

# RCA VICTOR MODEL T9-7

## Nine-Tube, Three-Band, A-C, D-C, Superheterodyne Receiver

### TECHNICAL INFORMATION

#### Electrical Specifications

##### FREQUENCY RANGES

Band A	540-1,600 kc.
Band B	1,600-5,500 kc.
Band C	5,500-18,000 kc.

##### ALIGNMENT FREQUENCIES

Band A	600 kc. (osc.), 1,400 kc. (osc., det., ant.)
Band B	None required
Band C	18,000 kc. (osc., det., ant.)

Intermediate Frequency .....460 kc.

##### RADIOTRON COMPLEMENT

(1) RCA-6K7	Radio-Frequency Amplifier	(5) RCA-6F5	Audio Voltage Amplifier
(2) RCA-6A8	First Detector-Oscillator	(6) RCA-25A6	Audio Power Amplifier
(3) RCA-6K7	Intermediate Amplifier	(7) RCA-25A6	Audio Power Amplifier
(4) RCA-6H6	Second Detector-A.V.C.	(8) RCA-6E5	Tuning Indicator
		(9) RCA-25Z6	Half-Wave Rectifier

##### POWER SUPPLY RATINGS

Rating (As shipped from Factory)	200-250 Volts, 40-100 Cycles, also D-C, 110 Watts
Rating (See note in text)	140-160 Volts, 40-100 Cycles, also D-C, 50 Watts

##### POWER OUTPUT (250-Volt Line)

Undistorted	2.25 Watts A-C, 1.75 Watts D-C
Maximum	3.00 Watts A-C, 2.30 Watts D-C

##### POWER OUTPUT (160-Volt Line)

Undistorted	0.90 Watts A-C, 0.75 Watts D-C
Maximum	1.25 Watts A-C, 0.95 Watts D-C

##### LOUDSPEAKER

Type	Electrodynamic	Voice Coil Impedance	2.25 Ohms at 400 Cycles
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#### Mechanical Specifications

Height	21 $\frac{3}{16}$ inches
Width	15 $\frac{3}{4}$ inches
Depth	9 $\frac{1}{2}$ inches
Weight (Net)	27 $\frac{1}{2}$ pounds
Weight (Shipping)	33 pounds
Chassis Base Dimensions	13 $\frac{7}{8}$ inches x 7 $\frac{5}{8}$ inches x 2 $\frac{1}{2}$ inches
Tuning Drive Ratios	10-to-1 and 50-to-1
Operating Controls	(1) Volume, (2) Tuning, (3) Range Selector, (4) Power Switch-Tone

#### General Features

This instrument comprises a nine-tube chassis, mounted in a table type of cabinet. It uses the new metal tubes. The tuning range is from 540 to 18,000 kc. This coverage includes the important short-wave broadcast bands at 49, 31, 25, 19, and 16 meters, as well as the American broadcast band (540-1600 kc.). Chassis features include automatic volume control, cathode-ray tuning indicator ("Magic Eye"), 3-point tone control, antenna wave trap, and audio compensation. A high level of output is available from the receiver for reproduction by the 8-inch electro-

dynamic speaker. The tuning dial is an illuminated semi-airplane type. Each dial scale is distinctly marked with a separate color. Positions of the range selector knob are correspondingly indexed on the control panel with sections of similar colors. The tuning control is a dual-ratio type, which permits fast tuning through a 10-to-1 drive ratio and vernier tuning through a 50-to-1 drive ratio. The latter is especially advantageous for accurate tuning of the short-wave stations.

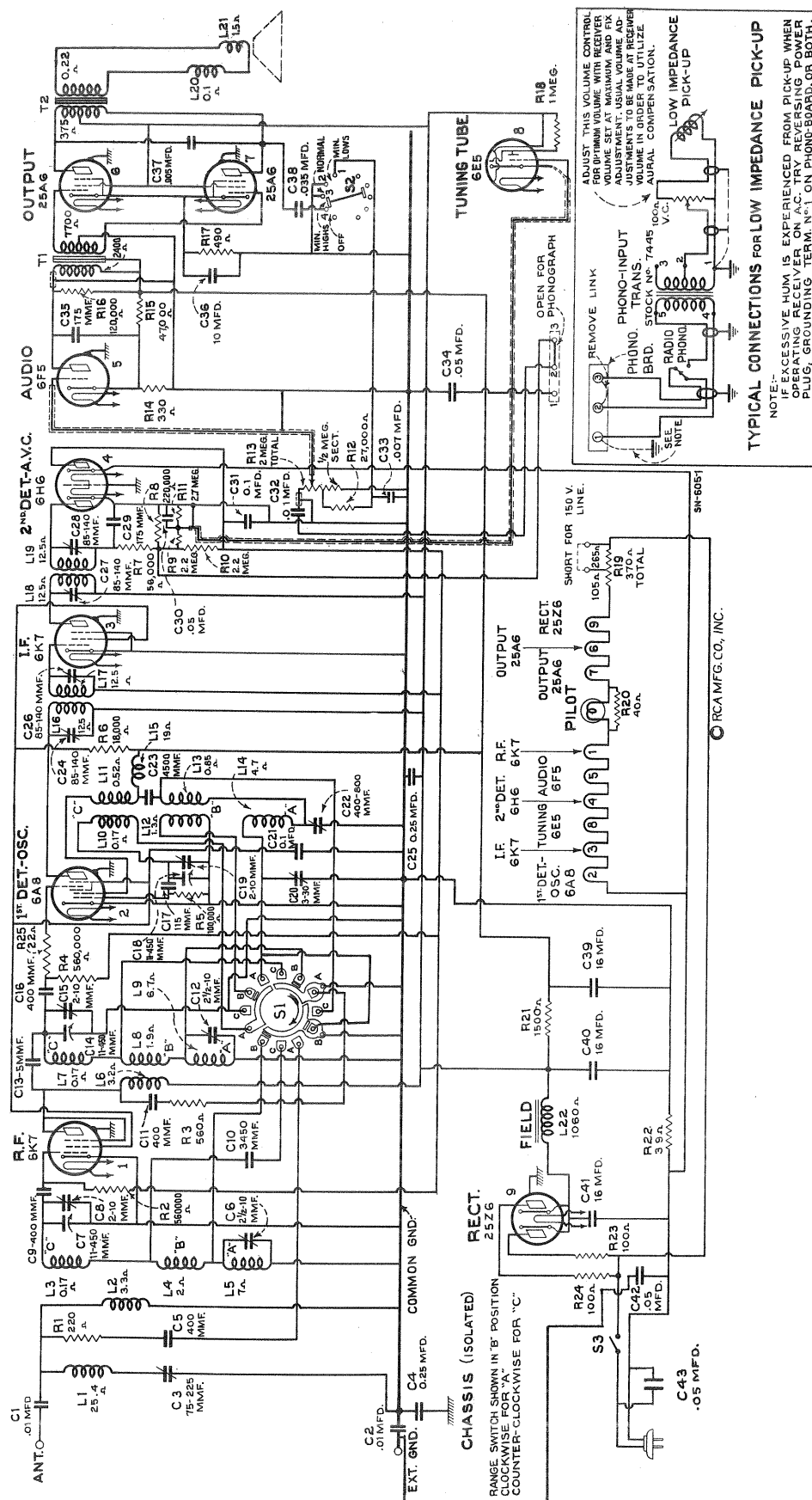


Figure 1—Schematic Circuit Diagram

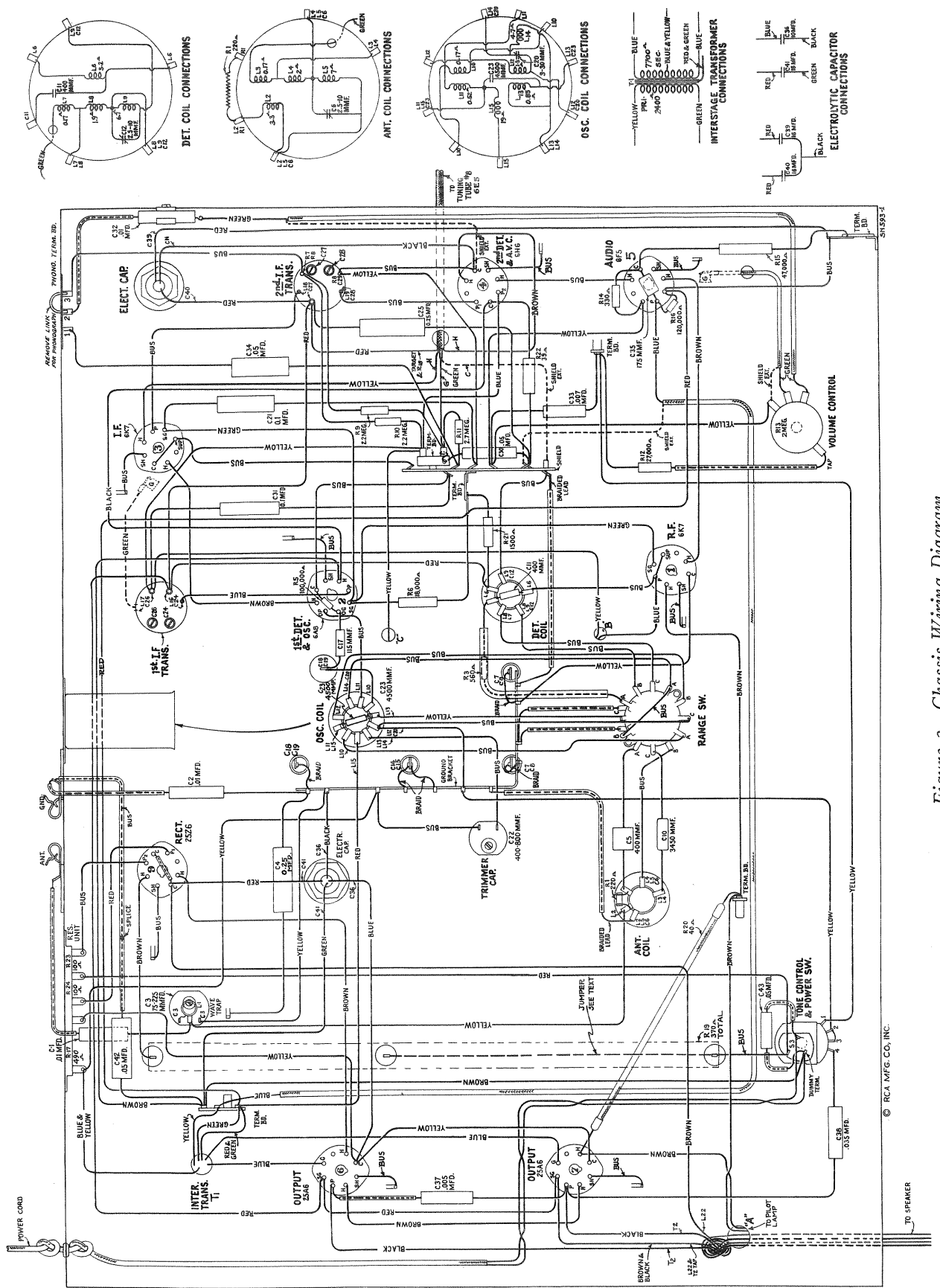


Figure 2—Chassis Wiring Diagram

## Circuit Arrangement

The conventional superheterodyne type of circuit is used. It consists of an r-f stage, a combined first detector-oscillator stage, a single i-f stage, a diode detector-automatic volume control stage, an audio voltage amplifier stage, a push-pull audio power output stage, a tuning indicator, and a half-wave rectifier power supply stage.

### Tuned Circuits

The antenna coil system and the detector coil system each consist of a single primary and three series-connected secondary windings to provide the three ranges of tuning. The oscillator coil system is similarly wound on a single form. A range selector switch (S-1) is used for connecting the various sections of these three coil systems into the circuit to provide operation on the band desired. The coils are tuned by a variable three-section gang condenser having trimmer capacitors in shunt with each section. There are additional trimmer capacitors across the section of each coil used for Band "A." A series trimmer is also associated with the Band "A" oscillator coil.

The intermediate frequency amplifier system consists of an RCA-6K7 in a transformer-coupled circuit. This stage operates at a basic frequency of 460 kc. Each winding of both i-f transformers (input and output) is tuned by an adjustable trimmer capacitor.

### Detector and A.V.C.

The modulated signal as obtained from the output of the i-f stage is detected by an RCA-6H6 twin-diode tube. 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 resistor R-8, is applied as automatic control-grid bias to the r-f, first-detector, and i-f tubes through a suitable resistance filter circuit. The second (auxiliary) diode of the RCA-6H6 is used to supply residual bias for the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R-8 and R-10, thereby maintaining the desired minimum operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias-diode ceases to draw current and the a.v.c.-diode takes over the biasing function.

### Audio System

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. This control has a tone-compensating filter connected to it, so that the correct aural balance will be obtained at different volume settings. Transformer coupling is used between the first audio stage and the push-pull

power output stage. The output of the power amplifier is transformer-coupled into the dynamic loudspeaker. High-frequency tone control is effected by a capacitor across the plate circuit of one of the output tubes. Speech-music control is effected by a resistor connected to the compensated volume control circuit. Control of tone is obtained by means of the switch (S-2).

### Tuning Indicator

A cathode-ray tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal.

*NOTE: On a-c and d-c circuits of 160 volts or less, the action of the "Magic Eye" will be limited.*

This tube is of new design and comprises an amplifier section and a cathode-ray section built in the same glass envelope. The cathode-ray section consists of a conically shaped luminescent screen, upon

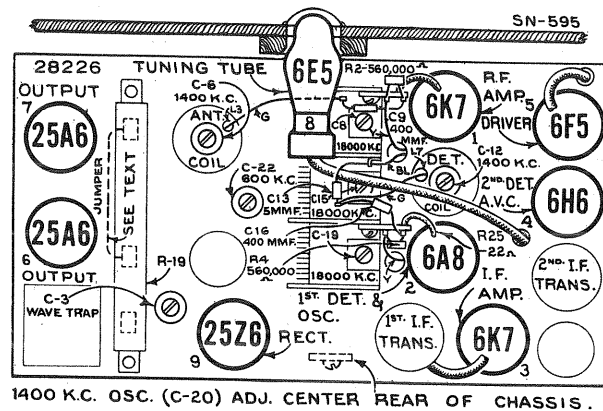


Figure 3—Radiotron, Coil and Trimmer Locations

### R. F. Trimmer Adjustments

which a pattern is formed by an effect of the detected signal after said effect has been amplified by the amplifier section, which is fed from the detector diode circuit. The size of the pattern is determined by the strength of the signal voltage, so that any change of tuning may be readily observed in order to facilitate tuning to exact resonance.

### Rectifier

The plate, grid, and cathode voltages required for the operation of this receiver are supplied by the RCA-25Z6 rectifier operating as a half-wave rectifier. The field winding of the loudspeaker is used as a reactor in the filter circuit from which it simultaneously receives its magnetizing current.

The filaments of all nine tubes are connected in series and are fed direct from the supply line, the

voltage being dropped to the required value by resistors R-19 and R-20. The correct operating voltage for the pilot lamp is developed across resistor R-20. This voltage across the pilot lamp will be slightly high when the receiver is first turned on, but will quickly drop to a normal value as soon as the tube filaments reach their operating temperature.

**NOTE:** (Power Supply Rating) As shipped from the factory, all instruments are connected for operation on a 200-250-volt supply line. They may be converted for operation at 140-160 volts by connecting a jumper between points shown by dotted line on resistor R-19, Figures 2 and 3.

## SERVICE DATA

**CAUTION:** Grid caps, tuning condenser, and resistor on top of chassis may be "hot" with respect to external ground, and should be avoided when servicing, unless due precautions are taken.

The various diagrams of this bulletin contain such information as will be needed to isolate causes for defective operation when such a condition develops. Values of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as R-3, L-2, C-1, etc., are provided for reference between the diagrams and the replacement parts list. Locating of the parts in the schematic circuit is facilitated by the fact that the numerical titles increase from left to right on the diagram. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only. Resistances of less than one ohm are generally omitted.

### Alignment Procedure

Precise alignment is vital to the proper functioning of this receiver. There are four trimming adjustments provided in the i-f system, three in the oscillator coil system, two in the detector coil system, and two in the antenna coil system. Each of these trimmers has been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions of climate, or have been altered for service purposes. Incorrect alignment is usually evidenced by loss of sensitivity, improper tone quality, and poor selectivity. These indications will generally be present together.

The correct performance of the receiver can only be obtained when the alignment is performed with adequate and reliable test apparatus. The manufacturer of this instrument has a complete assortment of such service equipment available. This equipment, illustrated and described on a separate page of this booklet, may be purchased from authorized distributors and dealers.

An oscillator (signal generator) is required as a source of the specified alignment frequencies. Visual indication of the receiver output during the adjustments is necessary to enable the serviceman to obtain an accuracy of alignment which is not possible by listening to the signal. The RCA Stock No. 9595 Full-Range Oscillator and the RCA Stock No. 4317 Neon Output Indicator are especially suitable and fulfill the above requirements.

The following procedure should be followed in adjusting the various trimmer capacitors:

### I-F Trimmer Adjustments

The four trimmers of the two i-f transformers are located as shown by Figure 4. Each must be aligned to a basic frequency of 460 kc. To do this, attach the output indicator across the voice coil circuit or across the output transformer primary. Connect the output of the test oscillator through a .05 mfd. condenser to the RCA-6A8 control grid, the ground of the test oscillator being connected to the receiver ground terminal. Tune the oscillator to 460 kc. Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point within its range where no interference is encountered either from local broadcast stations or the heterodyne oscillator. Increase the output of the test oscillator until a slight indication is apparent on the output indicator. Then adjust the two trimmers, C-27 and C-28, of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two trimmers, C-24 and C-26, of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. During these adjustments, regulate the test oscillator output so that the indication is always as low as possible. By doing so, broadness of tuning due to a.v.c. action will be avoided. It is advisable to repeat the adjustment of all i-f trimmers a second time to assure that the interaction between them has not disturbed the original adjustment.

### R-F Trimmer Adjustments

The seven trimmers associated with the r-f, first detector, and oscillator tuned circuits have their locations shown by Figures 3 and 4. The three trimmers which are at all times directly in shunt with the variable tuning condenser necessitates that the high-frequency range (Band C) be aligned first. The range selector switch should, therefore, be turned to its Band C position for the first adjustment. The output indicator should be left connected to the output system as for i-f alignment. Attach the output terminals of the test oscillator to the antenna and ground terminals of the receiver.

Calibrate the dial by rotating the tuning control until the variable condenser plates are in their full mesh (maximum capacity) position and adjusting the dial pointer so that its end points to the horizontal graduation (approximately 530 kc.) at the low-frequency end of the Band A scale.

Proceed further as follows:

- (a) Adjust the test oscillator to 18,000 kc. and set

the receiver tuning control to a dial reading of 18,000 kc.

- (b) Regulate the output of the test oscillator until a slight indication is perceptible at the receiver output. Then adjust the trimmer, C-19, on the oscillator section of the variable condenser to the point at which it produces maximum indicated receiver output. Two points may be found, each of which produces such a maximum. The one of *maximum trimmer capacitance* is correct and should be used. (The oscillator will be 460 kc. below the signal frequency at this adjustment point.)
- (c) Adjust the trimmer, C-15, of the detector section of the variable condenser, simultaneously rocking the receiver tuning control backward and forward through the 18,000 kc. input signal, until maximum receiver output results from these combined operations. Rocking of the variable condenser will prevent inaccurate adjustment, which would otherwise be caused by

the interaction between the heterodyne oscillator circuit and the detector tuned circuit.

- (d) With the receiver tuning control set to 18,000 kc. adjust the trimmer, C-8, on the antenna section of the variable condenser to the point which produces maximum (peak) indicated receiver output.
- (e) Change the receiver range selector to its Band A position and set the receiver tuning control to a dial reading of 1,400 kc. Tune the test oscillator to 1,400 kc. and regulate its output to produce a slight indication on the receiver output indicating device.
- (f) Adjust the high-frequency trimmers of the Band A oscillator, detector, and antenna coils, C-20, C-12, and C-6 respectively, to the points at which each produces maximum indicated receiver output.
- (g) Shift the test oscillator frequency to 600 kc. and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received.

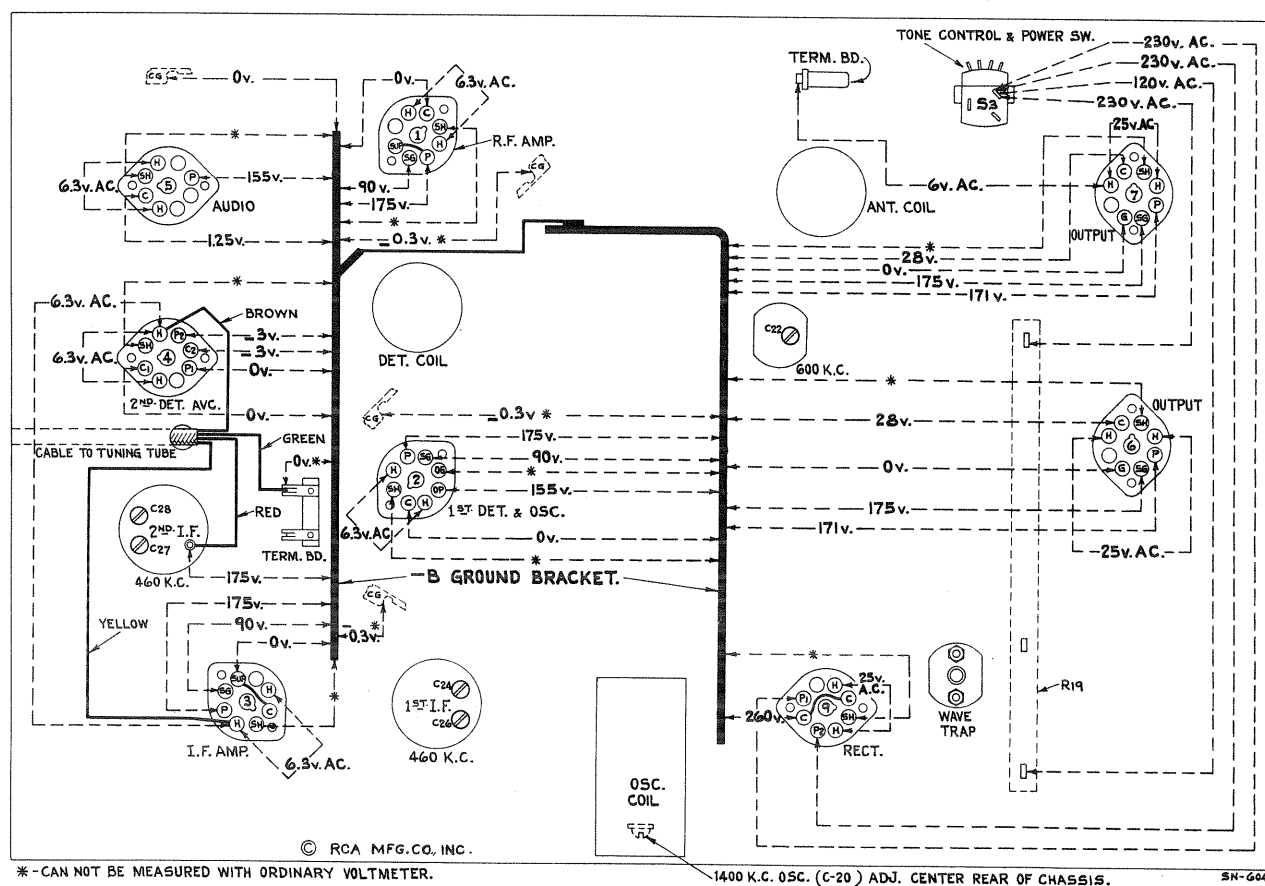


Figure 4—Radiotron Socket Voltages

Measured at 230 volts, 60-cycle supply

Tuned to approximately 900 kc. (Band A)—No signal being received—Volume control setting optional  
 For 160-volt, 60-cycle supply, 30% lower; for 230-volt d-c supply, 13% lower; for 160-volt d-c supply, 35% lower

- (h) Tune the low-frequency trimmer, C-22, of the oscillator Band A coil, simultaneously rocking the tuning control of the receiver backward and forward through the signal, until maximum indicated receiver output results from these combined operations. The adjustment of C-19, C-15, and C-8 should be corrected at 18,000 kc. as in (b), (c), and (d); also C-20, C-12 and C-6 should be corrected at 1,400 kc. as in (f) to compensate for any changes caused by the adjustment of the low-frequency oscillator coil trimmer.

## Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to -B ground bracket on Figure 4 will assist in the location of causes 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. These voltages were measured with set tuned to approximately 900 kc. (Band A); no signal being received, and volume control setting optional. 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. Voltages below 10 read on 10-volt scale, between 10 and 50 on 50-volt scale, and between 50 and 250 on 250-volt scale. A-C voltages were measured with a corresponding a-c meter.

## Phonograph Attachment

A terminal board is provided for connecting a phonograph into the audio amplifying circuit. A typical method of connection is shown on the schematic diagram (Figure 1). Correct procedure to be observed for adjustment of attachment to secure proper aural compensation is indicated.

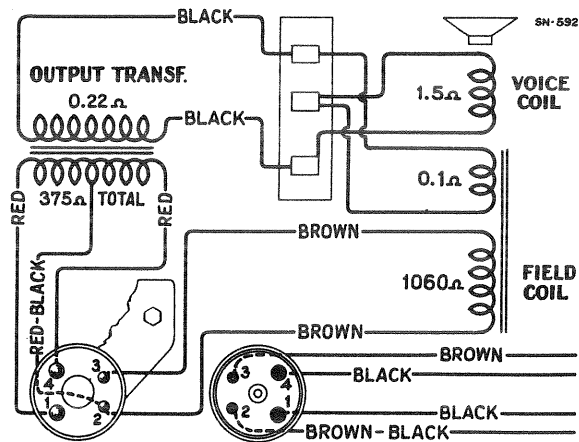


Figure 5—Loudspeaker Wiring

## Wave Trap Adjustment

With the receiver in operation using its normal antenna, tune station selector to the point at which the intermediate frequency interference is most intense. Then adjust the wave trap trimmer to the point which causes maximum suppression of the interference.

## 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>					
5237	Bushing—Variable tuning condenser mounting bushing assembly—Package of 3	\$0.43	12055	Capacitor Pack—Comprising 2 sections of 16 Mfd.—(C39, C40)	\$3.75
12066	Board—Terminal board assembly and link	.25	12056	Capacitor Pack—Comprising 1 section of 16 Mfd. and one section of 10 Mfd.—(C36, C41)	2.95
12068	Cable—Tuning tube cable and socket	.56	11600	Coil—Antenna coil—(L2, L3, L4, L5, C6, R1)	1.78
11465	Capacitor—Adjustable capacitor—(C22)	.48	12059	Coil—Detector coil—(L6, L7, L8, L9, C11, C12)	1.94
12077	Capacitor—5 Mmfd.—(C13)	.42	11602	Coil—Oscillator coil—(L10, L11, L12, L13, L14, L15, C20, C23)	2.15
11291	Capacitor—115 Mmfd.—(C17)	.24	11385	Condenser—3-gang variable tuning condenser—(C7, C8, C14, C15, C18, C19)	5.02
11623	Capacitor—175 Mmfd.—(C35)	.18	12057	Dial—Station selector dial	.75
11290	Capacitor—400 Mmfd.—(C5, C9, C16)	.25	11394	Foot—Chassis foot and bracket assembly—Package of 2	.70
12076	Capacitor—3,450 Mmfd.—(C10)	.42	11893	Indicator—Station selector indicator pointer	.28
4868	Capacitor—.005 Mfd.—(C37)	.20	4340	Lamp—Dial lamp—Package of 5	.60
5148	Capacitor—.07 Mfd.—(C33)	.20	12053	Resistor—Line resistor—Comprising one 265-ohm and one 105-ohm sections—(R19)	.58
4858	Capacitor—.01 Mfd.—(C1, C2)	.25			
11395	Capacitor—.01 Mfd.—(C32)	.18			
5196	Capacitor—.035 Mfd.—(C38)	.18			
4836	Capacitor—.05 Mfd.—(C30)	.30			
12078	Capacitor—.05 Mfd.—(C34, C42)	.30			
12480	Capacitor—.05 Mfd.—(C43)	.30			
5170	Capacitor—.25 Mfd.—(C4, C25)	.25			
4835	Capacitor—.01 Mfd.—(C21)	.28			
4841	Capacitor—.01 Mfd.—(C31)	.22			

The prices quoted above are subject to change without notice.

## REPLACEMENT PARTS (Continued)

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
12058	Resistor—Comprising 2 sections of 100 ohms and one section of 490 ohms—(R17, R23, R24)	\$0.90	12081	Transformer—Interstage transformer—(T1)	\$4.52
11624	Resistor—22 ohms—flexible type—complete with contact cap—(R25)	.22	11391	Trap—Wave trap (L1, C3)	1.22
11956	Resistor—39 ohms—carbon type— $\frac{1}{2}$ watt—(R22)—Package of 5	1.00	11237	Volume Control—(R13)	1.20
12074	Resistor—40 ohms—flexible type—(R20)	.30	<b>REPRODUCER ASSEMBLIES</b>		
11296	Resistor—330 ohms—carbon type— $\frac{1}{4}$ watt—(R14)—Package of 5	1.00	11232	Board—Terminal board with two lead wire clips	.18
11324	Resistor—560 ohms—carbon type— $\frac{1}{4}$ watt—(R3)—Package of 5	1.00	11231	Bolt—Yoke and core assembly bolt and nut	.16
3047	Resistor—1,500 ohms—carbon type— $\frac{1}{2}$ watt—(R21)—Package of 5	1.00	8060	Bracket—Output transformer mounting bracket	.14
3219	Resistor—18,000 ohms—carbon type— $\frac{1}{2}$ watt—(R6)—Package of 5	1.00	11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.18
11400	Resistor—27,000 ohms—carbon type— $\frac{1}{4}$ watt—(R12)—Package of 5	1.00	12079	Coil—Field coil—(L22)	1.88
12073	Resistor—47,000 ohms—carbon type—1 watt—(R15)—Package of 5	1.10	11233	Coil—Neutralizing coil—(L20)	.30
11281	Resistor—100,000 ohms—carbon type— $\frac{1}{10}$ watt—(R5)—Package of 5	.75	11235	Cone—Reproducer cone—(L21)—Package of 5	3.50
12355	Resistor—120,000 ohms—carbon type— $\frac{1}{10}$ watt—(R16)—Package of 5	.75	5040	Connector—4-contact female connector for reproducer cable	.25
11397	Resistor—560,000 ohms—carbon type— $\frac{1}{10}$ watt—(R2, R4)—Package of 5	.75	5039	Connector—4-contact male connector for reproducer	.25
11626	Resistor—2.2 megohms—carbon type— $\frac{1}{4}$ watt—(R9, R10)—Package of 5	1.00	9643	Reproducer—Complete	6.50
12072	Resistor—2.7 megohms—carbon type— $\frac{1}{4}$ watt—(R11)—Package of 5	1.00	12080	Transformer—Output transformer—(T2)	1.70
11603	Shield—Antenna or detector coil shield for Stock Nos. 11600 and 12059	.26	11886	Washer—Spring washer—used to hold field coil securely—Package of 5	.20
11390	Shield—Intermediate frequency transformer shield	.25	<b>MISCELLANEOUS ASSEMBLIES</b>		
11604	Shield—Oscillator coil shield for Stock No. 11602	.24	11996	Clamp—Tuning tube mounting bracket and clamp assembly	.22
3529	Socket—Dial lamp socket	.32	11276	Escutcheon—Tuning tube escutcheon	.40
11198	Socket—7-contact Radiotron socket	.15	11376	Escutcheon—Station selector escutcheon and crystal	.70
11196	Socket—8-contact 6A8 Radiotron socket	.15	11582	Knob—Range switch knob—Package of 5	.50
12054	Switch—Range switch (S1)	1.16	11610	Knob—Station selector knob assembly—Comprising 1 large and 1 small knob—Package of 5	1.00
11392	Switch—Tone control and power switch assembly (S2, S3)	1.14	11347	Knob—Volume control or power switch knob—Package of 5	.75
5238	Terminal—Antenna terminal board with clip insulating strip and rivets	.14	11382	Resistor—1 megohm—carbon resistor— $\frac{1}{10}$ watt—(R18)—Package of 5	.75
11976	Terminal—Ground terminal clip assembly	.15	11377	Screw—Chassis mounting screw assembly—Package of 4	.12
11388	Transformer—First intermediate frequency transformer—(L16, L17, C24, C26)	1.90	11381	Socket—Tuning tube socket and cover	.45
11389	Transformer—Second intermediate frequency transformer—(L18, L19, C27, C28, C29, R7, R8)	3.02	11349	Spring—Retaining spring for knob Stock Nos. 11347 and 11582 and small knob in No. 11610—Package of 5	.15
			4982	Spring—Retaining spring for large knobs—for Stock No. 11610—Package of 10	.26

The prices quoted above are subject to change without notice.

## SERVICE HINTS

- (1) Beat notes or heterodyning (whistles) may be encountered in some instances on these receivers due to excessive antenna capacitance. This condition may be corrected by reducing the size of the antenna or by inserting a 150 mmfd. capacitor in series with the antenna lead at the antenna terminal. Interference in the form of "beats" from a combination of local stations may frequently be remedied by tuning the wave trap to one of the interfering stations. The wave trap will tune from approximately 375 kc. to 700 kc.
- (2) In the event that unsatisfactory service is obtained from the standard rectifier, an RCA type 25Z6-G may be used for replacement.
- (3) Low sensitivity and reduced signal pickup may be due to poor alignment. Note that heterodyne oscillator tracks below signal on "C" band.