RCA
Radiola 64
SERVICE NOTES

RCA Radiola 64

Regular Edition– 25M

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 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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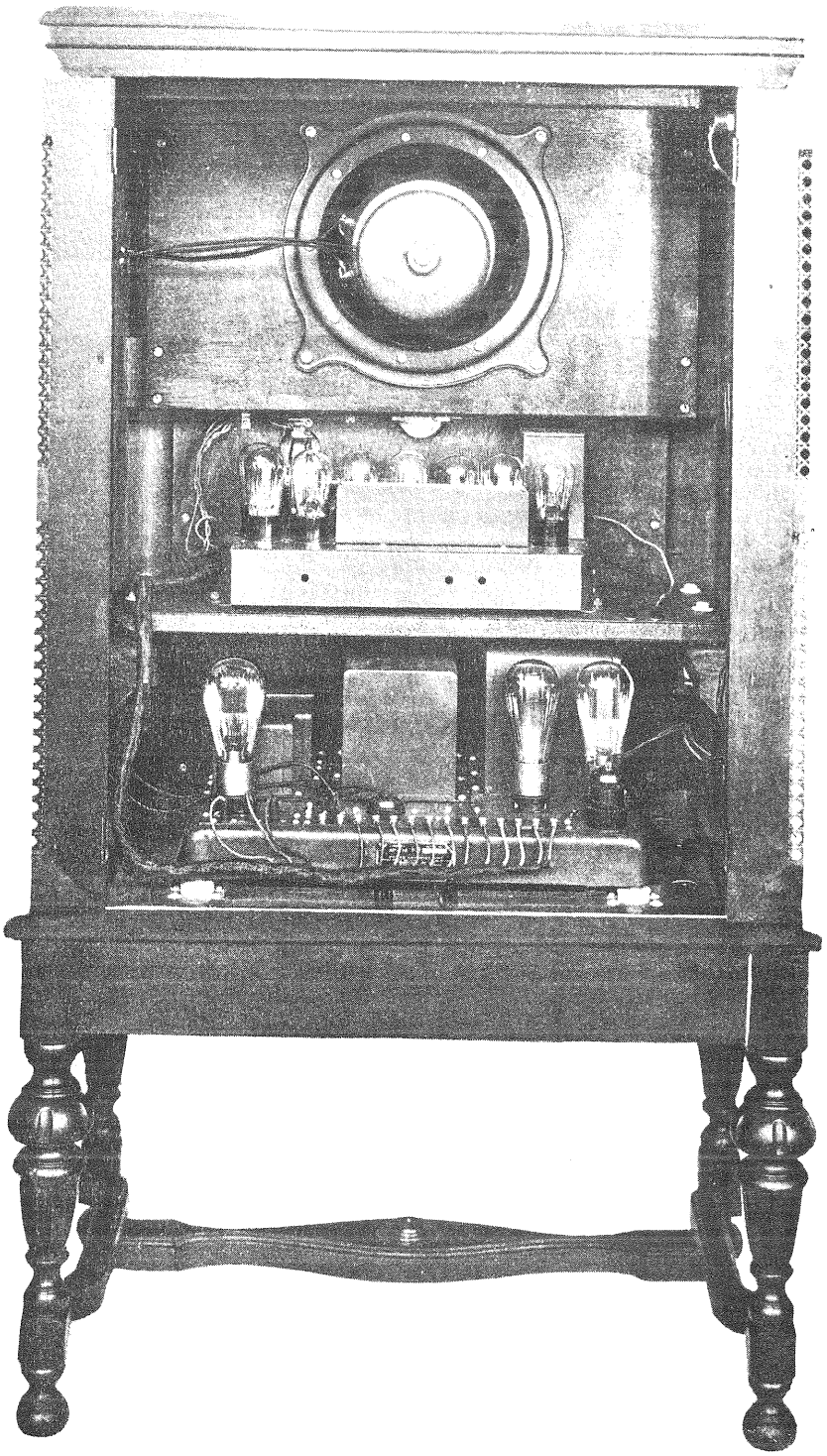


Figure 2—Rear interior cabinet view showing reproducer in top section; receiver chassis in center section and socket power unit in lower section

RCA RADIOLA 64

(105-125 Volts, 50-60 Cycle A. C.)

SERVICE NOTES

Prepared by RCA Service Division

INTRODUCTION

RCA Radiola 64 is a walnut console cabinet model of the standard Radiola 60 Super-Heterodyne receiver combined with features never before found in any radio receiver. A new dynamic reproducer driven by Radiotron UX-250 gives a quality of reproduction closely resembling the original rendition at the broadcasting studio. Features such as the automatic volume control tube for maintaining the level of sound at any predetermined value over a large range of signal variations, such as fading or when tuning from station to station, a visual tuning indicator for accurately tuning by sight rather than by sound, and a sensitivity con-

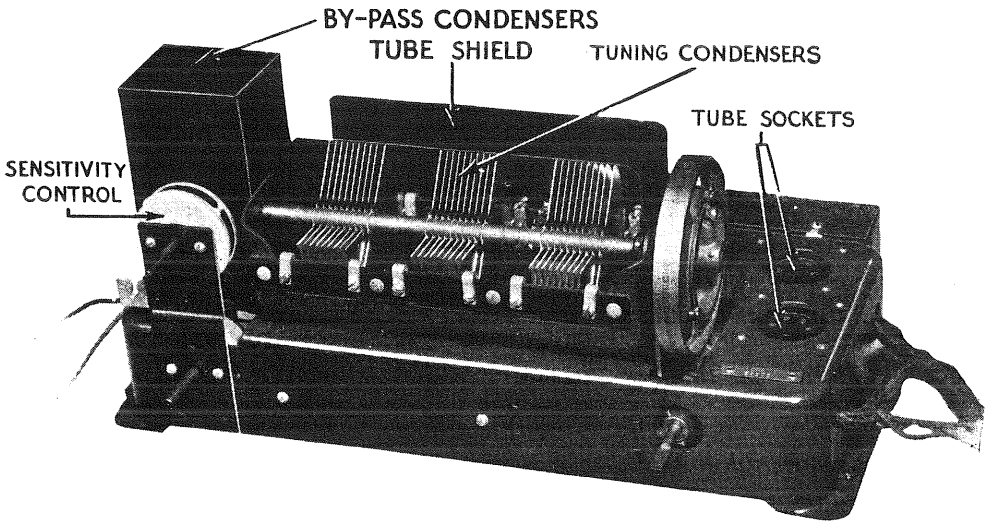


Figure 3—Top view of receiver chassis showing principal parts

trol for regulating the input to the receiver and thus controlling the noise level are features that distinguish Radiola 64 from all other radio receivers. Excellent sensitivity and unparalleled selectivity and tone quality are inherent characteristics of RCA Radiola 64. Figure 2 is a rear cabinet view showing the main parts. Figures 3 and 4 show the top and sub-chassis views of the receiver, and Figures 5 and 6 the socket power unit.

Radiola 64 is made in models both for 105-125 volts, 50-60 cycle A.C. operation and 105-125 volts, 25-40 cycle A.C. operation. The difference in these models is the power transformer. Should it be desirable to change a 50-60 cycle Radiola 64 for operation on 25-40 cycles or vice versa, a change of the power transformer is all that is necessary. These transformers may be obtained through the regular RCA channels as a replacement part.

CIRCUIT CHARACTERISTICS

The following circuit characteristics are incorporated in the design of Radiola 64.

(a) It is an eight-tube super-heterodyne circuit using seven Radiotrons UY-227 and one Radiotron UX-250. In addition one Radiotron UY-227 is used as a volume control tube and two Radiotrons UX-281 are used in a full wave rectifying circuit to supply all grid, plate and cathode voltages and field current for the reproducer unit.

(b) The circuit consists of one untuned coupling stage; one tuned R.F. stage; a tuned heterodyne detector circuit; two intermediate R.F. stages; an oscillator; a second detector and a power amplifier.

(c) A grid bias second detector is used, making possible the use of a high plate voltage with consequent high output and giving a quality of reproduction only obtainable

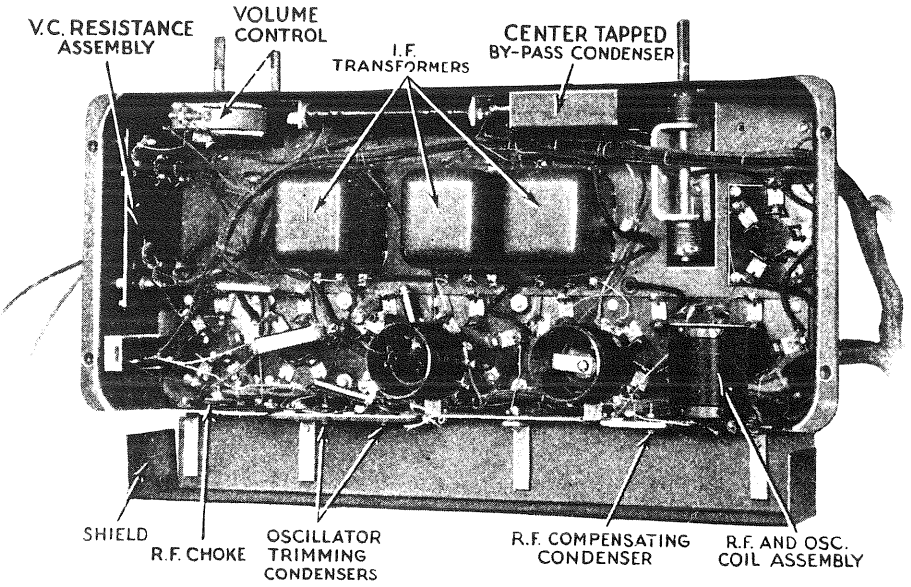


Figure 4—Sub-chassis view of receiver showing principal parts

with this type of detector. The output of this tube is used to drive the Radiotron UX-250 without an intermediate audio stage. This combination of a high output grid bias detector and absence of the usual intermediate audio stage results in a quality of reproduction not obtainable in other circuit arrangements.

(d) A sensitivity control in the antenna input circuit regulates the amount of input voltage to the grid of the coupling tube. A volume control is also provided for controlling the overall amplification of the receiver by regulating the bias on the volume control tube. The sensitivity control is installed for the purpose of regulating the input so that any existing background noise may be reduced to a level where it is not objectionable. See "Sensitivity and Volume Control," page 8, for operating method.

(e) A special tube is provided as an automatic volume control. This tube maintains any pre-determined level of volume over a large range of variations of strength in signal pick-up.

(f) A milliammeter placed in the plate circuit of the R.F. and I.F. amplifiers is used as a tuning meter to provide for visual adjustment of the station selector. It has a reversed scale so that normal plate current will give a zero reading. An incoming signal will cause a change of bias on these tubes thereby reducing the plate current and causing a deflection in the meter.

(g) Use of Radiotron UX-250 as a power amplifier provides a reserve of power rarely needed, but contributing to the quality of reproduction at any volume.

RADIOTRON SEQUENCE

Figure 7 illustrates the sequence of the Radiotrons in the receiver, omitting Radiotron UX-250 and two Radiotrons UX-281 in the S.P.U. From right to left when facing the front of the Radiola the Radiotron Sequence is as follows:

Radiotron No. 1 is an untuned stage of radio frequency amplification. It is coupled directly to the antenna and ground across the sensitivity control, and functions as a coupling tube to the antenna system.

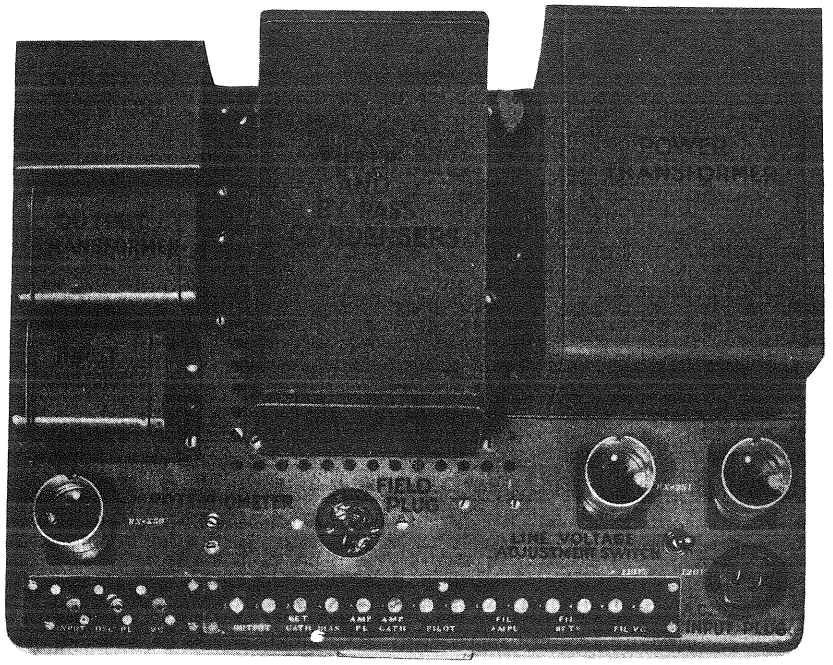


Figure 5—Top view of socket power unit showing principal parts

Radiotron No. 2 is a stage of tuned radio frequency amplification. It is tuned by means of the first of the gang condensers.

Radiotron No. 3 is the tuned heterodyne detector. It is tuned by the center of the gang condensers.

Radiotrons No. 4 and No. 5 are the first and second intermediate stages. These stages are tuned to a frequency of 180 K.C. giving ample distance between the two peaks of the oscillator to eliminate any possibility of stations coming in at more than one point on the tuning dial.

Radiotron No. 6 is the oscillator. It is tuned by the third of the gang condensers. Two trimming condensers are provided at the rear of the receiver assembly for adjusting the oscillator circuit so that a constant frequency difference from the tuned R.F. stage will be maintained by the oscillator throughout its tuning range.

Radiotron No. 8 is the automatic volume control tube. It functions to maintain a constant volume level regardless of variations of incoming signal intensity.

OPERATION AND PERFORMANCE

Several features in Radiola 64 are different from other radio receivers and an explanation will give the reader an understanding of their action.

SENSITIVITY AND VOLUME CONTROL

The sensitivity control is provided to adjust the sensitivity of Radiola 64 according to varying local receiving conditions at times when atmospherics, power line disturbances, and the like, produce an undesirable background of noise.

To adjust the sensitivity control turn volume control to position for maximum volume and set station selector to a position where no signals are heard and where background noise is loudest. Starting at maximum, slowly turn the sensitivity control counter-clockwise until the noise is satisfactorily subdued. This adjustment will probably not have to be changed during several hours of receiver operation.

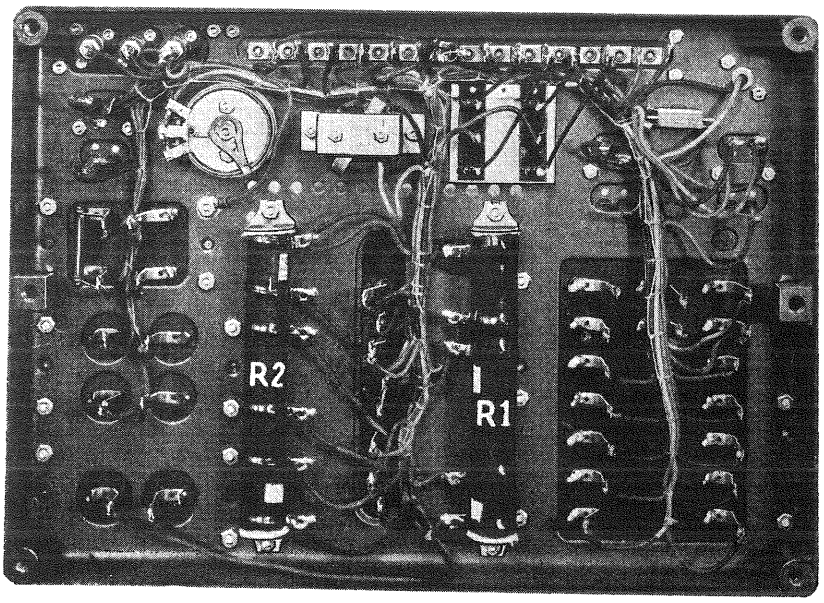


Figure 6—Sub-chassis view of socket power unit showing principal parts

Distortion may occur when receiving from powerful local stations with the volume control set for reproduction at room volume. Reducing the setting of the sensitivity control will increase the sensitivity of the R.F. amplifiers and clear up this distortion.

The volume control should be set for the desired volume on a station of moderate or high power. The automatic volume control tube will tend to maintain this volume on different signals of wide variations in intensity.

TUNING METER

Until the current is turned "On" the tuning meter (Figure 8) should register at its maximum position. On turning on the power and without any station tuned in it should read zero after the Radiotrons UY-227 have heated up. Tuning to a station should give a reading. Correct tuning is accomplished by adjusting the station selector for a maximum reading on the tuning meter.

PERFORMANCE

Radiola 64 being a very sensitive receiver and reproducing practically all audible frequencies at their true value must be properly operated if best results are to be obtained. The preceding notes on "Sensitivity and Volume Control" and "Tuning Meter" should be observed to obtain best results. Improper tuning will affect quality of reproduction, and failure to use the sensitivity control may result in considerable noise back ground at some locations.

PART I—INSTALLATION

[1] ANTENNA (Outdoor Type)

Due to the high sensitvity of Radiola 64 the antenna length need only be approximately 25 feet. It should be erected as high as possible and be 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.

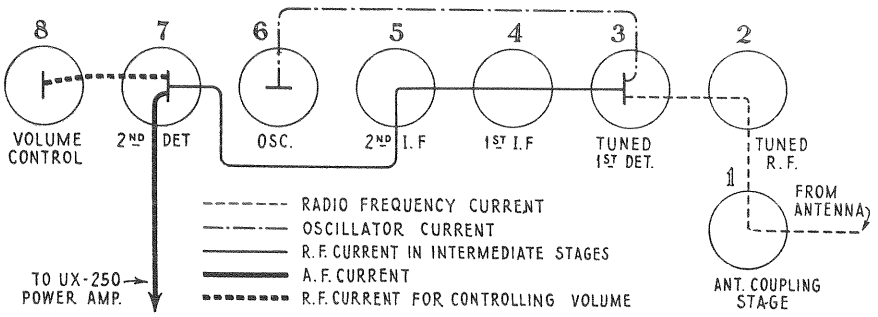


Figure 7—Radiotron sequence

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.

[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 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 64 will generally give entirely satisfactory reception with an indoor antenna.

[3] GROUND

A good ground is quite as important as a good antenna. No specific recommendations can be given in this matter as conditions vary in different locations. Water and steam pipes usually make good grounds. Gas pipes usually make poor grounds and, as a rule, are to be avoided. If neither water nor steam pipes are available, a pipe or metal rod may be driven into the ground to a depth of several feet. The success of this type of ground depends upon the moisture present in the soil. The ground lead should be connected by means of an approved ground clamp to a section of pipe that has been scraped and thoroughly cleaned. The connection should be inspected from time to time to make certain that a clean and tight electrical contact exists between the clamp and pipe. The service man should experiment with various grounds, and employ the one giving the best results.

[4] RADIOTRONS

Place the eight Radiotrons UY-227 in the receiver assembly. A guide shield is provided to facilitate the insertion of these tubes. Place the tube in the opening of the shield and then turn until the prongs slip in place. The Radiotrons UX-250 and UX-281 should be placed in the Socket Power Unit. Their correct places are shown by lettering on the base of the S.P.U.

In placing Radiola 64 into operation, if no signals are heard when tuning to a station known to be operating, examine the Radiotrons. Possibly one Radiotron has been damaged in transit. Interchanging with one or more of the same type known to be in operating condition will isolate the damaged one.

The Radiotron used as the volume control (Socket No. 8) is the most critical and should be selected first. It should be chosen on the basis of complete cut-off of loudest local stations at a minimum setting of the volume control and the greatest volume at a maximum setting when tuned to a weak or distant station.

Socket No. 2, the tuned R.F. stage, is also quite critical for the selection of Radiotrons. Select for this socket the tube that gives the loudest signal, without going into oscillation throughout the tuning range, with the volume control at maximum. If a non-oscillating tube is not found, a slight readjustment of the compensating condenser, as described in Part II, Section 17, may be necessary.

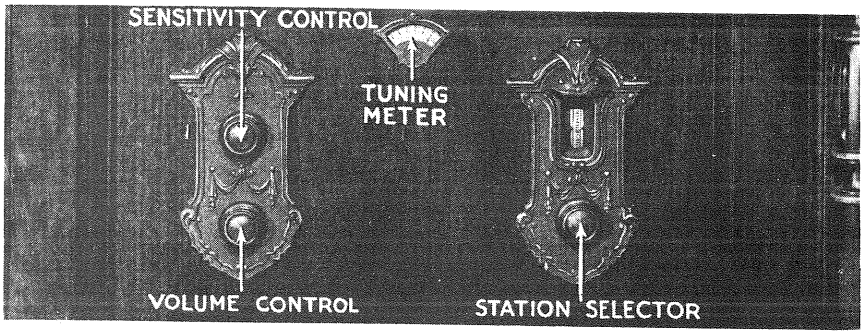


Figure 8—Tuning controls and tuning meter

Other stages somewhat critical are the oscillator and second detector, sockets Nos. 6 and 7 respectively. The remaining tubes should be interchanged until a tube is found for the oscillator that gives the loudest signal on a given station. The second detector should be selected for its ability to handle large volume. Select the tube for this socket that will cause the greatest volume to be delivered from the loudspeaker.

While selecting these tubes the volume control should be at maximum and any adjustments necessary should be made at the sensitivity control. In some cases it may be advisable to remove the volume control tube while selecting those for other sockets.

[5] LINE SWITCH

A two-way switch is provided in the S.P.U. for adjustment to line voltages. This switch is set at the 120-volt position in new sets. Unless it is definitely known that the line is always below 115 volts the switch should be left in its original position. It is a good plan to leave this switch at the 120-volt position on all lines unless unsatisfactory operation is experienced. If the switch is set at the 110-volt position on supply lines exceeding 115 volts the Radiotrons in the receiver will be damaged.

[6] KNOBS

Radiola 64 uses an improved type of push knob on the station selector and volume controls. This knob is removed by simply pulling it off the shaft, and replaced by pushing it on. Very little trouble should be experienced, as no setscrews or other parts that might give trouble are used.

When placing this knob on its shaft care must be exercised not to push it tight against the escutcheon, as then it will bind. Sometimes in new sets the knob will have become pushed against the escutcheon. The remedy is merely to pull the knob until it clears the escutcheon.

[7] PICK-UP FROM LONG WAVE HIGH POWER CODE STATIONS

Should Radiola 64 be installed very close to long wave, powerful code stations, it is possible that a certain amount of pick-up and interference from them will be experienced. Trouble of this kind may be eliminated in the following manner:

(a) Procure the following equipment.
Two Radiola 16 antenna coils (RCA Stock No. 5658.)
One .0002 Mfd. fixed condenser.

(b) Connect as shown in Figure 9.

(c) This apparatus may be placed inside the cabinet or made up in a separate unit and placed in any convenient location. It acts as a filter, allowing frequencies of the broadcast band only to reach the receiver.

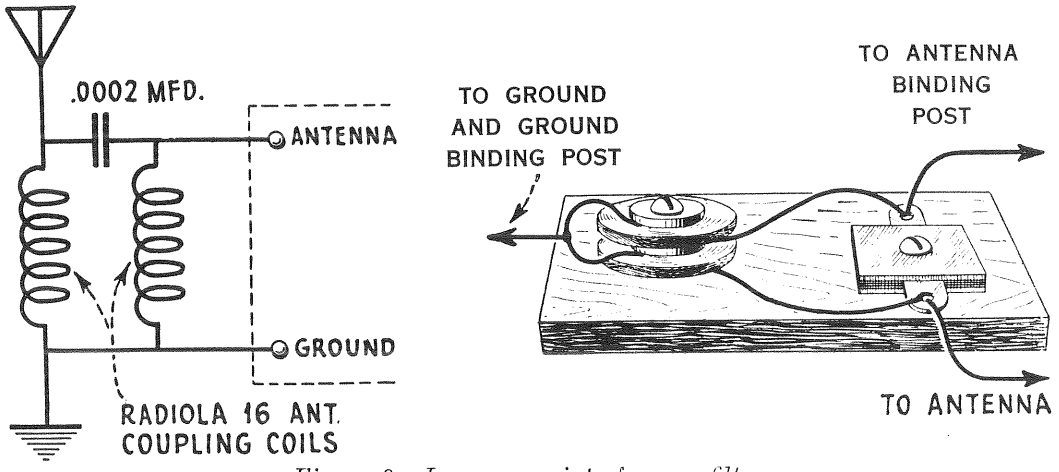


Figure 9—Long wave interference filter

[8] ADJUSTMENT OF HUM SUPPRESSOR

An adjusting screw on the S.P.U. is provided for adjustment to reduce hum. Should it be desirable to make such an adjustment proceed as follows:

(a) Place Radiola into normal operation, allowing sufficient time for all tubes to function properly. Turn the station selector to a position where no stations are received.

(b) With an insulated screw driver, adjust screw (See Figure 10), until the position is found where the least A.C. hum is heard in the reproducer unit.

If this adjustment does not reduce the hum satisfactorily some defect exists in the set. For trouble of this kind see Part II, Section 7.

PART II—SERVICE DATA

[1] ANTENNA SYSTEM FAILURES

A grating noise may be caused by a poor lead-in connection to the antenna; or the antenna touching some metallic surface, such as the edge of a tin roof, drain pipe, etc. By disconnecting the antenna and ground leads the service man can soon determine whether the cause of complaint is within or external to the receiver and plan his service work accordingly.

A grating noise may also be caused by dirty contacts in the sensitivity or volume control. Turning each of these controls to their extreme positions several times will generally remedy such trouble. Noisy operation may be caused by rosin from the soldering terminals lodging on the resistance in these controls. The resistance should be scraped clean.

[2] RADIOTRON SOCKETS

The sockets used in Radiola 64 are a seven-gang UY socket assembly, a single UY socket, and three single UX sockets. The three UX sockets are used in the socket power unit and are of a different design than those used in the receiver assembly.

The bakelite Radiotron guide shields used in the receiver assembly will prevent any possible shock from contact with high voltages in the socket when inserting the Radiotrons. The prongs of the tubes fit into this shield opening very snugly and require only a twist until the prongs find the correct holes into which they fit. This is especially helpful when inserting the five-prong tubes into their sockets.

[3] RADIOTRON PRONGS

Dirty Radiotron prongs may cause noisy operation or change the resistance of the filament circuits sufficiently to cause a hum in the loudspeaker. They should therefore be cleaned with fine sandpaper periodically to insure good contact. The use of emery cloth or steel wool is not recommended. Before re-inserting the Radiotrons in their sockets wipe the prongs and base carefully to make certain that all particles of sand are removed. Due to the relatively large filament current of Radiotron UY-227 it is imperative that the socket contacts make firm contact with the tube prongs.

If a Radiotron will not fit into a socket without considerable pressure, look for excessive solder on one or more of the prongs. Excessive solder on the prongs may be removed with a file or knife.

[4] LOOSE VOLUME OR SENSITIVITY CONTROL

A loose volume or sensitivity control arm may cause noisy or intermittent operation. It should be bent slightly so that it makes firm contact against the resistance strip. To do this it is necessary to remove the chassis from the cabinet as described in Part III, Section 1. The volume control is then accessible. It can be released by removing the two screws that hold it to the metal frame.

[5] ADJUSTMENT FOR SLACK DRUM CONTROL

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

After considerable wear or extreme changes of temperature the cable may become slack. To take up this slack open rear doors of cabinet and turn the cable adjusting screw with clamp until the cable is taut. This screw may become seated after several adjustments are made, thus allowing no further tightening of the cable. When this condition occurs it will be necessary to slip the cable a half turn on the grooved drum. To make this adjustment it is necessary to remove the chassis from the cabinet as described in Part III, Section 1. Remove the cable adjusting screw and clamp. The cable will then have approximately one inch slack. By removing the tapered pin holding the front grooved drum to its shaft and replacing it on the opposite side (180 degrees) the one inch slack in the cable can be taken up by using the new position of the pin for anchoring the cable. It will be noted that the tapered pin in the new position cannot be inserted as far as originally. However, it can be inserted far enough to lock the grooved drum to the control shaft and clear the metal housing. If the cable again is stretched to the maximum adjustment of the cable adjusting screw the tapered pin can be returned to its original position and an additional half turn slipped on the drum which will provide for taking up all slack. Sufficient grooves are provided on the drum for this purpose.

[6] BROKEN CONDENSER DRIVE CABLE

A broken condenser drive cable can be replaced in the manner described in Part III, Section 2. However, if a new cable is not immediately available a temporary repair can be made in the following manner, provided the break in the cable is not in that section that passes over the small grooved drums.

Splice and solder the two ends together. Splicing consists of interweaving the strands, as with rope and not just twisting the cable ends together as in an electrical wiring splice. Splicing gives greater strength and forms a smaller body on the cable. When soldering use plenty of flux and a small amount of solder. Heat sufficiently so that the solder adheres to all the strands of the cable. Placing the splice in an alcohol or bunsen flame affords sufficient heat and allows excess solder to drip away. This is but a temporary repair to be used only until a new cable can be procured.

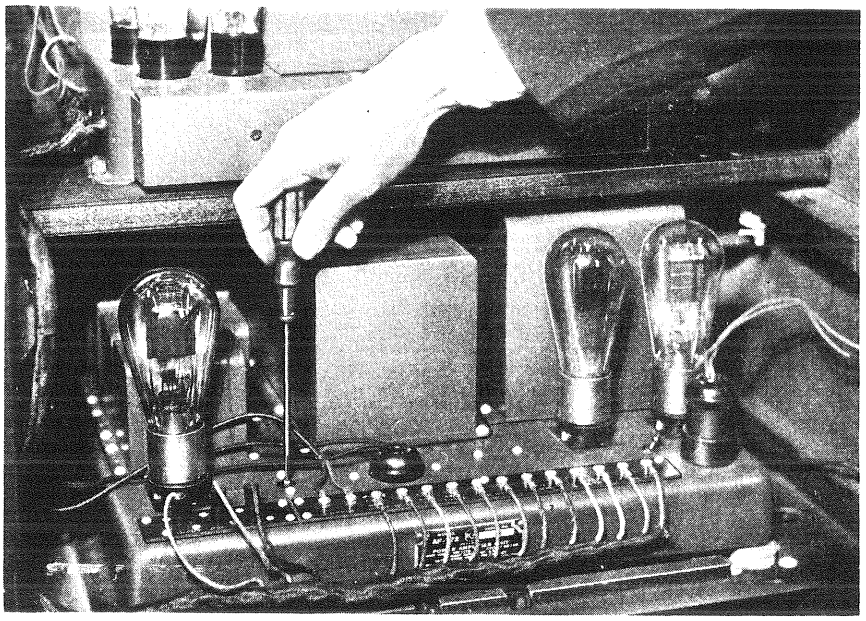


Figure 10—Adjusting the hum suppressor

[7] HUM

If a pronounced hum develops during operation check the following:

(a) S.P.U. potentiometer not properly adjusted. Adjust as described in Part I, Section 8.

(b) Low emission Radiotrons UX-281. A low emission rectifying tube will cause excessive hum and unsatisfactory operation.

(c) Defective center tapped resistance. A short or open of any of these resistances will cause a loud hum and imperfect operation of the Radiola.

(d) Any open of the several grounding connections in the Radiola or voltage supply resistances may cause a certain amount of hum. These defects will have a pronounced effect on the general operation of the Radiola which will be more noticeable than the additional hum. Check by means of the continuity test given in Part II, Section 26.

(e) Power line interference. This can be checked by removing the antenna and ground and the first R.F. Radiotron from the Radiola. If the hum disappears it is an indication that the trouble is external to the Radiola. In this case locate the trouble and have it corrected according to local conditions.

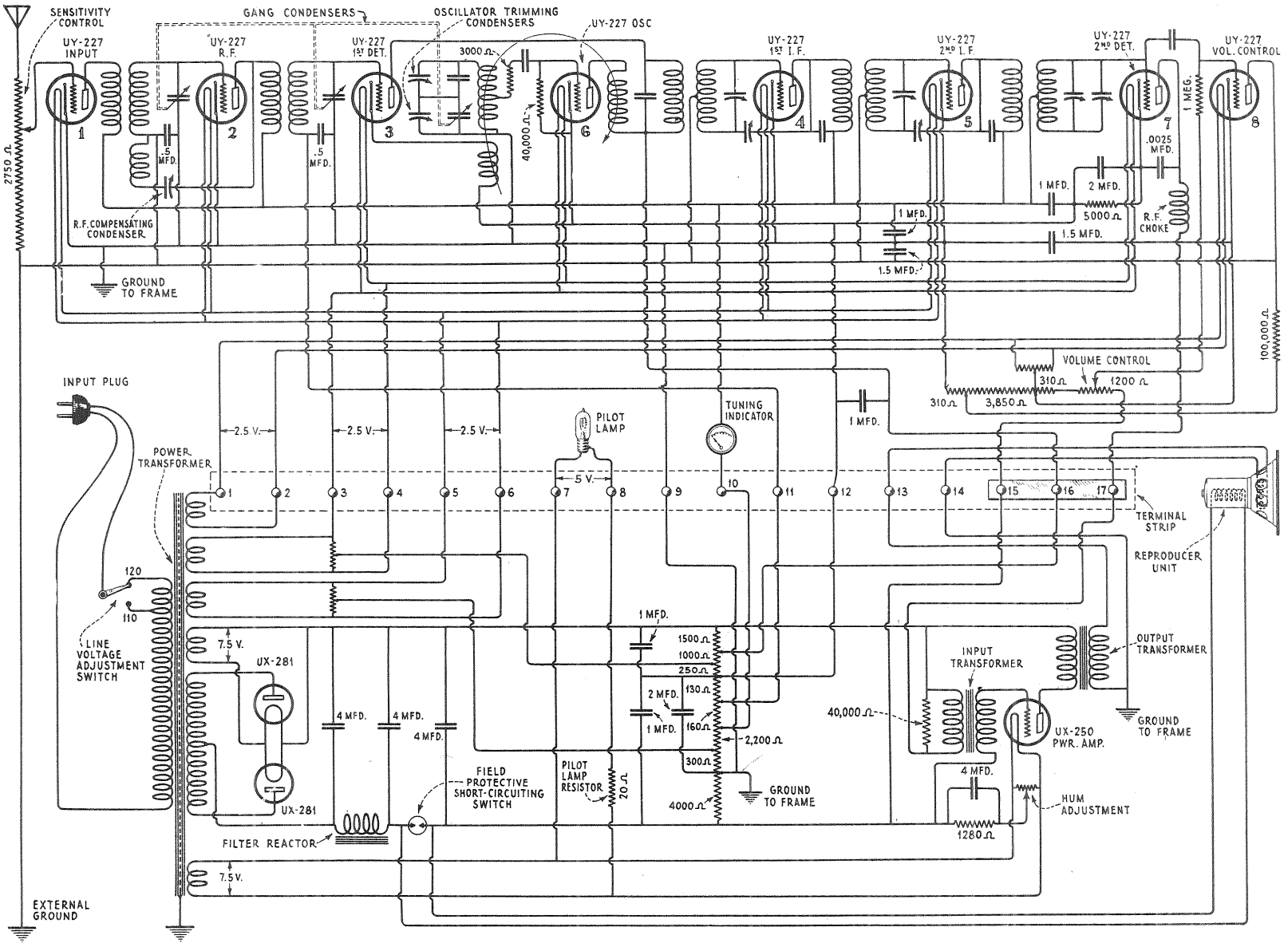


Figure 11—Schematic circuit diagram of Radiola 64

(f) Shorted 4 mfd. condenser across UX-250 bias resistance. This causes distorted reproduction and loud hum, as well as damage to Radiotron UX-250 if allowed to operate for any length of time.

A mechanical hum caused by vibration of loose laminations in the power transformer may be corrected by removing the power transformer from the S.P.U. as described in Part III, Section 5, and heating it in a slow oven. The terminal end should be kept up and the compound heated sufficiently to allow it to adhere to the laminations of the transformer. After heating, the transformer should be allowed to cool for at least 24 hours and then returned to the S.P.U.

[8] RADIOTRONS FAIL TO LIGHT WHEN OPERATING SWITCH IS "ON"

Should all Radiotrons fail to light when the operating switch is "ON," look for:

(a) House current switched off, or loose connection at convenience outlet.
(b) A.C. input plug to S.P.U. not in position.
(c) Operating switch not functioning properly.
(d) Line switch not functioning properly.
(e) Damaged power transformer in S.P.U.
(f) Burned-out filaments in Radiotrons.

The remedy for (a) (b) (c) and (d) is apparent. Any external cause (such as D.C. supply etc.) of (e) and (f) should be located and eliminated before making any replacements.

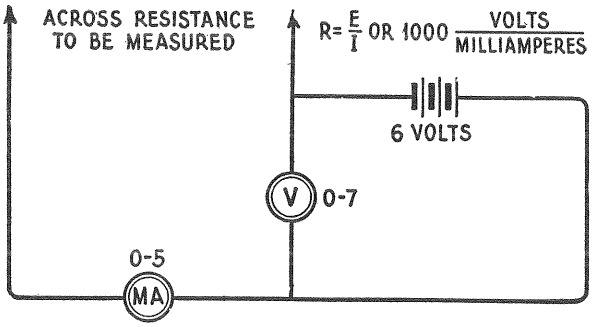


Figure 12—Schematic diagram of resistance measurement method

[9] PLATES OF RADIOTRONS EXCESSIVELY HOT

Should the plates of Radiotrons UX-281 become excessively hot, check the following:

(a) Shorted 4 mfd. filter condenser on high voltage side of field coil.
(b) Internal short in power transformer. Test for grounds to shield or to core, or short from one winding to another.

Should one Radiotron UX-281 become slightly overheated, but not show color and the other remain apparently normal, replace the one that appears normal. This tube is defective causing the other one to heat from overload.

[10] NO SIGNAL—RADIOTRONS O.K.

If the Radiotrons appear to be functioning properly and no signals are heard from the loudspeaker with the volume control at maximum, check the following:

(a) Inoperative Radiotrons. Defects other than filament failure are not apparent until the tubes are tested. Inoperative Radiotrons UX-281 may cause low voltages at the terminal strip. (See Part II, Section 25, for voltage readings.)
(b) Loose connections at S.P.U. terminal strip.
(c) Open movable coil on cone.
(d) Defective S.P.U. Check by means of continuity test.
(e) Open field coil in reproducer unit.
(f) Defective Radiotron in socket No. 8. Try removing. If defective, signals will come in at maximum intensity. A tube that does not function satisfactorily in this socket may prove O.K. in other positions.

[11] DISTORTION IN REPRODUCER UNIT

Distortion in the reproducer unit may be due to any of the following causes:

(a) Damaged Radiotron UX-250. Try one known to be in good operating condition.

(b) Cone out of alignment. Remove grille by pulling from left side and relocate cone coil by loosening center adjusting screw and shifting position of cone. The correct position is found as described in Part II, Section 20.

(c) Leads from cone coil broken away from side of cone. Make these fast with a little shellac.

(d) Defective S.P.U. Test by means of continuity test, Part II, Section 25.

(e) Loose grille, escutcheons, name plate or baffle board. Any loose part in the cabinet will cause a rattle. Tighten all loose parts.

[12] ACOUSTIC HOWL

Acoustic howl is caused by vibration of the elements in the receiver Radiotrons. This is amplified in the reproducer unit. Conditions being favorable the howl may increase in intensity and drown out the broadcast signal.

In Radiola 64 the receiver assembly shelf and the Socket Power Unit are both mounted on rubber bumpers to prevent any microphonic action. Should trouble of this kind be experienced, examine the rubber bumpers to make sure the receiver assembly shelf and the socket power unit is fully resting on rubber. If this is O.K. the Radiotrons in the receiver should be interchanged until the howl is eliminated.

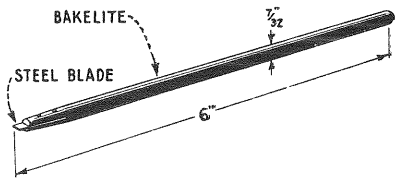


Figure 13—Dimensions of the insulated screwdriver

[13] CHECKING RESISTANCE UNITS

When checking Radiola 64 for possible trouble it is always a good plan to check the various resistance values of different resistance units. These values are shown in the schematic circuit diagram, Figure 11. A resistance bridge should be used for checking these values, or if this is not available, the following method may be used.

A milliammeter with a scale of 0-5 and a voltmeter of 0-7 is used with an applied voltage of approximately 6 volts. Figure 12 shows the hookup. The readings obtained are sufficiently accurate for checking purposes.

The resistance is calculated by Ohms law.

$$R = \frac{E}{I}$$ (Where R equals ohms, E equals volts and I equals amperes) or $$1{,}000 \frac{\text{Volts}}{\text{Milliamperes}}$$

Since the current reading is taken in milliamperes (or $\frac{1}{1000}$ ampere) it is necessary to multiply by 1,000 to get the resistance value in ohms.

This arrangement with a 0-5 milliammeter must be used for measuring the total resistance of the various units and not for the individual sections. In the latter case some of the readings would be beyond the range of the milliammeter. If it is desired to measure the resistance of the sections between taps a 0-100 milliammeter must be used.

[14] LOW VOLUME AND WEAK SIGNALS

Low volume or weak signals may be caused by:

(a) Defective antenna system. A poor antenna and ground or one in a shielded locality may cause weak signals. The suggestions given in Part I, Sections 1, 2 and 3, should be followed if trouble of this kind is experienced.

(b) Defective Radiotrons. A defective Radiotron in any stage may cause weak signals. Before checking other causes it is a good plan to check all Radiotrons by interchanging them with ones of a similar type known to be in good operating condition. A defective Radiotron in the eighth or volume control socket may prevent full volume. Test for this by removing the volume control tube from its socket while listening to local stations, with the volume and sensitivity controls at maximum. An increase in volume with the tube removed indicates another tube should be tried in this socket. A Radiotron that does not function correctly in the volume control socket may prove satisfactory in some other socket.

(c) R.F. compensating condenser out of adjustment. If this condenser is badly out of adjustment it will have the effect of making the Radiola very insensitive. To adjust correctly refer to Part II, Section 17.

(d) Oscillator trimming condensers out of adjustment. Should the oscillator trimming condensers be out of adjustment the Radiola may be sensitive at certain portions of the tuning scale and very insensitive at other sections. Also two tuning points may be found for the same station. Should these condensers be badly out of adjustment, only very loud local stations will be heard. The correct method for adjustment of these condensers is given in Part II, Section 18.

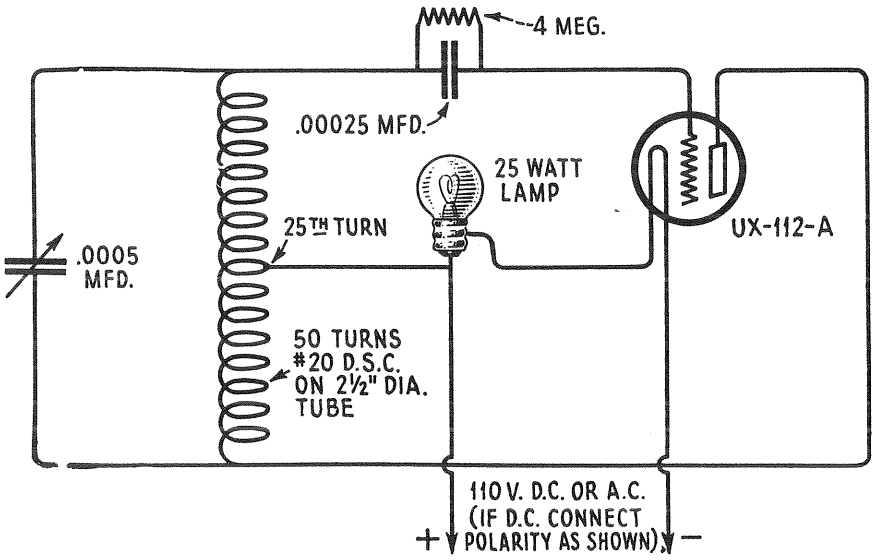


Figure 14—Socket powered modulated R.F. oscillator

(e) Intermediate transformers not correctly tuned or matched. Should the tuning condensers connected across the secondaries of the intermediate transformers be out of adjustment, weak signals and poor tuning or, in some cases no signals will result. Refer to Part II, Section 19, for the correct method of adjusting the I.F. transformers.

(f) Defective A.F. transformer. Check by means of the continuity test and make any replacement that is necessary.

(g) Low voltage from S.P.U. Check S.P.U. voltages at terminal strip with readings given in Part II, Section 25. Low voltages may be caused by a low emission rectifying tube or defective resistances in the S.P.U. or receiver. Check by means of continuity test.

(h) Open or short of various connections in receiver. Check by means of continuity tests and make any repair or replacement that is necessary.

[15] AUDIO HOWL

Audio howl may be caused by:

(a) Incorrect adjustment of R.F. compensating condenser. A compensating condenser adjusted to the verge of oscillation may cause a howl on nearby stations. Adjust as suggested in Part II, Section 17. Faint beat notes heard when listening to loud stations on frequencies of 900, 720 and 540 K.C. are not due to incorrect adjustment, and may be avoided by slight detuning until the beat disappears.

(b) Open A.F. condenser connections. An open of the A.F. by-pass condenser may cause a howl.

(c) Open by-pass condenser connections. An open of the connections to the by-pass condensers may cause a howl.

(d) Defective volume control resistance. Should there be an open or short in the volume control or in its adjacent resistances an audio howl may develop.

(e) Vibrating elements in receiver Radiotrons. A gradually developed howl may be due to the loudspeaker causing the receiver Radiotron elements to vibrate. Check as described in Part II, Section 12.

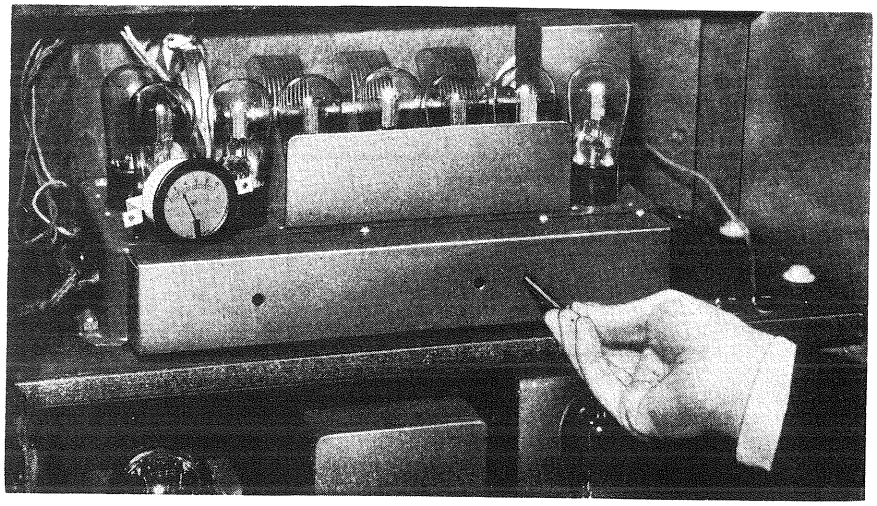


Figure 15—Adjusting the trimming condensers

(f) Poorly soldered or corroded joints. Any high resistance joint throughout the Radiola may cause a howl.

(g) Defective resistance in S.P.U. or the receiver assembly. An open resistance unit may cause howl. Under such conditions it is advisable to turn the set "off" until the trouble is found, otherwise excessive voltage rise may cause further damage.

(h) Neutralizing condensers in intermediate transformers out of adjustment. These condensers being out of adjustment might cause an I.F. stage to oscillate which will result in a howl when a station is tuned in, especially at loud volume. Adjust the neutralizing condensers as described in Part II, Section 19.

(i) Open of any of the several ground leads in the Radiola. This may cause some of the circuits to go into oscillation and result in a howl when a station is tuned "in" Generally a loud hum will also be present. The several grounding leads in the Receiver Assembly and in the Socket Power Unit should be checked and any open or poorly soldered joint should be repaired.

[16] DISTORTED OR NOISY REPRODUCTION

Poor quality or distortion may be due to any of the following causes:

(a) Defective Radiotrons. Though the Radiola may be in operating condition a defective Radiotron in any stage will cause distortion. This is especially true of the second

detector, audio stage and the rectifier tubes. A loud intermittent crackling noise, heard when the antenna and ground are disconnected, may be due to a defective Radiotron UX-250.

(b) High or low plate and grid voltages from the Socket Power Unit or a defective resistor in the Receiver Assembly. In the Socket Power Unit distortion may be caused by a defective Radiotron UX-281 or resistance unit.

(c) Defective A.F. transformer. Check by means of continuity test and replace if necessary.

(d) Trimming condensers out of adjustment. Should the oscillator trimming condensers be out of adjustment the beat signal may not be exactly the frequency to which the intermediates are tuned. This will cause weak signals and distortion of those received. This condition may or may not be present throughout the tuning range of the receiver. Adjust as described in Part II, Section 18.

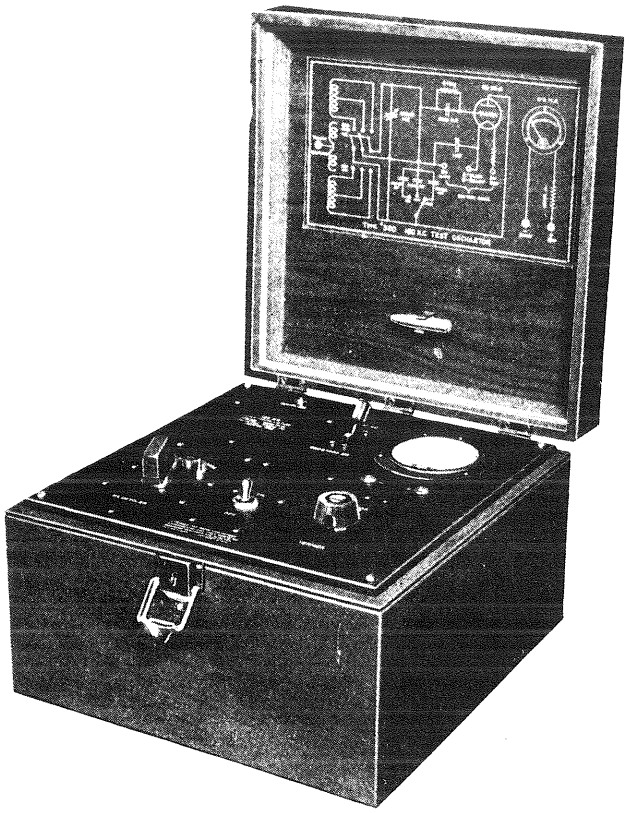


Figure 16—180 *K.C. Test Oscillator*

(e) Receiver oscillating. Should some circuit other than the oscillator be oscillating, distortion will be experienced when tuning in a station. This will be accompanied by a whistle or squeal when the carrier wave of the station is tuned in. To remedy trouble of this kind consult Part II, Section 15.

(f) Intermediate transformers out of line or not properly matched. This will have the effect of giving distorted reproduction and reduce the sensitivity of the receiver to a marked degree. Line up the entire I.F. transformer assembly as described in Part II, Section 19.

[17] ADJUSTMENT OF R. F. COMPENSATING CONDENSER

A cause of insensitivity may be a poor tube in the tuned R.F. stage or incorrect adjustment of the R.F. compensating condenser. Try changing tubes first to improve the sensitivity and if not successful adjust the compensating condenser. A step-by-step procedure for making proper adjustment follows:

(a) Procure a non-metallic screwdriver (See Figure 13).
(b) Connect a resistance of about 1.5 ohms across the cone coil leads. This will prevent damage to the cone spider should the Radiola go into oscillation.
(c) Place Radiola in operation and tune in a station, preferably at about the center of the dial scale.
(d) Locate the position of the compensating condenser. (See Figure 15).
(e) With the volume control at its maximum position and the sensitivity control set near minimum, adjust the screw of the condenser until the Radiola goes into oscillation. This will cause a whistle whenever a signal is tuned in. Then turn the screw in the opposite direction until the set just goes out of oscillation and no howl is experienced when receiving stations at any part of the scale. The condenser is now in correct adjustment.
(f) After the adjustment of the R.F. compensating condenser has been made the tube in the second socket should not be interchanged.

[18] ADJUSTMENT OF OSCILLATOR TRIMMING CONDENSERS

Two trimming condensers are provided for adjusting the oscillator circuit so that the beat note will always be 180 K.C. throughout the tuning range of the receiver.

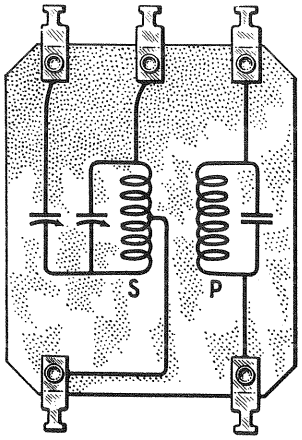


Figure 17—Internal connections of I.F. transformers

The most noticeable symptom of the oscillator trimming condensers being out of adjustment is two tuning points for the same station and insensitivity of the Radiola in some sections or throughout the tuning range. To check the adjustment of the trimming condensers as a possible cause of any noticeable insensitivity in the receiver proceed in the following manner:

(a) Procure the following equipment:

A modulated oscillator giving signals at 1,400 and 600 Kilocycles. Figure 14 shows the constants and circuit diagram of an oscillator satisfactory for this purpose which may be operated entirely from the house lighting circuit.

A non-metallic screwdriver. Such a screwdriver is shown in Figure 13.

(b) Open the rear doors of the Radiola. Remove the two wood screws that hold the tuning meter in place and release the meter lead clamp so the meter can be dropped below the baffle board and pulled out to read the scale from the rear of the Radiola.
(c) With the Radiola in operation, place the oscillator in operation at 1,400 K.C., about 15 on Radiola dial scale, close to the antenna lead, and tune the Radiola by adjusting the station selector until a deflection caused by the external oscillator is obtained in the tuning meter.
(d) Now adjust the oscillator trimming condenser on the right (Figure 15) with the non-metallic screw-driver until a maximum deflection is obtained in the tuning meter while tuning back and forth through the signal.

(e) Adjust oscillator for 600 K.C., about 80 on Radiola dial scale. Tune in the Radiola with station selector and then adjust the trimming condenser to the left for maximum deflection of the tuning meter while tuning back and forth through the signal.

(f) Now readjust at 1,400 K.C. as indicated in (c) and (d).

With this adjustment the trimming condensers are correctly adjusted for maximum efficiency, that is, so adjusted that the beat signal will be 180 K.C. throughout the tuning range.

(g) Remount tuning meter in its original position.

[19] ADJUSTMENT OF I. F. TRANSFORMERS

The three I.F. transformers used in Radiola 64 are of the air core, tuned primary and tuned secondary type. The primary condenser is of the fixed type, while the secondary is adjustable. Also in each assembly an adjustable condenser is provided for neutralizing the I.F. stage. Figure 17 illustrates the internal connections of all the I.F. transformers.

Should a transformer burn out or its primary fixed condenser change in capacity it will be necessary to replace that particular transformer. The correct procedure for making such a replacement is contained in Part III, Section 4.

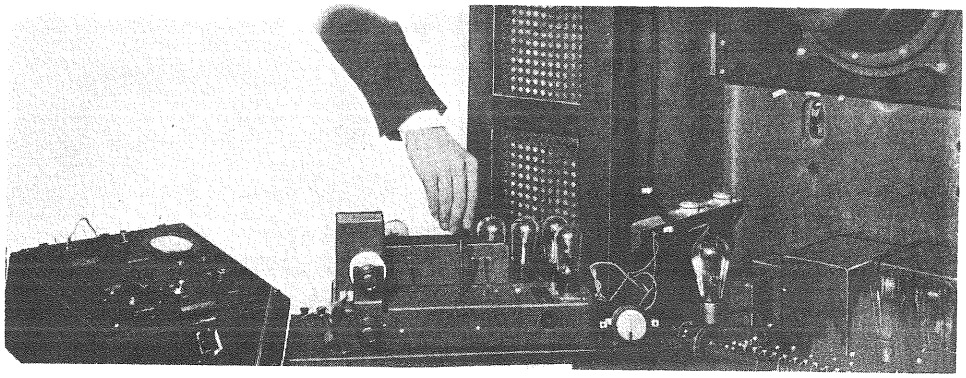


Figure 18—Adjusting the intermediate frequency transformers

A simple method of locating a shorted transformer is to use a resistance bridge or the resistance measuring method described in Part II, Section 13. The approximate transformer primary D.C. resistance is 20 ohms; secondary 100 ohms. Due to the circuit arrangement (See Figure 17) it will only be possible to get a reading of 50 ohms on the secondary as the end connection goes to the neutralizing condenser and the reading must be made at the center tap connection. This test can be made from the underside of the chassis. (See wiring diagram Figure 26).

After replacing a defective I.F. transformer or to make adjustments the following tuning and neutralizing procedure must be followed for correctly lining up the various circuits. This is of utmost importance, as the entire performance of Radiola 64 is based on the correct functioning of its intermediate stages.

The following equipment is needed:

1. A Test Oscillator (Driver). See Figure 16.
2. A coupling lead for coupling the output of the Driver to the grid coil of the first detector.
3. A non-metallic screw-driver.
4. A "dummy" Radiotron UY-227—A normal tube with one heater prong removed.

The RCA Service Division will advise RCA Distributors how to obtain this Driver and the above equipment.

Preliminary steps to be taken before adjusting the tuning, neutralizing and trimming condensers:

(a) Remove receiver assembly from cabinet as described in Part III, Section 1. Do not remove chassis from shelf and do not disconnect cable at S.P.U. terminals.

(b) Remove main tuning condenser assembly as described in Part III, Section 3.

(c) Replace screw holding ground lead on under side of receiver assembly and make certain that ground lead makes good contact with the chassis frame.

(d) Remove the two wood screws that hold down the tuning meter in place and release meter lead clamp. Slip the meter down below the baffle board and out to a position convenient for reading.

(e) Now place the coupling coil from the Driver under the center coil of the R.F. and Oscillator assembly. This is the transformer between the tuned R.F. stage and the first detector. Replace all Radiotrons except the Oscillator (No. 6) and turn operating switch "ON."

(f) Place Driver in operation by turning switch "ON," and set switches and vernier condenser at 180 K.C. The note from the Driver will then be heard in the reproducer unit of the receiver.

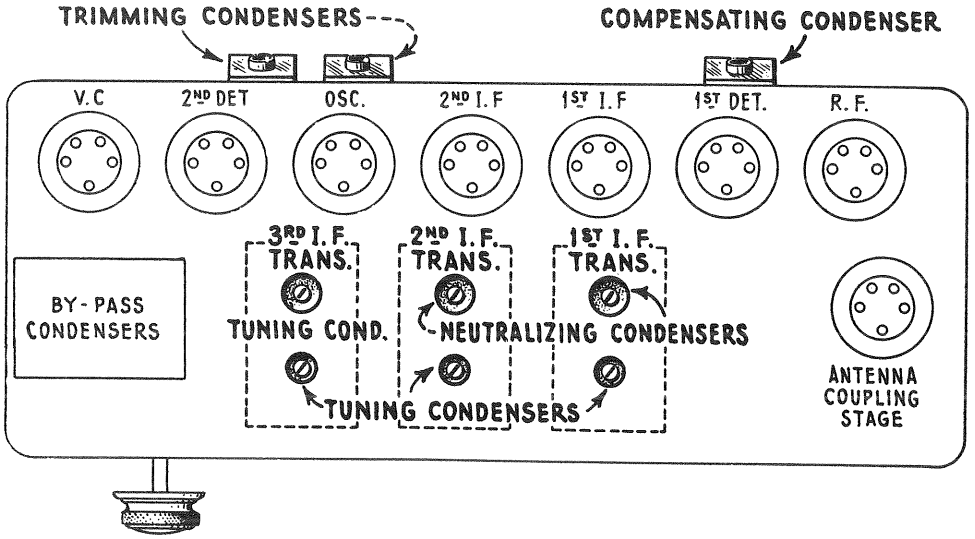


Figure 19—*I.F. neutralizing and tuning condensers, oscillator trimming condensers, and R.F. compensating condenser*

The I.F. transformer tuning condensers may now be adjusted (Figure 18) as follows:

(a) Adjust the tuning condensers successively on the third, second and first I.F. transformers (Figure 19) for maximum signal in the loudspeaker and maximum reading on the tuning meter. After making one adjustment on the transformers it is a good plan to repeat, as slight changes may have occurred in tuning the other circuits. No signal, or a loud howl indicates neutralizing condensers are at either extreme, and should be readjusted.

A maximum reading by adjusting all three tuning condensers indicates correct tuning of the intermediate stages.

It is now necessary to check the neutralization of the I.F. stages as follows:

(a) Leave all adjustments and apparatus in position on completion of tuning. Connect a pair of phones across the cone coil of the reproducer unit. Turn the power off while making this connection. Place dummy Radiotron in first I.F. socket. Now adjust the neutralizing condenser on the first I.F. transformer (Figure 19) for the position of minimum or no signal. This is easily identified and the adjustment is not critical.

(b) Replace the first I.F. tube and place "dummy" tube in second I.F. stage. Repeat the same adjustment as in (a) only adjusting with the neutralizing condenser on the second I.F. transformer. It will be noted that the two condensers on the third transformer are connected in parallel for tuning. This stage does not require neutralizing.

After the I.F. transformers are properly tuned and neutralized they should perform at their maximum efficiency. At this point it is a good plan to check the adjustment of the oscillator trimming condensers. Because the oscillator coil is close to the S.P.U. in the cabinet installation of the receiver assembly it is best to return the gang condenser to its position and then return the receiver assembly to the cabinet before adjusting the trimming condensers.

Adjust the trimming condensers as described in Part II, Section 18. The 600 K.C. and 1,400 K.C. positions of the test oscillator may be used for the necessary signal.

This check of the trimming condensers completes the adjustments to be made on Radiola 64 with the Driver.

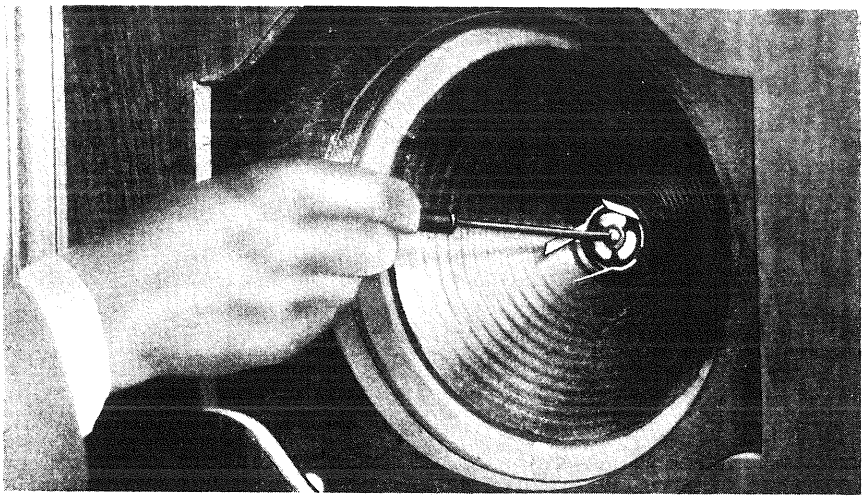


Figure 20—Adjusting the position of the cone

Due to the increased sensitivity of the receiver it may be necessary to reduce the setting of the R.F. compensating condenser to prevent the tuned R.F. stage from oscillating. This can be ascertained by tuning in stations of different wavelengths and noting if the receiver oscillates at any point throughout its tuning range. (See Part II, Section 17).

[20] CENTERING CONE OF REPRODUCER UNIT

To properly center a cone when making a replacement or one out of center proceed as follows:

(a) Remove front grille of Radiola by pulling from the left side, facing the front of the Radiola.

(b) Loosen centering screw of cone.

(c) Place three small cardboard strips, 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 give the cone coil the same clearance on all sides of the pole piece. Figure 20 shows this operation.

(d) Tighten the center screw and the cone will be properly centered. Remove the three pieces of cardboard and replace the grille in the cabinet.

[21] VOLTAGE SUPPLY SYSTEM

Figure 21 illustrates a schematic circuit showing the voltage dividing arrangement used in Radiola 64. As will be noted this Radiola uses the parallel feed system and the plate current drop through resistances for the volume control and power amplifier grid voltages. Other grid and cathode voltages are secured from the main voltage dividing resistance units. This system is very stable and tends to keep voltage variations in one circuit from affecting those in others. It also is a necessary arrangement for use with the automatic volume control tube.

[22] OPERATION OF AUTOMATIC VOLUME CONTROL

As the automatic volume control is a new feature, an explanation of its action may help the service man in his work. The action of this tube also has a bearing on the action of the tuning indicator which is explained in Part II, Section 23. Figure 22 shows a section of the circuit surrounding this tube. Its action to maintain a constant volume level is as follows:

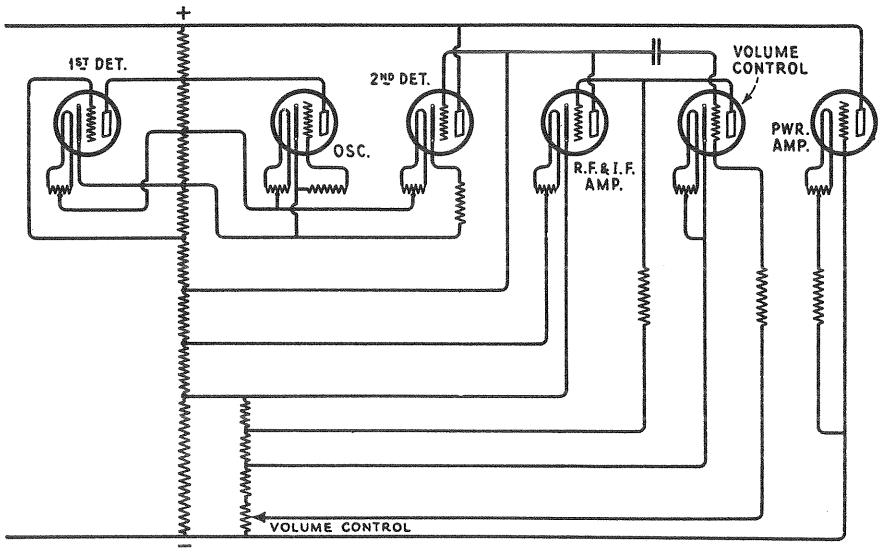


Figure 21—Schematic circuit diagram of voltage supply system

An incoming signal will swing the second detector and volume control grids exactly the same, as both grids are connected together through the condenser A. Assume the grid voltage at such a value as to increase the plate current in each tube. Neglecting the detector tube and just examining the volume control tube we find an increase of plate current will cause a greater voltage drop across resistor B than would be obtained with a normal grid voltage, such as would exist when no signal was tuned in. Examining the connections to each side of resistor B, we find that the voltage drop across it constitutes the grid bias for the two R.F. and two I.F. amplifiers. Thus a loud signal will increase the voltage drop across resistor "B" and increase the bias on the four radio

frequency amplifiers. This in turn reduces the signal at the volume control grid. The volume control is merely a variable resistance for regulating the bias on the volume control tube, this in turn regulating the amount of plate current in the tube which consequently regulates the effect of the incoming signal. A setting of the volume control that will give maximum current in the plate circuit will give a maximum bias on the four radio frequency amplifiers, and a consequent minimum amount of volume. A setting giving minimum plate current and minimum bias will, therefore, give the greatest volume.

[23] OPERATION OF TUNING METER

In the foregoing explanation it is evident that practically all incoming signals will cause an increased negative bias on the radio frequency amplifying tubes. This increased bias will naturally cause a decrease in the plate current of these tubes. Placing a milliammeter in the plate circuit of these four tubes and tuning in a signal will cause a decreased reading. In Radiola 64 the milliammeter is a reversed scale instrument with a maximum rating equal to the total plate current of these four tubes. By having a reversed reading scale, turning the current on and not tuning in a station the meter will read maximum current or zero scale reading. Tuning in a station and thus registering a smaller amount of plate current the meter will give an increased reading. The amount of this increased reading will depend on the accuracy of tuning and the setting of the volume control.

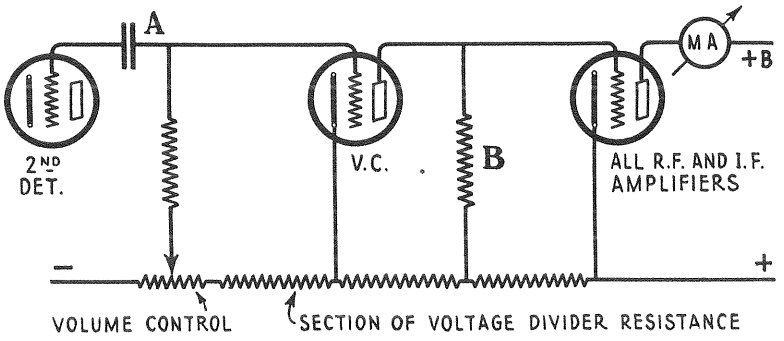


Figure 22—Schematic of automatic volume control system

[24] FILTER CONDENSER TESTS

The filter and by-pass condensers in Radiola 64 can be checked by noting the voltage readings given in Part II, Section 25. A no-voltage reading at any position will indicate a shorted condenser or an open resistance unit. The resistance unit can be checked by the continuity tests given in Part II, Section 26. After determining that the resistance units are not at fault, the individual condensers should be tested by charging them and noting their ability to retain the charge. The three high voltage 4 Mfd. condensers should be charged with any voltage up to 500—the higher the better. The rest of the condensers should not be charged with over 200 volts. After charging the condensers should be discharged by shorting their terminals with a screwdriver. The defective condenser will not hold its charge. If it is completely short-circuited a flash at the condenser terminals will occur when an attempt is made to charge it.

[25] VOLTAGE READINGS

The following table gives the correct voltages at the S.P.U. terminal strip. These readings are correct for a line voltage of 110 with the line switch at the 110-volt position and the volume and sensitivity control at zero. Variations in line voltage, tubes and individual Radiolas will make these readings only approximately correct when applied to different Radiolas. However, they are useful as a check and will indicate any defect that has a bearing on the voltage readings. In connecting the voltmeter to terminals 15, 16 and 17 it will be necessary to wind the lead from the meter around the cable plug before inserting plug in pin jack.

Precaution: Some of these voltages are sufficiently high to cause injury should a person come in contact with them. It is therefore best to turn "Off" the current while changing connections and be sure to clear all leads and the meter before turning "On" the current again.

Terminals	*Voltage*	
1 to 2	2.5 A.C.	
3 to 4	2.5 A.C.	
5 to 6	2.5 A.C.	
7 to 8	5.0 A.C.	(Pilot lamp "ON")
9 to 15	150 D.C.	
10 to 15	300 D.C.	
11 to 15	315 D.C.	
12 to 15	320 D.C.	
15 to 16	400 D.C.	
15 to 17	500 D.C.	

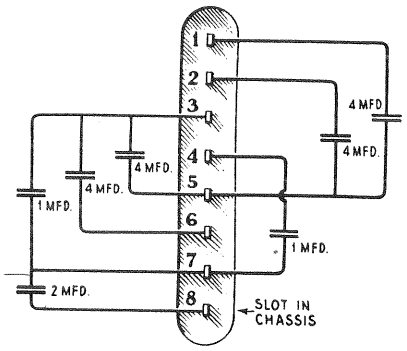


Figure 23—Internal connections of filter condensers

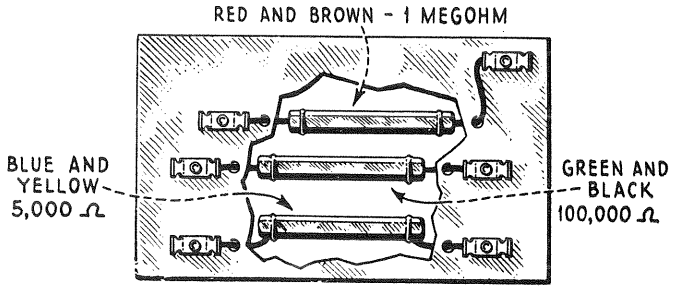


Figure 24—Arrangement of resistors on terminal board

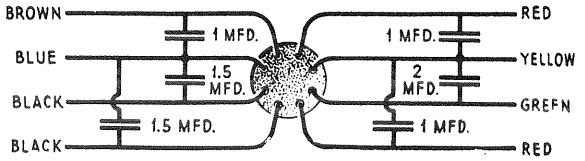


Figure 24A—Internal connections of the receiver by-pass condensers

[26] RADIOLA 64 CONTINUITY TESTS

The following tests will show complete continuity for the receiver assembly, socket power unit and connecting cables of Radiola 64. Disconnect the antenna and ground leads, the cable connecting the socket power unit to the receiver and the A.C. supply cord at its outlet.

A pair of headphones with at least 4½ volts in series, or a voltmeter with sufficient voltage to give a full scale deflection when connected across the battery terminals should be used in making these tests. The receiver Radiotron sockets, numbers, lugs and S.P.U. terminals used in these tests are shown in Figure 25. The receiver wiring diagram is illustrated in Figure 26 and the S.P.U. wiring diagram in Figure 27.

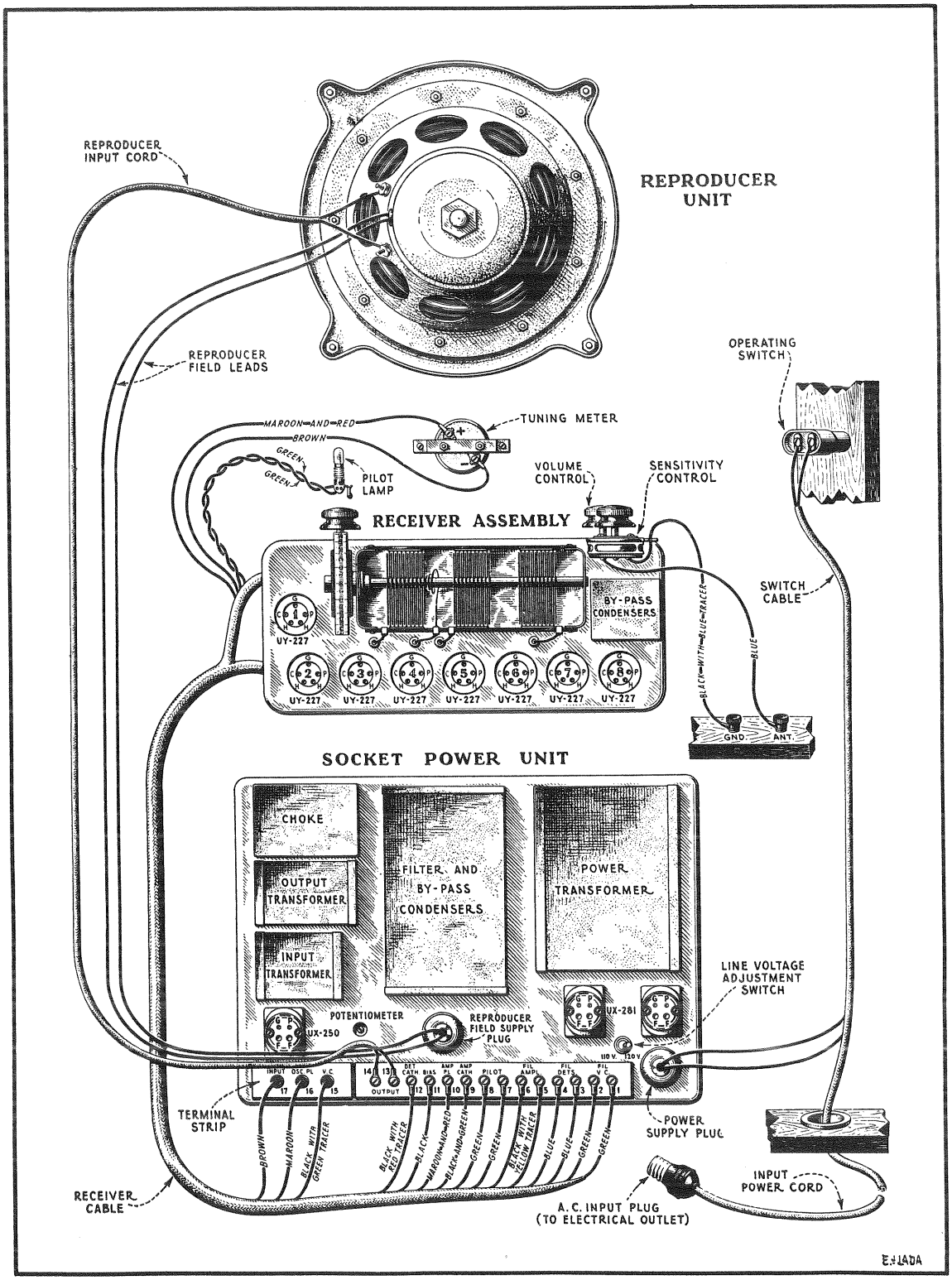


Figure 25—Reproducer, receiver and socket power units with connecting wires, terminal strip, lugs and Radiotron socket contacts

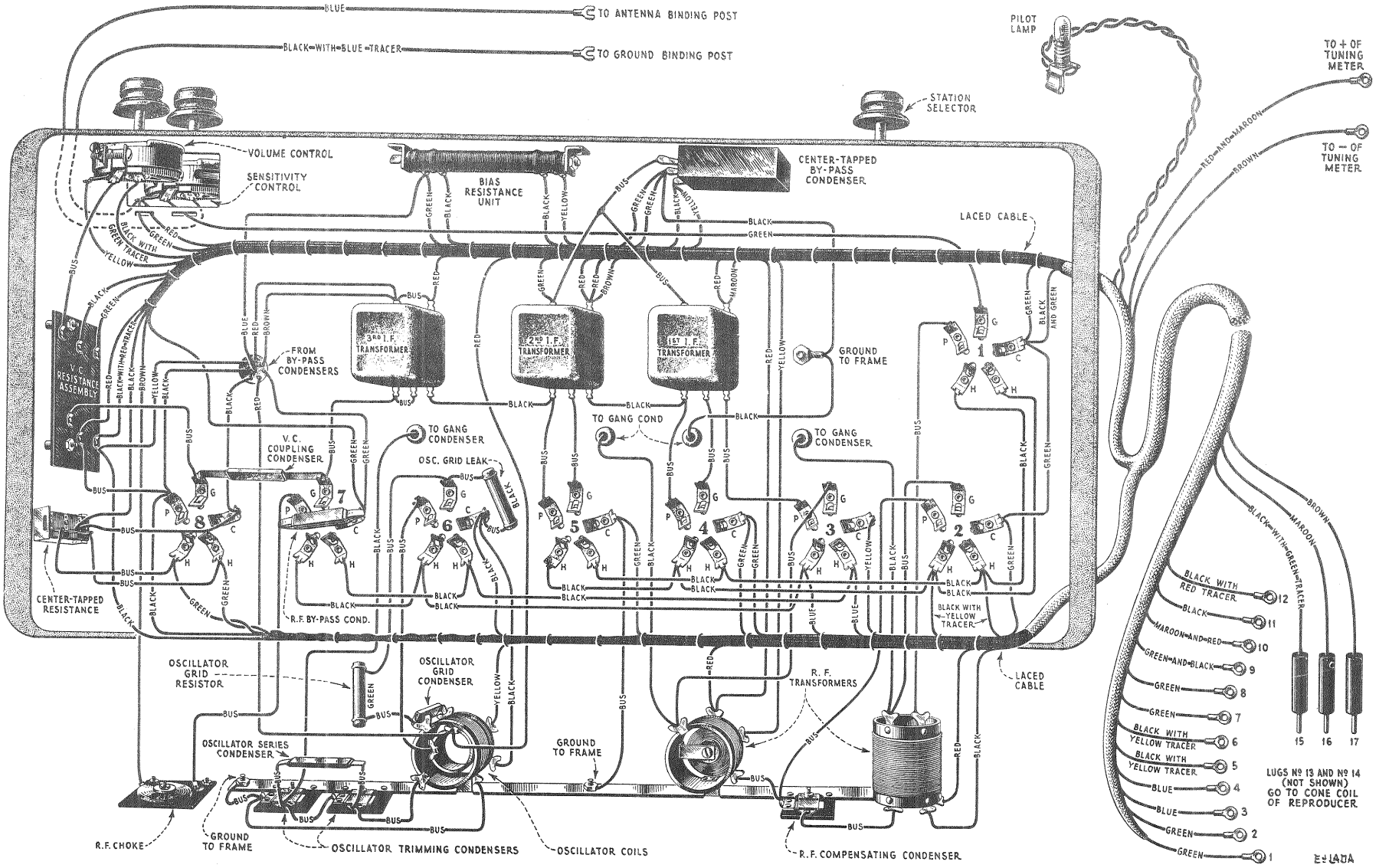


Figure 26—Receiver assembly wiring diagram

RECEIVER ASSEMBLY CONTINUITY TESTS

Remove all Radiotrons and Disconnect Cable at S.P.U. Terminal Strip.
See Figure 25 for cable lugs, terminals and Radiotron Socket Contacts.

Circuit	*Terminals*	*Correct Effect*	*Incorrect Effect Caused by*
Grid	Antenna to ground binding posts	Closed	Open sensitivity control
	Antenna binding post to G1	Closed	Open control arm of sensitivity control or connections
	G1 to P8	Closed	Open contact arm of sensitivity control or connection
	G2 to P8	Closed	Open secondary of 1st R.F. transformer or connection
	G4 to P8	Closed	Open ½ secondary of 1st I.F. transformer or connection
	G5 to P8	Closed	Open ½ secondary of 2nd I.F. transformer or connection
	G3 to Lug No. 11	Closed	Open secondary of 2nd R.F. transformer
	G6 to Lug No. 12	Closed (Weak)	Open grid resistor of oscillator circuit
	G7 to Lug No. 10	Closed	Open ½ secondary of 3rd I.F. transformer
	G8 to Lug No. 15	Closed (Very weak)	Open volume control or grid resistor of volume control tube
	G7 to G8	Open	Shorted volume control coupling condenser
Cathode	Cathode 1 to frame or Lug No. 9	Closed	Open connection
	Cathode 2 to frame	Closed	Open connection
	Cathode 3 to Cathode 6	Closed	Open oscillator coupling coil
	Cathode 4 to ground	Closed	Open connection
	Cathode 5 to ground	Closed	Open connection
	Cathode 7 to Lug 12	Closed	Open connection or resistance
	Cathode 7 to Plate 7	Open	Shorted detector by pass condenser
	Cathode 8 to Lug 15	Closed	Open connection, voltage dividing resistance or volume control
Heater	Lug 1 to either heater contact socket 8	Closed	Open connection
	Lug 2 to either heater contact socket 8	Closed	Open connection
	Lug 1 to Lug 2	Closed	Open center tapped resistance unit
	Lug 3 to one heater contact of sockets 3, 6 and 7	Closed	Open connection
	Lug 4 to other heater contact of sockets 3, 6 and 7	Closed	Open connection
	Lug 5 to one heater contact of sockets 1, 2, 4 or 5	Closed	Open connection
	Lug 6 to other heater contact of sockets 1, 2, 4 or 5	Closed	Open connection
Plate	P1 to Lug No. 10	Closed	Open primary of 1st R.F. transformer
	P2 to Lug No. 10	Closed	Open primary of 2nd R.F. transformer
	P3 to Lug No. 16	Closed	Open primary of 1st I.F. transformer
	P4 to Lug No. 10	Closed	Open primary of 2nd I.F. transformer
	P5 to Lug No. 10	Closed	Open primary of 3rd I.F. transformer
	P6 to Lug No. 16	Closed	Open oscillator plate coil
	P7 to Lug No. 17	Closed	Open radio frequency choke
	P8 to Lug No. 15	Closed (Weak)	Open volume control plate resistance or voltage dividing resistance
Miscellaneous	Frame to Lug No. 15	Closed	Open voltage dividing resistance
	Lug No. 9 to Lug No. 10	Open	Shorted 1 mfd. condenser
	Lug No. 12 to Lug No. 16	Open	Shorted 1 mfd. condenser
	Lug No. 10 to Lug No. 12	Open	Shorted 1 mfd. condenser
	Lug No. 11 to frame	Open	Shorted .5 mfd. condenser

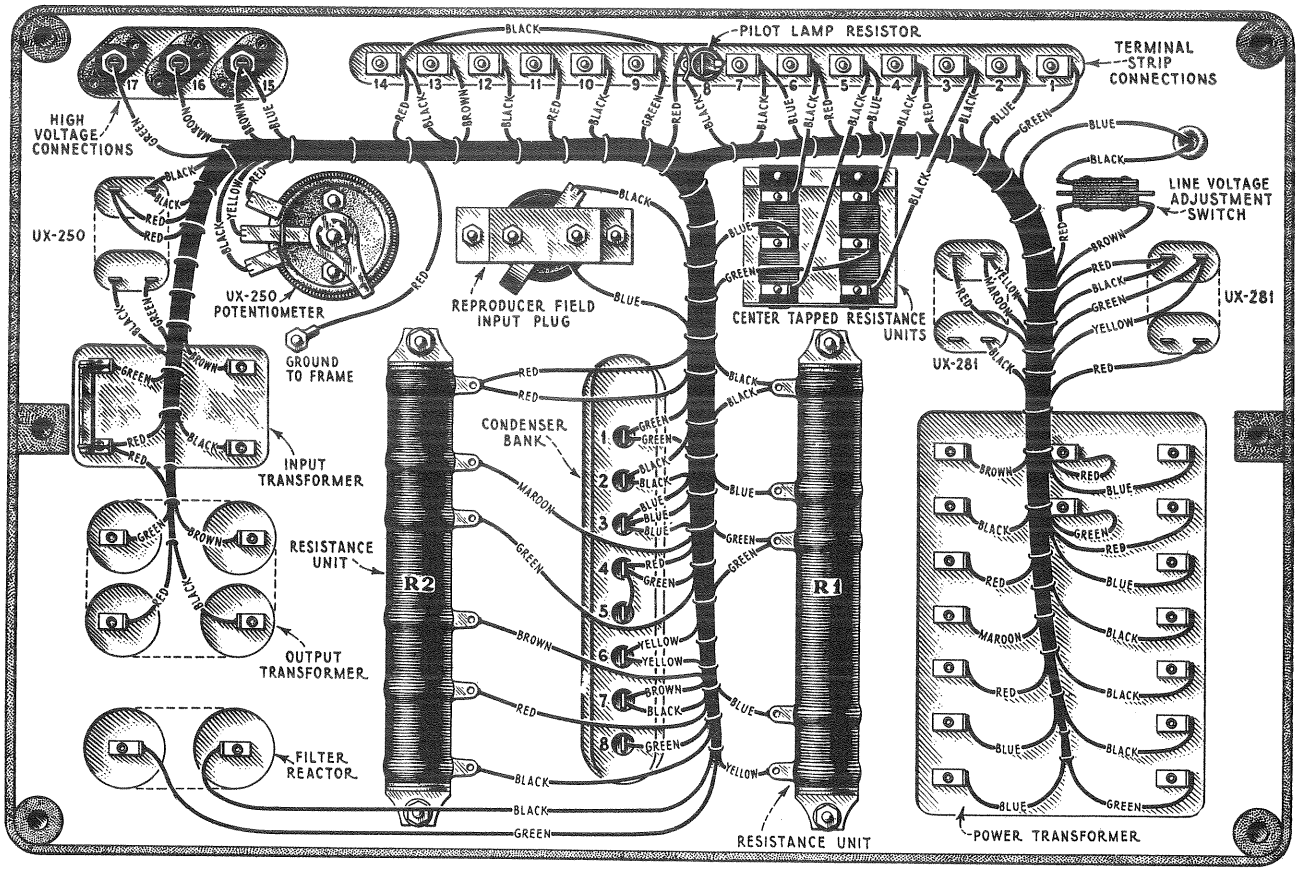


Figure 27—Wiring diagram of the socket power unit

SOCKET POWER CONTINUITY TESTS

Remove Radiotrons and disconnect leads to S.P.U. terminals, field plug and input plug.

Circuit	*Terminals*	*Correct Effect*	*Incorrect Effect Caused by*
Filament	1 to 2	Closed	Open volume control heater winding
	3 to 4	Closed	Open detector and osc. heater winding
	5 to 6	Closed	Open amplifier heater winding
	7 to 8	Closed	Open UX-250 filament winding or pilot lamp resistance
	Across filament of UX-281	Closed	Open UX-281 filament winding
	Across filament of UX-250	Closed	Open UX-250 filament winding
Plate	Plate of one UX-281 to plate of other UX-281	Closed	Open high voltage winding of power transformer
	Plate contact of UX-250 socket to terminal No. 17	Closed	Open primary of output transformer or primary of input transformer
Grid	Grid of UX-250 socket to one side of field input plug	Closed	Open secondary of input transformer
Miscellaneous	13 to 14	Closed	Open secondary of output transformer
	Lug No. 13 to No. 14	Closed	Open cone coil of reproducer unit
	UX-281 filament field input plug	Closed	Open resistance units R1 or R2
	Across reproducer field plug	Closed	Open reproducer field coil
	Plate of either UX-281 to field input plug	Closed	Open ½ high voltage winding or filter reactor

[27] VOLTAGE READINGS AT RADIOTRON SOCKETS

The following voltages taken at each Radiotron socket with the receiver in operating condition should prove of value when checking with test sets such as the Weston Model 537, Type 2, or others giving similar readings. The plate currents or grid voltages shown are not necessarily accurate for each tube, as the cable in the test set will cause some circuits to oscillate, due to its added capacity. Small variations of voltages will be caused by different tubes and line voltages. Therefore the following values must be taken as approximately those that will be found under varying conditions. The numbers in column 1 indicate the tube socket numbers shown in Figure 25.

VOLUME AND SENSITIVITY CONTROLS AT ZERO

Tube No.	*Cathode to Heater Volts*	*Cathode or Filament to Grid Volts*	*Cathode or Filament to Plate Volts*	*Plate Current Milliamps*	*Filament or Heater Voltage*
1	19	31	160	—	2.5
2	19	29	160	—	2.5
3	14	8	70	.75	2.5
4	19	29	160	—	2.5
5	19	30	160	—	2.5
6	14	—	65	7.0	2.5
7	14	18	160	.25	2.5
8	—	1	65	.25	2.5
UX-250	—	65	390	52.5	7.5

VOLUME AND SENSITIVITY CONTROLS AT MAXIMUM NO STATION TUNED IN

Tube No.	*Cathode to Heater Volts*	*Cathode or Filament to Grid Volts*	*Cathode or Filament to Plate Volts*	*Plate Current Milliamps*	*Filament or Heater Voltage*
1	15	3	120	3.5	2.5
2	15	3	120	3.5	2.5
3	15	9	75	.25	2.5
4	17	14	140	6.0	2.5
5	17	15	140	6.0	2.5
6	15	—	70	7.0	2.5
7	14	24	170	—	2.5
8	—	2	75	—	2.5
UX-250	—	64	390	52.5	7.5

[28] TESTING ELECTRICAL ALIGNMENT OF TUNING CONDENSERS

Radiola 64 uses a three-gang tuning condenser, one condenser being used for the oscillator, one for the tuned radio frequency stage and one for the heterodyne detector. These condensers are accurately aligned electrically at the factory and it is important that they maintain this electrical alignment. Condensers not aligned will cause weak signals, broad tuning and generally unsatisfactory operation. The following procedure may be used for checking and aligning the condensers properly.

(a) A small tool such as illustrated in Figure 28 is necessary. This may be easily constructed from an old condenser plate, a piece of wire and a bakelite rod.

(b) Tune in a station at the upper wavelengths. Then with the condenser end of the tester, touch the rotor plates, see Figure 29, and note if an increase or decrease of signal is obtained in the loudspeaker. Should touching the rotor plates and bringing the plate closer to the stator plates increase the signal, then either that particular condenser is low in capacity or the coil it tunes is low in inductance. Should the signal decrease in volume, then the condenser and coil is either normal or high in value.

(c) After checking at the upper wavelengths, the procedure should be repeated at the lower wavelengths.

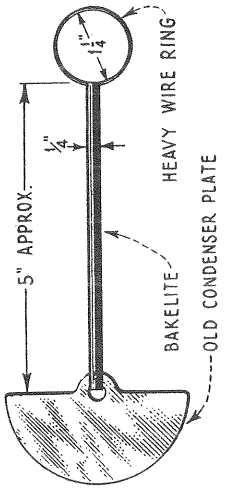


Figure 28—Tool for testing electrical alignment of gang tuning condensers

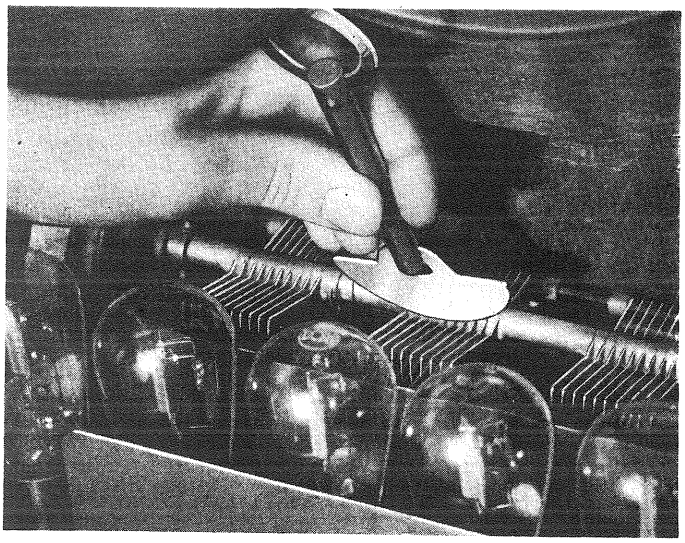


Figure 29—Checking condenser alignment in the three-gang tuning condenser assembly

To check against condensers or coils high in value the other end of the tester which has the wire ring should be placed inside of the coils or near the end of the coil. This reduces the inductance and should the coil be high in inductance or the condenser which tunes it high in capacity, the signal will increase in volume.

By thus checking each condenser and the coil it tunes, a positive check on the electrical alignment of the condensers and coils can be made. Should a circuit be found that is high, the end rotor plate of the particular condenser should be bent farther from the stator plates. The correct amount can be determined by checking as previously described. If the oscillator circuit should be out, a check must first be made of the adjustment of the trimming condensers. See Part II, Section 18.

Should it not be possible to align the circuits by bending the plates then the R.F. and oscillator is not properly matched. In this case this assembly must be replaced as described in Part III, Section 5.

PART III—MAKING REPLACEMENTS

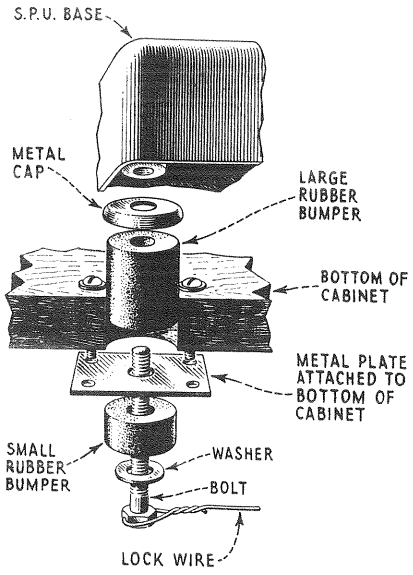
The various assemblies and parts of Radiola 64 are readily accessible and replacements can be easily made. Figures 3 and 4 illustrate the parts in the receiver assembly and Figures 5 and 6 the socket power unit. The following detailed procedure outlines the simplest methods to be used when making replacements.

[1] REPLACING VOLUME OR SENSITIVITY CONTROL

Should it be necessary to replace the volume or sensitivity control, proceed as follows:

(a) Open rear door of Radiola and remove the four cotter pins that are in the bolts holding the receiver assembly shelf to the cabinet.

(b) Remove the four nuts and rubber washers attached to these bolts. After this remove the bolts by pulling clear from the shelf. (See Figure 30.)



Mounting of socket power unit

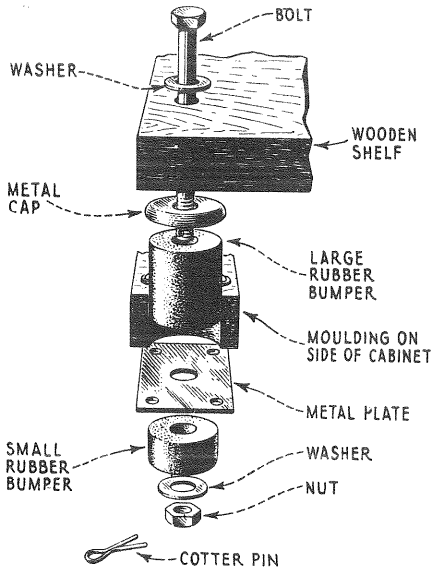


Figure 30

Mounting of receiver assembly shelf

(c) Release the two wood screws that hold the tuning meter in place. Slip the meter clear of the baffle board.

(d) Release the clamp that holds the leads of the tuning meter to the front of the Radiola.

(e) Disconnect all terminal connections at S.P.U. terminal strip.

(f) Remove the three knobs from the front of the Radiola. This is done by merely pulling them from their shafts.

The shelf with the receiver assembly may now be lifted clear (Figure 31), and the sensitivity control removed by releasing the two screws, nuts and washers that hold it in place, and unsoldering its three connections. The new one should be placed in the position occupied by the old one and the receiver assembly reassembled and returned to the cabinet in the reverse manner of that used to remove it.

The volume control is not accessible from the top of the receiver assembly, therefore it is necessary to remove the four machine screws that hold it in place and remove the shelf from the receiver assembly. Otherwise the replacement procedure is the same as that used for the sensitivity control.

[2] REPLACING CONDENSER DRIVE CABLE

(a) Remove the receiver assembly from the cabinet and from its shelf as described in Part III, Section 1. Place the receiver assembly on a table so that the cable on the grooved drums is accessible.

(b) Release the cable adjusting screw and clamp, and remove old cable from drums completely.

(c) Starting from the rear grooved drum, place eye of new cable over pin, which should be in a horizontal position and next to side of the assembly that is closest to the cable.

(d) Now pass cable over large drum. Turn the drum so the cable adjusting screw is on top. Pass cable over groove until point is reached where there is a slot in the drum for passing the cable to the track on the other side of the drum.

(e) Follow on around other track in same direction until a point is reached where cable is directly above front grooved drum.

(f) Starting on the third groove back from the front of the drum, wind on two and a half turns and slip eye over pin. The cable is now in its correct position, although probably slack.

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

(h) Return receiver assembly to cabinet in the reverse order of that used to remove it.

[3] REPLACING MAIN TUNING CONDENSERS AND DRIVE

The main tuning condensers and drive are replaced as one unit as follows:

(a) Remove receiver assembly from cabinet as described in Part III, Section 1.

(b) Remove the three screws, nuts and lock washers that hold the condenser assembly to the metal frame.

(c) Now pull the condensers as far forward as possible and unsolder the four leads connected at the rear. Releasing the condensers and pulling them forward provides ample space in which to do the unsoldering job and keeps solder material clear of the tube shield. Remove the entire assembly by tilting slightly and pulling clear.

(d) Place the new assembly in the position occupied by the old one and solder the four leads to their proper connections.

(e) Fasten the three screws, nuts and lock washers in their proper position. Make sure that the screw that holds the ground connection on the under side of the chassis makes firm contact.

(f) Return the receiver to the cabinet in the reverse order of that used to remove them.

[4] REPLACING INTERMEDIATE TRANSFORMERS

Radiola 64 has three intermediate frequency transformers, all three being exactly the same mechanically, and interchangeable electrically after the correct adjustments have been made for their particular position in the circuit. A step-by-step replacement procedure follows:

(a) Remove receiver assembly from cabinet as described in Part III, Section 1.

(b) Remove tuning condenser assembly as described in Part III, Section 3.

(c) Unsolder the connections of the transformer being replaced. Then turn up the metal tabs on the upper side of the receiver chassis. The old transformer may now be replaced by the new one. Turn over the metal tabs to hold it in place and resolder all connections. These are shown in Figure 26. Be careful not to heat any connection more than necessary to make a good joint, as excessive heat may change the capacity of the primary fixed condenser, thus rendering the entire transformer assembly defective.

(d) Before returning the main tuning condensers to the receiver chassis it will be necessary to tune and neutralize the transformer just connected in position. The correct procedure for doing this is contained in Part II, Section 19.

(e) Then return the tuning condenser assembly in the reverse order of that used to remove it. The entire receiver may now be tested and a check made on the adjustment of the oscillator trimming condensers as described in Part II, Section 19. After all tests and adjustments are completed the receiver assembly should be returned to the cabinet in the reverse order of that used to remove it.

[5] REPLACING R. F. TRANSFORMER AND OSCILLATOR ASSEMBLY

The two radio frequency transformers and the oscillator coils are mounted on a metal strip, together with three small adjustable condensers and two fixed condensers.

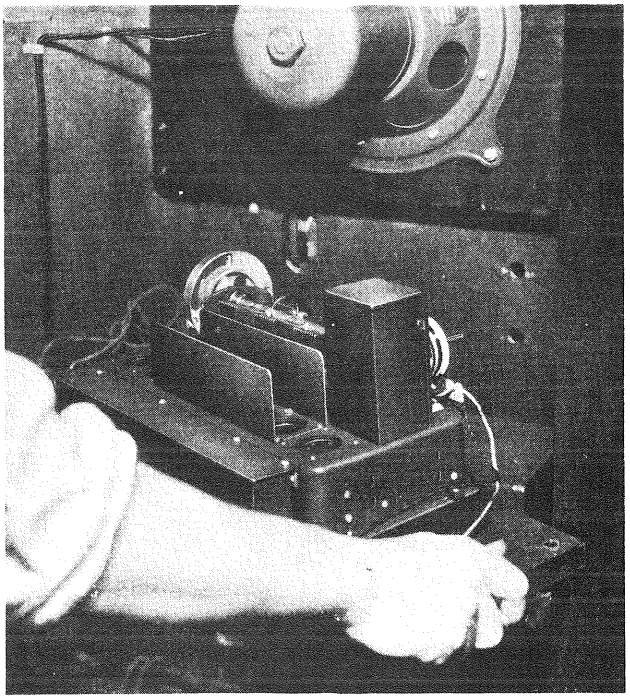


Figure 31—Removing receiver chassis and shelf from cabinet

This assembly must be replaced as a unit—the matching of the coils being an important point in the operation of the receiver. Use the following procedure:

(a) Remove receiver chassis from cabinet as described in Part III, Section 1.

(b) Turn chassis on side and unsolder all leads to the assembly being replaced.

(c) Remove the five machine screws and lock washers that hold the metal supporting strip to the receiver frame.

(d) The assembly may now be removed and the new assembly fastened in position with the five machine screws and washers previously removed.

(e) Resolder all connections in their correct position on the assembly. This is shown in Figure 26.

(f) The receiver assembly may now be returned to the cabinet in the reverse manner of that used to remove it.

[6] REPLACING RADIOTRON GANG SOCKETS

The receiver assembly of Radiola 64 uses one seven-gang UY socket and a single UY socket. These, together with their shields, are held in place by means of rivets which clamp them on the metal chassis frame. Should replacement be desirable, use the following procedure:

(a) Remove the receiver assembly from the cabinet as described in Part III, Section 1.

(b) Unsolder all connections to the particular socket or assembly being removed. The R.F. transformer assembly should be removed as a unit to provide room for replacing the six-gang Radiotron socket.

(c) Drill out the rivets holding the Radiotron socket to be replaced. The socket and shield will be released together.

(d) Remove the old Radiotron socket and fasten the new one in position by means of screws, nuts and washers. Resolder all connections and replace the R.F. assembly if removed. The correct connections are shown in Figure 00.

(e) Fasten receiver assembly in cabinet, connect cable and test. If O.K., replace shield over terminal strip and return Radiola to normal operation.

[7] REPLACING BY-PASS CONDENSER BANK IN RECEIVER ASSEMBLY

At one end of the receiver assembly of Radiola 64 is located a condenser bank, these capacitors being used only in the receiver assembly circuits. Should it be desirable to replace this condenser bank, use the following procedure:

(a) Remove receiver assembly from cabinet as described in Part III, Section 1.

(b) Turn chassis on side and unsolder all leads to the condenser bank being replaced.

(c) Remove the volume control resistor assembly as described in Part III, Section 1.

(d) Bend up the metal tabs that hold the condenser pack in place. It may now be removed and the new one placed in the position occupied by the old one. Turn down the tabs to secure it in place and replace the resistor assembly.

(e) Solder all connections in place (Figure 26) and return the receiver assembly to the cabinet in the reverse manner of that used to remove it.

[8] REPLACING CENTER-TAPPED BY-PASS CONDENSER

Should it be necessary to replace the center-tapped by-pass condenser in the receiver assembly, proceed as follows:

(a) Remove receiver assembly from the cabinet as described in Part III, Section 1.

(b) Unsolder the connections to the condenser.

(c) With a screwdriver bend up the metal tabs holding the condenser to the side of the receiver frame. These tabs bend easily, and when turned up make possible the removal of the condenser.

(d) The new condenser should now be fastened in place in the position formerly occupied by the old one.

(e) Resolder the connections as shown in Figure 26.

(f) Return the receiver assembly to the cabinet in the reverse order of that used to remove it.

[9] REPLACING RESISTORS USED IN VOLUME CONTROL RESISTANCE ASSEMBLY

Mounted on a small dilecto board are three resistance units used in conjunction with the volume control tube. Should replacement become necessary, proceed as follows:

(a) Remove receiver assembly from cabinet as described in Part III, Section 1.

(b) Turn receiver assembly on the side and unsolder the connections and the leads to the resistor being replaced.

(c) Place the new resistor in the position occupied by the old one, solder its leads in place and fasten the mounting board to the side of the chassis.
(d) Return receiver assembly to the cabinet in the reverse manner of that used to remove it.

[10] REPLACING DIAL SCALES

After considerable use a dial scale may become soiled or illegible and a new scale desired. A step-by-step procedure to make replacement follows:

(a) Open rear door of Radiola 64.
(b) Turn dial so that the two screws that hold the dial in place are toward the rear.
(c) Loosen screws, washers and nuts that hold dial in place.

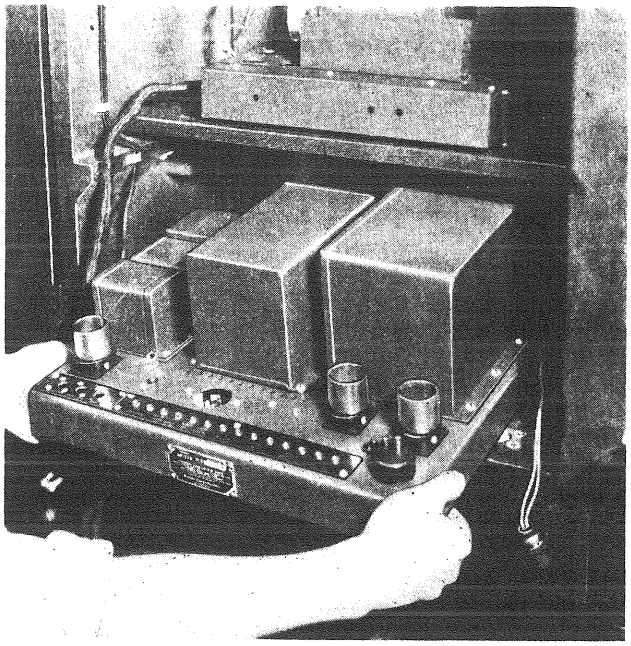


Figure 32—Removing socket power unit from cabinet

(d) The old dial may now be pulled clear and the new one placed in the position occupied by the old one. Examine dial from the front of the Radiola to see that the numbers on the dial are in their correct position.
(e) Tighten screws holding dial in place and close doors of cabinet.

[11] REPLACING POWER CABLE

A combination laced and braided cable is used in Radiola 64 for connecting the S.P.U. to the receiver assembly. Should it be necessary to replace this cable, use the following procedure:

(a) Remove receiver assembly from cabinet as described in Part III, Section 1.
(b) Turn assembly bottom side up and unsolder all connections to the cable.
(c) Remove old cable and connect up the new cable as indicated in Figure 26, soldering all connections.
(d) Return assembly to cabinet in reverse order of that used to remove it.

[12] REPLACING CONE OF REPRODUCER UNIT

Should it be desirable to replace a cone, the entire reproducer unit must be removed from the cabinet. In order to do this use the following procedure:

(a) Remove the reproducer field leads by pulling the field plug from its receptacle. Release these leads from the clamps that hold them to the sides of the cabinet.

(b) Remove the two cone coil leads that are connected to the terminals on the flange of the reproducer unit.

(c) Remove the four nuts that hold the reproducer to the baffle board, at the same time supporting the reproducer by hand to prevent it falling. Place the unit in some position convenient for work.

(d) Remove the nine nuts and machine screws that hold the cone ring in place. Remove this ring.

(e) Remove the screw and washer that centers the cone. The cone may now be removed and the new one placed in the position occupied by the old one.

(f) Return the centering screw; the ring and its nine screws and nuts to position, but do not tighten. The cone should now be centered as described in Part II, Section 20 and all screws tightened.

(g) The unit should now be returned to the cabinet in the reverse manner of that used to remove it.

[13] REPLACING POWER TRANSFORMER

Should it be desirable to replace the power transformer, use the following procedure:

(a) Under the bottom of the cabinet is a wire going to the four bolts holding the S.P.U. to the cabinet. Release this wire and remove the four machine screws, rubber washers and metal washers. (See Figure 30.)

(b) Remove all connections from the S.P.U. terminal strip, the A.C. input plug and the field plug. Remove all Radiotrons.

(c) The S.P.U. may now be lifted clear of the cabinet (See Figure 32), and placed in a position convenient for work.

(d) Turn up on end and unsolder all connections to the power transformer.

(e) Remove the six machine screws, nuts and lock washers that hold the transformer in place.

(f) The old transformer may now be removed, and the new one placed in the position occupied by the old one. The machine screws, nuts, washers and all connections should be replaced (See Figure 27) and the S.P.U. returned to the cabinet in the reverse manner of that used to remove it.

[14] REPLACING S. P. U. FILTER AND BY-PASS CONDENSERS

The filter and by-pass condensers used in the S.P.U. of Radiola 64 are assembled in one metal container. Should any condenser become defective, replacement of the entire assembly will be necessary. The procedure for making this replacement is as follows:

(a) Remove the S.P.U. from the cabinet as described in Part III, Section 5.

(b) Turn the S.P.U. on its side and unsolder all connections to the condenser assembly.

(c) Remove the six machine screws, nuts and washers that hold the condenser assembly in place. Four of these also hold the two resistance units, however, their leads will hold them in place until the screws are returned.

(d) The old assembly may now be replaced and the new one placed in the position occupied by the old one.

(e) Return the machine screws, nuts and washers to their positions, thus fastening the condenser assembly and resistance units in place.

(f) Solder all connections in place. These are shown in Figure 27.

(g) Return S.P.U. to cabinet in the reverse manner of that used to remove it.

[15] REPLACING FILTER REACTOR, INPUT TRANSFORMER OR OUTPUT TRANSFORMER

Should replacement of the filter reactor, input transformer or output transformer be necessary, proceed as follows:

(a) Remove S.P.U. from cabinet as described in Part III, Section 5.

(b) Turn S.P.U. on its side and unsolder the connections to the unit being replaced. In the case of the input transformer the resistance unit soldered across its primary terminals must also be released.

(c) Remove the four machine screws, nuts and lock washers that hold the unit in place. Remove the unit and place the new one in the position occupied by the old one.

(d) Resolder all connections previously removed. In the case of the input transformer solder the resistance unit in place. The correct connections are shown in Figure 27.

(e) Return the S.P.U. to the cabinet in the reverse manner of that used to remove it.

[16] REPLACING RESISTANCE UNITS

Two large resistance units are used in the S.P.U. of Radiola 64, one having five terminals and one having six terminals. Should replacement become necessary, proceed as follows:

(a) Remove S.P.U. as described in Part III, Section 5.

(b) Turn S.P.U. on its side and unsolder all connections to the resistance unit being replaced.

(c) Release the two machine screws, nuts and washers that hold it in place. The resistance unit may now be removed from the S.P.U. base. The end brackets and washers should be removed by releasing the long bolt that holds them in place and mounted on the new resistor. The new resistor assembly should now be placed in the position occupied by the old one and the machine screws, washers and nuts used to hold it in place.

(d) Solder all connections previously removed. These are shown in Figure 27.

(e) Return the S.P.U. to the cabinet in the reverse manner of that used to remove it.

[17] REPLACING S. P. U. WIRING CABLE

A laced cable is used for wiring the S.P.U. of Radiola 64. Should replacement be necessary, proceed as follows:

(a) Remove the S.P.U. from the cabinet as described in Part III, Section 5.

(b) Turn S.P.U. on side and unsolder all connections to the laced cable.

(c) Solder the new cable in the position occupied by the old one. The correct color scheme for making these connections is shown in Figure 27.

(d) Return S.P.U. to the cabinet in the reverse manner of that used to remove it.

[18] REPLACING TUNING METER

A tuning meter is used in Radiola 64 for a visual indication of tuning accuracy. Should replacement of this meter become necessary, proceed as follows:

(a) Open rear doors and remove the two wood screws that hold the meter to the front of the cabinet.

(b) Pull the meter straight back to the baffle board and then pull straight down. There is just room to remove the meter without removing the baffle board.

(c) The two leads may now be removed from the meter by removing the screws that hold them in place. The new meter should now be attached to the leads and bracket from the old meter and slipped in the position occupied by the old one.

(d) Fasten new meter in place by returning the two wood screws to their correct position.

SERVICE DATA CHART

Before using the following Service Data Chart, when experiencing no signals, weak signals, poor quality, noisy or intermittent reception, howling and fading, first look for defective tubes, or a poor antenna system. If imperfect operation is not due to these causes the "Service Data Chart" should be consulted for further detailed causes. Reference to Part No. and Section No. in the "Service Notes" is also noted for further details.

Indication	*Cause*	*Remedy*
No signals	Defective operating switch	Repair or replace switch
	Loose volume control arm	Tighten volume control arm, P. II, S. 4
	Defective power cable	Replace power cable, P III, S. 11
	Defective R.F. transformer	Replace R.F. and oscillator coil assembly, P. III, S. 5
	Defective I.F. transformer	Replace I.F. transformer, P. III, S. 4
	Defective Input or Output transformer	Replace input or output transformer, P. III, S. 14
	Defective Oscillator coil	Replace R.F. and oscillator coil assembly, P. III, S. 5
	Defective by-pass condenser	Replace by-pass condenser, P. III, S. 7 or 8
	Defective socket power unit	Check socket power unit by means of continuity test, and make any repairs or replacements necessary, P. II, S. 26
	Open cone coil of reproducer unit	Check cone coil and if open replace cone, P. III, S. 12
Weak Signals	Compensating condenser out of adjustment	Adjust compensating condenser correctly, P. II, S. 17
	Trimming condensers out of adjustment	Adjust trimming condensers, P. 11, S. 18
	I.F. transformers not correctly aligned	Align I.F. transformers correctly, P. II, S. 19
	Defective power cable	Repair or replace cable, P. III, S. 11
	Defective R.F. transformer	Replace R.F. and oscillator coil assembly, P. III, S. 5
	Defective I.F. transformer	Replace I.F. transformer, P. III, S. 4
	Defective Input or Output transformer	Replace input or output transformer, P. III, S. 14
	Dirty prongs of Radiotrons	Clean prongs with fine sandpaper, P. II, S. 3
	Defective by-pass condenser	Replace defective by-pass condensers, P. III, S. 7 or 8
	Defective main tuning condenser	Replace defective tuning condensers, P. III, S. 3
	Low voltages from socket power unit	Check socket power unit voltages with high resistance D.C. voltmeter and A.C. voltmeter, P. II, S. 25
	Field plug not in socket	Place field plug in socket
	Defective socket power unit	Check socket power unit by means of continuity tests and make any repairs or replacements necessary, P. II, S. 26
Poor Quality	Defective Input or Output transformer	Replace input or output transformer, P. III, S. 14
	Defective by-pass condenser	Replace defective by-pass condenser, P. III, S. 7 or 8
	Dirty contact arm of volume control	Clean contact arm on volume control, P. 11, S. 1
	Dirty prongs on Radiotrons	Clean prongs with fine sandpaper, P. II, S. 3
Howling	Compensating condenser out of adjustment	Adjust compensating condenser correctly, P. II, S. 17
	Defect in audio system	Check and repair any defect, P. II, S. 26
	Open grid circuit in any stage	Check circuit and repair defect
	Microphonic Radiotrons	Interchange Radiotrons
Excessive Hum	Potentiometer not adjusted	Adjust potentiometer correctly
	Open ground connection	Repair any defective connection, P. II, S. 7
	Defective center tapped resistance unit	Replace defective resistance unit,
	Socket plug position	Reverse socket plug
Radiotrons Fail to Light	Operating switch not "On"	Turn operating switch "On"
	Defective operating switch	Replace operating switch
	Defective input A.C. cord	Repair or replace A.C. input cord
	Defective power transformer	Replace power transformer, P. III, S. 13
	No. A.C. line voltage	Turn A.C. line voltage "On"