

RCA VICTOR MODEL 7X

Seven-Tube, Three-Band, AC-DC, Superheterodyne Receiver

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES		ALIGNMENT FREQUENCIES		
"Standard Broadcast" (A)	530-1,780 kc.	"Standard Broadcast" (A)	600 kc. (osc.), 1,500 kc. (osc., ant.)	
"Medium Wave" (B)	1,780-6,300 kc.	"Medium Wave" (B)	6,000 kc. (osc., ant.)	
"Short Wave" (C)	6,300-22,000 kc.	"Short Wave" (C)	20,000 kc. (osc., ant.)	
Intermediate Frequency	460 kc.			
RADIOTRON COMPLEMENT		(4) RCA-6H6		Second Detector-A.V.C.
(1) RCA-6L7	First Detector (Converter)	(5) RCA-6J7	Audio Voltage Amplifier	
(2) RCA-6J7	Oscillator	(6) RCA-25A6	Audio Power Amplifier	
(3) RCA-6K7	Intermediate Amplifier	(7) RCA-25Z6	Half-Wave Rectifier	
Pilot Lights (3)	Mazda No. 40, 6.3 volts, 0.15 ampere			
POWER SUPPLY RATINGS				
D. C. Rating	105-125 volts, 45 watts			
A. C. Rating	105-125 volts, 25-100 cycles, 50 watts			
Power Output	(125 volt, A. C. line)	Power Output	(125 volt, D. C. line)	
Undistorted	0.6 watt	Undistorted	0.5 watt	
Maximum	1.5 watts	Maximum	1.2 watts	
LOUDSPEAKER (Permanent-Magnet Dynamic)	Impedance (V. C.) 2.25 ohms at 400 cycles			

Mechanical Specifications

Height	20 $\frac{1}{4}$ inches
Width	14 $\frac{7}{8}$ inches
Depth	9 $\frac{3}{8}$ inches
Weight (Net)	27 pounds
Weight (Shipping)	34 pounds
Chassis Base Dimensions	12 inches x 7 inches x 2 $\frac{1}{2}$ inches
Over-all Height of Chassis	8 inches
Tuning Drive Ratios	10 to 1 and 50 to 1
Operating Controls	(1) Volume, (2) Tuning, (3) Range Selector, (4) Tone-Power Switch

General Features

This receiver consists of a seven-tube chassis mounted in a table-type cabinet. The superheterodyne type of circuit is used, with such features of design as: automatic volume control, diode detection, magnetite core adjusted i-f transformers, and wave-trap, band-selective illumination of full vision

dial scales, dual-ratio tuning, resistance-coupled audio system, phonograph terminal board, and a permanent-magnet dynamic loudspeaker. The tuning range is continuous through the "Standard broadcast," "Medium wave," and "Short wave" bands.

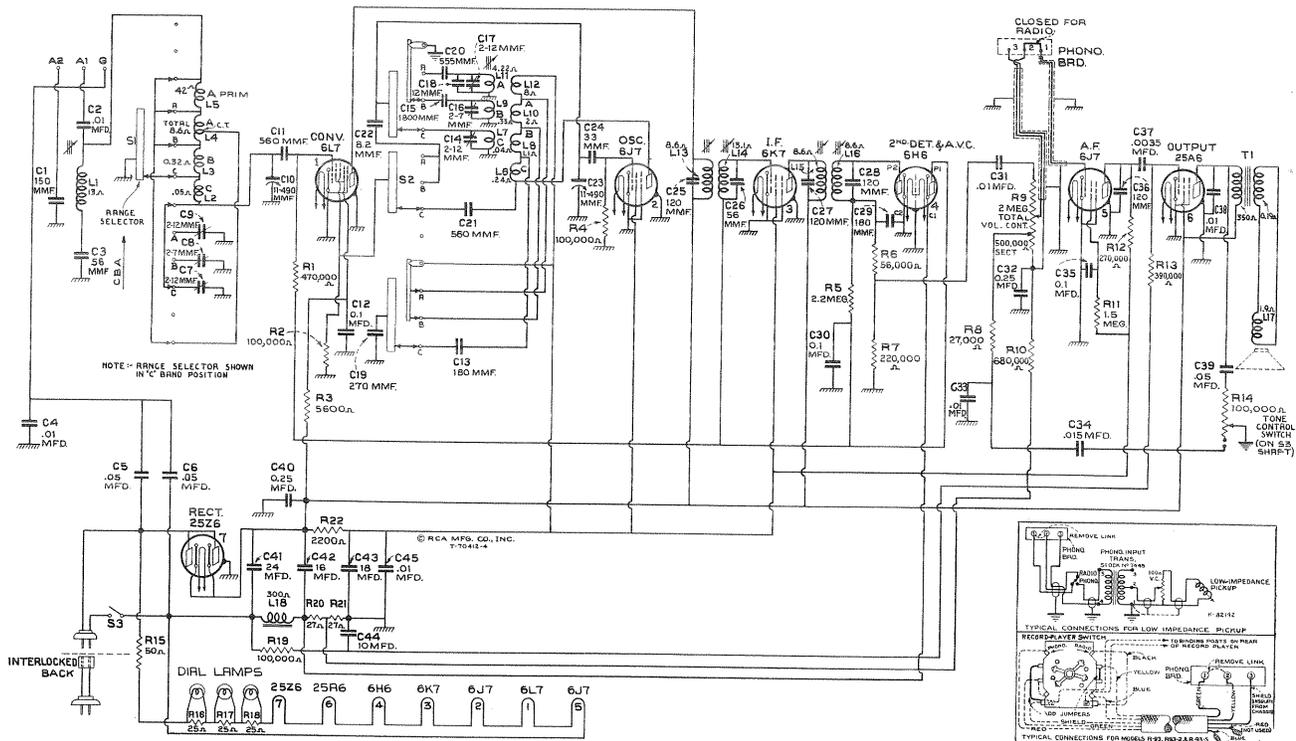


Figure 1—Schematic Circuit Diagram

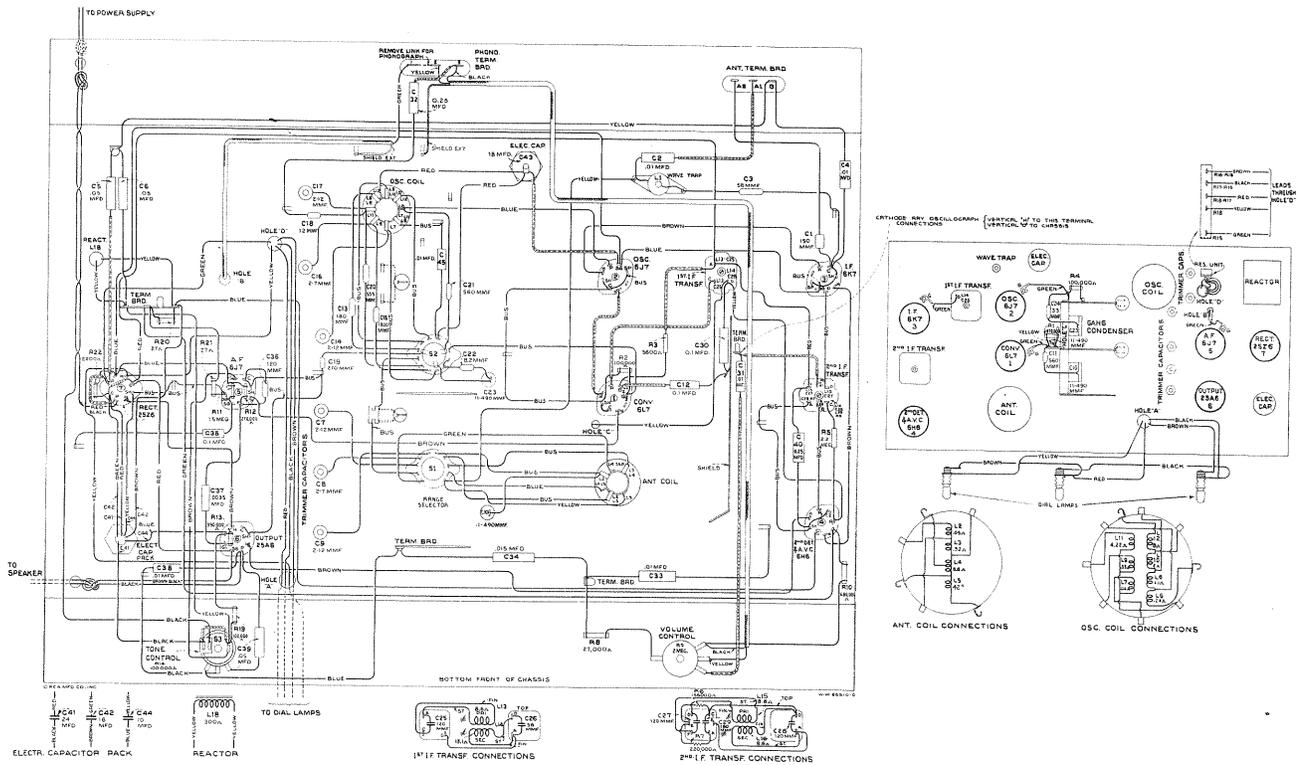


Figure 2—Chassis Wiring Diagram

Circuit Arrangement

The conventional type of superheterodyne circuit is used. It consists of a first-detector (converter) stage, separate oscillator stage, a single i-f stage, a diode-detector — automatic-volume-control stage, an audio voltage-amplifier stage, a pentode power-output stage, and a half-wave rectifier stage.

A single-wire antenna, or a doublet antenna, when connected to the proper input terminals of the receiver, is coupled to control grid No. 1 of the RCA-6L7 through a tuned r-f transformer. This transformer is tapped so that the range selector increases the range of tuning by decreasing the amount of inductance. Separate windings are employed in the oscillator stage for each position of the range selector. Air-dielectric trimming capacitors are used for obtaining exact alignment. Proper low-frequency tracking of the oscillator for "Standard broadcast" is accomplished by adjusting the inductance of the respective coil with a molded magnetite core.

The intermediate-frequency amplifier consists of an RCA-6K7 in a transformer-coupled circuit. The windings of these transformers are resonated with fixed capacitors, and are adjusted by molded magnetite cores (both primary and secondary) to tune to 460 kc.

The modulated signal, as obtained from the output of the i-f stage, is detected by an RCA-6H6 twin-diode tube (No. 2 diode). The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistors R6 and R7, is applied, as automatic control-grid bias to the first-detector, and i-f tubes. The No. 1 diode of the RCA-

6H6 is used to supply residual bias to the controlled tubes under conditions of little or no signal.

The manual volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector diode and the input grid of the audio voltage-amplifier tube. Phonograph terminals are inserted at this point for feeding the output of an external phonograph pickup to the control grid of the audio amplifier. Resistance-capacitance coupling is used between the first-audio stage and the power-output stage. The power-out-

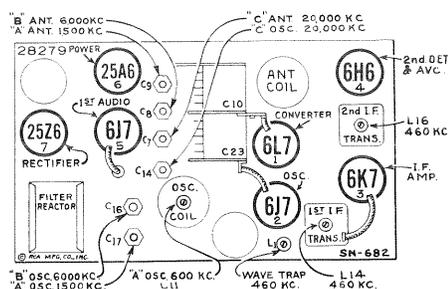


Figure 3—Radiotron, Coil, and Trimmer Locations

put stage is transformer-coupled to the permanent-magnet dynamic loudspeaker. Continuously-variable tone control is effected by means of capacitor C39 and variable resistor R14 shunting the plate circuit of the output tube. Extreme clockwise rotation of this tone control disconnects the resistor R14 from the circuit and places an additional capacitor C34 in shunt with capacitor C33, thereby reducing the low-frequency response of the amplifier. This point is known as the "Speech" position and provides optimum intelligibility of speech.

SERVICE DATA

Alignment Procedure

The low-frequency oscillator tracking (600 kc.), wave-trap, and i-f transformer adjustments are made by means of six screws attached to molded magnetite cores. The remaining adjustments in the antenna and oscillator circuits are made with six plunger-type air-dielectric trimming capacitors and require the use of an **RCA Stock No. 12636 Adjusting Tool**. Before adjusting the plunger-type trimmers, they must be unlocked by loosening their hexagon lock nuts. The lock nuts should be tightened upon completion of adjustments. For location of these adjustments refer to figures 3 and 5.

A standard test oscillator, such as the **RCA Stock No. 9595**, will be required as a source of signal at the specified alignment frequencies. Means for indication of the receiver output during alignment is also necessary to show when the correct point of adjustment is reached. The **RCA Stock No. 4317 Neon Glow Indicator** is designed for this purpose.

Attach the output indicator across the loudspeaker voice coil. Advance the receiver volume control to its

maximum position, letting it remain in such position for all adjustments. For each adjusting operation, regulate the test-oscillator output control so that the signal level is as low as possible and still be observable at the receiver output. Use of such small signal will obviate broadness of tuning which would otherwise result from a.v.c. action on a strong signal.

I-F Adjustments

Connect the "Ant." output of the test-oscillator to the grid cap of the RCA-6L7 through a .001 mfd. capacitor. Connect the test oscillator "Gnd." terminal to the ground terminal of the receiver chassis. Place the receiver range selector in its "Standard broadcast" (A) position and set receiver dial pointer to a position of no extraneous signals near 600 kc. Ground stator of local oscillator tuning condenser C23 to eliminate local oscillator signals. Adjust the test oscillator to 460 kc.

Adjust the two magnetite core screws L16 and L15 of the second i-f transformer to produce maximum (peak) indicated receiver output. Then adjust the

two magnetite core screws L14 and L13 of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. It is advisable to repeat the adjustment of all i-f magnetite core screws to assure that the interaction between them has not disturbed the original adjustments. Remove temporary chassis ground from oscillator stator C23.

R-F Adjustments

Calibrate the tuning dial by adjusting the scale pointer to the extreme low-frequency end calibration mark (530 kc.) on "Standard broadcast" scale while the gang tuning condenser plates are in their full-mesh position. Alignment should be made in sequence of "Wave-trap," "Short wave," "Medium wave," and "Standard broadcast."

Wave-Trap Adjustment

Attach the "Ant." output of the test oscillator to the receiver antenna terminal "A1" through a 200-mmfd. (important) capacitor. The ground connections remain connected together. Leave the test oscillator adjusted to 460 kc. and range selector in "Standard broadcast" position as before. Then adjust the wave-trap screw L1 to the point which causes maximum suppression (minimum indicated output) of the 460 kc. signal.

"Short Wave" Band

Connect the "Ant." output of the test oscillator to the receiver antenna terminal "A1" through a 300-

ohm resistor, leaving the ground connections as before. Place the receiver range selector to its "Short wave" (C) position and set the dial pointer to 20,000 kc. Adjust test oscillator to 20,000 kc. Adjust the oscillator trimmer C14 to produce maximum (peak) output. Two positions of this trimmer may be found which produce maximum output. The position of minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust the antenna trimmer C7 to produce maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two positions may be found on this trimmer which produce maximum output. The position of maximum capacitance (plunger near in) should be used. Tighten lock nut. Check for image signal by changing the receiver dial setting to 19,080 kc. If the oscillator trimmer C14 has been correctly adjusted, the image signal will be received at this position. No adjustments should be made while checking for the image signal.

"Medium Wave" Band

Connections for test oscillator remain the same as for "Short Wave" (C) Band. Adjust the test oscillator to 6,000 kc. Place receiver range selector to "Medium Wave" (B) position and set receiver dial pointer to 6,000 kc. Then adjust the two trimmers C16 and C8 of the oscillator and antenna coils so that each produces maximum (peak) indicated receiver output. Tighten trimmer lock nuts.

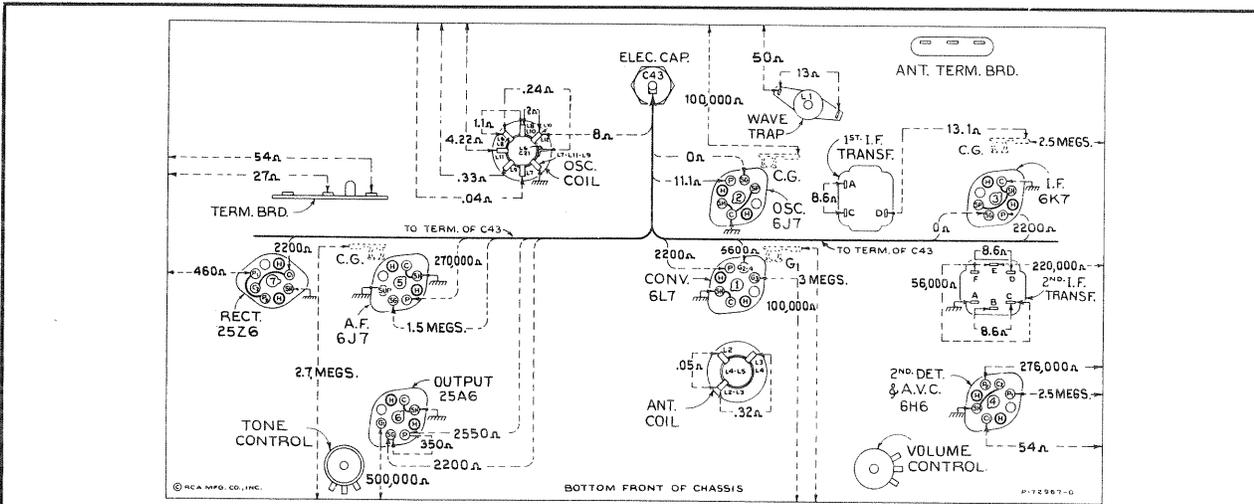


Figure 4—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full-mesh—
Range selector in "Standard broadcast" position—Tone control optional—
Volume control maximum

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground or other pertinent point on figure 4, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Wiring Diagram, figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within $\pm 20\%$. Variations in excess of this

limit will usually be indicative of trouble in circuit under test. When measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

"Standard Broadcast" Band

Change test oscillator connections by substituting 200 mmfd. condenser for the 300-ohm resistor. Adjust test oscillator and set receiver dial pointer to 1,500 kc. Place receiver range selector to "Standard broadcast" (A) position.

Then adjust the two trimmers, C17 and C9, of the oscillator and antenna coils so that each produces maximum (peak) receiver output. Shift the test oscillator frequency to 600 kc. Tune the receiver to pick up this signal near 600 kc., disregarding the dial reading at which it is best received. Then adjust the oscillator magnetite core screw L11 simultaneously rocking the receiver tuning control backward and forward through the signal until maximum receiver output results from these combined operations. The adjustments at 1,500 kc. should then be repeated to correct for any change which may have been caused by the 600 kc. oscillator adjustment. Tighten lock nuts on C17 and C9.

Miscellaneous

Antenna and Ground Terminals.—The ground terminal "G" shall always be connected to a good external ground. Connect transmission-line leads of the RCA-RK40A antenna system to terminals "A2" and "A." Connect the receiver coupling units of the

RCA-RK40 and the RCA Spider-web antenna systems to terminals "A1" and "G." Connect a single-wire antenna to terminal "A1."

Phonograph Terminal Board.—Typical methods of connecting a low-impedance pickup, or the RCA Victor Models R-93, R-93-2, and R-93-S Record Players are shown on Schematic Diagram (figure 1).

Loudspeaker.—Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed by softening its cement with a very light application of acetone, using care

Radiotron Cathode Current Readings

Measured with Milliammeter Connected at Tube Socket Cathode Terminals Under Conditions Similar to Those of Voltage Measurements

(1) RCA-6L7—Converter	7.5 ma.
(2) RCA-6J7—Osc.	3.5 ma.
(3) RCA-6K7—I. F. Amp.	8.5 ma.
(4) RCA-6H6—2nd Det.-A.V.C.	—
(5) RCA-6J7—Audio	0.22 ma.
(6) RCA-25A6—Power	27.0 ma.
(7) RCA-25Z6—Rectifier	48.0 ma.

not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

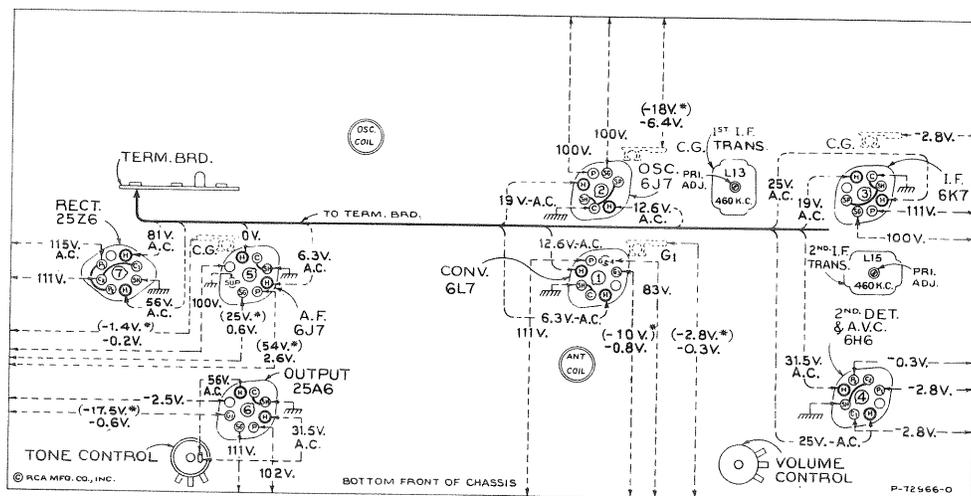


Figure 5—Radiotron Socket Voltages and Trimmer Locations

Measured at 115 volts, 60-cycle supply—For 115-volt d-c supply approximately 10% lower—Tuned to approximately 1,000 kc—No signal being received—Tone control optional—Volume control maximum

Radiotron Socket Voltages

Note: Two voltage values are shown for some readings. The value shown in parentheses with asterisk (*) indicates operating conditions without voltmeter loading. The other value (generally lower) is the actual measured voltage and differs from the value shown in parentheses because of the additional loading of the voltmeter through the high series circuit resistance.

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 5 will assist

in locating cause of faulty operation. Each value as specified should hold within $\pm 20\%$ when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1,000 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers.

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
RECEIVER ASSEMBLIES					
12716	Board—Antenna and ground terminal board	\$0.20	11398	Resistor—220,000 ohms, carbon type, 1/10 watt—Package of 5 (R7)	\$0.75
12717	Board—Phonograph terminal board	.22	11453	Resistor—270,000 ohms, carbon type, 1/10 watt—Package of 5 (R12)	.75
5237	Bushing—Tuning condenser mounting bushing assembly—Package of 3	.43	13005	Resistor—390,000 ohms, carbon type, 1/10 watt—Package of 5 (R13)	.75
12511	Cap—Grid contact cap—Package of 5	.15	11452	Resistor—470,000 ohms, carbon type, 1/10 watt—Package of 5 (R1)	.75
12714	Capacitor—Adjustable trimmer (C7, C9, C16, C17)	.38	11811	Resistor—680,000 ohms, carbon type, 1/4 watt—Package of 5 (R10)	1.00
12807	Capacitor—Adjustable trimmer (C8, C14)	.35	4241	Resistor—1.5 meg., carbon type, 1/4 watt—Package of 5 (R11)	1.00
13001	Capacitor—8.2 Mmfd. (C22)	.20	12651	Shield—Coil shield for Stock No. 12708	.22
13002	Capacitor—12 Mmfd. (C18)	.20	12710	Shield—Coil shield for Stock No. 12709	.28
12948	Capacitor—33 Mmfd. (C24)	.20	12607	Shield—1st I. F. transformer shield cap	.30
12723	Capacitor—56 Mmfd. (C3)	.20	12008	Shield—I. F. transformer shield for Stock Nos. 12801, 12653	.28
12629	Capacitor—56 Mmfd. (C26)	.20	12581	Shield—2nd I. F. transformer shield cap	.36
12404	Capacitor—120 Mmfd. (C25, C27, C28)	.26	12110	Shield—Top cap shield for 6J7 Radiotron	.14
12724	Capacitor—120 Mmfd. (C36)	.28	12704	Shutter—Dial scale holder and shutter assembly	.88
12725	Capacitor—150 Mmfd. (C1)	.28	11198	Socket—7-contact 6J7, 6K7 or 6L7 Radiotron socket	.15
12406	Capacitor—180 Mmfd. (C29)	.26	11196	Socket—8-contact 25A6, 25Z6, 6H6 or 6J7 Radiotron socket	.15
13003	Capacitor—180 Mmfd. (C13)	.20	3529	Socket—Dial lamp socket	.32
12488	Capacitor—270 Mmfd. (C19)	.20	12007	Spring—Retaining spring for Stock Nos. 12800, 12006 and 12664—Package of 10	.36
12537	Capacitor—560 Mmfd. (C11, C21)	.20	12849	Spring—Tension spring for band indicator shutter link—Package of 5	.18
12727	Capacitor—555 Mmfd. (C20)	.20	12668	Tone control and power switch (R14, S3)	1.22
12947	Capacitor—1,800 Mmfd. (C15)	.40	12801	Transformer—First I. F. transformer complete (L13, L14, C25, C26)	1.70
5005	Capacitor—.0035 Mfd. (C37)	.16	12653	Transformer—Second I. F. transformer complete (L15, L16, C27, C28, C29, R6, R7)	2.06
11315	Capacitor—.015 Mfd. (C34)	.20	12654	Trap—Wave trap complete (L1)	.75
4886	Capacitor—.05 Mfd. (C5, C6, C39)	.20	13144	Volume control (R9)	1.00
4841	Capacitor—.01 Mfd. (C12, C30, C35)	.22	REPRODUCER ASSEMBLIES		
4858	Capacitor—.01 Mfd. (C2, C4, C31, C33, C38, C45)	.25	12914	Board—2-contact reproducer terminal board	.25
5170	Capacitor—0.25 Mfd. (C32)	.25	12640	Bracket—Output transformer mounting bracket	.18
4840	Capacitor—0.25 Mfd. (C40)	.30	12642	Cone—Reproducer cone and dust cap (L17)	.94
5212	Capacitor—18 Mfd. (C43)	1.16	5118	Connector—3-contact male connector for speaker leads	.25
12998	Capacitor—Pack comprising one 24 Mfd., one 16 Mfd. and on 10 Mfd. sections (C41, C42, C44)	3.70	9717	Reproducer complete	16.20
12708	Coil—Antenna coil and shield (L2, L3, L4, L5)	2.04	11828	Transformer—Output transformer (T1)	1.46
12943	Coil—Oscillator coil and shield (L6, L7, L8, L9, L10, L11, L12)	2.30	MISCELLANEOUS ASSEMBLIES		
12701	Condenser—2-gang variable tuning condenser (C10, C23)	4.00	11824	Connector—2-contact female connector for power cord, Stock No. 11823	.34
11979	Connector—2-contact male connector for power leads	.30	11823	Cord—Power cord complete	.65
5119	Connector—3-contact female connector for speaker leads	.25	12698	Crystal—Station selector escutcheon and crystal	1.02
12800	Core—Adjustable core and stud for Stock No. 12709	.20	12699	Knob—Large station selector knob—Package of 5	.68
12006	Core—Adjustable core and stud for Stock No. 12801 and No. 12653	.22	12992	Knob—Small vernier station selector knob—Package of 5	.45
12664	Core—Adjustable core and stud for Stock No. 12654	.22	12995	Knob—Tone and power switch knob—Package of 5	.45
12996	Dial—Station selector dial scale	.80	12994	Knob—Volume control or range switch knob—Package of 5	.45
12702	Drive—Vernier drive for tuning condenser	.68	11377	Screw—Chassis mounting screw assembly—Package of 4	.12
12712	Indicator—Station selector indicator pointer	.22	12993	Screw—8-32 x 3/8 headless set screw for knob, Stock Nos. 12992, 12993, 12994 and 12995—Package of 10	.20
4340	Lamp—Dial lamp—Package of 5	.60	4982	Spring—Retaining spring for knob, Stock No. 12699—Package of 10	.50
12718	Mask—Dial light diffuser complete with colored screen	.40	12679	Resistor—2.2 meg., insulated, 1/4 watt—Package of 5 (R5)	1.00
12997	Range switch—(S1, S2)	2.05	13000	Resistor—Ballast resistor, comprising one 50-ohm and three 40-ohm sections (R15, R16, R17, R18)	1.40
12999	Reactor—Filter reactor (L18)	1.60	4669	Screw—8-32 set screw for Stock No. 12704—Package of 10	.25
11955	Resistor—27 ohms, carbon type, 1/4 watt—Package of 5 (R21)	1.00			
12453	Resistor—27 ohms, insulated, 1/4 watt—Package of 5 (R20)	1.00			
13004	Resistor—2,200 ohms, carbon type, 1/2 watt—Package of 5 (R22)	1.00			
11647	Resistor—5,600 ohms, carbon type, 1/4 watt—Package of 5 (R3)	1.00			
11400	Resistor—27,000 ohms, carbon type, 1/4 watt—Package of 5 (R3)	1.00			
11282	Resistor—56,000 ohms, carbon type, 1/10 watt—Package of 5 (R6)	.75			
11281	Resistor—100,000 ohms, carbon type, 1/10 watt—Package of 5 (R4)	.75			
5145	Resistor—100,000 ohms, carbon type, 1/4 watt—Package of 5 (R2, R19)	1.00			

First Edition.

Prices quoted above are subject to change without notice.