

RCA VICTOR MODELS 128-E AND 224-E

Six-Tube, Three-Band A. C. Receivers SERVICE NOTES

ELECTRICAL SPECIFICATIONS

Voltage Rating.....	105-125 Volts and 100-130/195-250 Volts (Double Range Transformer)										
Frequency Rating.....	50-60 Cycles										
Power Consumption.....	85 Watts (All Frequencies)										
Type and Number of Radiotrons.....	2 RCA-6D6, 1 RCA-6A7, 1 RCA-6B7, 1 RCA-41, 1 RCA-80—Total, 6										
Tuning Frequency Range.....	<table border="0"> <tr> <td rowspan="3" style="vertical-align: middle;">{</td> <td>Band A—</td> <td>140 K. C.—</td> <td>410 K. C.</td> </tr> <tr> <td>Band B—</td> <td>540 K. C.—</td> <td>1720 K. C.</td> </tr> <tr> <td>Band C—</td> <td>5400 K. C.—</td> <td>18,000 K. C.</td> </tr> </table>	{	Band A—	140 K. C.—	410 K. C.	Band B—	540 K. C.—	1720 K. C.	Band C—	5400 K. C.—	18,000 K. C.
{	Band A—		140 K. C.—	410 K. C.							
	Band B—		540 K. C.—	1720 K. C.							
	Band C—	5400 K. C.—	18,000 K. C.								
Line-Up Frequencies.....	175 K. C., 410 K. C., 460 K. C., 600 K. C., 1720 K. C., 18,000 K. C.										
Maximum Undistorted Output.....	1.9 Watts										
Maximum Output.....	3.5 Watts										

PHYSICAL SPECIFICATIONS

	Model 128-E	Model 224-E
Height.....	20 $\frac{3}{8}$ Inches	41 Inches
Width.....	16 $\frac{3}{4}$ Inches	24 $\frac{1}{2}$ Inches
Depth.....	11 $\frac{17}{16}$ Inches	12 $\frac{1}{8}$ Inches

This six-tube, three-band A. C. super-heterodyne receiver is of the "all-wave" type and has a tuning range of from 140 K. C. to 410 K. C., 540 K. C. to 1720 K. C., and 5400 K. C. to 18,000 K. C. This tuning range includes all of the important short-wave broadcasting, standard broadcasting and European broadcasting bands. Excellent sensitivity, selectivity and tone quality, together with a number of im-

portant operating features, make this an outstanding receiver of its type.

Operating features include a full vision "airplane" type dial, double-ratio vernier drive, high frequency tone control, three-position band switch with visual band indicator on dial and an automatic volume control. High tonal fidelity is realized by adequate power output, 1.9 watts undistorted, and well designed reproducer units.

DESCRIPTION OF ELECTRICAL CIRCUIT

The general circuit arrangement consists of an R. F. stage, a combined oscillator and first detector, an I. F. stage, a combined second detector and automatic volume control and a single Pentode output stage. An RCA-80 rectifier, together with a suitable filtering system, provides plate and grid voltages for all tubes and field excitation for the loudspeaker. Figure 1 shows the schematic circuit diagram, Figure 2 the chassis wiring, and Figures 3 and 4 the loudspeaker wiring.

The signal enters the receiver through a shielded antenna lead and is applied to the grid of the R. F. tube through the antenna coupling transformer. The secondary of this transformer is tuned to the signal frequency by means of one unit of the gang-capacitor. The output of this stage is transformer coupled to the grid circuit of the first detector, which is also tuned to the signal frequency by a unit of the gang-capacitor.

Combined with the signal in the first detector is the local oscillator, which is always at a 460 K. C. frequency difference (higher) from the signal frequency. A separate coil system and the third unit of the gang-capacitor are used in this circuit.

In conjunction with these three tuned circuits, it is well to point out that three different groups of tuned circuits are used, one for each tuning band. A three-position selector switch is provided for selecting the band in which the desired signal is located. In addition to selecting the desired coil system, additional groups of contacts are provided for short-circuiting the Band A coils when using Band B and the Band B coils together with the Band A oscillator coil when using Band C.

The output of the first detector, which is the I. F. signal (460 K. C.), is fed directly through two tuned circuits to the grid of the I. F. amplifier stage. The I. F. stage, which utilizes Radiotron RCA-6D6, uses two transformers, which consist of four tuned circuits, all of which are tuned to 460 K. C.

The output of the I. F. amplifier is then applied to the diode electrodes of the RCA-6B7, which is a combined second detector, automatic volume control and A. F. amplifier. The direct current component of the rectified signal produces a voltage drop across resistor R-12. The full voltage drop constitutes the automatic bias voltage for the R. F. while a tap is provided for

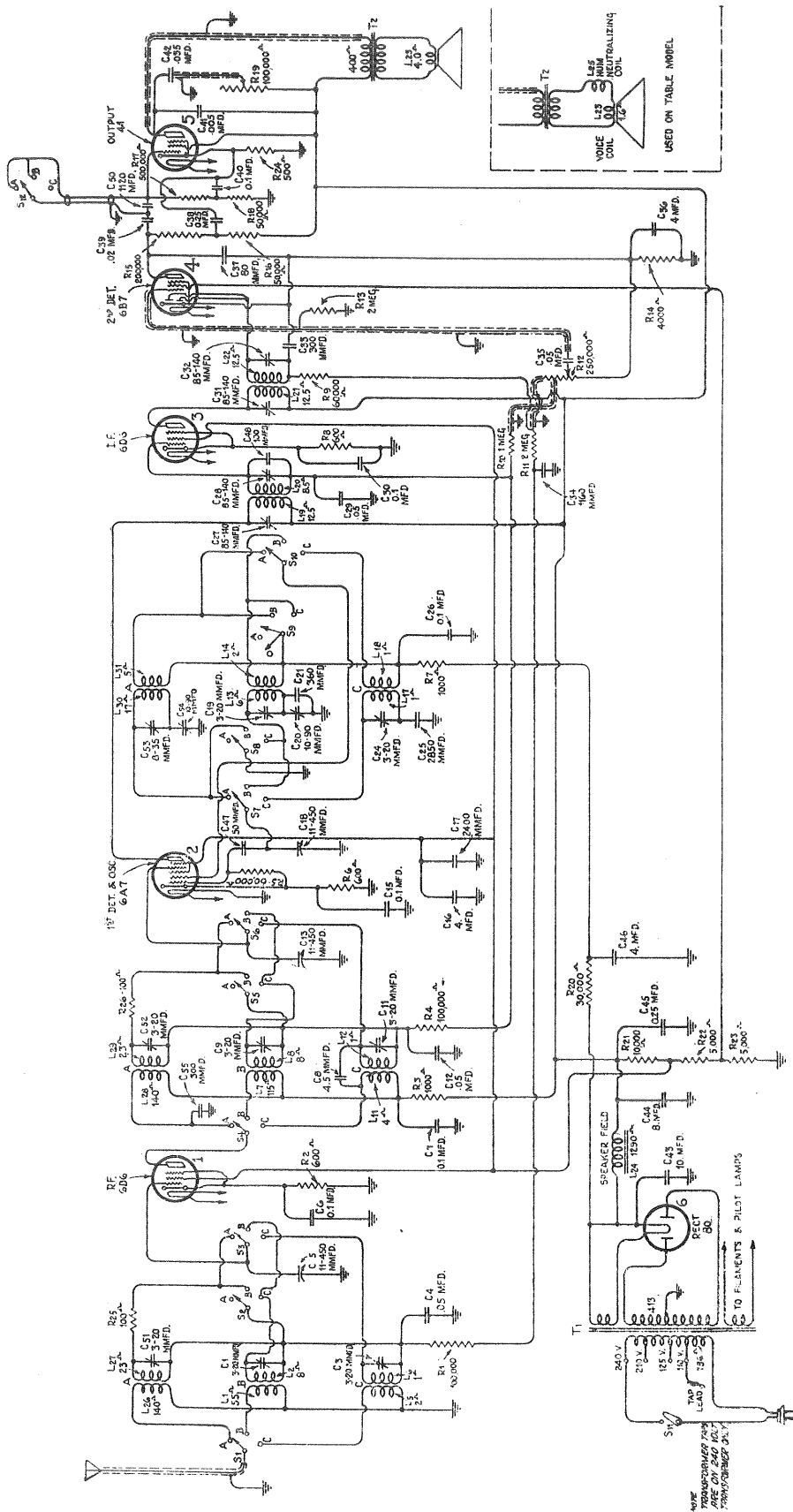


Figure 1—Schematic Circuit Diagram

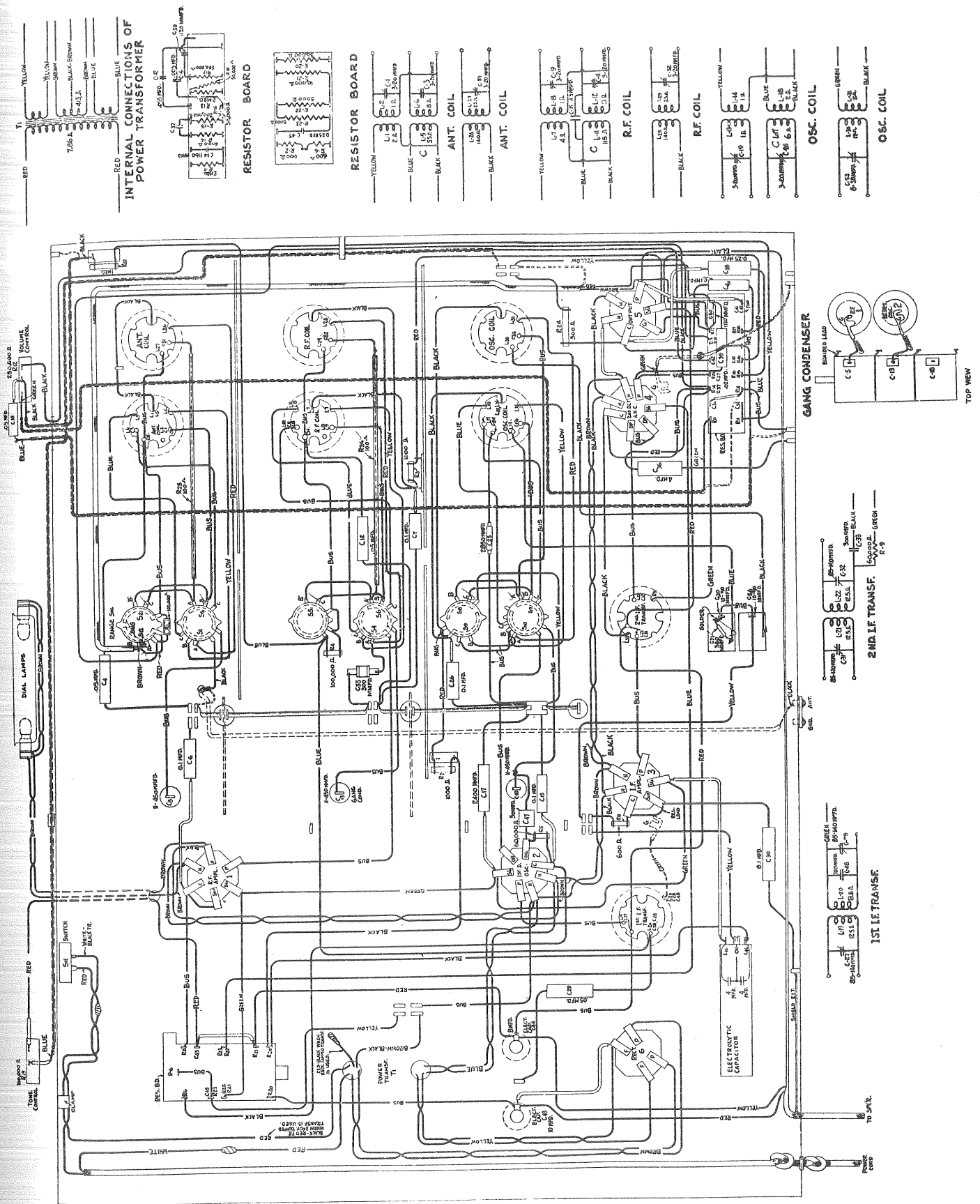


Figure 2—Chassis Wiring Diagram

the first detector and I. F. voltage. These automatic bias voltages for the R. F. first detector and I. F. give the automatic volume control action of the receiver. The volume control selects the amount of audio

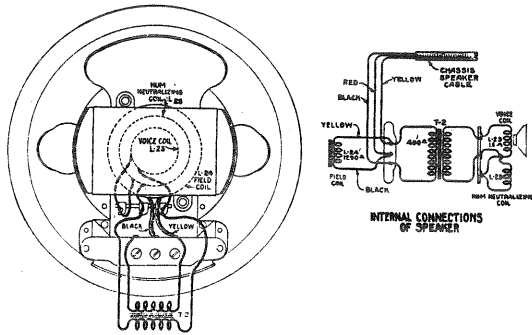


Figure 3—Table Loudspeaker Wiring

voltage that is applied to the grid of the RCA-6B7 and thereby regulates the audio output of the entire receiver.

The output of the RCA-6B7 is resistance coupled to the grid of the RCA-41 tube, which is the power output amplifier. This tube is operated as a Pentode and provides high audio gain and satisfactory output power. The plate circuit of the output stage is matched to the cone coil of the reproducer by means of a step-down transformer.

It should be noted that a small capacitor, C-50, is connected in series with C-39 during operation on Band C. This reduces the lower frequency output on this band which insures better operation.

The tone control consists of a variable resistor and fixed capacitor connected in series across the primary

of the output transformer. At the minimum resistance position of the variable resistor, maximum attenuation of the high audio frequencies is obtained.

Plate and grid voltages for all tubes are supplied from the output of the rectifier-filter system. An RCA-80 is used as a rectifier and a suitable network of capacitors and resistors gives the necessary filtering and voltages. The loudspeaker field is used as a filter reactor.

(1) LINE-UP PROCEDURE

The line-up procedure of this receiver is somewhat involved and it is important that these instructions be carefully followed when making adjustments. Properly aligned, this receiver has outstanding performance; improperly aligned, it may be impossible to receive signals on all bands.

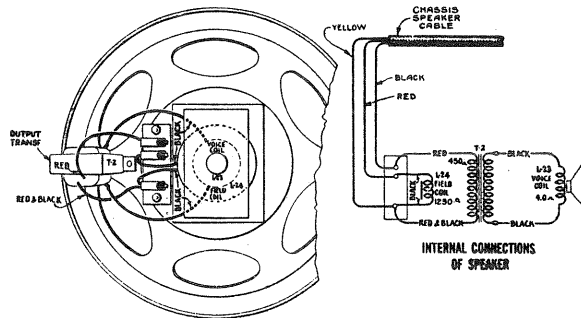


Figure 4—Console Loudspeaker Wiring

Equipment

To properly align this receiver, proper test equipment must be used. This consists of a modulated R. F. oscillator having proper frequency range, an

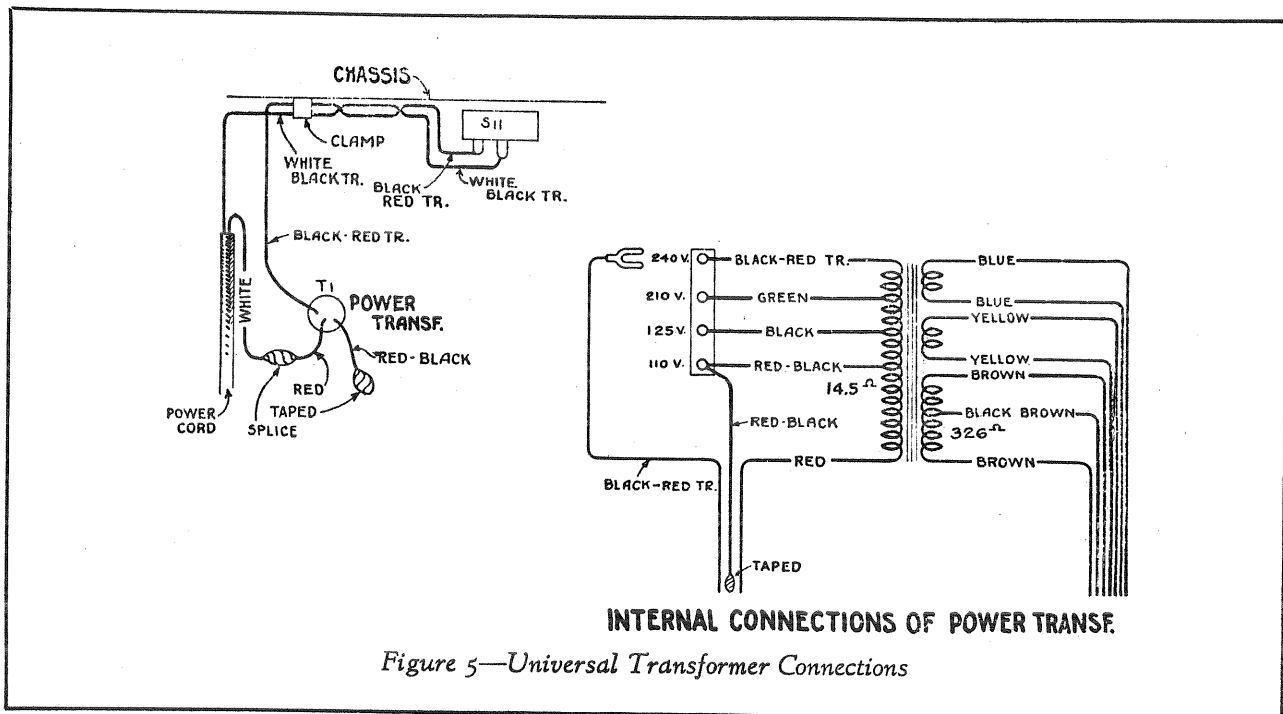


Figure 5—Universal Transformer Connections

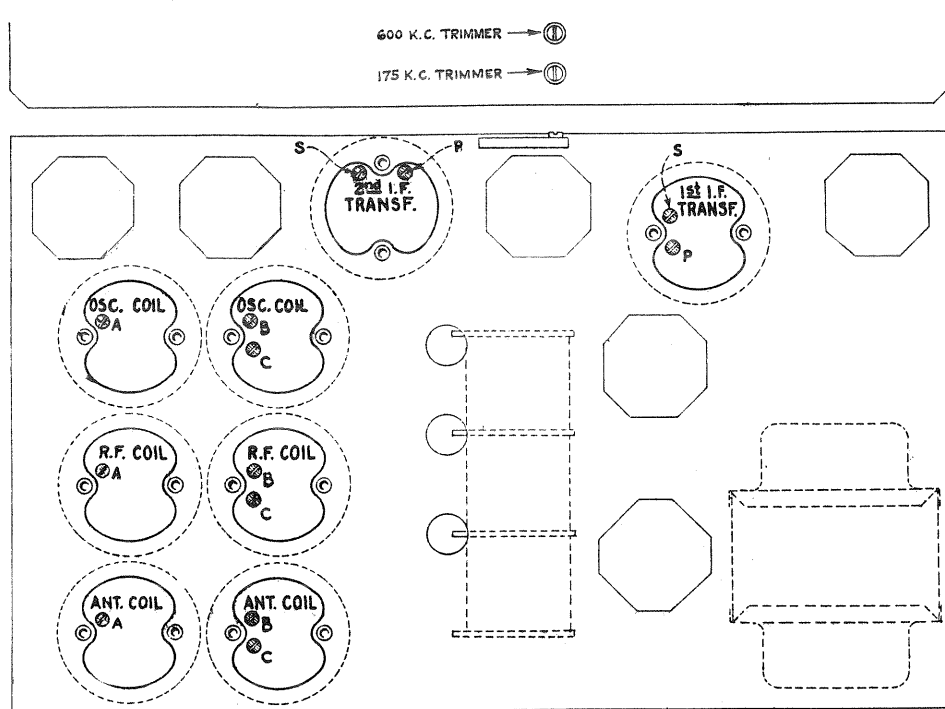
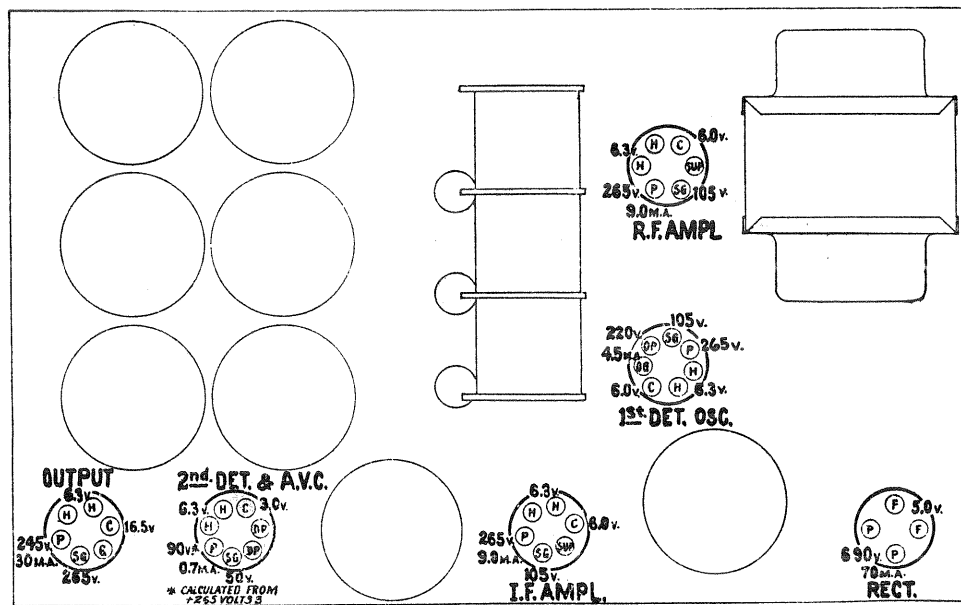


Figure 6—Location of Line-Up Capacitors



ALL VOLTAGES ARE TO GROUND

Figure 7—Tube Socket Voltages

output indicator, an alignment tool and a tuning wand. These parts, which are shown on page 11, have been developed by the manufacturer of this receiver for use by service men to duplicate the original factory adjustments.

Checking with Tuning Wand

Before making any R. F., oscillator or first detector adjustments, the accuracy of the present adjustments may be checked by means of the tuning wand (Stock No. 6679). The tuning wand consists of a bakelite rod having a brass cylinder at one end and a special finely divided iron insert at the other end. Inserting the cylinder into the center of a coil lowers its inductance, while inserting the iron end increases its inductance. From this, it is seen that unless the trimmer adjustment for a particular coil is perfect at alignment frequencies, inserting one end of the wand may increase the output of a particular signal. A perfect adjustment is evidenced by a lowering of output when either end of the wand is inserted into a coil.

The shields over the R. F. coil assembly have a hole at their top for entrance of the tuning wand. The location of the various coils inside of the shield is shown in Figure 8. An example of the proper manner of using the tuning wand would be to assume the external oscillator were set at 1720 and the signal tuned in, and the output indicator should be connected across the voice coil of the loudspeaker. Then the tuning wand would be inserted, first one end and then the other end, into the top of the three transformers at the left of the R. F. assembly, facing the front of the chassis. A perfect adjustment of the trimmer would be evidenced by a reduction in output when each end of the wand is inserted in each of the three transformers. If one end—for example, the iron end—when inserted in one coil caused an increase in output, then that circuit is low. An increase in the trimmer capacitance would be the proper remedy.

(2) I. F. TUNING CAPACITOR ADJUSTMENTS

This receiver has one I. F. stage that employs two transformers in conjunction with four adjustable capacitors. These capacitors may require adjustment, being tuned to 460 K. C.

A detailed procedure for making this adjustment follows:

(a) Connect the output of an external oscillator tuned to 460 K. C. between the first detector grid and ground. Connect the output indicator across the voice coil of the loudspeaker.

(b) Place the oscillator in operation at 460 K. C. Place the receiver in operation and adjust the station selector until a point is reached (Band B) where no signals are heard and turn the volume control to its maximum position. Reduce the oscillator input until a slight indication is obtained in the output indicator.

(c) Refer to Figure 6. Adjust each trimmer of the I. F. transformers until a maximum output is obtained. Go over the adjustments a second time.

This completes the I. F. adjustments. However, it is good practice to follow the I. F. adjustments with the R. F. and oscillator adjustments due to interlocking which always occurs.

(3) R. F., OSCILLATOR AND FIRST DETECTOR ADJUSTMENTS

Four R. F., oscillator and first detector adjustments are required in Bands "A" and "B." Three are required in Band "C."

To properly align the various bands, each band must be aligned individually in the order given. This is "A," "B" and "C." The preliminary set-up requires the external oscillator to be connected between the antenna and ground terminals of the receiver and the output indicator must be connected across the voice coil of the loudspeaker. The volume control must be at its maximum position and the input from the oscillator must be at the minimum value possible to get an output indication under these conditions. In the high frequency bands, it may be necessary to disconnect the oscillator from the receiver and place it at a distance in order to get a sufficiently low input to the receiver.

The dial pointer must be properly set before starting any actual adjustments. This is done by turning the variable capacitor until it is at its maximum capacity position. One end of the pointer should point exactly at the horizontal line at the lowest frequency end of Band "A," while the other end should point to within $\frac{1}{4}$ inch of the horizontal line at the highest frequency end of Band "A."

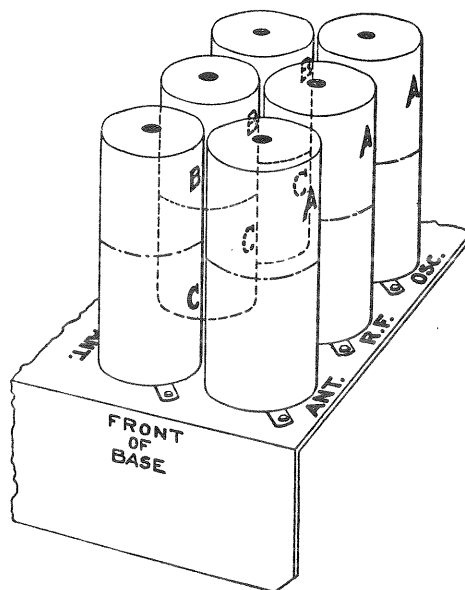


Figure 8—Location of Coils in Shields

Figure 6 shows the location of the trimmers for each band. Care must be exercised to merely adjust the trimmers of the band under test.

Band "A"

- (a) Set the Band Switch at "A."
- (b) Tune the external oscillator to 410 K. C., set the dial pointer at 410 K. C. and adjust the oscillator detector and R. F. trimmers for maximum output.
- (c) Shift the external oscillator frequency to 175 K. C. Tune in the 175 K. C. signal irrespective of scale calibration and adjust the series trimmer, marked 175 K. C. on Figure 6, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 410 K. C. as described in (b).

Band "B"

- (a) Set the Band Switch at "B."
- (b) Tune the external oscillator to 1720 K. C., set the pointer at 1720 K. C. and adjust the oscillator, detector and R. F. trimmers for maximum output.
- (c) Shift the external oscillator frequency to 600 K. C. Tune in the 600 K. C. signal, irrespective of scale calibration, and adjust the series trimmers, located on rear apron of chassis, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 1720 K. C. as described in (b).

Band "C"

- (a) Set the Band Switch at "C."
- (b) Tune the external oscillator to 18,000 K. C., set the pointer at 18 M. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

(c) Check for the image signal, which should be received at approximately 17,080 K. C. on the dial. It may be necessary to increase the external oscillator output for this check.

(d) Reduce the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal disappears. The first detector circuit is then aligned with the oscillator circuit and the RCA-6A7 tube is blocked. Then increase the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal is peaked for maximum output.

(e) The antenna trimmer should now be peaked for maximum output. It is not necessary to rock the main tuning capacitor while making this adjustment.

(4) POWER TRANSFORMER CONNECTIONS

The 220-volt power transformer furnished with some instruments includes taps for operating on 110-volt lines. Figure 5 shows the schematic circuit of the transformer and the proper voltage to be applied to the various taps. The taps are located on the power transformer assembly and are accessible without removing the chassis from the cabinet.

(5) VOLTAGE READINGS

The following voltages are those at the various tube sockets while the receiver is in operating condition. No allowance has been made for currents drawn by the meter, and if low-resistance meters are used, such allowances must be made:

RADIOTRON SOCKET VOLTAGES

115-Volt A. C. Line—No Signal—Volume Control Maximum

RADIOTRON NUMBER	CATHODE TO GROUND, VOLTS, D. C.	SCREEN GRID TO GROUND, VOLTS, D. C.	PLATE TO GROUND, VOLTS, D. C.	PLATE CURRENT, M. A.	HEATER VOLTS, A. C.
RCA-6D6—R. F.	6.0	105	265	9.0	6.3
RCA-6A7	Det.	105	265	3.5	6.3
	Osc.	—	220	4.5	
RCA-6D6—I. F.	6.0	105	265	9.0	6.3
RCA-6B7—2nd Detector	3.0	50	90*	0.7	6.3
RCA-41—Power	16.5	265	245	30.0	6.3
RCA-80—Rectifier	—	—	690 (RMS)	70.0	5.0

* Voltage calculated from 265 V. + B.

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					
4427	Bracket—Volume control or tone control mounting bracket.....	\$0.18	3218	Resistor—600 ohms—Carbon type— $\frac{1}{4}$ watt (R2, R6, R8)—Package of 5.....	\$1.00
2747	Cap—Contact cap—Package of 5.....	.50	4370	Resistor — 1000 ohms — Carbon type — $\frac{1}{4}$ watt (R3, R7)—Package of 10.....	2.00
3861	Capacitor — Adjustable trimmer capacitor (C20).....	.78	3997	Resistor — 4000 ohms — Carbon type — $\frac{1}{4}$ watt (R14)—Package of 5.....	1.00
4442	Capacitor—50 mmfd. (C47).....	.22	6318	Resistor—10,000 ohms (R21).....	.80
4662	Capacitor—80 mmfd. (C37).....	.28	3114	Resistor—50,000 ohms—Carbon type— $\frac{1}{4}$ watt (R16, R18)—Package of 5.....	1.00
3981	Capacitor—300 mmfd. (C55).....	.30	3602	Resistor—60,000 ohms—Carbon type— $\frac{1}{4}$ watt (R5)—Package of 5.....	1.00
4413	Capacitor—360 mmfd. (C21).....	.22	3118	Resistor—100,000 ohms—Carbon type— $\frac{1}{4}$ watt (R1, R4)—Package of 5.....	1.00
4634	Capacitor—1120 mmfd. (C50).....	.35	3116	Resistor—200,000 ohms—Carbon type— $\frac{1}{4}$ watt (R15)—Package of 5.....	1.00
4515	Capacitor—1160 mmfd. (C34).....	.22	6186	Resistor—500,000 ohms—Carbon type— $\frac{1}{4}$ watt (R17)—Package of 5.....	1.00
4670	Capacitor—2250 mmfd. (C14).....	.30	3033	Resistor—1 megohm—Carbon type— $\frac{1}{4}$ watt (R10)—Package of 5.....	1.00
4523	Capacitor—2400 mmfd. (C17).....	.26	6242	Resistor — 2 megohms — Carbon type — $\frac{1}{4}$ watt (R11, R13)—Package of 5.....	1.00
4524	Capacitor—2850 mmfd. (C25).....	.35	3413	Resistor — 5000 ohms — Carbon type — $\frac{1}{2}$ watt (R22, R23)—Package of 5.....	1.00
4435	Capacitor—0.02 mfd. (C39).....	.25	4513	Resistor — 30,000 ohms — Carbon type — 3 watts (R20).....	.25
4518	Capacitor—0.05 mfd. (C35).....	.52	4521	Shield—Antenna R. F. or oscillator coil shield.....	.42
4417	Capacitor—0.05 mfd. (C4, C12, C29).....	.25	4145	Shield—First detector or output Radiotron shield.....	.30
3877	Capacitor—0.1 mfd. (C40).....	.32	4103	Shield—I. F. amplifier Radiotron shield.....	.20
4415	Capacitor—0.1 mfd. (C6, C15, C30).....	.30	6955	Shield—R. F. amplifier Radiotron shield.....	.25
4645	Capacitor—0.1 mfd. (C7, C26).....	.25	3782	Shield—Second detector Radiotron shield.....	.26
3597	Capacitor—0.25 mfd. (C38, C45).....	.40	3529	Socket—Dial lamp socket.....	.32
4525	Capacitor—4.0 mfd. (C36).....	.70	3859	Socket—4-contact Radiotron socket.....	.30
4428	Capacitor—8.0 mfd. (C44).....	1.05	6676	Socket—6-contact output Radiotron socket.....	.40
7790	Capacitor—10.0 mfd. (C43).....	1.05	7485	Socket—6-contact Radiotron socket.....	.40
4692	Capacitor pack—Comprising one 0.035 mfd. and one 0.005 mfd. capacitors (C41, C42).....	.30	3572	Socket—7-contact Radiotron socket.....	.38
7589	Capacitor pack—Comprising two 4.0 mfd. capacitors (C16, C46).....	1.64	4379	Strip—Antenna terminal engraved "ANT-GND".....	.20
4358	Clamp — Electrolytic capacitor mounting clamp.....	.15	4684	Switch—Operating switch (S11).....	.45
4734	Coil—Antenna coil "A" (L26, L27, C51).....	3.05	4728	Switch—Range switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10).....	4.32
7803	Coil—Antenna coil "B & C" (L1, L2, L5, L6, C1, C3).....	1.82	4517	Tone control (R19).....	.90
4751	Coil—Detector coil "A" (L28, L29, C52).....	2.38	4431	Transformer — First intermediate frequency transformer (L19, L20, C27, C28, C48).....	2.28
7805	Coil—Detector coil "B & C" (L7, L8, L11, L12, C8, C9, C11).....	2.15	4433	Transformer—Second intermediate frequency transformer (L21, L22, C31, C32, C33, R9).....	2.15
7807	Coil—Oscillator coil "B & C" (L13, L14, L17, L18, C19, C24).....	1.62			
4733	Coil—Oscillator coil "A" (L30, L31, C53).....	3.05			
7801	Condenser—3-gang variable tuning condenser (C5, C13, C18).....	4.42			
4340	Lamp—Dial lamp—Package of 5.....	.60			
3632	Resistor—500 ohms—Carbon type—1 watt (R24)—Package of 5.....	1.10			

REPLACEMENT PARTS (Continued)

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
9511	Transformer—Power transformer—105-125 volts—50-60 cycles (T1).....	\$4.78		REPRODUCER ASSEMBLY TABLE MODEL	
9512	Transformer—Power transformer—105-125 volts—25-40 cycles.....	6.58	4526	Cable—3-conductor—Reproducer cable.....	\$0.32
9513	Transformer—Power transformer—105-250 volts—40-60 cycles.....	4.85	9579	Coil—Field coil (L24).....	2.10
4519	Volume control (R12).....	1.25	9533	Cone—Reproducer cone mounted and centered on housing.....	3.50
	DRIVE ASSEMBLIES		7818	Reproducer complete.....	6.58
4362	Arm—Band indicator operating arm.....	.28	4818	Transformer—Output transformer (T2).....	2.15
10194	Ball—Steel ball for condenser drive assembly—Package of 20.....	.25		REPRODUCER ASSEMBLY CONSOLE MODEL	
4422	Clutch—Clutch drive assembly for variable condenser drive.....	.88	4473	Board—Terminal board assembly.....	.26
4510	Drive—Tuning condenser drive assembly....	2.42	9460	Coil—Field coil, magnet and cone support (L24).....	6.00
4361	Indicator—Band indicator (celluloid).....	.12	8935	Cone—Reproducer cone (L23)—Package of 5.....	5.25
4732	Scale—Station selector dial scale.....	.40	9527	Reproducer—Complete.....	8.00
3943	Screen—Dial light screen (celluloid)—Package of 2.....	.18	4472	Transformer—Output transformer (T2).....	1.40
3993	Screw—Number 6-32-5/32 square head set screws for band indicator operating arm—Package of 10.....	.25		MISCELLANEOUS ASSEMBLY	
4669	Screw—Number 8-32-5/32 set screw for variable condenser drive assembly—Package of 10.....	.25	4677	Bezel—Station selector dial (escutcheon) bezel.....	.56
4377	Spring—Band indicator and arm tension spring—Package of 5.....	.25	6614	Glass—Station selector dial glass.....	.30
4378	Stud—Band indicator operating arm stud—Package of 5.....	.25	4520	Indicator—Station selector indicator pointer..	.18
			4449	Knob—Station selector, volume control, tone control, range switch or operating switch knob—Package of 5.....	.60
			4678	Ring—Dial glass retaining ring—Package of 5.....	.34
			4527	Screw—Chassis mounting screw assembly comprising 4 spacers, 4 screws, 4 lock-washers, 4 washers, 8 cushions—For table model.....	.40
			4685	Screw—Chassis mounting screw assembly—Comprising 4 spacers, 4 screws, 4 lock-washers, 4 washers and 8 cushions—For console model.....	.40
			4632	Screw—Number 8-32-7/16 headless set screw for knobs—Package of 10.....	.25