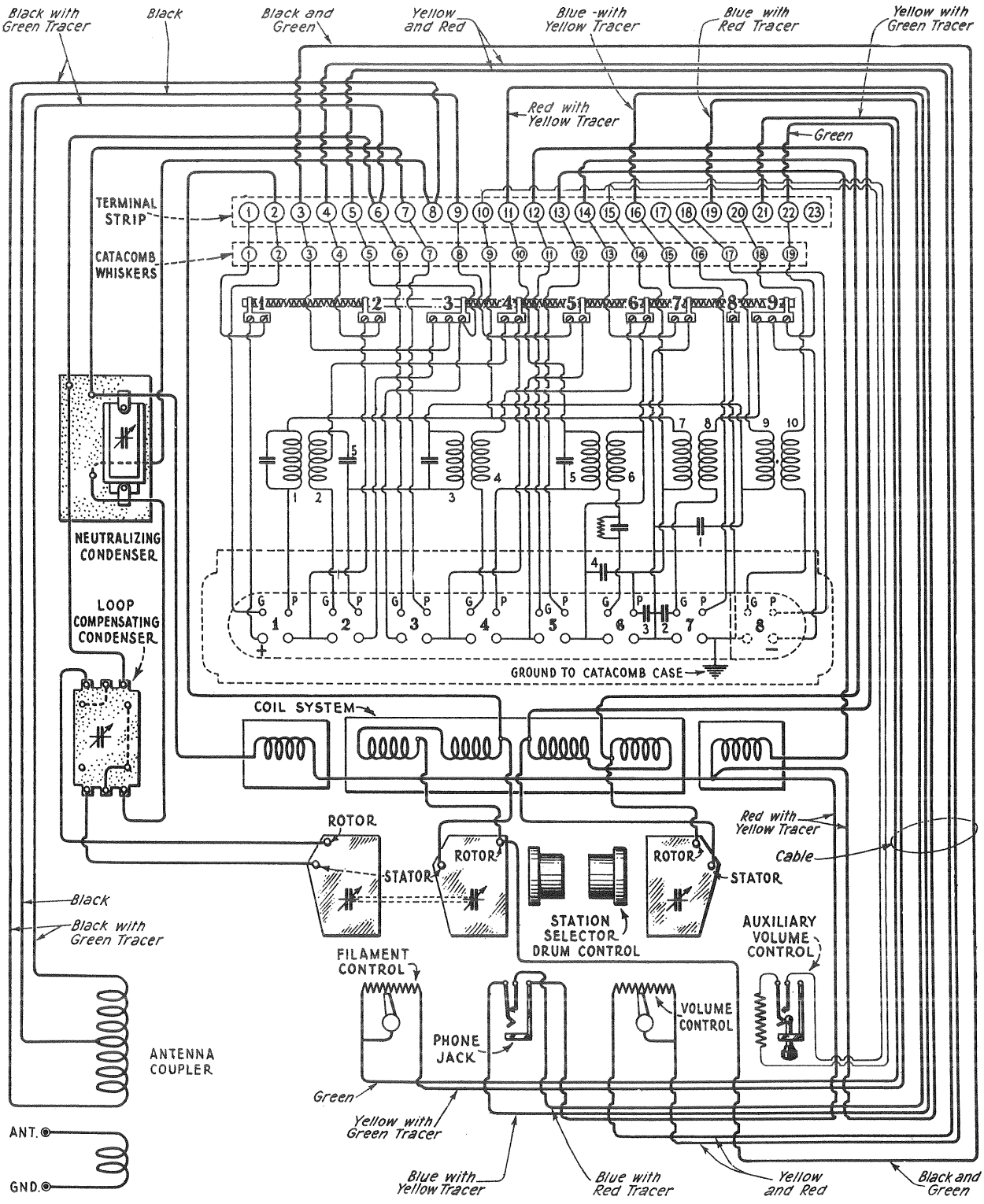


Figure 10—Panel and antenna coupler assembly continuity wiring diagram

A pair of headphones with at least 4½ volts in series, or a voltmeter with voltage sufficient to give full scale deflection when connected directly across the 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 on the catacomb terminal board indicated in the test table below, under the column marked "Terminal," and the results should be as indicated under the column marked "Correct Effect." 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 first column indicates the circuit under test.

The designation "P" and "G" refer to plate and grid contacts of the socket indicated by the number following. For example, G2 would indicate the grid contact of the second socket; P7 would indicate the plate contact of the seventh tube socket. The coil numbers referred to in the right-hand column will be found in Figure 10.

If the catacomb fails to pass any of the above tests it should be removed from the panel and replaced by a new one. Under no circumstances should the lead seals on the cover plate be broken. No marks of any kind should be made on the catacomb. To indicate the defect in the catacomb for future reference, attach tag to catacomb and note thereon observed defect.

The following tests will show complete continuity for both external and internal connections of the catacomb.

CATACOMB TESTS (Coils and Connections)

The Radiotrons, Cable and Antenna Coupler Connections Are to Be Removed

Terminals	*Correct Effect*	*Incorrect Effect Caused by:*
2 to G1	Closed	Open connection
6 to G3	Closed	Open connection
7 to P3	Closed	Open connection
9 to G2	Closed	Open ½ coil No. 2 or resistance strip
9 to G4	Closed	Open coil No. 4 or resistance strip
10 to P1	Closed	Open coil No. 1
10 to P6	Closed	Open coil No. 7
11 to P2	Closed	Open coil No. 3
11 to P4	Closed	Open coil No. 5
11 to Terminal No. 17	Closed	Open coil No. 9
12 to G5	Closed	Open connection
13 to P5	Closed	Open connection
16 to P7	Closed	Open connection
22 to G7	Closed	Open coil No. 8

PANEL TESTS

With Radiotrons, Cable, Antenna Coupler Connections and Resistance Strip Removed

Terminals	*Correct Effect*	*Incorrect Effect Caused by:*
3 to 2	Closed	Open R. F. coil
5 to 4	Closed	Open volume control
11 to 7	Closed	Open R. F. coil
13 to 11	Closed	Open oscillator coil
14 to 12	Closed	Open oscillator coil
16 to 11 (With shorted telephone plug in 1st stage jack)	Closed	Defective 1st stage jack
19 to 16 (With no telephone plug in 1st stage jack)	Closed	Defective 1st stage jack
22 to 21	Closed	Open filament control

PANEL TESTS (Condensers)

Antenna Coupler Disconnected

Terminals	*Correct Effect*	*Incorrect Effect Caused by:*
8 to 6	Open	Compensating Condenser or the main tuning condenser shorted
8 to 7	Open	Shorted neutralizing condenser

(14) VOLTAGE READINGS

The following are the voltages obtained at the catacomb terminal strip, when tests are taken across the terminals indicated in the table below. A high resistance voltmeter of at least 600 ohms resistance per volt should be used. The allowable variation plus or minus is approximately 5 volts.

VOLTAGE READINGS OF RADIOLA 30A

Taken at Catacomb Terminal Strip—Count Terminals from Left to Right When Facing Front of Radiola 30A

Terminals	*Correct Effect*
1 to 21	Should measure 31 volts, normally, with all Radiotrons lit and battery setting near "Off." Positive terminal of voltmeter on No. 1.
1 to 10	Should measure 21.5 volts, normally. Positive terminal of voltmeter to No. 10.
10 to 11	Should measure 41 volts, normally. Positive terminal of voltmeter to No. 11.

(15) AUXILIARY VOLUME CONTROL

On the front panel, several inches to the right of the volume control, is located a small switch. This is known as the auxiliary volume control and is used when howling occurs on powerful local stations.

This auxiliary volume control switch cuts on or off a 5,000-ohm resistance shunted across the primary of the first audio transformer. Normally, it should not be necessary to use it. In case of trouble with this switch it should be examined for dirt or other interfering substance which may prevent the blades from making contact. Also the resistance unit should be checked for a possible open.

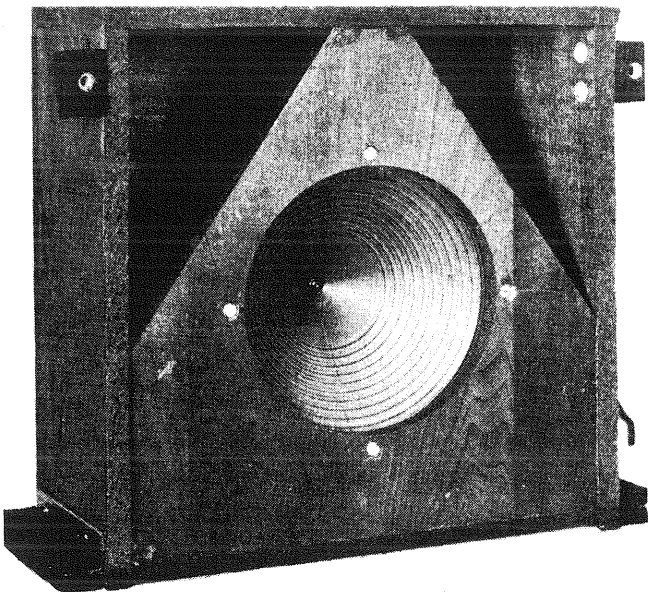


Figure 11—*Reproducer unit in housing*

PART II—REPRODUCER UNIT

The reproducer used in Radiola 30A is a standard RCA Loudspeaker, Model 100A, unit mounted in a special baffle housing (Figure 11). Excellent reproduction throughout the entire musical range is secured which, combined with its mechanical construction, makes an outstanding reproducing device for use with moderately powered receivers.

The simple and rugged design of the loudspeaker makes it practically trouble-proof and permits easy and simple adjustment or replacement when necessary.

The service problems of the loudspeaker deals with conditions evidenced by weak reproduction, no reproduction, distortion and rattle. These conditions and their attending causes are explained in the following text, and remedies noted so that service men may be provided with helpful information in any service work that is required.

To examine the reproducer unit it is first necessary to remove it from the cabinet (Figures 22 and 23). For removal procedure see Part IV, Section 3.

(1) IMPERFECT REPRODUCTION

Before inspecting the loudspeaker for imperfect reproduction, check the receiver output with another loudspeaker, preferably RCA Loudspeaker, Model 100A, and note any distortion that may be the cause of the imperfect reproduction experienced. This external speaker is connected across terminals 4 and 5 of the R.P.A. unit after disconnecting the leads already connected to them.

If the test indicates that the output from the receiver and power amplifier is of good quality, the loudspeaker in Radiola 30A should be examined in order to determine the cause of the imperfect reproduction obtained.

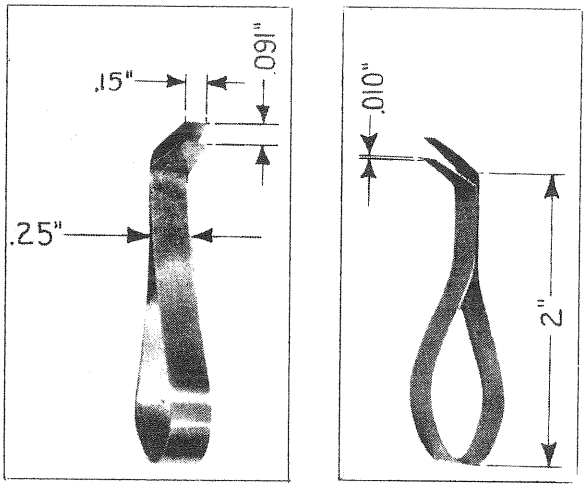


Figure 12—General appearance and correct dimensions of armature spacing tools

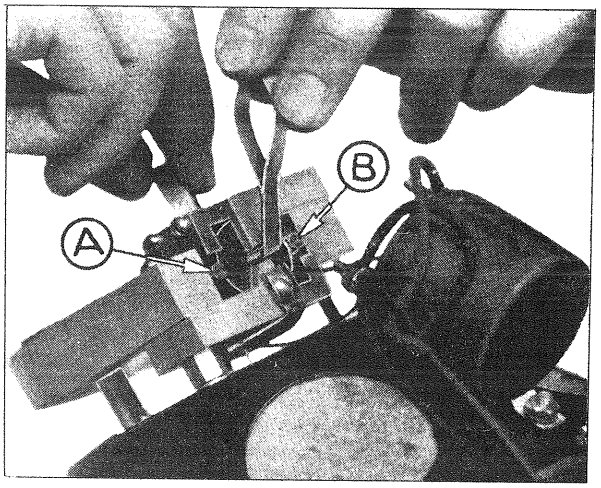


Figure 13—Armature bracket adjusting screws A and B

(2) FOREIGN MATERIAL INTERFERING WITH ARMATURE ACTION

An inspection of the armature will generally disclose any foreign matter interfering with the armature action resulting in poor reproduction. A small piece of heavy paper or a piece of copper or brass not over .010 in. thick may be used between the armature and pole piece to remove dirt, dust or other interfering substance. The spacer tool, described in Part II, Section 3, may also be used for this purpose.

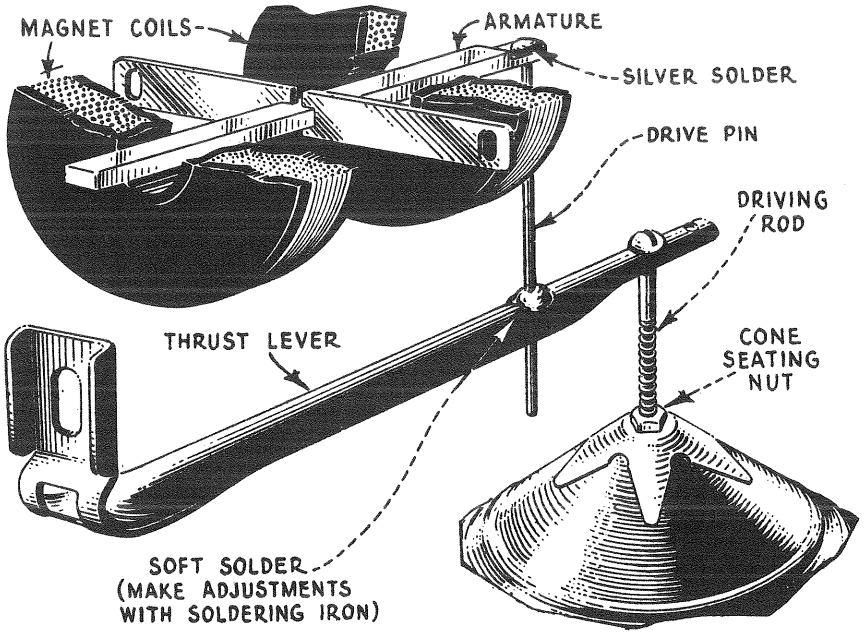
(3) ARMATURE STRIKING POLE PIECES

Distortion and rattle may be caused by the armature striking either or both of the pole pieces. This is generally determined by inspection, though in some cases the contact may be so slight it may be necessary to adjust the armature to check on this condition. In any case, an adjustment of the armature is necessary.

To adjust the armature a set of spacer tools are necessary. Figure 12 illustrates the general appearance and correct dimensions of these spacer tools. The stock—obtainable on the open market—should be phosphorous bronze strip .010 in. thick and .25 in. wide. It is bent as illustrated to a .15 in. width at the extremities.

Two of these tools are necessary when adjusting the armature. Place one tool in the space between the armature and pole piece of the motor mechanism at the end next

to the filter unit. This is shown in Figure 13. The other tool is placed at the other end of the armature, a little to one side, in order to clear the drive pin located at this end of the armature. By loosening screws A and B, Figure 13, any tension in either direction that may have been on the armature is released and the spacer tools will provide the correct clearance or spacing. Now while the spacer tools are in place a hot soldering iron is applied to the drive pin thrust lever connection, Figure 14, and the solder heated sufficiently to allow the drive pin to find its normal position with regard to the thrust lever. The iron is now removed. Screws A and B, Figure 13, are tightened and the spacer tools removed. The armature is now correctly aligned and balanced so that no abnormal strain is being imposed upon it in any direction.



principle of the reproducer unit

Figure 14—Diagram showing constructional details and operating

(4) CONE NOT PROPERLY ADJUSTED

In some cases a cone may become improperly aligned or adjusted, causing a strain to be placed on the driving rod, due to the cone not centering or seating properly. Poor reproduction is the result, and inspection of the armature drive pin may indicate a slight torque or twist. This is most likely to occur when replacing a cone. The new cone should be carefully seated by placing the cone over the driving rod and adjusting the cone seating nut, located on driving rod next to thrust lever (See Figure 14). Then attach cone locknut and washer lightly on inside of cone before fastening the edge of cone. The holes on the edge of the cone can now be lined up with those of the metal frame and the outside ring lightly attached with screws and nuts. The cone locknut is then tightened and sealed in place with ordinary sealing wax, so that the vibration of the cone will not cause it to loosen. This nut can best be tightened by means of a small socket wrench made to fit a 3/16 in. hex. nut (Stevens' "Spintite" No. 3 can be used). The six screws at the outside edge are then seated properly. In doing this, take up on each screw a little at a time, causing a gradual seating of the screws.

(5) LOOSE THRUST LEVER, NUTS AND SCREWS

Rattle and noisy reception are sometimes caused by a loose thrust lever. To correct this condition tighten the thrust lever mounting screw (Figure 15). Sometimes when this is done a readjustment of the armature, as described in Part IV, may be necessary. Any loose screw or nut in the motor mechanism may cause an audible rattle while the speaker is in operation. If any trouble is experienced along this line, all the screws and nuts in the motor mechanism should be gone over and loose ones tightened.

(6) FILTER UNIT AND MAGNET COIL TESTS

A defective filter unit or a filter unit not properly connected in the circuit will cause distortion. Defective magnet coils will also cause imperfect reproduction. The circuit

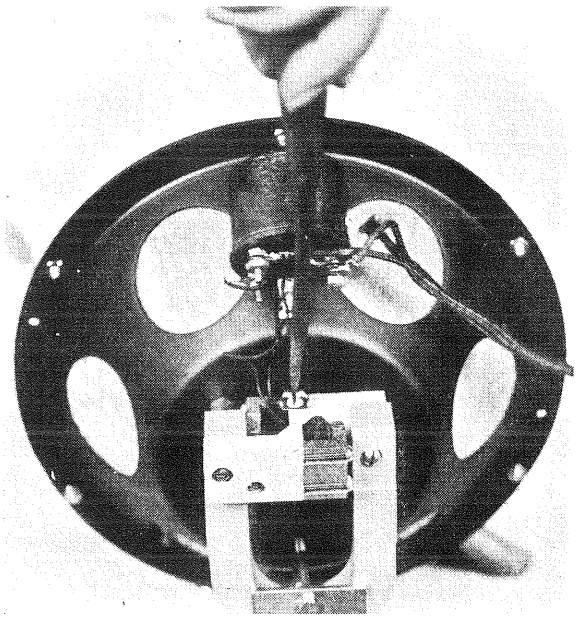


Figure 15—Adjusting the thrust lever screw

and correct connections are shown in Figure 16. The reference letters in the circuit diagram refer to the filter terminals shown in the small halftone illustration (Figure 16). These should correspond electrically, otherwise distorted or no reception will result. A click test will indicate an electrical defect, either in the coils or filter unit.

A pair of headphones and a 4½-volt battery connected together in series, or a voltmeter and sufficient battery to give a full scale deflection should be used.

FILTER UNIT CONTINUITY TEST (See Figure 16)

Disconnect Magnet Coils and Loudspeaker Cord

Test	*Correct Effect*	*Incorrect Effect Caused by:*
L to M	Closed	Open filter coil
L to N	Open	Shorted filter condenser
M to N	Open	Shorted filter condenser

CONTINUITY TEST FOR MAGNET COILS AND LOUDSPEAKER CORD (See Figure 16)

Connect Magnet Coils and Loudspeaker Cord

Magnet coils may be tested as indicated below. A click test from one lead to the other while they are completely disconnected from the rest of the circuit is also a simple and effective method of testing.

Test	*Correct Effect*	*Incorrect Effect caused by:*
One cord terminal to L or N	Closed	Open cord
Other cord terminal to L or N	Closed	Open cord
M to N	Closed	Open magnet coils or coil leads

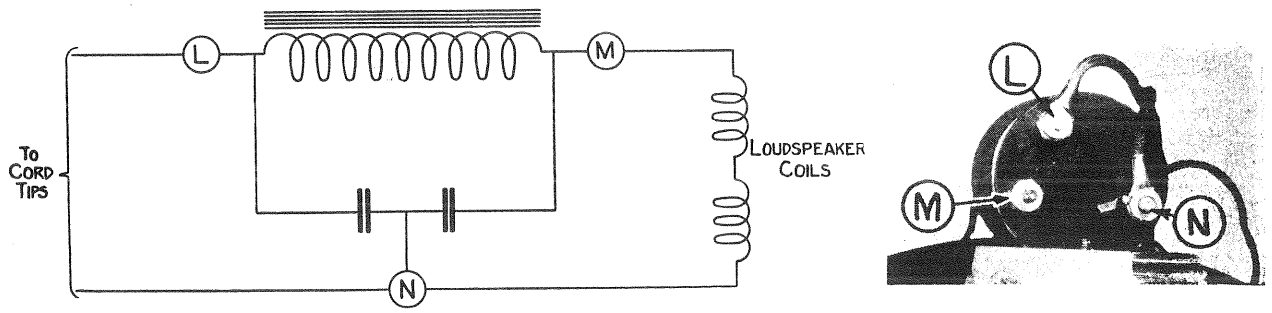


Figure 16—*Schematic circuit diagram of RCA Loudspeaker Model* 100A *and photo of the filter unit*

PART III—RECTIFIER-POWER-AMPLIFIER UNIT

The rectifier-power-amplifier unit (Figure 17), incorporated in Radiola 30A uses two Radiotrons UX-281 in a full wave rectifying circuit and one Radiotron UX-171 as a power amplifier.

The use of two Radiotrons UX-281 in a full wave rectifying circuit provides an output of rectified current in excess of the maximum requirements for this Radiola. Being operated at less than half their maximum output, excellent life and operating characteristics are obtained from these Radiotrons.

Radiotron UX-171, used as a power amplifier, provides all amplification necessary for use with Loudspeaker Model 100-A. Its maximum undistorted output gives sufficient volume for all requirements.

Radiotron UV-876, known as the "Ballast Tube," is connected in the primary circuit of the power transformer. The resistance of its filament rises and falls rapidly with an increase or decrease of current flowing through it, thus maintaining a substantially constant input current. Radiotron UV-876 is used when the frequency of the house lighting current is between 50 and 60 cycles.

A ventilating stack is provided to enclose this Radiotron, and Radiola 30A should not be operated unless it is in place.

(1) FILAMENT ACTION OF R.P.A. RADIOTRONS

Should Radiola 30A suddenly cease to operate satisfactorily, open the rear door and note whether or not the Radiotrons in the R.P.A. unit are lit. The filaments of Radiotrons UX-281 glow very dimly, and Radiotron UX-171 slightly brighter. Radiotron UV-876 glows very slightly or not at all, and its operating condition must be ascertained by its normal heat dissipation.

Should all Radiotrons fail to light or operate as indicated, look for:

(a) House current disconnected, or loose connection at outlet.
(b) Blown fuse in house lighting circuit.
(c) Operating switch not functioning properly.
(d) Input plug not making proper contact.
(e) Burned out filament in ballast tube.
(f) Poor contact in ballast tube socket.

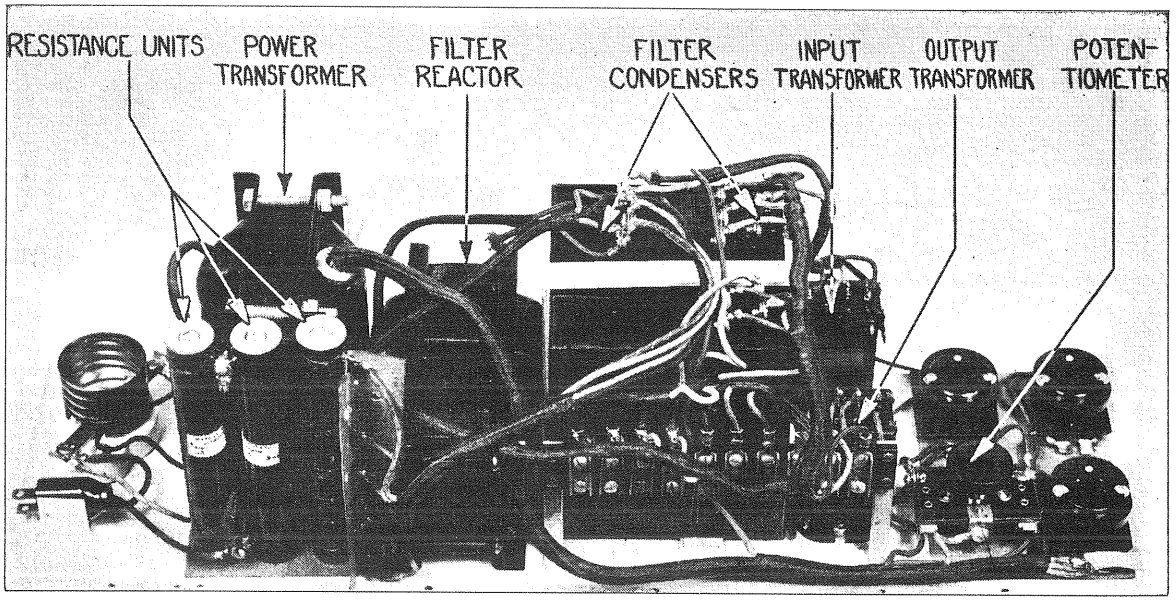


Figure 17—View of R.P.A. unit with cover removed

(g) House lighting current not A.C. (manifest by filament or Ballast tube lighting a bright red).

If the Ballast tube glows excessively and the other Radiotrons light below normal brilliancy trouble may be due to an open in one filament of Radiotron UV-876. (This Radiotron has two parallel filaments.)

(2) IF RADIOTRONS IN R.P.A. UNIT FUNCTION PROPERLY. BUT RADIOTRONS UX-199 DO NOT LIGHT

If the R.P.A. Radiotrons function properly, and the UX-199 Radiotrons located in catacomb dō not light, any of the following causes may account for the trouble.

(a) Defective condenser in R.P.A. unit.
(b) Open connections in R. P. A. unit.

In both (a) and (b) the continuity test should be used to isolate the defect.

(c) Defective catacomb. (Run catacomb continuity test.)

(d) Defective connections at R.P.A. terminal board.

(e) Defective resistance strip on back of catacomb. (Use resistance strip test.)

(3) NO SIGNAL WHEN ALL RADIOTRONS ARE APPARENTLY O.K.

After the receiver has been checked according to previous continuities and all Radiotrons appear to be functioning correctly, if no signal is heard look for:

(a) Loose connections at loudspeaker.

(b) Open in coils of loudspeaker. (Try external speaker.)

(c) Filament to grid short in Radiotron UX-171.

(d) Filament to plate short in Radiotron UX-281.

(e) Dirty contacts in any Radiotron socket.

(4) IF ALL RADIOTRONS LIGHT EXCESSIVELY BRIGHT

Should all Radiotrons both in the panel assembly and R.P.A. unit light excessively bright it would be an indication that one or both resistance units R1 or R2 are open. When this occurs, it is important to immediately shut off the Radiola until the defective resistance unit is replaced, to prevent damaging the Radiotrons due to excessive filament voltage.

(5) IF VOLUME DROPS AFTER RADIOLA HAS BEEN IN OPERATION FOR SEVERAL MINUTES

This may be caused either by a Radiotron UV-876 or Radiotron UX-171. There will be a slight drop in signal strength when starting the Radiola, due to the heating of Radiotron UV-876 to its normal condition. Should there be an abnormal drop substitute a new Radiotron UV-876 or Radiotron UX-171 for those in use. This will generally indicate the cause of the trouble.

(6) EXCESSIVE HUM

Excessive hum in the reproducer unit may be due to any of the following causes.

(a) Potentiometer not properly adjusted.

(b) A.C. plug reversed.

(c) Defective condenser in R.P.A. unit.

(d) Loose laminations in power transformer or filter choke. Tighten all clamping screws in R.P.A. unit.

(7) IF PLATES OF RADIOTRONS UX-171 AND UX-281 HEAT EXCESSIVELY

Plates of Radiotron UX-171 hot. Check the following:

(a) Defective (open) resistor unit R1.

Plates of Radiotron UX-281 hot. Check the following:

(a) Shorted 12 Mfd. filter condenser.

(b) Defective transformer.

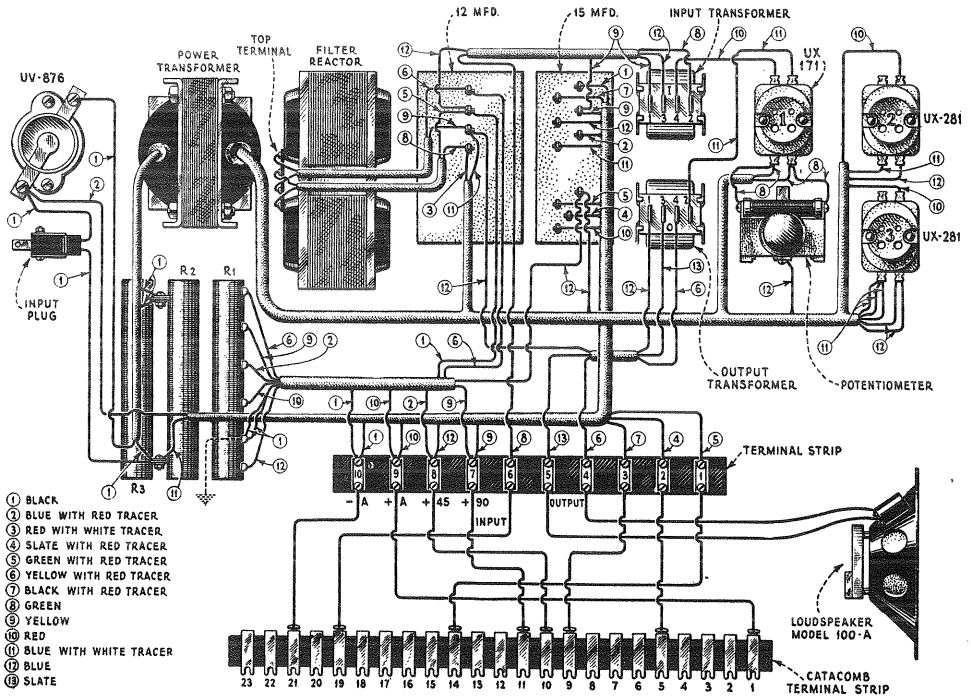


Figure 18—*Pictorial view of R.P.A. unit and color scheme of R.P.A. cables*

Should one Radiotron UX-281 become slightly red and the other Radiotron UX-281 be apparently normal, replace the Radiotron that is apparently O.K. This Radiotron is defective, causing the other to heat from overload.

(8) CHANGES OF SIGNAL STRENGTH WHILE RADIOLA 30A IS IN OPERATION

Should Radiola 30A change in intensity of signal strength, either greater or lower, while in operation, resistance unit R1 should be examined. The connections to this tapped resistor may have become corroded or dirty, causing a changing value of the resistance in the circuit which would cause a corresponding change in signal strength. The remedy is to heat all the connections to this resistor until a new joint is formed by the solder.

(9) COMPLETE R.P.A. CONTINUITY TEST

The continuity test covers all circuits of the Radiola 30A R.P.A. unit and the terminal numbers contained therein refer to those of Figure 19. Before running this test remove all connections from the terminal board at the rear of the R.P.A. unit (Figure 18), and also the input plug and the Radiotrons.

The testing equipment consists of a high resistance type voltmeter with battery voltage sufficient to give approximately full scale deflection when connected directly across battery terminals—for example, a 45-volt "B" battery unit connected in series with a voltmeter having a zero to 50-volt scale. The contact points of the testing equipment should be well insulated from their handles, and care should be taken not to touch any metallic part of the R.P.A. unit. Discharge the filter condensers by short-circuiting their terminals with a screwdriver before starting test.

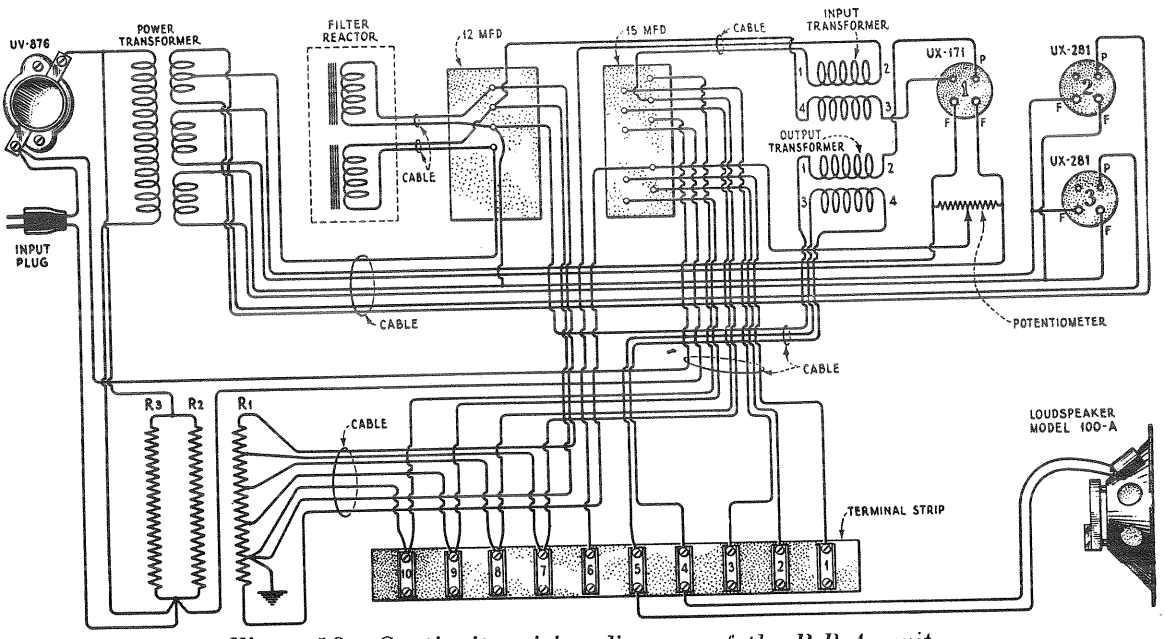


Figure 19—*Continuity wiring diagram of the R.P.A. unit*

R.P.A. CONTINUITY TEST

(Remove All Connections from Terminal Strip)

Terminals	*Correct Effect*	*Incorrect Effect Caused by*
1 to 2	Open	Shorted 1 mfd condenser
3 to 7	Open	Shorted 1 mfd condenser
4 to 5	Closed	Open secondary of output transformer
6 to 7	Closed	Open primary of input transformer
7 to 10	Closed	Open resistance unit R1
10 to 3	Open	Open 1 mfd condenser
10 to both sides of input plug	Open	Open 1 mfd condenser
10 to 1	Open	Shorted 1 mfd condenser
10 to 2	Open	Shorted 1 mfd condenser
G1 to ground	Closed	Open secondary input transformer
P1 to either F2	Closed	Open primary of output transformer
P2 to P3	Closed	Open high voltage winding of power transformer
Across filament contacts of socket No. 1	Closed	Open UX-171 filament winding of power transformer and potentiometer
Across filament contacts of sockets No. 2 or No. 3	Closed	Open UX-281 filament winding of power transformer
Shell of UV-876 socket to one side of input plug (determined by experiment)	Closed	Open primary of power transformer and resistance units R2 and R3
Ground to P2 or P3	Closed	Open filter reactor or ½ high voltage secondary of power transformer
Either filament contact of socket 2 or 3 to terminal 7	Closed	Open UX-281 filament winding, filter reactor and resistance unit R1

(10) CONDENSER TESTS

The filter condensers in Radiola 30A are best tested by means of a D. C. voltage used to charge these condensers and then noting their ability to hold the charge. The correct manner to do this is to disconnect the condensers from any other part of the circuit and then charge each condenser individually and discharge it by means of a well-insulated screwdriver. These condensers should be charged with approximately 200 volts D. C., obtainable from a set of "B" batteries or a "B" eliminator. Figure 20 shows the connections of the filter condensers inside of the metal containers.

Any condenser not holding its charge is defective, and the entire assembly must be replaced. This is accomplished by releasing all leads, removing the strap that holds the two condenser blocks together, and replacing the block that contains the defective condenser. Figure 18 shows the correct connections to be used when replacing the defective assembly.

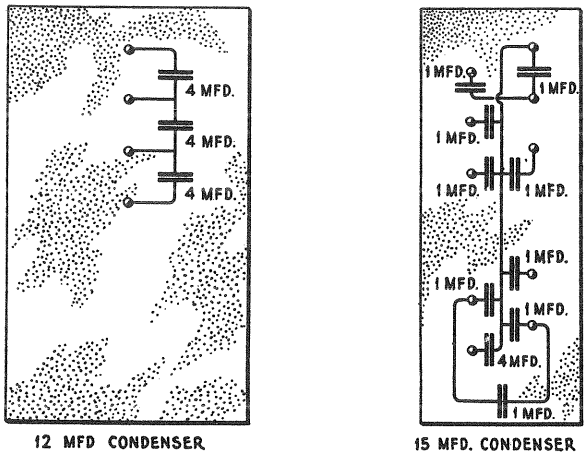


Figure 20—Internal connections of filter condensers

PART IV—MÁKING REPLACEMENTS

(1) REPLACING DEFECTIVE PARTS IN PANEL ASSEMBLY

The panel assembly of Radiola 30A is held in place by means of four bolts, these bolts being locked by a wire connecting all the bolts together. A step by step procedure for removing the panel assembly follows:

(a) Place Radiola 30A in position so that the rear door can be opened wide.

(b) Remove antenna coupler connections and power cable terminal strip from rear terminal strip of panel assembly.

(c) Cut and remove the wire connecting the heads of the four bolts holding the panel assembly to the cabinet.

(d) Remove four bolts holding panel assembly to cabinet. When removing these bolts the rubber washers should be taken off with each bolt.

(e) The panel assembly may now be lifted clear of its compartment and removed to a place convenient for making repairs or replacements.

Any defective unit may be readily replaced, wiring of all units being very accessible. When removing a unit it is good practice to first tag all wires disconnected, so that when

the unit is replaced the wires may be easily connected to their original terminals. The color scheme of the panel assembly may be referred to in Figure 10.

After the repair or replacement is completed, the panel assembly should be returned to the cabinet in the reverse of the foregoing order. A piece of bare copper or brass wire, about No. 18 B. & S., should be used to lock the bolts. Special care should be taken to see that the rubber supports and rubber washers are returned to their original location. The panel should also clear the front apron and each side of the cabinet. This is very important, for unless the entire panel assembly is full-floating within the cabinet and resting upon its rubber supports, serious microphonic trouble may result.

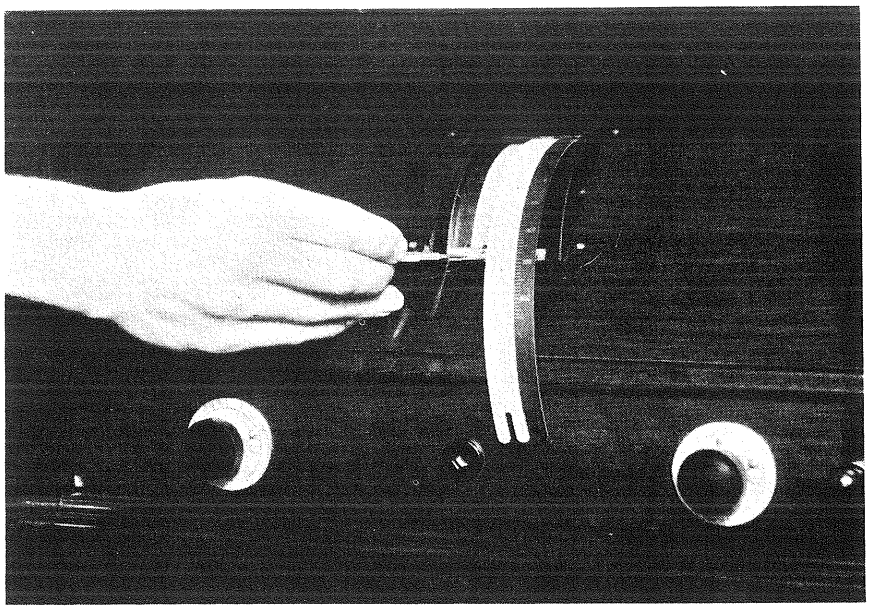


Figure 21—Replacing tuning drum dials

(2) REPLACING DIAL SCALES

The dial scales on Radiola 30A are of the renewable type, and frequently it is desirable to replace them with clean scales. This operation is very simple, and takes but a few minutes (Figure 21). A step by step procedure is as follows:

(a) Open front doors and remove escutcheon plate from control drums.

(b) Turn drums to either extreme and loosen the four screws that hold the scales. Merely loosen these screws and do not remove them. The ends of the scales may now be pulled clear of the clamping plate.

(c) Now turn tuning drums to other extreme and loosen the four screws that hold the scales in place at this end. The dial scales may now be completely removed.

(d) Place the new scales in the position occupied by the old ones, line up the scales and tighten the clamping plates.

(e) Replace the escutcheon plate.

(3) PROCEDURE TO REMOVE REPRODUCER UNIT FROM CABINET

The following procedure should be used when removing reproducer unit from the cabinet:

(a) Remove screen assembly from bottom of cabinet by removing its six retaining screws. This screen is located directly under the loudspeaker and covers the hole through which it must be removed.

(b) Remove front grille.

(c) Remove the four small nails that lock the four screws holding the assembly in place.

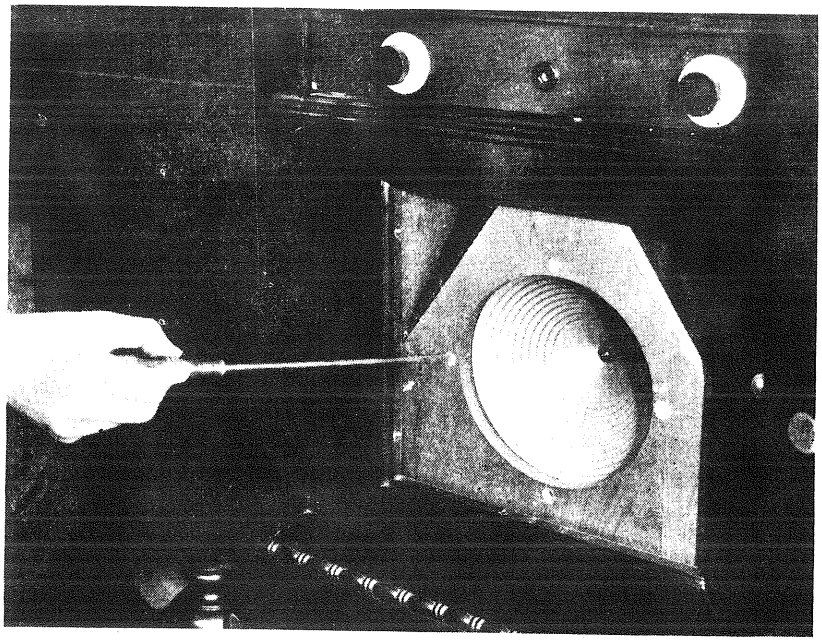


Figure 22—Releasing reproducer from housing

(d) Remove the four screws holding the speaker unit to the baffleboard (Figure 22). Before the last screw is released the speaker unit should be held from the opening at the bottom of the cabinet, so that it will not fall through.

(e) The loudspeaker unit may now be removed through the bottom of the cabinet (Figure 23). The cord should be released from its terminal posts on the filter unit and the speaker removed to a convenient place for inspection and repair.

(4) MAKING REPLACEMENTS ON RCA LOUDSPEAKER 100A

The necessary procedure for making replacement in the RCA 100A Loudspeaker unit used in Radiola 30A is fully covered in "RCA Loudspeaker 100A Service Notes." A reference to this booklet when making any replacement will be found helpful.

(5) REPLACING DEFECTIVE PARTS IN R.P.A. ASSEMBLY

In order to make any replacement in the R.P.A. unit it will be necessary to remove the unit from the cabinet and then remove its metal covers. A step by step procedure is as follows:

(a) Place Radiola 30A in a position so that its rear door can be opened wide.

(b) Cut and remove the lock wire connecting the heads of the four bolts holding the R.P.A. assembly to the cabinet. Now remove these bolts.

(c) Remove the input plug located on the left side, when facing the R.P.A. unit from the rear. Also remove the cover from the terminal strip and disconnect all the terminals from the terminal strip.

(d) The entire R.P.A. assembly may now be removed and placed in a position convenient for inspection and repair.

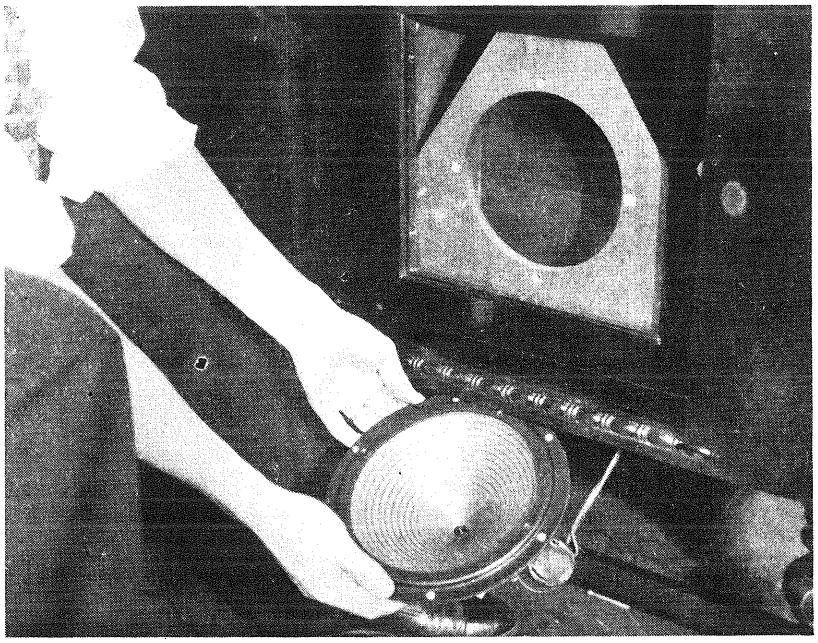


Figure 23—Removing the reproducer from the cabinet

(e) Remove the small screws and break the seals that are located around the edge of the covers. The three sections of the cover may now be removed.

Any repair or replacement may easily be made, using the color scheme of connections contained in Figure 18, which covers all parts with the exception of the power transformer. Figure 24 illustrates the color scheme of the power transformer connections.

When the repair or replacement is effected, the three cover sections should be replaced and substitute seals placed in the position of those broken. These seals will enable the dealer, at a future date, to tell whether service work is caused by ordinary wear and tear or by tampering.

The entire assembly may now be returned to the cabinet, the cable replaced, the input plug returned to its position and the bolts locked in position with a piece of No. 18 B. & S. brass or copper bare wire.

(6) REPLACING THE POWER TRANSFORMER IN R.P.A. UNIT

In replacing a power transformer the following procedure should be used:

(a) Remove R.P.A. unit from cabinet and release cover from R.P.A. unit as described in Part IV, Section 5.

(b) Cut the secondary cable about 3 inches from transformer housing.

(c) Push back the outer braid of the cable about 1 inch. Skin the ends of the seven wires, clean and tin.

(d) Disconnect the primary cable from the resistance units and the UV-876 socket.

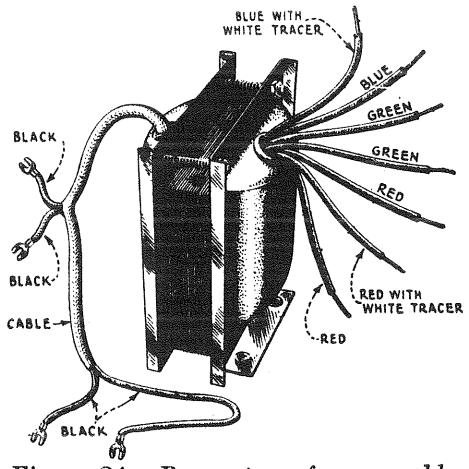


Figure 24—Power transformer cable connections, showing color scheme

(e) Release the screws holding the power transformer to the metal base of the R.P.A. unit and remove the power transformer.

(f) The new transformer is supplied with the primary cable complete and secondary leads having the same color scheme as in the secondary cable (Figure 24). Match up the secondary leads with the cable, and solder connections. Tape joints neatly, using only enough tape to properly insulate.

(g) Slip cable braid back toward connections. This work, if properly done, will present a neat appearance.

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	House current not "On"	Turn house current "On," PIII-S1
	Defective operating switch	Repair or replace operating switch, PIII-S1
	Defective input plug to R.P.A. unit	Repair or replace input plug, PIII-S1
	Defective panel assembly	Check by continuity and repair or replace, PI-S13
	Defective R.P.A. unit	Check by continuity and repair or replace, PIII-S9
	Defective reproducer unit	Check and repair Reproducer unit, PII-S6
Weak Signals	Defective antenna coil or antenna coil connections	Repair or replace antenna coupler or connections, PI-S2
	Radiola in shielded locality	Use short outdoor antenna, PI-S2
	Main tuning condensers out of alignment, or compensating condenser not adjusted	Line up main tuning condensers and adjust compensating condenser, PI-S9
	Defective R.P.A. assembly	Check R.P.A. continuity and repair or replace defect, PIII-S8
	Defective panel assembly	Check panel continuity and repair or replace defect, PI-S13
Poor Quality	Defective catacomb	Check catacomb continuity and replace if defective, PI-S13
	Defective condensers in R.P.A. unit	Check and replace, PIII-S9
	Improperly adjusted Reproducer	Adjust Reproducer unit correctly, PII-S3
Noisy or Intermittent Reception	Dirty Radiotron prongs	Clean Radiotron prongs, PI-S4
	Loose filament or volume control rheostat	Tighten filament or volume control arm and clean contact point, PI-S5
	Sprung socket contacts	Bend socket contacts, PI-S3
	Defective or loose antenna connections	Repair or tighten antenna connections, PI-S2
	Defective resistor connections	Repair connections, PIII-S8
Howling	Microphonic Radiotrons UX-199	Interchange Radiotrons UX-199, PI-S11
	Panel assembly not positioned properly	Position panel correctly, PI-S11
	Reproducer assembly not properly insulated from cabinet	See that reproducer assembly is properly insulated from cabinet, PI-S11
	Open resistor on auxiliary volume control	Replace resistor found defective, PI-S15
All Radiotrons fail to light	Operating switch not "On"	Pull operating switch "On," PIII-S1
	Defective operating switch	Repair or replace, PIII-S1
	Defective R.P.A. unit	Check R.P.A. unit and make repair or replacement, PIII-S9
Radiotrons UX-199 fail to light	Defective R.P.A. unit	Check R.P.A. unit, and make repair or replacement, PIII-S9
	Defective cables	Check and repair or replace
	Defective catacomb	Test and replace, PI-S13

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