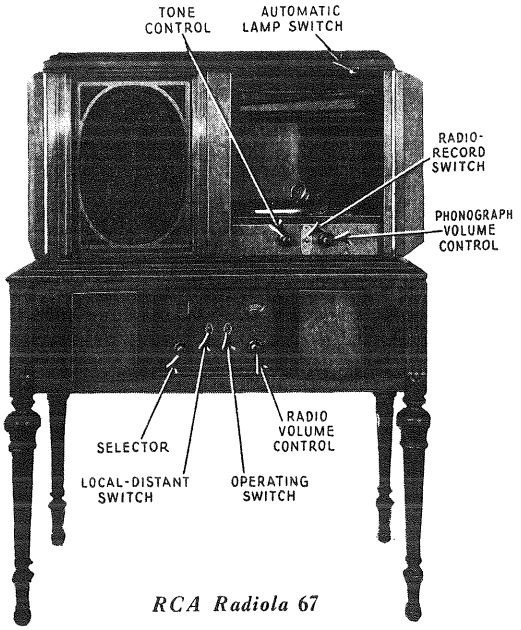
RCA
Radiola 67

SERVICE NOTES



RCA Radiola 67

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RADIO-VICTOR CORPORATION OF AMERICA

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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 Department 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 Department 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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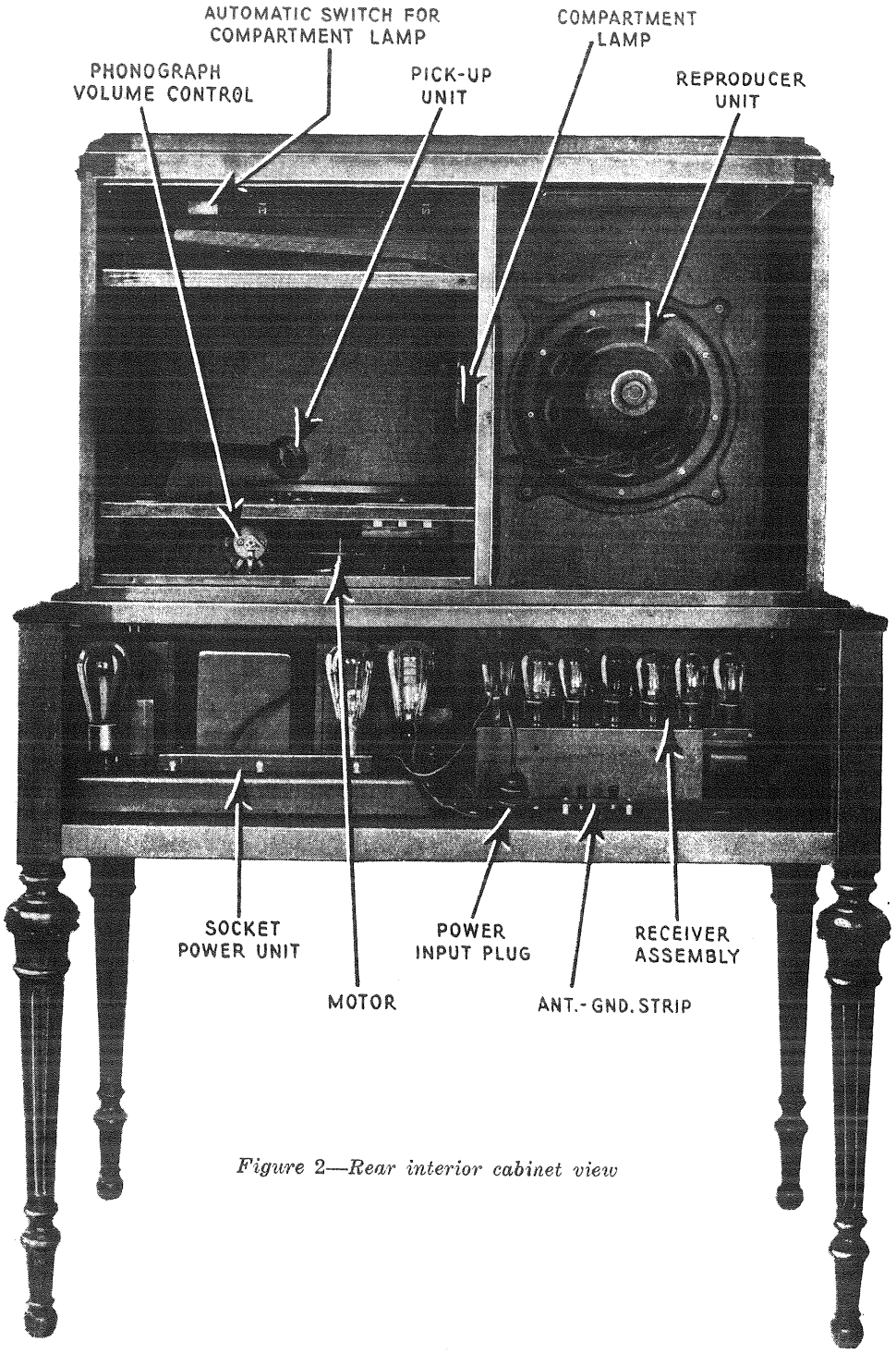

Figure 2—Rear interior cabinet view

RCA RADIOLA 67

Service Notes

Prepared by RCA Service Department

ELECTRICAL SPECIFICATIONS

Rating .....Voltage, 105 to 125 volts—Frequency 50 to 60 cycles
Rating (Also Available).....Voltage, 200 to 250 volts—Frequency 50 to 60 cycles
Rating (Also Available).....Voltage, 105 to 125 volts—Frequency 25 to 40 cycles
Power Consumption .....335 watts (total)
Power Consumption of Phonograph Motor.....35 watts
Power Consumption of Phonograph Compartment Lamp.....15 watts
Recommended Antenna Length.....30 to 60 feet
Type of Circuit.....Superheterodyne with Automatic Volume Control
Types and Number of Radiotrons..... UY-227—7
..... UX-250—1
..... UX-281—2
Number of Radio Frequency Stages..... 1
Type of First Detector.....Tuned Input (Grid Bias)
Number of Intermediate Frequency Stages..... 2
Type of Second Detector.....Power (Grid Bias)
Number of Audio Stages—Radio..... 1
—Phonograph..... 2
Type of Rectifier .....Full Wave
Type of Loudspeaker ..... Dynamic
Type of Loudspeaker Field.....Series 100-volt, 100 M.A.
Type of Phonograph Pick-up.....Flexible—Low Impedance—Needle Diameter .035 to .070 inches
Type of Phonograph Motor.....Induction Disc

PHYSICAL SPECIFICATIONS

Height ..... 56 inches
Depth ..... 21 inches
Width .....40 ½ inches
Weight (Receiver complete with phonograph ready for operation)..... 225 pounds
Weight (Packed for Shipping)..... 375 pounds
Packing case dimensions.....24 in. x 46½ in. x 60½ in.

INTRODUCTION

The Radiola 67 is a combination electric phonograph and sensitive superheterodyne receiver designed to be energized from an AC house lighting supply. It is housed in a walnut console cabinet embellished with burl maple panels and rosewood trimmings. The instrument is entirely self-contained except for the power supply cord, ground and antenna, which should be a single-wire indoor or outdoor type from 30 to 60 feet in length.

The radio receiver, although fundamentally similar to the Radiola 64, has several new features and improvements. The automatic volume control and resonance indicator are retained, but visual tuning is facilitated by the addition of a "silent tuning switch" which is actuated by pressing inward on the station selector knob. The intermediate frequency transformers (shown in Figure 9) have been improved electrically by incorporating shunt resistors in the primary circuits which makes it possible to

preserve the advantage of critical coupling under all conditions and thus eliminate the possibility of "double -peak" tuning. The increased plate voltage at the second detector provides—even with signals having low percentage modulation—sufficient audio excitation to load the UX-250 power Radiotron. The plate voltage now applied to the UX-250 although increased only 12 per cent as compared with the Radiola 64, augments the maximum undistorted power output of this stage by 40 per cent making available a sound volume well in excess of normal requirements.

No specific mention above has been made of the following electrical and mechanical improvements which were first incorporated in the Radiola 66 and which have been retained in this model:

(a) Local-distant switch
(b) Use of "Isolantite" mounting in I. F. transformers, R. F. compensating condenser, and oscillator trimming condensers
(c) Improved accessibility of I. F. adjustments
(d) Electrostatic shield between R. F. gang tuning condensers
(e) Projection type of dial scale with kilocycle marking
(f) Use of 175 K. C. for mid-band I. F. frequency.

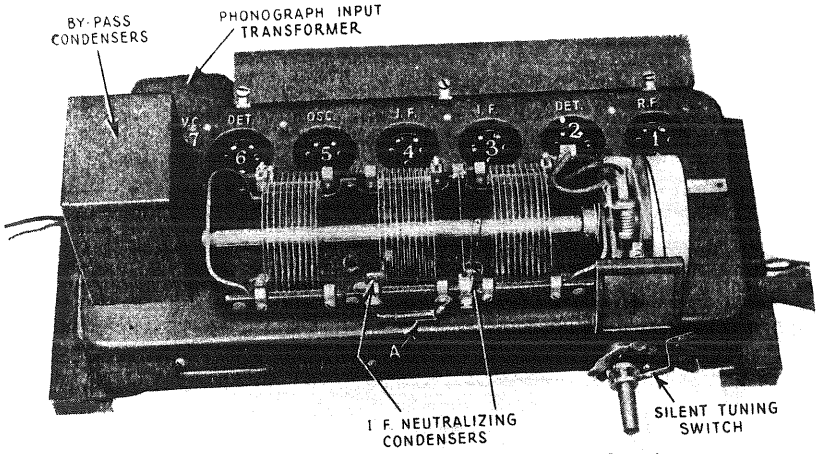

Figure 3—Top view of receiver chassis

The tone quality control—the knob of which is indicated in the cover illustration—provides for tone balance of both the radio and phonograph output and permits the operator who has a preference for low tones to accentuate the bass register by rotating the control knob in a counter-clockwise direction. In the extreme clockwise position the tone quality control circuit is open and normal reproduction with natural high-pitched tones and overtones is achieved.

A simple and easily operated means of transition from broadcast to phonograph reproduction is provided by the "Radio-Record" switch which is of the double-throw, telephone key-type, arranged to lock in either position. For phonograph reproduction the switch is thrown to the "Record" position which connects the pick-up impedance matching transformer to the grid of the second detector, simultaneously reducing the bias so that this tube acts as an audio amplifier. At the same time, the bias of the volume control tube is reduced which results in cutting off the plate current flow in the radio and intermediate frequency amplifier Radiotrons rendering the receiver inoperative. In the "Radio" position, the phonograph transformer secondary is short-circuited and the proper bias voltages are provided for receiver operation.

The phonograph is driven by an induction-disc motor controlled by a fly-ball governor. The rugged mechanical construction of the phonograph motor and the simplicity of the motor circuit reduce the service requirements of this unit to a minimum. The motor switch may be operated manually, but provision is also made to open the motor supply circuit automatically and apply a friction brake to the turntable at the finish of the record—if eccentrically grooved (Victor) records are used.

The phonograph pick-up represents the latest advance in the art. The low impedance coil design with the balanced type armature results in substantially uniform reproduction of all frequencies. The flexible mounting reduces needle pressure and decreases record wear.

An added convenience is provided in the phonograph compartment lamp which is automatically switched on when the doors of this compartment are opened.

Frequent reference will be made to Service Notes covering Radiola 64 and Radiola 66, as many of the adjustments necessary in servicing the Radiola 67 have been covered in detail therein. Also, a thorough description of the mechanical details of the phonograph will be found in the Radiola 47 Service Notes.

The Radiola 67 Service Notes can be applied in their entirety to the 200 to 250-volt (60 cycle) model of this set, inasmuch as this model differs from standard only in the primary of the power transformer.

The 25 to 40 cycle (105 to 125-volt) set has certain changes in the socket power unit which are explained in detail on page 11. With the additional information there noted this book will apply fully to the "25 cycle" Model 67.

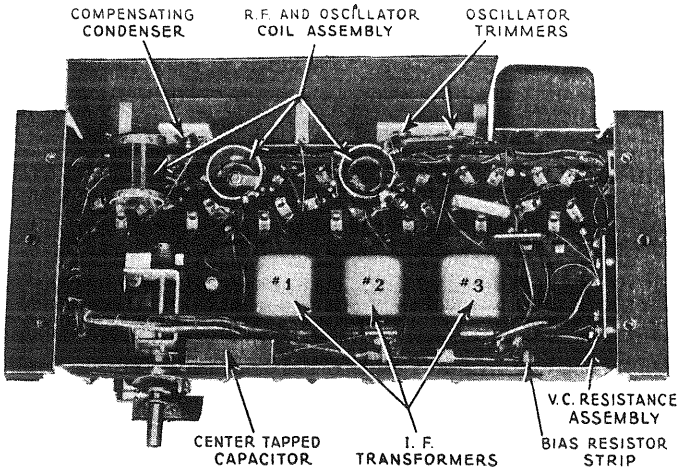

Figure 4—Sub-chassis view of receiver

PART I—INSTALLATION

Information covering the unpacking and setting up of the Radiola 67 is given in the Instruction Book which accompanies the set.

Particular emphasis, however, should be laid on the following:

(a) Care should be used in removing the set from the packing case and in moving it about on the floor. It should be lifted bodily rather than slid along the floor where the legs might catch in crevices or obstructions. Although the legs will support the weight of the set with a reasonable factor of safety, they must not be carelessly subjected to bending stresses.

(b) In addition to removing the wooden cradle, reproducer "U" clamp and block, and receiver chassis blocks, the paper wedges must be removed from the phonograph motor.

(1) KNOBS

The Station Selector Knob is secured to the shaft by means of a set-screw. This must be loosened or removed before attempting to pull off the knob. Failure to observe this precaution may result in damage to the flexible drive mechanism.

The remaining three wooden knobs are of the "push-pull" type and can be pulled off readily.

(2) ANTENNA (Indoor or Outdoor)

Refer to R-66 Service Notes, pp. 8—9

Note. Under certain conditions of noise pick-up, it has been recommended that copper braid be placed over the lead-in. Lead-in wire covered with metallic braid is now available in the market (see July "Town Crier," vol. VII, No. 10, p. 15).

(3) GROUND

Refer to R-66 Service Notes p. 10.

(4) RADIOTRONS

Figure 5 shows diagrammatically the Radiotron sequence in the Radiola 67. Information concerning the selection of Radiotrons for the various sockets is given in the R-66 Service Notes pp. 10-11. It should be noted further that a low emission UX-250 Radiotron will produce weak signals and distortion. Occasionally a low emission or very gassy UX-250 tube will cause a "popping" sound in the reproducer which in extreme cases may damage the cone.

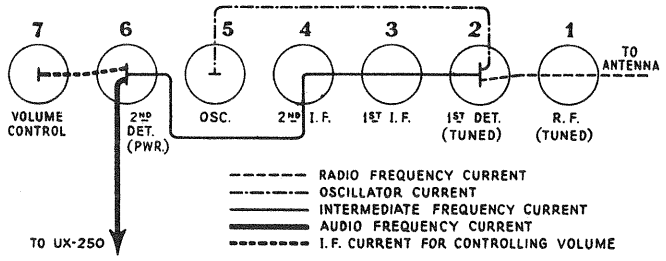

Figure 5—Radiotron sequence

(5) RECEIVING STRONG LOCAL STATIONS

Refer to R-66 Service Notes p. 11.

(6) "LOCAL-DISTANT" SWITCH

Refer to R-66 Service Notes p. 12.

(7) LOW LINE VOLTAGE ADJUSTMENT

Refer to R-64 Service Notes p. 10.

(8) JERKY ACTION OF SELECTOR

Refer to R-66 Service Notes p. 12.

(9) PILOT LAMP INSTALLATION

Refer to R-66 Service Notes pp. 12-13.

(10) PHONOGRAPH

Refer to R-47 Service Notes.

PART II—SERVICE DATA

(1) ANTENNA SYSTEM FAILURES

Refer to Radiola 66 Service Notes, p. 14.

(2) RADIOTRON SOCKETS AND PRONGS

Refer to Radiola 66 Service Notes, p. 14.

(3) BROKEN CONDENSER DRIVE CORD

Refer to Radiola 66 Service Notes, pp. 14-15.

(4) NO SIGNAL, OR LOW VOLUME

The trouble may be due to a poor contact in the "Radio-Record" switch or in the "Silent Tuning Switch" (See Par. 6 below). These switches should be operated a few times in an effort to restore the electrical contact; this failing, the switches should be inspected for mechanical defects or broken connections.

For routine tests and data, refer to Radiola 66 Service Notes pp. 15-16.

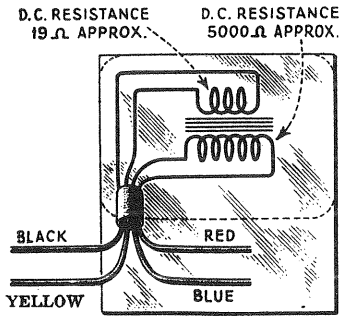

Figure 6—Internal connections of phonograph input transformer

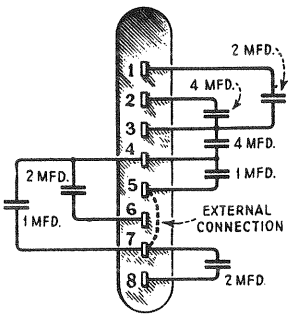

Figure 7—Internal connections of SPU filter condensers

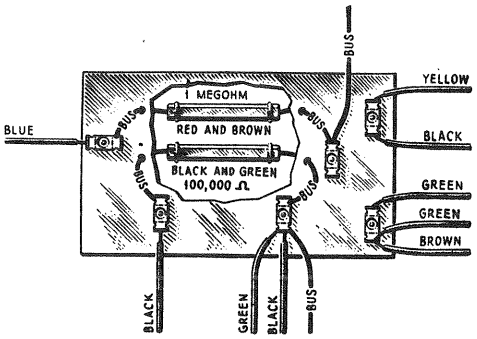

Figure 8—Connections of volume control resistors

(5) HUM OR HOWL (Audio or Acoustic)

Refer to Radiola 66 Service Notes, pp. 16-17-18.

It should be noted also that the filter reactor (indicated in Figure 15) has a definite polarity which depends on the direction of winding in the audio transformers. This reactor is properly connected at the factory, but should either an audio transformer or reactor become defective, there is a possibility that the replacement unit may be wound in the reverse direction. If hum is noted, it is only necessary to reverse the leads (black and green), at the reactor. It is recommended that the receiver be placed in operation and a listening test made before the S. P. U. is secured to the cabinet.

(6) "SILENT TUNING" SWITCH

This switch is operated—as noted in the Introduction—by pressing inward on the Station Selector Knob. Its purpose is to prevent an increase in noise level during tuning intervals between stations—the noise would otherwise be increased due to the action of the automatic volume control. It also provides a means of reducing the sound volume to a whisper and thus direct the attention of the operator to the use of the resonance indicator in tuning. Because of the action of the Automatic Volume Control, aural tuning of the Radiola 67 is not recommended as it is virtually impossible to secure the optimum adjustment by ear.

At first sight, it may appear from an inspection of the schematic circuit diagram, which reveals that this switch operates electrically by short-circuiting the voice coil of the reproducer, that its use would result in zero sound output. This is not the case, however, since the switch points and current path—lead and chassis ground return—have a resistance which—though low—is still appreciable in comparison to that of the voice coil.

The mechanical construction of the switch is such that the Station Selector Knob will return outward to its normal position when released, allowing the switch contacts to open. Friction developing in the switch mechanism due to foreign matter or other causes may prevent the contacts from opening, resulting in signals of low volume.

(7) ADJUSTMENT OF R. F. COMPENSATING CONDENSER, OSCILLATING TRIMMING CONDENSERS, and I. F. TUNING and NEUTRALIZING CONDENSERS.

Refer to Radiola 66 Service Notes, pp. 18-19-20-21-22.

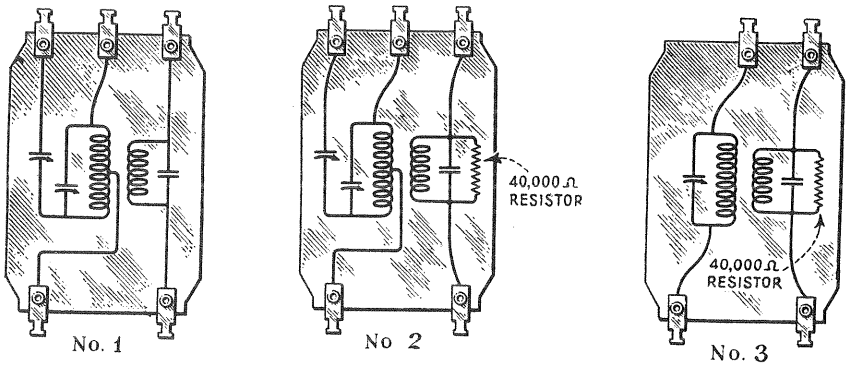

Figure 9—Internal connections of I. F. transformers

It should be noted that the automatic volume control will operate to defeat accurate adjustments unless the volume control potentiometer is in the maximum or extreme clock-wise position. In making adjustments of the oscillator trimming condensers or I. F. transformer tuning condensers, it is recommended that the "Local-Distant" switch be put in the "Distant" position and the Antenna-Ground binding posts be short circuited with a short piece of wire. The coupling lead or coil from the test oscillator should be brought just close enough to give a good readable deflection of the test-set resonance indicating meter. In tuning the intermediate transformers, the volume control tube should NOT be removed as its effective grid-to-cathode capacity—which is by no means negligible in comparison with the total capacity in the third I. F. transformer secondary circuit—affects the adjustment of this stage.

(8) DISTORTED REPRODUCTION

Refer to Radiola 66 Service Notes, p. 18.

This effect may also be caused by a defective output coupling device (see Figure 20). The continuity of the reactor (Terminals 1 and 2), and of the output winding of the transformer (Terminals 4 and 5) should be checked. If these are O. K. the 2 mfd. condenser should be tested by connecting a D.C. voltmeter (0—150 volt scale) in series with a 90-volt "B" battery to Terminals 2 and 3. The voltmeter should read zero after giving a slight kick; a steady reading indicates a shorted condenser.

If radio signals have a pronounced "flutter," the condensers in the receiver chassis condenser pack (See Figure 12) should be tested by the method described in Part III, Section 4.

If the reproduction is faulty only when the phonograph is in operation, an inspection of the phonograph volume control resistor should be made to determine whether the movable arm is making proper contact—the location of this unit is indicated in Figure 1. The contacts of the "Radio-Record" Switch should also be examined. A continuity test of the phonograph input transformer (See Fig. 3 for location) should be made.

Internal connections and approximate D.C. resistance values are indicated in Figure 6.

If none of the above units are faulty, the pick-up should be examined or an O. K. pick-up substituted for the one under suspicion. Methods for testing and adjusting the pick-up are covered fully in the Radiola 47 Service Notes.

A soft iron keeper should be placed across the poles of the pick-up permanent magnet before its removal. Failure to observe this precaution, will result in a loss of magneto-motive force which will impair the sensitivity of the unit.

(9) 25-40 CYCLE RADIOLA 67

This model differs from the 50-60-cycle set in four details:

(a) A 25-40 cycle power transformer is used. The voltages and position of the terminals are standard, however.

(b) A 25-40 cycle motor is used in the phonograph. Information pertaining to the service of the 50-60 cycle motor (See Radiola 47 Service Notes) applies without modification to this unit.

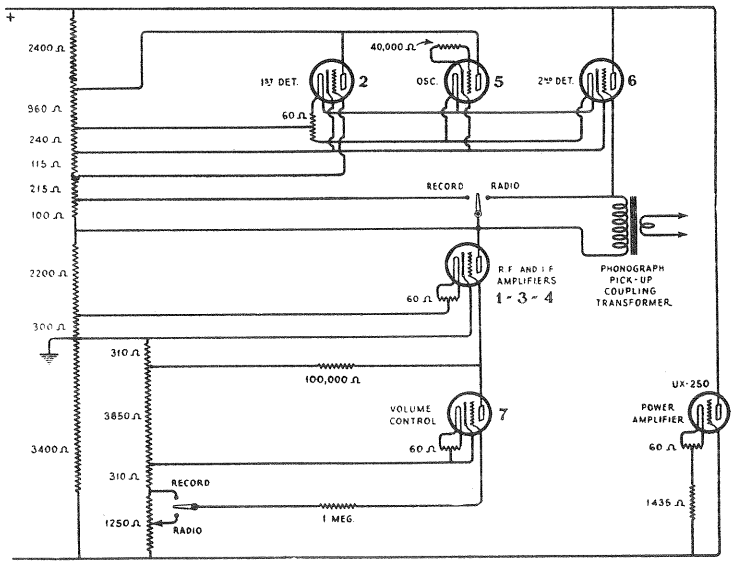

Figure 10—*Schematic circuit diagram of voltage supply system*

(c) A 1 mfd. condenser—contained in can affixed to vertical cabinet partition—is connected in parallel to the first (2 mfd.) filter condenser.

(d) A 3 mfd. condenser—contained in can referred to in Paragraph (c)— is connected from the mid-point (arm) of the UX-250 filament potentiometer to the high side of the reproducer field coil.

In servicing the SPU of a 25-40 cycle Model Radiola 67, it is recommended that the two additional condensers just described be disconnected at the SPU capacitor pack and tested. Radiola 67 (50-60 cycle) Service Notes and wiring diagrams will then apply in their entirety.

In reconnecting, it should be noted that the green and black leads from the external 1 mfd. condenser (See Paragraph (c) Section 9) should be connected to Terminals 1 and 3, respectively, of the SPU capacitor pack (See Figure 23). Also the black and yellow leads from the external 3 mfd. condenser (See Paragraph (d), Section 9) should be connected to Terminals 3 and 6, respectively of the SPU capacitor pack. There is only one black lead to the two external condensers and it is common to both.

SERVICE DATA CHART

Referring to Radio Reception

Indication	Cause	Remedy
No Reproduction	Defective Radiotrons	Replace with O.K. tubes
	No supply voltage	Examine fuses and power supply cord
	Defective operating switch	Replace
	" Radio-record switch	Clean contacts. Replace if necessary
	Silent tuning switch (stuck or defective)	Free by pulling forward on selector knob. Replace if defective
	Shorted condenser (plate to cathode No. 2 detector)	Replace
	Shorted condenser in oufput coupling device	Replace. (See page 23) Sec. 8
	Defective vol. control or No. 7 Radiotron	Test by removing tube No. 7. Replace defective unit
	Loose connections at SPU terminal strip	Tighten
	Defective parts in SPU, receiver or reproducer	Check by continuity tests and replace the defective part.
Low Volume	Defective or inadequate antenna	See R-66 Service Notes, p. 14
	Defective "local-distant" switch	Replace. See R-66 Service Notes, p. 12
	Defective Radiotrons	Replace
	R. F. compensating condenser out of adjustment	Adjust. See R-66 Service Notes, p. 18
	I. F. tuning condensers out of adjustment	Retune and re-neutralize. See Part II, Sec. 7
	Low voltages at sockets or terminal strip	Check using tables, p. 18. Locate defective part by continuity test and replace
	Shorted 0.002 mfd. condenser in tone control	Check by rotating ½ megohm variable resistor to extreme clockwise position which opens circuit. Replace defective condenser (located across terminals of A.F. input transformer).
	Bathtub condensers out of line	Align. See R-66 Service Notes, pp. 22 and 23
	Silent tuning switch stuck	Check by pulling forward on Station Selector Knob. Replace mechanism, if defective

SERVICE DATA CHART—Continued

Referring to Radio Reception

Indication	Cause	Remedy
Low Vol.	Oscillator trimming condensers out of adjustment	Adjust. See Part II, Sec. 7
	Open or shorted parts	Check by continuity tests, pp. 25-34, and repair or replace
Distorted Reproduction	Defective Radiotrons	Replace
	Improper voltages at Radiotron sockets	Check voltages (See tables, p. 19) Isolate trouble by continuity tests
	Oscillator trimming condensers out of adjustment	Adjust. See Part II, Sec. 7
	Oscillation in R.F. or I.F. stages	See Part II, Sec. 7
	I.F. transformers out of alignment	See Part II, Sec. 7
	Defective audio input transformer	See text, p. 22. Replace, if defective
	Defective output coupling device	See text, p. 23. Replace, if defective
	Shorted cone coil	Check DC resistance (approx. 11 ohms) Replace cone if defective
	Cone out of center	Adjust. See R-66 Service Notes, p. 24
	Open or leaky condensers in capacitor packs	Test (See text, p. 20). Replace if defective
	Defective connections or parts	Check by continuity tests
	Heterodyne due to interfering signal	Try local position of Local-Distant Switch
Hum	Defective Radiotrons	Replace
	Open or shorted center-tapped fixed resistors	Repair or replace
	Hum suppressor out of adjustment	Adjust. See R-64 Service Notes, p. 11
	Low-emission UX-281	Replace
	Open by-pass or filter condensers	Test and replace. See text, p. 20
	Shorted filter reactor (or reversed polarity)	Test and replace. See text, p. 22.

SERVICE DATA CHART—Continued

Referring to Radio Reception

Indication	Cause	Remedy
Hum	Open chassis grounds	Check from diagrams pp. 26, 28, 32
	Interference from external arcing ground	Try local position of Local-Distant Switch
	Grounded pilot lamp socket	Clear ground
	Loose laminations in power transformer	See R-66 Service Notes, page 16
Acoustic Howl	Failure to remove shipping blocks	Remove and check rubber mounting in receiver assembly
	Microphonic Radiotrons	Interchange tubes
Audio Howl	Poorly soldered or corroded joints	Clean and re-solder
	Open by-pass condenser or ground connection	Check connections
	R.F. or I.F. oscillation	See Part II, Sec. 7
	Heterodyne from interfering radio signal	Try local position of Local-Distant Switch
	If the radio receiver and associated audio system operate normally, but throwing the Radio-Record Switch to the "Record" position results in unsatisfactory phonograph reproduction, the following charts will be found helpful in diagnosing the trouble.	
Referring to Phonograph Reproduction		
No Reproduction	Poor contact or broken connections in Radio-Record Switch	Check connections and clean contact points
	Open connection of volume control	Repair
	Defective winding in phonograph input audio transformer	Check resistance of windings. See Figure 6, p. 9.

MAGNETIC PICK-UP SERVICE DATA CHART

Indication	Cause	Remedy
No Reproduction	Poor volume control contact between arm and resistance	Clean volume control resistance with a pipe cleaner and any of the various cigarette lighter fluids
	Open or shorted pick-up coil or connections	Repair any loose connections by resoldering or replace an open coil as described in Part III, Section 3, R-47 S. Notes
Weak or Distorted Reproduction	Loose needle	Tighten needle in socket with needle set screw
	Dirty contact in volume control	Clean volume control resistance and contact arm
	Armature out of adjustment	Center armature as described in Part III, Section 1, R-47 S. Notes
	Defective rubber damping block or pivot supports	Replace rubber damping block and pivot supports as described in Part III, Section 2, R-47 S. Notes
	Dirt in armature air gap	Clean all dirt from air gap by means of a blower or disassemble pick-up and clean. Remove rust from armature if necessary.
	Weak magnet	Remagnetize magnet by taking to magneto repair shop. Place keeper across pole faces until magnet is again in place in the pick-up. Making repairs without placing a keeper on the magnet is the easiest way of having the magnet lose its magnetism.
	Needle holder rattle	If the needle hole of the pick-up cover touches the set screw that holds the needle, a rattle will result. Relocate the cover by shifting the magnet clamp

PHONOGRAPH MOTOR SERVICE DATA CHART

Indication	Cause	Remedy
Failure to run	Operating switch or record switch "off" or defective	Turn switches "On" or repair any defective switches
	No A. C. power at socket outlet	Check with a O-150-V. A. C. voltmeter
	Loose or open connection in the connector cord or plug	Repair any defective connections
	Wrong or open connections of motor coils	Check wiring and make any repairs necessary
	Jammed motor	Rotate turntable by hand with power on. If jammed examine motor and replace or repair part causing jamming
	Shipping blocks not removed	Remove paper blocks between disc and coils use to hold motor during shipment
Motor fails to maintain correct speed	Low line voltage	Check line voltage with a O-150 Volt A. C. voltmeter while motor is running and phonograph is in operation. The voltage must be between 105-125 for proper operation. See Part IV, Sec. 3, R-47 S. Notes
	Improper lubrication	Examine moving parts, bearings and gears. If oil and grease is gummy clean and lubricate as described in Part III, Section 4, R-47 S. Notes
	Motor improperly mounted or jarred in shipping	Loosen the three motor mounting screws and tighten alternately while motor is running. Do not tighten any screw sufficiently to cause binding or slowing down of the motor.
	Worn motor spindle ball bearing	Replace a worn ball bearing
	Weak motor coils	After checking all the above causes and the motor still fails to maintain speed replace one or both of the motor coils as described in Part IV, Section 9, R-47 S. Notes. It is possible for them to test electrically O. K. but be weak in operation
Noisy operation	See R-47 S. Notes, Part IV, Section 6, for the cause and remedy of defects or improper adjustments that may cause noisy operation	
Hum	Loose coils or coil laminations	Tighten screws that hold coil cores together. If this does not correct the hum place a small wooden wedge between inside of coil and core.
	Cabinet hum	Tighten motor mounting screws or replace felt washers between motor and cabinet.

AUTOMATIC STOP SERVICE DATA CHART

Indication	Cause	Remedy
Failure to trip	Loose latch plate	Tighten latch plate screws with plate in correct position (See Fig. 15, R-47 S. Notes)
	Latch trip does not engage latch plate properly	Increase tension on latch trip by cutting off one or more of tension spring coils
	Defective latch plate. If the friction lever swings with the eccentric record groove but the operating lever fails to swing or swings slightly, the latch plate is probably caught in a lever on one of the teeth of the latch plate	Remove all burrs from the latch plate with a piece of emery cloth or a fine file. Also make sure no burrs are on the edge of the latch trip
	If failure to trip is not due to the above causes, bend the lug "A," Figure 15, R-47 S. Notes, on the brake lever away from the brake lever pivot so that there will be a smaller bite between the hand lever and the latch at point "B"	
Premature Tripping	Worn surface	Examine the contact surfaces between the hand lever and the latch (point "B," Figure 15, R-47 S. Notes). These two surfaces must be square, they should be squared with a fine file
	Insufficient tension	If the latch does not strike the latch stop pin "C" (Figure 15, R-47 S. Notes), when the hand lever is pulled to the "On" position, increase the tension of the latch spring or decrease the tension of the latch trip spring
	If the mechanism still trips prematurely after checking the springs and contact surfaces as suggested in the foregoing, bend the lug "A" toward the brake lever pivot so that there will be a larger bite of the hand lever at the point "B" (Figure 15, R-47 S. Notes).	
Brake fails to stop turntable	Worn friction leather, sticky brake	See Part V, Section 1, R-47 S. Notes
Switch Failure	Mal-adjustment of switch	See Part V, Section 2, R-47 S. Notes

PART III—ELECTRICAL TESTS

(1) VOLTAGE SUPPLY SYSTEM

Figure 10 illustrates schematically the resistance network which supplies the proper plate, grid-bias, and cathode-bias voltages to the Radiotrons. The resistances associated with the automatic volume control are also shown (See also Figure 8). (For further detail concerning the operation of the automatic volume control see Radiola 64 Service Notes, p. 24).

(2) VOLTAGE READINGS AT TERMINAL STRIP (SPU)

Contact with the maximum open-circuit—cable off—high voltage available across Terminals 3 and 11 at the terminal strip should be avoided. Also power should NOT be applied to the S.P.U. with reproducer field disconnected.

The column entitled "Cable Connected and Tubes Lighted" in the appended table gives the terminal voltages under actual operating conditions.

The column entitled "Cable Off" gives the open circuit voltages. If these check reasonably well, it is a good indication that the S.P.U. is O.K., except possibly for excessive hum or high resistance joints caused by corrosion or poor soldering.

If the "Cable Off" voltages are normal, but some of the readings are low with the cable connected, a short-circuit or ground in the cable or receiver assembly is indicated.

Should the "Cable On" voltages check with the table, but no voltage be available at some of the Radiotron socket points, an open circuit is indicated in the cable or receiver assembly.

Having determined whether the fault is in the receiver assembly or SPU the proper continuity test (See pp. 24 to 34) may be applied which will indicate the location of the defect.

SOCKET POWER UNIT TERMINAL STRIP VOLTAGES

Volume Control at Maximum

Terminal Nos.	Cable Connected and Tubes Lighted Volts	Cable Off Volts
12 to 13 (Heater Tubes 2-5-6)	2.55	2.60 A.C. (rms)
14 to 15 (Heater Tubes 1-3-4)	2.58	2.70 A.C.
16 to 17 (Heater Tube 7)	2.55	2.60 A.C.
9 to 3	358.	376. D.C.
9 to 4	235.	218. D.C.
9 to 5	174.	157. D.C.
9 to 6	167.	150. D.C.
9 to 7	153.	138. D.C.
9 to 8	147.	133. D.C.
9 to 11	134.	184. D.C.

Measurements should be made with line voltage within the range for which the 110-120-volt switch is set. It is assumed in Column 2 that O.K. tubes are placed in the sockets. Voltages given are approximate only and will vary somewhat under different operating conditions.

(3) VOLTAGE READINGS AT RADIOTRON SOCKETS

Socket voltage readings (which may be taken with a Weston Model 537 Set Analyzer or similar instrument) such as are given in the tables below are frequently helpful in locating trouble. It should be borne in mind, however, that it will be impossible in practice to duplicate these readings exactly due to manufacturing tolerances, variations in line voltages, the use of leads and meters of different resistances, and the fact that long leads may cause oscillation when attached to the R.F. or I.F. sockets.

The following measurements were made at a line voltage corresponding to the setting of the voltage adjustment 110-120-volt switch.

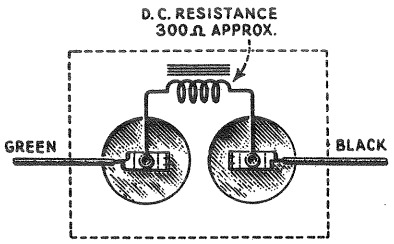

Figure 11—Internal connections of filter reactor

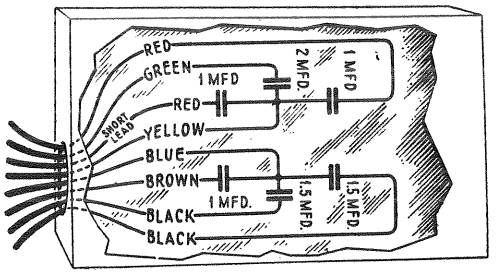

Figure 12—Internal connections of receiver by-pass condensers

VOLTAGE READINGS AT RADIOTRON SOCKETS

"Radio-Record" Switch in Radio Position—Volume Control at Minimum

Socket No.	Cathode to Heater Volts	Cathode to Grid Volts	Cathode to Plate Volts	Plate Current Milamps.	Filament or Heater Volts (rms.)
1 (R.F.)	19.	—35.	160.	0.0	2.40
2 (No. 1 Det.)	14.	—8.	68.	1.2	2.35
3 (No. 1 I.F.)	19.	—35.	160.	0.0	2.40
4 (No. 2 I.F.)	19.	—35.	160.	0.0	2.40
5 (Osc.)	14.	0.0	68.	6.2	2.35
6 (No. 2 Det.)	14.	—28.	215.	0.7	2.35
7 (V.C.)	0.	—1.5*	25.*	0.7	2.35
UX-250	—	—65.	435.	49.	7.2
Volume Control at Maximum					
1	16.	—8.	120.	4.5	2.40
2	14.	—8.	73.	1.5	2.35
3	16.	—8.	120.	4.5	2.40
4	16.	—8.	120.	4.5	2.40
5	14.	0.0	73.	5.8	2.35
6	14.	—29.	235.	0.6	2.35
7	0.	—2.5*	78.*	0.0	2.35
UX-250	—	—80.	440.	55.	7.2
Switch in "Record" Position					
6	14.	—20.	200.	1.8	2.35
7	0.	—1.5*	25.*	0.7	2.35

*Readings will vary considerably depending on resistance of voltmeter used.

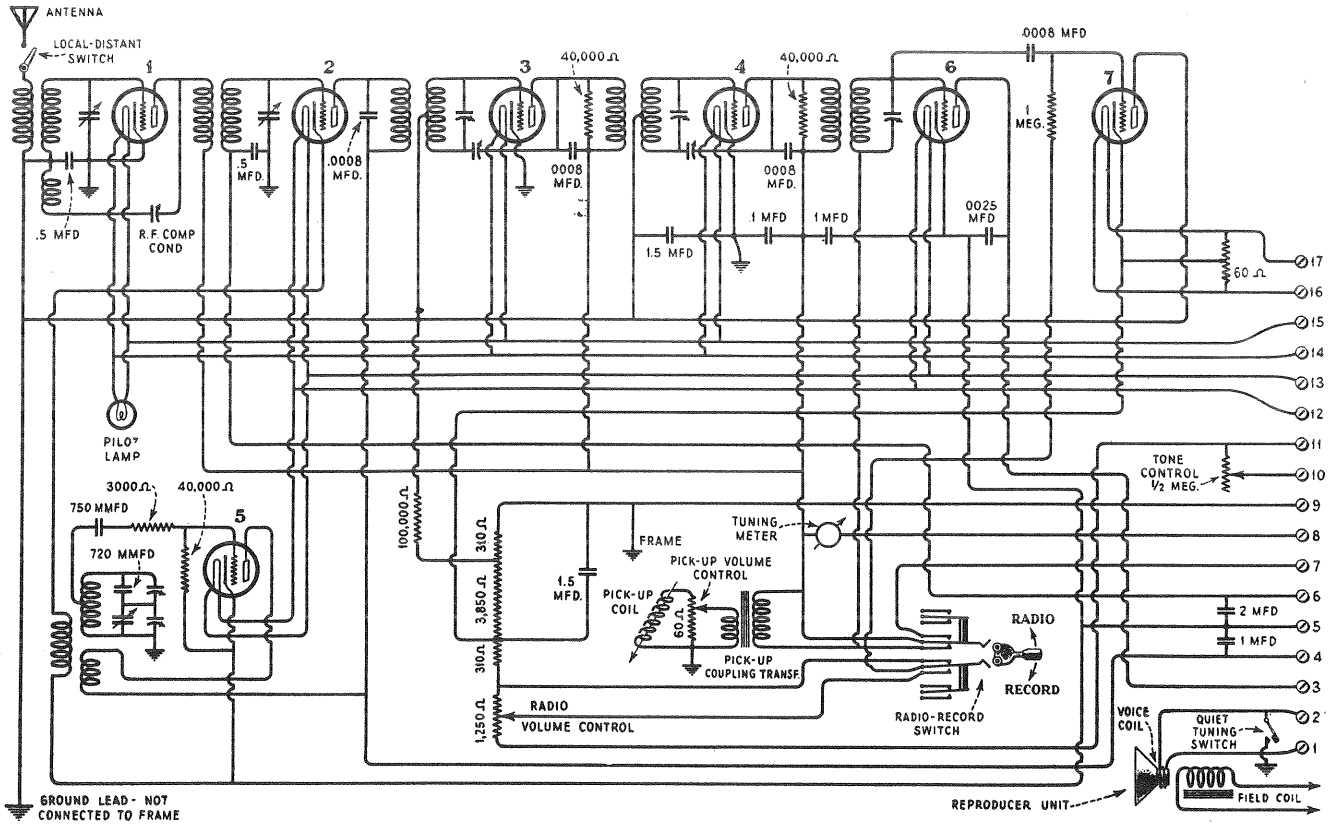

Figure 13—*Schematic circuit diagram of receiver assembly*

(4) GENERAL TESTING METHODS

Most radio receiver failures are due to one or more of the following electrical defects: short-circuits, partial short-circuits, open-circuits, and grounds (a special case of short circuit).

Coils and resistors are normally closed—or continuous—circuits and may be tested by means of a D.C. voltmeter in series with a battery having an E.M.F. approximately equal to the full-scale reading of the voltmeter. The resistance of the circuit can be calculated from the formula:

$$\left(\frac{\text{Reading obtained of battery alone}}{\text{Reading obtained with resistor or coil in series}} - 1 \right) \text{Resistance of meter in ohms} = \text{Unknown Resistance in ohms}$$

For high values of resistance a voltmeter having an internal resistance of 1,000 ohms per volt should be used.

Condensers, on the other hand, should pass no current when subjected to a pure D.C. voltage and are, consequently, under this condition, open-circuit devices. They may be tested by the D.C. voltmeter method described above. The needle of the meter may "kick" up-scale when the voltage is applied—due to the charging current—but it should return immediately to zero. If the meter continues to read, the condenser is leaky or short-circuited and should be discarded as defective.

Open circuits in condensers of more than 1,000 micro-micro-farads capacity (0.001 mfd.) may be tested for as follows: procure a Neon glow lamp—such as the Cooper-Hewitt 115-volt 3.5 milliamperes glow lamp—and connect it in series with a 115-volt supply of 60-cycle alternating current and in series with the condenser under test. The lamp will glow if the condenser is not open (the terminals of the condenser should be short-circuited momentarily to make certain that the lamp is OK). Condensers of less than 0.001 mfd. capacity cannot be tested by this method due to their high reactance at 60 cycles. In this case, a capacity bridge should be used. For

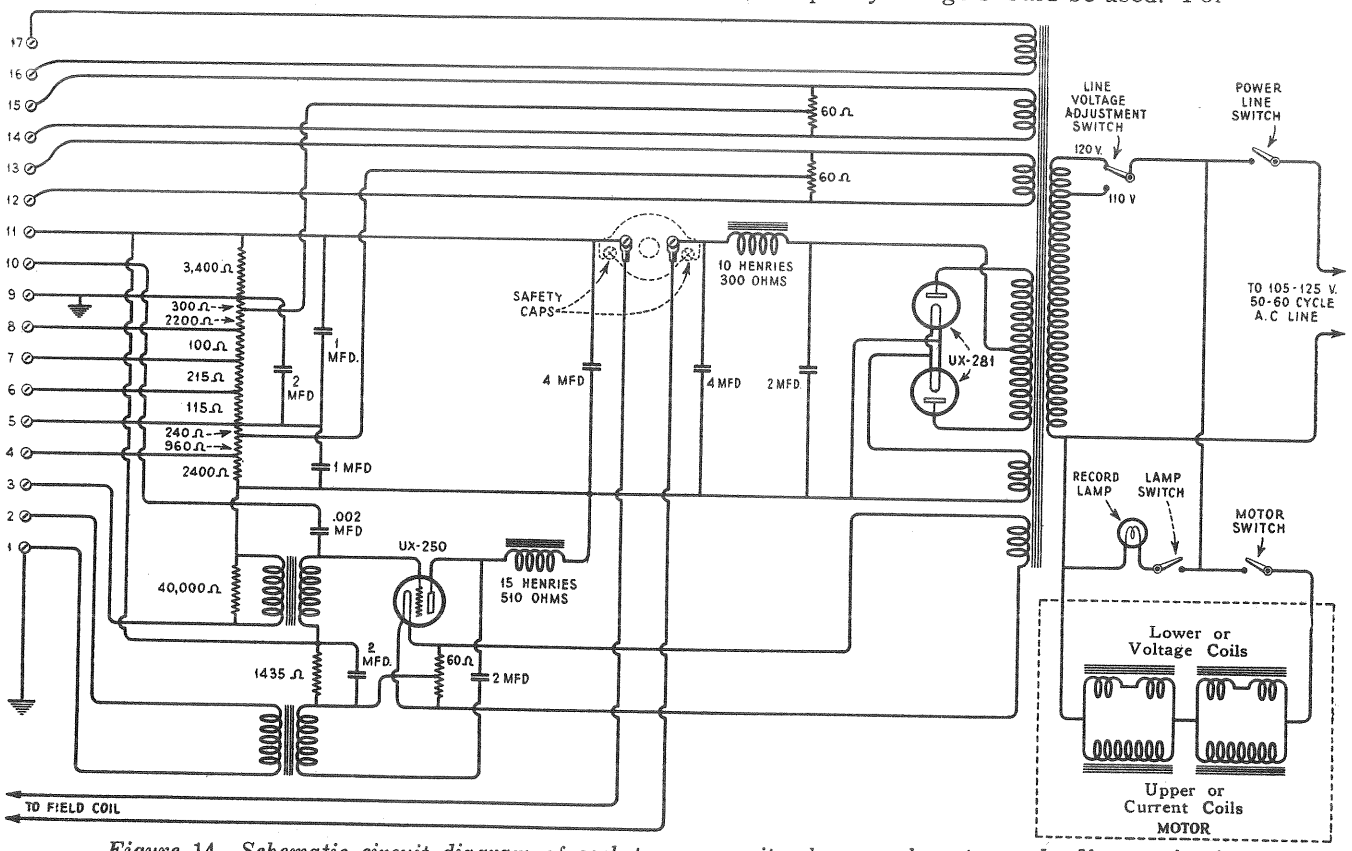

Figure 14—Schematic circuit diagram of socket power unit, phonograph motor and adjacent circuits

a rough test, a pair of 'phones can be connected in series with the condenser and an audio frequency voltage.

The possibility of a short-circuit in the condenser should be eliminated by the D.C. test before applying the open-circuit test.

(5) TONE QUALITY CONTROL CIRCUIT

An inspection of the schematic circuit diagram (Figure 13) will reveal that this circuit consists of a 0.002 mfd. condenser in series with a variable resistor. This combination is connected across the secondary of the audio input transformer (See Par. 7 this section.)

The resistance of the variable resistor increases from about 2,000 ohms to 500,000 ohms as the control knob is turned clockwise. In the extreme clockwise position, the resistance is infinite (nearly) and the tone control circuit is open.

From the above it will be evident that a short-circuited 0.002 mfd. condenser will greatly reduce the strength of the audio signal as the control knob is rotated counter-clockwise with no increase in the relative strength of the low-frequency tones. With normal output if no increase in bass tones is noted when the control knob is rotated

counter-clockwise, an open in the tone control circuit is indicated. Also a short-circuited variable resistor will be manifested by a preponderance of low-frequency tones and no variation in tone quality as the knob is rotated. Check by disconnecting the resistor.

(6) CAPACITOR PACKS

The location of the S.P.U. capacitor pack is shown in Figure 15, and the internal connections together with the capacity values are illustrated in Figure 7. Short-circuited condensers will result in low terminal voltages and, in general, in excessive heating of the filter reactor (See Figure 15) and possibly of the plates of the UX-281 rectifier Radiotrons. An open-circuit in the pack or at its terminals will usually cause a hum in the signal output. The testing methods described in Section 4 can be used to isolate the defect.

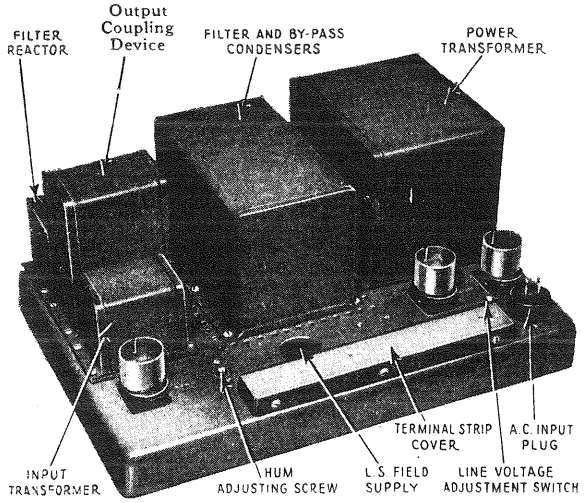

Figure 15—Top view of socket power unit

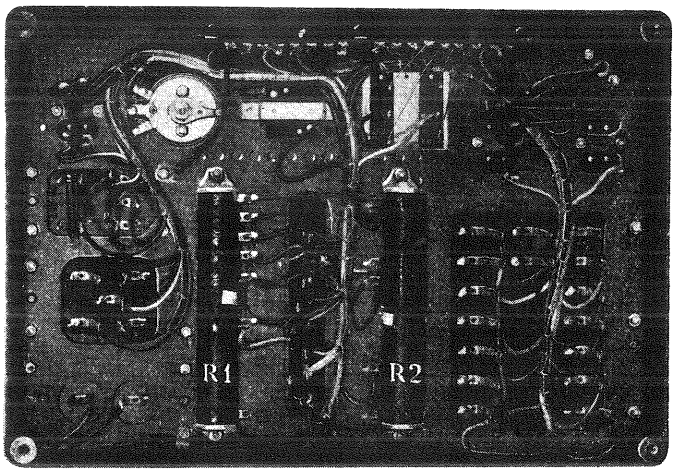

Figure 16—Sub-chassis view of socket power unit

The receiver assembly capacitor pack is shown in Figure 3 and the internal connections and capacitances are given in Figure 12. (N. B.—This diagram shows eight leads. Later productions of this pack will have seven leads; the short red lead will be connected to the brown lead internally and only the latter brought out). A short circuit in any of the capacitors will result in low voltages at some of the socket points. Open circuits in or at the terminals of the capacitor pack will probably result in varying signals or flutter.

(7) AUDIO INPUT TRANSFORMER

The location of this device is shown in Figure 15. The internal connections and the D.C. resistances of the windings are shown in Figure 19. It will be noted that there are five terminals on the base, of which, four are connected internally to the transformer windings. The fifth terminal serves as a support and connection for the 0.002 mfd. tone quality control condenser. Open or short circuits can be tested for by measuring the resistance of the windings by the method in Section 4.

(8) OUTPUT COUPLING DEVICE

The location of this device is indicated in Figure 15 and the internal connections of the plate reactor, coupling condenser, and output transformer are shown in Figure 20. The D.C. resistances of the windings are shown in Figure 20.

If the output coupling device is suspected of being defective, the resistance of the reactor—Terminals 1 to 2—and that of the output winding—Terminals 4 to 5—should be checked.

The 2 mfd. condenser can be tested by the D.C. test and the "glow lamp" test (See Section 4) across Terminals 2 to 3. If the glow lamp lights, it indicates that the A.C. circuit through the condenser and transformer primary is continuous. If the above tests have disclosed no defect, it is likely that the output transformer primary is totally or partially short-circuited. There is no simple method of making a direct test for this defect. The "elimination method" just described must be employed.

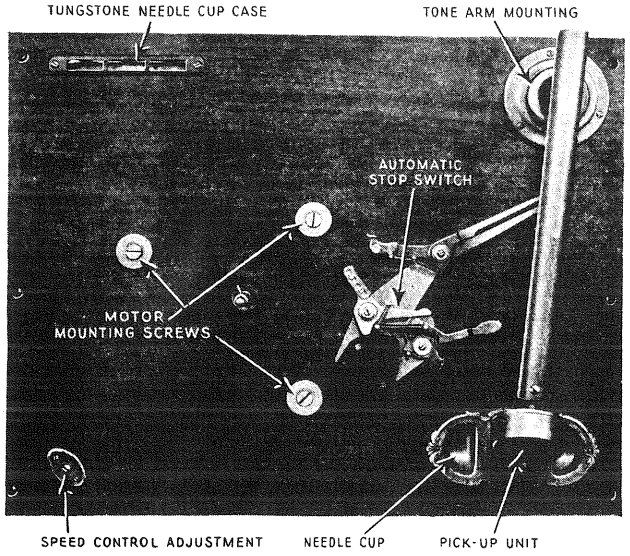

Figure 17—Top view of phonograph compartment with turntable removed

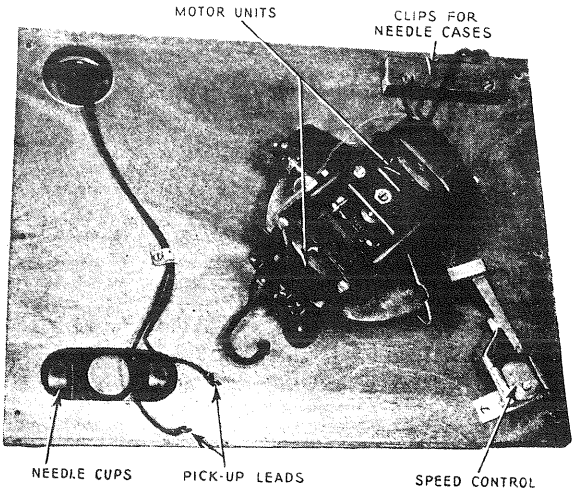

Figure 18—Sub-shelf view of phonograph compartment

(9) PHONOGRAPH MOTOR AND SWITCH (Illustrated in Figs. 17-18)

Electrical tests and mechancial adjustments covering these units are given fully in the Radiola 47 Service Notes, pp. 20-28. In addition, to the information contained therein, it should be noted that the reversal of the potential coil leads with respect to its associated current coil of either motor unit will result in zero torque and consequently the turntable shaft will not rotate. If the connections of the potential coils of both motor units are reversed with respect to their associated current coils, the motor will run with counter-clockwise rotation (backwards).

(10) PHONOGRAPH AUDIO SYSTEM

As will be noted in the Schematic Circuit Diagram, Figure 13, the phonograph audio system consists of a low-impedance, flexible pick-up, volume control, impedance matching input transformer (Location shown in Figure 3), and "Radio-Record" switch.

In the "Radio" position, the operation of the receiver and its audio system is normal and the secondary of the phonograph input transformer is short-circuited.

In the "Record" position, the bias of the "second detector" is decreased so that this tube acts as an audio amplifier receiving its audio excitation from the phonograph

input transformer. Simultaneously the bias of the automatic volume control tube is decreased which—due to its increased plate current—increases the negative bias on the R.F. and I.F. amplifier Radiotrons to a point where these tubes no longer draw plate current, rendering the radio section of the Radiola 67 inoperative.

Due to the simplicity of the phonograph audio system, it is expected that little trouble will be experienced. Service data are given in the Service Data Chart, pp. 14-17. Details concerning the adjustments of the pick-up, phonograph motor, and automatic switch are given fully in the Radiola 47 Service Notes.

A defective phonograph input transformer (See Figure 6) can be checked by measuring the resistance of the windings. Also the pick-up coil can be checked in the same manner—the correct resistance is approximately 11 ohms. Should the coil be O.K., but the pick-up insensitive, it will be necessary to remove the permanent magnet, after affixing a soft-iron keeper thereto, and have it remagnetized.

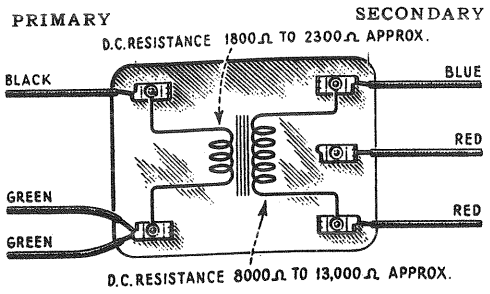

Figure 19—Internal connections of input transformer

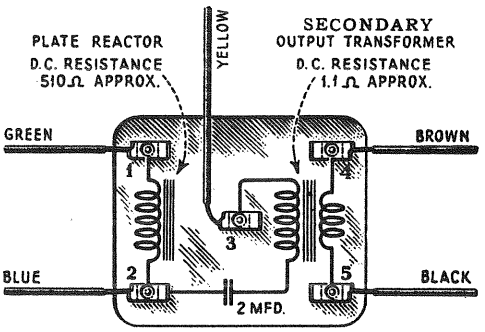

Figure 20—Output coupling device

(11) RECEIVER ASSEMBLY CONTINUITY TEST

Remove all Radiotrons, disconnect cable from terminal strip, and remove pilot lamp. See Figure 22 for cable lugs, terminals and Radiotron socket contacts. For convenience coloring of cable leads as well as numbers is shown. Code: Maroon (M), Black (Bla), Blue (Blu), Red (R), Brown (Br), Yellow (Y), Green (G). All resistance values noted in the following continuity test charts are D.C.

When testing from Lug 8 (R-M) the current taken by the measuring instrument should not exceed 15 milliamperes, as a higher current might injure the tuning meter. If necessary, the tuning meter can be short-circuited during test, but the resistance readings when thus measured with Lug 8 as one terminal should be approximately 800 ohms less than when the meter is not shorted.

RECEIVER CONTINUITY TEST CHART

Circuit	*Test Terminals*	*Correct Effect*	*Incorrect Effect*	
			Indication	*Caused by*
Grid	G1 to Ground Lead	Closed (5.6 ohms)	Open	Open secondary of 1st R.F. transformer
	G1 to Frame	Closed (100,000 ohms)	Open Shorted	Open 100,000-ohm carbon resistor or open 310-ohm section of resistor Shorted .5 mfd.mid-tapped condenser or shorted 1.5 mfd. condenser in condenser pack or shorted 1st R.F. tuning condenser, or ground on any of the following; antenna inductance, secondary of 1st R.F. transformer, 1st or 2nd R.F. transformers
	G1 to P7	Closed	Open	Open lead or connection
	G1 to P1	Open	Shorted 100,000 ohms	Shorted R. F. compensating condenser Grounded primary of 2nd R.F. transformer or tuning meter
	G2 to Lug 6 (Bla)	Closed (5.6 ohms)	Open	Open secondary of 2nd R.F. transformer
	G2 to Frame	Open	Shorted	Shorted or grounded .5 mfd. mid-tapped condenser, or shorted or grounded 2nd R.F. tuning condenser, or grounded secondary of 2nd R.F. transformer, or grounded stator of 2nd R.F. tuning condenser
	G2 to C2	Open	Shorted	Shorted 2 mfd. condenser in condenser pack
	G3 to Ground Lead	Closed (50 ohms)	Open 100,000 ohms Shorted	Open secondary of 1st I.F. transformer Open connection to ground lead Shorted 1st I.F. secondary tuning condenser
	G3 to P3	Open	Shorted	Shorted 1st I.F. neutralizing condenser
	G4 to Ground Lead	Closed (50 ohms)	Open 100,000 ohms Shorted	Open secondary of 2nd I.F. transformer Open connectiton to ground lead Shorted 2nd I.F. tuning condenser
	G4 to P4	Open	Shorted	Shorted 2nd I.F. neutralizing condenser
	G5 to C5	Closed (40,000 ohms)	Open Shorted	Open oscillator grid leak Shorted 40,000-ohm oscillator grid leak
	G5 to Frame	Open	Closed (3,000 ohms)	Shorted 750-mmfd. oscillator coupling condenser or ground on oscillator coil and condenser system
	G6 to Lug 8 (R-M)(Switch in neutral or Radio position. See Sec. 11)	Closed 100 ohms	Open	Open secondary of 3rd I.F. transformer. Open switch contacts

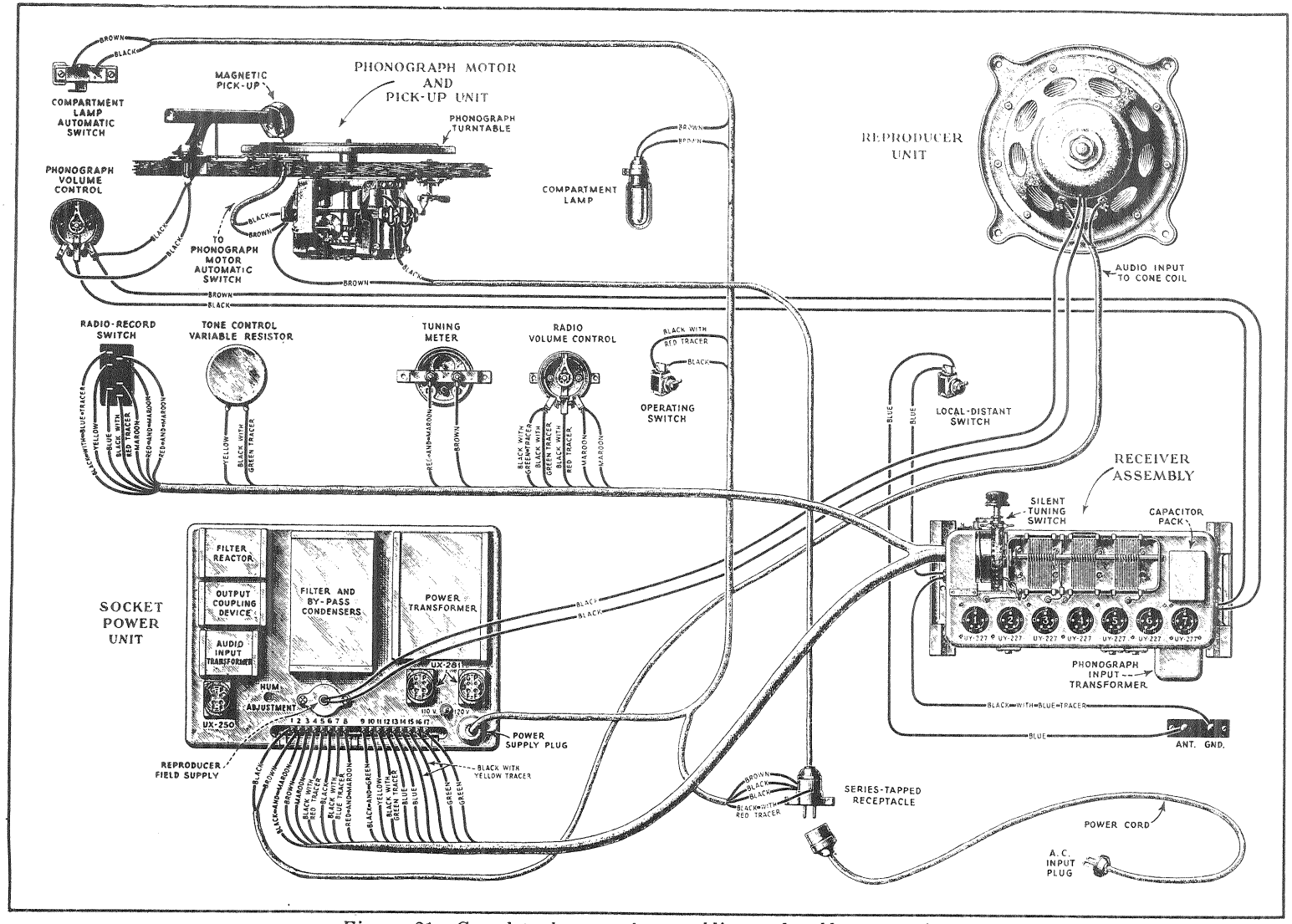

Figure 21—Complete layout of assemblies and cable connections

RECEIVER CONTINUITY TEST CHART—Continued

Circuit	*Test Terminals*	*Correct Effect*	*Incorrect Effect*	
			Indication	*Caused by*
Grid	G6 to Lug 8 (R-M) (Switch in Record position. See Sec. 11)	Closed (5,000 ohms)	100 ohms	Radio position contacts of "Radio-Record" switch do not open
	G6 to G7	Open	Shorted	Shorted .0008 mfd. condenser between G6 and G7
	G7 to Lug 11 (Bla-GTr) (Switch in neutral or Radio position)	Closed (1 meg)	Open	Open 1 meg. resistor Or open switch contact; Or open volume control potentiometer; Or open in mid-tap connection to volume control potentiometer
	G7 to Lug 11 (Bla - G. Tr.) (Switch in Record position)	Closed (1 meg)	Open	Open 1 meg. resistor or open switch contact Or open volume control potentiometer
Plate	P1 to Lug 8 (R - M) (See Sec. 11)	Closed (840 ohms) (45 ohms with tuning meter shorted out)	Open	Open primary of 2nd R.F. transformer or open tuning meter
	P2 to Lug 4 (M)	Closed (20 ohms)	Open Shorted	Open primary of 1st I.F. transformer Shorted 1st I.F. tuning condenser
	P2 to C2	Open	Shorted	Shorted 1 mfd. condenser in condenser pack
	P3 to Lug 8 (R - M) (See Sec. 11)	Closed (810 ohms) (19 ohms with tuning meter shorted out)	Open 40,000 ohms Shorted	Open primary winding of 2nd I.F. transformer and open 40,000-ohm resistor Open primary winding of 2nd I.F. transformer Shorted primary tuning condenser 2nd I.F. transformer
	P4 to Lug 8 (R - M) (See Sec. 11)	Closed (810 ohms) (19 ohms with tuning meter shorted out)	Open 40,000 ohms Shorted	Open primary winding of 3rd I.F. transformer and 40,000-ohm resistor Open primary winding of 3rd I.F. transformer Shorted primary tuning condenser of 3rd I.F. transformer
	P4 to Ground Lead	Open	Shorted	Shorted 2nd I.F. neutralizing condenser
	P4 to C4	Open	Shorted	Shorted 1 mfd. condenser in condenser pack
	P4 to C6	Open	Shorted	Shorted 1 mfd. condenser in condenser pack

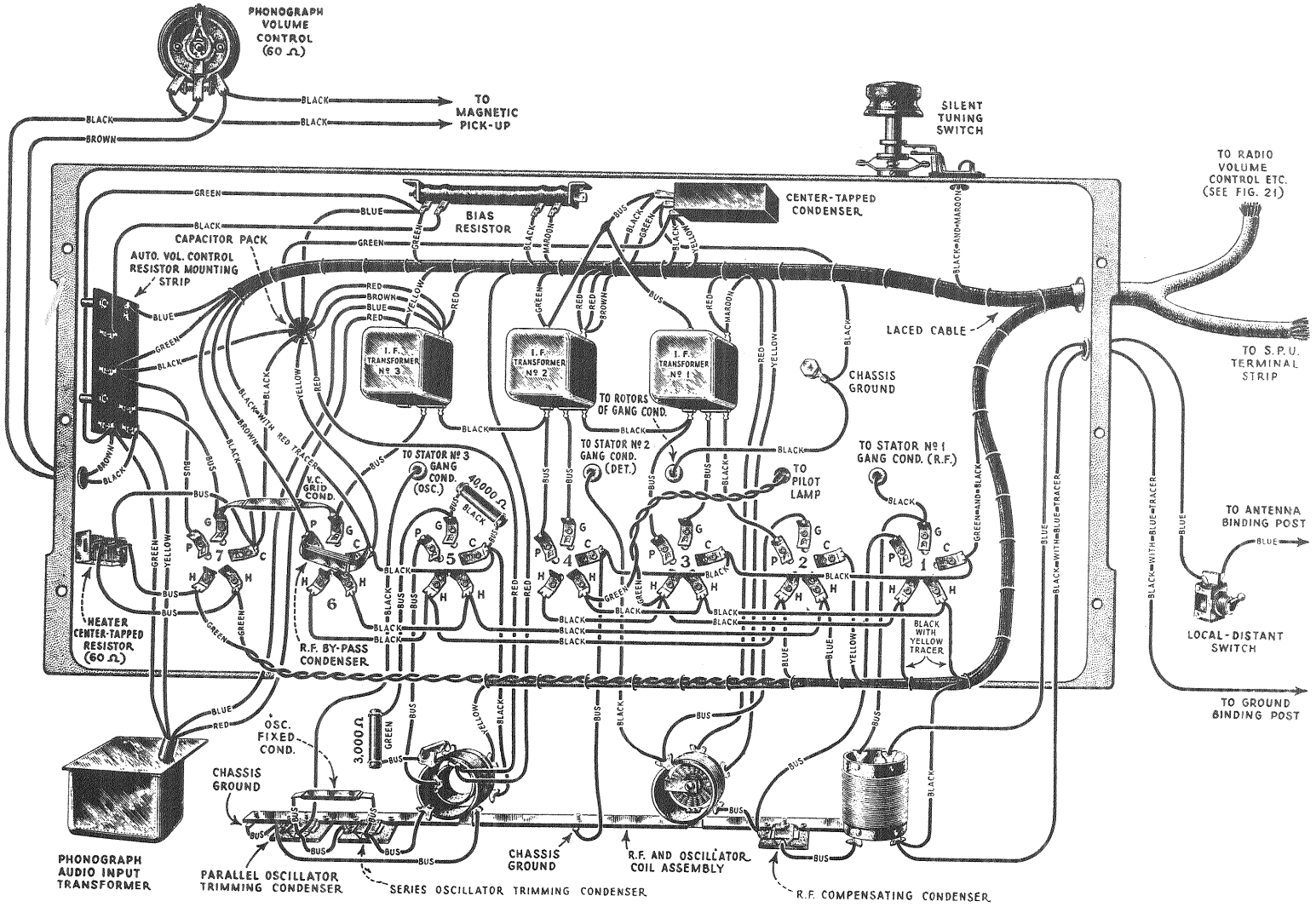

Figure 22—Wiring connections and parts of the receiver assembly

RECEIVER CONTINUITY TEST CHART—Continued

Circuit	*Test Terminals*	*Correct Effect*	*Incorrect Effect*	
			Indication	*Caused by*
Plate	P5 to Lug 4 (M)	Closed (1.8 ohms)	Open	Open primary winding in oscillator circuit
	P6 to Lug 3 (Br)	Closed	Open	Open in lead to terminal strip
	P6 to C6	Open	Shorted	Shorted .0025 mfd. condenser
Cathode	C1 to Frame	Closed	Open	Open connection or lead
	C2 to Lug 5 (Bla-R.Tr.)	Closed (1 ohm)	Open	Open coupling coil in oscillator circuit
	C3 to Frame	Closed	Open	Open connection or lead
	C4 to Frame	Closed	Open	Open connection or lead
	C5 to Lug 5 (Bla-R.Tr.)	Closed	Open	Open connection or lead
	C7 to Frame	Closed (4,160 ohms)	Open Shorted	Open 3,850-ohm section of resistor Shorted or grounded 1.5 mfd. condenser in condenser pack or grounded resistor unit
	C7 to Lug 11 (Bla-G.Tr.)	Closed (1,560 ohms)	Open	Open in 310-ohm section of resistor connected to volume control
Heater	Lug 15 (Bla-Y Tr.) to one heater contact of Sockets 1-3-4	Closed	Open	Open connections
	Lug 14 (Bla-Y Tr.) to other heater contact of Sockets 1-3-4	Closed	Open	Open connections
	Lug 13 (Blu) to one heater contact of Sockets 2-5-6	Closed	Open	Open connections
	Lug 12 (Blu) to other heater contact of Sockets 2-5-6	Closed	Open	Open connections
	One heater contact of Socket 7 to other heater contact of Socket 7	Closed (60 ohms)	Open	Open connections or open 60-ohm mid-tapped resistor
	Lug 17 (G) to Lug 16 (G)	Closed (60 ohms)	Open	Open connection or open 60-ohm mid-tapped resistor
	Heater contact of Socket 7 to C7	Closed (30 ohms)	Open	Open connection, cathode to mid-tapped resistor
Miscellaneous	Antenna binding post to ground binding post—Switch in "Distant" position	Closed (45 ohms)	Open	Open antenna inductance or "Local-Distant" Switch

RECEIVER CONTINUITY TEST CHART—Continued

Circuit	*Test Terminals*	*Correct Effect*	*Incorrect Effect*	
			Indication	*Caused by*
Miscellaneous	Lug 10 (Y) to Lug 11 (Bla-G. Tr.)	In extreme clock-wise position of tone control, circuit should test open. At a position back a little from extreme clock-wise position circuit should test approximately .5 meg. In extreme counter clock-wise position it should test from 1000-3000 ohms.	Open	Open tone control resistor or leads
Frame	Lug 8 (R-M) to Frame (See Sec. 11)	Open	Shorted	Ground on any of the following: Primary of 2nd R. F. transformer; Primary of 2nd or 3rd I.F. transformer. Tuning meter and "Radio-Record" Switch
	Lug 3 (Br.) to Frame	Open	Shorted	.0025 mfd. condenser grounded
	Lug 4 (R) to Frame	Open	Shorted	Primary coil of oscillator or primary of 1st I.F. transformer grounded
	Lug 5 (Bla-R. Tr.) to Frame	Open	Shorted	Coupling coil of oscillator, or .0025 mfd. condenser grounded
	Lug 7 (Bla-Blue Tr.) to Frame. (Switch in Record position)	Open	Shorted	Ground on any of following: "Radio-Record" Switch, Secondary of pick-up transformer, Secondary of 3rd I.F. transformer, or .0008 mfd. condenser, connecting G6 to G7
	Lugs 12 (Blu) and 13 (Blu) to Frame	Open	Shorted	Ground on leads to, or on heater contacts of Sockets 2, 5 and 6
	Lugs 14 (Bla-Y Tr.) and 15 (Bla-Y Tr.) to Frame	Open	Shorted	Ground on leads to, or on heater contacts of Sockets 1-3-4

(12) S. P. U. ASSEMBLY CONTINUITY TESTS

Remove All Radiotrons and Disconnect Cable at Terminal Strip.

SOCKET POWER UNIT CONTINUITY TEST CHART

Terminals	*Correct Effect*	*Incorrect Effect*	
		Indication	*Caused by*
P of one UX-281 socket to P of other UX-281 socket	Closed (260 ohms)	Open	Open high voltage winding of power transformer
Across filament contacts of one UX-281	Closed	Open	Open UX-281 filament winding of power transformer or open connection
Across filament contacts of other UX-281	Closed	Open	Open UX-281 filament winding of power transformer or open connection
Terminal 1 to Terminal 2	Closed (1.1 ohm)	Open	Open low voltage winding of output transformer
Terminal 3 to Terminal 4	Closed (4000-4700 ohms)	42,000-48,000 ohms Open	Open primary of input transformer or open 2400-ohm section of resistor Both primary of input transformer and 40,000-ohm resistor open
Terminal 4 to Terminal 5	Closed (1200 ohms)	800 ohms Open	Shorted 1 mfd. condenser in condenser pack Open in either or both of 960-ohm and 240-ohm section of resistor
Terminal 5 to Terminal 6	Closed (115 ohms)	Open	Open 115-ohm section of resistor
Terminal 5 to Terminal 9	Closed (2930 ohms)	Shorted	Shorted 2 mfd. condenser in condenser pack
Terminal 5 to Terminal 11	Closed (6330 ohms)	Shorted	Shorted 2 mfd. condenser in condenser pack
Terminal 6 to Terminal 7	Closed (215 ohms)	Open	Open 215-ohm section of resistor
Terminal 7 to Terminal 8	Closed (100 ohms)	Open	Open 100-ohm section of resistor
Terminal 8 to Terminal 9	Closed (2500 ohms)	Open	Open in either or both 2200-ohm or 300-ohm section of resistor
Terminal 9 to Terminal 11	Closed (3400 ohms)	Open 1000-1300 ohms	Open 3400-ohm section of resistor Grounded filter reactor
Terminal 10 to Terminal 11	Open	Shorted	Shorted .002 mfd. condenser

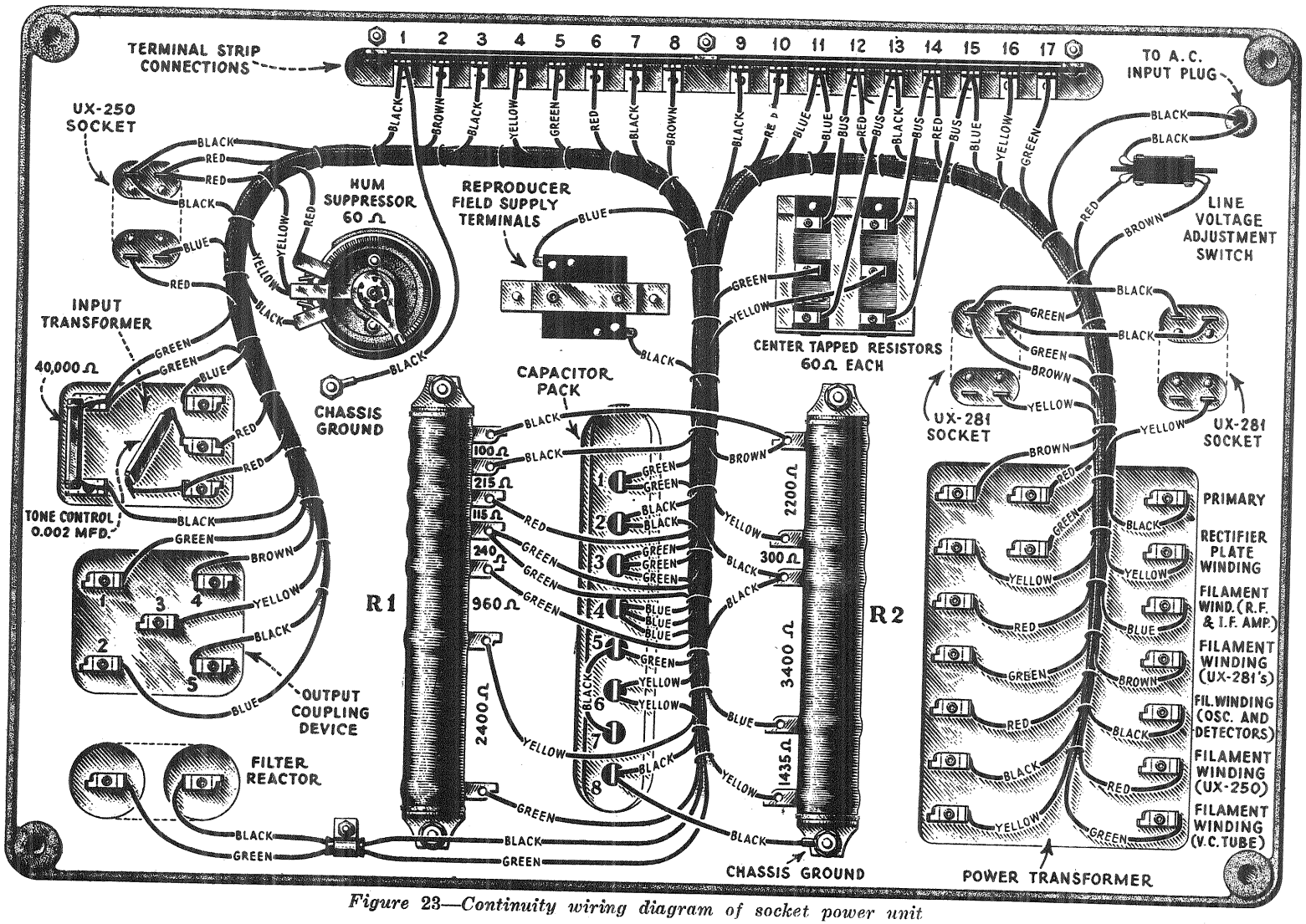

Figure 23—Continuity wiring diagram of socket power unit

SOCKET POWER UNIT CONTINUITY TEST CHART—Continued

Terminals	*Correct Effect*	*Incorrect Effect*	
		Indication	*Caused by*
Terminal 11 to Terminal 4	Closed (7530 ohms)	1800 ohms	Shorted filter condenser in condenser pack
Terminal 12 to Terminal 13	Closed	60 ohms	Open 2.5-volt winding in power transformer
		Open	Open 2.5-volt winding in power transformer and mid-tapped resistor. Or open connection
Terminal 14 to Terminal 15	Closed	60 ohms	Open 2.5-volt winding in power transformer
		Open	Open 2.5-volt winding in power transformer and mid-tapped resistor. Or open connection
Terminal 16 to Terminal 17	Closed	Open	Open 2.5-volt winding in power transformer. Or open connection
Terminal 11 to plate of either UX-281 socket	Closed (1450 ohms)	Open	Open filter choke or loudspeaker field
Terminal 4 to plate contact of UX-250 socket	Closed (2910 ohms)	Open	Open UX-250 plate reactor
Terminal 11 to plate contact of UX-250 socket	Closed (10,440 ohms)	1600 ohms	Shorted 2 mfd. condenser in output unit
		380	Shorted 2mfd. condenser in output unit, and shorted 2mfd. condenser across 1435-ohm section of resistor
Across filament contacts of UX-250 socket	Closed	60 ohms	Open in UX-250 filament winding of power transformer
Filament contact of UX-250 socket to Terminal 11	Closed (1465 ohms)	Open	Open 1435-ohm section of resistor
Grid contact of UX-250 socket to Terminal 11	Closed (8000-1200) ohms	Open	Open primary of input transformer
Across prongs of line plug with 110-120-volt switch in 110-volt position	Closed	Open	Open primary of power transformer
Across prongs of line plug with 110-120-volt switch in the 120-volt position	Closed	Open	Open primary of power transformer
Terminal 9 to prong of line plug	Open	Shorted	Grounded primary of power transformer

SOCKET POWER UNIT CONTINUITY TEST CHART—Continued

Terminals	*Correct Effect*	*Incorrect Effect*	
		Indication	*Caused by*
Terminal 9 to Terminal 12	Closed (3200 ohms)	Shorted	Grounded 2.5 volt filament winding of power transformer
Terminal 9 to Terminal 14	Closed (330 ohms)	Shorted	Grounded 2.5 volt filament winding of power transformer
Terminal 9 to Terminal 16	Open	Shorted	Grounded 2.5 volt winding of power transformer
Terminal 9 to filament contact of UX-250 socket	Closed (4865 ohms)	Shorted	Grounded UX-250 filament winding of power transformer
Terminal 9 to filament contact of UX-281 socket	Closed (6530 ohms)	Shorted	Grounded UX-281 filament winding of power transformer
Terminal 9 to plate contact of UX-281 socket	Closed (4700 ohms)	Shorted	Grounded high voltage winding of power transformer
Terminal 9 to plate contact of UX-250 socket	Closed (7000 ohms)	0-510 ohms	Grounded UX-250 plate reactor winding
Terminal 9 to Terminal 3	Closed (8300-8800 ohms)	0-2300 ohms	Grounded primary of input transformer
Grid contact of UX-250 socket to Terminal 11 with Terminal 11 connected to Terminal 9	Closed (Same resistance as between grid of UX-250 socket and Terminal 11 alone)	Lower resistance	Grounded secondary winding of input transformer

PART IV—MAKING REPLACEMENTS

The methods for replacing various defective component parts are described in Service Notes covering Radiolas 66, 64 and 41. Details will therefore be omitted here and only the procedure to be used in removing the major units and assemblies will be discussed.

(1) REMOVAL OF RECEIVER ASSEMBLY

(a) Remove set-screw from Station Selector Knob and pull off three remaining knobs.
(b) Remove "Local-Distant" Switch clamping ring.
(c) Remove rear covers from Reproducer compartment and Receiver- S. P. U. compartment.
(d) Make certain that power supply is off and remove S. P. U. terminal strip cover.

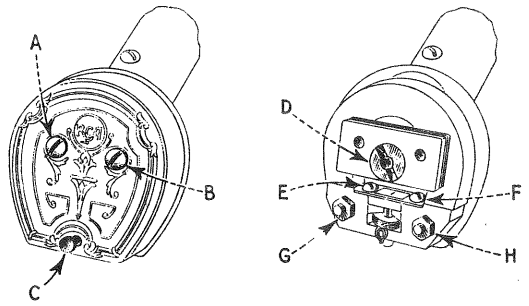

Figure 24—Details of the phonograph pick-up

(e) Remove cable connections from S. P. U. terminal strip.
(f) Remove two wood screws from antenna ground strip.
(g) Disconnect black and brown leads at phonograph volume control.
(h) Free tuning meter and radio volume control by removing two wood screws from each.
(i) Free Centralab tone control resistor by removing two hexagonal nuts from shaft (front of panel.)
(j) Free "Radio-Record" Switch by unscrewing switch knob, removing two wood screws holding escutcheon plate, and removing four machine screws which hold switch to metal mounting plate.
(k) Remove cleats holding receiver assembly wires and cables to cabinet.
(l) Remove four chassis machine screws from bottom of cabinet. Receiver assembly may then be lifted out to rear.

It should be replaced in the reverse order making certain that the two wooden spacing blocks and rubber supporting blocks are in place.

(2) REMOVAL OF S. P. U.

(a) Remove rear cover of Receiver-S. P. U. compartment.
(b) Lift off A.C. power input plug.
(c) Remove terminal strip cover and disconnect cable and cone leads.
(d) Pry open safety rosette cup, washer and remove screws holding field supply terminal.
(e) Disconnect leads to reproducer field.
(Note: S. P. U. Continuity Tests or S. P. U. voltage readings should be made with these leads connected. Beware of high voltage at this point.)
(f) Remove four machine screws from bottom of cabinet.
(g) S. P. U. may be lifted out to rear.

(3) REMOVAL OF PHONOGRAPH ASSEMBLY

(a) Remove phonograph compartment rear cover.
(b) Pull out motor power plug.
(c) Lift off turntable—holding pick-up and arm out of the way
(d) Disconnect pick-up leads (black) from phonograph volume control.
(e) Remove six wood screws from wooden phonograph compartment shelf.
(f) Entire unit may be lifted out to rear by elevating the rear edge to about 45 degrees.

(4) REMOVAL OF PHONOGRAPH PICK-UP

(a) Remove phonograph compartment rear cover.
(b) Disconnect pick-up leads (black) from phonograph volume control, and receiver cleats holding wires to cabinet.
(c) Remove three wood screws from pick-up arm mounting ring.
(d) Remove pick-up and arm assembly.
(e) Remove needle holder screw C, Figure 24, and two machine screws A, B, holding pick-up cover. Remove cover.
(f) Remove nut D, Figure 24, that holds the magnet bracket and fibre spacers. Mark the magnet poles and pole pieces so that the magnet may be replaced with correct polarity.
(g) Place a soft-iron "keeper" (such as a large nail) across the poles of the magnet and remove the magnet.
(h) Unsolder external leads from terminals.
(i) Remove machine screw holding pick up to pick-up arm. In assembling the unit, the above order is reversed.

(5) REMOVAL OF REPRODUCER UNIT

(a) Remove rear covers of Reproducer and Receiver-S. P. U. compartments.
(b) Make certain power is "off" and remove S. P. U. terminal strip cover.
(c) Remove voice coil leads (Brown and Black) from Terminals 1 and 2.
(d) Open safety rosette washers. Remove two machine screws holding cover. Take off cover and disconnect two (black) field supply leads.
(e) Remove cleat holding voice coil cable and field supply leads to cabinet.
(f) Remove four hexagonal nuts—holding reproducer in place by hand.
(g) Reproducer unit may then be removed.

(6) REMOVAL OF FRONT GRILLE PANEL

(a) Remove reproducer unit—(See Part IV, Section 5).
(b) Remove 12 wood screws from baffle board. Note position of these screws as four of them are somewhat shorter.
(c) Remove baffle board by swinging right edge to the rear and tilting lower edge to the rear.
(d) Remove eight wood screws from grille panel and free by tapping lightly on the front of grille panel.
(e) Grille may then be removed.