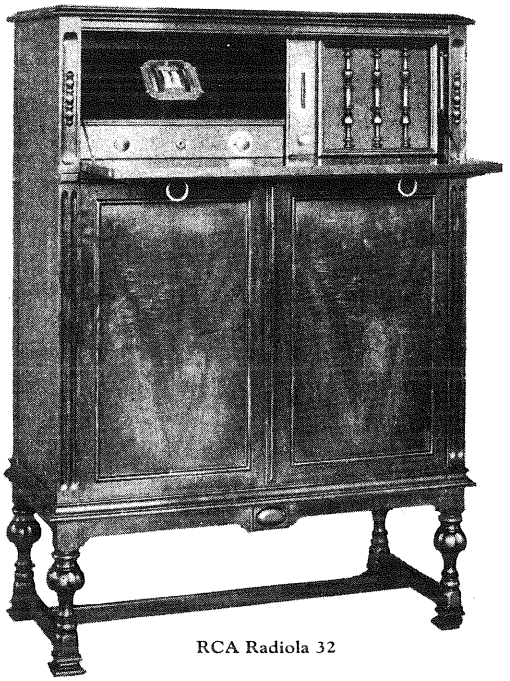
RCA
Radiola 32

SERVICE NOTES



RCA Radiola 32

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R32—1

Radio Corporation of America

SERVICE DIVISION OF THE PRODUCTION AND SERVICE DEPARTMENT

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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 at point of contact and therefore Dealers and Distributors who are properly equipped with a knowledge of the design and operation of Radiolas occupy a favorable position to contract for this work.

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

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

In addition to supplying the Service Notes the RCA, through its Service Stations, has available to Dealer and Distributor the services of engineers who are qualified to render valuable help in solving service problems.

CONTENTS

PART I—PANEL ASSEMBLY AND LOOP

PART II—R. P. A. ASSEMBLY AND REPRODUCER UNIT

PART III—MAKING REPLACEMENTS

ILLUSTRATIONS

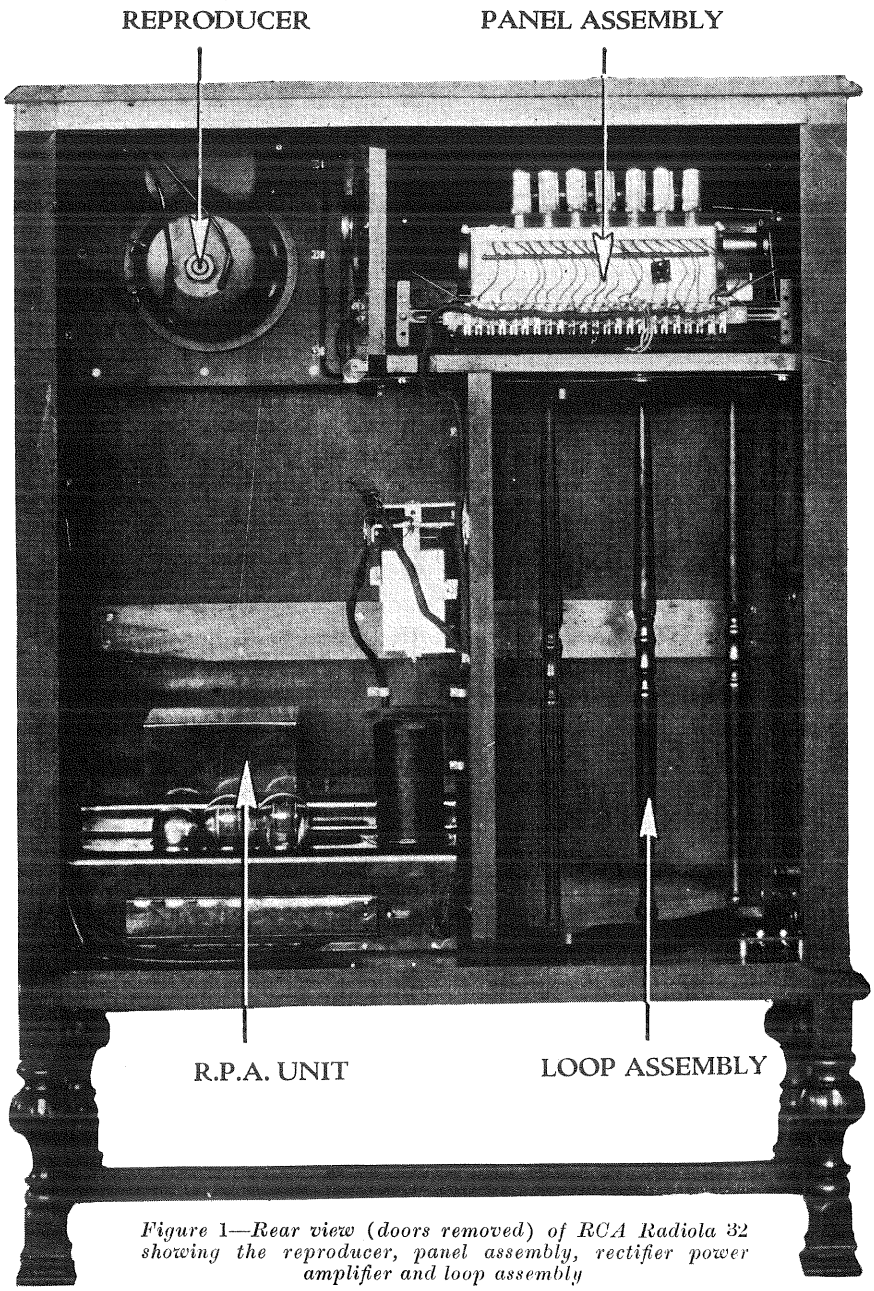

Figure 1—Rear view (doors removed) of RCA Radiola 32 showing the reproducer, panel assembly, rectifier power amplifier and loop assembly

RCA RADIOLA 32

SERVICE NOTES

Prepared By

RCA SERVICE DIVISION

R32-1

INTRODUCTION

RCA Radiola 32 is a complete, self contained socket power radio broadcast receiver of the super-heterodyne type. Essentially it consists of the well known RCA Radiola 28 and RCA Loudspeaker Model 104 combined in a de luxe cabinet with all the refinements necessary to ensure the utmost in sensitivity and selectivity together with tone quality of the reproduced signal. (See Figure 1.)

Many service problems common to receivers of this type have been eliminated in the inherent design of the Radiola.

The service notes are divided into three parts, namely, Part I, Panel Assembly and Loop; Part II, R.P.A. Assembly and Reproducer Unit; and Part III, Making Replacements.

PART I—PANEL ASSEMBLY AND LOOP

(1) RADIOTRON SEQUENCE

Radiola 32 is designed to operate with seven UX-199 Radiotrons in the receiver assembly. 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.

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

From Radiotron No. 4 the signal is fed into No. 6, which is the second detector. The audio frequency current is then fed through Radiotron No. 7 and into Radiotron

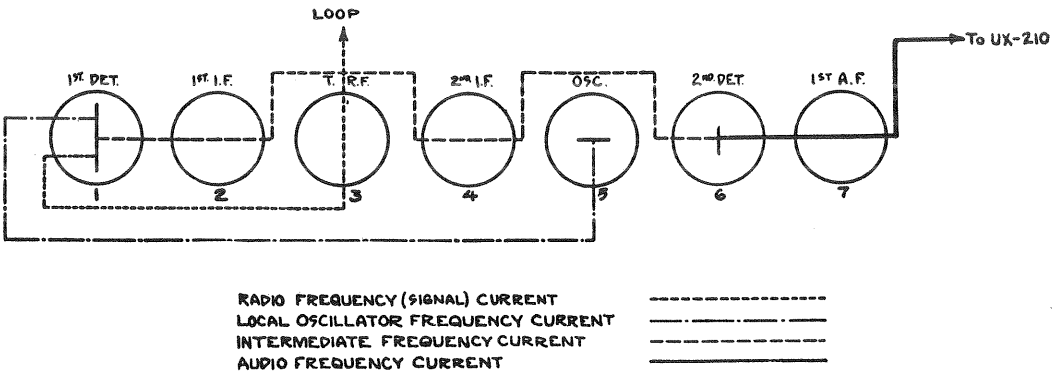

Figure 2—Radiotron sequence and path of the different currents

UX-210 of the R.P.A. unit. Figure 2 illustrates the Radiotron sequence and the path of the different currents through them.

(2) RADIOTRON SOCKETS

In placing Radiotrons in their respective sockets care should be exercised to make certain that the two large pins 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, 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 a Radiotron into its socket. The design is such that they should fit in snugly without force. It might be possible by exerting considerable pressure, to force the prongs into the wrong holes, resulting in a filament burn-out.

(3) RADIOTRON PRONGS

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

(4) LOOSE RHEOSTAT CONTACTS

To get at the rheostat contacts the panel must be released and pulled out of the rear of the cabinet. This is done by removing the four bolts that hold the panel in position. First, however, the wire which is threaded through each bolt must be removed by unsoldering it at its splice. With the bolts removed, the cable connected to the terminal strip at the rear must be disconnected and dropped so as not to interfere with the removal of the panel. The panel may then be removed and the rheostats examined. (See Figure 3.)

The square head set screw holding the contact arm to the shaft may now be loosened 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. Tighten set screw and slip panel assembly back into cabinet. When doing this it is very important to see that the panel is supported on the rubber strips it formerly rested upon and that it 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 does touch, serious microphonic trouble will result. After ascertaining that the panel is in its proper position the four bolts, washers and locking wire should be returned to their original positions.

(5) DRUMS FAILING TO HOLD POSITION

When adjustment is necessary due to the tuning drums slipping their position, the following procedure should be used:

(a) Remove panel from cabinet and re-adjust tension screw on the inside of the drum. This screw controls the pressure of the friction shoe against the shaft of the opposite condenser. If one drum turns too hard when the other is held, the tension screw may be slightly loosened.

(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 ones.

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

The adjustment of control drums in this condition 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

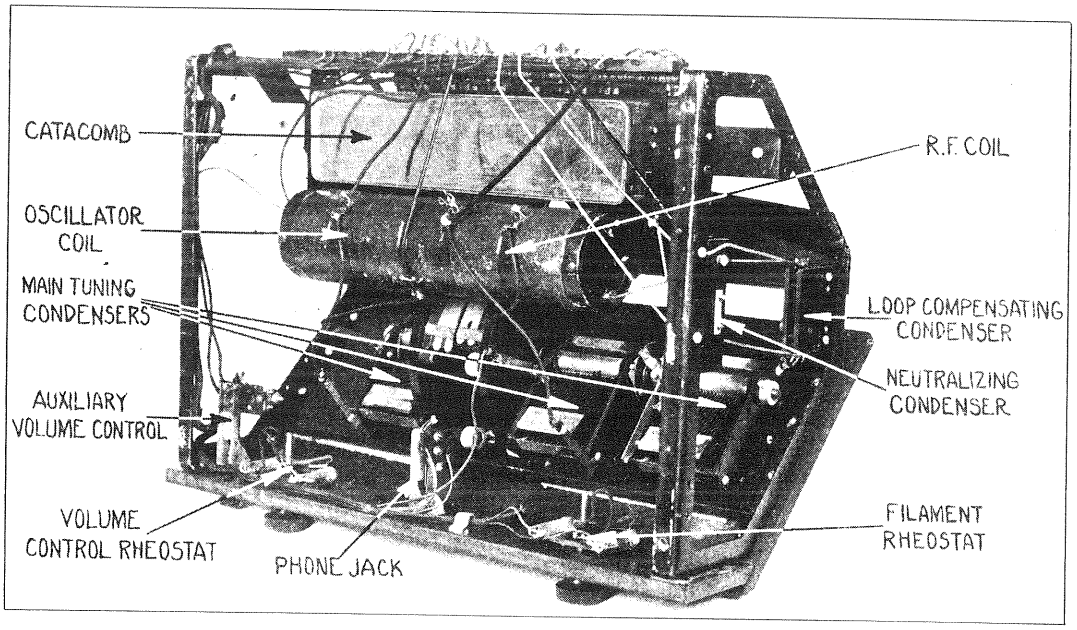

Figure 3—Rear view of panel assembly

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 this condition remove front panel as described in Part I, Sec. 4 and adjust the mounting screws of 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) 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 thrown 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 of adjusting the drum

set screws to provide the necessary clearance so that scraping will not take place. If adjusting these hex nuts or set screws does not provide the necessary clearance, the points touching should be filed until the metal dials clear each other. Care should be taken when filing to prevent scratching the dials.

(8) OPEN LOOP

In the Radiola 32, the loop may be entirely disconnected from the set and nearby local stations heard when both the left and right-hand drum controls are in their normal position for a given local station. In this case, the windings of the tuned radio frequency circuit act as a small loop, furnishing the necessary pick-up.

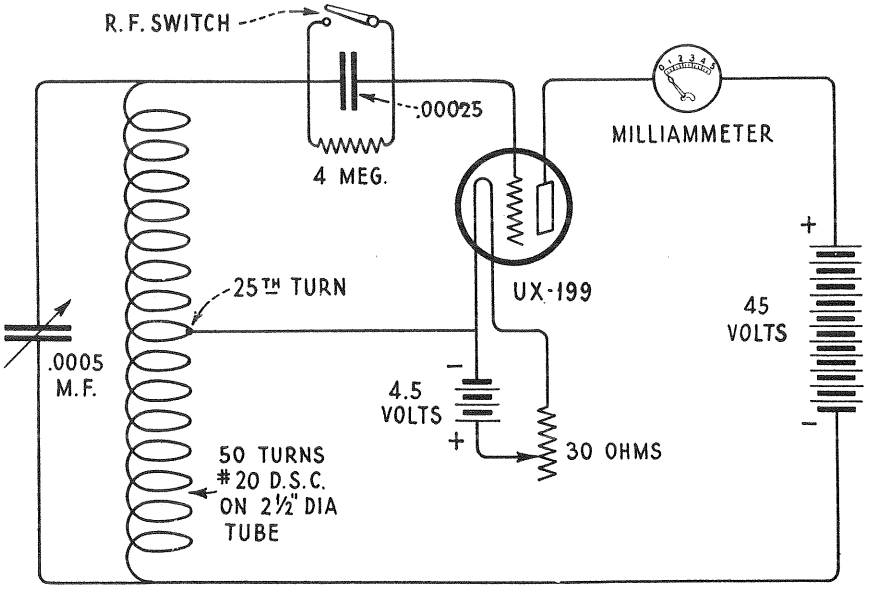

Figure 4—Schematic circuit diagram of the radio frequency and audio frequency oscillator

It will be somewhat difficult, therefore, to tell whether or not the loop circuit is open without testing it for continuity. In general, if the center terminal of the loop were open, very little effect on local stations would be noted. If either leg of the loop were open, signal strength from local stations would be considerably reduced. It is doubtful whether distant stations would be heard at all.

The complete loop circuit may be tested for continuity with a battery in series with a lamp, voltmeter or headphone. Place one battery lead on terminal No. 9 counting left to right on the catacomb terminal strip, and the other first on terminal No. 6 and then on No. 8. Terminal No. 9 goes to the center tap of the loop and terminals 6 and 8 go to the opposite sides of the compensating condenser directly across the loop. If test from 9 to 8 or 9 to 6 shows open, look for:

(a) Open at point where leads are connected to catacomb terminal strip.
(b) Broken loop connection.

The symptoms of a broken loop condenser pig-tail will be similar to those for an open loop. This pig-tail should therefore be carefully checked.

(9) LOOP COMPENSATING CONDENSER

The loop compensating condenser is connected in shunt to the loop circuit to compensate the loop for increased distributed capacity in the radio frequency windings. It is adjusted at the factory to properly balance the loop 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. The necessary adjusting equipment consists of a calibrated R.F. oscillator and a non-metallic screw driver at least 8 inches long. The circuit diagram and general appearance of the oscillator

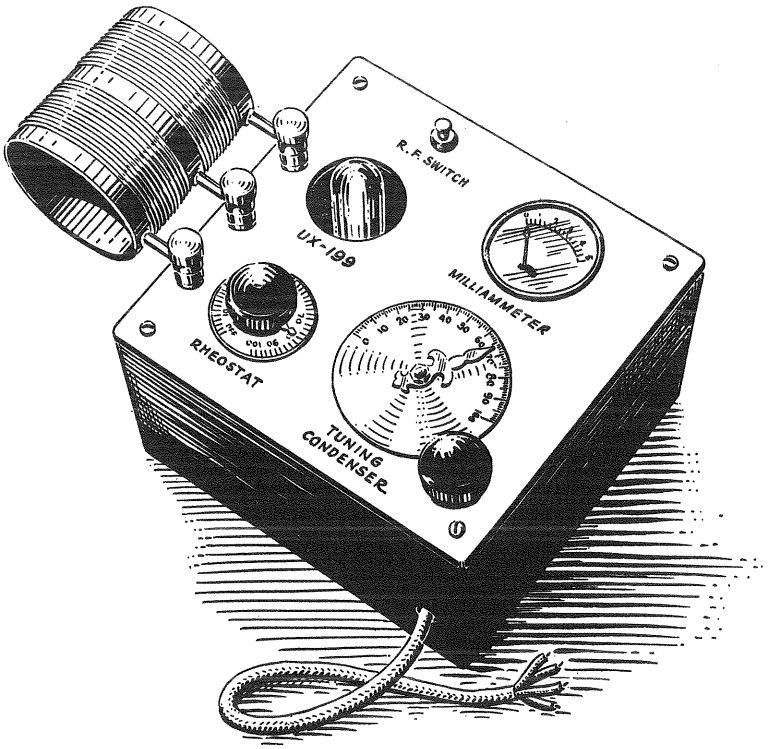

Figure 5—Complete model of R.F. and A.F. oscillator

is shown in Figures 4 and 5. The coil consists of 50 turns of No. 20 D.S.C. wire wound on a 2½-inch 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 1500 K.C. (200 to 546 meters) very efficiently. The grid condenser and leak will modulate the output when the oscillator is used as an A.F. oscillator. 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 useful in servicing all types of receivers, adjusting compensating condensers on other Radiolas of this type and neutralizing Radiola 20. It will amply repay the dealer for the small outlay of material and labor required.

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:

(a) Remove tubes from Radiola catacomb.

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

(c) Place oscillator into operation at 1500 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. This can be conveniently done outside of cabinet.

(d) Now move the left tuning drum, leaving the right one in the position of 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 the bottom of the loop compartment in an inductive relation to the loop. Reconnect the three loop leads to the terminal strip.

(f) If the circuit is properly compensated, there will be a deflection obtained when the loop is connected with the oscillator in its new position.

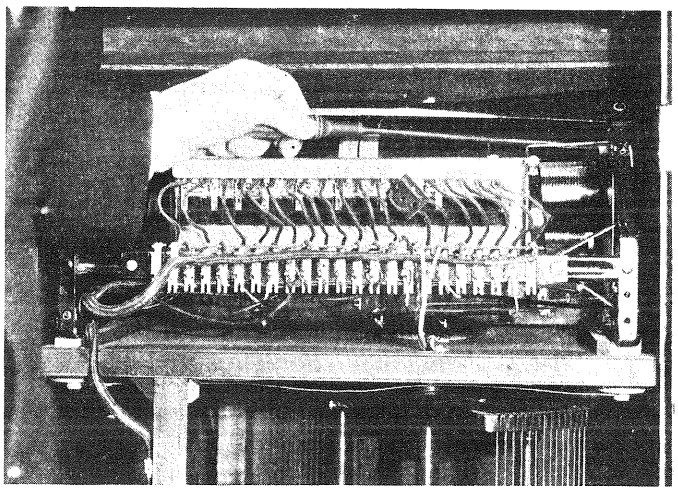

Figure 6—Adjusting the loop compensating condenser

If no deflection is obtained under these conditions, the loop compensating condenser should be adjusted 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. (See Figure 6.)

Repeat operation at 550 K.C. and make readjustment if necessary. Generally when the compensating condenser is adjusted at one frequency it will be found to be correct at all other frequencies.

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) WEAK SIGNALS DUE TO HIGHLY SHIELDED LOCATION

There may be found an occasional location so badly shielded that an external pick-up will be necessary. Installations in steel buildings are at times troubled with this shielding effect. Should this phenomenon manifest itself, a short antenna of insulated wire not over 25 or 30 feet in length may be erected outside of the building or may be

conveniently hung out of a window, although it would, of course, be better to get it away from the absorbing effect of the building, if possible. This antenna should be connected to the antenna coupling coil terminal strip at the terminal designated "A". To the other terminal designated "G", a wire should be attached and connected to a good ground. (See Figure 7.) This should preferably be a cold water pipe or radiator and should be connected by means of an approved ground clamp.

Thus installed the loop will lose its directional effect, one position giving maximum signal strength on all signals. All other tuning adjustments will remain the same as when using only the loop as a pick-up device.

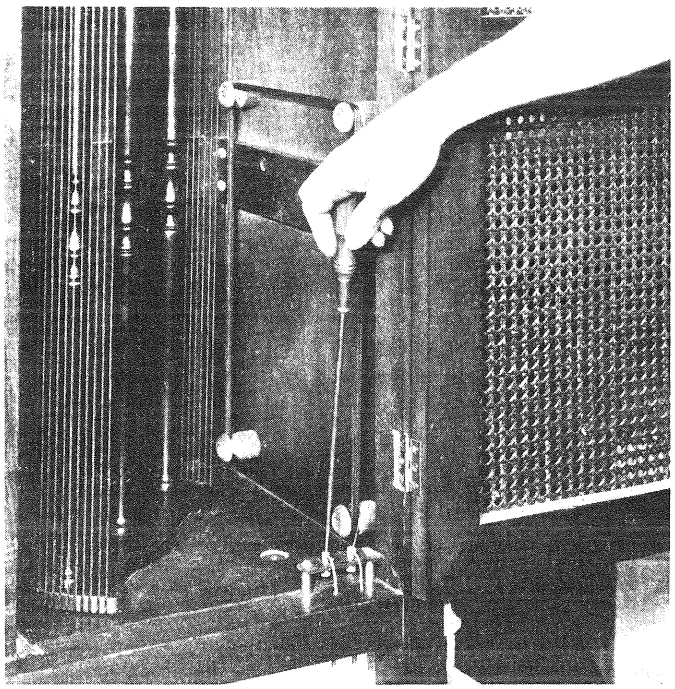

Figure 7—Connecting antenna and ground leads to the antenna coupler terminals

(11) OSCILLATION

Radiola 32 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 is the trouble all other possible causes should be checked.

(b) Loop neutralizing condenser connected across terminals 7 and 8 of the catacomb terminal strip out of adjustment.

A procedure for properly adjusting the loop neutralizing 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 non-metallic screw driver and a 50-ohm compensating resistance.

1. Place the modulated oscillator into operation at 1000 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 not 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 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 dis-

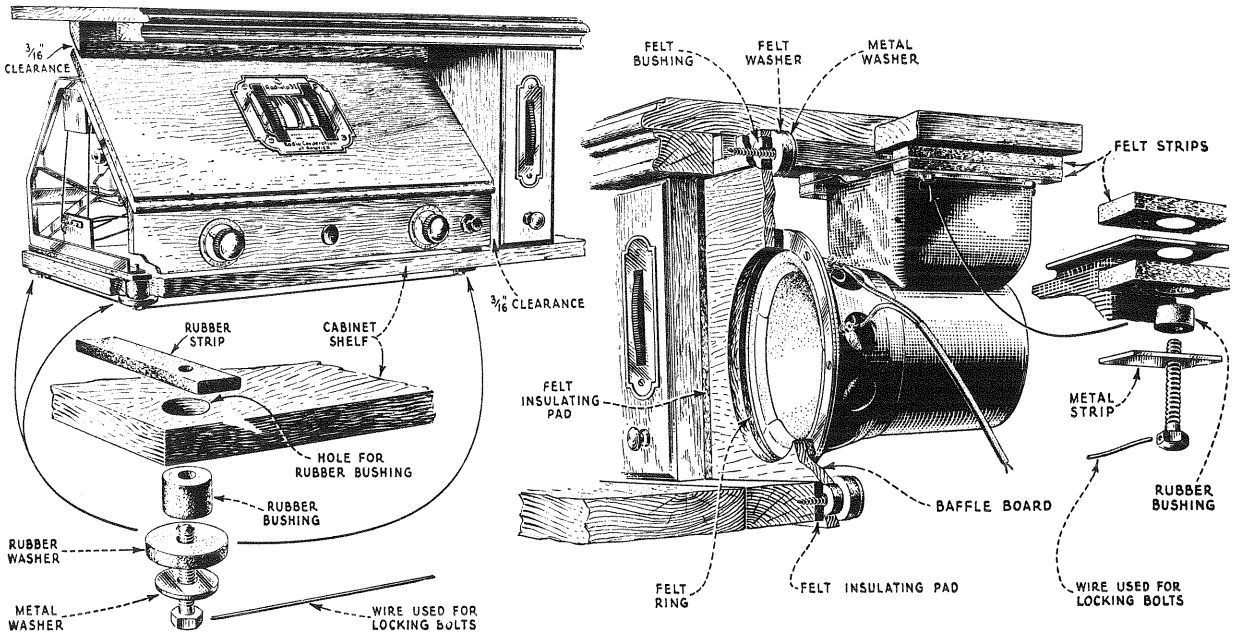

Figure 8—Panel assembly and reproducer supports with felt and rubber insulation to prevent microphonic action

appear, 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 the compensating resistance is now removed and the set is returned to normal operation.

(12) HOWLING

Howling may be caused either by a microphonic Radiotron in the catacomb, or by some part of the panel assembly or reproducer unit not being properly insulated from the cabinet.

In the case of a microphonic Radiotron UX-199 in the catacomb, the sound waves set its elements into vibration which in turn is reproduced in the loudspeaker. Conditions being favorable, the howl will increase in intensity. If a microphonic adapter is used with the detector tube, it should be placed so that no part of it will touch any part of the panel assembly except at the catacomb. A microphonic adapter touching the panel assembly may cause howling. After ascertaining that this is not the

trouble, the Radiotrons should be interchanged, remembering that Radiotrons 1, 3 and 6 are the most sensitive to microphonic conditions.

If interchanging the Radiotrons does not remedy the howling condition, an inspection must be made of the cushion supports of the panel assembly and reproducer unit. (See Figure 8.) The panel assembly rests on rubber strips. The bolts holding this frame are provided with large rubber washers. The panel assembly resting on the rubber strips should not touch any part of 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. If the panel assembly proves to be in the right position, the reproducer unit must be examined for possible microphonic action.

The reproducer unit is suspended by four bolts, these bolts having heavy felt cushions for the unit to rest upon. Also on the front, a felt ring is provided on the baffle plate. The baffle plate is also cushioned to the cabinet by means of large felt washers. The baffle plate should be examined to make sure it does not touch any of the cabinet, and the reproducer should not touch the baffle plate except at the felt ring provided for that purpose.

This series of rubber and felt cushions is what makes it possible to house the powerful 104 Loudspeaker and Radiola 28 in one cabinet and it is imperative that they function properly, otherwise the result will be very bad microphonic trouble. When looking for trouble of this nature the service man should carefully check the foregoing points.

(13) LOOP ASSEMBLY

The loop of Radiola 32 is driven from a control dial on the front of the Radiola by means of a cable and drum arrangement. This cable may become slack after considerable use, or replacement may be required.

A turnbuckle is provided to take up any slack that may develop in this cable from time to time. This turnbuckle is very accessible, being located beneath the panel assembly in the loop compartment. It is merely necessary to open the rear doors in order to make an adjustment. If the cable should be broken and require replacement, the new cable should be installed as described in Part III, Section 5.

(14) BROKEN LOOP DRIVE CABLE

Should a loop drive 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 III, Section 5. If a new cable is not immediately available a temporary repair may be made provided the break is not in the section that passes over the cable guide, or threads through the control and drive 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 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 all the strands of the cable to adhere to the solder. Placing the splice in an alcohol or bunsen flame affords sufficient heat and allows any excess solder to drip away. After the splice is finished the cable should be returned to its proper position and the slack taken up by means of the turnbuckle. Do not tighten the cable more than necessary to take up any slack, for otherwise it may break again.

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.

(15) CATACOMB AND PANEL CONTINUITY TEST

In making catacomb and panel continuity tests both filament control and volume rheostats are adjusted so that half the resistance is in the circuit; the loop connections are removed and the power supply cable is disconnected from the terminal strip at the rear of the catacomb.

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 are used in making the tests. This arrangement will be found to be very sensitive in checking voltage drop in various circuits.

The contacts of the test equipment are 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 designations "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 9.

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 a tag to the catacomb and note thereon the 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, Power Supply Cable and Loop Connections Removed

Terminals	*Correct Effect*	*Incorrect Effect Caused by:*
2 to G 1	Closed	Open connection
6 to G 3	Closed	Open connection
7 to P 3	Closed	Open connection
9 to G 2	Closed	Open ½ coil No. 2 or resistance strip
9 to G 4	Closed	Open coil No. 4 or resistance strip
10 to P 1	Closed	Open coil No. 1
10 to P 6	Closed	Open coil No. 7
11 to P 2	Closed	Open coil No. 3
11 to P 4	Closed	Open coil No. 5
11 to Terminal No. 17	Closed	Open coil No. 9
12 to G 5	Closed	Open connection
13 to P 5	Closed	Open connection
16 to P 7	Closed	Open connection
22 to G 7	Closed	Open coil No. 8

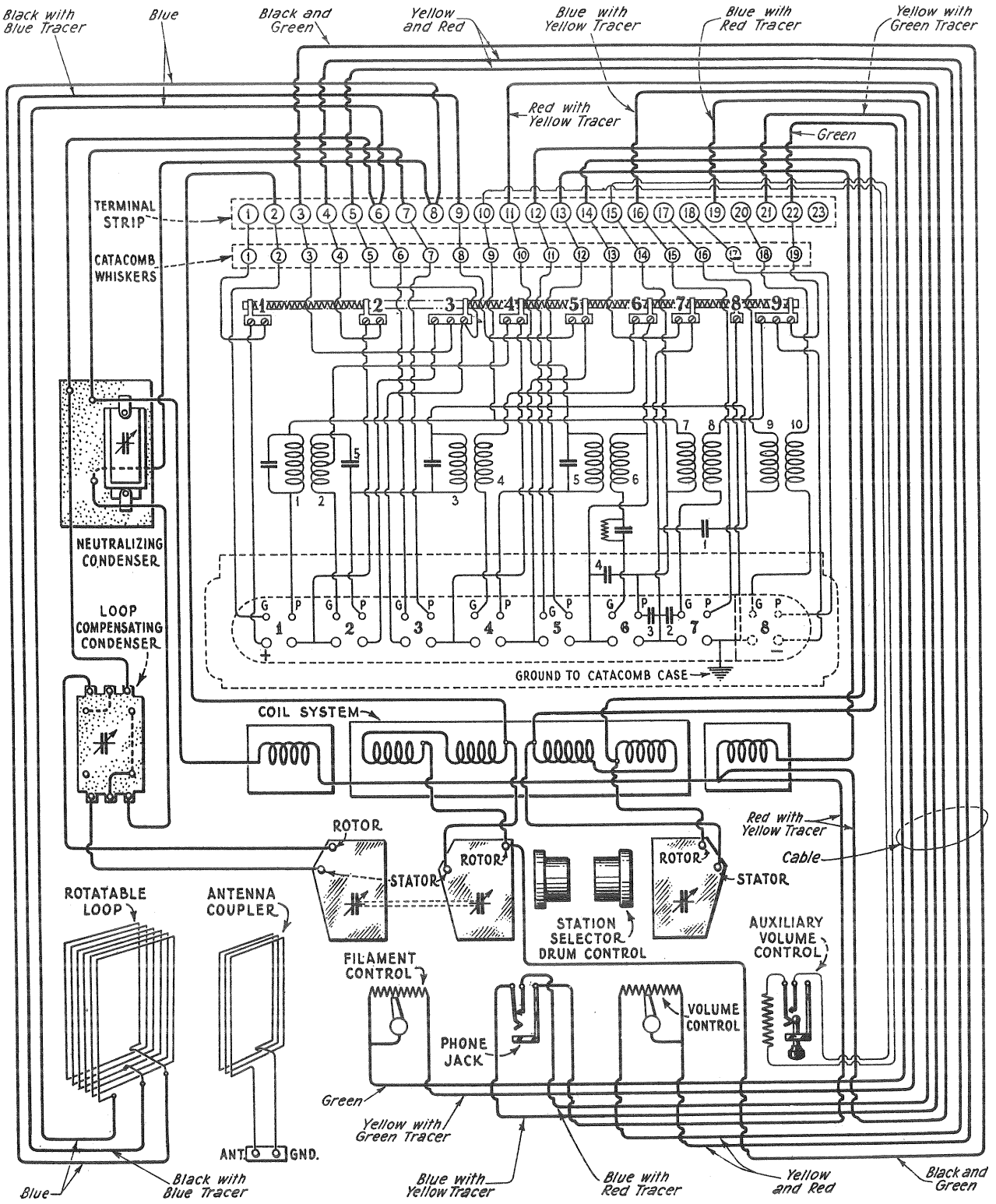

Figure 9—Panel and loop assembly continuity wiring diagram

PANEL TESTS

With Radiotrons, Power Supply Cable, Resistance Strip Removed and Loop Disconnected

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)

Loop Disconnected

Terminals	*Correct Effect*	*Incorrect Effect Caused by:*
8 to 6	Open	Shorted loop or compensating condenser
8 to 7	Open	Shorted neutralizing condenser

(16) RESISTANCE STRIP TESTS

The resistances 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 10.

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)

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

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 allowable values in ohms for the different sections of the resistance strip in Radiola 32 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

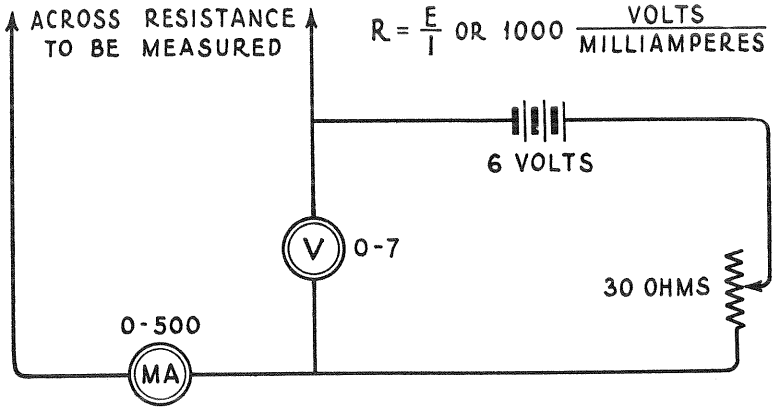

Figure 10—Schematic circuit diagram for resistance measurement

(17) VOLTAGE READINGS

The following are the voltages obtained at the catacomb terminal strip, when tests are taken across the terminals indicated in the table. 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 32

Taken at Catacomb Terminal Strip—Count Terminals from Left to Right When Facing Front of Radiola 32

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 on No. 10.
10 to 11	Should measure 41 volts normally. Positive terminal of voltmeter on No. 11.

PART II—R.P.A. ASSEMBLY AND REPRODUCER UNIT

The R.P.A. Unit used in Radiola 32 (See Figure 11) is known by the designation AP-832-A. Service work in conjunction with it will be along the same lines as those followed in the case of Radiola 30 R.P.A. unit and RCA Loudspeaker 104. This unit is of particularly good design and will require very little service work.

The reproducer unit in Radiola 32 is the standard RCA Loudspeaker Model 104 Pot Magnet and cone assembly. This reproducer provides the utmost in quality of reproduction, together with any desired volume without distortion.

The unit makes use of one Radiotron UV-886, two Radiotrons UX-281 and one Radiotron UX-210. Radiotron UV-886, known as the "Ballast tube," is connected in the primary circuit of the power transformer. The resistance of the filament of Radiotron UV-886 rises and falls rapidly with an increase or decrease of current flowing through it, thus maintaining a substantially constant input current. Radiotron UV-886 when used in Radiola 32 is to be used when the house lighting current is 60 cycles only. A ventilating stack is provided to enclose this Radiotron, and the R.P.A. unit should not be operated unless it is in place.

It should be understood that the electrical protective devices on Radiola 32 are adjusted at the factory. If for any reason a service man finds it necessary to remove them to adjust or replace a defective part, great care should be taken to see that they are returned to proper operation. Dealers should caution their customers not to attempt to render these protective devices inoperative or to experiment with the apparatus inside the metal cabinet or R.P.A. Unit.

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

Should Radiola 32 suddenly cease to operate satisfactorily, open the rear door and note whether or not the tubes in the R.P.A. unit are lit. Replace any of the Radiotrons whose filaments are not burning. If Radiotron UV-886 is apparently operating correctly (indicated by considerable heat dissipation), and the other tubes do not glow, the trouble may be due to an open in the filament windings of the power transformer or defective filament connections.

Should all Radiotrons fail to light or operate as indicated in the preceding paragraph, look for:

(a) House lighting current not on or loose connection at outlet.

(b) Operating switch not functioning properly.

(c) Blown fuse in house lighting circuit.

(d) Loose protective plug.

(e) Input plug not making proper contact.

(f) Burned-out filament of Ballast tube.

(g) Poor contact in Ballast tube socket.

(h) House lighting current not A.C. (Manifested by the filament of the Ballast tube lighting a bright red.)

If the Ballast tube glows excessively and the other Radiotrons light below normal brilliancy the trouble may be due to an open in one filament of Radiotron UV-886. (This Radiotron has two parallel filaments.)

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

Look for:

(a) Shortened 20 Mfd. condenser in A.C. package.
(b) Open connections at A.C. package.
(c) Defective catacomb. (Run continuity test.)
(d) Defective connections at R.P.A. terminal board.
(e) Defective resistance strip on catacomb.

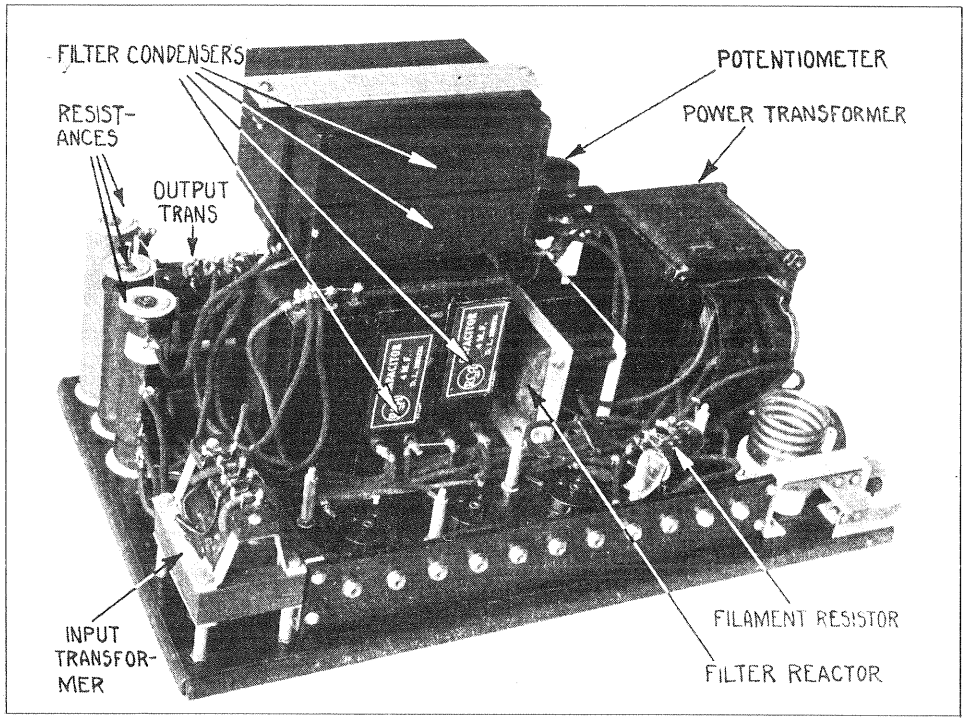

Figure 11—R.P.A. unit showing location of filter condensers, resistances, potentiometer, power transformer, input transformer, filament resistor and filter reactor

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

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

(a) Loose cone coil connections.
(b) Open in cone coil winding.
(c) Filament to grid short in Radiotron UX-210.
(d) Filament to plate short in Radiotrons UX-281.
(e) Dirty contacts in socket of Radiotron UX-210.

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

This condition is usually caused by a defective Radiotron UV-886. Such a Radiotron after having been in use for considerable time may develop a tendency to increase its resistance sufficiently, when heated, to cause a drop in signal strength of Radiola 32

greater than the normal drop due to the tube heating. The Radiotron will not show any other indication of being unsatisfactory. Substituting another UV-886 or stopping the Radiola long enough for the Radiotron to cool and then starting it will be the only way of locating this trouble. When making this test an increase of signal strength will be noted when the Radiotron is cool, gradually falling off as the tube warms up.

If a drop of volume is obtained with the signal becoming distorted, the trouble is a defective Radiotron UX-210. The remedy is to replace the tube.

(5) EXCESSIVE HUM

Excessive hum may be due to any of the following causes:

(a) A. C. input plug reversed. (Change position of plug).

(b) Defective 2 Mfd. condenser (Located next to 4 Mfd. condensers).

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

(d) Potentiometer not properly adjusted. Adjust potentiometer on top of R.P.A. unit for position of minimum hum.

(e) Power line interference. This can be checked by disconnecting loop from terminal strip and noticing if hum disappears.

(6) DISTORTION AFTER LOUDSPEAKER HAS BEEN CHECKED

Distortion may originate in a leaky 2 Mfd. condenser (located next to 4 Mfd. filter condenser), or it may be due to a low emission Radiotron UX-210. The 2 Mfd. condenser may be checked by temporarily disconnecting it from the circuit while operating the Radiola and noting if distortion ceases.

A low emission Radiotron UX-210 may cause a "burr" or "fringe" on each musical note accompanied by unnatural and rough speech. This Radiotron may usually be reactivated by operating the R.P.A. unit for a period of ten minutes with the two Radiotrons UX-281 removed. If this process fails it will be necessary to use a new Radiotron UX-210.

(7) IF PLATES OF RADIOTRONS UX-210 AND UX-281 HEAT EXCESSIVELY

If plate of Radiotron UX-210 is dull red—check the following:

(a) Shorted 2 Mfd. condenser. (Located next to resistance units.)

If plate of Radiotron UX-210 is white hot. Check the following:

(a) Open resistance R-1.

If plates of Radiotrons UX-281 are dull red—check the following:

(a) Shorted 4 Mfd. filter condenser. (Either of the two top condensers or the one located next to 2 Mfd. condenser.)

If plates of Radiotrons UX-281 are white hot—check the following:

(a) Shorted 4 Mfd. filter condenser. (Located next to filter reactor.)

Should one Radiotron UX-281 become a dull red while the other is apparently normal, replace the Radiotron UX-281 that is apparently normal. The apparently normal Radiotron UX-281 is defective, causing the other to heat from overload.

(8) DISTORTION IN REPRODUCER UNIT

Distortion in the Reproducer unit may be caused by any of the following:

(a) Poor input from Receiver. Examine output of receiver at input connections of R.P.A. unit.

(b) Leads from movable coil broken away from sides of cone. (Make these fast with a little shellac.)

(c) Shorting of movable coil to pole piece of pot magnet.

(d) Mis-alignment of reproducer cone.

In the case of "c" and "d" the remedy is to re-align or center the cone properly. When centered properly the cone coil is free to move in the air gap of the pot magnet without touching either side of the pole piece. The proper procedure for making this adjustment is as follows:

(a) Remove grille from front of reproducer unit.

(b) Loosen screw centering cone to pole piece.

(c) Insert three small strips of cardboard about $\frac{1}{4}''$ x $1\frac{1}{2}''$ and the thickness of a visiting card, in the space between the inside of the cone coil and the pole piece of the pot magnet. These pieces of card should be placed in the center of the small slots in the webbing of the centerpiece of the cone. They just hold the cone so that it is evenly spaced on all sides. Figure 14 illustrates this operation in adjusting the cone.

(d) Now tighten screw in center of pole piece and then remove the strips of card.

The cone is now properly centered, and if any further distortion is experienced it is due to other causes.

(9) FILTER CONDENSER TESTS

The filter condensers in Radiola 32 are best tested by means of a high D.C. voltage used to charge these condensers and then noting their ability to hold the charge. As a high D.C. voltage is rarely obtainable either in the dealer's shop or the customer's home it will be necessary to use the high voltage source incorporated in the R.P.A. unit.

The following procedure should be used to test these condensers:

(a) Take out the R.P.A. assembly from cabinet and remove the metal cover. Replace R.P.A. assembly in cabinet without cover and connect input plug to unit. Remove all other connecting cables. Short terminals No. 10 and No. 11 which go to the reproducer unit and remove Radiotron UX-210. Have operating switch "Off."

(b) With a hot soldering iron release the leads connecting the 2 Mfd. condenser at the extreme left, looking at the R.P.A. unit from the rear of the Radiola, and the double filter reactor. This connection is at the terminal nearest the front of Radiola 32.

(c) Standing so as not to be in contact with any part of the R.P.A. unit throw the operating switch to the "On" position for about 30 seconds and then turn it "Off." Then using a well insulated screw driver or one having a wooden handle bring the lead released back to its original position. At the point of contact there will be a large flash. *When doing this do not come in contact with either of these leads as a severe shock may result.* The flash obtained will be an indication that all the filter condensers are in good operating condition, because any defective condenser would immediately discharge all the others and no spark could be obtained.

(d) If no spark is obtained each condenser should be released from the circuit by unsoldering one of its leads one at a time and the test applied to those remaining. When the defective condenser is released a good discharge will be obtained from the remaining condensers.

This test subjects these condensers to a voltage in excess of the maximum operating voltage normally received. When subjected to this test a defective condenser that might pass a click or low voltage test will immediately be identified.

(10) NO "B" VOLTAGE

A no-voltage reading obtained at the 45 or 90-volt terminals will indicate one of the following defects:

(a) Shorted 2 Mfd. condenser—located next to resistance units.
(b) Defective Radiotron UX-281.
(c) Open or shorted "B" voltage connections.

(11) COMPLETE R.P.A. CONTINUITY TESTS

The tabulated continuity tests given in the text cover all circuits of the Radiola 32 R.P.A. unit. Before running these tests remove all connections from the terminal board at the rear of the R.P.A. unit, also the Radiotrons. The reference letters and numbers used in the table will be found in Figure 12.

The testing equipment consists of a high resistance voltmeter with battery voltage sufficient to give approximately full scale deflection when connected directly across battery terminals—for example, a 45-volt "B" battery connected in series with a voltmeter having a 0-50 volt scale. The contact points of the testing equipment should not touch any metallic part of the unit except the terminals specified. *Discharge the 4 Mfd. filter condensers by short-circuiting their terminals with a screwdriver before starting test.*

R.P.A. CONTINUITY TEST

Terminals	*Correct Effect*	*Incorrect Effect Caused by*
1 to 2	Closed	Open primary of input transformer
3 to 4	Closed	Open secondary of output transformer
4 to 7	Closed	Open connection
4 to 8	Closed	Open connection or resistor unit R-1
4 to 9	Closed	Open connection or resistor unit R-1
5 to ground	Closed	Open connection
5 to 10	Closed	Open connection
11 to P2 or P3	Closed	Open connection or high voltage winding of power transformer
G1 to top of R3 (Remove cover)	Closed	Open primary of output transformer
Across filament contacts of socket No. 1	Closed	Open UX-210 filament winding or resistance
Across filament contacts of socket 2 or 3	Closed	Open UX-281 filament winding or resistance
+ or —F3 to terminal No. 9	Closed	Open connection, filter reactor or resistor unit R-2 or R-3
P2 to P3	Closed	Open high voltage winding of power transformer
Center of socket 4 to one side of input plug (determined by experiment)	Closed	Open primary power transformer
Ground to center of socket 4	Open	Shorted 2 Mfd. condenser—located next to 4 Mfd. condenser

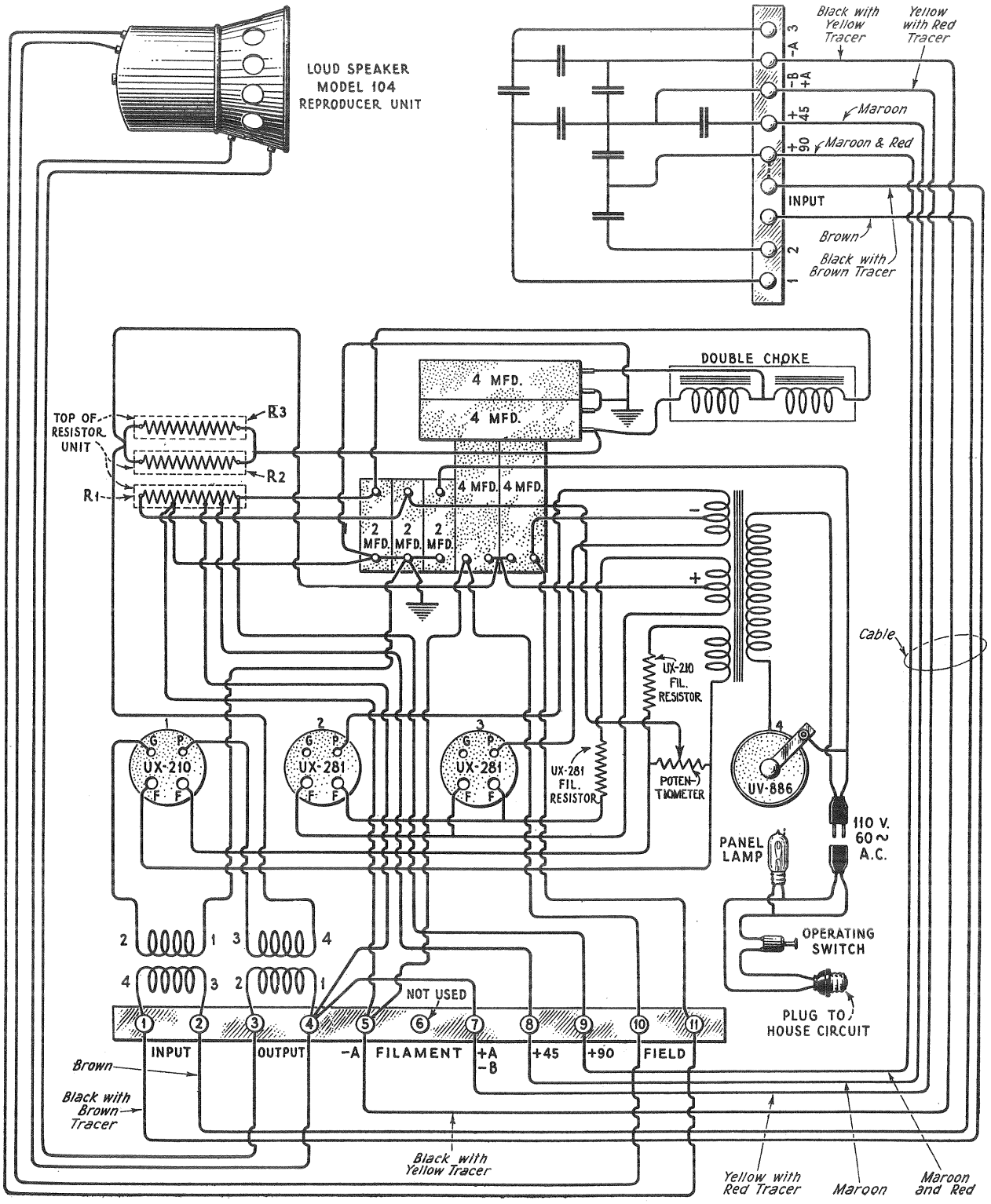

Figure 12—Rectifier power amplifier and reproducer unit continuity wiring diagram

PART III—MAKING REPLACEMENTS

(1) REPLACING DEFECTIVE PARTS IN PANEL ASSEMBLY

The panel assembly of Radiola 32 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 is as follows:

(a) Place Radiola 32 in position so that both rear doors can be opened wide.

(b) Remove loop 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.

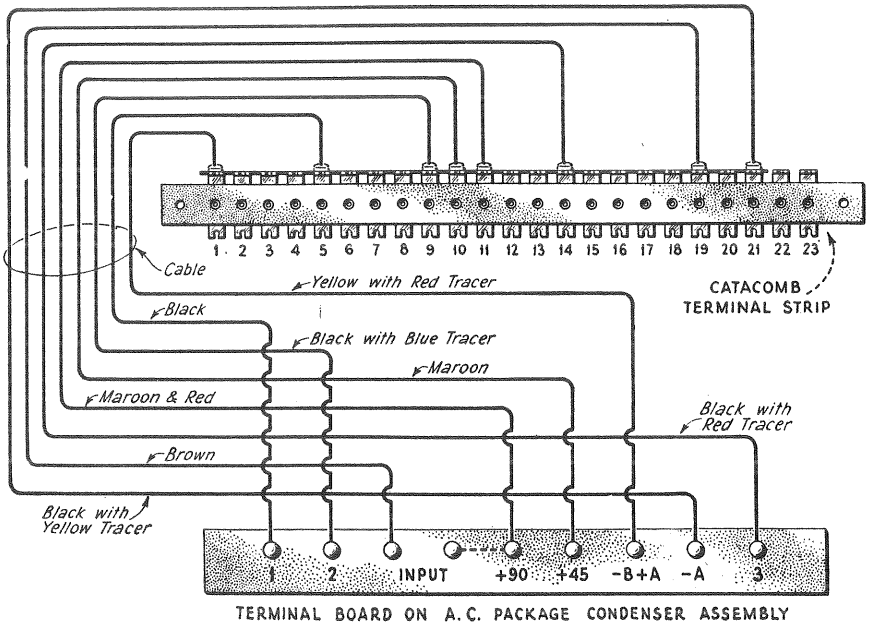

Figure 13—Panel and R.P.A. connecting cable with color scheme

(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 repair or replacing.

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 9.

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 so that the vibration of the loudspeaker will not cause them to loosen. 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 free from contact with the cabinet and resting upon its rubber supports, serious microphonic trouble will result.

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

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

(a) Place Radiola 32 in a position so that both rear doors can be opened wide.

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

(c) Remove the four bolts holding R.P.A. assembly to cabinet.

(d) Disconnect input plug and close sliding safety door. Now open cover of terminal strip and remove all connections to the terminals.

(e) **The R.P.A. unit may now be lifted clear of the cabinet.**

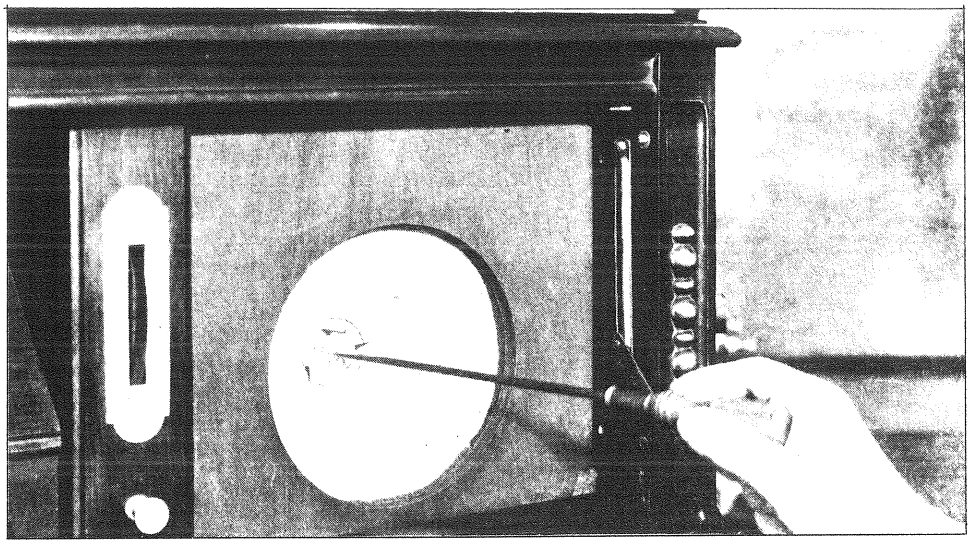

Figure 14—Method of adjusting the cone. Note the three pieces of cardboard used in centering the cone

(f) At each end of the R.P.A. unit is located a seal. Each of these seals may be released with a screw driver. The small screws around the lower edge of the cover should then be removed.

(g) Now remove the small pin protruding at the safety door.

(h) The cover may now be removed allowing access to any part.

When the repair or replacement is effected the cover should be replaced and substitute seals placed in the position occupied by 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 cables replaced and the bolts locked in position with wire in the reverse order of that used to remove it.

(3) REPLACING LOUDSPEAKER CONE

The cone assembly of Radiola 32 is a standard RCA 104 pot magnet and cone assembly suspended by means of a special felt cushion arrangement. In order to replace a cone the entire assembly must be removed from the cabinet. A step by step procedure is as follows:

(a) Place cabinet in position so that left door (facing Radiola 32 from the rear) may be opened.

(b) Cut and remove the wire locking the four bolts that hold the pot magnet to the cabinet.

(c) Release the field and output wires from the terminal strip of the R.P.A. unit and also from the sides to provide clearance when the pot magnet is removed.

(d) Holding the pot magnet in one hand, release the four bolts that hold it. Be careful not to drop the pot magnet as it is very heavy and would damage the R.P.A. unit should it fall. The felt strips should be removed and the pot magnet placed in a position convenient for removing the cone.

(e) Release the two leads connecting the cone coil to the terminals.

(f) Remove the six screws on the ring holding the cone and the screw centering the cone to pole piece. Remove ring and slip cone clear of pot magnet.

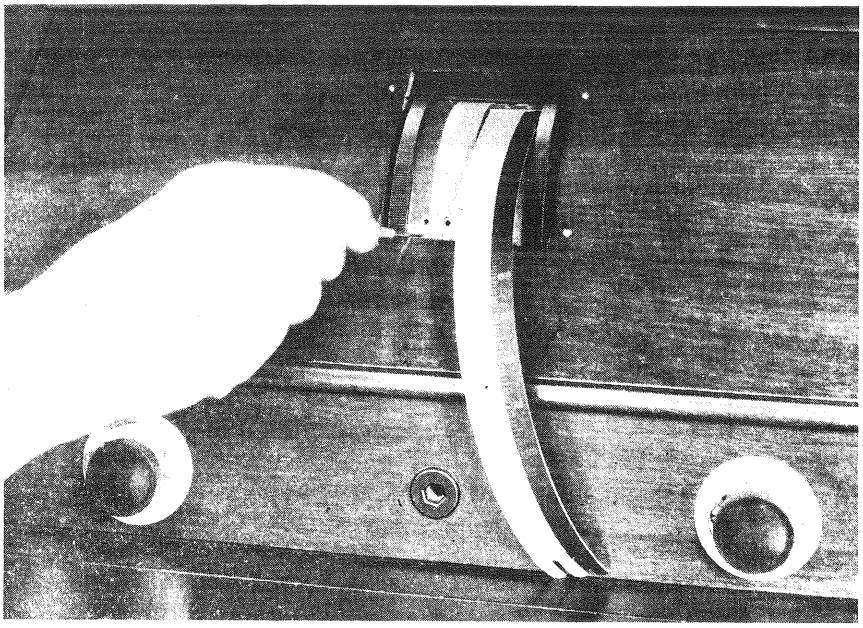

Figure 15—The correct method of replacing dial scales

(g) Place the new cone in the position occupied by the old cone. Replace the cone ring and the six screws that hold it, but do not draw them up tight. Put centering screw in place, but do not tighten it.

(h) Now insert three small strips of cardboard about 1½" x ¼" and the thickness of a visiting card—through the center web of the cone into the space between the pole piece and cone. This will cause the cone coil to have the same clearance on all sides of the pole piece. Figure 14 shows this operation, but with the pot magnet in its position in the cabinet. Refer to Part II Section 3.

(i) Tighten center screw of cone and then the six small screws holding the cone ring in position. Remove the three pieces of card.

(j) Connect the two cone coil leads to their binding posts.

(k) The pot magnet may now be replaced in the cabinet in the reverse of the procedure used to remove it. Special care should be taken to see that the assembly is suspended by the felt strips provided for that purpose. The entire reproducer unit should be insulated from the baffle board and from the cabinet by the felt ring and strips.

(4) REPLACING DIAL SCALES

The dial scales on Radiola 32 are of the renewable type, permitting the replacement of clean scales for soiled ones when desirable. This operation is very simple. A step by step procedure is as follows. (See Figure 15.)

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

(b) Turn drums to either extreme and loosen the four screws that hold the scales. The ends of the scales may now be pulled clear.

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

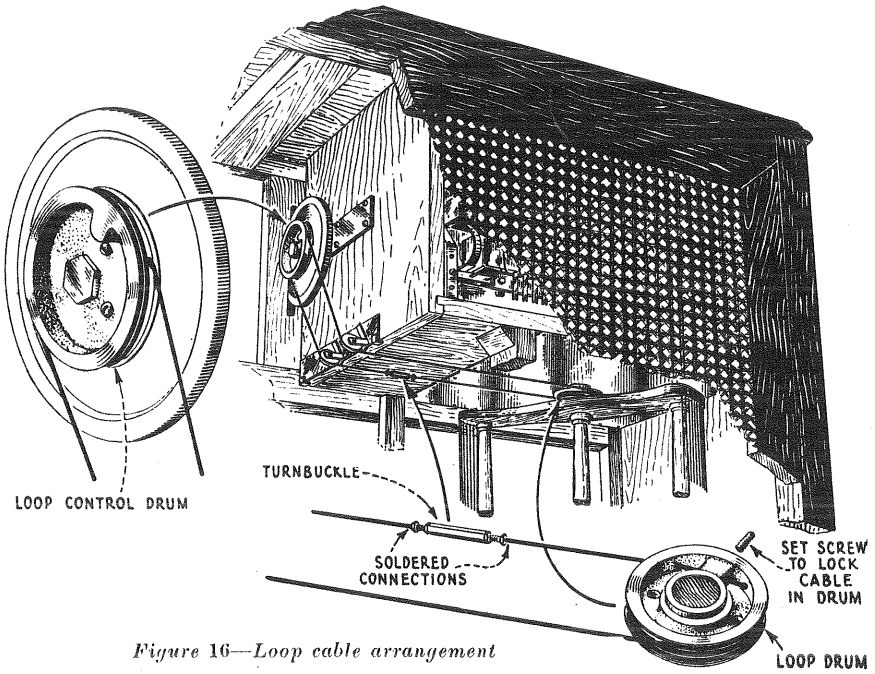

Figure 16—Loop cable arrangement

(5) REPLACING THE LOOP DRIVE CABLE

The rotation of the loop in Radiola 32 is controlled from a drum protruding on the front of the cabinet. The motion of the control drum is transmitted to the loop by means of a stranded drive cable. This cable gives a positive control with no lost motion. After considerable use or abuse it may become broken or for other reasons require replacement. The following procedure should be followed when this is necessary.

(a) Open rear doors of cabinet and release old cable from control drum on panel and drive drum at top of loop.

(b) As replacement cables are stocked complete with turnbuckles, it will be necessary to first remove one end of the cable from the turnbuckle so that the cable may be threaded through the holes on the drums. The position for placing the new cable is shown in Figure 16 which must be followed closely. Special attention should be given the position of the turnbuckle to clear the drums and guides.

(c) After placing the cable in position, the turnbuckle end is soldered to the cable end and then threaded into the turnbuckle. The turnbuckle should be adjusted to take up all slack in the cable, but not tight enough to cause friction at the control drum.

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. If imperfect operation is not due to defective tubes the "Service Data Chart" should be consulted for further detailed causes.

Indication	*Cause*	*Remedy*	See Service Notes *Part I*	See Service Notes *Part II*
No signals	House current not "On"	Turn house current "On"	—	Sec. 1
	Defective operating switch	Repair or replace operating switch	—	—
	Defective input plug to R.P.A. unit	Repair or replace input plug	—	Sec. 1
	Defective panel assembly	Check by continuity and repair or replace	Sec. 15	—
	Defective R.P.A. Unit	Check by continuity and repair or replace	—	Sec. 11
	Defective A.C. Package condenser bank	Check and replace defective condenser	—	—
	Defective pot magnet or open cone coil	Check for continuity and replace	—	—
	Defective cables connecting various assemblies	Check and repair or replace defective cables	—	—
Weak Signals	Defective loop or loop connections	Repair loop or loop connections	Sec. 8	—
	Radiola in shielded locality	Use short outdoor antenna	Sec. 10	—
	Main tuning condensers out of alignment or loop compensating condenser not adjusted.	Line up main tuning condensers and adjust loop compensating condenser	Sec. 9	—
	Defective R.P.A. Assembly	Check R.P.A. continuity and repair or replace defect	Sec. 17	Sec. 11
	Defective panel assembly	Check panel continuity and repair or replace defect.	Sec. 15	—
Poor Quality	Defective catacomb	Check catacomb continuity and replace if defective	Sec. 15	—
	Defective condensers in R.P.A. unit	Check and replace	—	Sec. 9
	Cone of Reproducer unit not centered properly	Center cone of Reproducer or replace cone	—	Sec. 8
	Wires loose on side of cone	Fasten wires with shellac	—	Sec. 8
Noisy or Intermittent Reception	Dirty Radiotron prongs	Clean Radiotron prongs	Sec. 3	—
	Loose filament or volume control rheostat	Tighten filament or volume control arm and clean contact point	Sec. 4	—
	Sprung socket contacts	Bend socket contacts	Sec. 2	—
	Defective or loose loop connections	Repair or tighten loop connections	Sec. 8	—
Howling	Microphonic Radiotrons UX-199	Interchange Radiotrons UX-199	Sec. 12	—
	Panel assembly not positioned properly	Position panel correctly	Sec. 12	—
	Reproducer not properly insulated from cabinet	See that reproducer is properly insulated from cabinet	Sec. 12	—
	Baffle board not properly insulated	Check baffle board insulation	Sec. 12	—
	Open resistor on auxiliary volume control	Replace resistor found defective	—	—
All Radiotrons fail to light	Operating switch not "On"	Pull operating switch "On"	—	Sec. 1
	Defective operating switch	Repair or replace	—	Sec. 1
	Defective R.P.A. unit	Check R.P.A. unit and make repair or replacement	—	Sec. 11
Radiotrons UX-199 fail to light	Defective R.P.A. unit	Check R.P.A. unit, and make repair or replacement	—	Sec. 11
	Defective cables	Check and repair or replace	—	—
	Defective A.C. package condenser bank	Test and replace defective condenser	—	—
	Defective catacomb	Test and replace	Sec. 15	—