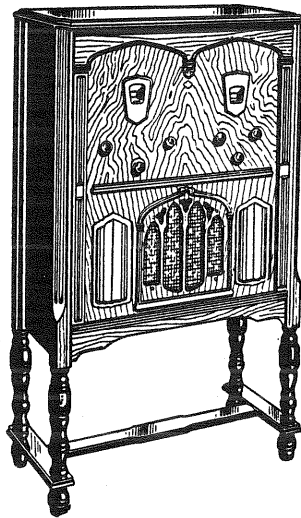


RCA Victor

Universal Radiola RO-23

SERVICE NOTES

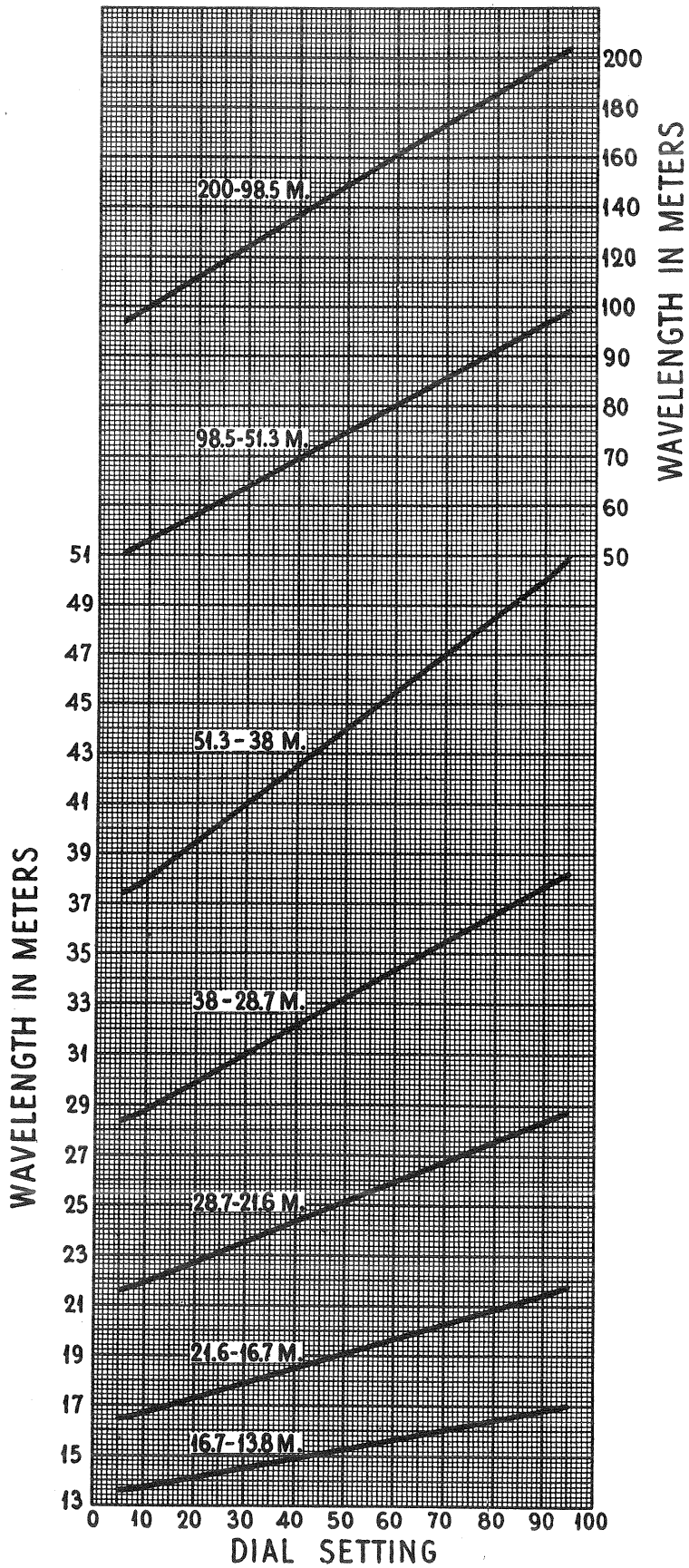


RCA Victor RO-23

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SERVICE DIVISION
RCA Victor Company, Inc.
Camden, N.J.

A RADIO CORPORATION OF AMERICA SUBSIDIARY
REPRESENTATIVES IN PRINCIPAL CITIES



Approximate Calibration of Short Wave Tuning Dial of RO-23
(with 1075 K.C. Intermediate Frequency).

SERVICE NOTES

for

RCA Victor

Universal Radiola RO-23

ELECTRICAL SPECIFICATIONS

Voltage Rating.....	105-125 Volts and 200-250 Volts
Frequency Rating.....	50-60 cycles and 25-40 cycles
Power Consumption.....	120 Watts
Recommended Antenna Length.....	25-75 feet
Type of Circuit (Broadcast).....	A. C. Screen Grid, Super-Heterodyne—8 Tubes
Type of Circuit (Short Wave).....	A. C. Screen Grid, Super-Heterodyne—11 Tubes
Number and types of Radiotrons (Broadcast)	2 RCA-235, 3 UY-227, 1 UY-224, 1 UX-280, 1 RCA-247
Number and types of Radiotrons (Short Wave)	Same as Broadcast band plus 2 UY-224 and 1 UY-227
Number of Radio Frequency stages (Broadcast Band).....	1
Number of R. F. stages (Short Wave Converter).....	2
Number of I. F. stages (Broadcast).....	1
Number of I. F. stages (Short Wave).....	2
Type of Second Detector.....	Power Grid Bias
Type of Tone Control	
Variable resistance in series with capacitor connected across secondary of interstage transformer	
Number of Audio stages.....	1 (Pentode)
Type of Rectifier.....	Full Wave, UX-280
Type of Loudspeaker.....	Dynamic
Wattage dissipation in L. S. Field.....	10 Watts
Undistorted Output.....	2.25 Watts

PHYSICAL SPECIFICATIONS

Height.....	46 Inches
Depth.....	12 ¹³ / ₁₆ Inches
Width.....	27 ¹ / ₄ Inches
Weight Alone.....	76 lbs.
Weight packed for shipment.....	127 lbs.

SERVICE DATA

Service information in conjunction with the broadcast receiver is covered in the Service Notes already issued on RCA-Victor Models R-8, R-10 or R-12. The Short Wave Converter is however somewhat different from the usual broadcast receiver and a discussion of its service problems will help the service man in the performance of his work.

ELECTRICAL DESCRIPTION OF CONVERTER CIRCUIT

The RCA Victor Short Wave Converter uses three Radiotrons, one UY-224 as an R. F. Amplifier, one UY-224 as a Detector and one UY-227 as an Oscillator. The purpose of the Converter is to amplify the incoming high frequency signal by means of the R. F. stage, beat it with a local Oscillator signal and produce a modulated beat frequency by means of the Detector, extract the beat frequency so that it may be amplified by means of the broadcast receiver. A special tuning Capacitor for tuning the Oscillator and Detector stages simultaneously, is incorporated in this unit. A series of tapped coils in conjunction with a range switch provides for the shifting to various bands without interchanging coils as with the older style Converters. Also this switch changes the capacity used by the tuning capacitor so that the frequency range of each band is approximately the same. A small trimmer capacitor, known as the Resonator, is used to re-align the detector circuit with the Oscillator whenever the band is changed or the I. F. frequency is shifted. The shaft that controls the Resonator capacitor is also mechanically connected to the operating switch and the antenna switch. It is so made that when the power is turned "off," the antenna is shifted to the broadcast receiver so that broadcast reception may be obtained.

(1) ALIGNMENT OF CONVERTER CIRCUITS

If the Converter does not cover the bands indicated on the range switch, refer to Figure 2 and make the following adjustments. A calibrated oscillator or frequency meter is desirable although if the service man is familiar with the stations in the high frequency spectrum, the location of these stations on the scale can be used as a guide for making the adjustments. Also a calibrated short-wave receiver that has an oscillating detector may be used to check the Converter oscillator frequency.

Adjust the broadcast receiver so that it is accurately set at 1075 K. C.—the short wave I. F. frequency. Set the "Range" switch at the 51.3–98.5 meter position.

Set the tuning capacitor at its minimum position. (Plates fully out of mesh.)

Place the external oscillator in operation at 5960 K. C.

Adjust the oscillator shunt capacitor C-8 so that the external oscillator will be heard in the loudspeaker or noted on an output meter.

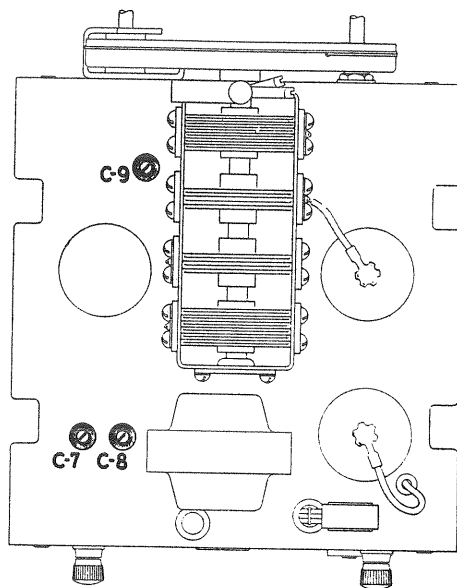


Figure 2—Location of Adjusting Capacitors

If the calibrated oscillator is not available then a calibrated receiver may be used to receive and check the frequency of the converter oscillator. The capacitor C-8 should be adjusted until the oscillator frequency is 7035 K. C.

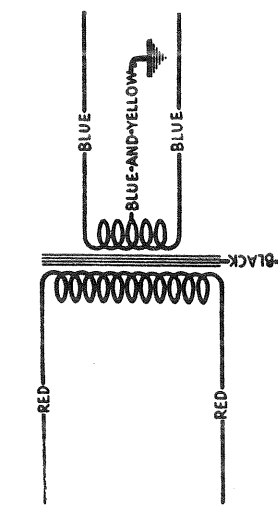
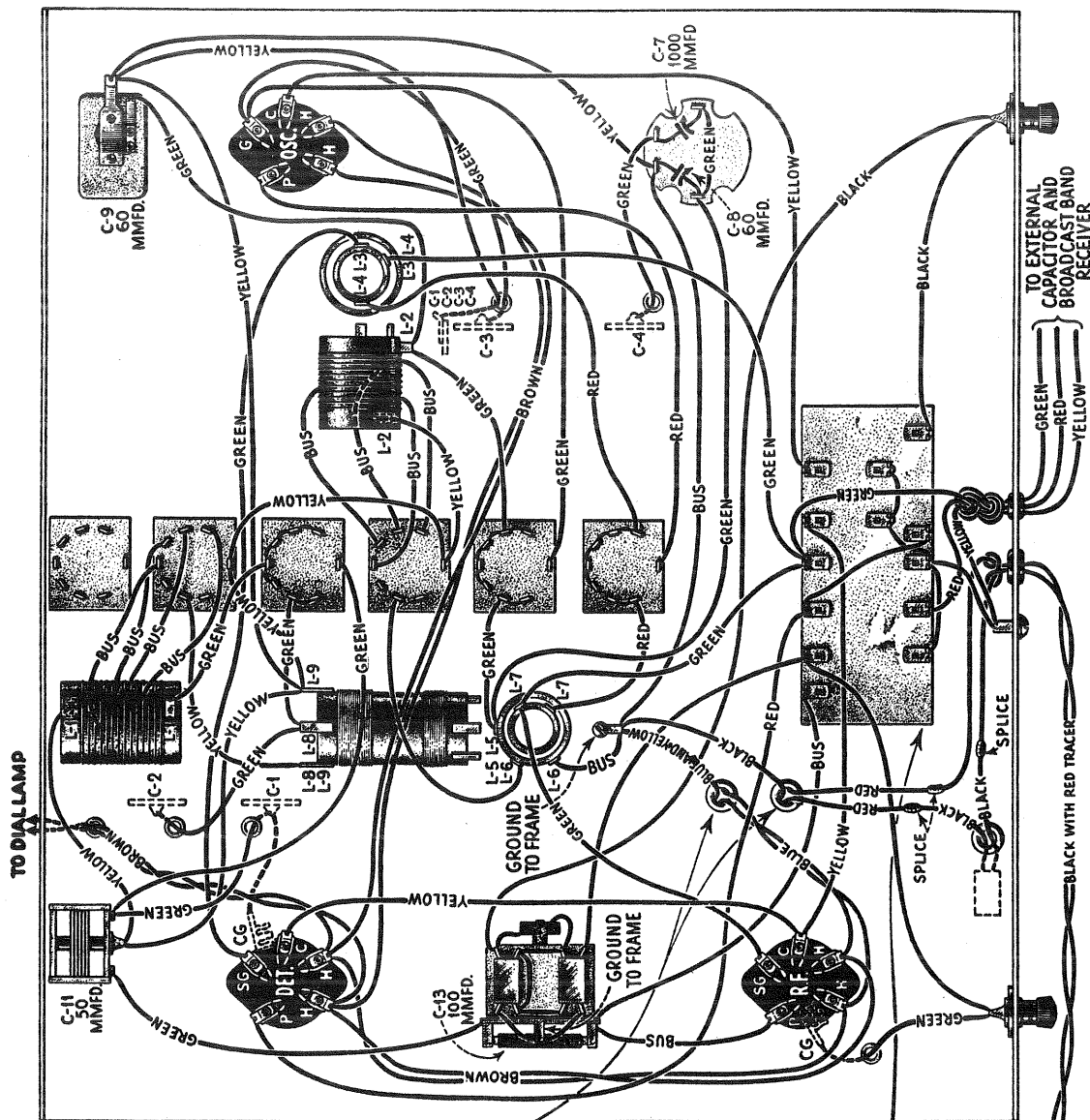
If a wave meter is the only standard available, then a second receiver should be calibrated from it by means of one of the several methods for doing this accurately.

If no standards are available a satisfactory adjustment can be made by increasing capacitor C-8 slightly more than the point at which the 49 meter broadcasting stations are heard when the tuning capacitor is at its minimum position on the 51.3–98.5 meter band. (With C-8 set at minimum the 49 meter band should be received.)

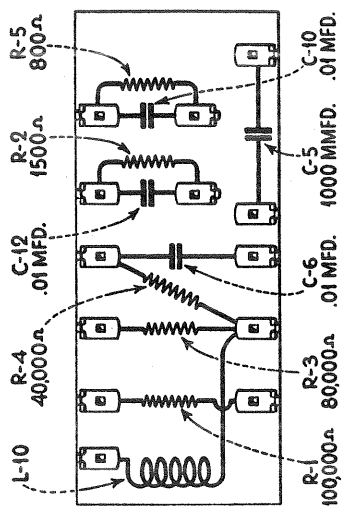
Now shift the tuning capacitor to its maximum position. The Converter oscillator frequency as picked up on a calibrated receiver, should be adjusted for 4130 K. C. by the oscillator series capacitor C-7. So adjusted, the receiver will receive a 3055 K. C. signal with an intermediate frequency of 1075.

Again, if no standards are available, an adjustment of C-7 that will give a definite point of resonance near the center range of the Resonator control with the tuning dial at 50 will be satisfactory.

After checking each end of the 51.3 to 98.5 meter band, shift the range switch to the 38–51.3 meter position. Set the tuning capacitor at its minimum position (plates fully out of mesh) and the I. F. frequency at 1075. Adjust the oscillator shunt capacitor C-9 until the oscillator frequency is 9100 K. C. or the receiver will respond to a signal of 8025 K. C. If no standards are available, adjust C-9 until the 49 meter stations all fall within and near the center of the 49 meter markings on the dial. Unless this adjustment is properly made the short wave broadcasting will not fall within the bands marked on the dial.



INTERNAL CONNECTIONS OF HEATER TRANSFORMER



RESISTOR BOARD CONNECTIONS

Figure 3—Wiring Diagram of Short Wave Converter

Alignment at each end of the 51.3–98.5 meter band are also for the 98.5–200 meter band. The other alignment is for the five high frequency ranges. When these alignments are properly made, and an intermediate frequency between 1050 and 1100 K. C. is used, the Resonator control will function properly and the various short wave broadcasting services will fall within the bands indicated on the dial.

Special Notes on Effects of Aligning and I. F. Frequency Changes

Unless the line-up adjustments are carefully and properly made, the dial markings will be found to be incorrect. If it is necessary to replace the oscillator coil, the leads on the new coil should be made as short as possible and the alignment of the set checked. Also during operation it is preferable that the I. F. frequency of 1075 be used although any frequency between 1050 and 1100 will be satisfactory.

In unusual cases where local conditions preclude the use of a frequency between 1050 and 1100 K. C., considerably more variation in I. F. frequency without the loss of sensitivity will be permissible. However, the calibration will be shifted considerably, especially at the lower frequencies.

(2) DIAL INDICATOR

The indicator on the dial lamp should be so adjusted that the dial will read 100 when the tuning capacitor is at its maximum capacity position. It is important that this be checked before any alignment adjustments are made.

(3) BROADCASTING STATION HARMONICS

When tuning on the 98.5–200 meter band, the second and third harmonics of broadcasting stations will be heard and as there is no regular short wave broadcasting service on this band such signals may be discounted as better results will be obtained by listening to such programs on their regular wave band.

On the lower length bands, the short wave broadcasting stations will be received in the bands indicated for each position of the range switch with but few exceptions. Broadcasting received at other positions of the dial should therefore be viewed with skepticism unless it is definitely proved to be a short wave station and not a higher harmonic of a broadcast station.

(4) LOCAL STATION INTERFERENCE

When the receiver is located very close to a powerful transmitter, either broadcasting or code it is recommended that an antenna not exceeding 30 feet in length be used. However, if a longer antenna is necessary in order to obtain satisfactory reception, cross modulation from the local station may occur. Such a condition is evidenced by the local station coming in on unmodulated carriers on top of some short wave stations.

Under such conditions, it is advisable to use a tuned input circuit to the short Wave Converter. Such an input circuit can readily be made by winding 3 turns of No. 20 wire on a $1\frac{1}{4}$ inch tube, spacing the turns $\frac{1}{8}$ inch apart. The coil is tuned by means of a .0005 mfd. variable capacitor and should be connected from the antenna input to ground. Such a combination will tune broadly from 13.8 to 51 meters.

(5) ACOUSTIC FEEDBACK

If Acoustic feedback is experienced, it is an indication that the two chassis are not entirely supported on rubber. While with the usual broadcast receiver, such a condition is not so vitally necessary, with high frequency reception, unless each chassis is entirely floating in its rubber mounting and its shafts and knobs not touching the cabinet, howling will result.

(6) BROADCAST RECEIVER HARMONICS

When tuning through the various bands, at various points a slight breathing tone can be heard that is not a C. W. signal, but a harmonic of the broadcast receiver oscillator, being received. If an intermediate frequency of between 1050 and 1100 is used, these will not fall on any of the short wave broadcasting services. However, if they should and thereby cause a whistle, a slight shift—5 kilocycles of the intermediate frequency—will eliminate the interference. Retuning the Short Wave Converter will be necessary to restore the signal to its normal intensity. Identification of these harmonics can be made by this means, a slight shift in the intermediate frequency causing them to disappear while an incoming signal will slowly diminish in volume.

(7) C. W. RECEPTION

Normally C. W. transmitters will not be heard unless they are modulated. However, such reception can be obtained by coupling an external oscillator loosely to the second detector of the broadcast receiver. This oscillator should be at about 174 or 176 K. C. so that a pleasing beat note will be obtained. Also a beat note may be obtained by means of an oscillator, the frequency of which is at the 1st I. F. frequency—1150 to 1100 K. C.—and loosely coupled to the input of the Broadcast receiver chassis.

(8) HUM

In addition to the usual causes of hum in the broadcast receiver, the following points should be checked in relation to hum in the Short Wave Converter.

- (a) A. C. input cord near antenna wire. Keep these two leads separate as much as possible.
- (b) Slack in A. C. cord has been placed close to Converter chassis. Take up the slack near the outlet, not near the Converter.
- (c) Filament transformer center tap not connected.
- (d) One side of filament transformer grounded, thereby shorting one section of the secondary.

(9) RANGE SWITCH

A defective "Range" switch may cause any of the following conditions:

- (a) Noise. A corroded or loose wire or contact may cause excessive noise even when the switch is not being shifted. Check by removing the antenna to see if the noise decreases.
- (b) Resonator control not effective. Check the detector sections—1 and 3 from the front—for faulty contacts.
- (c) Oscillator not functioning. Check the oscillator sections—2, 4 and 5 from the front.
- (d) Shift of dial readings. Check for corroded or loose connections.

(10) ANTENNA RESONANCE COIL

An open antenna resonance coil will lower the sensitivity of short wave reception. Its purpose is to match the output of the Converter to the input of the broadcast receiver.

(11) ANTENNA TRANSFER SWITCH

The Resonator Control shaft also is used to shift the antenna from the Short Wave Converter to the broadcast receiver. Also the power switch to the converter is operated simultaneously. A failure of these switches will usually be due to the failure of the engaging lever to throw the switch. If such a condition develops, the switch may be raised so that it properly engages with the operating arm on the shaft. See that no oil or grease prevents proper connection to the shaft at the friction bearing or noise will result when the Resonator is adjusted.

(12) FLUTTER

Fluttering may be caused by either of the following:

- (a) Open capacitor C-14 or C-15. The purpose of these capacitors is to prevent flutter that may be encountered in a single Pentode receiver.
- (b) Antenna lead close to detector Radiotron. See that this lead is in its proper position and removed from the detector Radiotron in the Converter.

(13) VOLTAGE READINGS

The following voltages are obtained at the Converter Radiotron sockets when measured with the usual set analyzers.

RADIOTRON SOCKET VOLTAGES

120 Volt A. C. Line

Radiotron No.	Control Grid to Cathode Volts D. C.	Screen Grid to Cathode Volts D. C.	Plate to Cathode Volts D. C.	Plate M. A.	Heater Volts A. C.
R. F.	—3	50	260	1.0	2.66
Detector	—3	50	180	1.0	2.66
Oscillator	—5	—	50	5.0	2.66

REPLACEMENT PARTS

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
LONG WAVE RECEIVER					
2563	Resistor—6,000 ohms—Carbon type—1 watt—Package of 5.....	\$3.00	6187	Resistor — 300,000 ohms — Carbon type—½ watt—Package of 5.....	\$2.00
2730	Resistor—18,000 ohms—Carbon type—1 watt—Package of 5.....	2.00	6188	Resistor—2 megohm—Carbon type—½ watt—Package of 5.....	2.00
2746	Socket—Dial lamp socket.....	.50	7054	Cord—Power cord.....	1.00
2747	Cap—Grid contactor caps—Package of 5.....	.50	7062	Capacitor—Adjustable capacitor 15–70 mmfd.....	1.00
2749	Capacitor—2400 mmfd.....	1.50	7298	Capacitor—0.01 mfd.....	.80
2882	Socket—UY Radiotron socket complete with insulation strip.....	.50	7299	Capacitor—745 mmfd.....	.70
2968	Socket—UX Radiotron socket—Complete with insulation strip.....	.50	7340	Transformer—1st Intermediate transformer.....	3.00
2970	Resistor — 500,000 ohms — Carbon type—1 watt—Package of 5.....	2.50	7341	Transformer—2nd Intermediate transformer.....	3.00
2977	Knob—Tuning control, volume control or tone control knob—Package of 5.....	2.50	7342	Capacitor—Comprising two 0.05 mfd., four 0.5 mfd., one 10.0 mfd., two 4.0 mfd. and four 0.1 mfd. capacitors in metal container.....	7.85
3003	Cushion — Receiver chassis rubber cushion—Package of 4.....	.50	7343	Transformer—Audio transformer.....	3.85
3024	Capacitor—9 mmfd.—Package of 2.....	.50	7344	Transformer — Power transformer — 110 volts—60 cycles.....	8.00
3029	Bracket—Dial lamp bracket and indicator.....	.50	7348	Board—Resistor board complete less resistors and capacitor.....	2.30
3045	Resistor—40,000 ohms—Carbon type—1 watt—Package of 5.....	2.50	7362	Capacitor—0.025 mfd.....	1.00
3048	Resistor — 500,000 ohms — Carbon type—½ watt—Package of 5.....	2.50	7404	Drum—Dial drum and scale.....	1.20
3049	Resistor—150 ohms—Carbon type—½ watt—Package of 5.....	2.50	7405	Capacitor—20 mfd. electrolytic capacitor—In metal container.....	5.00
3056	Shield — Radiotron shield — Package of 2.....	.50	8770	Transformer — Power transformer — 25 cycles.....	12.00
3076	Resistor—1 megohm—Carbon type—½ watt—Package of 5.....	2.50	8771	Transformer — Power transformer — 220 volts—60 cycles.....	9.00
3077	Resistor—30,000 ohms—Carbon type—½ watt—Package of 5.....	2.50	8805	Capacitor—Variable tuning capacitor.....	6.00
3078	Resistor—10,000 ohms—Carbon type—½ watt—Package of 5.....	2.50	8837	Support — Receiver chassis metal mounting support—Package of 4.....	.70
3079	Resistor—40,000 ohms—Carbon type—½ watt—Package of 5.....	2.50	LOUDSPEAKER ASSEMBLY		
3081	Resistor—16,000 ohms—Carbon type 3 watt.....	.60	3237	Loudspeaker mounting screw assembly—Comprising 4 screws, 8 nuts, 8 washers and 4 eyelets—Package of 1 set.....	.50
3092	Volume control—Volume control complete with mounting nut.....	1.50	7345	Coil assembly—Comprising field coil, cone bracket and magnet.....	5.00
3093	Tone control—Tone control complete with mounting nut.....	1.90	8559	Ring—Cone retaining ring.....	.80
3095	Coil—R.F. coil.....	1.90	8601	Cone—Speaker cone—Package of 5.....	15.00
3235	Coil—1st detector and oscillator coil.....	2.85	SHORT WAVE RECEIVER		
3251	Coil—Choke coil.....	.90	2747	Cap—Grid contactor cap—Package of 5.....	.50
3284	Board—Terminal board with 1 soldering terminal—Package of 5.....	.90	2977	Knob—Station selector or Resonator knob—Package of 5.....	2.50
3285	Cord—Drive cord—Package of 5.....	1.00	3058	Resistor — 100,000 ohms — Carbon type—1 watt—Package of 5.....	2.50
3286	Spring—Drive cord tension spring—Package of 5.....	1.40	3153	Resistor—1500 ohms—Carbon type—1 watt—Package of 5.....	2.75
6185	Resistor — 100,000 ohms — Carbon type—½ watt—Package of 5.....	2.00	3285	Cord—Drive cord—Package of 5.....	1.00
6186	Resistor — 500,000 ohms — Carbon type—¼ watt—Package of 5.....	2.00	3286	Spring—Drive cord tension spring—Package of 5.....	1.40

REPLACEMENT PARTS (Continued)

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
	SHORT WAVE RECEIVER —Continued				
3288	Socket—UY Radiotron socket—Complete with insulation strip.....	\$.50	7407	Coil—High frequency detector coil....	\$1.05
3289	Contact lug—Complete with mounting rivet—Package of 10.....	.50	7408	Coil—Low frequency detector and oscillator coil.....	1.45
3290	Switch—"Off and On"—Toggle switch complete with mounting nut.....	1.00	7409	Coil—High frequency oscillator coil....	1.85
3291	Board—Terminal board with two soldering terminals complete with mounting rivets—For switch and bracket assembly—Package of 5....	.50	7410	Capacitor—Variable capacitor 7 plate—Complete with mounting nut and washer.....	1.75
3292	Drive shaft and pulley—Package of 5	2.35	8806	Transformer—Filament power transformer.....	3.25
3293	Coil—For resistor board assembly....	.65	8807	Transformer—Filament power transformer—105–120 volts, 25 cycles...	5.75
6100	Coil—Coil assembly complete with mounting eyelet—For switch and bracket assembly.....	.75	8808	Transformer—Filament power transformer—220 volts, 60 cycles.....	3.40
6101	Socket—Dial lamp socket and bracket with mounting rivets.....	.50	8809	Board—Resistor board less resistors, capacitors and coil.....	1.00
6102	Capacitor—1000 mmfd.—Package of 5	2.50	8810	Lever—Switch lever assembly—Comprising shaft, 3 switch levers and coupling bushing.....	.70
6103	Resistor—800 ohms—Carbon type—1 watt—Package of 5.....	2.00	8811	Switch—Band selector switch complete with mounting washer and nut.....	6.60
6104	Resistor—80,000 ohms—Carbon type 1 watt—Package of 5.....	2.00	8812	Capacitor—Tuning capacitor assembly.....	5.10
6105	Resistor—40,000 ohms—Carbon type 3 watt—Package of 5.....	2.00	8813	Dial drum and scale.....	1.20
6106	Coupling—Switch lever shaft coupling bushing with 2 groove pins—Package of 5.....	.50	8837	Support — Chassis metal mounting support—Package of 4.....	.70
6107	Switch — Antenna transfer toggle switch.....	1.00	10820	Capacitor—100 mmfd.....	.50
6108	Binding post—Complete with terminal lug, mounting washer and nut—Package of 5.....	1.75		CABINET ASSEMBLY	
6109	Knob—Knob with pointer—Package of 5.....	1.75	X-24	Top.....	7.00
6110	Dial lamp shield and indicator.....	.50	X-25	Stretcher—Comprising R. H. and L. H. end rails and center rail.....	4.10
6111	Escutcheon—Band selector switch knob escutcheon—Package of 5.....	1.80	X-26	Leg.....	4.15
6112	Cushion — Receiver chassis rubber cushion—Package of 4.....	.50	X-27	Foot assembly — Comprising foot, hanger bolt, packing nut and ferrule—Assembled.....	1.45
7062	Capacitor — Adjustable capacitor — 15–70 mmfd.....	1.00	X-28	Baffle board and grille cloth.....	1.35
7298	Capacitor—0.01 mfd.....	.80	X-29	Escutcheon—Tuning dial escutcheon for long wave.....	1.60
7406	Capacitor—Double adjustable capacitor—One section 10–70 mmfd., one section 800–1000 mmfd.....	1.10	X-30	Escutcheon—Tuning dial escutcheon for short wave.....	1.60
			3223	Escutcheon—Metal bezel for dial....	.50
			3287	Label—Metal trade mark label—Package of 5.....	.75
			9398	Cabinet—Cabinet complete less equipment.....	77.25

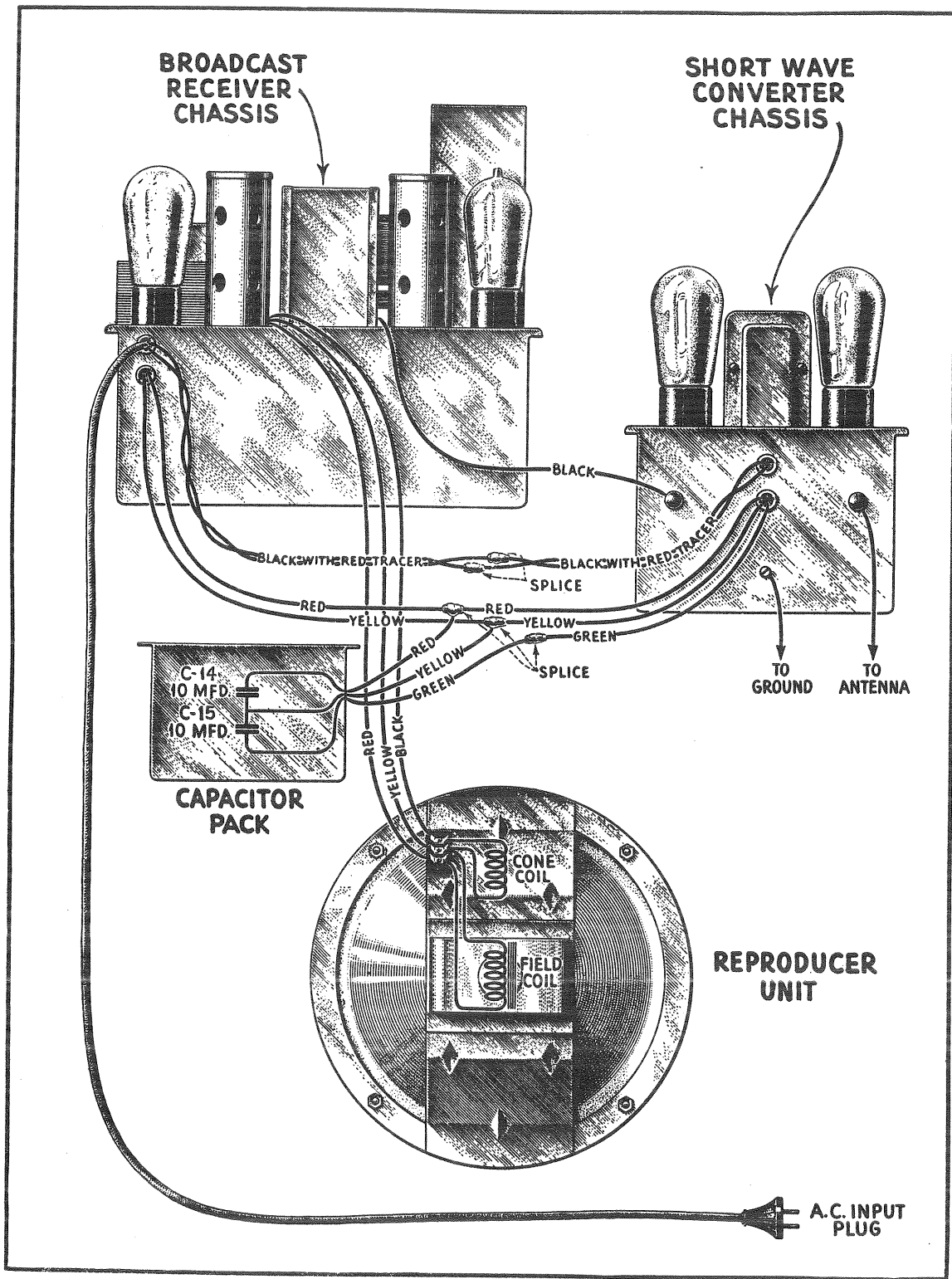


Figure 5—Assembly Wiring