

MODEL C-61

Six-Tube "De-Luxe" Automobile Receiver

Electrical Specifications

Type and Number of Radiotrons Used—2 G.E.-6D6,
1 G.E.-6A7, 1 G.E.-75, 1 G.E.-41, 1 G.E.-79
—Total, 6

Battery Current (6.3 Volt Battery):

Speaker Field (Cold).....	1.35 Amperes
Tubes.....	2.2 Amperes
Dial Lamp.....	0.15 Ampere
Power Supply (No Signal).....	2.8 Amperes
Total (No Signal).....	6.5 Amperes
Total (Maximum Output).....	8.0 Amperes (Average)

Tuning Frequency Range.....540 K. C.—1600 K. C.
Maximum Undistorted Output.....4.2 Watts
Maximum Output.....6.8 Watts
Line-up Frequencies.....175 K. C., 600 K. C.,
1400 K. C.

Physical Specifications

Height.....7 $\frac{1}{2}$ Inches
Width.....12 Inches
Depth (Case Alone).....7 Inches
Depth (Overall).....8 $\frac{1}{2}$ Inches

This six-tube automobile receiver incorporates the latest mechanical and electrical refinements for furnishing a rugged, fool-proof, mobile-type receiver

having performance equivalent to that of a high quality home receiver. Ease of installation, accessibility for servicing and ruggedness of construction are features of unusual interest.

In performance the receiver is characterized by unusual tone quality, high output (equal to that of the usual console and greater than that of a table model), high sensitivity and adequate selectivity. Full control of all features is made possible by having the station selector, volume control and operating switch accessible on the steering column control and the sensitivity and tone control on the right panel of the receiver proper.

The construction of the unit embodies several new features of particular interest to the service man. The receiver proper is mounted to the front fire wall of the car by means of a single bolt. The case of the receiver is made in two sections so that the chassis may be dropped down for inspection or tube replacement, merely by removing and loosening several thumb nuts and screws. The receiver proper is divided into three units, the power supply including a plug-in type vibrator, a loudspeaker including the audio transformers and the receiver chassis. Each of these several units may be removed for replacement or repair merely by the use of a screwdriver. Adequate terminal boards eliminate the need for a soldering iron when making such removals.

ELECTRICAL DESCRIPTION OF CIRCUIT

The circuit is of the superheterodyne type, having features such as automatic volume control, diode second detector, continuously variable tone control, continuously variable sensitivity control and a class "B" output stage. The power supply consists of a plug-in type vibrator inverter-rectifier and a specially designed filter system which eliminates all traces of vibrator R. F. interference from the power supply.

Examining the circuit closely we find the following functions taking place while the receiver is in operation.

The signal enters the receiver through the shielded antenna lead-in and the antenna coupling coil. The signal voltage is applied to the grid of the first R. F. tube by means of the secondary coupling coil, which is tuned by means of the first unit of the three-gang tuning capacitor. The R. F. tube is a Radiotron G.E.-6D6, which is a super-control R. F. amplifying Radiotron which gives a minimum amount of cross modulation, hum modulation and modulation distortion. This tube has the general characteristics of the G.E.-58.

The output of the R. F. stage is fed to the Radiotron G.E.-6A7, which is a combined oscillator and first detector. The detector grid circuit is tuned to the signal, whereas the oscillator grid circuit is tuned to a frequency 175 K. C. higher than the signal. The use of a suitable bridge circuit provides a method whereby the tuning capacitor maintains this same frequency difference throughout its tuning range. The output of the detector is the difference or beat frequency provided by combining the signal and oscillator frequency and is the I. F. frequency of the receiver. A single I. F. stage using Radiotron G.E.-6D6 and utilizing three tuned circuits is provided for selecting and amplifying the I. F. signal. The output of this stage is applied to the second detector. It will be noted that the secondary of the second I. F. transformer is divided into two sections, wound in opposite directions. The purpose of this is to avoid vibrator interference pickup due to circulating currents in the chassis case.

The next tube is a G.E.-75, which is a combined second detector, automatic volume control and audio amplifier. The signal is applied to the diode sections of this tube, which act as a two-element rectifier. The direct current component of the rectified signal produces a voltage drop across resistors R-8 and R-9. This voltage drop constitutes the automatic bias voltage for the R. F., 1st detector and I. F. amplifier which gives the automatic volume control action of the receiver. The volume control selects the amount of audio voltage that is applied to the grid of the audio amplifying part of the tube and thereby regulates the audio output of the entire receiver.

The output of the audio section of the Radiotron G.E.-75 is resistance coupled to the grid circuit of the G.E.-41, which is the audio driver stage. While this tube is usually connected as a pentode, in this receiver it operates as a triode (Class A).

The last tube is a G.E.-79, which is a Class "B" twin amplifier. This tube has two individual sets of

elements and takes the place of two tubes, required in the usual Class "B" stage.

The tone control, comprising a variable resistor and fixed capacitor, is connected across the grids of the G.E.-79. Maximum attenuation of the high frequencies is obtained when the variable resistor is at its minimum resistance position. The plate circuit is coupled through a step-down transformer to the cone coil of the reproducer unit.

A sensitivity control, which varies the fixed bias on the R. F. and 1st detector stage, is mounted on the right side of the case. By means of this control, the sensitivity of the receiver may be adjusted so that any degree of noise suppression is obtained.

Field excitation power is obtained by connecting the loudspeaker field directly across the car battery. Filament power is obtained in a similar manner, all Radiotrons having 6.3 volt heaters. Plate and grid voltage for all tubes is obtained through the vibrator inverter-rectifier unit and its associated transformer and filter circuits.

SERVICE DATA

(1) Removing Units from Chassis:

The three major units, the power unit, the loudspeaker and the receiver chassis, are easily removed independently without disturbing the other units not removed. To do this, the use of a screwdriver is the only tool required. Figure 2 shows the details of the screws and terminals to be removed in each individual case.

(2) Loose or Tight Tuning Action:

An adjustment screw is provided at the worm drive unit, so that proper tension may be provided for the particular worm being used. The instruction book accompanying the instrument describes the proper manner of turning the drive assembly when using either right or left hand drives. However, whenever this change is made, the adjusting screw located on the front of the drive unit should be loosened or tightened until a satisfactory amount of tension and elimination of backlash is obtained.

(3) Line-up Capacitor Adjustments:

Adjustable capacitors are provided in the R. F. oscillator and intermediate frequency amplifier to provide a means of properly aligning the receiver. A modulated R. F. oscillator such as Full Range Test Oscillator, Type TMV-97-B (Stock No. 9050), a non-metallic screwdriver such as alignment wrench Stock No. 4160 and an output meter are required for properly aligning this receiver. Refer to Figure 3 for the location of the line-up capacitors.

I. F. Tuning Adjustments:

Two transformers comprising three tuned circuits (the secondary of the second transformer is untuned) are used in the intermediate amplifier. These are tuned to 175 K. C. and the adjustment screws are accessible from beneath the chassis as shown in Figure 3. Proceed as follows:

- (a) Procure a modulated oscillator giving a signal at 175 K. C., a non-metallic screwdriver such as Stock No. 4160 and an output meter.
- (b) Short-circuit the antenna and ground leads and tune the receiver so that no signal is heard. Set the volume control at maximum and connect a ground to the chassis.
- (c) Connect the oscillator output between the first detector control grid and chassis ground. Connect the output meter across the voice coil of the loudspeaker and adjust the oscillator output so that with the receiver volume control at maximum, a slight deflection is obtained in the output meter.
- (d) Adjust the primary of the second, and the secondary and primary of the first I. F. transformers, until a maximum deflection is obtained. Keep the oscillator output at a low value so that only a slight deflection is obtained on the output meter at all times. Go over these adjustments a second time, as there is a slight interlocking of adjustments. This completes the I. F. adjustments.

R. F. and Oscillator Adjustments:

The three-gang capacitor screws are located on the main tuning capacitor, accessible at the top of the chassis. Proceed as follows:

- (a) Procure a modulated oscillator giving a signal at 1400 K. C. and 600 K. C., a non-metallic screwdriver such as Stock No. 4160 and an output meter.
- (b) Connect the output of the oscillator to the antenna and ground lead of the receiver. Place the receiver in operation and attach the control box as in normal operation. Turn the tuning control until the tuning capacitors are fully meshed. Then set the indicator on the dial at the 530 K. C. reading. Turn the tuning control until the dial reads 1400. Then set the oscillator at 1400 K. C. and connect the output meter across the cone coil. Adjust the three-gang capacitor trimmer screws until maximum output is obtained. Be careful not to disturb the relation of the control box to the receiver after setting the dial.
- (c) After making the 1400 K. C. adjustment, shift the oscillator to 600 K. C. and tune in the signal. Adjust the 600 K. C. trimmer, accessible from the side of the chassis for maximum output while rocking the gang-capacitor back and forth. Then again check the adjustment described in (b).

When making both the I. F. and R. F. adjustments, the important point to remember is that the receiver volume control must be at its maximum position and the minimum input signal necessary from the oscillator must be used.

(4) R. F. Interference from Vibrator:

In event R. F. interference originating with the vibrator inverter-rectifier unit is encountered, check the following points:

- (a) Vibrator not properly seated. The vibrator must be pushed tight against its socket at all times.
- (b) The clip from the top of the R. F. tube shield to the gang-capacitor must be in place.

- (c) The various by-pass capacitors, such as C-29 C-30, C-31, C-34, C-37, and chokes L-16 and L-14, L-13, must be properly connected, and in operating condition. It is well to remember that some of the interference produced by the vibrator is of a frequency as high as one meter and any replacement of capacitors must always be made with ones of similar mechanical as well as electrical construction.

(5) Voltage Readings:

The following voltages are those at the tube socket 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.

(6) Vibrator Inverter-Rectifier:

The Vibrator Inverter-Rectifier unit used in this receiver is of advanced design and construction. It is adjusted by means of special equipment at the factory and then sealed to prevent tampering. The unit is provided with a special plug-in base so that in event of suspected failure it may be easily interchanged with one of known condition.

With the seals unbroken, the Vibrator carries the standard ninety-day guarantee, which also applies to all parts of the receiver. Vibrator defects should be remedied by replacement, not be attempted adjustment.

(7) Stiff Tuning Mechanism:

In event the station selector turns hard or stiff, it is probably due to excessive pressure between the worm and drive gear. Proper tension between these units exists when the gear is pushed $\frac{1}{32}$ " beyond the point of contact with the worm, before being tightened.

(8) Antenna Lead Clamp:

A clamp has been provided for holding the antenna lead securely to the side of case. This clamp is held by one of the chassis mounting screws and prevents the antenna lead from interfering with the operation of the brake pedal or starter button. When making an installation it is important to see that this lead is securely clamped.

RADIOTRON SOCKET VOLTAGES

6.3 Volt Battery—No Signal—Maximum Sensitivity

RADIOTRON No.	CATHODE TO GROUND VOLTS, D. C.	SCREEN GRID TO GROUND VOLTS, D. C.	PLATE TO GROUND VOLTS, D. C.	CATHODE CURRENT M. A.	HEATER VOLTS, D. C.
G.E.-6D6—R. F.	3.9	76	192	4.5	5.9
G.E.-6A7	3.9	76	192	7.5	5.9
		—	192		
G.E.-6D6—I. F.	3.6	76	192	5.3	5.9
G.E.-75—2nd Det.	1.25	—	165	.46	5.9
G.E.-41—A. F.	22.0	—	235	14.5	5.9
G.E.-79—Pwr.	0	—	256	10.5	5.9

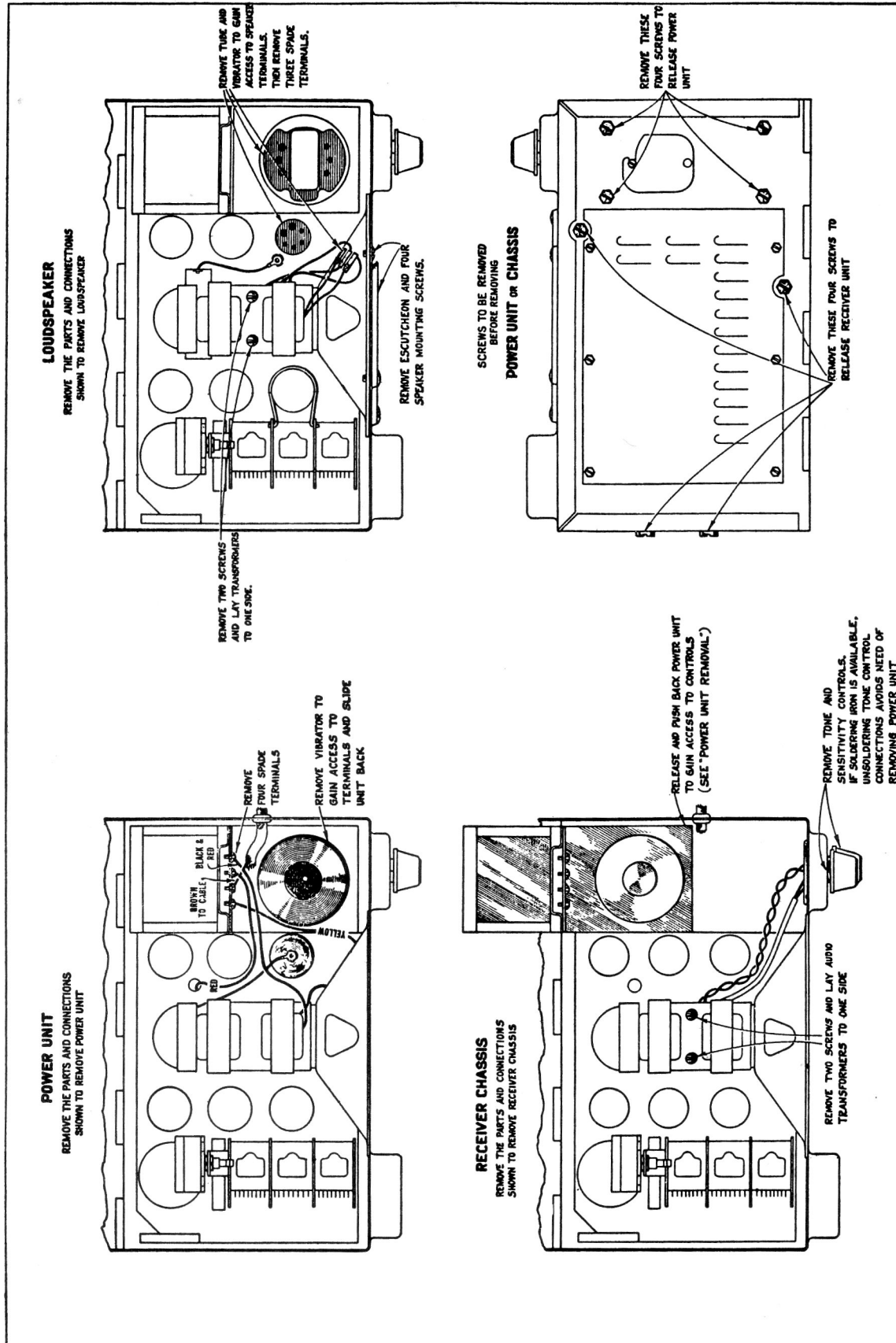


Figure 2—Details of removing units individually from chassis

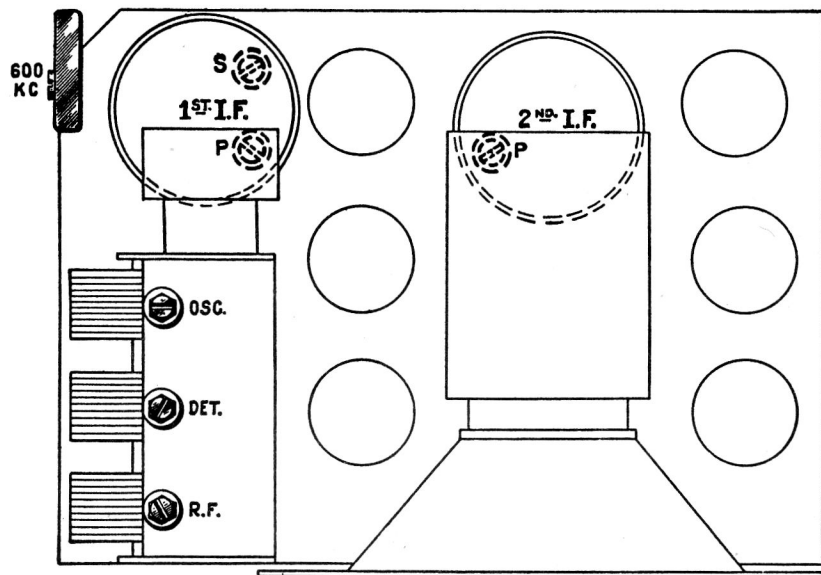
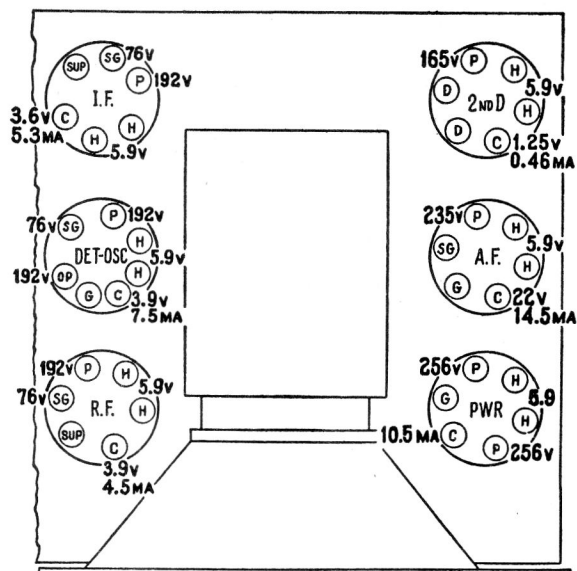


Figure 3—Location of Line-up Capacitors



All voltages except heater are to ground.

Figure 4—Voltages at Individual Socket Contacts

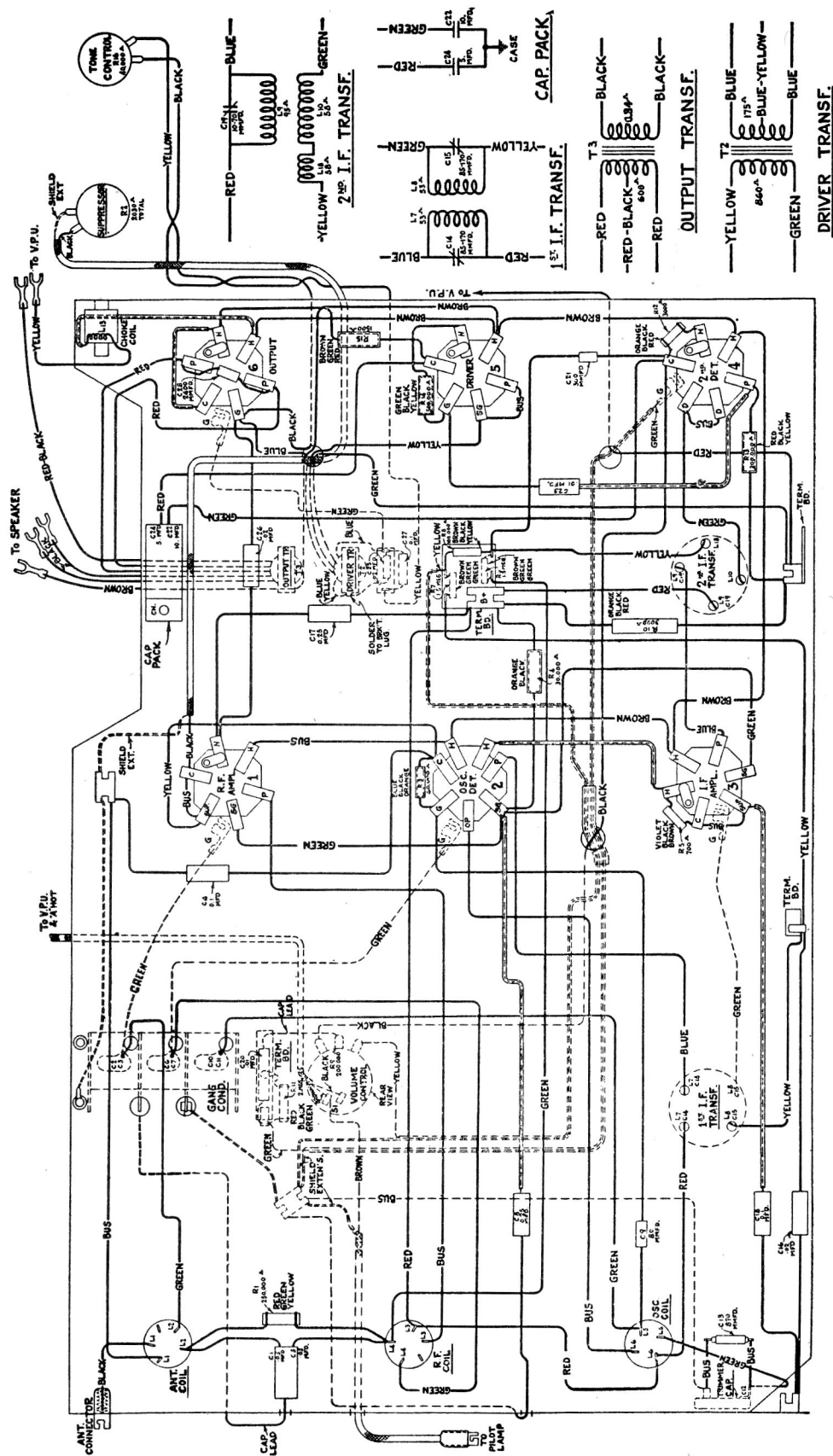


Figure 5—Receiver Assembly Wiring Diagram

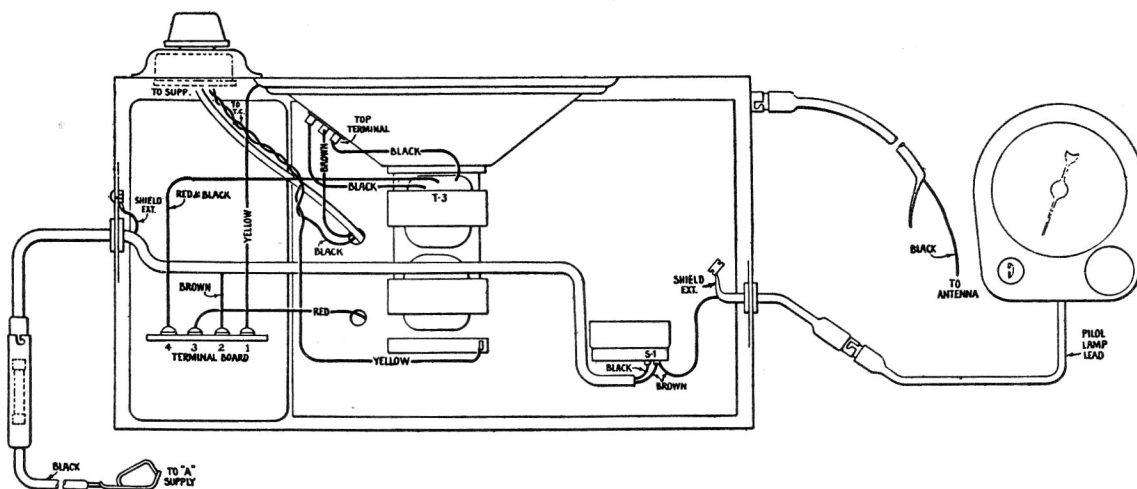


Figure 6—Assembly Wiring Diagram

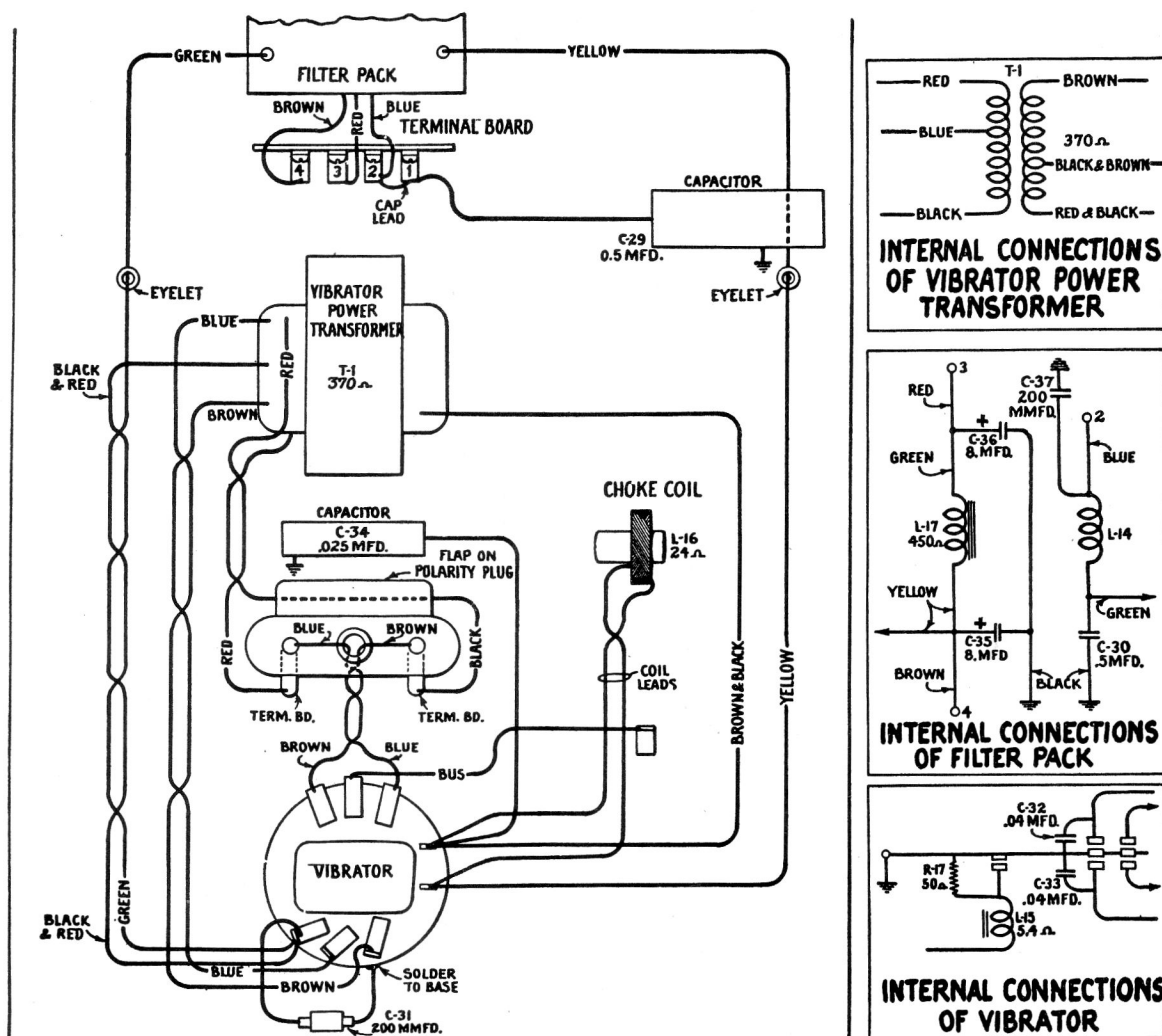


Figure 7—Vibrator Inverter-Rectifier Unit Wiring

REPLACEMENT PARTS—MODEL C-61

KEY No.	STOCK No.	DESCRIPTION	KEY No.	STOCK No.	DESCRIPTION
		RECEIVER ASSEMBLIES			
	4237	Cable — Single-conductor shielded cable with female section of connector—From volume control switch to pilot lamp cable.....		3584	Ring—Retaining ring for antenna, radio frequency or oscillator coils, —Package of 2.....
	4238	Cable—Two-conductor power cable from S1 to power lead connector.		4295	Screw—No. 10-32-1/4 inch headless set screw—For mounting condenser drive assembly to shaft—Package of 10.....
S-1404		Cap—Contact cap—Package of 2..		3623	Shield—Antenna, radio frequency or oscillator coil shield.....
S-1360		Capacitor—Adjustable capacitor...		4233	Shield—Oscillator or second detector Radiotron shield.....
C-12	4246	Capacitor—80 mmfd.....		4235	Shield — Intermediate frequency Radiotron shield.....
C-9	4248	Capacitor—300 mmfd.....		4236	Shield—Radio frequency Radiotron shield.....
C-21	4245	Capacitor—890 mmfd.....		4232	Socket—6-contact Radiotron socket
C-13	4247	Capacitor—2,400 mmfd.....		3572	Socket—7-contact Radiotron socket
C-28	3702	Capacitor—0.25 mfd.....		6971	Tone control.....
C-8				6969	Transformer—Audio driver transformer.....
C-16	S-1382	Capacitor—.02 mfd.....	R-16		
C-25			T-2	6970	Transformer—Audio output transformer.....
C-26					
C-20	3701	Capacitor—.01 mfd.....	T-3		
C-23	S-1371	Capacitor—0.1 mfd.....			
C-27			L-7		
C-4	3877	Capacitor—0.1 mfd. capacitor.....	L-8	6960	Transformer — First intermediate frequency.....
C-18			C-14		
C-17	3597	Capacitor—0.25 mfd.....	C-15		
C-1	4243	Capacitor pack—Comprising two 0.05 mfd. capacitors.....	L-9		
C-5	6963	Capacitor pack—Comprising one 10. and one 5. mfd. capacitors....	L-10	6962	Transformer—Second intermediate frequency transformer.....
C-22			L-18		
C-24	6965	Coil—Antenna coil.....	C-19		
L-1			R-9	6964	Volume control.....
L-2	6967	Coil—Oscillator coil.....	S-1		
L-5					CONTROL BOX ASSEMBLIES
L-6	6966	Coil—R. F. coil.....			
L-3				6974	Box—Control box complete—Fin. 58A.....
L-4				6976	Back—Control box back—Fin. 58A
C-2				6975	Cover—Control box front cover—Fin. 58A.....
C-3	6961	Condenser—3-gang variable tuning condenser.....		4259	Cover—Station selector dial cover —Transparent celluloid.....
C-6			S-1428	Dial—Station selector dial.....	
C-7			3649	Key—Volume control key.....	
C-10	6973	Drive assembly—Variable tuning condenser drive assembly.....	4256	Lamp—dial lamp.....	
C-11	4249	Drive bracket and worm assembly —For variable tuning condenser drive.....	4260	Pointer—Station selector indicator —Fin. 34.....	
L-13	6968	Reactor.....	4257	Ring—Station selector dial cover ring.....	
R-5	4240	Resistor—700 ohms—Carbon type —1/4 watt.....	4262	Screen—Dial light screen—Package of 3.....	
R-12	4242	Resistor — 3,000 ohms — Carbon type—1/4 watt.....	4252	Screw—No. 10-32-11/32-inch filister head set screw for holding condenser drive and pinion gear and volume coupling control shaft—Package of 5—Fin. 1....	
R-3	3602	Resistor — 60,000 ohms — Carbon type—1/4 watt.....	3652	Screw—No. 10-32-1/4-inch cupped point set screw for holding station selector or volume control flexible drive shaft to control box—Package of 5.....	
R-8	S-1354	Resistor—100,000 ohms—Carbon type—1/4 watt.....	4255	Screw—No. 4-40-1/4-inch oval head machine screw for holding control box cover—Package of 10—Fin. 7	
R-13	3116	Resistor—200,000 ohms—Carbon type—1/4 watt.....	4254	Shaft—Volume control coupling shaft—Fin. 1.....	
R-1	3744	Resistor—250,000 ohms—Carbon type—1/4 watt.....	4250	Shaft and gear—Station selector pointer shaft and gear.....	
R-14	S-1067	Resistor—500,000 ohms—Carbon type—1/4 watt.....	4251	Shaft and gear—Station selector drive shaft and pinion gear.....	
R-6	4241	Resistor—1.5 megohms — Carbon type—1/4 watt.....	4253	Spring—Volume control key holding spring—Package of 5.....	
R-7					
R-11	6242	Resistor — 2 megohms — Carbon type—1/4 watt.....			
R-15	3047	Resistor — 1,500 ohms — Carbon type—1/2 watt.....			
R-4	2240	Resistor — 30,000 ohms — Carbon type—1 watt.....			
R-10	4239	Resistor — 3,000 ohms — Carbon type—3 watts.....			
R-2	6972	Rheostat—Noise suppressor rheostat.....			

REPLACEMENT PARTS—MODEL C-61

KEY No.	STOCK No.	DESCRIPTION	KEY No.	STOCK No.	DESCRIPTION
	3690	Strap and bracket assembly—For mounting control box to steering column—Comprising one bracket, two screws, one lockwasher and one strap.....	7755		Housing—Front section of housing complete—Less hinge pin.....
			7756		Housing—Rear section of housing complete—Less hinge pin.....
		FLEXIBLE SHAFT AND CABLE ASSEMBLIES	4267		Nut—Wing nut—Fin. 58A—Package of 10.....
	7762	Cable—Dial lamp cable with socket and section of connector.....	4266		Pin—Hinge pin—Package of 5.....
	4264	Clamp—Metal clamp—Package of 5	4268		Screw—Wing screw—Package of 5—Fin. 58A.....
	4295	Screw—No. 10-32-1/4-inch cupped point set screw—Fastens flexible shaft housing to shaft bushing—Package of 10.....	4269		Screw—No. 6 self-tapping screw for fastening front and bottom sections of housing—Package of 5—Fin. 6.....
	7764	Shaft — Station selector flexible drive shaft—Approximately 27 inches long.....	4271		Screw—Self-tapping No. 6 screw for fastening tuning condenser drive bracket and worm cover to housing—Package of 5—Fin. 6.....
	7763	Shaft — Volume control flexible drive shaft—Approximately 24 inches long.....	4295		Screw—No. 10-32-1/4-inch headless set screw—Located in worm gear cover and bracket used to fasten drive shafts—Package of 10—Fin. 8.....
	4265	Sleeve—Coupling sleeve for volume control shaft—Package of 5.....			MISCELLANEOUS ASSEMBLIES
	4263	Socket—Dial lamp socket.....	4287		Body—Antenna connector body—Package of 4.....
		REPRODUCER ASSEMBLIES	4289		Body — Fuse connector body — Package of 4.....
L-12	9493	Coil—Field coil magnet and cone support.....	4283		Cable — Antenna lead-in cable — Approximately 35 inches long...
L-11	9492	Cone—Reproducer cone.....	4288		Cap—Antenna or fuse connector cap—Package of 4.....
	9491	Reproducer complete.....	4293		Capacitor—Ammeter capacitor 0.5 mfd.....
		VIBRATOR ASSEMBLIES	4292		Capacitor—Generator capacitor—0.5 mfd.....
	4280	Board—Terminal board—Located on filter pack.....	4291		Clip—"A" supply clip—Package of 2.....
C-31	4013	Capacitor—200 mmfd.....	S-1427		Escutcheon—Grille escutcheon and nameplate.....
C-34	4274	Capacitor—.025 mfd.....	4286		Ferrule—Antenna or fuse connector ferrule and bushing—Package of 4.....
C-29	4273	Capacitor—0.5 mfd.....	3646		Fuse—20 ampere—Package of 5...
L-16	4275	Coil—Choke coil.....	7765		Grille—Baffle board and grille cloth.
C-30			S-1413		Insulator—Fuse connector insulator—Package of 5.....
C-35			4132		Knob—Noise suppressor or tone control knob—Package of 2....
C-36			4282		Knob — Station selector knob — Package of 2.....
C-37			7766		Lead—Power lead with female section of fuse connector—From power cable to battery.....
L-14			4284		Spring—Antenna or fuse connector spring—Package of 5.....
L-17			S-1182		Suppressor—Distributor suppressor.
T-1			S-1201		Suppressor—Spark-plug suppressor.
R-17			4277		Screw—No. 8-32-3/8-inch binder head screw used to mount escutcheon—Package of 10.....
C-32			4294		Screw—No. 10-32-5/16-inch hexagon head screw—Used to mount chassis to housing—Package of 5.
C-33			4285		Washer—Antenna or fuse connector insulating washer—Package of 10
L-15					
		HOUSING ASSEMBLIES			
	4272	Bracket — Volume control shaft bracket—For left-hand mounting located on front of receiver housing.....			
	4270	Cover—Tuning condenser drive bracket and worm assembly cover.			