MODELS F-5B & F-5CB

Five-Tube, Superheterodyne Battery-Operated Receivers

Electrical Specifications

FREQUENCY RANGE ..... 530-1,600 kc
ALIGNMENT FREQUENCIES ..... 600 kc (osc.), 1,500 kc (osc. det, ant.)
Intermediate Frequency ..... 260 kc

RADIOTRON COMPLEMENT

(1) Type-1A4 ..... R.F. Amplifier
(2) Type-1A6 ..... First Detector—Oscillator
(3) Type-1F6 ... Second Det., A-F Amp., and A.V.C.
(4) Type-30 ..... Audio Driver
(5) Type-19 ..... Push-Pull Power Output

Pilot Lamp ..... Mazda 2.0 volts, .06 ampere

BATTERIES REQUIRED

"A," 2½-volt Air Cell, or one 2-volt storage battery; "B," three 45-volt, heavy-duty, plug-in type B batteries; "C," two 4½ volt plug-in type "C" batteries.

CURRENT CONSUMPTION

"A" at 2 volts (pilot lamp off) ..... 0.56 ampere
"A" at 2 volts (pilot lamp on) ..... 0.63 ampere
"B" at 135 volts ..... 17 milliamperes
Fuse Rating ..... ½ ampere

POWER OUTPUT

Undistorted ..... 1.2 watts
Maximum ..... 2.2 watts

LOUDSPEAKER

Type ..... Permanent-Magnet Dynamic
Voice Coil Impedance ..... 2.2 ohms at 400 cycles

Mechanical Specifications

	MODEL F5CB	MODEL F5B
Height	38⅝ inches	9 11/16 inches
Width	25½ inches	17 25/32 inches
Depth	12⅛ inches	6½ inches
Weight (net)	53½ pounds	14¾ pounds
Weight (shipping)	67 pounds	17¾ pounds
Chassis Base Dimensions	9⅞ x 5½ x 2 inches	
Over-all Height of Chassis	6¾ inches	
Operating Controls	(1) Volume; (2) Tuning; (3) Power Switch—Tone	
Tuning Drive Ratio	6 to 1	

General Description

Each of these receivers employs a similar chassis, the superheterodyne circuit arrangement of which is shown by figure 2. Model F5CB is a console model employing an 8-inch, permanent-magnet dynamic loudspeaker while Model F5B is a table model employing an 6 inch, permanent-magnet dynamic loudspeaker. Features of design include magnetite-core i-f transformers and low-frequency "A"-oscillator tracking; automatic volume control; resistance-coupled, first-audio stage and transformer-coupled, audio-driver stage to a push-pull, class-B, audio-output stage; phonograph terminal board; continuous

high-frequency tone control; super-sensitive, permanent-magnet dynamic loudspeaker with dust screen; low current drain; and a large, easy-to-read, illuminated dial with save-a-drain pilot lamp switch combined with the tuning control.

This receiver is designed for 135 volt operation, that is, 3 - 45 volts "B" batteries and 2 - 4½ volt "C" batteries. In cases where 90 volt operation is desired (2 - 45 volt "B" batteries and 1 - 4½ volt "C" battery), the 2 shorting caps supplied, one with the main battery cable the other with the "C" battery cable must be used. The cap for the main battery cable may be attached to any of the three "B" battery plugs. The cap for the "C" battery must be attached to the 'C' battery plug with the 2 leads (Green and Red & Black 50/50). It must be understood, however, that the efficiency of the receiver will be somewhat lower while operating at 90 volts.

These receivers may be easily converted to 6-volt operation by employing a GE 100 Powerunit which, with a 6-volt storage battery, replaces the "A" and "B" batteries listed under "Batteries required."

Service Data

CAUTION—Do not replace dial lamp with any other than the one specified otherwise the current drain on "A" battery will be excessive, and consequently the life of the battery will be greatly reduced.

The various diagrams of this booklet contain such information as will be needed to isolate causes for 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 R1, L1, C1, etc., provide reference between the illustrations and Replacement Parts List.

Phonograph Attachment.—A terminal board is provided for connecting a phonograph into the audio amplifying circuit. The model R-93 Record Player should be connected as follows: Remove link between terminals 1 and 2 on terminal board. Connect green wire in Radio-Record switch cable to terminal 1, yellow to terminal 2, and shield extension to terminal 3. Tape unused red and blue leads separately. Connect a 2-conductor twisted cable between the Record Player binding posts and the screw terminals on Radio-Record switch.

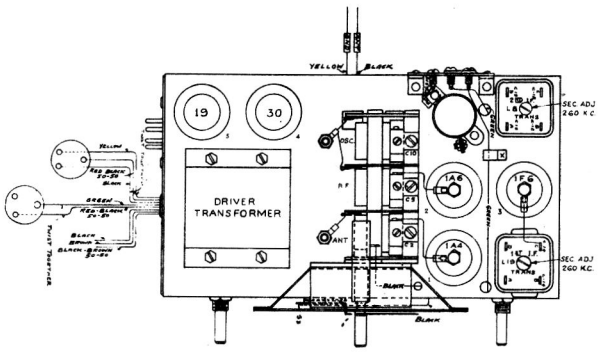


Figure 1—Radiotron, Coil, and Trimmer Locations

Circuit Arrangement

The inductance L-1 is used for the purpose of shunting out low-frequency interference such as power-line hum pick-up. The antenna transformer is of the magnetite-core type which provides high signal to noise ratio, this is pre-set and sealed at the time of its manufacture, and due to its critical setting no adjustment should be attempted. The amplified incoming signal is applied to the grid of the Type 1A4 tube.

The first-detector and oscillator functions are combined in the type 1A6 tube. The input of this tube coupled to the type 1A4 through a tuned r-f transformer.

The intermediate-frequency stage is coupled to the Type-1A6 and to the Type-1F6 by means of tuned transformers. These transformers resonate with fixed capacitors and are adjusted by molded magnetite cores to tune to 260 kc.

The modulated signal as obtained from the output of the i-f system is detected by one of the diode plates of the Type-1F6. The audio component of this rectified signal, which develops across the volume control R7, is fed through coupling capacitor C15 to the control grid of this same Type-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 Type-1A6 and 1A4 tubes as automatic volume control voltage. The output of the Type-1F6 is resistance-capacitance coupled to the Type-30 driver. The driver is transformer-coupled to the Type-19 tube used in the output stage. The output of this push-pull stage is transformer-coupled to the permanent-magnet dynamic loudspeaker.

Alignment Procedure

Calibrate the tuning dial by adjusting dial pointer to the low-frequency (end) calibration mark on dial scale with the gang tuning-condenser plates in full-mesh position. This is a friction adjustment.

Perform alignment in proper order, tabulated below, starting with No. 1 and following all operations across, then No. 2, etc. Adjustment locations are shown on figures 1, and 4.

Cathode-ray alignment is preferable, if an output indicator is used, connect it across the loudspeaker voice-coil and advance the receiver volume control to full-volume position.

Connect the "low" output terminal of the test oscillator to the receiver chassis for all alignment operations. Regulate the output of the test oscillator so that minimum signal is applied to the receiver to obtain an observable output indication. This will avoid a-v-c action.

The term "Dummy antenna" means the device which must be connected between the "high" test-oscillator output and the point of connection to the receiver in order to obtain ideal alignment. "No signal, 550-750 kc" means that the receiver should be tuned to a point between 550 and 750 kc where no signal or interference is received from a station or local (heterodyne) oscillator.

Order of Alignment	Test Oscillator			Receiver Dial Setting	Circuit to Adjust	Adjustment Symbols	Adjust to Obtain
	Connection to Receiver	Dummy Antenna	Frequency Setting				
1	I-F Amp. Grid Cap	.001 Mfd.	260 kc	No Signal 550-750 kc	2nd I-F Trans.	L9 and L-10	Max. (peak)
2	1st Det.-Osc. Grid Cap	.001 Mfd.	260 kc	No Signal 550-750 kc	1st I-F Trans.	L7 and L8	Max. (peak)
3	Ant. Lead	200 Mmfd.	1,500 kc	1,500 kc	"A" Osc.	C10	Max. (peak)
4	Ant. Lead	200 Mmfd.	1,500 kc	1,500 kc	"A" Det.	C5	Max. (peak)
5	Ant. Lead	200 Mmfd.	1,500 kc	1,500 kc	"A" Ant.	C2	Max. (peak)
6	Ant. Lead	200 Mmfd.	600 kc	Rock Thru 600 kc	"A" L.F. Osc.	C10	Max. (peak)

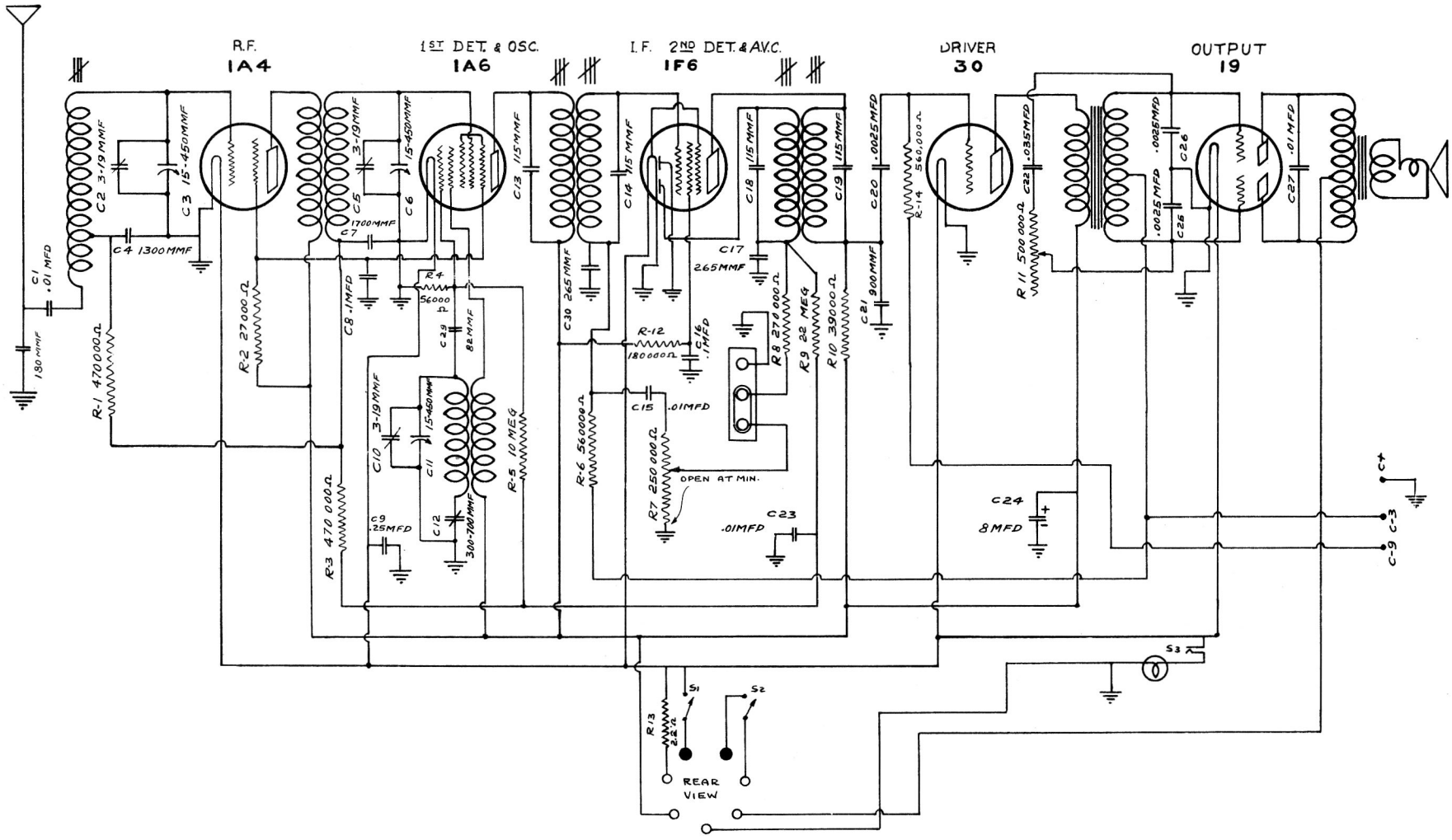


Figure 2—Schematic Circuit Diagram

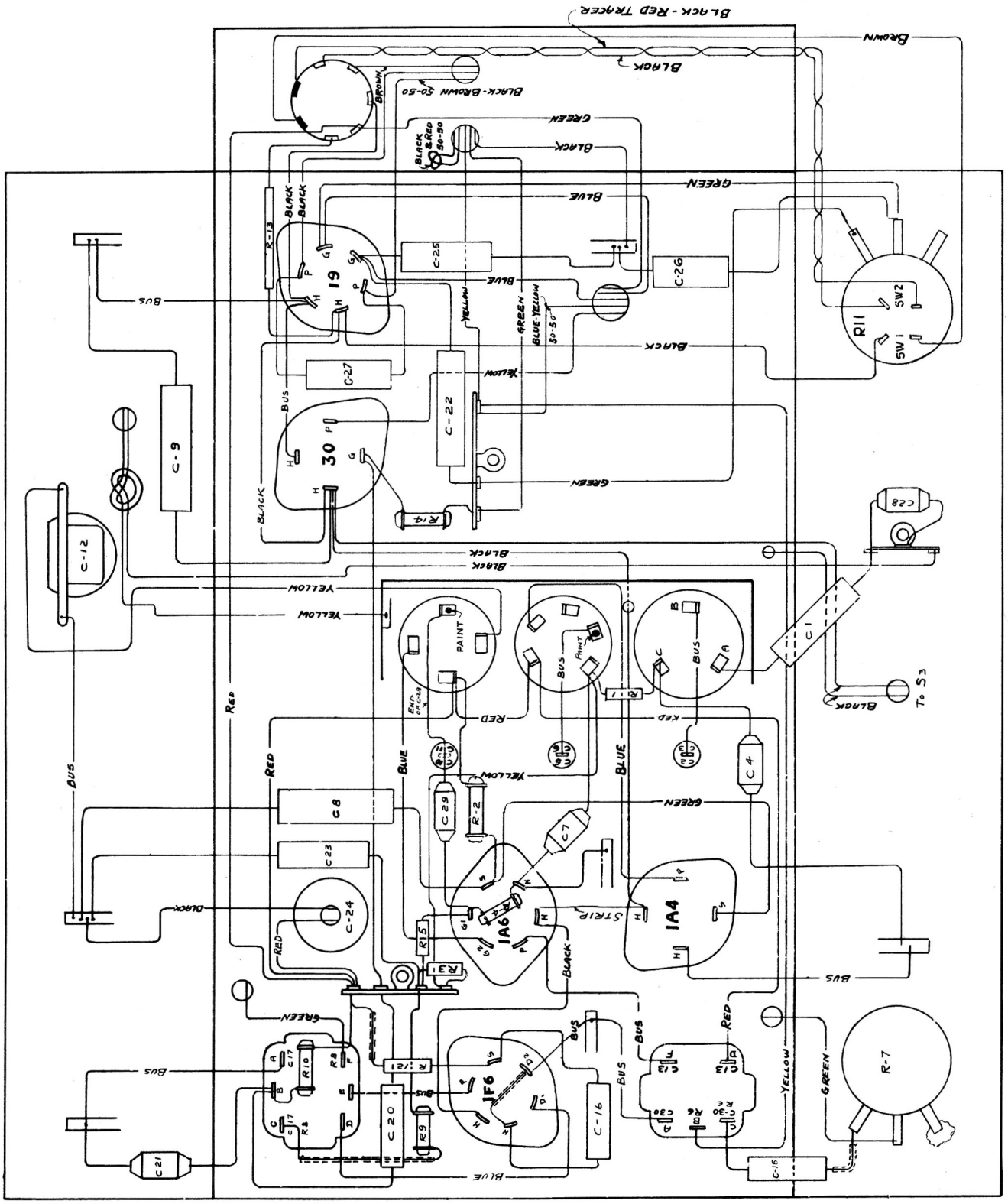
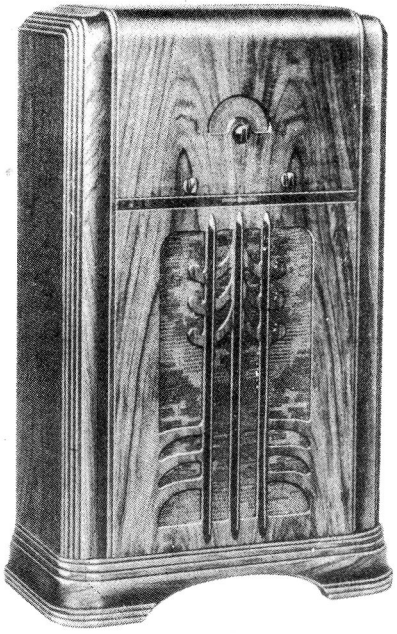
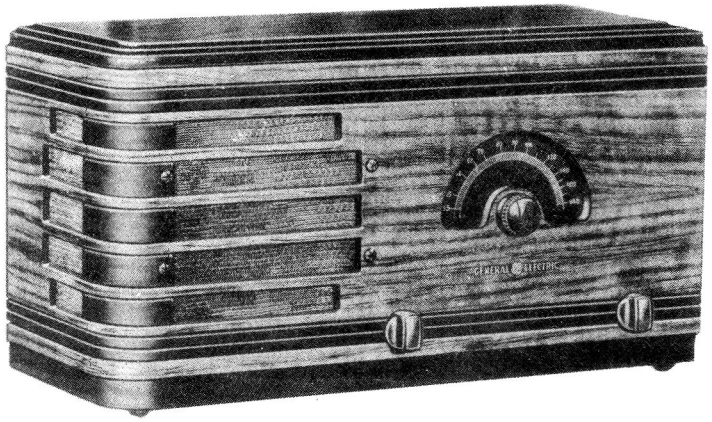


Figure 3—Chassis Wiring Diagram



MODEL F5CB



MODEL F5B

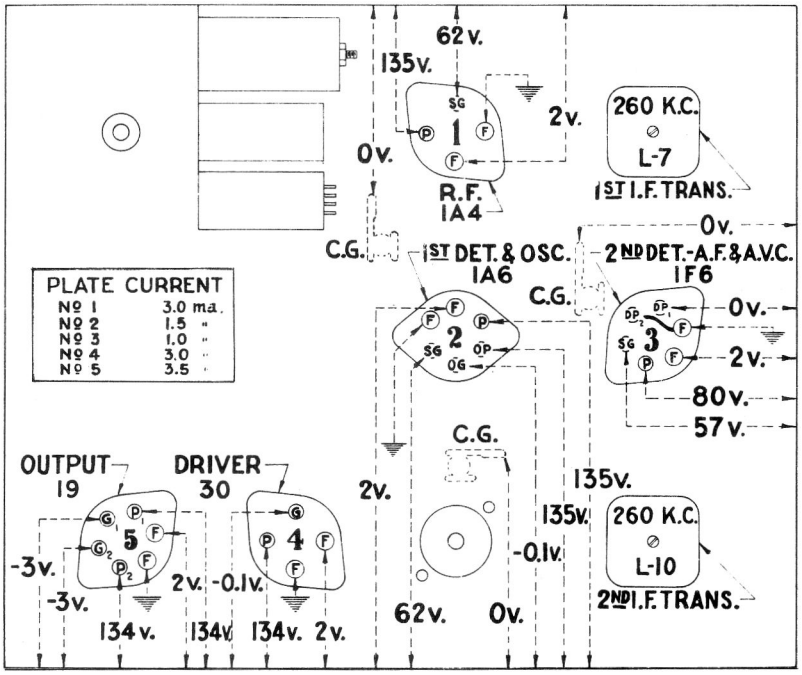


Figure 4—Radiotron Socket Voltages, Coil, and Trimmer Locations
Measured with all batteries at normal voltage—Tuned to approximately 1,000 kc—
No signal being received—Volume control minimum

Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts, grid caps, and terminals to receiver chassis ground on figure 4 will assist in locating cause for faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated voltage. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10 and 250 volts. Use the nearest range above the specified measured voltage.

Operation With a GE 100 Powerunit—These receivers may readily be operated from a GE 100 Powerunit, in which case, a six-volt storage battery replaces the "A" and "B" batteries listed under "Batteries required." When using the 100, one cell (2 volts) of the storage battery supplies filament voltage to the tubes, while the other two cells (4 volts) supplies power for the 100. When installing, the seven prong 100 receptacle plugs into the seven prong plug on the rear apron of the receiver chassis and the four battery leads clip on terminals of the storage battery as follows: Red to + 6 V.; Blue to + 4 V.; Yellow to + 4 V.; and brown (fused lead) to —V. The two four-volt leads (Blue and Yellow) should make separate connections to the same battery strap to avoid vibrator buzz which might otherwise result if these two leads are joined together or touch each other. Observe extreme care that proper connections are made to the battery, as a wrong connection will burn out the tubes. The green lead (originally connected to — 3 v. on the "C" battery) should be shifted to the — 4.5 volt tap. The other "C" battery connections remain unchanged.

The following changes under "Electrical specifications" become effective when employing the 100; "A" battery current drain at 6 volts, 1.65 amperes. Fuse rating, 5 amperes. Undistorted output, 1.3 watts. Maximum output, 1.8 watts. Under "Service data," the following voltages apply to the Type-19 power-output tube. Either plate to chassis, 180 volts. Either grid to chassis, —4½ volts. Plate current (either plate), 1.6 ma.

When servicing, the 100 chassis should be insulated from the receiver chassis to avoid vibrator buzz.

REPLACEMENT PARTS

STOCK NO.	DESCRIPTION
	RECEIVER ASSEMBLIES
S-1735	Board-Phonograph terminal board.....
S-1736	Bracket-Dial scale bracket.....
S-1709	Cable-Battery cable complete with fuse, fuse holder, and battery clips, approximately 54".....
12118	Cap-Grid contact cap, Pkg. of 5.....
13689	Capacitor-Adjustable capacitor (C12)...
12813	Capacitor-82 Mmfd (C29).....
11998	Capacitor-115 Mmfd(C13,C14,C18,C19)....
S-1716	Capacitor-180 Mmfd(C28).....
12761	Capacitor-265 Mmfd(C30).....
S-1737	Capacitor-900 Mmfd(C21).....
13701	Capacitor-1300 Mmfd (C4).....
13702	Capacitor-1700 Mmfd (C7).....
3932	Capacitor-.0025 Mfd (C25,C26).....
5107	Capacitor-.0025 Mfd (C20).....
4883	Capacitor-.01 Mfd (C1,C15).....
4858	Capacitor-.01 Mfd (C23,C27).....
5196	Capacitor-.035 Mfd (C22).....
4791	Capacitor- .1 Mfd (C8,C16).....
4840	Capacitor-.25 Mfd (C9).....
S-1738	Capacitor- 8 Mfd (C24).....
12177	Coil-Antenna choke coil (L1).....
13685	Coil-Antenna coil and shield (L2).....
13684	Coil-R.F. coil less shield (L3,L4).....
12225	Coil-Oscillator coil less shield(L5,L6)
S-1739	Condenser-3 gang variable tuning condenser (C2,C3,C5,C6,C10,C11).....
6516	Connector-Fuse connector complete.....
12006	Core-Adjustable core and stud assembly for 1st or 2nd I.F. transformer.....
S-1741	Dial-Station selector dial scale.....
3748	Fuse-½ Ampere Pkg. of 2.....
S-1742	Indicator-Station selector indicator pointer.....
S-1761	Knob-Pilot lamp knobs Pkg. of 2.....
S-1762	Knob-Tone control and volume control knobs, Pkg. of 2.....
S-1763	Knob-Tuning knobs, Pkg. of 2.....
4348	Lamp-Dial lamp.....
12827	Plug-Battery cable plug (male Pkg.of 2.
11341	Plug-"O" Battery plug (male) Pkg. of 2..
S-1748	Plug-Male battery plug (on chassis).....
S-1749	Connector-Battery cable connector (female).....
3743	Resistor-0.5 ohm, wire wound flexible (R16).....
14406	Resistor-2.2 ohm, wire wound flexible (R13).....
S-1744	Resistor-27,000 ohm, insulated ½ watt (R2).....
S-1746	Resistor-39,000 ohm, insulated ½ watt (R10).....
5029	Resistor-56,000 ohm carbon type, ¼ watt (R4).....
S-1747	Resistor-180,000 ohm insulated ¼ watt (R12).....
11453	Resistor-270,000 ohm Carbon type 1/10 watt (R8).....
11172	Resistor-470,000 ohm Carbon type ¼ watt (R3).....
12285	Resistor-470,000 ohm insulated ¼ watt (R1).....
11397	Resistor-560,000 ohm Carbon type 1/10 watt (R6).....
5035	Resistor-560,000 ohm Carbon type ¼ watt (R14).....
11626	Resistor-2.2 Megohm Carbon type ¼ watt (R9).....
S-1745	Resistor-10 Megohm Carbon type ¼ watt (R5).....
12008	Shield-1st and 2nd I.F.Transformer shield.....
12607	Shield-Top for 1st I.F.Transformer shield.....
12581	Shield-Top for 2nd I.F.Transformer shield.....
12218	Shield-1A4,1A6 or 1F6 Radiotron shield
11222	Socket-Dial lamp socket.....
4794	Socket-4 contact 1A4 or 30 Radiotron socket.....
4786	Socket-6 contact 1A6,1F6 or 19 Radiotron Socket.....
S-1750	Switch-Dial lamp switch.....
S-1751	Transformer-Driver transformer.....
S-1752	Transformer-1st I.F.Transformer.....
S-1753	Transformer-2nd I.F.Transformer.....
S-1754	Tone Control and operating switch 500,000 ohm (R11).....
S-1706	Volume control 250,000 ohm (R7).....
	* **REPRODUCER ASSEMBLIES**
S-1755	Cone-Reproducer cone and housing complete (Table Model).....
S-1756	Cone-Reproducer cone and housing complete (Console Model).....
S-1757	Reproducer-Reproducer complete with output transformer-(Table Model)6"
S-1758	Reproducer-Reproducer complete with Output transformer (Console Model)8"
S-1759	Transformer-Output transformer(Console)
S-1760	Transformer-Output transformer(Table).

* NOTE:- When ordering reproducer assemblies, state whether or not reproducer is enclosed in a black dust bag. When ordering Stock No. S-1756 (with black dust bag) state whether it has a spider, or suspension bracket.