

Instructions for

RCA Victor R-90-P

Double-Range Bi-Acoustic Superheterodyne with Tonalite Control

INTRODUCTION

This ten-tube superheterodyne radio receiver offers superb musical reproduction—the result of many recent developments and improvements. Two of the new A. F. Pentode Radiotrons RCA-2A5 are used in the push-pull output stage. Acoustic “tone equalizer” chambers are built into the cabinet, effectually preventing sound distortion resulting from cabinet resonance. A tuning meter, having a translucent illuminated scale, is mounted just above the station selector dial. This meter permits *exact* visual tuning of stations and thus prevents faulty reproduction resulting from inaccurate tuning.

In addition to providing the usual broadcast entertainment from stations in the 540–1500 kilocycle band, this receiver can be tuned to receive stations transmitting in the range from 1500 to 2800 kilocycles. The latter range permits “listening in” to police calls, amateur radio “phone” communication, etc.—a fascinating diversion.

An outstanding feature of this instrument is the use of colored illuminated indicators for the operating controls, showing at a glance just where each control is set. This feature is new, being used for the first time in this series of models.

Not only does the harmonious color illumination provide a modern and artistic refinement in appearance, but the indicators will be found of great usefulness in the manipulation of the receiver. Another improvement which has been initiated in this series of instruments is the recessing of the panel for the controls, reducing the extent of knob projection and rendering the controls less conspicuous. A double tone control is provided, also for the first time in this instrument series. Separate tone control knobs permit independent adjustment of the bass and treble response.

The automatic volume control minimizes the effects of “fading.” This control also tends to maintain the volume level for which it is set when the dial is shifted from one station to another, thus eliminating “blasting” when passing through the settings of powerful stations.

The silent-tuning control (noise “suppressor” or “silencer”) may be set for quiet tuning between station settings, without loss of ability to receive distant stations whose signals are above the background noise level.

INSTALLATION

Preliminary—Remove the packing material from the Radiotrons. Refer to the tube location diagram on rear of receiver, and *make certain*:

- (a) That all tubes are in the proper sockets and pressed down firmly. *Never apply power to the instrument unless all Radiotrons are in place.*
- (b) That all shields are rigidly in place over the Radiotrons shown by double circles on the diagram.
- (c) That the short flexible leads shown on the diagram are attached to the top grid contacts of the proper Radiotrons as indicated, and that the spring contact caps are pressed down firmly. Particular attention should be given to the proper connections of the adjacent green and black leads in accordance with the diagram.
- (d) That the lid is securely in place on the shield of the RCA-58 Radiotron designated by the heavy circle on the diagram.

Location—The instrument should be located close to the antenna lead-in and ground connections, and near an electrical outlet.

Antenna and Ground—An antenna 25 to 75 feet long, including the lead-in and ground connections, is recommended.

The antenna should be well insulated from all objects, and should not be run close to or parallel with electric circuits inside or outside the building. Generally, an indoor antenna of short or medium length should be found satisfactory. An outdoor antenna of greater length may provide some increase in the receiving range, and is recommended for localities remote from broadcasting stations. When the receiver is installed in a building of metallic construction, an outdoor antenna is essential for satisfactory results.

A *good* ground connection is necessary for best performance of this receiver. The connection to ground should be as short and direct as possible and preferably should be made to a cold water pipe. An approved ground clamp should be used to insure a tight and permanent connection.

A terminal board is provided at the rear of the receiver chassis for connecting to the antenna and ground. Connect the antenna lead to the left-hand terminal (marked “ANT”) and the ground lead to the right-hand terminal (marked “GND”). Tighten the terminals with a screw driver to insure permanent electrical connections.

Power Supply—Connect the power cord to an electrical outlet supplying alternating current at the voltage and frequency (cycles) specified on the rating label, located on the rear of the receiver.

OPERATION

The operating controls are shown in Figure 1. Proceed as follows:

1. Set the Frequency Range Switch for the band desired, as follows:

- (a) *Counter-clockwise*—540–1500 kilocycle broadcast band. The dial scale reads directly in kilocycles for this band, using the large numerals.
- (b) *Clockwise*—1400–2800 kilocycles. Frequencies in this band are indicated approximately by the positions of the small numerals at the bottom of the dial (add two ciphers to obtain kilocycles). The following services are included in this band:
 - (1) Police Calls—Stations operating at 1712 kilocycles, and between 2400 and 2500 kilocycles.
 - (2) Amateur Radio "Phone"—Assigned band 1900–2000 kilocycles.
 - (3) Aviation Reports, Airport Beacons, Etc.—Assigned band 2000–2400 kilocycles.
 - (4) Amateur Radio "CW" (Code)—Assigned band 1715–1900 kilocycles. Signals of this class normally are unintelligible or inaudible with this type of receiver.

NOTE—The majority of stations in the 1400–2800 kilocycle band do not offer continuous programs. Police calls are usually intermittent, at regular or irregular intervals. Strong local stations in the 540–1500 kilocycle broadcast band may be audible (sometimes at more than one point on the dial) when the Frequency Range Switch is set for 1400–2800 kilocycles.

2. Apply power by turning the Volume Control knob clockwise from the "off" position. Set this control near the middle of its range by observing the illuminated colored indicator associated with the control knob. Several seconds are required for the Radiotrons to heat before satisfactory reception is possible.

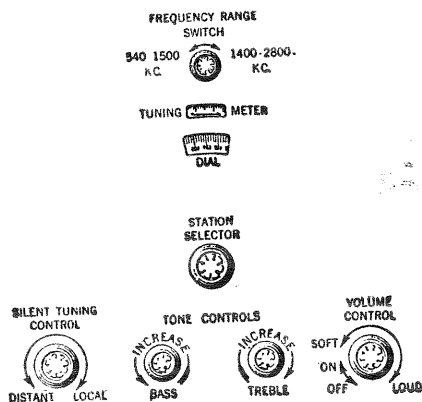


Figure 1

3. With the Silent-Tuning Control set in the extreme counter-clockwise position, turn the Station Selector to a point near the middle range of the dial, at which no station is heard within several scale divisions. Then turn the Silent-Tuning Control clockwise until the background noise (static) just disappears. (The setting of the Silent-Tuning Control is shown by the illuminated colored indicator associated with this control knob.)

NOTE—The adjustment just described provides quiet tuning, that is, *suppression of background noise between station settings*, and permits reception of all stations whose signals are above the existing noise level.

4. Turn the Station Selector slowly in either direction until a station is heard. (The dial scale is calibrated in kilocycles, for locating stations of known frequency assignment.)

NOTE—If no stations are received throughout the complete range of the dial, it is an indication that there are no station signals above the prevailing level of background noise. In this case it may be possible to tune in distant or weak stations by turning the Silent-Tuning Control counter-clockwise (in small steps) and continuing to rotate the Station Selector until signals are heard. When this is done, a higher level of background noise is, of course, to be expected.

5. When a desirable station signal is heard, accurate tuning for best reproduction is accomplished as follows:

- (a) Turn the Volume Control counter-clockwise (if necessary) until the volume is at a low level.
- (b) Adjust the Station Selector carefully to the position at which the indicator of the tuning meter travels farthest to the right (as designated by the arrow on the meter scale). When receiving a powerful local station, the Station Selector dial should be set at the center of the scale range for which the meter deflection is maximum (this range may be narrowed somewhat by turning the Silent-Tuning Control clockwise).
- (c) Adjust the Volume Control to obtain the desired sound level.

6. Adjust the two Tone Controls to obtain the tone shading preferred. The full range of musical reproduction is obtained with the right-hand knob all the way clockwise and the left-hand knob fully counter-clockwise, and is represented by full illumination of the tone color indicator which extends between the two knobs. Modifications of the tone range may be obtained as follows:

- (a) To reduce the high-frequency (treble) response, or to decrease the background noise (static) interference on station settings, turn the right-hand tone control knob counter-clockwise. The extent of high-frequency cut-off thus obtained is indicated by shading of the yellow illumination at the right-hand side of the tone color indicator.
- (b) To reduce the low-frequency (bass) response, or to decrease low pitched hum present on the signals of some stations, turn the left-hand tone control knob clockwise. The extent of low-frequency cut-off thus obtained is indicated by shading of the blue illumination at the left-hand side of the tone color indicator.
- (c) The red illumination at the center of the tone color indicator represents the middle range of musical response. This illumination is not cut off by rotation of either of the tone control knobs as described in the preceding paragraphs (a) and (b).

7. When through operating, interrupt the power by turning the Volume Control to the extreme counter-clockwise (off) position.

Radiotrons—Improved results may sometimes be obtained by interchanging Radiotrons of the same type, either RCA-56 or RCA-58, in their sockets. Spare Radiotrons should be kept on hand.

SERVICE DATA

Electrical Specifications

Voltage Rating.....	105-125 Volts
Power Consumption.....	120 Watts
Type and Number of Radiotrons.....	3 RCA-56, 4 RCA-58, 1 UX-280, 2 RCA-2A5—Total, 10
Frequency Range.....	540 K. C.—1500 K. C. 1400 K. C.—2800 K. C.
Undistorted Output.....	4.0 Watts

This receiver is a ten tube Super-Heterodyne radio receiver. Features such as illuminated controls, improved automatic volume control, noise suppressor, compensated volume control, heater pentode output tubes operated as a push-pull stage, acoustically correct cabinets and the inherent sensitivity, selectivity and tone quality of the Super-Heterodyne are included in this instrument.

A special feature is the Range Switch that allows reception of signals either of the broadcast band or higher frequencies. With the switch in the broadcast band position, the frequency range is from 540 to 1500 K. C. At the higher frequency position, the receiver covers the 1400 to 2800 K. C. band.

Figure A shows the schematic circuit, Figure B the wiring diagram, Figure C the location of the adjustable capacitors and Figure D, the loud-speaker wiring. The Radiotron socket voltages, the line-up procedure and the replacement parts are given on the following pages.

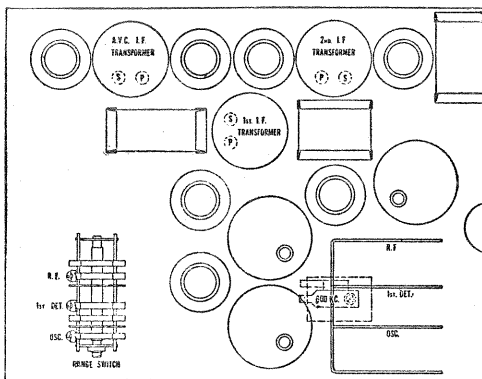


Figure C—Location of Adjustable Capacitors

R. F. And Oscillator Line-Up Capacitor Adjustments

Four adjustable capacitors are provided for aligning the R. F. circuits and adjusting the oscillator frequency so that the oscillator will maintain a constant frequency—175 K. C.—difference from that of the incoming signal. Poor quality, insensitivity, poor A. V. C. action and possible inoperation of the receiver may be caused by these capacitors being out of adjustment.

If the other adjustments have not been tampered with the intermediate transformer tuning capacitors—the following procedure may be used for aligning these capacitors.

- Procure an R. F. Oscillator giving a modulated signal at 600 K. C., 1400 K. C. and 2440 K. C. Also procure a non-metallic screw driver such as Stock No. 7065.
- An output meter is necessary. This may be a current squared galvanometer connected to the secondary of the output transformer instead of the cone coil, a 0.5 milliammeter connected in series with the plate supply to the second detector or a low range A. C. voltmeter connected across the reproducer unit cone coil.
- A dummy Radiotron RCA-56 is necessary to substitute for the one normally used in the A. V. C. socket. This should be a tube that is otherwise normal in all respects but having one heater prong removed. Insert this tube in the A. V. C. socket.
- First check the chassis and carefully ascertain that the dial pointer reads exactly at the first line on the scale when the tuning capacitor rotor plates are fully meshed with the stator plates.
- Place the oscillator in operation at exactly 1400 K. C. and couple its output to the antenna. Set the Range Switch counter-clockwise and the dial scale at exactly 1400. Connect the output meter to the set and place the volume control and suppressor control, if noise level will permit, at its maximum position. Adjust the oscillator input so that an excessive reading on the output meter is not obtained.

- With a suitable socket wrench—the nuts are at ground potential—adjust the oscillator, first detector and R. F. line-up capacitors, until a maximum deflection is obtained in the output meter.
- The high frequency band is adjusted at 2440 K. C. This is done in a similar manner to the R. F. adjustments except that the oscillator is set at 2440 K. C., the dial at 1200 and the Range Switch in the clockwise position. The line-up capacitors on the selector switch are adjusted for maximum output at this frequency.
- Set the oscillator at 600 K. C. Tune in the signal with the receiver until a maximum deflection is obtained in the output meter. Now adjust the 600 K. C. series capacitor, Figure C, until a maximum deflection is obtained in the output meter. Rock the tuning capacitor back and forth while making this adjustment as the tuning capacitor and oscillator series capacitor adjustments interlock.

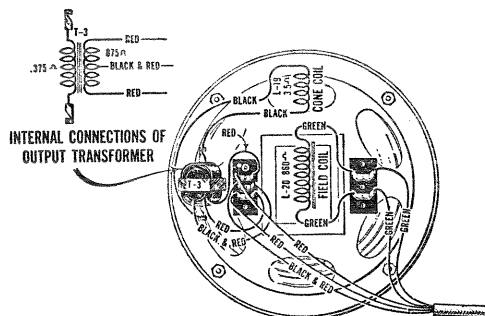


Figure D—Loudspeaker Wiring

- Change the frequency of the oscillator to 1400 K. C. and set the dial at 1400. Again make the adjustments given under (f), (g) and then (h).

So adjusted, the R. F. circuits are properly aligned and the oscillator will maintain a constant frequency difference from the incoming R. F. signal.

I. F. Tuning Capacitor Adjustments

Although this receiver has two I. F. stages, one for the second detector and one for the A. V. C., only two of the three I. F. transformers are tuned by adjustable capacitors and require adjustment. The stage used for the A. V. C. is broadly tuned and does not require any adjustment.

The transformers are all tuned to 175 K. C. and the circuits broadly peaked.

A detailed procedure for making this adjustment follows:

- Procure a modulated R. F. Oscillator that gives a modulated 175 K. C. signal. Also procure a non-metallic screw driver such as Stock No. 7065.
- An output meter is necessary. This may be a current squared galvanometer connected to the secondary of the output transformer instead of the cone coil, a 0.5 milliammeter connected in series with the plate supply to the second detector or a low range A. C. voltmeter connected across the reproducer unit cone coil.
- A dummy Radiotron RCA-56 is necessary to substitute for the one normally used in the A. V. C. socket.
- Remove the oscillator tube and make a good ground connection to the chassis. Place the oscillator in operation and couple its output from the control grid of the first detector to ground. Adjust the oscillator output, with the receiver volume control at maximum, until a deflection is obtained in the output meter.
- Refer to Figure C. Adjust the secondary and primary of the second and then the first I. F. transformer until a maximum deflection is obtained in the output meter. Go through these adjustments a second time as a slight readjustment may be necessary.

When the adjustments are made the set should perform at its maximum efficiency. However, due to the interlocking of adjustments, it is good practice to follow the I. F. adjustments with the R. F. and oscillator line-up capacitor adjustments. The correct method of doing this is given in the preceding section.

RADIOTRON SOCKET VOLTAGES

120 Volt, A. C.—No signal being received—Volume Control at minimum

Radiotron No.	Cathode to Control Grid Volts, D. C.	Cathode or Filament to Screen Grid Volts, D. C.	Cathode or Filament to Plate Volts, D. C.	Plate Current, M. A.	Heater or Filament Volts, A. C.
1. R. F.	3.0	100	230	7.0	2.4
2. 1st Detector	8.0	95	220	2.5	2.4
3. Oscillator	—	—	105	6.0	2.4
4. I. F.	7.5	100	225	2.5	2.4
5. A. V. C.—I. F.	7.5	100	225	2.5	2.4
6. A. V. C.	20.0	—	0	—	2.4
7. 2nd Detector	17.0	—	250	1.2	2.4
8. Power	18.0	255	245	33.0	2.4
9. Power	18.0	255	245	33.0	2.4

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					
3024	Capacitor—9 mmfd.—Package of 2.....	\$0.50	6298	Cord—Three gang tuning condenser drive cord—Package of 5.....	\$0.60
3047	Resistor—1,500 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	1.00	6314	Capacitor—160 mmfd.—Package of 5.....	2.00
3076	Resistor—1 megohm—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	1.00	6316	Resistor—2,500 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	1.00
3252	Resistor—100,000 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	1.00	6323	Shaft—Three gang variable tuning condenser drive shaft—Comprising 1 shaft, 2 "C" washers and 2 flat washers—Package of 2.....	.20
3358	Resistor—3,000 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	1.00	6429	Capacitor pack—Comprising one 0.11 mfd. and one 0.7 mfd. capacitor in metal container.....	.98
3435	Resistor—250 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	1.00	6430	Capacitor pack—Comprising two 4.0 mfd., one 0.25 mfd., one 0.025 mfd., one 0.1 mfd. and one 0.5 mfd. capacitors in metal container.....	3.78
3440	Resistor—4,500 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	1.00	6431	Reactor—Filter reactor.....	1.92
3455	Capacitor—0.01 mfd. capacitor.....	.44	6432	Transformer—Interstage audio transformer.....	3.69
3460	Capacitor—1,200 mmfd.....	.30	6434	Reactor—Second detector plate coupling reactor.....	1.96
3513	Capacitor—700 mmfd.....	.48	6435	Transformer—First intermediate frequency transformer.....	2.54
3526	Resistor—2,000 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	1.00	6436	Reactor—High frequency tone control compensating reactor.....	.70
3527	Resistor—800 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	1.00	6437	Coil—Oscillator coil assembly.....	1.24
3528	Bracket—Volume control or noise suppressor indicator lamp bracket.....	.18	6439	Reactor—High frequency tone control reactor.....	1.14
3529	Socket—Noise suppressor or volume indicator lamp socket.....	.32	6440	Transformer—Second intermediate frequency transformer.....	1.94
3530	Coil—Second detector plate choke coil.....	.72	6441	Transformer—Third intermediate frequency transformer.....	1.76
3531	Shutter—Volume control shutter.....	.50	6442	Reactor—Volume control series reactor.....	.88
3532	Shutter—Noise suppressor shutter.....	.50	6443	Capacitor—10 mfd.....	1.50
3533	Shutter—High frequency tone control shutter.....	.50	6444	Socket—Five contact Radiotron socket.....	.36
3534	Shutter—Low frequency tone control shutter.....	.50	6445	Socket—Six contact Radiotron socket.....	.38
3535	Socket—High or low frequency indicator lamp socket.....	.32	6446	Socket—Four contact Radiotron socket.....	.32
3546	Capacitor—150 mmfd.....	.32	6447	Volume control—Complete with mounting nut.....	1.92
3548	Knob—High or low frequency tone control knob.....	.24	6448	Tone control—Low frequency tone control complete with mounting nut.....	1.04
3551	Screw assembly—Chassis mounting washer and screw assembly—Comprising 4 screws, 4 lock washers, 4 washers, 8 cushions and 4 spacers—One set.....	.68	6449	Tone control—High frequency tone control complete with mounting nut.....	1.06
3552	Resistor—200 ohms—Porcelain type—20 watts.....	.80	6450	Rheostat—Noise suppressor rheostat.....	1.24
3553	Resistor—8,000 ohms—Porcelain type—20 watts.....	.80	6456	Escutcheon—Volume control escutcheon and color screen.....	.50
3554	Resistor—1,200 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	1.00	6457	Escutcheon—Noise suppressor escutcheon and color screen.....	.50
3555	Capacitor—0.1 mfd. capacitor—Tuning meter.....	.36	6458	Escutcheon—High and low frequency excutcheon and color screen.....	.92
3556	Capacitor—0.05 mfd. capacitor.....	.34	6459	Cable—Braid covered—Five conductor reproducer cable.....	2.54
3557	Capacitor—0.002 mfd. capacitor.....	.30	6461	Meter—Tuning meter.....	1.14
3558	Capacitor—50 mmfd. capacitor.....	.36	6537	Switch—Range switch.....	1.30
3563	Socket—Tuning meter lamp socket and bracket.....	.32	6538	Coil—Antenna coil assembly.....	1.80
3564	Bracket—Station selector dial lamp mounting bracket.....	.25	6539	Coil—Detector Coil.....	1.44
3565	Socket—Dial lamp socket.....	.50	6541	Scale—Dial and dial scale.....	.75
3598	Capacitor—0.1 mfd.....	.36	6547	Bezel—Tuning Meter bezel.....	.45
3615	Knob—Range switch knob—Package of 5.....	.60	6786	Condenser—3 gang variable tuning condenser assembly.....	7.12
3638	Scale—Tuning Meter scale—Package of 5.....	.60	7062	Capacitor—Adjustable trimming capacitor—15 to 70 mmfd.....	.50
3726	Arm—Range switch operating arm assembly—Comprising arm, link, studs and set screws.....	.45	7065	Screw driver—Non-metallic screw driver for oscillator and I. F. adjustments.....	.80
3727	Shaft—Shaft and bushing assembly for range switch operating arm—Comprising two washers, shaft bushing and nut.....	.30	7439	Drum—Dial drum with set screws and three dial mounting nuts.....	.35
3747	Capacitor—15 mmfd.....	.36	7487	Shield—Radiotron tube shield.....	.25
3900	Resistor—2,600 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	1.00	7488	Shield—Tube shield top.....	.20
6114	Resistor—20,000 ohms—Carbon type—1 watt—Package of 5.....	1.10	8978	Transformer—Power transformer—105-120 volts—50-60 cycles.....	8.50
6142	Resistor—6,000 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	1.00	8979	Transformer—Power transformer—105-120 volts—25-40 cycles.....	12.88
6192	Spring—Three gang tuning condenser drive cord tension spring—Package of 10.....	.30	8980	Transformer—Power transformer—210-240 volts—50-60 cycles.....	9.36
6279	Resistor—15,000 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	1.00	8982	Capacitor pack—Comprising two 1.0 mfd. capacitors in metal container.....	1.44
6280	Resistor—400,000 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	1.00	REPRODUCER ASSEMBLIES		
6282	Resistor—60,000 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	1.00	6184	Board—Terminal board complete with three terminals—Package of 5.....	.50
6288	Knob—Volume control or noise suppressor knob—Package of 5.....	1.00	6455	Transformer—Output transformer.....	1.95
			8920	Ring—Cone retaining ring.....	.35
			8969	Cone—Reproducer cone—Package of 5.....	6.35
			9425	Coil assembly—Comprising field coil, magnet and cone support.....	4.94

RCA Victor Company, Inc.

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