

# RCA VICTOR MODEL 5BT

## Five-Tube, Single-Band, Battery-Operated, Superheterodyne Receiver

### TECHNICAL INFORMATION

#### Electrical Specifications

FREQUENCY RANGE .....	530-1,800 kc	ALIGNMENT FREQUENCIES	600 kc (osc.), 1,500 kc (osc., ant.)
Intermediate Frequency .....			460 kc
RADIOTRON COMPLEMENT		(3) RCA-1F6 ...	Second Detector—A. F.—A.V.C.
(1) RCA-1A6 .....	First Detector—Oscillator	(4) RCA-30 .....	Audio Driver
(2) RCA-1A4 .....	Intermediate Amplifier	(5) RCA-19 .....	Power Output
Pilot Lamp (1) .....			Mazda 2.0 volts, .06 ampere, miniature screw base
BATTERIES REQUIRED			
"A," one plug-in 2½-volt Air-cell (heavy duty), or one 2-volt storage battery; "B," three 45-volt B batteries (heavy duty); "C" one 7½-volt C battery and two bias cells (Stock No. 12681)			
CURRENT CONSUMPTION			
"A" at 2 volts .....			0.54 amp.
"B" at 135 volts .....			18 ma.
Fuse Rating .....			½ ampere
POWER OUTPUT (135 volts "B" Battery)			
Undistorted .....			1.3 watts
Maximum .....			2.2 watts
LOUDSPEAKER (Permanent-Magnet Dynamic) .....		Impedance (V. C.)	2.2 ohms at 400 cycles

#### Mechanical Specifications

CABINET DIMENSIONS	
Height .....	17 <sup>7</sup> / <sub>8</sub> inches
Width .....	13 <sup>3</sup> / <sub>8</sub> inches
Depth .....	8 inches
WEIGHTS	
Net .....	19 pounds
Shipping .....	23 pounds
Chassis Base Dimensions .....	12 inches x 7 inches x 2 <sup>7</sup> / <sub>8</sub> inches
Over-all Height of Chassis .....	7 <sup>1</sup> / <sub>4</sub> inches
Operating Controls .....	(1) Power Switch-Volume, (2) Tuning
Tuning Drive Ratios .....	5 to 1

#### General Features

This model contains a five-tube chassis, battery operated, mounted in a table-type cabinet. The superheterodyne circuit is used, incorporating such features of design as automatic volume control, magnetite core adjusted i-f transformers, diode detection,

improved dust-proof permanent-magnet dynamic speaker, and phonograph terminal board. The frequency range extends from 530 to 1,800 kc which covers the regular broadcast band and includes police calls in the 1,600 to 1,800 kc portion of the range.

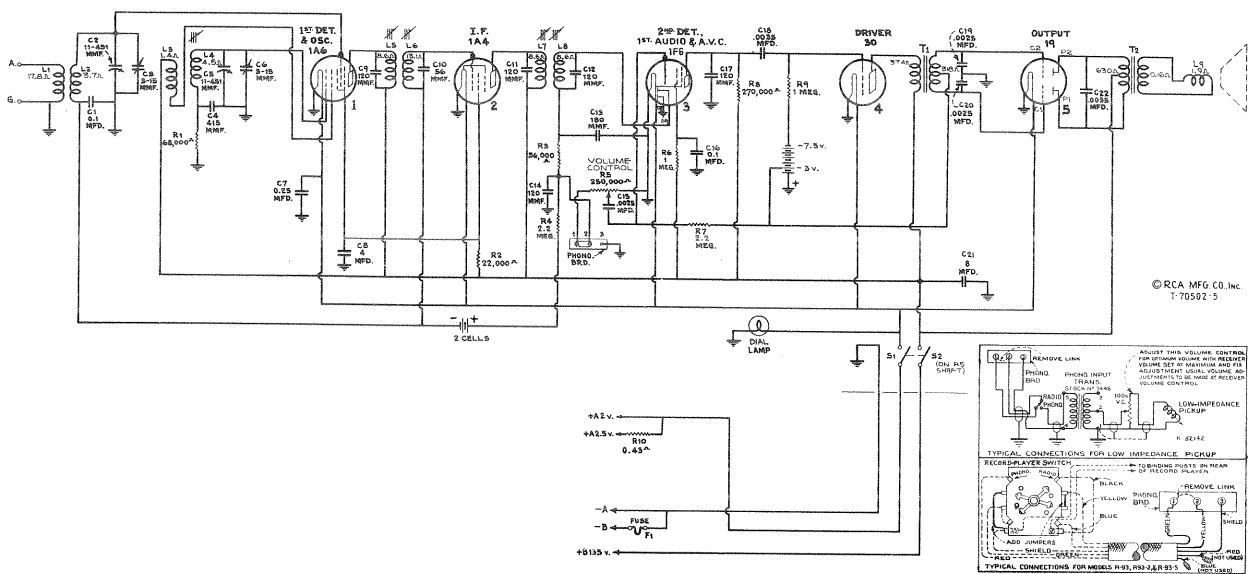


Figure 1—Schematic Circuit Diagram

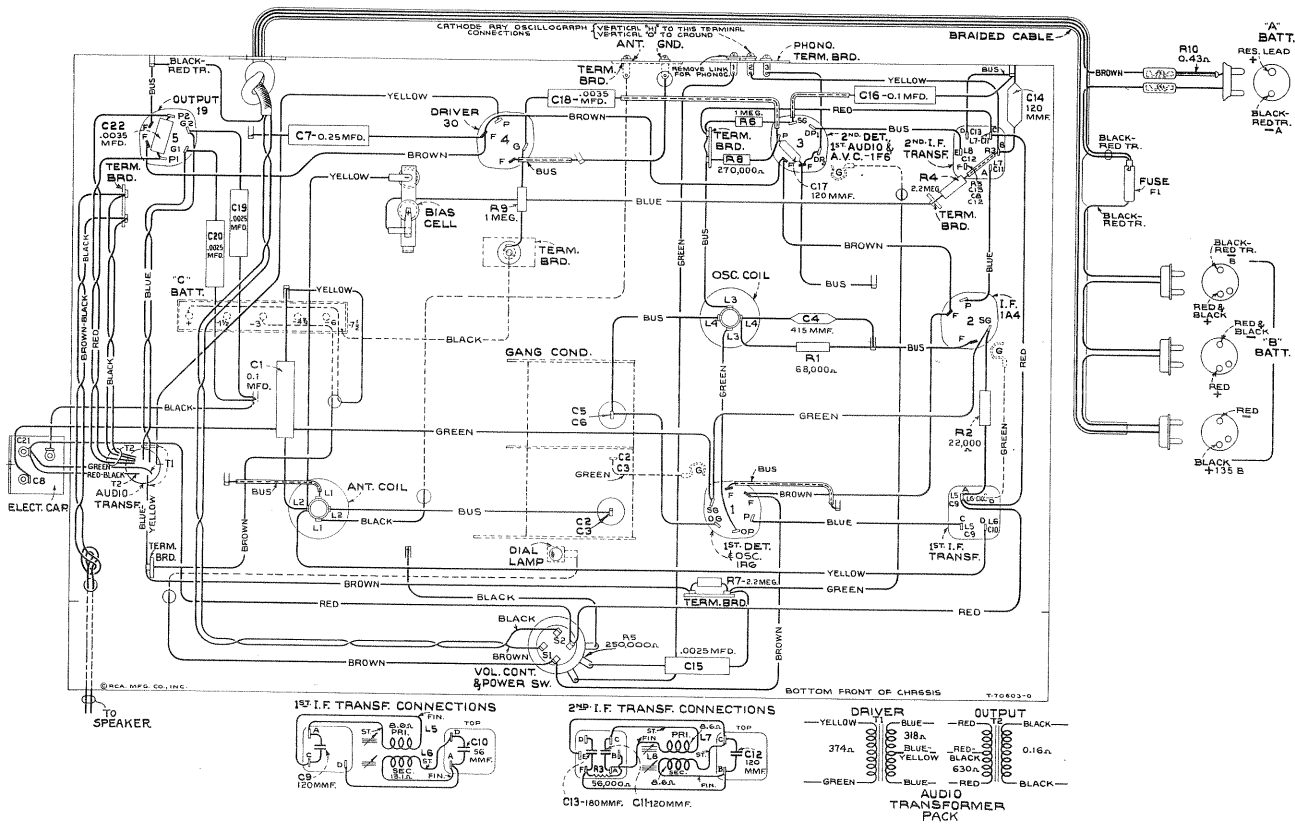


Figure 2—Chassis Wiring Diagram

## Circuit Arrangement

The first-detector and oscillator functions are combined in the RCA-1A6 tube. The input of this tube is coupled to the antenna through a tuned r-f transformer.

The intermediate-frequency stage is coupled to the RCA-1A6 and to the RCA-1F6 by means of tuned transformers. These transformers resonate with fixed capacitors and are adjusted by molded magnetite cores to tune to 460 kc.

The modulated signal as obtained from the output of the i-f system is detected by one of the diode plates of the RCA-1F6. The audio component of this rectified signal, which develops across the volume control R5, is fed through coupling capacitor C15

to the control grid of this same RCA-1F6 for audio voltage amplification. The d-c component resulting from the detection is fed through resistance-capacitance filters to the control grid returns of the RCA-1A6 and RCA-1A4 tubes as automatic volume control voltage. Bias cells are connected in these grid circuits to provide minimum bias voltage under conditions of little or no signal. The output of the RCA-1F6 is resistance-capacitance coupled to the RCA-30 driver. The driver is transformer-coupled to the RCA-19 tube used in the output stage. The output of this push-pull stage is transformer-coupled to the permanent-magnet dynamic loudspeaker.

## SERVICE DATA

The various diagrams in this booklet contain such information as will be needed to isolate causes of defective operation if such develops. The ratings of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as L1, C2, R1, etc.,

### Alignment Procedure

The circuits of this receiver have been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions or altered during servicing. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment.

The correct performance of this receiver can only be obtained when the aligning has been done with adequate and reliable apparatus. The manufacturer of this receiver has available, for sale through its distributors and dealers, a complete assortment of such service equipment as may be needed for the alignment operation.

A test oscillator, such as the RCA Stock No. 9595, is required as a source of the specified alignment frequencies. Visual indication of receiver output during the adjustments is necessary and should be accomplished by the use of an indicator such as the RCA Stock No. 4317 Neon Output Indicator.

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 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 stronger one.

### I-F Adjustments

The four adjustment screws (attached to molded magnetite cores) of the two i-f transformers (one on top and one on bottom of each i-f transformer) are located as shown by figures 3 and 6. Each circuit must be aligned to a basic frequency of 460 kc.

Connect the "Ant." output of the test-oscillator to the control grid of the RCA-1A6 through a .001 mfd. capacitor. Connect the test oscillator "Gnd." terminal to the ground terminal of the receiver chassis. Tune the test oscillator to 460 kc. Adjust the receiver tuning control to a point, within its range,

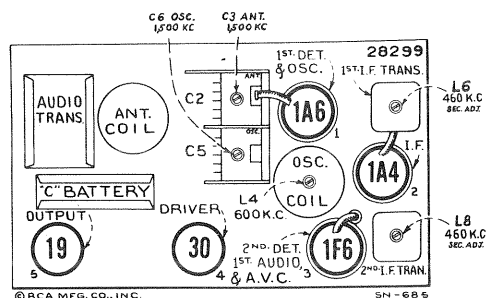


Figure 3—Radiotron, Coil, and Trimmer Locations

are provided for reference between the illustrations and the Replacement Parts List. The coils and transformer windings are rated in terms of their d-c resistance only. Ratings of less than one ohm are generally omitted.

**Caution:** The two bias cells are used only for the purpose of supplying bias potential and should never be measured with an ordinary voltmeter or other device which draws any current. A simple check on these cells may be made by connecting a milliammeter in the plate circuit of the RCA-1A4 tube and noting the plate current reading. Then remove the two bias cells, being careful that the spring contact clips do not short-circuit them during removal. Connect a 2-volt battery between the + and - 2v. (- battery to grid side) terminals of the bias cell board, and again note the plate current reading. If the first reading obtained (with bias cells) is more than 40% from the latter reading (with 2-volt battery), the bias cells should be replaced. This 40% difference is equivalent to a change of approximately 25% battery voltage.

where no interference is encountered either from broadcast stations or short stator of oscillator tuning condenser C5 to ground, eliminating local (heterodyne) oscillator signals.

Adjust the two magnetite core screws L8 and L7 of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two magnetite core screws L6 and L5 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 jumper, stator C5 to ground, if used.

### R-F Adjustments

Calibrate the tuning dial by adjusting the dial pointer to the extreme low-frequency end calibration mark (530 kc) on dial scale while the gang tuning condenser plates are in their full-mesh position. Reduce output of test oscillator to minimum. Set receiver dial pointer to 600 kc. Tune the test oscillator to 600 kc and increase its output until an indication is obtained on the output indicator.

Adjust oscillator magnetite core screw L4 (top of oscillator coil) so that maximum (peak) indication is shown by the output indicator.

Set receiver dial pointer to 1,500 kc. Tune test oscillator to 1,500 kc. Adjust the oscillator and antenna trimmers C6 and C3 for maximum (peak) indicated output.

Tune test oscillator to 600 kc and adjust receiver to pick up this signal near 600 kc. Readjust the oscillator magnetite core screw L4 for maximum (peak) indicated output while rocking the receiver gang tuning condenser back and forth through this signal.

Repeat adjustments of C6 and C3 as above to correct for any changes in the oscillator tuning caused by the adjustment of L4.

### 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 not to allow

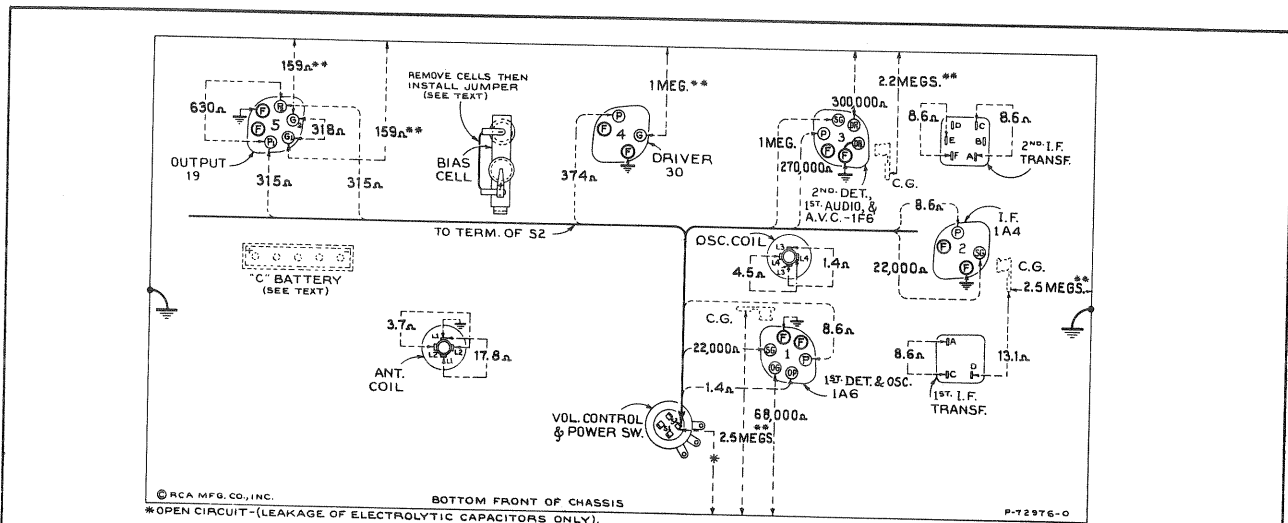


Figure 4—Resistance Diagram

Battery-supply cable disconnected—Radiotrons removed—Tuning condenser in full-mesh—Bias cells and "C" battery removed—Volume setting optional

### Resistance Measurements

**\*\*Before making any resistance measurements, remove the two bias cells and connect jumpers on bias-cell board as shown. Also, remove the "C" battery and connect the two leads ( $-7\frac{1}{2}$  v. and  $-3$  v.) to chassis ground. After measurements are completed, remove jumpers from bias-cell board and then carefully insert bias cells. Next, insert "C" battery and restore leads to their respective positions.**

The resistance values shown between Radiotron socket contacts, grid caps, resistors, terminals and receiver chassis ground, on figure 4, have been carefully selected so as to facilitate a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram,

figure 1, and Chassis 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. In all cases of 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.

the acetone to flow down into the air gap. The dust cover should be cemented back in place with ambroid upon completion of adjustment.

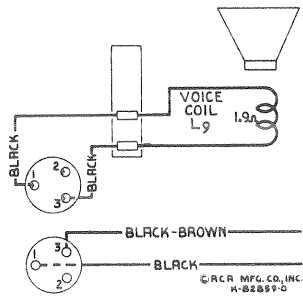


Figure 5—Loudspeaker Wiring

### Power Supply

Filament voltage for this receiver is obtained from either a 2½-volt Air-cell or a 2-volt storage battery. When the Air-cell is used, the 0.43 ohm resistor R10 must be connected in series with the A-battery lead

as shown on figure 2. When operating on a 2-volt storage battery, this resistor R10 should be removed. Plugs are provided on the battery cable (see figure 2) for plugging in the Air-cell and B batteries. The A-battery plug should be removed when operating

### Radiotron Plate Current Readings

Measured with Milliammeter Connected at Tube Socket Plate Terminals under Conditions Similar to Those of Voltage Measurements

- (1) RCA-1A6—1st. Det. .... 2.26 ma.  
—Osc. .... 1.86 ma.
  - (2) RCA-1A4—I.F. .... 3.6 ma.
  - (3) RCA-1F6—2nd Det.—A.F.—A.V.C. 0.3 ma.
  - (4) RCA-30—Driver .... 3.8 ma.
  - (5) RCA-49—Output .... 2.8 ma.\*\*
- (\*\* Total plate current.)

on a 2-volt storage battery. The 7½-volt C battery is located on the top-side of the chassis and securely held in place by a metal cover (see figure 3). The two bias cells are located underneath the chassis (see figures 2 and 5).

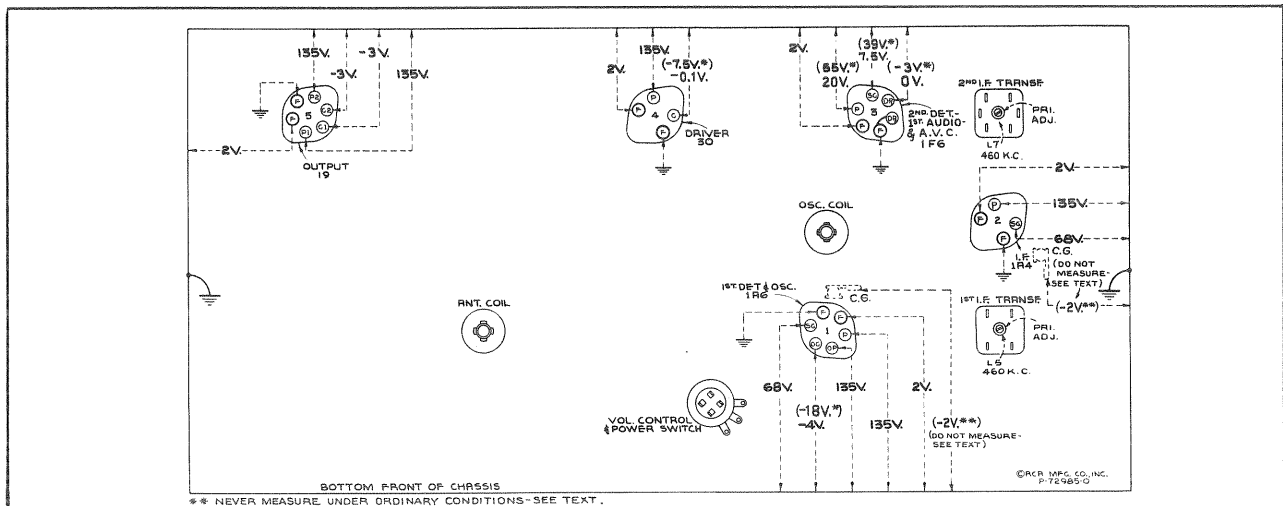


Figure 6—Radiotron Socket Voltages, Coil, and Trimmer Locations  
Measured with all batteries at normal voltage—Tuned to approximately 1,000 kc—  
No signal being received—Volume control optional

### Radiotron Socket Voltages

**CAUTION:** Do not attempt to measure voltages on control grids of RCA-1A6 or RCA-1A4, with any conventional voltmeter, due to presence of bias cells. See "Caution" under "Service data" for method of measuring these cells.

**Note:** Two voltage values are shown for some readings. The higher value shown in parenthesis with asterisk (\*) indicates operating conditions without voltmeter loading. The lower value is the actual measured voltage and differs from the higher value 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 6 will assist in locating cause for 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, and 250 volts. Use the nearest range above the voltage to be measured.

# 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
<b>RECEIVER ASSEMBLIES</b>					
13216	Board—Antenna and ground terminal board	\$0.25	12009	Resistor—68,000 ohms, carbon type, ¼ watt—Package of 5 (R1)	\$1.00
12717	Board—Phonograph terminal board	.22	11323	Resistor—270,000 ohms, carbon type, ¼ watt—Package of 5 (R8)	1.00
4289	Body—Female section of fuse holder—Package of 10	.35	12200	Resistor—1 meg., insulated, ¼ watt—Package of 5 (R6, R9)	1.00
4286	Bushing—Bushing and ferrule assembly for fuse holder—Package of 10	.38	11626	Resistor—2.2 meg., carbon type, ¼ watt—Package of 5 (R4, R7)	1.00
13217	Cable—Battery cable complete with four 2-contact male connectors, fuse holder and fuse	3.05	13296	Shield—Coil shield for coil Stock Nos. 13293 and 13294	.30
4288	Cap—Male section of fuse holder—Package of 10	.36	12008	Shield—First or second I. F. transformer shield	.28
12629	Capacitor—56 Mmfd. (C10)	.20	12607	Shield—First I. F. transformer shield top	.30
12404	Capacitor—120 Mmfd. (C9, C11, C12)	.26	12581	Shield—Second I. F. transformer shield top	.36
12724	Capacitor—120 Mmfd. (C14, C17)	.28	3682	Shield—1A4, 1A6, or 1F6 Radiotron shield	.22
12406	Capacitor—180 Mmfd. (C13)	.26	8098	Socket—Dial lamp socket	.10
13297	Capacitor—415 Mmfd. (C4)	.25	4794	Socket—4-contact 1A4 or 30 Radiotron socket	.15
5107	Capacitor—.0025 Mfd. (C15, C19, C20)	.16	4786	Socket—6-contact 1A6, 1F6 or 19 Radiotron socket	.15
5005	Capacitor—.0035 Mfd. (C18, C22)	.16	12007	Spring—Retaining spring for core, Stock No. 12006—Package of 10	.36
4841	Capacitor—0.1 Mfd. (C1, C16)	.22	4284	Spring—Spring for female section fuse holder—Package of 10	.30
4840	Capacitor—0.25 Mfd. (C7)	.30	12803	Transformer—Audio transformer pack (T1, T2)	3.55
13295	Capacitor Pack—Comprising one 4 mfd. and one 8 mfd. sections (C8, C21)	1.70	12801	Transformer—First I. F. transformer (L5, L6, C9, C10)	1.70
13293	Coil—Antenna coil with shield (L1, L2)	1.00	12802	Transformer—Second I. F. transformer (L7, L8, C11, C12, C13, R3)	1.85
13294	Coil—Oscillator coil with shield (L3, L4)	1.00	13214	Volume control and power switch (R5, S1, S2)	1.50
13212	Condenser—2-gang variable tuning condenser (C2, C3, C5, C6)	3.40	4285	Washer—Insulating washer for female section of fuse holder—Package of 10	.22
12828	Connector—2-contact male connector for cable, Stock No. 13217	.20	<b>REPRODUCER ASSEMBLIES</b>		
12827	Connector—2-contact and guide pin male connector for cable Stock No. 13217	.30	12642	Cone—Reproducer cone and dust cap	.94
5119	Connector—3-contact female connector for speaker cable	.25	5118	Plug—3-contact male connector for reproducer	.25
12006	Core—Adjustable core and stud assembly for Stock Nos. 12801 and 12802	.22	9712	Reproducer—Complete	6.60
12681	Cell—Bias cell	.30	<b>MISCELLANEOUS ASSEMBLIES</b>		
13391	Dial—Station selector dial scale	.45	12638	Knob—Station selector control knob—Package of 5	.58
3748	Fuse—½ ampere—Package of 5 (F1)	.40	11347	Knob—Volume control knob—Package of 5	.75
13215	Holder—Bias cell holder	.25	11377	Screw—Chassis mounting screw assembly—Package of 4	.12
13213	Indicator—Station selector indicator pointer	.15	11349	Spring—Retaining spring for knob, Stock Nos. 11347 and 12638—Package of 5	.25
4290	Insulator—Insulator for female section of fuse holders—Package of 10	.35			
4348	Lamp—Dial lamp	.38			
13298	Resistor—Flexible type, 0.43 ohm—Package of 5 (R10)	.90			
11305	Resistor—22,000 ohms, carbon type, ¼ watt—Package of 5 (R2)	1.00			
11282	Resistor—56,000 ohms, carbon type, 1/10 watt—Package of 5 (R3)	.75			

Prices quoted above are subject to change without notice.