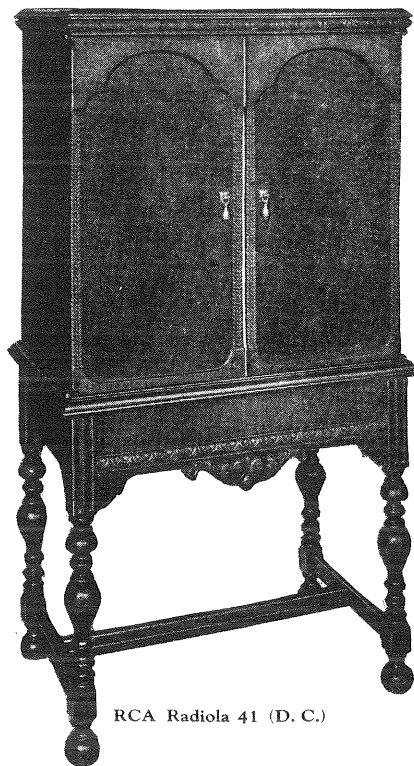


RCA

Radiola 41 (D. C.)

SERVICE NOTES



RCA Radiola 41 (D. C.)

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PREFACE

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

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

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

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

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

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

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CONTENTS

	Page
Preface	2
Introduction	5

PART I—INSTALLATION

Antenna (Outdoor Type)	6
Antenna (Indoor Type)	6
Ground	6
Location of Radiola in Room	6
"C" Battery	7
Radiotrons	7
Acoustic Howl	8

PART II—SERVICE DATA

Weak Signals	8
Uncontrolled Oscillations	8
Distorted Reproduction	9
Gradually Developed Distorted Reproduction	9

PART III—ELECTRICAL TESTS

Voltage Readings	11
Receiver Continuity Tests	13
S.P.U. Continuity Tests	15

PART IV—MAKING REPLACEMENTS

Replacing the Main Units	15
--------------------------------	----

ILLUSTRATIONS

RCA Radiola 41 (D.C.)	1
Rear Interior Cabinet View	4
Sub-Chassis of Receiver	5
Socket Power Unit	7
Schematic of Receiver	8
Schematic of S.P.U.	9
Connections of Reproducer, Receiver and S.P.U.	10
Wiring Diagram of Receiver	12
Wiring Diagram of S.P.U.	14

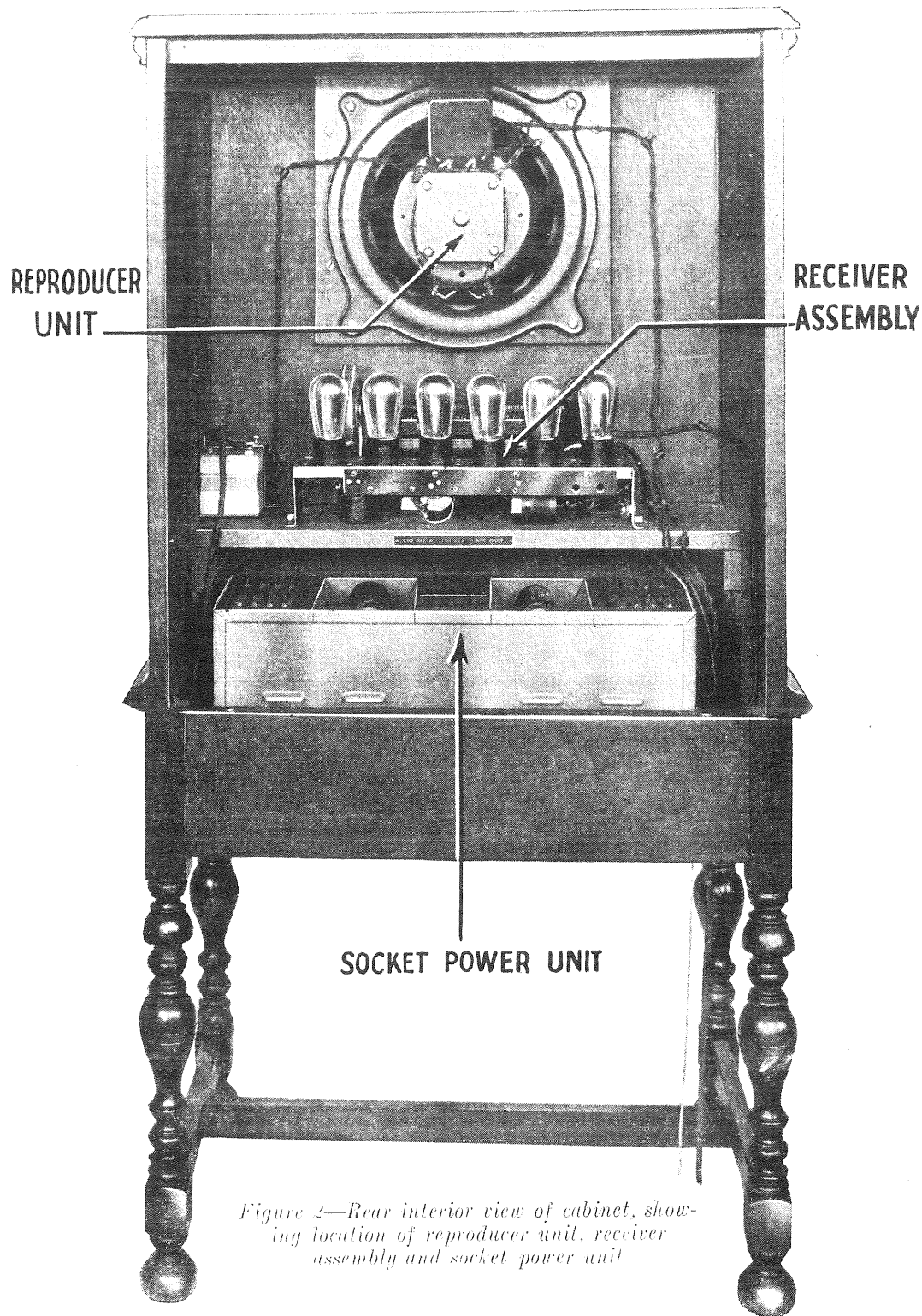


Figure 2—Rear interior view of cabinet, showing location of reproducer unit, receiver assembly and socket power unit

RCA RADIOLA 41 (D. C.)

(107.5-127.5 Volts Direct Current)

SERVICE NOTES

Prepared by RCA Service Division

INTRODUCTION

RCA Radiola 41 D.C. is a direct current socket powered radio receiver having excellent sensitivity, selectivity, and tone quality. A special audio system using two push-pull audio stages, gives fine quality and ample power to the output. The new dynamic loudspeaker used responds favorably to the excellent features built into the audio system.

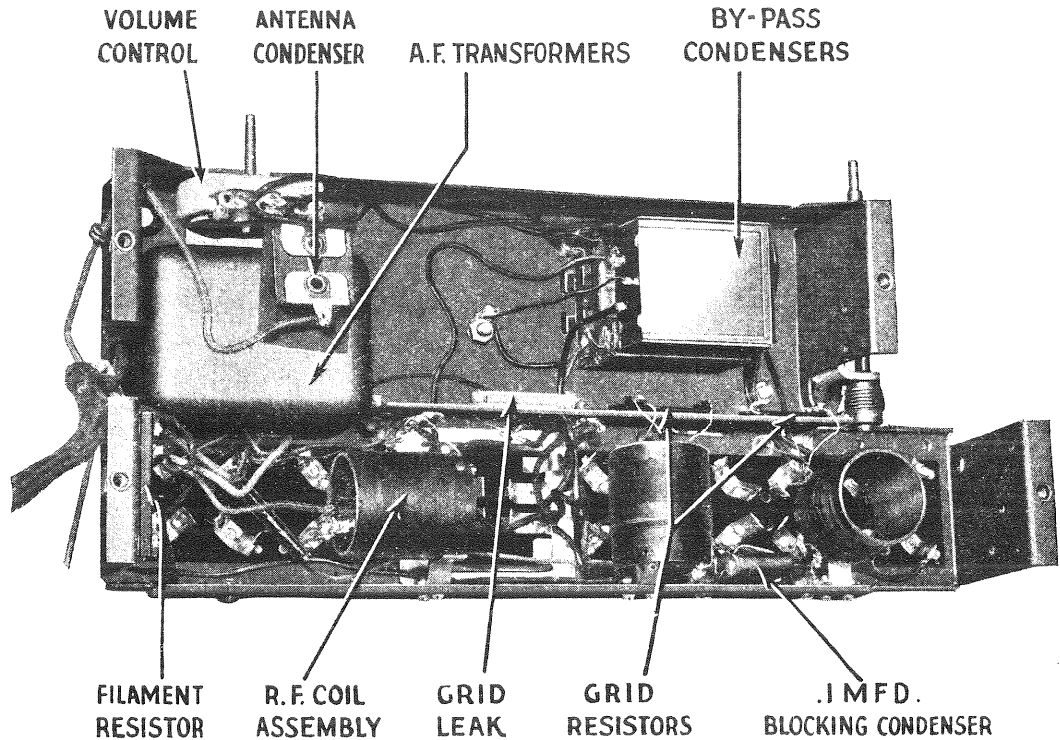


Figure 3—Sub-chassis view of receiver, showing parts

Figure 2 illustrates the rear interior view of the cabinet showing the location of the reproducer, receiver and socket power unit.

The receiver uses a tuned radio frequency circuit employing six Radiotrons UX-112A and four Radiotrons UX-171A. Figure 3 illustrates a sub-chassis view of the receiver and Figure 4 the S.P.U.

RCA Radiola 41 D.C. is designed to operate on direct current of 107.5-127.5 volts as used for house lighting. Connection to direct current lines of other rating or to A.C. lines may damage the Radiola or the Radiotrons. When installing Radiola 41 (D.C.) the position of the input D.C. plug must be tried for operation. Connected one way the Radiola will operate. Reversed, silence will result.

The following design characteristics are incorporated in Radiola 41 D.C.:

(a) The circuit consists of one untuned coupling stage, two tuned radio frequency stages,

a tuned detector, a push-pull first audio stage employing two Radiotrons UX-112A and a parallel push-pull second audio stage employing four Radiotrons UX-171A.

- (b) The volume control regulates the input grid voltages to the coupling stage. This gives smooth control of volume without distortion.
- (c) Grid resistors in the two tuned radio frequency stages effectively prevent any tendency to self oscillation in these circuits.
- (d) The reproducer is a regular RCA 106 dynamic speaker minus the disc rectifiers which are not necessary in D.C. socket power operation.

The electrical sequence of the Radiotrons used in the receiver assembly is shown in the schematic diagram Figure 5.

PART I—INSTALLATION

[1] ANTENNA (Outdoor Type)

Due to the sensitivity of Radiola 41 D.C. the antenna length need only be 25 to 50 feet. It should be erected as high as possible and removed from all obstructions. The lead-in should be a continuation of the antenna itself, thus avoiding all splices which might introduce additional resistance and, in time, corrode sufficiently to seriously affect reception. If it is absolutely necessary to splice the lead-in to the antenna the joint must be carefully soldered to insure a good electrical contact. Clean off all excess flux and tape the connection to protect it from the oxidation effects of the atmosphere.

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

[2] ANTENNA (Indoor Type)

Where the installation of an outdoor antenna is not practical, satisfactory results may generally be obtained by using an indoor antenna of about 25 to 40 feet of insulated wire strung around the picture moulding or placed under a rug. In buildings where metal lathing is employed, satisfactory results are not always possible with this type of antenna. However, due to its sensitivity, Radiola 41 D.C. will generally give satisfactory reception with an indoor antenna.

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

[3] GROUND

A ground lead is provided in Radiola 41 D.C. which may or may not be used. The use of the ground lead is entirely dependent on local conditions. As practically all D.C. lines have one side grounded, and no transformers are used, a direct ground connection occurs through the input D.C. line. The ground lead should be **experimentally** tried and if improved results are obtained it should be used. The ground should be connected to a steam radiator or water pipe if available. This ground will generally reduce the noise background, sometimes encountered in D.C. locations, and in most instances will make the receiver more stable.

[4] LOCATION OF RADIOLA IN ROOM

As with other musical instruments, the location of Radiola 41 D.C. in the room should be chosen with care. Various positions should be tried until the most desirable reproduction is obtained. If this position is outside the radius of the connection cord to the D.C. outlet, an extension cord can be used.

[5] "C" BATTERY

An external "C" battery is used to bias the power amplifier Radiotrons UX-171A. The use of this battery makes possible the use of the highest possible plate voltage on these tubes which gives maximum undistorted output. The battery should be $22\frac{1}{2}$ volts, tapped at $16\frac{1}{2}$ volts. Eveready battery No. 768 or Burgess No. 5156, or others having equivalent voltages may be used. The battery should be held under the clamp at one side of the receiver assembly. Connection should be made as follows:

Green	C— $22\frac{1}{2}$ volts
Brown	C— $16\frac{1}{2}$ volts
Black	C+

This battery should be replaced about once a year.

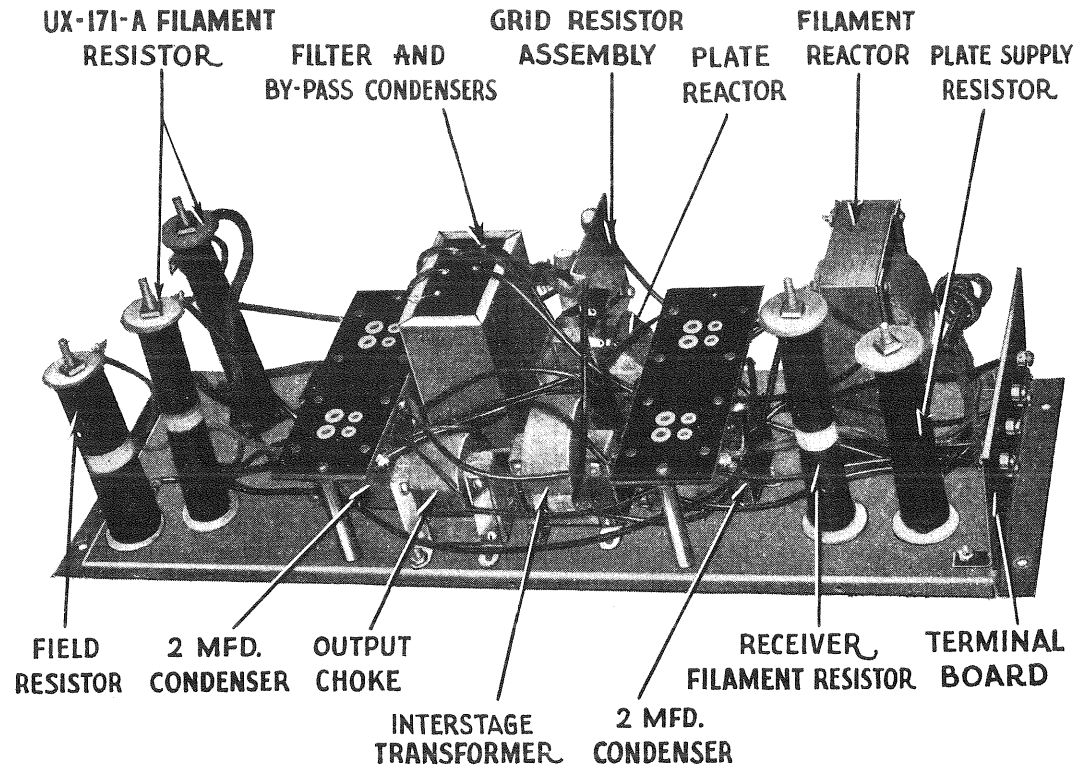


Figure 4—Socket power unit, showing parts

[6] RADIOTRONS

The Radiotrons UX-112A should be placed in the receiver assembly and the UX-171A's in the Socket Power Unit. Interchanging the tubes in the R.F. stages may give improved operation. Also in cases where oscillation occurs, interchanging the Radiotrons may clear up the condition. Always turn "off" the current before removing any tube and do not turn the current "on" unless all tubes are in place.

If any Radiotron UX-112A burns out the filament supply to all the Radiotrons in the receiver assembly will be cut off and the receiver will become inoperative. A burn-out of one of the UX-171A Radiotrons in the S.P.U. will cut off the filament supply to one other UX-171A, but the receiver will not become inoperative, although the quality of reproduction will be affected. The defective tube should be replaced.

While in most Radiolas, or other receiving sets using Radiotrons UX-112A and UX-171A, the older type Radiotrons UX-112 and UX-171 are interchangeable with the A tubes, this is not the case in Radiola 41 D.C. The greater filament current consumption makes the UX-112 and UX-171 unsuitable for use in the Radiola 41 D. C.

[7] ACOUSTIC HOWL

Radiola 41 D.C. may be more susceptible to microphonic howl than the A.C. model. Trouble of this kind while rare, may be corrected by interchanging the Radiotrons in the receiver assembly. The tube selected for the detector socket should have a minimum howl characteristic when touched or thumped, with the Radiola in operation.

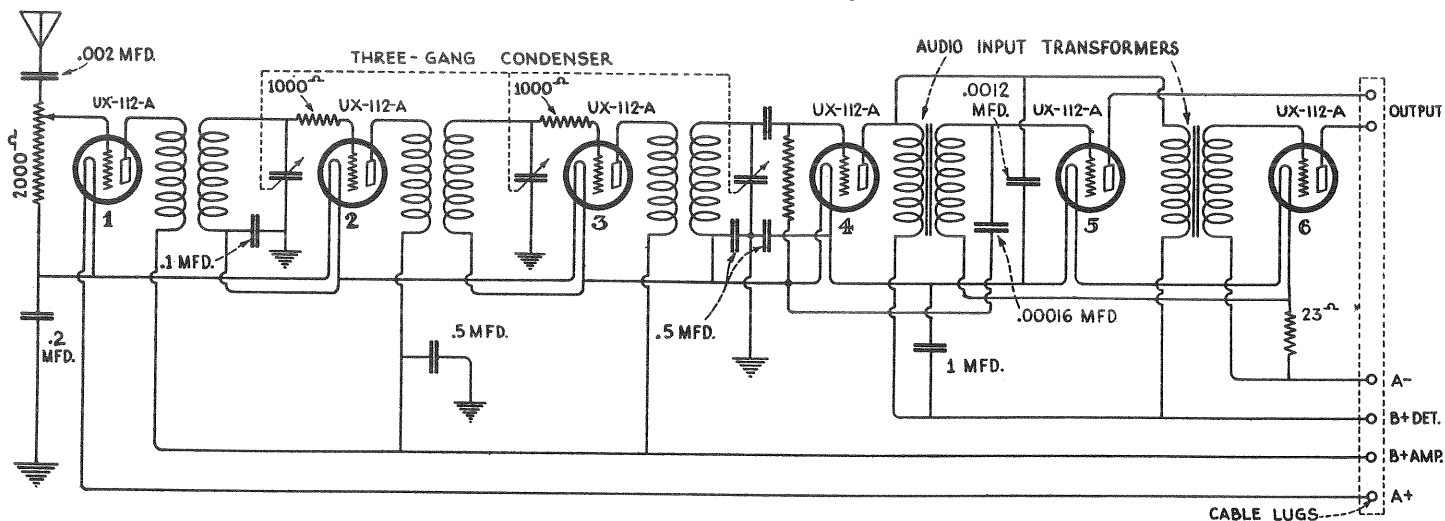


Figure 5—Schematic circuit diagram of receiver

PART II—SERVICE DATA

[1] WEAK SIGNALS

Should the loudspeaker output be weak at maximum volume, check the following points:

- Defective Radiotrons. Take one of each type known to be in good operating condition and interchange successively with those in the receiver and S.P.U.
- Open secondary center tap connection of interstage push-pull transformer or secondary of either A.F. transformer in receiver assembly.
- Open center connection to grid resistors in S.P.U. This will also give distorted reproduction.
- Defective receiver assembly or S.P.U. Check by means of the continuity tests given in Part III, Section 2, and make any repair or replacement necessary.

[2] UNCONTROLLED OSCILLATION

Should Radiola 41 D.C. oscillate or regenerate at any point in the tuning range the trouble is probably caused by:

- Defective grid resistor in second or third R.F. stages. The resistors may be checked by means of a resistance bridge, or the voltmeter ammeter method described in the regular Radiola 41 Service Notes. Figure 5 shows the correct value of these resistors.
- Open ground connection. Make repair.

- (c) Ground not connected. Connect the ground lead to a cold water pipe, a hot water or steam radiator or both.
- (d) Open UX-112A bias lead. Make any repair necessary.
- (e) Open ground lead in set. Any of the several grounding leads in the receiver and S.P.U. assembly being open may cause oscillation. Test for open connections and make repair.
- (f) Antenna and ground leads reversed, either at their point of connection to the volume control or outside of the set. Connect properly.

Where everything tests O.K. and the Radiola still oscillates, connect an 800-ohm fixed resistance across the primary of the second R.F. transformer. This will effectively prevent any case of oscillation.

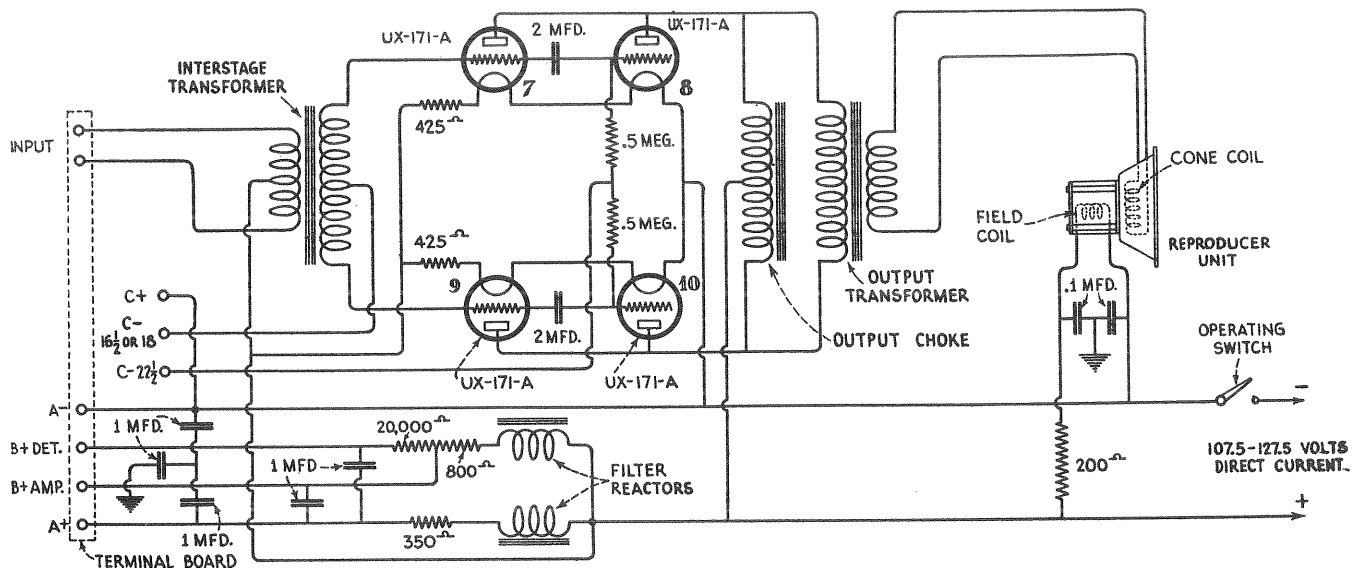


Figure 5A—Schematic circuit diagram of socket power unit

[3] DISTORTED REPRODUCTION

If the reproduction obtained at the loudspeaker is not of good quality, the trouble may be due to:

- (a) Defective Radiotrons. A burned-out Radiotron in the S.P.U. cuts off the filament supply of another Radiotron, unbalancing the amplifier and causing distortion.
- (b) "C" battery incorrectly connected. If the Radiola has been operated for a period of time with a wrongly connected "C" battery, the Radiotrons in the S.P.U. will probably be damaged. This will necessitate replacement of the tubes.
- (c) Defective "C" battery. The "C" battery should be replaced at least once a year.
- (d) Defective audio transformers in receiver, S.P.U., or on reproducer unit. Check all A.F. transformers by means of continuity test.

Any replacement or repair found necessary should be made.

[4] GRADUALLY DEVELOPED DISTORTED REPRODUCTION

Should the output gradually become poor after several hours of use, check the following:

- (a) Incorrectly connected "C" battery. Connect "C" battery correctly and replace damaged UX-171A Radiotrons.

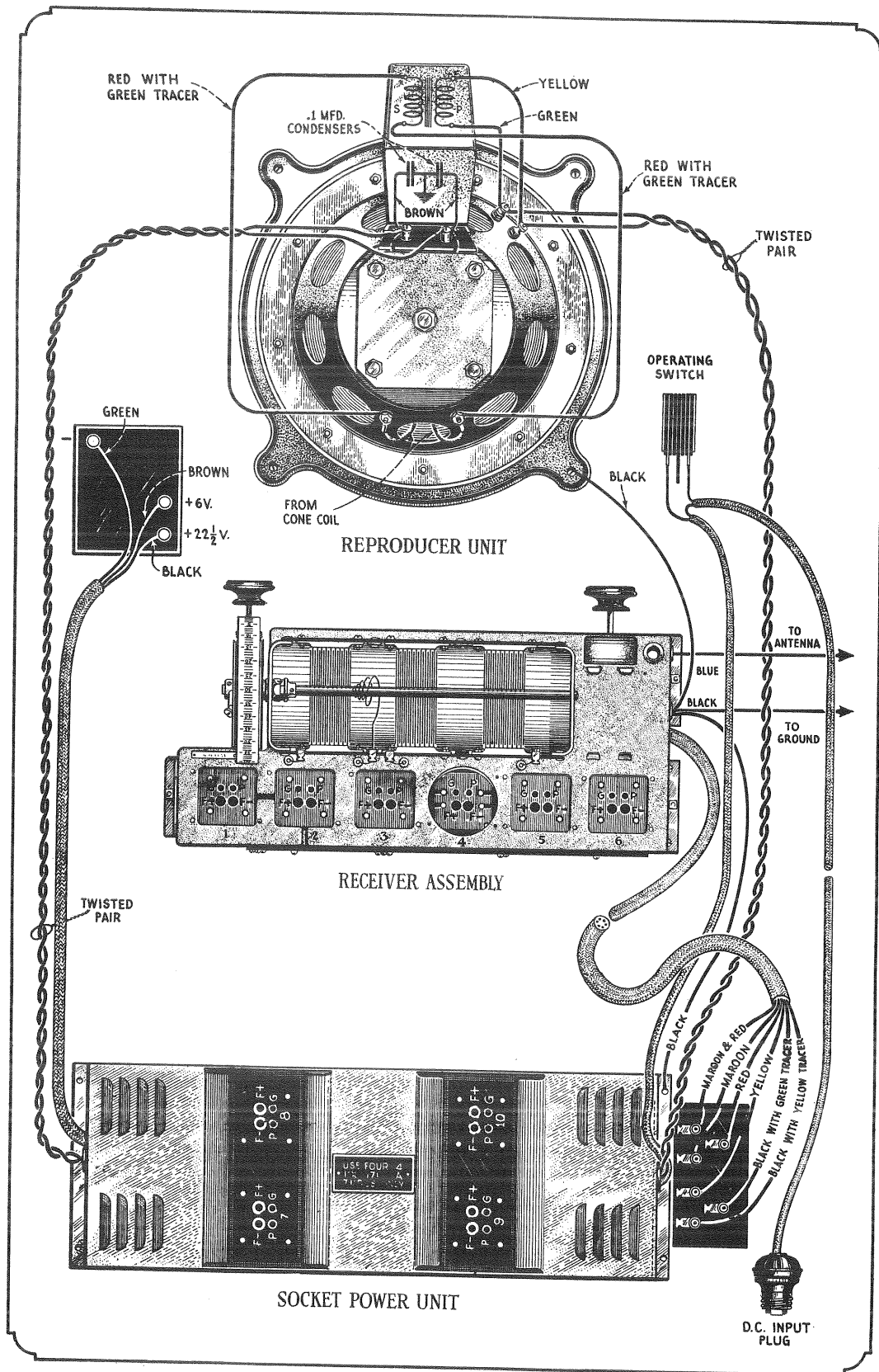


Figure 6—Complete layout and connections of reproducer, receiver and socket power unit

- (b) Shorted 2 mfd. condenser. A shorted 2 mfd. condenser will cause the wrong "C" bias to be applied to one tube and may damage the tube if operated very long. Replace the condenser and replace the Radiotron if it has been damaged.
- (c) Defective or open grid resistor in S.P.U. This will damage one of the Radiotrons because of improper grid bias and result in distorted output.

PART III—ELECTRICAL TESTS

[1] VOLTAGE READINGS

When checking Radiola 41 D.C. for possible defects, it is good practice to check the voltage of the various sources of current. To do this a service man should use a good D.C. voltmeter, preferably of the high resistance type. The following voltages at the S.P.U. terminal strip are correct for the particular line voltage noted (120 volts) with all Radiotrons in operating condition and in their correct positions. The terminals are indicated in Figures 5 and 8.

TERMINAL VOLTAGES

120-Volt D. C. Line

<i>Terminals</i>	<i>Voltage</i>
A— to A+	35
A+ to B+ Det.	5
A+ to B+ Amp.	21

If it is desired to check the voltages at the individual sockets the following readings are correct. The readings are taken with a Weston Model 537, Type 2, test set or others giving similar readings.

RADIOTRON SOCKET VOLTAGES

120-Volt D. C. Line

<i>Tube No.</i>	<i>+Filament to Grid Volts</i>	<i>Filament to Plate Volts</i>	<i>Plate Current Milliamperes</i>	<i>Filament Voltage</i>
1	4.2	22	1.5	4.3
2	4.1	26	2.0	4.4
3	4.2	31	2.4	4.5
4	4.0	15	1.0	4.6
5	10.0	95	6.0	4.8
6	10.0	100	7.0	5.0
9	27.0	100	6.5	4.8
10	4.0	95	6.5	5.0
7	27.0	100	7.0	5.0
8	4.0	95	6.5	5.0

The grid voltages given are not those under which the tubes operate, due to the necessity of reading them from one side of the filament. Also those taken on the two tubes, Nos. 8 and 10, that are biased through .5 megohm resistors are low, due to the drop across the resistor caused by the load of the meter. Actually these tubes receive the same bias as the others in the S.P.U.

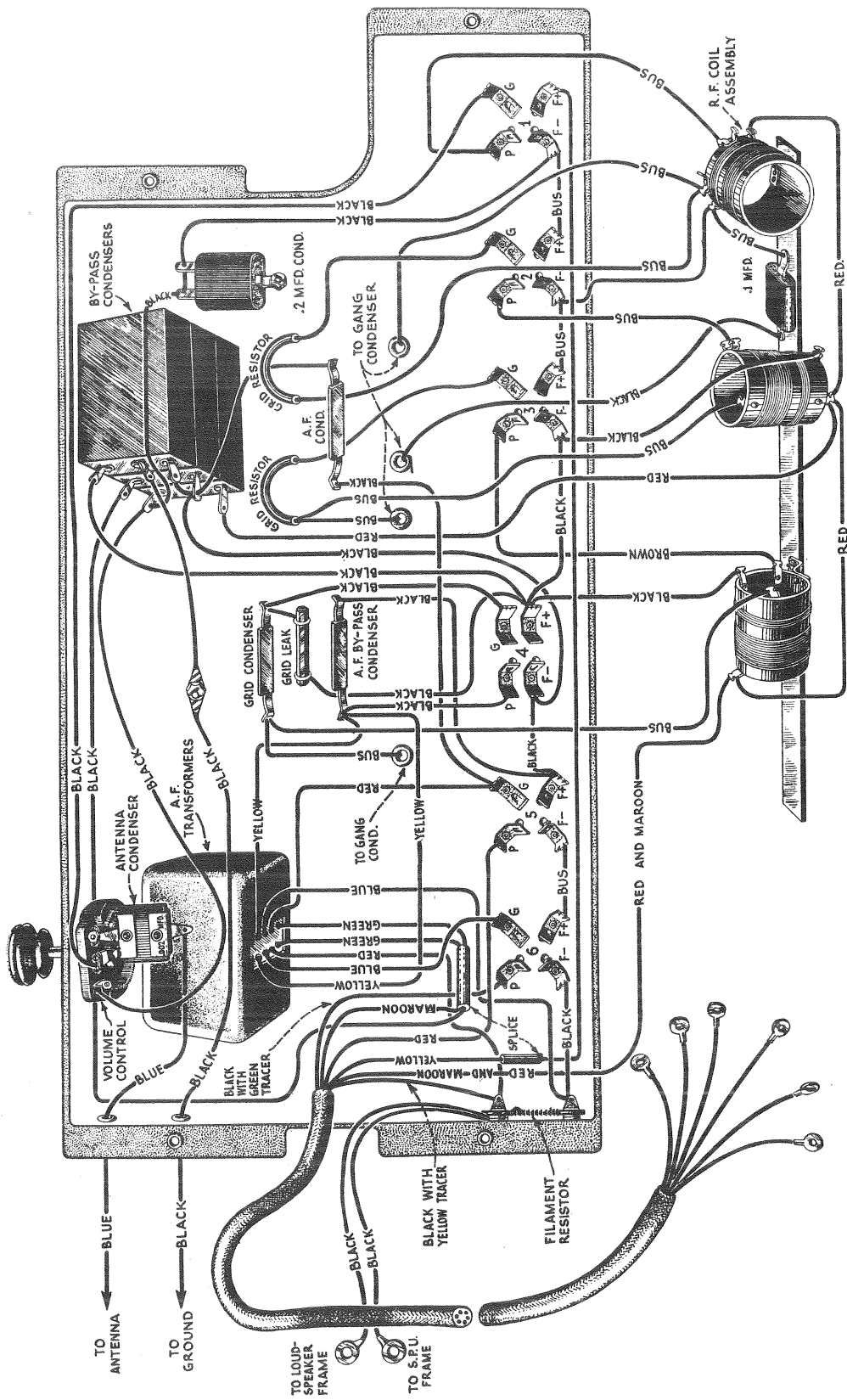


Figure 7—Wiring diagram of receiver assembly

[2] RADIOLA 41 D. C. CONTINUITY TESTS

The following tests will show complete continuity for the receiver assembly and the socket power unit of Radiola 41 D.C. See Figures 7 and 8 for wiring diagrams. All Radiotrons should be removed, the S.P.U. released from the bottom of the cabinet, and the receiver cable released from the S.P.U. Also release all other cables from the S.P.U. and receiver assembly and the antenna and ground leads from their respective connections. See Figure 6 for socket numbers and terminal board and cable designations.

RECEIVER ASSEMBLY CONTINUITY TESTS			
<i>Circuit</i>	<i>Terminals</i>	<i>Correct Effect</i>	<i>Incorrect Effect Caused by</i>
Grid	G1 to antenna lead	Open	Shorted antenna condenser
	G1 to ground lead	Open	Shorted .2 mfd. condenser
	G1 to —F1	Closed	Open volume control
	G2 to —F2	Closed	Open grid resistor or secondary of 1st R.F. transformer
	—F2 to frame	Open	Shorted .1 mfd. condenser
	G3 to —F3	Closed	Open grid resistance or secondary of 2nd R.F. transformer
	—F3 to frame	Open	Shorted .5 mfd. condenser
	Stator condenser No. 3 to +F4	Closed	Open secondary of 3rd R.F. transformer
	—F4 to frame	Open	Shorted 5 mfd. condenser
	G5 to —F6	Closed	Open secondary of 1st A.F. input transformer
Plate	G6 to —A (Black with yellow tracer)	Closed	Open secondary of 2nd A.F. input transformer
	P1 to B+ Amp. (Maroon and red)	Closed	Open primary of 1st R.F. transformer
	P2 to B+ Amp. (Maroon and red)	Closed	Open primary of 2nd R.F. transformer
	P3 to B+ Amp. (Maroon and red)	Closed	Open primary of 3rd R.F. transformer
	P4 to B+ Det. (Maroon)	Closed	Open primary of 1st and 2nd A.F. input transformers
	P5 to one output terminal (Red)	Closed	Open connection
	P6 to other output terminal (Black with green tracer)	Closed	Open connection
Filament	A+ (Black with yellow tracer) to +F1	Closed	Open connection
	—F1 to +F2	Closed	Open connection
	—F2 to +F3	Closed	Open connection
	—F3 to +F4	Closed	Open connection
	—F4 to +F5	Closed	Open connection
	—F5 to +F6	Closed	Open connection
	—F6 to —A (Yellow)	Closed	Open filament resistor
Miscellaneous	B+ Amp. (Maroon and red) to frame	Open	Shorted .5 mfd. condenser
	+F4 to B+ Det.	Open	Shorted 1 mfd. condenser
	P4 to —F4	Open	Shorted .0012 mfd. condenser
	G5 to +F4	Open	Shorted .00016 mfd. condenser

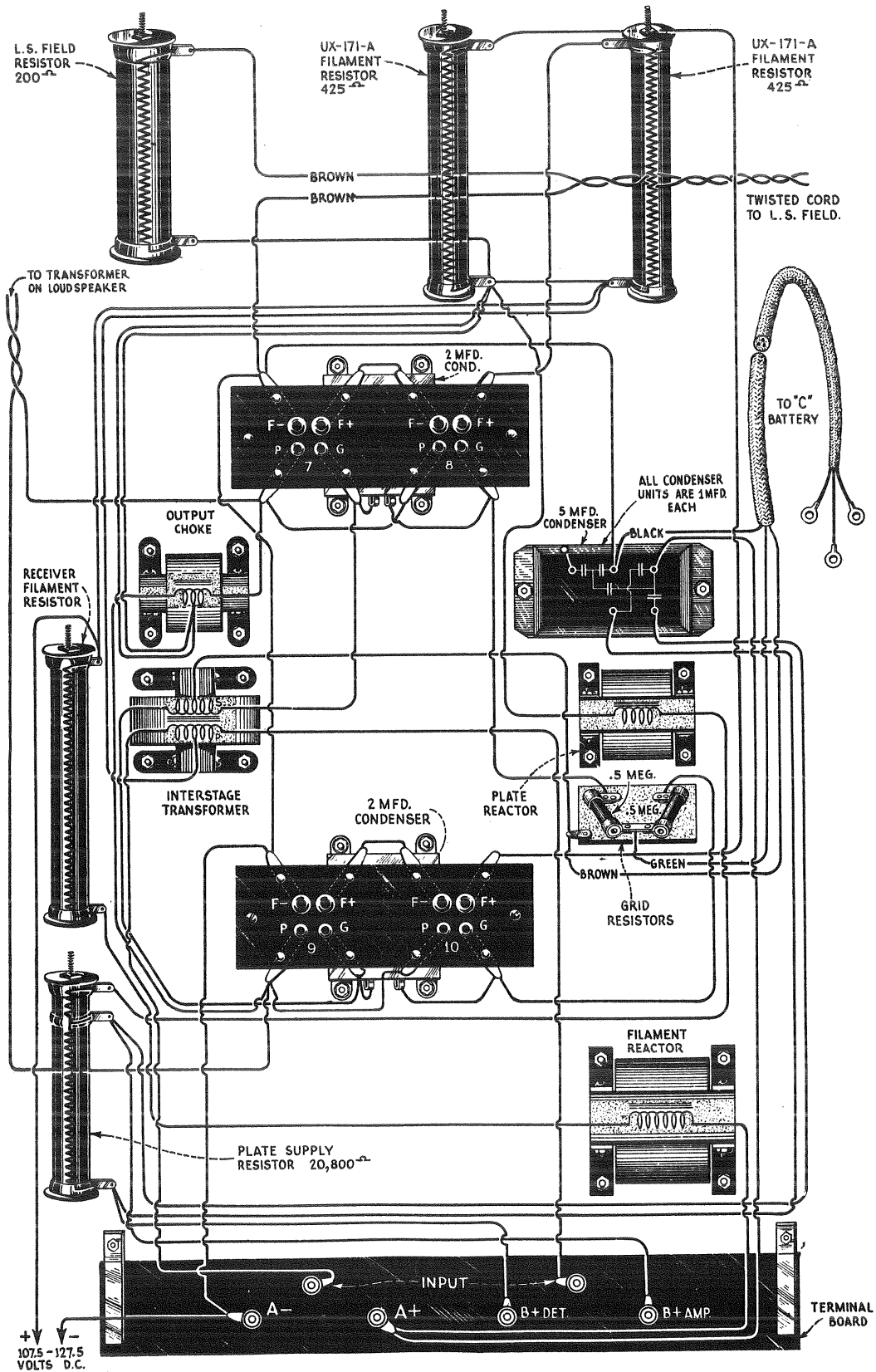


Figure 8—Wiring diagram of socket power unit

S. P. U. CONTINUITY TESTS

<i>Circuit</i>	<i>Terminals</i>	<i>Correct Effect</i>	<i>Incorrect Effect Caused by</i>
S.P.U.	Across input terminals	Closed	Open primary of interstage transformer
	G7 to G9	Closed	Open secondary of interstage transformer
	G7 to G8	Open	Shorted 2 mfd. condenser
	G9 to G10	Open	Shorted 2 mfd. condenser
	C—22½ (Green) to G8	Closed (Weak)	Open .5 meg. resistor
	C—22½ (Green) to G10	Closed (Weak)	Open .5 meg. resistor
	P8 to P10	Closed	Open primary of output transformer and output choke
	Disconnect connections to cone coil on L.S. and test across cone coil	Closed	Open cone coil
	Test across leads connected to cone coil terminals	Closed	Open secondary of output transformer
	Test across two terminals or bakelite strip	Closed	Open field coil
	Test across D.C. input plug	Closed	Open field coil or field resistance in S.P.U.
	+ of D.C. input plug to B+ Det. (Disconnect field)	Closed	Open plate reactor or plate resistor
+ of D.C. input plug to A+ (Disconnect field)	Closed	Open filament reactor or filament resistor	

The condensers may be tested by click testing or charging and noting their ability to retain the charge. This can be done by removing the S.P.U. cover and disconnecting one lead to the condenser to be tested. The internal connections of the condensers are shown in Figure 8.

MAKING REPLACEMENTS

The various assemblies and parts of Radiola 41 (D.C.) are readily accessible and replacements are easily made.

The reproducer unit, receiver assembly and socket power unit are removable individually after the cable connections to the other units are disconnected and the cabinet mounting screws are released.

A suitable place should be provided in advance for working on the unit to be removed so that the cabinet will not become marred nor any further damage occur to the apparatus when making a replacement.

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. For further detailed information refer to the text of "Service Notes."

<i>Indication</i>	<i>Cause</i>	<i>Remedy</i>
No Signals	Defective operating switch Loose volume control arm Defective power cable Defective R. F. transformer Defective A. F. transformer Defective By-pass condenser Defective socket power unit Open grid resistor Open cone coil of reproducer unit Grounded input terminals to loudspeaker Socket plug position	Repair or replace switch Tighten volume control arm Replace power cable, Replace R. F. transformer assembly Replace A. F. transformer assembly Replace By-pass condenser Check socket power unit by means of continuity test and make any repairs or replacements necessary Replace grid resistor Check cone coil—if open replace cone Check for grounds Reverse socket plug
Weak Signals	Defective power cable Defective R. F. transformer Defective A. F. transformer Dirty Radiotron prongs Defective By-pass condenser Defective main tuning condensers Defective output transformer Defective socket power unit	Repair or replace cable Replace R. F. transformer assembly Replace A. F. transformer assembly Clean prongs with fine sandpaper Replace defective By-pass condenser Replace defective tuning condensers Replace defective transformer Check socket power unit by means of continuity test and make any repairs or replacements necessary
Poor Quality	Defective A. F. transformer Defective output transformer Defective By-pass condenser Dirty contact arm of volume control Dirty prongs on Radiotrons	Replace A. F. transformer assembly Replace output transformer Replace defective By-pass condenser Clean contact arm on volume control Clean prongs with fine sandpaper
Howling	Defect in audio system Open grid circuit in any stage Microphonic Radiotrons	Check and repair any defect Check circuits and repair defect Interchange Radiotrons
Radiotrons fail to light	Operating switch not "On" Defective operating switch Defective input D. C. cord No. D. C. line voltage	Turn operating switch "On" Replace operating switch Repair or replace D. C. input cord Turn D. C. line voltage "On"