RADIOLA 33 (D.C.) 220 VOLTS

SERVICE NOTES

Prepared by RCA-Victor Service Department

ELECTRICAL SPECIFICATIONS

Direct Current Line Voltage	200-240 volts
Maximum Power Consumption	72 watts

PHYSICAL DIMENSIONS

Height	31 inches
Depth	8¾ inches
Width	27 inches
Weight (Receiver ready for operation)	42 lbs.
Weight (Packed for shipping without legs)	50 lbs.
Packing Case Dimensions	13½" x 14½" x 36½"

INTRODUCTION

RCA-Victor Radiola 33 is designed for 220-240-volt direct current lighting circuit operation. Figure 1 is a top view of the receiver chassis and socket power unit and Figure 2 is a sub-chassis view of both assemblies.

While this model is similar to the A.C. model in appearance and performance and circuit arrangement, it is considerably different in the manner of supplying the necessary electric power to the circuits. For this reason a special Service Note on this model is issued for the guidance of those called upon to locate and remedy any trouble that may develop.

PART I—GENERAL SERVICE DATA

(1) CIRCUIT CHARACTERISTICS

The following characteristics are incorporated in the design of the 220-volt Radiola 33 (D.C.).

(a) It is a six-tube tuned radio frequency receiver utilizing five Radiotrons UX-112A and one Radiotron UX-171A.

(b) A single control three-gang condenser is employed to tune the two radio frequency amplifiers and the detector.

(c) The volume control regulates the R.F. input grid voltage to the first R.F. amplifier stage. This is a simple and effective method for controlling volume in this type of receiver.

(d) A series filament connection is used for all tubes, resulting in a minimum input wattage.

(e) The D.C. house current in addition to supplying filament voltages for the Radiotrons, supplies all the plate and grid voltages.

(f) Counting from right to left 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 antenna and ground.

Radiotron No. 2 is a stage of tuned radio frequency amplification, and is tuned by the 1st of the gang condensers.

Radiotron No. 3 is the second stage of tuned radio frequency amplification, and is tuned by the second of the gang condensers.

Radiotron No. 4 is the detector, and is tuned by the third of the gang condensers.

Radiotron No. 5 is the first stage audio frequency amplification.

Radiotron No. 6, the second stage of audio amplification, is the UX-171A power Radiotron which is capable of delivering a large undistorted output to the speaker. An output transformer prevents the D.C. plate current from flowing through the loudspeaker windings.

The Radiotron sequence is shown schematically in Figure 3.

The schematic wiring diagram of the receiver and socket power unit is shown in Figure 4.

(2) ANTENNA (Outdoor and Indoor Types)

Due to the high sensitivity of the 220-volt Radiola 33 (D.C.) the length of an outdoor antenna need only be approximately 50 feet. However, due to the design of the input stage the length of antenna will have no effect on the tuning of the set. The best length of antenna for a particular installation will depend upon local conditions. For localities near high powered broadcast stations a short antenna is advisable, and in general the more remote the installation is from powerful stations the longer the

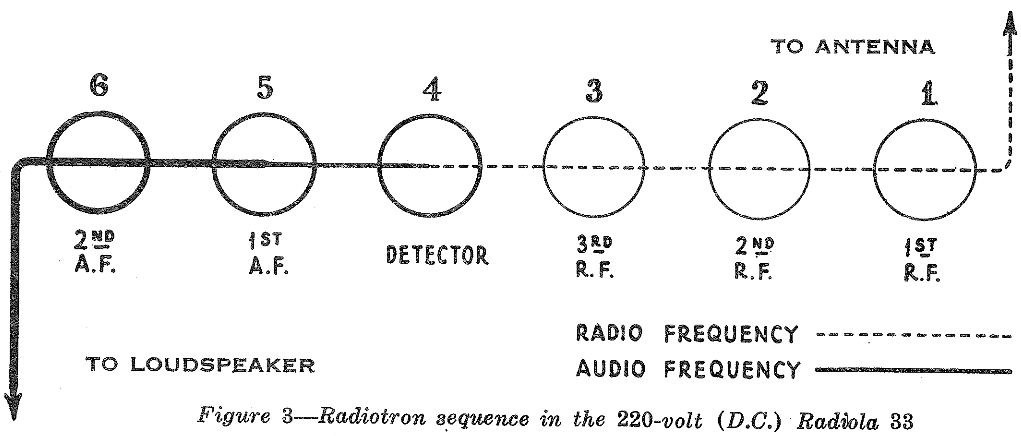


Figure 3—Radiotron sequence in the 220-volt (D.C.) Radiola 33

antenna can be without encountering interference difficulties. However, there is no point in using an antenna length in excess of that necessary to obtain an objectionable noise level with the volume control set for maximum sensitivity. The antenna should be as high as possible and removed from all obstructions. The lead-in should be a continuation of the antenna itself, thus avoiding all splices which might introduce additional resistance and in time corrode sufficiently to seriously affect reception. If it is necessary to splice the lead-in to the antenna the joint must be carefully soldered to insure good electrical contact. Clean off all excess flux and tape the connection to protect it from oxidation effects of the atmosphere.

High grade glass or porcelain insulator supports are required, and at no point should the antenna or lead-in come in contact with any part of the building. Use a porcelain tube insulator where the lead-in enters the house.

The antenna should not cross either over or under any electric light, traction or power line and should be at right angles to, and as far as possible from, such lines or other antennas. Care should be taken not to run the antenna or lead-in near any apparatus that is liable to cause disturbance. Where it is necessary to run an antenna or lead-in near disturbing apparatus or power lines it is often advisable to use a long antenna so that the major part of the antenna can be kept clear of the disturbance. A small fixed condenser (approx. .00025 to .0005 mfd.) should then be put in series with the antenna at the receiver to cut down the strength of the signal. A shielded lead-in will often be found advisable. The advisability of grounding the shield should be determined by experiment. An outdoor antenna should be protected by means of an approved lightning arrester.

Where the installation of an outdoor antenna is not practical, satisfactory results may generally be obtained by using an indoor antenna of about 20 or 40 feet of insulated wire strung around the picture moulding or placed under a rug. In buildings where metal lathing is employed, satisfactory results are not always obtainable with this type of antenna. Under such conditions various arrangements of the indoor antenna should be tried to secure satisfactory results.

(3) GROUND

A good ground is as important as a good antenna. A short lead to the nearest cold water pipe will usually be satisfactory. In some cases where it is necessary to go some distance to a cold water pipe, a lead run to a steel rod or pipe driven several feet into the ground will be more convenient and satisfactory. A soft, damp loam or clay is the best type of soil for this kind of ground connection. Sandy, rocky or dry soil should be avoided whenever possible.

(4) RADIOTRONS

Five Radiotrons UX-112A and one Radiotron UX-171A are used. These should be placed in their correct sockets, as indicated by the lettering at each socket, before the current is turned "On." The current should never be turned on unless all Radiotrons are in place.

After placing the Radiola in operation it is well to interchange the Radiotrons for best performance. The second R.F. stage is the most critical and the Radiotron selected for No. 2 socket should be the one giving the loudest signal on a weak station. It should not go into oscillation at any position of the volume control or station selector.

If no tube is found satisfactory for this socket, or the Radiola is insensitive, a readjustment of the R.F. compensating condenser may be necessary. The correct method for making this adjustment is described in Part I, Section 7.

(5) VOLTAGE REGULATING SWITCH

A four-position switch is provided on the S.P.U. for adjusting the Radiola to various line voltages over a range of 200 to 240 volts. The line voltage should be measured with an accurate D.C. voltmeter, and the switch set at the correct position for the voltage.

Position	For Line Voltage of
1	200—210
2	210—220
3	220—230
4	230—240

The voltage regulating switch is accessible by removing the switch cover—see Figure 1.

(6) RADIOLA 33 WAVE TRAP

Due to the wide variation in broadcast receiving conditions the performance of any radio receiver will vary with the locality and its performance in any particular location will depend upon the local receiving conditions.

Receivers located in the vicinity of powerful broadcasting stations receive the signal from such stations with great intensity over several divisions of the tuning dial scale. If it is desired to receive a relatively distant station whose frequency assignment is comparatively close to that of the local station it is impossible to do so without interference.

To satisfy the Radiola 33 (D.C.) user located in districts where bad receiving conditions exist, the "Radiola 33, Wave Trap" has been designed and is carried in stock by RCA as an accessory.

The function of the wave trap is to absorb a large portion of the energy of the station it is tuned to, therefore it can be used to reduce the effect of the powerful local signal to a value comparable with that of more distant stations.

This wave trap may be adjusted to absorb a strong signal at any point on the Radiola 33 (D.C.) dial scale. After it has been adjusted to absorb a strong local signal causing interference it needs no further adjustment or attention.

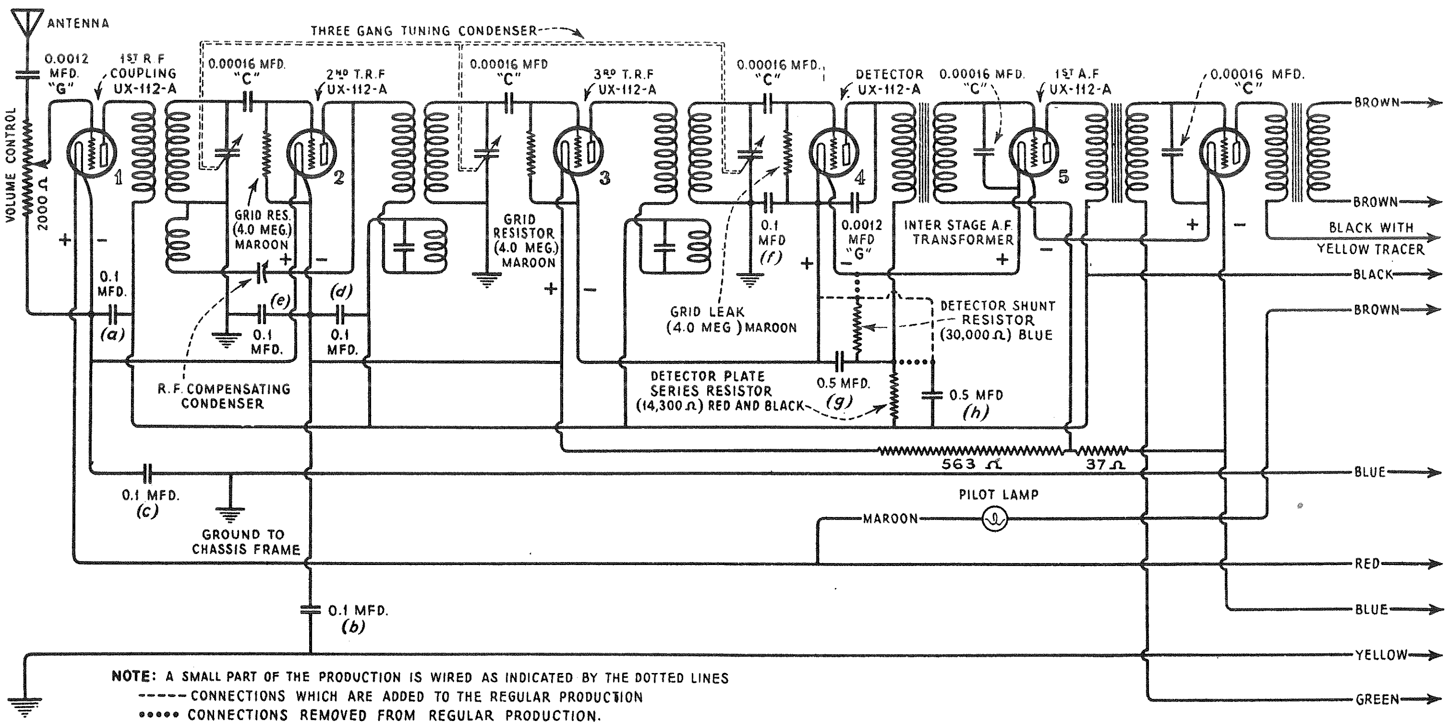


Figure 4—Schematic circuit diagram of

Due to the location of the output transformer on the 220-volt Radiola 33 (D.C.) it is not possible to locate the wave trap at the end of the gang condenser as in the Radiola 33 (A.C.). It must, therefore, be located outside of the cabinet in any convenient location. Using small brackets and attaching it to the bottom of the cabinet is quite convenient.

(7) ADJUSTMENT OF R. F. COMPENSATING CONDENSER

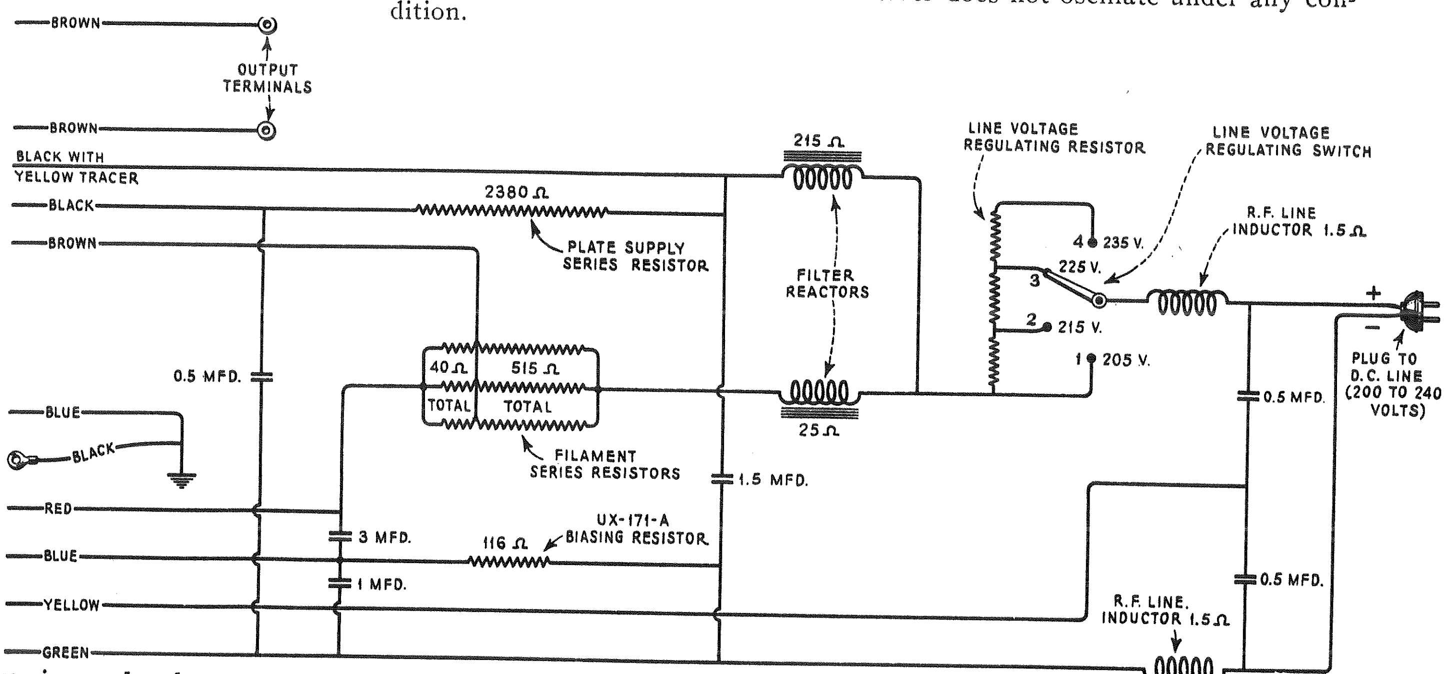
The R.F. compensating condenser in Radiola 33 (D.C.) is provided to allow adjustment of the receiver to compensate for variations in tube characteristics and thereby allow the receiver to function in its most sensitive condition. Before readjusting this condenser, the Radiotrons should be interchanged and satisfactory operation secured by this means if possible. The interchanging of tubes should be made with the idea of getting a tube in socket No. 2 that will not go into oscillation, and give the loudest signal on a weak station. The test should be made on a station near each end of the dial to insure that the sensitivity is satisfactory over the entire dial. If satisfactory sensitivity cannot be secured by this means an adjustment of the compensating condenser may be made as follows:

(a) Put the receiver in operation in the usual manner using an antenna and ground and set the tuning condensers to a position corresponding to the lowest frequency obtainable.

(b) Locate the position of the compensating condenser adjusting screw at the rear of the receiver assembly. (See Figure 5.)

(c) With the volume control at the position of maximum intensity, turn the screw to the right until the set just goes into oscillation. Then turn the station selector to the high frequency end of the dial. The receiver should go into oscillation at this end of the dial also. If it does not, try interchanging Radiotrons, bearing in mind that the desirable condition is to have the receiver go into oscillation at both ends of the dial at a fixed compensating condenser setting. When this condition is obtained, back off the compensating condenser screw (turn to the left) just enough to prevent oscillation.

(d) Try various settings of the volume control for both extreme settings of the station selector, and make sure the receiver does not oscillate under any condition.



receiver and socket power unit.

(e) Should the receiver oscillate only when the volume control setting is decreased or should it not be possible to select a tube for No. 2 socket that will satisfy the conditions of (c) it is probable that the tuning condensers are out of alignment. (See Part I, Section 8.) If the compensating condenser is adjusted just below the point of oscillation for a low frequency dial setting the reproduction will sometimes be distorted. This should be checked by tuning the receiver to a broadcast station of low frequency and the compensating condenser adjusted to maximum sensitivity consistent with good quality.

(8) ALIGNMENT OF TUNING CONDENSERS

If the tuning condensers are out of alignment, line up as follows:

(a) Procure or construct a tool as illustrated in Figure 6.

(b) Remove the receiver assembly and S.P.U. from the cabinet (See Introduction Part III), and place in operating condition. Tune in a fairly weak signal, either broadcast or a modulated oscillator of about 1400 K.C. and adjust the volume control so that the signal is very weak, making sure that receiver is accurately tuned to the signal.

(c) With the condenser plate end of the tool touch the rotor of one of the gang condensers and gradually slide it along the rotor plates, bringing it closer to the stator plates. This increases the capacity of the condenser in question. If the signal increases that particular condenser is low in capacity. This can be corrected by bending the two end rotor plates toward their adjacent plates slightly until the test paddle gives a decrease rather than an increase in signal. The test should be continued until all three of the condensers show decrease in signal when their respective capacities are increased slightly. The gang condenser that tunes the detector circuit has a trimmer (See Figure 1). It may be used in adjusting that condenser by bending the bus toward the

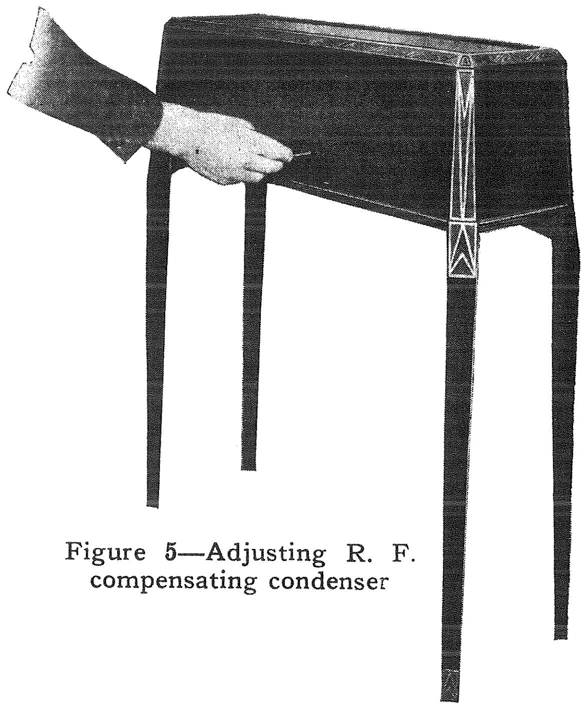


Figure 5—Adjusting R. F. compensating condenser

Figure 5—Adjusting compensating condenser.

frame to increase the capacity. But this trimmer should be used only when making the adjustment at a high frequency (1400 K.C., approximately).

(d) After adjusting at 1400 K.C. the set should be checked at 600 K.C., approximately. The same method of testing can be used as was used at 1400 K.C., but it is advisable to use the other end of the aligning tool, with the shorted turn, because the circuit is more sensitive to changes in inductance at low frequencies. The shorted turn brought up parallel to the coil windings reduces the inductance. If the circuits were properly aligned, bringing the shorted turn up close to the coil will cause a decrease in signal. Should the signal increase as the shorted turn is brought up toward the coil it would indicate that there was too much capacity in the circuit. The end plates of the rotor should then be bent away from their adjacent plates until the shorted turn causes a decrease in the signal when brought close to the coil.

(e) After completion of all tests return the receiver to the cabinet in the reverse manner of that used to remove it.

NOTE: The tuning condensers are not often out of alignment at low frequencies sufficiently to impair the performance and it is usually only necessary to adjust at 1400 K. C. and, therefore, not necessary to remove the set from the cabinet.

(9) PILOT LAMP

Radiola 33 (D.C.), 220-volt, is equipped with a small pilot lamp operating from the filament resistor. Its purpose is to illuminate the tuning dial and act as a current supply indicator.

The pilot lamp is mounted on a small lever that can be pulled clear of the dial for inserting the lamp and then pushed in place to give proper illumination to the translucent dial. If the lamp is not in its proper place the dial will not be sufficiently illuminated.

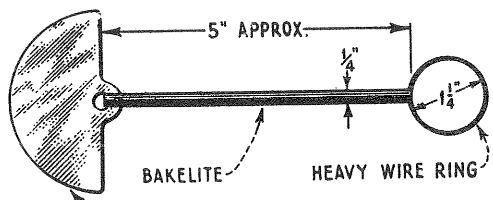


Figure 6—Aligning tool.

(10) INTERSTAGE TRANSFORMER, OUTPUT TRANSFORMER AND FILTER CONDENSERS

The two interstage transformers are alike and they are both in one container mounted on the underside of the receiver chassis frame. Their internal connections are shown in Figure 9. Their primary resistances are approximately 1000 ohms and their secondary resistance is approximately 5000 ohms. The output transformer is mounted on the top of the chassis at the end of the gang condensers. The internal connections are shown in Figure 9. The primary resistance is approximately 580 ohms and the secondary resistance is approximately 770 ohms. Shorted turns in audio transformers can appreciably decrease their efficiency without changing the resistance of the winding beyond limits allowed in O.K. transformers. Replacing the transformer of questionable performance is a reliable means of testing for such a defect. An O.K. transformer can be connected in the circuit temporarily to check any transformer in question, without physically replacing the unit.

The filter condensers are mounted in a single container mounted on the S.P.U. chassis. The diagram of internal connections is shown in the "Continuity Wiring Diagram of the S.P.U.," Figure 10.

SERVICE DATA CHART

When experiencing no signals, weak signals, poor quality, noisy or intermittent reception, howling and fading, first look for defective tubes, a poor antenna or ground system. If convenient it is advisable to check the socket voltages. Should any of the voltages be appreciably different from those given in Part II, Section 1, check the circuits by means of continuity and to ground. If imperfect operation is not due to any of these causes the "Service Data Chart" below should be consulted for further detailed causes.

SERVICE DATA CHART—Continued

Indication	Observation	Cause	Remedy
No Signal	Radiotrons fail to light	Operating switch not "On"	Turn operating switch "On"
		Defective operating switch	Replace operating switch
		Defective D.C. input cord	Replace or repair input cord
		No D.C. line voltage	Obtain proper D.C. line voltage
		Defective part or connection	Check by means of continuity test and make any repairs necessary
	Radiotrons light	Socket plug in reverse position	Reverse socket plug
		Loose volume control arm	Tighten volume control arm
		Defective part or connection	Check by means of continuity test and make any repairs or replacements necessaiy
Weak Signals	Signals normal on local stations but weak on distant station	Compensating condenser out of adjustment	Adjust compensating condenser correctly Part I, Sec. 7
		Defective alignment of main tuning condenser	Re-align main tuning condensers (See Part I, Sec. 8)
		Defective R.F. transformer	Replace R.F. transformer assembly
		Low line voltage	Adjust "Line Voltage Regulating Switch," (See Part I, Sec. 5)
	Signals weak on local stations, distant stations received though weak	Defective part or connection	Check by means of continuity test and make any repairs or replacements necessary
		Defective audio transformer not shown by continuity test	Replace audio transformer (See Part I, Sec. 10)
Poor Quality	Volume normal	Compensating condenser out of adjustment	Adjust compensating condenser correctly (See Part I, Sec. 7)
	Volume below normal	Defective part or connection	Check by means of continuity test and make any repairs or replacements necessary
		Defective audio transformer or output transformer	Replace defective transformer (See Part I, Sec. 10)
	Howling or high pitched squeal	Compensating condenser out of adjustment	Adjust compensating condenser correctly (See Part I, Sec. 7)
		Open in any of the small fixed condensers connected between plate and filament, on grid and filament in the audio stages	Check and repair
		Open in 0.5 mfd. condenser connected between one side of 30,000-ohm resistor and filament of socket No. 4	Check and repair

SERVICE DATA CHART—Continued

Indication	Observation	Cause	Remedy
Noisy Operation	Noise eliminated when antenna is disconnected	External disturbance picked up by antenna	Locate disturbing apparatus and eliminate disturbance by use of line filters or use a long antenna with a .00025 to .0005 mfd. condenser in series Relocate the antenna and lead-in
	Noise not eliminated when antenna is disconnected	Noise due to commutator ripple of generator or picked up by the power lines Defective filter condensers or chokes	Use filter in power supply. Use additional capacity across Radiotron filaments Check for open or shorted filter condensers and shorted filter reactors
Uncontrolled Oscillation	Howling or squeal noticed only at high volume level	Overloading the detector Radiotron	Replace UY-227 Radiotron. Back off on volume control
	Howling affected by volume control setting	Receiver wiring not suited to particular D.C. line condition	Change wiring to conform with standard production (See Figures 4 and 9)
	Oscillation controllable by use of compensating condenser	Radiotrons not arranged for best results Improper setting of compensating condenser	Rearrange Radiotrons in R.F. stages Adjust compensating condenser (See Part I, Sec. 7)
	Oscillates too readily over the high frequency range of the tuning condensers, causing the receiver to be insensitive over low frequency range	Poor receiver ground Condenser connected across the primary R.F. coil too high in capacity	Use better means of grounding the receiver Replace condenser with one of lower capacity
	Oscillates too readily over the low frequency range of the tuning condensers, causing the receiver to be insensitive over high frequency range	Tuning condensers out of alignment over the high frequency range of the tuning condensers Condenser connected across concentrated primary of R.F. coil too low in capacity	Align the tuning condensers (See Part I, Sec. 8) Replace condenser with one of higher capacity
	Oscillation not appreciably affected by changing the setting of the compensating condenser	A defective ground or a defective by-pass condenser	Check for grounds and open or shorted by-pass condensers
Play in Station Selector	Knob tight on shaft	Slack caused by defective tension spring	Replace defective spring

PART II—ELECTRICAL TESTS

(1) VOLTAGE READINGS

Voltage readings of the Radiola 33 (D.C.) 220-volts may best be checked at the individual tube sockets with a Weston Model 537, Type 2, Test Set, or others giving similar readings. The following readings taken at the sockets are correct when connected to a 240-volt D.C. line with the line voltage regulating switch at Position No. 4.

When using a standard set checker for testing see that the proper Radiotron is inserted in the instrument's socket before the set is turned "On," otherwise the filament voltmeter will probably burn out, as approximately full line voltage is impressed across the filament voltmeter under this condition.

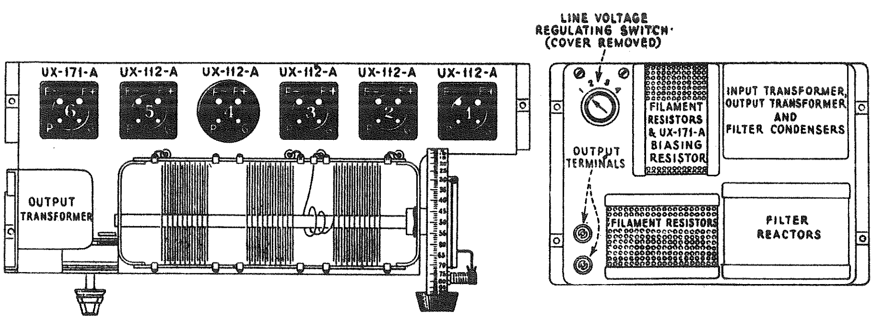


Figure 7—Radiotron socket contacts

VOLTAGES AT RADIOTRON SOCKETS

Tube No.	Filament to Grid (Volts)	Filament to Plate (Volts)	Plate Current Milliamperes	Filament Voltage
1	3.5	63	4.0	4.9
2	*2.0	68	4.5	4.8
3	*2.0	73	4.0	4.7
4	*2.0	30	1.8	4.7
5	8	78	5	5.1
6	33	150	16	5.1

*Will vary with type of Tester used.

The above readings are for average Radiotrons. Conditions may arise where high filament voltages are experienced. In such cases the line voltage switch should be adjusted to a tap that will give the above readings approximately.

(2) VOLTAGE SUPPLY SYSTEM

Figure 8 shows the abridged schematic circuit of the voltage supply system. The filaments of the Radiotrons are all connected in series. A by-pass resistor is used across the last three Radiotrons to by-pass accumulated plate current from the UX-112A's as well as by a tapped connection to supply correct grid bias to the first interstage audio amplifier. The voltage drop in a resistor in series with the filaments, supplies the grid bias for the UX-171A tube. The grid bias for the R.F. amplifiers is supplied by connecting the grid to the negative side of the filament. For the second and third Radiotron this connection is made through a 2 to 4-megohm resistor. This resistor is in no sense a grid leak as employed, because the grid does not take current. The detector is of the grid leak and condenser type. The grid is connected to the positive side of the filament through a 2 to 4-megohm resistor.

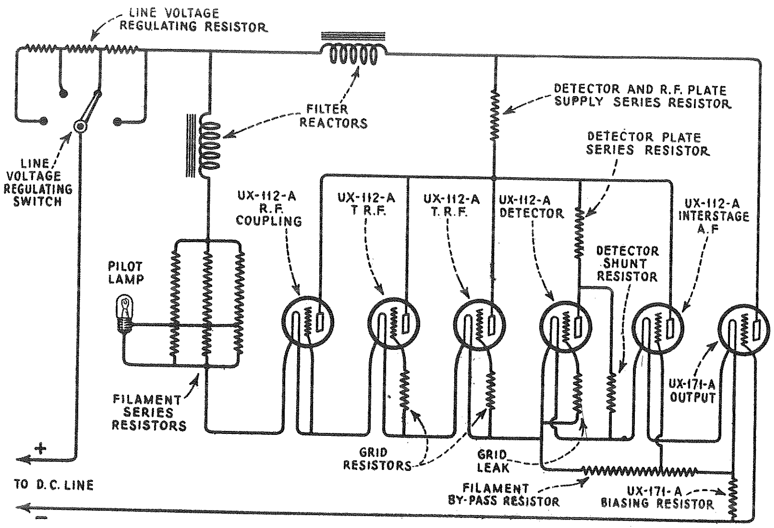


Figure 8—Schematic circuit diagram of voltage supply system

(3) RADIOLA 33 (D. C.) 220-VOLT CONTINUITY TESTS

The following tests will show complete continuity for the receiver assembly (Figure 9), and socket power unit (Figure 10).

A pair of head phones with at least 4½ volts in series, or a voltmeter with sufficient voltage to give full scale deflection when connected directly across the battery terminals can be used in making these tests. But a more complete test can be made if the actual resistances are measured. This can readily be done with any of the various resistance meters now on the market, or by employing a voltmeter in series with a battery as mentioned above and calculating the resistance. (See Part II, Section 5.)

The following nomenclature is used in the continuity table.

In the "Correct Effect" column "Open" is used to indicate that the circuit will not pass direct current. "Closed" is used where the resistance is greater than one ohm and may be as high as 4 meghoms, and the correct resistance is given beneath the word "Closed." These values as given are approximate, being subject to manufacturing tolerances. "Shorted" is used to indicate a resistance of less than one ohm.

In the "Indication" column "Open" is used in the same sense as when used in the "Correct Effect" column, but a measured resistance appreciably greater than the correct value should be investigated.

Where a value of resistance is given in this column the probable cause of the incorrect reading is given in the column headed "Caused by."

Before proceeding with the continuity test disconnect the antenna and ground leads. Remove all Radiotrons and pilot lamp. Disconnect D.C. input plug. Reference letters in last column refer to Figure 9.

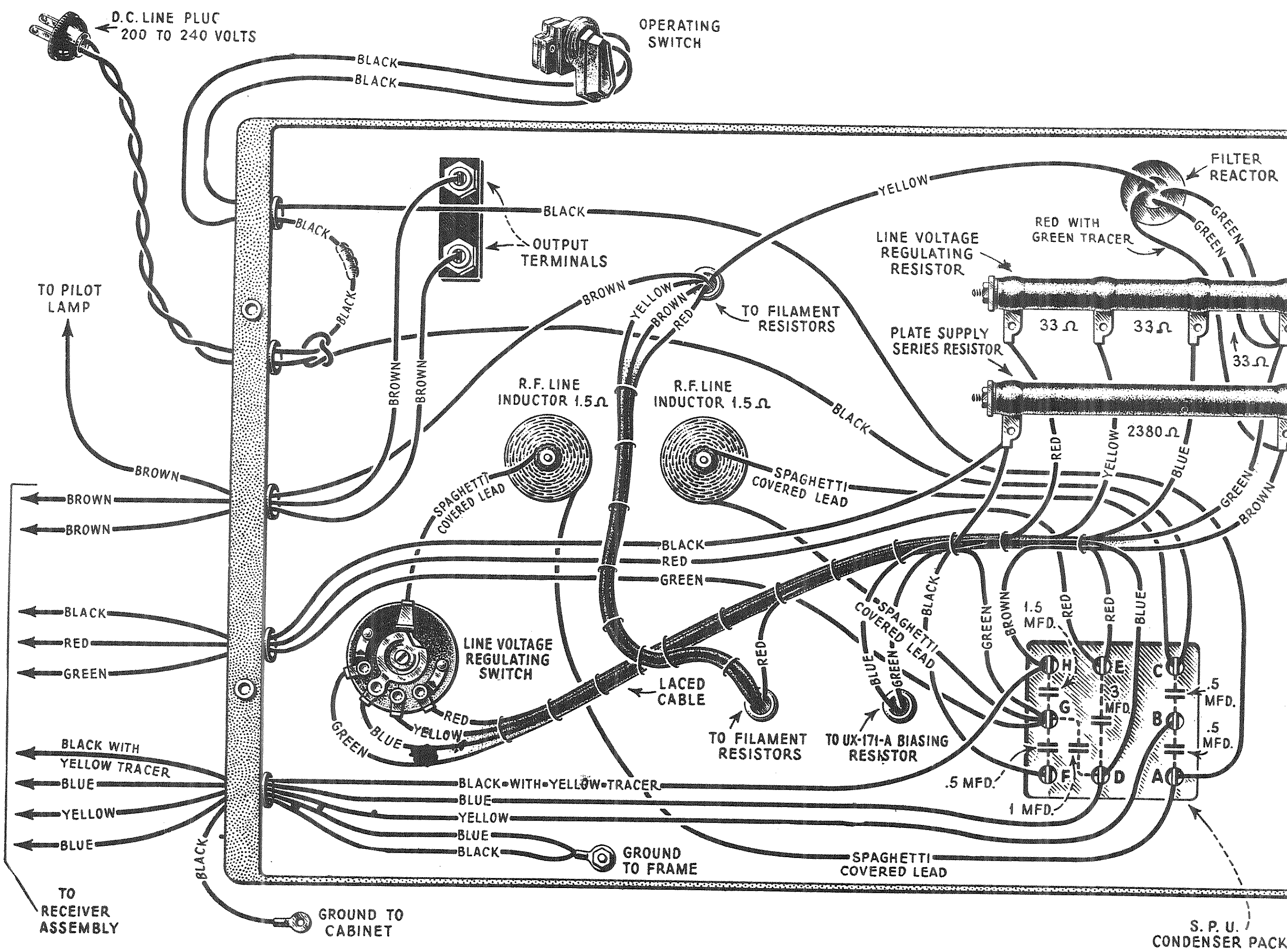


Figure 10—Continuity wiring diagram of socket power unit.

CONTINUITY TEST CHART—Continued

Circuit	Terminals	Correct Effect	Incorrect Effect: Indication	Incorrect Effect: Caused By
Plate	P1 to — prong of line plug	Open	Closed 2500 ohms	Shorted 0.5 mfd. condenser in S.P.U. condenser pack Shorted 1.5 mfd. condenser in S.P.U. condenser pack
	P1 to —F1	Open	Closed	Shorted 0.1 mfd. condenser (a) in receiver condenser pack
	P2 to P1	Closed 28 ohms	Open	Open primary of 2nd R.F. transformer
	P2 to —F2	Open	Closed	Shorted 0.1 mfd. condenser (d) in receiver condenser pack
	P2 to receiver frame	Open	Closed	Shorted R.F. compensating condenser
	P3 to P2	Closed 52 ohms	Open	Open primary of 3rd R.F. transformer or open connection
	P4 to P3	Closed 15,500 ohms	Open 1200 ohms	Open primary of 1st interstage AF transformer, or open 14300-ohm carbon resistor or open connection Shorted 0.5 mfd. condenser (h) in receiver condenser pack
	P4 to +F4	Open	Closed 31,000 ohms	Shorted 0.5 mfd. condenser (g) or shorted 1200 mfd. condenser from P4 to + F4 Of slightly different production check by referring to test from P4 to —F4 immediately following
	P4 to —F4	Closed 31,000 ohms	Open	Open primary or 1st interstage A.F. transformer or open 30,000-ohm carbon resistor or open connection or of slightly different production. Check by referring to test from P4 to + F4
	P5 to P3	Closed 920 ohms	Open	Open primary of 2nd interstage A. F. transformer, or open connection
	P6 to + prong of line plug	Closed 840 ohms	Open	Open primary of output transformer or open line switch, or open connection
Filament	+F1 to + prong of line plug, voltage regulator switch at position No. 1	Closed 580 ohms	Open 850 ohms 1680 ohms	Open filament resistor or open filter choke or open line voltage tapped resistor or open connection to any of above Open in one section of filament resistors Open in two sections of filament resistor
	+F1 to —F6	Open	Closed	Shorted 3.0 mfd. condenser in S.P. U. condenser pack
	—F6 to — prong of line plug	Closed 120 ohms	Open Shorted	Open 116-ohm UX-171A biasing resistor Shorted 1.0 mfd. condenser across the 116 ohm resistor
	—F1 to receiver frame	Open	Closed	Shorted 0.1 mfd. condenser (c) in receiver condenser pack

CONTINUITY TEST CHART—Continued

Circuit	Terminals	Correct Effect	Incorrect Effect	
			Indication	Caused By
Filament	—F1 to +F2	Closed Short	Open	Open connection
	—F2 to receiver frame	Open	Closed	Shorted 0.1 mfd. condenser (e) in receiver condenser pack
	—F2 to +F3	Closed Short	Open	Open connection
	—F2 to — prong of line plug	Closed 740 ohms	Open	Open 600-ohm filament by-pass resistor, or open 116-ohm UX-171A biasing resistor or open R. F. line reactor or open connection to any of above parts
	+F3 to —F4	Closed Short	Open	Open connection
	+F4 to —F5	Closed Short	Open	Open connection
	+F4 to receiver frame	Open	Closed	Shorted 0.1 mfd. condenser (f) in receiver condenser pack
	+F5 to —F6	Closed	Open	Open connection
	Receiver frame S.P.U. frame	Closed Short	Open	Open connection
	One audio output terminal to other output terminal	Closed 756 ohms	Open	Secondary of output transformer open
Secondaries of R.F. Transformer	Stator 1st gang condenser to receiver frame	Closed 5 ohms	Open Shorted	Open secondary of 1st R. F. transformer Shorted 1st gang condenser or grounded secondary of 1st R. F. transformer
	Stator 2nd gang condenser to receiver frame	Closed 5 ohms	Open Shorted	Open secondary of 2nd R. F. transformer Shorted 2nd gang condenser or grounded secondary of 2nd R. F. transformer
	Stator 3rd gang condenser to receiver frame	Closed 5 ohms	Open Shorted	Open secondary of 3rd R. F. transformer Shorted 3rd gang condenser or grounded secondary of 3rd R. F. transformer

(4) TESTING CONDENSERS AND TESTING FOR DEFECTIVELY GROUNDED PARTS

The large by-pass condensers (from 0.1 mfd. up) and filter condensers may be checked by connecting them across the terminal of a high resistance D.C. voltmeter and suitable battery, connected in series. When contact is made with the terminals of the condenser the meter should give a slight kick upwards and then return to its zero position. Should the needle not "kick" as stated the indication is that the condenser is open. Should a continuous reading be shown the indication is a leaky or shorted condenser. (Note: In testing condensers it is advisable to use a fairly high voltage, about 150 volts, as a shorted condenser may show O. K. at a potential below operating voltage.)

In order to avoid false tests on condensers or parts in the chassis assembly due to one side being normally grounded it is recommended that the three ground connections to the frame shown in Figure 9 and Figure 10 be disconnected when testing for ground. This isolates all parts from ground. If a defective ground is causing trouble a test from the suspected part to ground should uncover the defect.

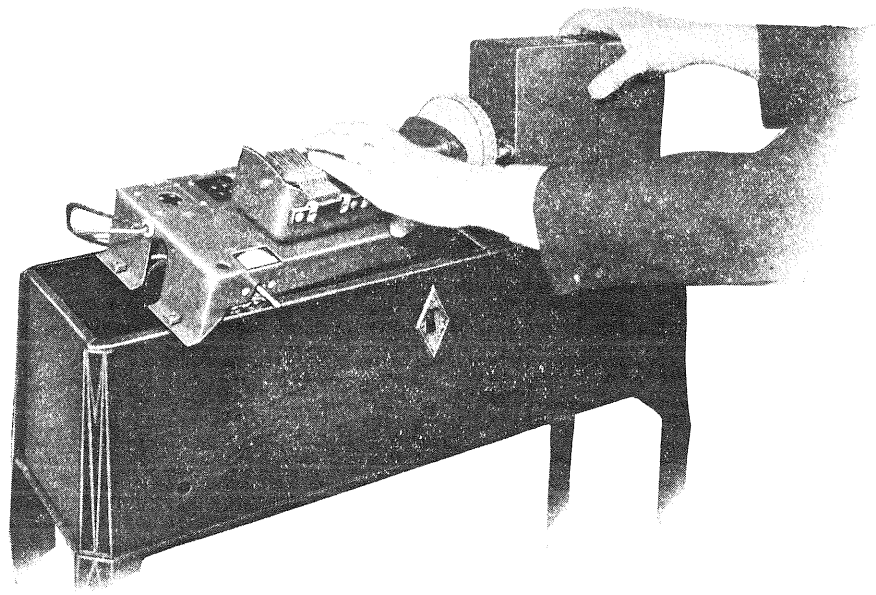


Figure 11—Removing receiver chassis and socket power unit from cabinet in one operation.

(5) RESISTANCE TESTS

The values of the various resistance units of Radiola 33 (D.C.), 220 volts, are shown in the schematic diagram, Figure 4. When testing a receiver for defects the various values of resistance should be checked. This may be done by a resistance bridge; the voltmeter-ammeter method shown in previous Service Notes; or by the following method, the results depending upon the care exercised in using the prescribed method.

For resistances of low value 5000 ohms or less, use a voltmeter not greater than 100 ohms per volt. The rating of 100 ohms per volt means that a meter with 50 volts maximum scale reading, has a total resistance of 50 times 100, or 5000 ohms, when the 50-volt scale is used. For high values of resistance use a meter of 1000 ohms or more per volt. The Weston Meters, Type 301 and 280, each have a resistance of 62 ohms per volt and are satisfactory for low values. For very low resistances below 100 ohms, it is best to use a dry cell—1½ volt—with the 3-volt scale of a Weston, Model 280. For higher resistances up to 5000 and above use sufficient battery to give a good deflection on the meter, for example, a 45-volt "B" for a 0-50 unit meter. Then take two readings, one of the battery alone, and one of the battery with the unknown resistance in series. Then apply the following formula:

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

Example—Using a Weston, Type 301, 30-volt scale, 22½-volt "B" battery, resistance of meter equals 30x62 or 1860 ohms.

$$\left(\frac{22.5}{8.45} - 1 \right) 1860 = 3091, \text{ or unknown resistance in ohms approx.}$$

The above method may be used in checking the resistance values of the correct closed circuits as shown in the Continuity Test Tables in Part II, Section 3.

In addition to the resistances shown in Figure 4 the 1st, or inter-stage, audio frequency transformer primary resistance is 1070 ohms and secondary resistance is 5630 ohms. All resistances given are approximate in value.

PART III—MAKING REPLACEMENTS

The replacement procedure, for many parts of Radiola 33 (D.C.), 220 volts, is self-evident and therefore will not be included in these instructions. The continuity wiring diagrams, Figures 9 and 10, show all connections and should be used in making connections to replacement parts. As it is necessary to remove the receiver and S.P.U. from the cabinet in making replacement of most parts, a detailed description of the procedure is given.

(1) REMOVING THE RECEIVER AND S. P. U. CHASSIS FROM THE CABINET

(a) Remove the left front leg and remove the screw under it that holds the receiver assembly. Then replace the leg temporarily.

(b) Remove the seven other screws that hold the receiver assembly and S.P.U. to the bottom of the cabinet.

(c) Remove the screw holding the ground lead at the back of the cabinet (inside).

(d) Remove the three control knobs. All the knobs are of the "push-pull" type and can be removed by simply pulling off.

(e) Remove the collar that holds the switch to the front of the cabinet. The switch should now be pulled clear of the cabinet.

(f) Pull the D.C. cord through the large hole in the bottom of the cabinet.

(g) Grasping the receiver assembly by the tuning condenser assembly, and the S.P.U. by the filter reactor, lift the two assemblies clear of the cabinet. (See Figure 11.)

(h) The units should be replaced in the reverse manner, making sure the asbestos pad is in place beneath the S.P.U.

(2) REPLACING THE RADIO FREQUENCY COILS

The three radio frequency transformers, together with the small fixed condensers across the concentrated primary coils and R.F. compensating condenser are mounted on one strip and must be replaced as a unit.

(3) REPLACING RADIOTRON SOCKETS

The Radiotron sockets are of the gang variety, using one detector socket two A.F. socket strips and one three-gang socket strip for the R.F. amplifying tubes. There is a small Micarta shield placed over all the sockets. This shield is supplied separately and does not come with the socket. The sockets are riveted to the metal chassis. To replace them drill out the old rivets and use screws, nuts and lock washers for securing the new sockets.

(4) REPLACING MAIN TUNING CONDENSERS AND DRIVE

The main tuning condensers and drive mechanism are replaced as one unit. Three screws hold the unit to the chassis frame. Be sure to reconnect the ground lead when making the replacement.

(5) REPLACING CONDENSER DRIVE CABLE

It is necessary to remove the chassis from the cabinet to make this replacement.

By referring to Figure 12 a new cable can be placed in the position occupied by the old one.

(6) REPLACING THE TUNING DIAL

It is not necessary to remove the chassis from the cabinet.

(a) Turn the dial so that the bronze clamp that holds the dial in place is accessible.

(b) Remove the bronze clamp by prying its lower end out; this will release dial.

(c) Place the new dial on the drum and clamp in place.

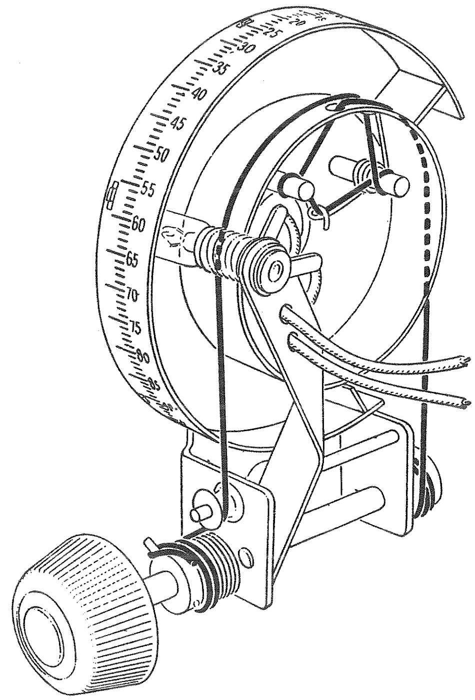


Figure 12—Gang tuning condenser drive mechanism and cable

(7) REPLACING FILAMENT OR UX-171A BIASING RESISTORS

Before the perforated covers can be removed it will be necessary to remove a R.F. line inductor.

(8) REPLACING THE VOLTAGE REGULATING SWITCH

A single nut holds the switch in place. Save the insulating washers for replacing.

(9) REPLACING THE OUTPUT TRANSFORMER

The channel bracket is included with the output transformer and the bracket and transformer assembly should be replaced as a unit.

(10) REPLACING THE RECEIVER BY-PASS CONDENSER PACK

It will be necessary to release the tuning condenser assembly before the tabs holding the condenser pack can be released.