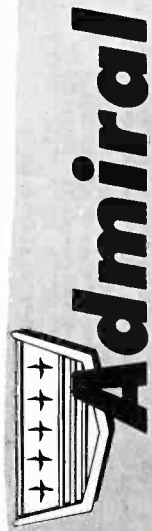


# **TRANSISTOR RADIO SECTION**

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## CHASSIS 4P2

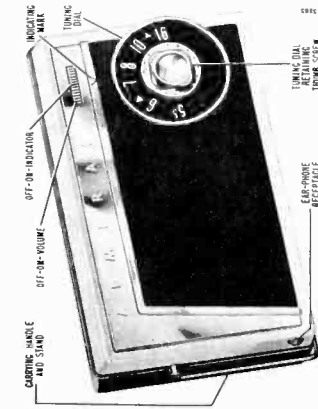


Figure 1.

### SPECIFICATIONS

**CIRCUIT:** Superheterodyne using four transistors and two germanium diodes.

**FREQUENCY RANGE:** Standard broadcast band, 535 to 1620 KC.

**INTERMEDIATE FREQUENCY:** 455 KC.

**POWER SUPPLY:** This receiver is operated from power supplied from either four 1½ volt ordinary penlight "AA" size batteries or equivalent size mercury batteries.

**ANTENNA:** Built-In Ferro-Scope (iron core).

**SPEAKER:** 2-3/4" PM with Alnico V magnet. Voice coil impedance, 12 ohms.

### BATTERY INFORMATION AND REPLACEMENT

The batteries can be replaced by removing the battery compartment cover at the rear of the set. Move the button on the battery compartment cover toward cabinet center and lift cover free of cabinet. Then pull the batteries out.

When installing penlight batteries, be sure the positive terminal (center cap) of each battery faces in direction indicated by arrows stamped in the battery compartment. The polarity of the center caps on mercury batteries, however, is opposite that of penlight batteries. Its negative terminal (center cap) must face direction opposite to that indicated by arrows stamped in the battery compartment.

### TRANSISTOR PORTABLE.

MODEL	COLOR	CHASSIS
4P21	Charcoal	4P2
4P22	Red	4P2
4P24	Tan	4P2
4P28	Turquoise	4P2

**IMPORTANT:** Batteries must be installed with correct polarity. If installed incorrectly, the radio will be damaged.

In normal use, batteries for this set should furnish about 100 operating hours. If longer battery life is desired, mercury batteries may be used in place of penlight batteries. Battery life when mercury batteries are used is up to 400 hours. Batteries listed below, or an equivalent substitute may be used.

#### PENLIGHT BATTERIES

Burgess.....Z General.....900

Eveready.....915 Ray-O-Vac.....7R or 7LP

#### MERCURY BATTERIES

Eveready.....E502 Mallory.....RM502R

Batteries listed above (1½ volts, "AA" size penlight batteries, or mercury batteries) constitute the power supply.

If reception becomes weak, muffled or distorted, or if the radio fails to operate, it is recommended that all batteries be replaced. Weak batteries can become corroded, develop leaks, and due to corrosion acid, damage metal parts. The immediate insertion of new batteries can prevent such acid damage.

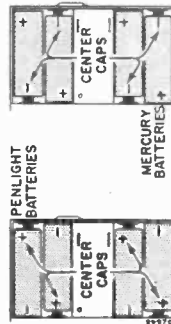


Figure 2. Battery Positions.

### ALIGNMENT PROCEDURE

Alignment procedure of the 4P2 chassis is similar to alignment procedure of an ordinary vacuum-tube radio. However, there is somewhat more interaction between the RF and IF circuits, thus requiring greater care in the setting of the adjustments as well as repetition of some of the steps. Therefore, for best results, follow the alignment procedure exactly as given below.

- Fresh batteries should be used.
- Use lowest output of signal generator capable of producing adequate indication on lowest scale of output meter.
- Set Volume control at maximum.
- Connect output meter across speaker voice coil.

Step	Connection of Signal Generator	Signal Gen. Frequency	Receiver Gang Setting	Adjustment Description	Adjustment
1	Radiated Signal. † Loop of several turns of wire, or place generator lead close to receiver for adequate signal.	455 KC	Gang fully open	3rd IF 2nd IF 1st IF	ⓐ, ⓑ and ⓒ for maximum output.
2	Same as "Step 1"	1620 KC	Gang fully open	Oscillator Trimmer	ⓓ for maximum output.
3	Repeat "Step 1" several times until there is no further increase in the output.				
4	Same as "Step 1"	§ 1400 KC	Tune in generator signal	Antenna Trimmer	ⓔ for maximum output.
<p>Note: Tune in 535 KC. If 535 KC can be tuned in, alignment is complete. If unable to tune in 535 KC, set the oscillator trimmer ¼ turn from its tight position and then proceed with the following steps.</p>					
5	Same as "Step 1"	535 KC	Gang fully closed	Oscillator Coil Core	ⓕ for maximum output.
6	Repeat "Step 2", then repeat Steps 5 and 2 several times until oscillator covers required range. Step 2 should always be second in order of adjustment.				
7	Repeat "Step 4"				
8	Repeat "Step 1"				

† If signal generator does not produce sufficient output for usable reading, clip hot lead of generator to mixer stator plates of gang; clip ground lead to frame of gang. Adjust ⓐ, ⓑ and ⓒ for maximum output. Then return to "Step 1".

\* If difficulty is experienced in obtaining signal output, first rotate IF slug out several turns, then slowly adjust slug in until peak is reached. Caution: Rotating slugs too far inward (past a position flush with top of IF can) will damage ceramic capacitor contained in IF can.

§ Antenna trimmer ⓔ should first be adjusted for maximum output with generator tuned to 1400 KC. Then try to increase output by rocking gang or generator slightly while readjusting trimmer ⓔ.

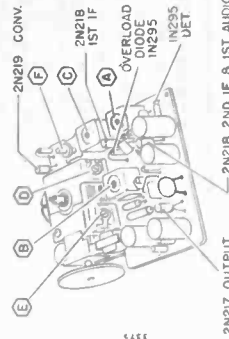


Figure 6. Transistor and Alignment Locations.

### REMOVING THE CHASSIS

The front section of the cabinet is removable for alignment and for servicing the component side of the chassis.

To remove the cabinet front from the chassis, proceed as follows:

1. Remove the battery compartment cover.
2. Remove the batteries.
3. Remove the four Phillips head screws that are visible within the battery compartment.
4. The tuning knob hub is a thumb screw. Remove it by turning counterclockwise.
5. Remove tuning knob by working it forward and off the tuning shaft.
6. Remove the Phillips head screw at the left of the tuning shaft.
7. Gently lift the cabinet front from the cabinet back and chassis.
8. To remove chassis from cabinet back for servicing the wiring side of the chassis:
9. Make sure tuning gang is closed. Then remove the two Phillips head screws that are visible—one near the tuning capacitor and the other in lower left corner as radio is viewed from the front.
10. Lift speaker from cabinet and away from chassis.
11. Gently lift out wiring side of chassis from cabinet.

### SERVICING TRANSISTOR RADIOS

The servicing of Admiral transistor portable radios is similar to that of servicing vacuum-tube sets. Therefore, regardless of whether the circuitry is termed conventional or printed, since the basic circuit functions which are performed by the vacuum-tube can be performed by the transistor, the trouble symptoms and methods of trouble shooting are also similar.

To simplify circuit tracing as well as locating and identifying individual circuit components, refer to figures 4 and 5. Figure 5 is a photograph of the circuit's components as they appear in their exact physical location. Figure 4, refer to the foil side of the board and its schematic symbols illustrate what appears in approximately the same position on the reverse side of the board. Use figure 4 together with the schematic for circuit tracing as well as voltage and/or resistance measurements. After the

trouble has been localized to a particular section, then refer to figure 5 which is a photograph of the top side of the board with all parts showing and identified according to their schematic reference number. Individual parts may then be removed from the circuit and the trouble further isolated. Refer to Service Manual No. S559, available from your Admiral distributor for further general service and repair information of printed circuit wiring.

Remember that transistors are easily damaged by an excessive application of heat. Furthermore, since the transistor is designed to operate with a low voltage, low impedance circuit, it can also be damaged by use of high voltages, high current or an erroneous reversal of polarity. For these reasons certain precautions must be taken either when replacing components, or when making voltage and resistance checks. Therefore, keep in mind these few basic rules:

- a. Soldering . . . When wiring components connected to transistors, insert the tips of a long nose pliers or alligator clips between the component to be wired and the transistor. Always solder the position of the lead between the pliers and component. The pliers or alligator clips serves to conduct heat up its shaft, and away from the transistor which otherwise would be damaged.
- b. Power Supply Voltages . . . Watch battery polarity closely. Reversing power supply may damage a transistor or a low voltage rated electrolytic capacitor.
- c. Replacing Transistors . . . Never remove or replace a transistor without turning the receiver off. To remove the transistor, place the tips of the long nose pliers or alligator clips between the transistor to be removed and point at which it is soldered to the adjacent component. Any damaging heat will thus be conducted by the pliers shaft or alligator clips away from the transistor. To insert the new transistor, place the pliers or clips between the end of the transistor lead and the transistor to be soldered. Heat will travel up the pliers or clips and thus be diverted from the transistor.
- d. Troubleshooting . . . Watch placement of test probes! If a slip of a test probe shorts the transistor base to the collector, the transistor may be damaged.
- e. Use of Signal Generators . . . Before connecting any signal generator to the radio circuits, adjust the output attenuator for mini-

mum output. Gradually increase the output attenuator for lowest possible signal capable of giving an adequate indication on the output meter. This will insure maximum alignment accuracy and prevent any possible damage to the transistors due to excessive signal input.

If the signal generator has high output impedance, the output may have to be advanced near maximum to obtain a usable reading.

f. Capacitor Checks . . . A number of electrolytic capacitors with low voltage ratings are used. Many capacitor checkers apply voltage to the capacitor sufficient to damage it. Even a small voltage of incorrect polarity can cause damage. This must be remembered in making ohmmeter checks of the circuit.

g. Ohmmeter Checks . . . The current supplied by most ohmmeters on low resistance ranges is great enough to damage a transistor. Generally, it is safe to use a vacuum-tube ohmmeter with a battery supply of 3 volts or less if used only on the RX 1,000 or higher range. When making ohmmeter checks of the circuit, always remove the transistors. Know the polarity of the ohmmeter test leads. Even the voltage supplied by an ohmmeter may harm electrolytic capacitors in the circuit if applied in reverse polarity. In general, circuit checks made with an accurate voltmeter are more useful than ohmmeter checks. See section on Ohmmeter Test Of Transistors before using this method.

### TESTING TRANSISTORS

The transistors used in this set are junction type. This type of transistor is more apt to become shorted than open. A shorted transistor will cause a resultant increase in current drain of the power supply. Thus a quick check is to measure the current drain with a milliammeter connected in series with the leads from the power supply. Normal current drain with no signal will be approximately 17 milliamperes. Transistors often become shorted because of excessive current flow, usually indicative of circuit trouble. If a transistor is found to be shorted, check the circuit carefully before installing a new one.

### OHMMETER TEST OF TRANSISTORS

In general, the forward current through a transistor should never be allowed to exceed 15 ma. A milliammeter can be used to determine whether any particular ohmmeter is safe to use in testing transistors.

For ohmmeter testing purposes a transistor can be considered as two germanium diodes connected back-to-back. See figure 3A.

Figure 3B also illustrates the relative resistances for PNP type transistors used in this set. The polarity signs shown in the illustration indicate the polarity of the ohmmeter leads. The transistors must be removed from their sockets

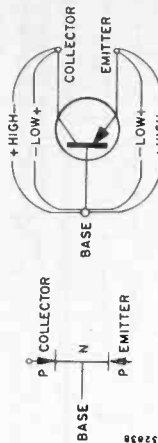


Figure 3A. Germanium Diode Equivalent. Test of Transistor.

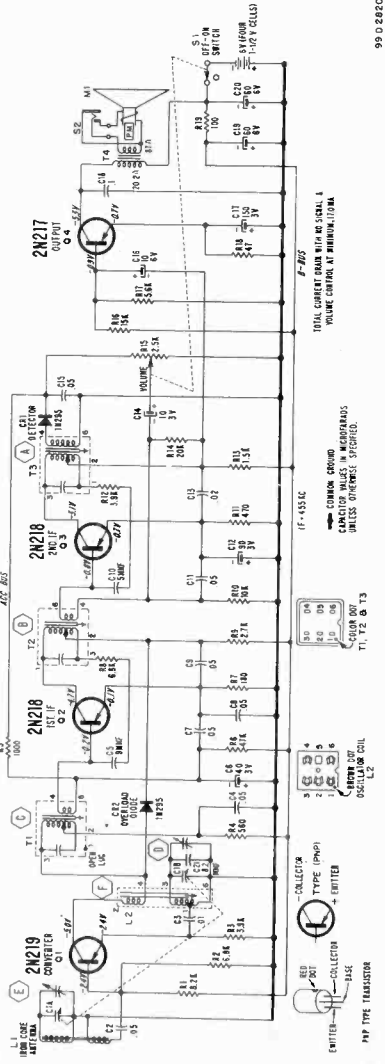
to make this check. Low resistance readings will range between 50 and 500 ohms or more. High resistance readings will range from .1 megohm to several megohms, depending on the ohmmeter used and the transistor type.

### CLEANING CABINET

Wash the cabinet with a strong soap or detergent and water and dry carefully. After cleaning the cabinet, the lustre can be restored by polishing with a good grade of abrasive-free paste wax, using a dampened absorbent cotton or cheesecloth to apply the wax. Before the wax dries, rub off the excess wax with dry cotton and then buff to a polish.

Admiral plastics polish, part number 51A11-3 can be used to remove minor scratches and scuff marks. After using this polish, the cabinet should be washed and then waxed to return its high lustre.

**CHASSIS 4P2**  
**MODELS 4P21-4P22-4P24-4P28**



99 02282C

**VOLTAGE DATA**

- Voltages shown measured with no signal, using fresh batteries.
- Volume control at minimum; dial set at low frequency end.
- All readings made between transistor lead terminals and B plus (ground).
- All voltage readings are negative.

**PARTS LIST**

Sym.	Description	Part No.
R1	8,200 ohms, 1/2 watt	60B 8-822
R2	6,800 ohms, 1/2 watt	60B 8-682
R3	3,900 ohms, 1/2 watt	60B 8-392
R4	500 ohms, 1/2 watt	60B 8-561
R5	1,000 ohms, 1/2 watt	60B 8-102
R6	47,000 ohms, 1/2 watt, 5%	60B 7-473
R7	180 ohms, 1/2 watt	60B 8-181
R8	6,800 ohms, 1/2 watt	60B 8-682
R9	2,700 ohms, 1/2 watt	60B 8-272
R10	10,000 ohms, 1/2 watt	60B 8-103
R11	470 ohms, 1/2 watt	60B 8-471
R12	3,900 ohms, 1/2 watt	60B 8-392
R13	1,500 ohms, 1/2 watt	60B 8-152
R14	20,000 ohms, 1/2 watt, 5%	60B 7-203
R15	2,500 ohms, Volume control (includes switch S1)	75B 36-1
R16	15,000 ohms, 1/2 watt	60B 8-153
R17	5,600 ohms, 1/2 watt	60B 8-562
R18	47 ohms, 1/2 watt	60B 8-470
R19	100 ohms, 1/2 watt	60B 8-101
C1A	123.1 mmf, max., ant.	
C1B	78.2 mmf, max., osc	68B 67-1
C2	.05 mf, 30 volts, ceramic	65B 45-6
C3	.01 mf, 600 volts, cer. disc	65D 10-41
C4	.05 mf, 30 volts, ceramic	65B 45-6

**CAPACITORS**

Sym.	Description	Part No.
L1	Antenna, Iron Core	69C 218-2
L2	Oscillator Coil	69B 213-2
*T1	Transformer, 1st IF	72C 182-1 or -7
*T2	Transformer, 2nd IF	72C 182-2 or -5
*T3	Transformer, 3rd IF	72C 182-3 or -6
T4	Transformer, Output	79D 68-3
M1	Speaker, 2 3/4" PM	78B 125-1
S1	Switch, On-Off	Part of R15
S2	Earphone Jack	88B 39-3

**MISCELLANEOUS PARTS**

Description	Part No.
Bracket, Volume Control Mig	15B 1513
Operating Instructions	41C 20-168
Rivet, Battery Contact Spring Mig	6B 1-13-24
Screw	
#4-40 x 1/2 BHMS PH (speaker mig)	345-250-C2-24
#2-56 x 3/16 BHMS PH (for mig)	18A 176
Volume control knob	325-187-C2-24

\*Alternate types used. Replace with same part number transformers used in set.

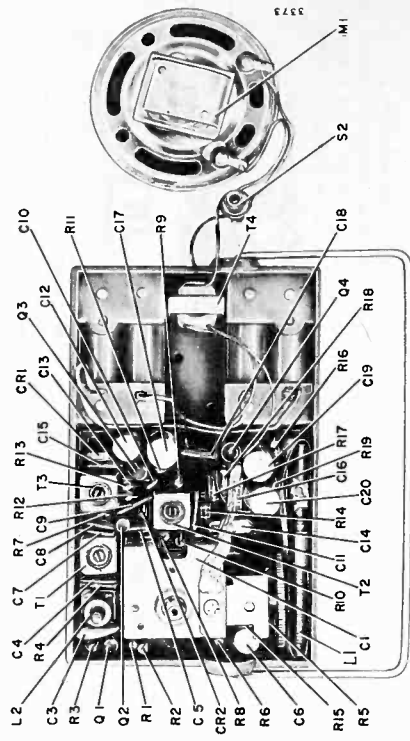


Figure 5. Top View of Chassis Showing Parts Locations

Description	Part No.
Speaker Mounting Pad	43A 285
Spring, Battery Contact, Single	18A 173
Spring, Battery Contact, Double	18A 174

**CABINET PARTS**

Description	Part No.
Cabinet Back Assembly	
Black, model 4P21	A5649
Red, model 4P22	A5582
Tan, model 4P24	A5650
Turquoise, model 4P28	A5651
Cabinet Front	
Black, model 4P21	34E 115-1
Red, model 4P22	34E 115-2
Tan, model 4P24	34E 115-4
Turquoise, model 4P28	34E 115-8
Cover, Battery Compartment Assembly	
Black, model 4P21	A5645
Red, model 4P22	A5646
Tan, model 4P24	A5647
Turquoise, model 4P28	36B 75-2
Grille, Metal, Aluminum	37A 155-2
Hands, Chrome	33C 217-1
Knob, Tuning	33C 217-2
Knob, Volume Control	33C 217-3
Black, model 4P22	33C 217-4
Red, model 4P22	33C 217-5
Tan, model 4P24	33C 217-4
Turquoise, model 4P28	33C 217-5
Push Button, Battery Cover	27A 233
Retainer, Antenna	32A 316

**COILS, TRANSFORMERS, ETC.**

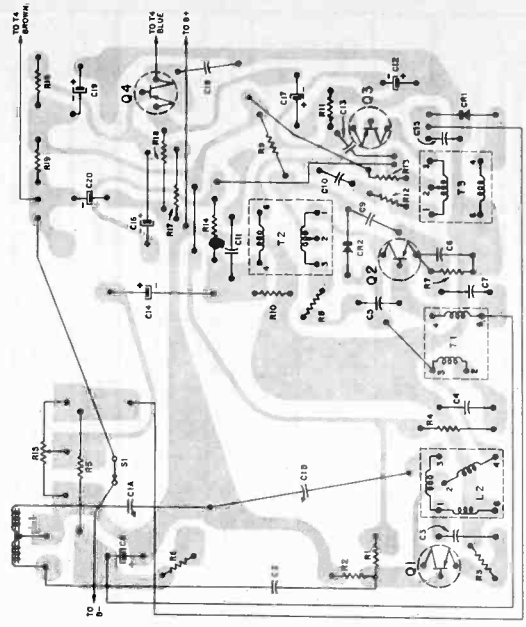
Sym.	Description	Part No.
L1	Antenna, Iron Core	69C 218-2
L2	Oscillator Coil	69B 213-2
*T1	Transformer, 1st IF	72C 182-1 or -7
*T2	Transformer, 2nd IF	72C 182-2 or -5
*T3	Transformer, 3rd IF	72C 182-3 or -6
T4	Transformer, Output	79D 68-3
M1	Speaker, 2 3/4" PM	78B 125-1
S1	Switch, On-Off	Part of R15
S2	Earphone Jack	88B 39-3

**MISCELLANEOUS PARTS**

Description	Part No.
Bracket, Volume Control Mig	15B 1513
Operating Instructions	41C 20-168
Rivet, Battery Contact Spring Mig	6B 1-13-24
Screw	
#4-40 x 1/2 BHMS PH (speaker mig)	345-250-C2-24
#2-56 x 3/16 BHMS PH (for mig)	18A 176
Volume control knob	325-187-C2-24

\*Alternate types used. Replace with same part number transformers used in set.

Figure 4. View of printed Wiring Board. NOTE: Gray area represents printed wiring, black symbols and lines represents components, wiring and connections on opposite side.



# Admiral

## 6S2 CHASSIS

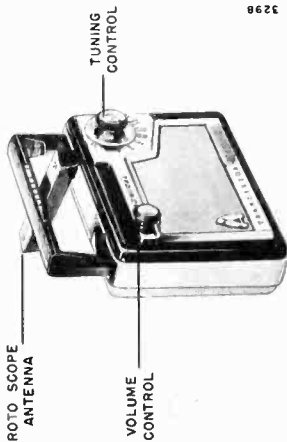


Figure 1. Front View of Cabinet.

### SPECIFICATIONS

**CIRCUIT:** Superheterodyne using six transistors and one germanium diode.

**FREQUENCY RANGE:** Standard broadcast band. 535 to 1620 KC.

**INTERMEDIATE FREQUENCY:** 455 KC.

**POWER SUPPLY:** This receiver can be operated from power supplied by eight, 1½ volts, "C" size, flashlight batteries.

**ANTENNA:** Built-In Ferro-Scope (iron core).

**SPEAKER:** 4" PM with Alnico V magnet. Voice coil impedance, 3.2 ohms.

### BATTERY REPLACEMENT

Open the cabinet by pulling with the fingers on the top rear surface of the cabinet back. This releases the internal spring catch mechanism allowing the cabinet back to swing down on its hinges. The batteries are located inside the long cylindrical plastic case, at the bottom of the cabinet. The battery case is held in position by two spring clamps. Remove the battery case from the cabinet by grasping it between the thumb and fingers and pulling it free of the spring clamps. Use caution when pulling out the case to prevent undue strain on the two wire leads connected to the cap.

### TRANSISTOR PORTABLE

MODEL	COLOR	CHASSIS
221	Black	6S2
227	Tan	6S2
228	Turquoise	6S2

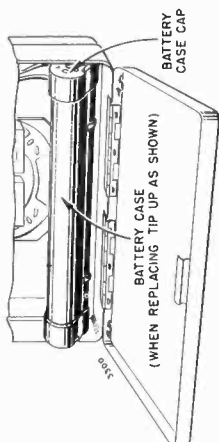


Figure 2. Rear View of Set, Cabinet Back Open.

To remove the batteries, first remove the cap from the case by pulling back the two cap retaining springs and lifting off the cap. Invert the open end of the case a few inches over a table or any convenient surface. This allows the batteries to slide out of the case. The case holds eight "C" size batteries, four in each section. This size battery is commonly used in flashlights and is readily available at drug and hardware stores.

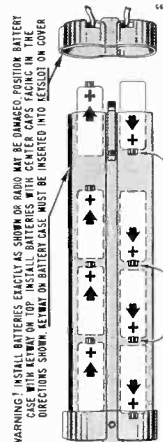


Figure 3. Battery Case, Showing Correct Method for Installing Batteries.

**IMPORTANT:** When installing batteries refer to figure 3, or the diagram on the battery case, to make sure the batteries are being installed in the case properly. When installing cap on case, check the diagram again to make sure the cap is not reversed.

**WARNING:** TURNING SET ON EITHER AFTER INSTALLING THE BATTERIES WRONG, OR REVERSING THE CAP CAN

### ALIGNMENT PROCEDURE

- Fresh batteries should be used when making an alignment.
- Set Volume control full on.
- Connect output meter across speaker voice coil.
- Use lowest setting of signal generator capable of producing adequate indication on lowest scale of output meter.
- Use a non-metallic alignment tool for IF transformers.
- Refer to "figure 7" for location of alignment point.

Step	Connection of Signal Generator	Signal Generator Frequency	Receiver Gang Setting	Adjustment Description	Adjustment
1	Radiated Signal *Loop of several turns of wire, or place generator lead close to receiver for adequate signal pickup.	455 KC	Gang fully open	2nd IF 1st IF	** "A", "B" and "C" for maximum output
2	Same as "Step 1".	1620 KC	Gang fully open	Oscillator Trimmer	"D" for maximum output
3	Same as "Step 1".	1400 KC	Tune in on generator signal	§ Antenna Trimmer	"E" for maximum output
4	Same as "Step 1".	600 KC	Tune in on generator signal	§ Antenna Peaking Coil	"F" for maximum output
5	Repeat "Steps 2 and 3" until no further increase in output is obtained.				

\* If sufficient signal cannot be injected by this means, connect the signal generator "hot" lead to the mixer stator plates (large fixed plates on the tuning gang) and the ground "cold" lead to the gang frame (ground).

\*\* Remove chassis to make adjustments on IF transformers.

§ 1st IF transformer secondary adjustment B is made from foil side of the chassis.

To align the 1st IF transformer, back the slugs out and then adjust inward. Tune for the first peak on both the secondary "B" and primary "C".

Fasten chassis into cabinet before performing "Step 2".

§ Make adjustment for maximum output. Then try to increase output further by "rocking" the signal generator frequency control slightly while making the adjustment.

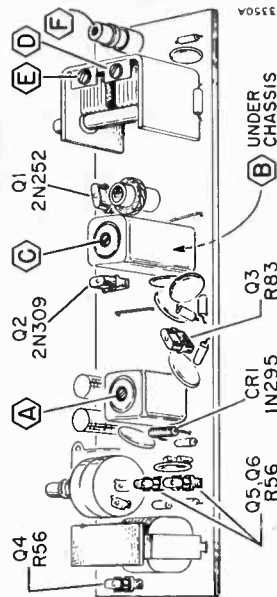


Figure 5. Transistor and Alignment Adjustment Locations.

**PERMANENTLY DAMAGE THE TRANSISTORS AS WELL AS OTHER PARTS OF THE RADIO. If radio does not play after installing new batteries, turn off immediately, and check for improper battery installation.**

*When inserting the battery case in the clips in the cabinet, tip the case up at a slight angle to insure proper closure of cabinet back.*

Operating power for these portables is provided by eight individual "C" size batteries (commonly used in flashlights). Under normal operating conditions, battery life may be in excess of 1000 operating hours.

Batteries deteriorate more rapidly in excessive heat. Therefore, do not leave this set on or near a radiator or other source of heat. Also note that all batteries will run down with age even when not in use. It is recommended that all batteries be replaced when reception becomes weak, muffled or distorted, or radio fails to operate.

**IMPORTANT!** Run-down batteries should be removed **IMMEDIATELY** because the chemical action inside the cells will cause some batteries to leak when they are worn out. The acid which leaks from a run-down battery may damage parts of the set or the cabinet because of its corrosive action.

Batteries listed below, or an equivalent substitute may be used.

Burgess .....	1	General .....	914
Eveready .....	985	Ray-O-Vac .....	11P

Batteries listed above are 1½ volt, "C" size flashlight batteries.

**REMOVING THE CHASSIS**

1. Remove Tuning knob and Volume Control knob by working them forward and off the shaft.
2. Open cover on rear of cabinet.
3. Remove the battery case.
4. On the front of the cabinet, *loosen* the two Phillips head screws adjacent the tuning shaft.
5. *Loosen* the hex nut that secures the Volume Control to front of case.
6. Hold the printed circuit board while removing the two screws and hex nut, to prevent damage.
7. Gently lift the circuit board from within the case.

8. Remove speaker by straightening the four prongs which hold the speaker assembly to the cabinet and then lifting it from the cabinet.

**SERVICING TRANSISTOR RADIOS**

The servicing of Admiral transistor portable radios is similar to that of servicing vacuum-tube sets. Therefore, regardless of whether the circuitry is termed conventional or printed, since the basic circuit functions which are performed by the vacuum-tube can be performed by the transistor, the trouble symptoms and methods of trouble shooting are also similar.

To simplify circuit tracing as well as locating and identifying individual circuit components, refer to figures 6 and 7. Figure 7 is a photograph of the circuit's components as they appear in their exact physical location. Figure 6, refers to the foil side of the board and its schematic symbols illustrate what appears in approximately the same position on the reverse side of the board. Use figure 6 together with the schematic for circuit tracing as well as voltage and/or resistance measurements. After the trouble has been localized to a particular section, then refer to figure 7 which is a photograph of the top side of the board with all parts showing and identified according to their schematic reference number. Individual parts may then be removed from the circuit and the trouble further isolated. Refer to Service Manual No. S559, available from your Admiral distributor for further general service and repair information of printed circuit wiring.

Remember that transistors are easily damaged by an excessive application of heat. Furthermore, since the transistor is designed to operate with a low voltage, low impedance circuit, it can also be damaged by use of high voltages, high current or an erroneous reversal of polarity. For these reasons certain precautions must be taken either when replacing components, or when making voltage and resistance checks. Therefore, keep in mind these few basic rules:

- a. Soldering . . . . . When replacing components connected to a transistor socket, remove the transistor before doing any soldering. Always solder as quickly as possible. Be sure the soldering iron is hot enough to melt solder quickly before touching it to soldered connections.
- b. Power Supply Voltages . . . . . Watch battery polarity closely. Reversing power supply may damage a transistor or a low voltage rated electrolytic capacitor.

- c. Replacing Transistors . . . . . Never remove or replace a transistor without turning the receiver off. To remove the transistor, gently work it loose from the socket and lift out. When replacing the transistor, carefully align the pins on the transistor and insert into socket.

- d. Troubleshooting . . . . . Watch placement of test probes! If a slip of a test probe shorts the transistor base to the collector, the transistor may be damaged.

- e. Use of Signal Generators . . . . . Before connecting any signal generator to the radio circuits, adjust the output attenuator for minimum output. Gradually increase the output attenuator for the lowest possible signal capable of giving an adequate indication on the output meter. This will insure maximum alignment accuracy and prevent any possible damage to the transistors due to excessive signal input.

Some signal generators designed for vacuum tube circuits have a high output impedance. If this type generator is used, very little signal will be transferred to the transistor amplifier input. The output attenuator may then have to be advanced much further than the "normal" output setting for a comparable vacuum tube radio.

- f. Capacitor Checks . . . . . A number of electrolytic capacitor checkers apply voltage to the capacitor sufficient to damage it. Even a small voltage of incorrect polarity can cause damage. This must be remembered in making ohmmeter checks of the circuit.

- g. Ohmmeter Checks . . . . . The current supplied by most ohmmeters on low resistance ranges is great enough to damage a transistor. Generally, it is safe to use a vacuum tube ohmmeter with a battery supply of 3 volts or less if used only on the R X 1,000 or higher ranges. When making ohmmeter checks of the circuit, always remove the transistors. Know the polarity of the ohmmeter test leads. Even the voltage supplied by an ohmmeter may harm electrolytic capacitors in the circuit if applied in reverse polarity. In general, circuit checks made with an accurate voltmeter are more useful than ohmmeter checks. See section on Ohmmeter Test Of Transistors before using this method.

**TESTING TRANSISTORS**

The transistors used in this set are junction type. This type of transistor is more apt to become shorted than open. A shorted transistor will cause a resultant increase in current drain of the power supply. Thus a

quick check is to measure the current drain with a milliammeter connected in series with the leads from the power supply. Normal current drain with no signal will be approximately 8 milliamperes. Transistors often become shorted because of excessive current flow, usually indicative of circuit trouble. If a transistor is found to be shorted, check the circuit carefully before installing a new one.

**OHMMETER TEST OF TRANSISTORS**

In general, the forward current through a transistor should never be allowed to exceed 15 ma. A milliammeter can be used to determine whether any particular ohmmeter is safe to use in testing transistors.

For ohmmeter testing purposes a transistor can be considered as two germanium diodes connected back-to-back. See figure 4A.

Figure 4B also illustrates the relative resistances for PNP type transistors used in this set. The polarity signs shown in the illustration indicate the polarity of the ohmmeter leads. The transistors must be removed from

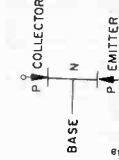


Figure 4A. Germanium Diode Equivalent.

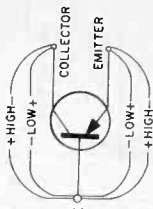


Figure 4B. Ohmmeter Test of PNP Type Transistor.

their sockets to make this check. Low resistance readings will range between 50 and 500 ohms or more. High resistance readings will range from .1 megohm to several megohms, depending on the ohmmeter used and the transistor type.

**CLEANING CABINET**

To clean the cabinet use a mild solution of soap or detergent and lukewarm water. Apply the solution with a soft rag or sponge. Squeeze out thoroughly before applying, to avoid any excess water from coming in contact with any of the electrical parts. Rub the surface thoroughly with the solution. Wipe with a damp cloth, and then wipe dry with a dry cloth.

**CAUTION:** Never use carbon tetrachloride, acetone, naphtha, alcohol, gasoline, or any commercial cleaning fluids for cleaning the cabinet.

**SERVICING TRANSISTOR RADIOS**

The servicing of Admiral transistor portable radios is similar to servicing vacuum tube operated sets. The same basic circuit functions are present and the same troubles and trouble symptoms can exist. Methods of trouble shooting both conventional and printed wiring circuits will generally apply to transistor radio servicing. However, transistors are subject to heat damage, and low supply voltages and low impedance circuits are used in the design of this set. For these reasons certain precautions must be taken when replacing components and checking the circuits. To prevent possible damage to transistors while servicing, remember these few basic rules:

- When replacing components connected to a transistor socket, remove the transistor before doing any soldering. Always solder as quickly as possible. Use only 50/50 or 60/40 (40% tin, 40% lead) low melting point rosin core solder. Be sure the soldering iron is hot enough to melt solder quickly before touching it to soldered connections.
- Power Supply Voltages . . . Watch battery polarity closely. Reversing power supply may damage a transistor or a low voltage rated electrolytic capacitor.
- Replacing Transistors . . . Never remove or replace a transistor without turning the receiver off.
- Troubleshooting . . . Watch placement of test probes! If a slip of a test probe shorts the transistor base to the collector, the transistor may be damaged.
- Use of Signal Generators . . . Before connecting any signal generator to the radio circuits, adjust the output attenuator for minimum output. Signal generators designed for vacuum tube circuits can furnish more signal than a transistor can handle without harm. Transistor amplifiers have a relatively low input im-

pedance. If the signal generator output impedance is high, very little signal will be transferred to the transistor amplifier input.

- Capacitor Checks . . . A number of electrolytic capacitors with low voltage ratings are used. Many capacitor checkers apply voltage to the capacitor sufficient to damage it. Even a small voltage of incorrect polarity can cause damage. This must be remembered in making ohmmeter checks of the circuit.
- Ohmmeter Checks . . . The current supplied by most ohmmeters on low resistance ranges is great enough to damage a transistor. Generally, it is safe to use a vacuum tube ohmmeter with a battery supply of 3 volts or less if used only on the R X 1,000 or higher range. When making ohmmeter checks of the circuit, always remove the transistors. Know the polarity of the ohmmeter test leads. Even the voltage supplied by an ohmmeter may harm electrolytic capacitors in the circuit if applied in reverse polarity. In general, circuit checks made with an accurate voltmeter are more useful than ohmmeter checks. See section on Ohmmeter Test Of Transistors before using this method.

**TESTING TRANSISTORS**

The transistors used in this set are junction type. This type of transistor is more apt to become shorted than open. A shorted transistor will cause a resultant increase in current drain of the power supply. Thus a quick check to measure the current drain with a milliammeter connected in series with the leads from the power supply. Normal current drain with no signal will be approximately 8 milliamperes. Transistors often become shorted because of excessive current flow, usually indicative of circuit trouble. If a transistor is found to be shorted, check the circuit carefully before installing a new one.

**OHMMETER TEST OF TRANSISTORS**

In general, the forward current resistances for both NPN and PNP type transistors used in this set. The polarity signs shown in the illustration indicate the polarity of the ohmmeter leads. The transistors must be removed from their sockets to make this check. Low resistance readings will range between 50 and 500 ohms or more. High resistance readings will range from .1 megohm to several megohms, depending on the ohmmeter used and the transistor type.

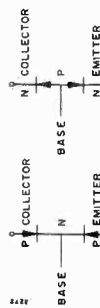


Figure 1. Germanium Diode Equivalent of Transistor for Testing Purposes.

**VOLTAGE DATA**

- DC voltages shown measured with no signal, using fresh batteries.
- Volume control at minimum; dial set at low frequency end.
- All readings made between transistor socket terminals and B minus (ground).
- Voltages on oscillator (2N172) measured directly from emitter to ground (should be 1 volt or more with 9 volt supply).
- Normal bias voltage between base and emitter of .2 volt.



Figure 2. Ohmmeter Test of Transistors.

**RESISTORS**

Symbol	Description	Part No.
R1	150,000 ohms, 1/2 watt	608 8-154
R2	500,000 ohms, 1/2 watt	608 8-152
R3	500 ohms, 1/2 watt	608 8-464
R4	47,000 ohms, 1/2 watt	608 8-473
R5	470 ohms, 1/2 watt	608 8-471
R6	1,100 ohms, 1/2 watt	608 8-112
R7	3,300 ohms, 1/2 watt	608 8-332
R8	2,200 ohms, 1/2 watt	608 8-222
R9	15,000 ohms, 1/2 watt	608 8-153
R10	1,500 ohms, 1/2 watt	608 8-152
R11	470 ohms, 1/2 watt	608 8-471
R12	1,100 ohms, 1/2 watt	608 8-112
R13	220 ohms, 1/2 watt	608 8-221
R14	2,500 ohms, Volume control (includes switch S1)	75C 25-5
R15	220 ohms, 1/2 watt	608 8-221
R16	2,200 ohms, 1/2 watt	608 8-222
R17	15,000 ohms, 1/2 watt	608 8-153
R18	47 ohms, 1/2 watt	608 8-102
R19	47 ohms, 1/2 watt	608 8-470
R20	10 ohms, 1/2 watt	608 8-100
R21	10 ohms, 1/2 watt	608 8-100
R22	15,000 ohms, 1/2 watt	608 8-153
R23	15,000 ohms, 1/2 watt	608 8-153

**CAPACITORS**

Symbol	Description	Part No.
C1A	272.3 mmf, max. ant. coupling	608 66-1
C1B	102.1 mmf, max. osc. coupling	608 66-1
C2	.05 mf, ceramic	65D 10-116

Symbol	Description	Part No.
C3	250 mmf, silver mica	65D 10-3
C4	.01 mf, ceramic	65D 10-3
C5	Part of T1	65C 6-117
C6	8.2 mf, ceramic	65C 6-33
C7	Part of T1	65C 6-117
C8	10 mf, ceramic	65D 10-116
C9	50 mf, 3 volts, electrolytic	67B 32-5
C10	50 mf, 3 volts, electrolytic	67B 32-5
C11	.05 mf, ceramic	65D 10-116
C12	Part of T2	65D 10-116
C13	Part of T2	65D 10-116
C14	8.2 mf, ceramic	65C 6-117
C15	Part of T2	65C 6-33
C16	10 mf, ceramic	65D 10-116
C17	.05 mf, ceramic	65D 10-116
C18	.05 mf, ceramic	65D 10-116
C19	.05 mf, ceramic	65D 10-116
C20	Part of T3	65D 10-116
C21	Part of Sun Power Pak	61-187-C2-24
C22	100 mf, 10 volts, electrolytic	67B 32-2
C23	100 mf, 10 volts, electrolytic	67B 32-2
C24	10 mf, 10 volts, electrolytic	67B 32-2
C25	10 mf, 10 volts, electrolytic	67B 32-2
C26	100 mf, 10 volts, electrolytic	65D 10-116
C27	.05 mf, ceramic disc	65D 10-71
C28	.05 mf, ceramic disc	65D 10-116

Symbol	Description	Part No.
T1	Transformer, 1st IF	72C 174-2
T2	Transformer, 2nd IF	72C 174-2
T3	Transformer, 3rd IF	72C 174-1
T4	Transformer, Driver	79B 67-1
T5	Transformer, Output	88B 39-2
M1	Sun Power Pak Receptacle	79B 121-1
M2	Speaker, 4" PM (with output trans.)	79B 121-1
S1	Switch, On-Off	Part of R14

**MISCELLANEOUS PARTS**

Description	Part No.
Insulator, Battery Compartment	32A 282
Lever, Antenna Release, Gold	15A 134-9
Palnut, (#6-32) mig. Volume control	2A 6-43-24
Receptacle, Sun Power Pak	88B 39-2
Screw, Wing type, mounts battery contact bracket	1A 101-9-24
Screw, #2-32x1/16" (Flt) HMS	61-187-C2-24
Shield, Printed Circuit Board	32A 284
Spring, Battery Contact	29A 13
Spring, Battery Contact	18A 160
Spring, Contact, Antenna Mig.	19A 10-9
Spring, Coil, Antenna Release	19A 108
Transistor Socket	87B 63-1

**CABINET PARTS**

Description	Part No.
Antenna Cover, Top "Solo-Scope"	33D 180-3
Antenna Cover, Bottom	33D 180-4
Beffle Board, Speaker	43B 270
Cabinet, Bottom	34E 104-10
Red (7112)	

Description	Part No.
Ton (7114)	34E 104-11
Yellow (7116)	34E 104-12
Torque (7118)	34E 104-13
Cabinet, Cover	34E 104-34
Escutcheon, without Grille, Gold	23C 256
Escutcheon, Gold "V"	23D 257
Grille, Plastic, Black	36B 72
Handle, Plastic	33B 177-2
Red (7114)	33B 177-3
Yellow (7116)	33B 177-4
Ton (7114)	33B 177-4
Knob, Case Locking	33C 183-3
Knob, On-Off-Volume	33C 183-5
Red (7112)	33C 183-5
Ton (7114)	33C 183-7
Yellow (7116)	33C 183-7
Torque (7118)	33C 183-7
Knob, Tuning	33C 183-4
Red (7114)	33C 183-6
Ton (7114)	33C 183-6
Yellow (7116)	33C 183-12
Torque (7118)	33C 183-8
Ring, Compression (for knobs)	18A 5-9
Rubber Strip, Mig. Bar Antenna	12C 4-5
Screw	34C 312-C2-57
for mig. chassis (=4.40x5/16" RHMS)	14A 78-11-24
for mig. handle (=2.6x5/16" self-tapping)	1A 175-1-24
for mig. antenna case bottom cover (=4x3/4" self-tapping)	78B 121-1
Washer	4A 648
for mig. cabinet locking knob	4C 127-5
"E" for mig. antenna	



## 7M1 CHASSIS

### TRANSISTOR PORTABLE

MODEL	COLOR	CHASSIS
7M11	Ebony	7M1
7M12	Red and White	7M1
7M14	Tan and White	7M1
7M16	Yellow and White	7M1
7M18	Turquoise and White	7M1

**IMPORTANT:** Batteries must be installed with correct polarity. If installed incorrectly, the radio will be damaged.

In normal use, batteries for this set should furnish about 100 operating hours. If longer battery life is desired, mercury batteries may be used in place of penlight batteries. Battery life when mercury batteries are used is up to 400 hours. Batteries listed below, or an equivalent substitute may be used.

#### PENLIGHT BATTERIES

Burgess.....Z General.....900  
Eveready.....915 Ray-O-Vac.....7R or 7LP

#### MERCURY BATTERIES

Eveready.....E502 Mallory.....RM502R

Batteries listed above (1½ volts, "AA" size penlight batteries, or mercury batteries) constitute the power supply.

If reception becomes weak, muffled or distorted, or if the radio fails to operate, it is recommended that all batteries be replaced. Weak batteries can become corroded, develop leaks, and due to corrosion acid, damage metal parts. The immediate insertion of new batteries can prevent such acid damage.



Figure 2. Battery Positions.

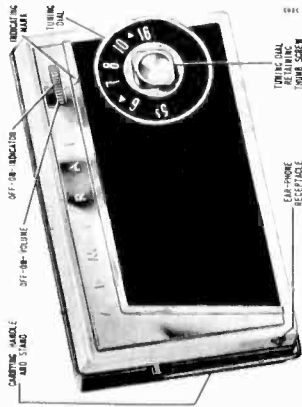


Figure 1.

#### SPECIFICATIONS

**CIRCUIT:** Superheterodyne using seven transistors and one germanium diode.  
**FREQUENCY RANGE:** Standard broadcast band, 535 to 1620 KC.

**INTERMEDIATE FREQUENCY:** 455 KC.  
**POWER SUPPLY:** This receiver can be operated from power supplied from either four 1½ volt ordinary penlight "AA" size batteries or equivalent size mercury batteries.

**ANTENNA:** Built-In Ferro-Scope (iron core).  
**SPEAKER:** 2 3/4" PM with Alnico V magnet. Voice coil impedance, 12 ohms.

#### BATTERY INFORMATION AND REPLACEMENT

The batteries can be replaced by removing the battery compartment cover at the rear of the set. Move the button on the battery compartment cover toward cabinet center and lift cover free of cabinet. Then pull the batteries out.

When installing penlight batteries, be sure the positive terminal (center cap) of each battery faces in the direction indicated by arrows stamped in the battery compartment. The polarity of the center caps on mercury batteries, however, is opposite that of penlight batteries. Its negative terminal (center cap) must face direction opposite to that indicated by arrows stamped in the battery compartment.

#### ALIGNMENT PROCEDURE

Alignment procedure of the 7M1 chassis is similar to alignment procedure of an ordinary vacuum-tube radio. However, there is somewhat more interaction between the RF and IF circuits, thus requiring greater care in the setting of the adjustments as well as repetition of some of the steps. Therefore, for best results, follow the alignment procedure exactly as given below.

- Fresh batteries should be used.
- Set Volume control at maximum.
- Connect output meter across speaker voice coil.
- Use lowest output of signal generator capable of producing adequate indication on lowest scale of output meter.
- Use a non-metallic alignment tool for IF adjustments.

Step	Connection of Signal Generator	Signal Gen. Frequency	Receiver Gang Setting	Adjustment Description	Adjustment
1	Loop of several turns of wire, or place generator lead close to receiver for adequate signal.	455 KC	Gang fully open	3rd IF 2nd IF 1st IF	ⓐ and ⓑ for maximum output.
2	Same as "Step 1".	1620 KC	Gang fully open	Oscillator Trimmer	ⓒ for maximum output.
3	Repeat "Step 1" several times until there is no further increase in the output.				
4	Same as "Step 1".	§ 1400 KC	Tune in generator signal	Antenna Trimmer	ⓓ for maximum output.
<p>Note: Tune in 535 KC. If 535 KC can be tuned in, alignment is complete. If unable to tune in 535 KC, set the oscillator trimmer ¼ turn from its tight position and then proceed with the following steps.</p>					
5	Same as "Step 1".	535 KC	Gang fully closed	Oscillator Coil Core	ⓔ for maximum output.
6	Repeat "Step 2"; then repeat Steps 5 and 2 several times until oscillator covers required range. Step 2 should always be second in order of adjustment.				
7	Repeat "Step 4".				
8	Repeat "Step 1".				

† If signal generator does not produce sufficient output for usable reading, clip hot lead of generator to mixer stator plates of gang; clip ground lead to frame of gang. Adjust ⓐ, ⓑ and ⓒ for maximum output. Then return to "Step 1".

\* If difficulty is experienced in obtaining signal output, first rotate IF slug out several turns, then slowly adjust slug in until peak is reached. Caution: Rotating slugs too far inward (past a position flush with top of IF can) will damage ceramic capacitor contained in IF can.

§ Antenna trimmer ⓓ should first be adjusted for maximum output with generator tuned to 1400 KC. Then try to increase output by rocking gang or generator slightly while readjusting trimmer ⓔ.

Description	Part No.
Knob, Tuning	33C 217-1
Knob, Volume Control	33C 217-2
Push Button, Battery Cover	27A 233
Retainer, Antenna	32A 316
Screw for mfg. cabinet back to front (#4x½ STBH PH)	1A 24-1-24
for mfg. cabinet to gang (6-32x½ FMHS PH)	361-250-C-2-24
for mfg. chassis (#4x½ STBH PH)	1A 24-1-24
Speaker, 2-3/4" PM	78B 125
Spring Latch, Battery Cover	18A 176
Thumb Screw, Tuning Knob	27A 232

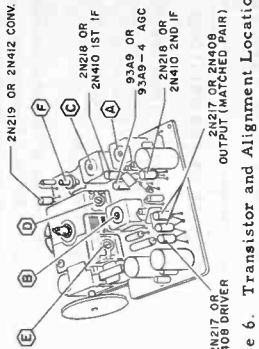


Figure 6. Transistor and Alignment Locations.



### REMOVING THE CHASSIS

The front section of the cabinet is removable for alignment and for servicing the component side of the chassis.

To remove the cabinet front from the chassis, proceed as follows:

1. Remove the battery compartment cover.
2. Remove the batteries.
3. Remove the four Phillips head screws that are visible within the battery compartment.
4. The tuning knob hub is a thumb screw. Remove it by turning counterclockwise.
5. Remove tuning knob by working it forward and off the tuning shaft.
6. Remove the Phillips head screw at the left of the tuning shaft.
7. Gently lift the cabinet front from the cabinet back and chassis.
8. To remove chassis from cabinet back for servicing the wiring side of the chassis:
9. Make sure tuning gang is closed. Then remove the two Phillips head screws that are visible—one near the tuning capacitor and the other in lower left corner as radio is viewed from the front.
10. Lift speaker from cabinet and away from chassis.
11. Gently lift out wiring side of chassis from cabinet.

### SERVICING TRANSISTOR RADIOS

The servicing of Admiral transistor portable radios is similar to that of servicing vacuum-tube sets. Therefore, regardless of whether the circuitry is termed conventional or printed, since the basic circuit functions which are performed by the vacuum-tube can be performed by the transistor, the trouble symptoms and methods of trouble shooting are also similar.

To simplify circuit tracing as well as locating and identifying individual circuit components, refer to figures 4 and 5. Figure 5 is a photograph of the circuit's components as they appear in their exact physical location. Figure 4, refers to the foil side of the board and its schematic symbols illustrate what appears in approximately the same position on the reverse side of the board. Use figure 4 together with the schematic for circuit tracing as well as voltage and /or resistance measurements. After the

trouble has been localized to a particular section, then refer to figure 5 which is a photograph of the top side of the board with all parts showing and identified according to their schematic reference number. Individual parts may then be removed from the circuit and the trouble further isolated. Refer to Service Manual No. S559, available from your Admiral distributor for further general service and repair information of printed circuit wiring.

Remember that transistors are easily damaged by an excessive application of heat. Furthermore, since the transistor is designed to operate with a low voltage, low impedance circuit, it can also be damaged by use of high voltages, high current or an erroneous reversal of polarity. For these reasons certain precautions must be taken either when replacing components, or when making voltage and resistance checks. Therefore, keep in mind these few basic rules:

- a. Soldering ... When wiring components connected to transistors, insert the tips of a long nose pliers or alligator clips between the component to be wired and the transistor. Always solder the portion of the lead between the pliers and component. The pliers or alligator clips serves to conduct heat up its shaft, and away from the transistor which otherwise would be damaged.
- b. Power Supply Voltages ... Watch battery polarity closely. Reversing power supply may damage a transistor or a low voltage rated electrolytic capacitor.
- c. Replacing Transistors ... Never remove or replace a transistor without turning the receiver off. To remove the transistor, place the tips of the long nose pliers or alligator clips between the transistor to be removed and point at which it is soldered to the adjacent component. Any damaging heat will thus be conducted by the pliers shaft or alligator clips away from the transistor. To insert the new transistor, place the pliers or clips between the end of the transistor lead and the transistor to be soldered. Heat will travel up the pliers or clips and thus be diverted from the transistor.
- d. Troubleshooting ... Watch placement of test probes! If a slip of a test probe shorts the transistor base to the collector, the transistor may be damaged.
- e. Use of Signal Generators ... Before connecting any signal generator to the radio circuits, adjust the output attenuator for mini-

mum output. Gradually increase the output attenuator for lowest possible signal capable of giving an adequate indication on the output meter. This will insure maximum alignment accuracy and prevent any possible damage to the transistors due to excessive signal input.

If the signal generator has high output impedance, the output may have to be advanced near maximum to obtain a usable reading.

f. Capacitor Checks ... A number of electrolytic capacitors with low voltage ratings are used. Many capacitor checkers apply voltage to the capacitor sufficient to damage it. Even a small voltage of incorrect polarity can cause damage. This must be remembered in making ohmmeter checks of the circuit.

g. Ohmmeter Checks ... The current supplied by most ohmmeters on low resistance ranges is great enough to damage a transistor. Generally, it is safe to use a vacuum-tube ohmmeter with a battery supply of 3 volts or less if used only on the RX 1,000 or higher range. When making ohmmeter checks of the circuit, always remove the transistors. Know the polarity of the ohmmeter test leads. Even the voltage supplied by an ohmmeter may harm electrolytic capacitors in the circuit if applied in reverse polarity. In general, circuit checks made with an accurate voltmeter are more useful than ohmmeter checks. See section on Ohmmeter Test Of Transistors before using this method.

### TESTING TRANSISTORS

The transistors used in this set are junction type. This type of transistor is more apt to become shorted than open. A shorted transistor will cause a resultant increase in current drain of the power supply. Thus a quick check is to measure the current drain with a milliammeter connected in series with the leads from the power supply. Normal current drain with no signal will be approximately 8 milliamperes. Transistors often become shorted because of excessive current flow, usually indicative of circuit trouble. If a transistor is found to be shorted, check the circuit carefully before installing a new one.

### OHMMETER TEST OF TRANSISTORS

In general, the forward current through a transistor should never be allowed to exceed 15 ma. A milliammeter can be used to determine whether any particular ohmmeter is safe to use in testing transistors.

For ohmmeter testing purposes a transistor can be considered as two germanium diodes connected back-to-back. See figure 3A.

Figure 3B also illustrates the relative resistances for PNP type transistors used in this set. The polarity signs shown in the illustration indicate the polarity of the ohmmeter leads. The transistors must be removed from their sockets

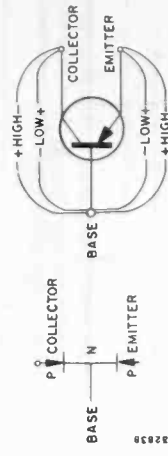


Figure 3A. Germanium Diode Equivalent.  
Figure 3B. Ohmmeter Test of Transistor.

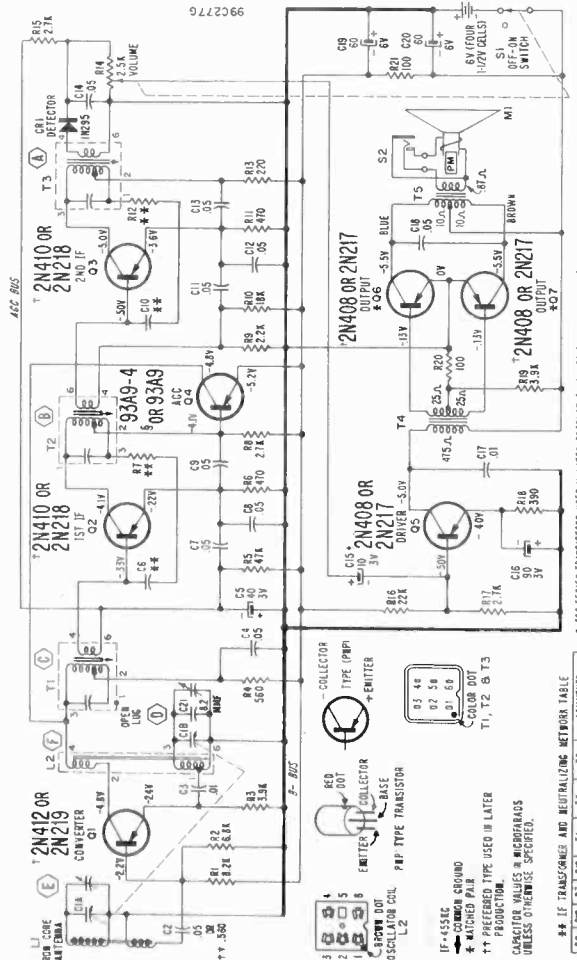
to make this check. Low resistance readings will range between 50 and 500 ohms or more. High resistance readings will range from 1 megohm to several megohms, depending on the ohmmeter used and the transistor type.

### CLEANING CABINET

Wash the cabinet with a strong soap or detergent and water and dry carefully. After cleaning the cabinet, the lustre can be restored by polishing with a good grade of abrasive-free paste wax, using a dampened absorbent cotton or cheesecloth to apply the wax. Before the wax dries, rub off the excess wax with dry cotton and then buff to a polish.

Admiral plastics polish, part number 51All-3 can be used to remove minor scratches and scuff marks. After using this polish, the cabinet should be washed and then waxed to return its high lustre.

**CHASSIS 7M1  
MODELS 7M11 · 7M12 · 7M14 · 7M16 · 7M17 · 7M18**



† 600 SERIES TRANSISTORS USED IN LATER PRODUCTION CHASSIS.  
 † 600 SERIES SHOWN.  
 † INTERMEDIATE PRODUCTION CHASSIS.  
 † 93A9-4 TRANSISTOR USED IN LATER PRODUCTION CHASSIS.  
 † INTERCHANGEABLE WITH 93A0.

† 600 SERIES TRANSISTORS USED IN LATER PRODUCTION CHASSIS.  
 † 600 SERIES SHOWN.  
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 † INTERCHANGEABLE WITH 93A0.

**VOLTAGE DATA**  
 Voltages shown measured with no signal, using fresh batteries.  
 Volume control at minimum; dial set at low frequency end.  
 All readings made between transistor lead terminals and B plus (ground).  
 All voltage readings are negative.

**RESISTORS**

Sym.	Description	Part No.
R1	8,200 ohms, 1/2 watt	60B 8-822
R2	6,800 ohms, 1/2 watt	60B 8-682
R3	3,900 ohms, 1/2 watt	60B 8-392
R4	560 ohms, 1/2 watt	60B 8-561
R5	47,000 ohms, 1/2 watt, 5%	60B 7-473
R6	470 ohms, 1/2 watt	60B 8-471
R7	15,000 ohms, 1/2 watt	60B 8-682
R8	3,000 ohms, 1/2 watt, 5%	60B 8-153
R9	2,700 ohms, 1/2 watt	60B 7-302
R10	2,200 ohms, 1/2 watt	60B 8-222
R11	18,000 ohms, 1/2 watt	60B 8-183
R12	3,300 ohms, 1/2 watt	60B 8-471
R13	39,000 ohms, 1/2 watt, 5%	60B 8-332
R14	220 ohms, 1/2 watt, 5%	60B 7-163
R15	2,500 ohms, 1/2 watt, Volume control (includes switch S1)	75B 36-1
R16	2,700 ohms, 1/2 watt	60B 8-272
R17	2,700 ohms, 1/2 watt	60B 8-272
R18	390 ohms, 1/2 watt	60B 8-391
R19	3,900 ohms, 1/2 watt	60B 8-392
R20	100 ohms, 1/2 watt	60B 8-101
R21	100 ohms, 1/2 watt	60B 8-101

**CAPACITORS**

Sym.	Description	Part No.
C1A	123.1 mmf, max. ant. gang	68B 67-1
C1B	78.2 mmf, max. osc. gang	68B 67-1
C2	560 mf, 5% 500 volts, cer.	65B 45-12
C3	0.1 mf, 600 volt, cer. disc	65B 10-41
C4	0.05 mf, 30 volts, ceramic	65B 45-6
C5	40 mf, 3 volts, electrolytic	67B 32-9
C6	4 mf, 500 volts, ceramic	65D 6-124
C7	5.1 mmf, 5%, 500 volts, cer.	65D 6-1
C8	11 mmf, 5%, 500 volts, cer.	65D 10-175
C9	0.05 mf, 30 volts, ceramic	65B 45-6
C10	0.05 mf, 30 volts, ceramic	65B 45-6
C11	8 mmf, 500 volts, ceramic	65D 6-125
C12	3 mmf, 500 volts, ceramic	65D 6-97
C13	5.6 mmf, 5%, 500 volts, cer.	65D 10-176
C14	0.05 mf, 30 volts, ceramic	65B 45-6
C15	0.05 mf, 30 volts, ceramic	65B 45-6
C16	10 mf, 3 volts, electrolytic	67B 35-6
C17	0.1 mf, 3 volts, electrolytic	67B 32-10
C18	0.1 mf, 600 volts, cer. disc.	65D 10-41
C19	0.05 mf, 30 volts, ceramic	65B 45-6
C20	60 mf, 6 volts, electrolytic	67B 32-8
C21	80 mf, 6 volts, electrolytic	67B 32-8
C22	8.2 mmf, 5%, 500 volts, ceramic, NPO temp. coeff.	65D 10-131

**COILS, TRANSFORMERS, ETC.**

Sym.	Description	Part No.
L1	Antenna, Iron Core	69B 218-3
L2	Oscillator Coil	69B 213-2
T1	Transformer, 1st IF	72C 182-1
T2	Transformer, 2nd IF	72C 182-2
T3	Transformer, 3rd IF	72C 182-3
T4	Transformer, Driver	79B 67-3
T5	Transformer, Output	79B 68-4
M1	Speaker, 2-3/4" PM	78B 125
S1	Switch, On-Off	Part of R14

**MISCELLANEOUS CHASSIS PARTS**

Sym.	Description	Part No.
S2	Earphone Jack	88B 39-3
Bracket	Volume Control Mtg	15B 1513
Operating Instructions		41C 20-168
Rivet	Battery Contact Spring Mtg.	6B 1-13-24
Screw, Spacer		345-250-C2-24
Screw, Volume Control Knob		325-187-C2-24
Speaker Mounting Pad		43A 285
Spring, Battery Contact, Single		18A 173
Spring, Battery Contact, Double		18A 174

**CABINET PARTS**

Sym.	Description	Part No.
Cabinet Back Assembly		A5582
Red (7M12)		A5650
Tan (7M14)		A5651
Turquoise (7M18)		A5652
Yellow (7M16)		34E 115-10
Cabinet Front Assembly		A5583
White (7M12, 7M18)		A5584
Red (7M12)		A5646
Tan (7M14)		A5647
Yellow (7M16)		23D 280
Turquoise (7M18)		36B 75-1
Escutcheon, Cabinet		37A 155-1
Grille, Metal, Black		
Handle, Gold		

\*\*Replace with same type or value used, see schematic table.

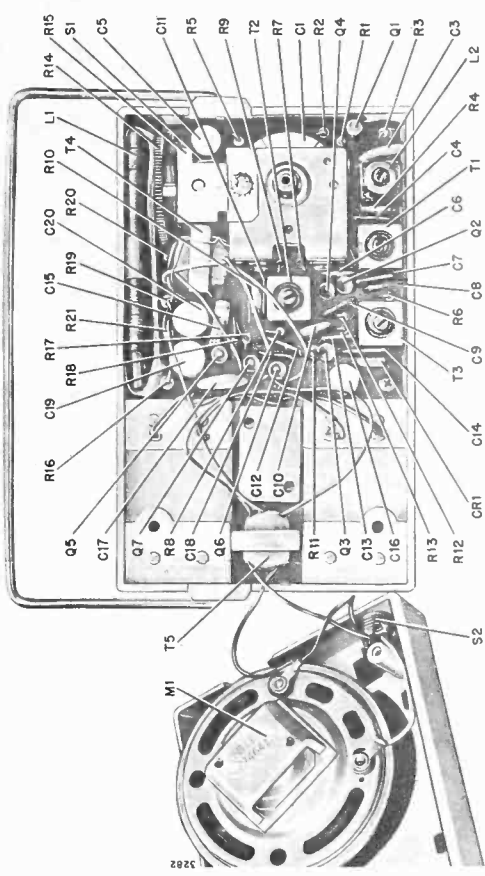


Figure 5. Top View of Chassis Showing Parts Locations.

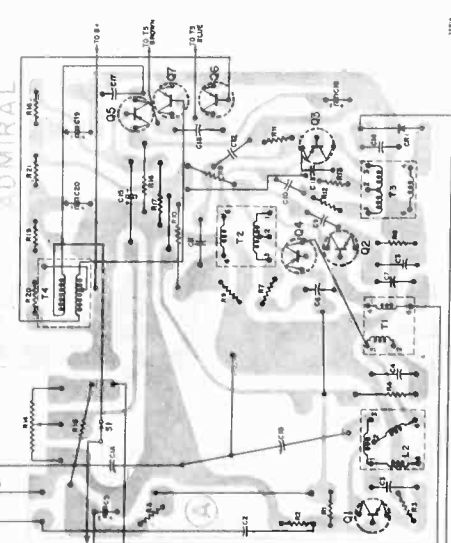


Figure 6. View of Printed Wiring Board. NOTE: Gray area represents printed wiring, black symbols and lines represent components, wiring and connections on opposite side.



# 8K1 CHASSIS

## TRANSISTOR PORTABLE CHASSIS

MODEL	COLOR	CHASSIS
231	Black	8K1
237	Tan	

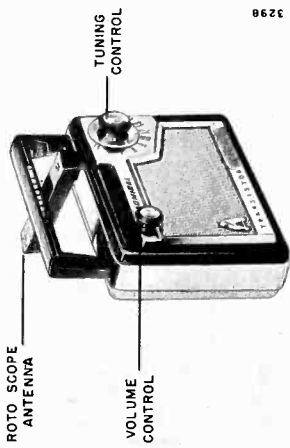


Figure 1. Front View of Cabinet.

### SPECIFICATIONS

**CIRCUIT:** Superheterodyne using eight transistors and one germanium diode.

**FREQUENCY RANGE:** Standard broadcast band, 535 to 1620 KC.

**INTERMEDIATE FREQUENCY:** 455 KC.

**POWER SUPPLY:** This receiver is operated from power supplied by eight, 1½ volts, "C" size, flashlight batteries.

**ANTENNA:** Built-In Ferro-Scope (iron core).

**SPEAKER:** 4" PM with Alnico V magnet. Voice coil impedance, 3.2 ohms.

### BATTERY REPLACEMENT

Open the cabinet by pulling with the fingers on the top rear surface of the cabinet back. This releases the internal spring catch mechanism allowing the cabinet back to swing down on its hinges. The batteries are located inside the long cylindrical plastic case, at the bottom of the cabinet. The battery case is held in position by two spring clamps. Remove the battery case from the cabinet by grasping it between the thumb and fingers and pulling it free of the spring clamps. Use caution when pulling out the case to prevent undue strain on the two wire leads connected to the cap.

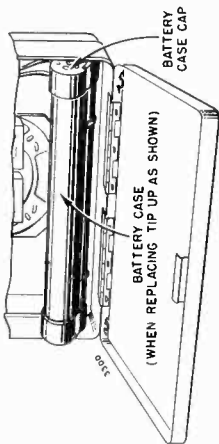


Figure 2. Rear View of Set, Cabinet Back Open.

To remove the batteries, first remove the cap from the case by pulling back the two cap retaining springs and lifting off the cap. Invert the open end of the case a few inches over a table or any convenient surface. This allows the batteries to slide out of the case. The case holds eight "C" size batteries, four in each section. This size battery is commonly used in flashlights and is readily available at drug and hardware stores.

**WARNING!** INSTALL BATTERIES EXACTLY AS SHOWN OR RADIO MAY BE DAMAGED. POSITION BATTERY WITH POSITIVE TERMINAL OF BATTERY CASE FACING IN THE DIRECTION SHOWN. TERMINAL OF BATTERY CASE MUST BE INSERTED INTO RECESS ON COVER.

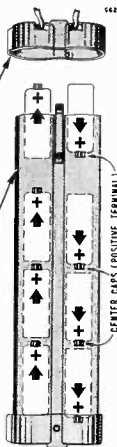


Figure 3. Battery Case, Showing Correct Method for Installing Batteries.

**IMPORTANT:** When installing batteries refer to figure 3, or the diagram on the battery case, to make sure the batteries are being installed in the case properly. When installing cap on case, check the diagram again to make sure the cap is not reversed.

**WARNING: TURNING SET ON EITHER AFTER INSTALLING THE BATTERIES WRONG, OR REVERSING THE CAP CAN**

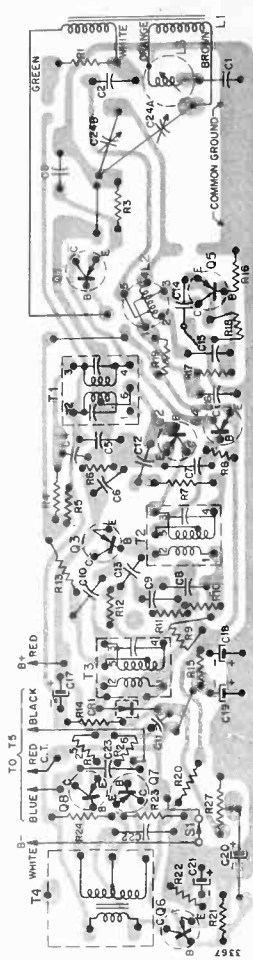


Figure 6. View of Printed Wiring Board. NOTE: Gray area represents printed wiring, black symbols and lines represent components and wiring on opposite side.

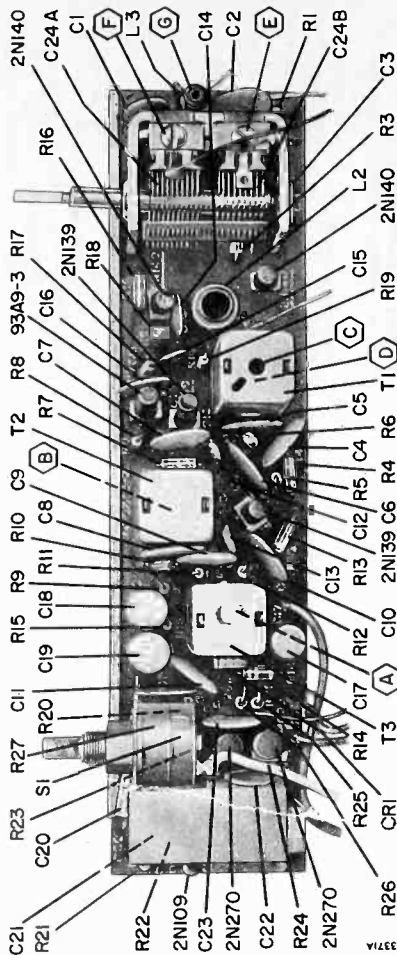


Figure 7. Top View of Chassis Showing Parts Locations.

Description	Part No.	Part No.
Bearing Sleeve, Roto Antenna	27A 255	
Cabinet (less handle, escutcheon, and grille)	Black, Model 231	34E 124-1
Tan, Model 237		34E 124-2
Escutcheon (mounts on cabinet front, around the metal speaker grille)		23D 285-2
Grille, Metal Speaker		36C 77-2
Handle Half, Tongue		33D 234-2
Black, Model 231		33D 234-1
Brown, Model 237		33D 234-1
Handle Half, Groove (the word ANTENNA moulded into plastic)		33D 234-4
Black, Model 231		33D 234-3
Handle Mounting Sleeve (mounts antenna case to handle)		27A 256
Knob, Volume Control (with compression ring)		33C 232-1
Black, Model 231		33C 232-4
Brown, Model 237		33C 232-2
Knob, Tuning (with compression ring)		33C 232-3
Black, Model 231		33C 232-5
Brown, Model 237		33C 232-7
Knob, Pointer (with compression ring)		33C 232-7
Red and Clear, Models 231 and 237		27A 254
Latch Plunger, Roto Antenna		26C 68-2
Monogram "A", Admiral		27A 256
Sleeve, Handle Mtg.		27A 255
Stud, Fastening (mounts handle halves)		27A 255
Handle Latch Plate (mounts to case with handle)	15B 1607	
Nut, Hex, ¼-24 (for mtg. handle to antenna)	2A 2-70-24	
Palnut, ¼-20, (mounts handle to case)	2A 6-11-24	
Palnut, ¾-32 (mounts Volume control)	2A 6-43-24	
Retainer, Nut (antenna case)	15A 1611	
Ring, Retaining, Triangular, Antenna Handle	4A 25-20	
Screws		
#2-56x¼ BHMS PH (for mtg. handle halves)	325-250-C2-70	
#6-32x½ BHSTS PH (mounts antenna cover to antenna case)	1A 56-10-24	
#2x¼ FHSTS PH (for mtg. antenna to handle)	1A 201-3-70	
Socket, Transistor	87B63-4	
Spring, Latch, Roto Antenna	18A 193	
Washer, Spring, Antenna Handle	4A 5-20	
Washer, Flat, Antenna Handle	4B 1-129-24	

### CABINET PARTS

Antenna Case (with oylet)	
Black, Model 231	A5834-2
Brown, Model 237	A5834-1
Antenna Cover	
Black, Model 231	33D 234-6
Brown, Model 237	33D 234-5

CHASSIS 8K1  
MODELS 231 • 237

ALIGNMENT PROCEDURE

Alignment procedure of the 8K1 chassis is similar to alignment procedure of an ordinary vacuum-tube radio. However, there is some what more interaction between circuits, thus requiring greater care in the setting of the adjustments as well as repetition of some of the steps. For best results, follow the alignment procedure exactly as given below.

- Fresh batteries should be used.
- Set Volume control at maximum.
- Connect output meter across speaker voice coil.
  - Use a non-metallic alignment tool for IF adjustments.

Step	Connection of Signal Generator	Signal Gen. Frequency	Receiver Gang Setting	Adjustment Description	Adjustment
1	* Couple radiated signal through several turns of wire or place "hot" lead near antenna.	455 KC	Gang fully open	3rd IF 2nd IF 1st IF	* A, B, C and D for maximum output.
2	Repeat "Step 1".				
3	Same as "Step 1".	1620 KC	Gang fully open	Oscillator Trimmer	E for maximum output.
4	Same as "Step 1".	§ 1400 KC	Tune in on generator signal	Antenna Trimmer	F for maximum output.
5	Same as "Step 1".	600 KC	Tune in on generator signal	Antenna Adjustment Coil	G for maximum output.
6	Repeat "Step 3".				
7	Repeat "Steps 4 and 5".				

\* If signal generator does not produce sufficient output for usable reading, clip hot lead of generator to mixer stator plates of gang; clip ground lead to frame of gang.

§ If difficulty is experienced in obtaining signal output, first rotate IF slug out several turns, then slowly adjust slug in until peak is reached. To align T1, rotate IF slugs out. Then, rotate inward until first peak is reached. A second (false) peak can be obtained by rotating slugs too far inward. Undesirable changes in gain and bandwidth are caused by tuning to the second peak. Adjustments A, B, C and D are made from foil side of wiring board.

§ Antenna trimmer E should first be adjusted for maximum output with generator tuned to 1400 KC. Then try to increase output by rocking signal generator slightly while readjusting trimmer F.

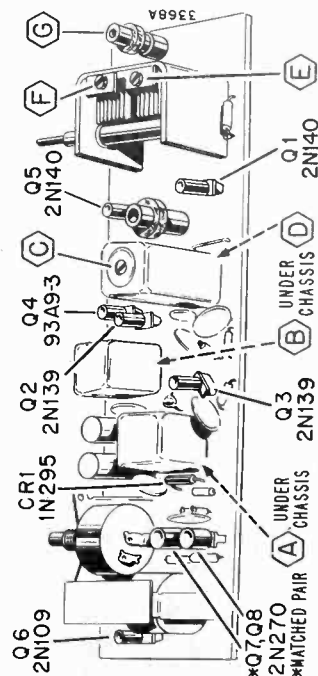
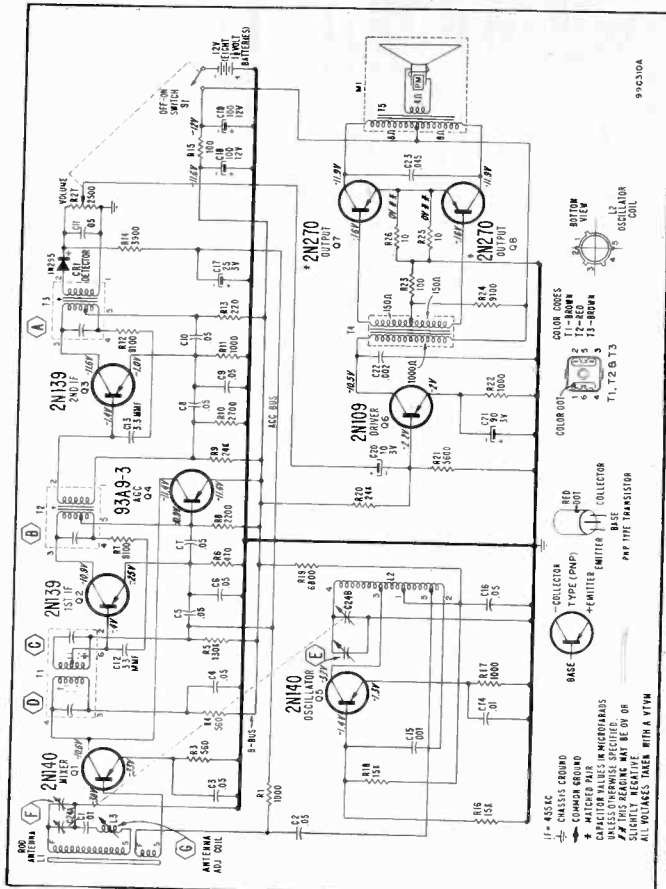


Figure 5. Transistor and Alignment Adjustment Locations.



VOLTAGE DATA

- DC voltages shown measured with no signal, using fresh batteries.
- Volume control at minimum; dial set at low frequency end.
- All readings made with respect to B plus (ground).
- All voltage readings are negative.

PARTS LIST

RESISTORS

Symbol	Description	Part No.
R1	1,000 ohms, 1/2 watt	608 8-102
R3	560 ohms, 1/2 watt	608 8-561
R4	560 ohms, 1/2 watt	608 8-561
R5	130,000 ohms, 1/2 watt, 5%	608 7-134
R6	470 ohms, 1/2 watt, 5%	608 8-471
R7	9,100 ohms, 1/2 watt, 5%	608 7-912
R8	2,200 ohms, 1/2 watt, 5%	608 8-222
R9	24,000 ohms, 1/2 watt, 5%	608 7-243
R10	2,700 ohms, 1/2 watt	608 8-272
R11	1,000 ohms, 1/2 watt	608 8-102
R12	9,100 ohms, 1/2 watt, 5%	608 7-912
R13	220 ohms, 1/2 watt	608 8-221
R14	3,900 ohms, 1/2 watt	608 8-392
R15	100 ohms, 1/2 watt	608 8-101
R16	15,000 ohms, 1/2 watt, 5%	608 7-153
R17	15,000 ohms, 1/2 watt, 5%	608 7-153
R18	1,000 ohms, 1/2 watt	608 8-102
R19	6,800 ohms, 1/2 watt, 5%	608 7-682

CAPACITORS

Symbol	Description	Part No.
C1	.01 mf, 600 volts, cer. disc	65D 10-41
C2	.05 mf, 30 volts, ceramic	65B 45-6
C3	.05 mf, 30 volts, ceramic	65B 45-6
C4	.05 mf, 30 volts, ceramic	65B 45-6
C5	.05 mf, 30 volts, ceramic	65B 45-6
C6	.05 mf, 30 volts, ceramic	65B 45-6
C7	.05 mf, 30 volts, ceramic	65B 45-6
C8	.05 mf, 30 volts, ceramic	65B 45-6
C9	.05 mf, 30 volts, ceramic	65B 45-6
C10	.05 mf, 30 volts, ceramic	65B 45-6
C11	.05 mf, 30 volts, ceramic	65B 45-6
C12	3.3 mmf, 500 volts, NPO temp. coeff.	65D 6-89
C13	3.3 mmf, 500 volts, NPO temp. coeff.	65D 6-89
C14	.01 mf, 600 volts, cer. disc	65D 10-41
C15	.001 mf, 500 volts, cer. disc	65D 10-82
C16	.05 mf, 30 volts, ceramic	65B 45-6
C17	25 mf, 3 volts, electrolytic	67B 32-13
C18	100 mf, 12 volts, electrolytic	67B 32-6

MISCELLANEOUS PARTS

Symbol	Description	Part No.
Battery Case Tube (with springs)	A3836	
Battery Case End Cap (with terminals)	A3857	
Battery Case End Cap (bottom)	33C223-2	
Bearing Plate (Roto Air-anna)	15A 1610	

COILS, TRANSFORMERS, ETC.

Symbol	Description	Part No.
L1	100 mf, 12 volts, electrolytic	67B 32-6
L2	10 mf, 3 volts, electrolytic	67B 32-6
L3	90 mf, 3 volts, electrolytic	67B 32-10
L4	.002 mf, 500 volts, cer. disc	65D 10-125
L5	.045 mf, 30 volts, ceramic	65B 45-11
L6	273.3 mmf, max. anl.	688 66-4
L7	102.1 mmf, max. anl.	688 66-4

**PERMANENTLY DAMAGE THE TRANSISTORS AS WELL AS OTHER PARTS OF THE RADIO. If radio does not play after installing new batteries, turn off immediately, and check for improper battery installation.**

*When inserting the battery case in the clips in the cabinet, tip the case up at a slight angle to insure proper closure of cabinet back.*

Operating power for these portables is provided by eight individual "C" size batteries (commonly used in flashlights). Under normal operating conditions, battery life may be in excess of 1000 operating hours.

Batteries deteriorate more rapidly in excessive heat. Therefore, do not leave this set on or near a radiator or other source of heat. Also note that all batteries will run down with age even when not in use. It is recommended that all batteries be replaced when reception becomes weak, muffled or distorted, or radio fails to operate.

**IMPORTANT!** Run-down batteries should be removed IMMEDIATELY because the chemical action inside the cells will cause some batteries to leak when they are worn out. The acid which leaks from a run-down battery may damage parts of the set or the cabinet because of its corrosive action.

Batteries listed below, or an equivalent substitute may be used.

Burgess .....	1	General .....	914
Eveready .....	935	Ray-O-Vac .....	1LP

Batteries listed above are 1½ volt, "C" size flashlight batteries.

**REMOVING THE CHASSIS**

1. Remove Tuning knob, Volume Control knob and Pointer knob by working them forward and off their shafts.
2. Open cover on rear of cabinet.
3. Remove the battery case.
4. On the front of the cabinet, *loosen* the two Phillips head screws adjacent the tuning shaft.
5. *Loosen* the hex nut that secures the Volume Control to front of case.
6. Hold the printed circuit board while removing the two screws and hex nut, to prevent damage.
7. Gently lift the circuit board from within the case.

8. To remove speaker, straighten the four prongs which hold the speaker assembly to the cabinet and then lift it from the cabinet.

**SERVICING TRANSISTOR RADIOS**

The servicing of Admiral transistor portable radios is similar to that of servicing vacuum-tube sets. Therefore, regardless of whether the circuitry is termed conventional or printed, since the basic circuit functions which are performed by the vacuum-tube can be performed by the transistor, the trouble symptoms and methods of trouble shooting are also similar.

To simplify circuit tracing as well as locating and identifying individual circuit components, refer to figures 6 and 7. Figure 7 is a photograph of the circuit's components as they appear in their exact physical location. Figure 6, refers to the foil side of the board and its schematic symbols illustrate what appears in approximately the same position on the reverse side of the board. Use figure 6 together with the schematic for circuit tracing as well as voltage and/or resistance measurements. After the trouble has been localized to a particular section, then refer to figure 7 which is a photograph of the top side of the board with all parts showing and identified according to their schematic reference number.

Individual parts may then be removed from the circuit and the trouble further isolated. Refer to your Admiral distributor Manual No. S559, available from your Admiral distributor for further general service and repair information of printed circuit wiring.

Remember that transistors are easily damaged by an excessive application of heat. Furthermore, since the transistor is designed to operate with a low voltage, low impedance circuit, it can also be damaged by use of high voltages, high current or an erroneous reversal of polarity. For these reasons certain precautions must be taken either when replacing components, or when making voltage and resistance checks. Therefore, keep in mind these few basic rules:

- a. Soldering . . . . . When replacing components connected to a transistor socket, remove the transistor before doing any soldering. Always solder as quickly as possible. Be sure the soldering iron is hot enough to melt solder quickly before touching it to soldered connections.
- b. Power Supply Voltages . . . . . Watch battery polarity closely. Reversing power supply may damage a transistor or a low voltage rated electrolytic capacitor.

- c. Replacing Transistors . . . . . Never remove or replace a transistor without turning the receiver off. To remove the transistor, gently work it loose from the socket and lift out. When replacing the transistor, carefully align the pins on the transistor and insert into socket.

- d. Troubleshooting . . . . . Watch placement of test probes! If a slip of a test probe shorts the transistor base to the collector, the transistor may be damaged.

- e. Use of Signal Generators . . . . . Before connecting any signal generator to the radio circuits, adjust the output attenuator for minimum output. Gradually increase the output attenuator for the lowest possible signal capable of giving an adequate indication on the output meter. This will insure maximum alignment accuracy and prevent any possible damage to the transistors due to excessive signal input.

Some signal generators designed for vacuum tube circuits have a high output impedance. If this type generator is used, very little signal will be transferred to the transistor amplifier input. The output attenuator may then have to be advanced much further than the "normal" output setting for a comparable vacuum tube radio.

- f. Capacitor Checks . . . . . A number of electrolytic capacitors with low voltage ratings are used. Many capacitor checkers apply voltage to the capacitor sufficient to damage it. Even a small voltage of incorrect polarity can cause damage. This must be remembered in making ohmmeter checks of the circuit.

- g. Ohmmeter Checks . . . . . The current supplied by most ohmmeters on low resistance ranges is great enough to damage a transistor. Generally, it is safe to use a vacuum tube ohmmeter with a battery supply of 3 volts or less if used only on the R X 1,000 or higher range. When making ohmmeter checks of the circuit, always remove the transistors. Know the polarity of the ohmmeter test leads. Even the voltage supplied by an ohmmeter may harm electrolytic capacitors in the circuit if applied in reverse polarity. In general, circuit checks made with an accurate voltmeter are more useful than ohmmeter checks. See section on Ohmmeter Test Of Transistors before using this method.

**TESTING TRANSISTORS**

The transistors used in this set are junction type. This type of transistor is more apt to become shorted than open. A shorted transistor will cause a resultant increase in current drain of the power supply. Thus a

quick check is to measure the current drain with a milliammeter connected in series with the leads from the power supply. Normal current drain with no signal will be approximately 8 milliamperes. Transistors often become shorted because of excessive current flow, usually indicative of circuit trouble. If a transistor is usually to be shorted, check the circuit carefully before installing a new one.

**OHMMETER TEST OF TRANSISTORS**

In general, the forward current through a transistor should never be allowed to exceed 15 ma. A milliammeter can be used to determine whether any particular ohmmeter is safe to use in testing transistors.

For ohmmeter testing purposes a transistor can be considered as two germanium diodes connected back-to-back. See figure 4A.

Figure 4B also illustrates the relative resistances for PNP type transistors used in this set. The polarity signs shown in the illustration indicate the polarity of the ohmmeter leads. The transistors must be removed from

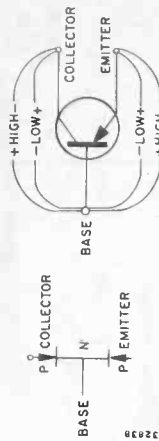


Figure 4A. Germanium Diode Equivalent.  
Figure 4B. Ohmmeter Test of PNP Type Transistor.

their sockets to make this check. Low resistance readings will range between 50 and 500 ohms or more. High resistance readings will range from .1 megohm to several megohms, depending on the ohmmeter used and the transistor type.

**CLEANING CABINET**

To clean the cabinet use a mild solution of soap or detergent and lukewarm water. Apply the solution with a soft rag or sponge. Squeeze out thoroughly before applying, to avoid any excess water from coming in contact with any of the electrical parts. Rub the surface thoroughly with the solution. Wipe with a damp cloth, and then wipe dry with a dry cloth.

**CAUTION:** Never use carbon tetrachloride, acetone, naphtha, alcohol, gasoline, or any commercial cleaning fluids for cleaning the cabinet.

**MODEL 8584**

**SPECIFICATIONS**

**CHASSIS I.44600**

**FREQUENCY RANGE**  
Broadcast 540-1670 Kc  
IF 455 Kc

**TRANSISTORS AND FUNCTIONS**  
2N252 Mixer-OSC  
2N308 IF  
2N310 Reflex IF  
2N185 Output  
2N185 Output  
2N185 Diodes

**SPEAKER**

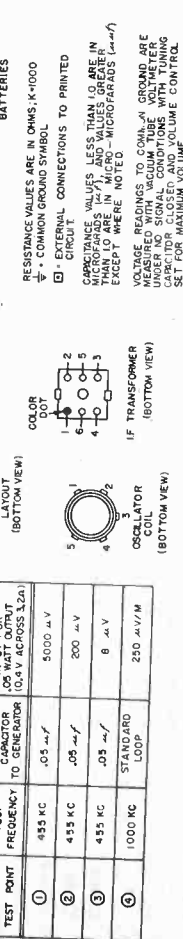
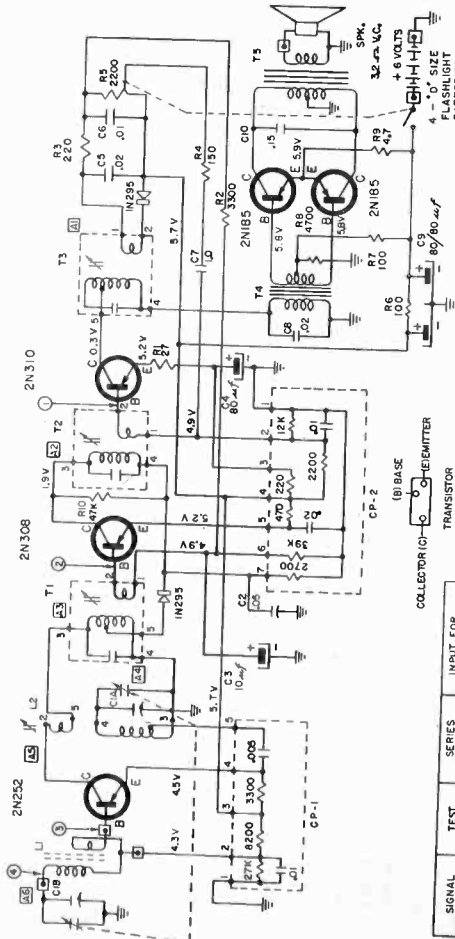
Type: Permanent Magnet  
Size: 4", 3.2 ohm v.c.

**POWER SUPPLY**  
4 - "D" Size Flashlight cells

**POWER OUTPUT**  
Undistorted 100 MW  
Maximum 125 MW

**ALIGNMENT PROCEDURE**

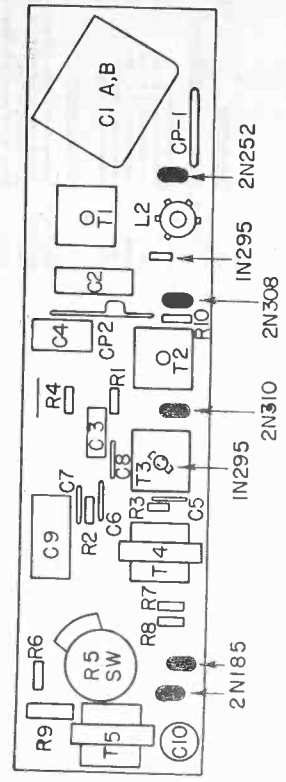
Output meter reading to indicate 50 milliwatts ..... 0.4V  
Output meter connection ..... Across speaker voice coil  
Connection of generator ground lead ..... Common Ground  
Generator Modulation ..... 30% 400 Cycles  
Position of volume control ..... Fully Clockwise



RESISTANCE VALUES ARE IN OHMS; K-1000  
□ EXTERNAL CONNECTIONS TO PRINTED  
MICROFARADS VALUES LESS THAN 10 ARE IN  
EXCEPT WHERE IN MICRO-MICROFARADS (μm.f.)  
VOLTAGE READINGS TO COMMON GROUND ARE  
UNLESS OTHERWISE NOTED.  
UNDER NO SIGNAL CONDITIONS WITH TUNING  
SET FOR MAXIMUM VOLUME CONTROL.

Position of Variable	Generator Frequency	Dummy Antenna	Generator Connections	Trimmers Adj. in order shown for Max. Output	Function of Trimmer
Open	455 Kc	.05 μf	C1A	A1 (Top of T8) A2 (Top of T2) A3 (Top of T1) A4 A6	I. F. I. F. I. F. Oscillator Antenna
Open	1670 Kc		*Test Loop	Check Point	
1400 Kc			*Test Loop		
600 Kc			*Test Loop		

\*Standard Hazeltine Test Loop Model 1150 or 3 turns of wire about 6" in diameter placed about one foot from the set loop.  
The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the AVC action of the receiver ineffective.



**PARTS LIST**

SCHEMATIC LOCATION	PART NO.	DESCRIPTION	LIST NO.
C1A, B	45789-1	Variable	1.25
C2	44396-4	80 μf., 10V., Tubular	1.50
C4	44396-5	10 μf., 10V., Elect.	1.50
C5, 8		.01 μf., Disc.	1.50
C6		.01 μf., Disc.	2.50
C7		1 μf., 3V. Disc.	2.50
C9		80-80/10V., Elect.	10.50
C10		.15 μf., Tubular	10.50
R1		27 ohm, 1/2W., 10%	10.50
R2		3300 ohm, 1/2W., 10%	10.50
R3		150 ohm, 1/2W., 10%	50
R4		150 ohm, 1/2W., 10%	75
R5		Control, Volume & Switch	50
R6, 7		100 ohm, 1/2W., 10%	1.50
R8		4700 ohm, 1/2W., 10%	1.50
R9		4.7 ohm, 1/2W., 10%	1.50
R10		47K., 1/2W., 10%	4.50
T1		Coil, Oscillator	1.25
T2		Transformer, 1st I. F.	1.50
T3		Transformer, 2nd I. F.	1.50
T4		Transformer, 3rd I. F.	1.50
T5		Transformer, Input	2.50
T6		Transformer, Output	2.50
T7		Grille Tube	1.50
T8		Speaker, 4" P. M., 3.2 ohm v.c.	4.50
T9		Coupling Unit	1.25
T10		Chassis Bump	1.50
L1	45478-55	Antenna Rod & Handle Assembly, Blue	3.00
L2	45478-93	Antenna Rod & Handle Assembly, Red	3.00

**MODEL 9562**

**SPECIFICATIONS**

**CHASSIS 1. 40900**

**FREQUENCY RANGE**  
Broadcast 540-1620Kc  
IF 455Kc

**SPEAKER**

Type: Permanent Magnet  
Size: 5 1/4"  
Voice Coil Impedance 3.2 ohms

**TRANSISTORS AND FUNCTIONS**

2N212 Mixer  
2N211 Oscillator  
2N94 1st IF  
2N94 2nd IF  
2N35 Driver  
2N214 Output  
2N214 Output

**POWER SUPPLY**

6 - 1 1/2 Volt "D" Size Cells

**POWER OUTPUT**

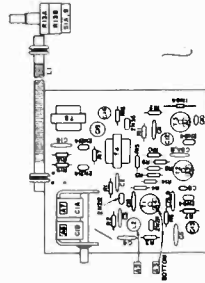
Type: Push-Pull  
Undistorted  
Maximum  
125 MW  
250 MW

**ALIGNMENT PROCEDURE**

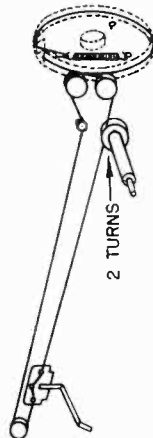
**PRELIMINARY**  
Output meter reading to indicate 50 milliwatts ..... 0.4V  
Output meter connection ..... Across speaker voice coil  
Connection of generator ground lead ..... Common Ground  
Generator Modulation ..... 30% 40 cycles  
Position of volume control ..... Fully Clockwise  
Position of tone control ..... Maximum Clockwise

Position of Variable	Generator Frequency	Dummy Antenna	Generator Connections	Trimmers Adj. in order shown for Max. Output	Function of Trimmer
Open	455 Kc	.05 µf	C1A	A1, 2, 3, 4	I. F. Oscillator
Open	1670 Kc		*Test Loop A6		Antenna
1400Kc	1400 Kc		*Test Loop A7		
600Kc	600 Kc		*Test Loop	Check Point	

\*Standard Hazeltine Test Loop Model 1150 or 3 turns of wire about 6" in diameter placed about one foot from the set loop.  
The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the AVC action of the receiver ineffective.  
**WARNING:** Since a DC voltage exists across the oscillator section (C1B) of the variable capacitor, it is recommended that the plates in this section not be adjusted unless absolutely necessary for calibration purposes.



POSITION WITH VARIABLE AT MAXIMUM CAPACITY



2 TURNS

**PARTS LIST**

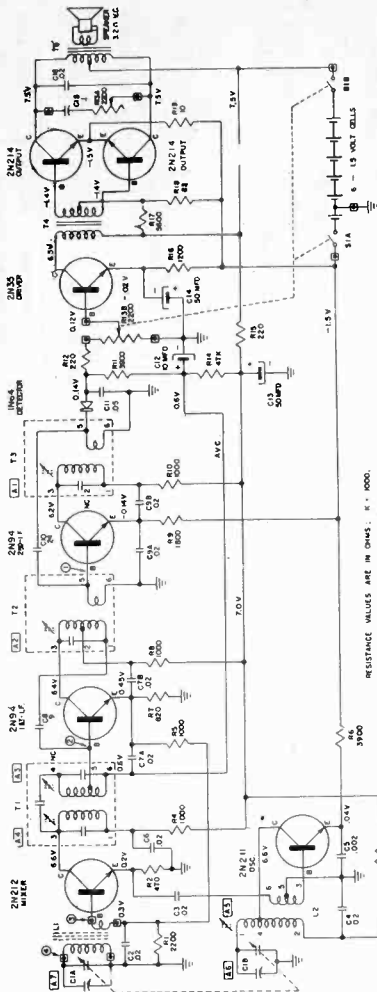
DESCRIPTION	LIST	SCHEMATIC LOCATION	PART NO.	DESCRIPTION	LIST
<b>CAPACITORS</b>				<b>COILS &amp; TRANSFORMERS (continued)</b>	
Variable	2.00	L2	44066-1	Coil, Oscillator	.65
.02 µf., Disc.		T1	43872	Transformer, I. F. 1st	4.15
.02 µf., Disc.		T2	43873	Transformer, I. F. 2nd	2.35
.02 µf., Dual Disc.	.40	T3	43960	Transformer, I. F. 3rd	2.35
9 µf., Disc.		T4	43865	Transformer, Input	2.35
24 µf., Disc.		T5	43864	Transformer, Output	2.35
10 µf./10V., Elect.	.80			<b>MISCELLANEOUS</b>	
50 µf./10V., Elect.	.80			Cabinet Assy., British Tan	17.40
.22 µf.				Cabinet Assy., Alligator	17.40
<b>RESISTORS</b>				Knob, Tuning & Tone	.25
2200 ohm, 1/2W., 10%		R13A, B, SW1	44055	Control, Volume, Tone &	.25
470 ohm, 1/2W., 10%		A, B	43816	Switch (2200 ohm)(200 ohm)	1.80
1000 ohm, 1/2W., 10%			43941-1	Puller Assembly	.35
3900 ohm, 1/2W., 5%			44114	Pointer	.25
820 ohm, 1/2W., 5%			43989	Speaker, 5 1/4" P. M.	4.20
1800 ohm, 1/2W., 10%			44055-1	Handicaps	1.25
220 ohm, 1/2W., 20%			44055	Handicap Handle	1.25
47K., 1/2W., 5%			44016	Base	3.35
100 ohm, 1/2W., 10%			44017	Wire Grille	1.15
5600 ohm, 1/2W., 5%			44015	Metal Grille	1.40
82 ohm, 1/2W., 10%			44036-1	Contact Board Assy., Rear	1.10
10 ohm, 1/2W., 10%			44058-1	Contact Board Assy., Front	1.10

**COILS & TRANSFORMERS**

\* Cabinet Assembly consists of: Dial crystal and nameplate

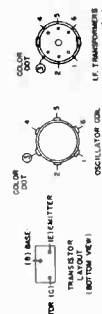
L1 44067-1 Red Antenna Assembly 1.54

MODEL 9562 43917 756



RESISTANCE VALUES ARE IN OHMS. R = 1000.  
CAPACITANCE VALUES LESS THAN 100 P.F. IN MICROFARADS  
MICRO-MICROFARADS (µµF) EXCEPT WHERE NOTED.  
VALUABLE READING TO COMMON GROUND ARE CALCULATED  
CONDITIONS WITH TUNING CAPACITOR CLOSED TO  
VARIABLE CAPACITOR AT MAXIMUM CAPACITY POSITION.

SIGNAL RELAY POSITION	RELAY	RELAY TO GENERATOR	INDICATOR TO ANTENNA	INDICATOR TO ANTENNA
1	455 Kc	0.5 µf	1000 µv	1000 µv
2	455 Kc	0.5 µf	4.5 µv	4.5 µv
3	455 Kc	0.5 µf	4.5 µv	4.5 µv
4	600 Kc	EXTENDED LOAD	250 µv	250 µv



EXTERNAL CONNECTION TO PRINTED CIRCUIT

# MODEL 9574

# CHASSIS I.43000

## SPECIFICATIONS

**FREQUENCY RANGE**  
Broadcast  
IF

540-1670Kc  
455Kc

**SPEAKER**  
Type: Permanent Magnet  
Size: 5"  
Voice Coil Impedance 3.2 ohms

**POWER SUPPLY**  
2 - 9 Volt Battery  
(Parallel Connection)  
Eveready 276, Burgess D6,  
NEDA 1603, Ray-o-Vac 1603

**POWER OUTPUT**  
Undistorted  
Maximum  
300MW  
500MW

**TRANSISTORS AND FUNCTIONS**  
2N212 Mixer-OSC  
2N94 1st & 2nd IF  
2N213 Driver  
2N241A Output  
OR  
2N188A  
2N241A Output  
OR  
2N188A

## ALIGNMENT PROCEDURE

Output meter reading to indicate 50 milliwatts ..... 0.4V  
Output meter connection ..... Across speaker voice coil  
Connection of generator ground lead ..... Common Ground  
Generator Modulation ..... 30% 400 cycles  
Position of volume control ..... Fully Clockwise

**Position of Variable**  
Generator Frequency  
Antenna  
Dumy  
Antenna  
Connections  
Trimmers Adj.  
in order shown  
for Max. Output  
Function  
Trimmer

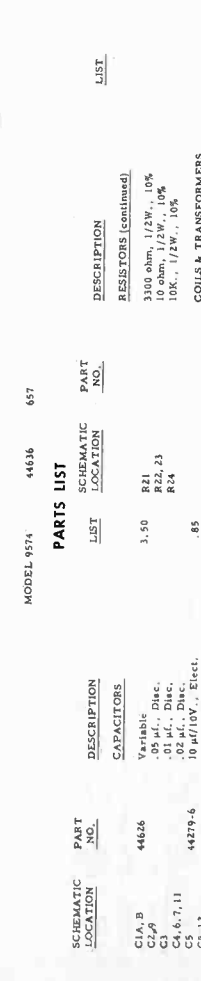
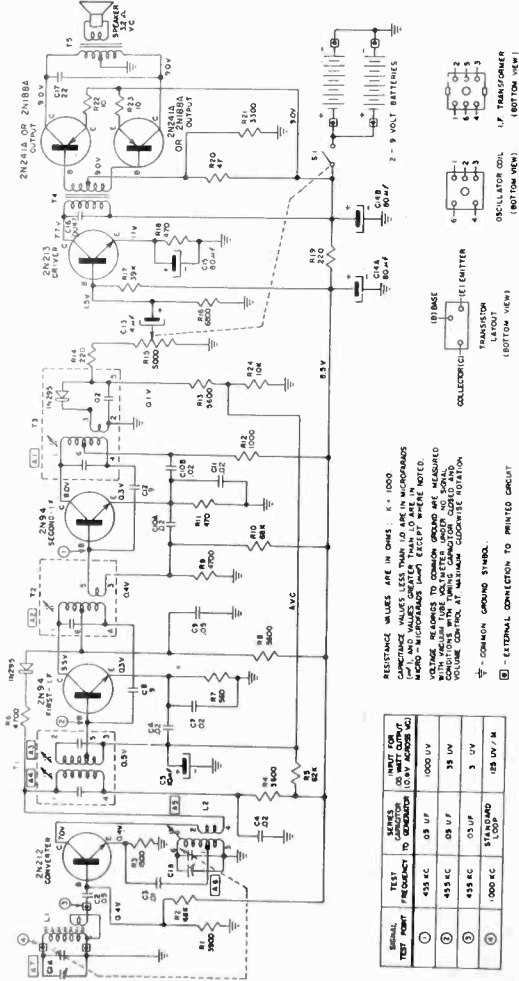
Open 455 Kc  
Open 1400 Kc  
600 Kc

.05 μf C1A

\*Test Loop  
\*Test Loop  
\*Test Loop

A1 (Top of T3)  
A2 (Top of T2)  
A3 (Bottom of T1)  
A4 (Top of T1)  
A6  
A7  
Check Point

\* Standard Hazeltine Test Loop Model 1150 or 3 turns of wire about 6" in diameter placed about one foot from the set loop.  
The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the AVC action of the receiver ineffective.



### PARTS LIST

SCHEMATIC LOCATION	PART NO.	DESCRIPTION	SCHEMATIC LOCATION	PART NO.	DESCRIPTION
C1A, B	44626	Variable	R21	3.00	3300 ohm, 1/2W., 10%
C2, A		.05 μf., Disc.	R22, 23	10.00	10 ohm, 1/2W., 10%
C3		.01 μf., Disc.	R24	100.	100., 1/2W., 10%
C4		.02 μf., Disc.	L1	44571-67	COILS & TRANSFORMERS
C5, 6, 7, 11	44279-6	10 μf/10V., Elect.	L2	44571-67	Red Anodes and Handle
C8, 12		.02 μf., Dual Disc.	L3	44571-67	Coil with
C10A, B	44398-1	4 μf/10V., Elect.	L4	44571-67	Transformer, I. F. 1st
C13	44397-2	80-80 μf/10V., Elect.	L5	44571-67	Transformer, I. F. 2nd
C14	44397-3	80-80 μf/10V., Elect.	L6	44571-67	Transformer, I. F. 3rd
C15	44279-1	0.047 μf/10V., Elect.	L7	44571-67	Transformer, Output
C16		.22 μf., 100V., P. T.	L8	44571-67	Transformer, Output
C17			L9	3.00	3.00
R1		3900 ohm, 1/2W., 5%	L10	10.00	10.00
R2, 10		68K., 1/2W., 5%	L11	10.00	10.00
R3, 4, 13		1500 ohm, 1/2W., 10%	L12	2.50	2.50
R5		820 ohm, 1/2W., 5%	L13	2.50	2.50
R6, 9		4700 ohm, 1/2W., 10%	L14	4.00	4.00
R7, 11, 18		560 ohm, 1/2W., 5%	L15	4.00	4.00
R8, 12, 16		470 ohm, 1/2W., 10%	L16	3.00	3.00
R14, 19		220 ohm, 1/2W., 10%	L17	3.00	3.00
R16		6800 ohm, 1/2W., 10%	L18	3.00	3.00
R17		39K., 1/2W., 10%	L19	3.00	3.00
R20		47 ohm, 1/2W., 10%	L20	3.00	3.00

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CHASSIS I. 43000



# MODEL 8576

# CHASSIS 1.41400

## SPECIFICATIONS

**FREQUENCY RANGE**  
Broadcast  
IF

540-1670 Kc  
455 Kc

### SPEAKER

Type: Permanent Magnet  
Size: 2 3/4"  
Voice Coil Impedance 12 ohms

### TRANSISTORS AND FUNCTIONS

ZN212 Mixer-OSC.  
1st I.F.  
ZM94 2nd I.F.  
ZN35 Driver  
ZN321 Output  
OR  
ZN241A  
OR  
ZN270

**POWER SUPPLY**  
9 Volt Battery

**POWER OUTPUT**  
Undistorted  
Maximum 35M W  
50M W

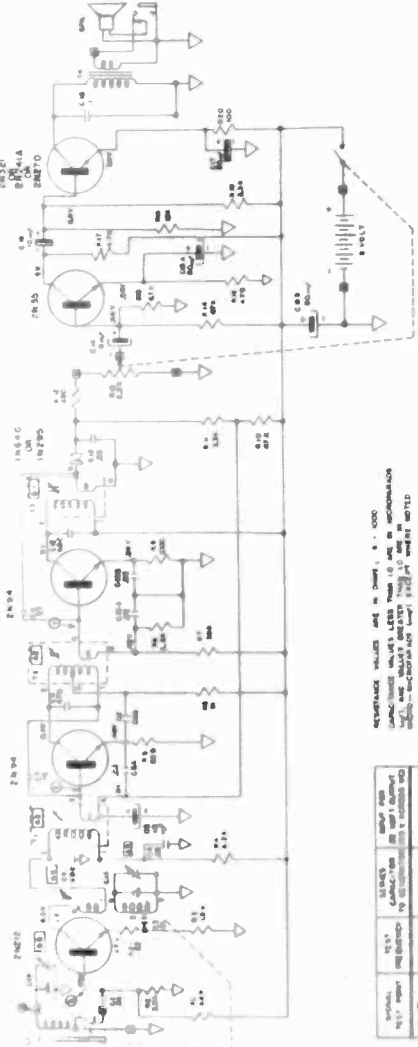
### ALIGNMENT PROCEDURE

#### PRELIMINARY

Output meter reading to indicate 20 milliwatts ..... 0.5V  
Output meter connection ..... Across speaker voice coil  
Connection of generator ground lead ..... Common Ground  
Generator Modulation ..... 30% 40 Cycles  
Position of Volume Control ..... Fully Clockwise

Position of Variable	Generator Frequency	Dummy Antenna	Generator Connections	Trimmers Adj. in order shown for Max. Output	Function of Trimmer
Open	455 Kc	.05 µf	C1B	A1, 2, 3, 4	I. F.
Open	1670 Kc		*Test Loop	A5	Oscillator
1400 Kc	1400 Kc		*Test Loop	A6	Antenna
600 Kc	600 Kc		*Test Loop		Check Point

\*Standard Hazeltine Test Loop Model 1150 or 3 turns of wire about 6" in diameter placed about one foot from the set loop.  
The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the AVC action of the receiver ineffective.



RESISTANCE VALUES ARE IN OHMS, K = 1000  
CAPACITANCE VALUES LESS THAN 10 µF ARE IN MICROFARADS  
ALL VALUES ARE IN PARALLEL UNLESS OTHERWISE NOTED  
ALL VALUES ARE IN SERIES UNLESS OTHERWISE NOTED  
ALL VALUES ARE IN SERIES UNLESS OTHERWISE NOTED  
VOLUME CONTROL OF SIGNAL GENERATOR IS CALIBRATED  
VOLUME CONTROL OF SIGNAL GENERATOR IS CALIBRATED  
VOLUME CONTROL OF SIGNAL GENERATOR IS CALIBRATED

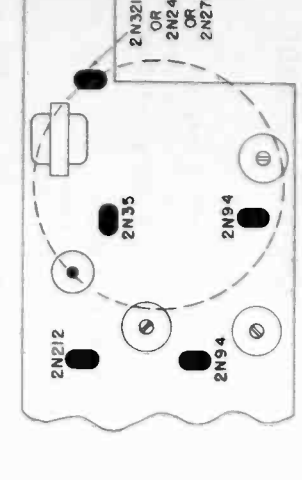
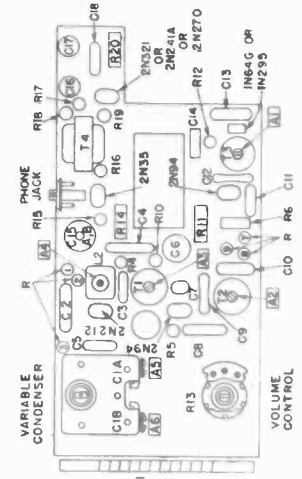


### MODEL 8576 44743 457

#### PARTS LIST

SCHEMATIC LOCATION	PART NO.	DESCRIPTION	LIST
C1A, B	44730	Variable	2.50
C1, 11		50 pf., Disc.	F16
C2		50 pf., Disc.	F18
C3		50 pf., Disc.	F21
C4, 12		60 pf., Mix.	
C4, 16		10 pf., 10V., Elect.	.85
C7		18 mf., Disc.	
C8, 10		.01 pf., Dual Disc.	
C9		70 pf., Disc.	L1
C11		4 pf., 10V., Elect.	T1
C14		90-80/10V., Elect.	T3
C18A, B		85 pf., 18V., Elect.	1.50 T4
C19		.1 pf., Disc.	1.00 T4
B1	44559-28	470 ohm, 1/2W., 10%	2.10
B2	44559-25	12K., 1/2W., 5%	6.25
B3	44728-29	12K., 1/2W., 5%	.25
B4	44728-29	22 ohm, 1/2W., 10%	.35
B5	44727	Knob, Volume, Turquoise	1.00
B6	44797	Knob, Tune	1.00
B7	44804-1	Knob, Insert	1.00
B8	44820	Clip	5.50
B9	44548	Speaker, 2 3/4" P.M., 12 ohm v.c.	2.00
B10	44952-1	Earphone Jack	.25
B11, 19	44952-2	Earphone Assembly - Male	2.50
B12	45000-2	Ballport Strap Assembly - Female	2.00
B13, 17		Control, Volume & Switch (2200 ohm)	2.00
B14		470 ohm, 1/2W., 10%	
B15, 17		470 ohm, 1/2W., 10%	
C1A, B	44559-28	*Cabinet Assembly, Ebony	6.25
C1, 11	44728-29	*Cabinet Assembly, Turquoise	.25
C2	44728-29	Knob, Volume, Ebony	.35
C3	44728-29	Knob, Tune, Turquoise	1.00
C4, 12	44797	Knob, Insert	1.00
C4, 16	44804-1	Clip	5.50
C7	44820	Speaker, 2 3/4" P.M., 12 ohm v.c.	2.00
C9	44548	Earphone Jack	.25
C11	44952-1	Earphone Assembly - Male	2.50
C14	44952-2	Ballport Strap Assembly - Female	2.00
C18A, B	45000-2	Control, Volume & Switch (2200 ohm)	2.00
C19		470 ohm, 1/2W., 10%	
C19		470 ohm, 1/2W., 10%	

\*Cabinet Assembly includes Back, Front, Exciter and Grille



# MODEL 9577 CHASSIS 1.41700

## SPECIFICATIONS

**FREQUENCY RANGE**  
Broadcast 540-1670Kc  
IF 455Kc

**SPEAKER**  
Type: Permanent Magnet  
Size: 2 3/4"  
Voice Coil Impedance 12 ohms

## TRANSISTORS AND FUNCTIONS

2N252 Mixer - OSC  
2N253 1st I. F.  
2N254 2nd I. F.  
2N238 Driver  
2N185 Output  
2N185 Output

**POWER SUPPLY**  
9 Volt Battery  
Eveready 226, RCA VS 300,  
Burgess P6, NEDA 1600

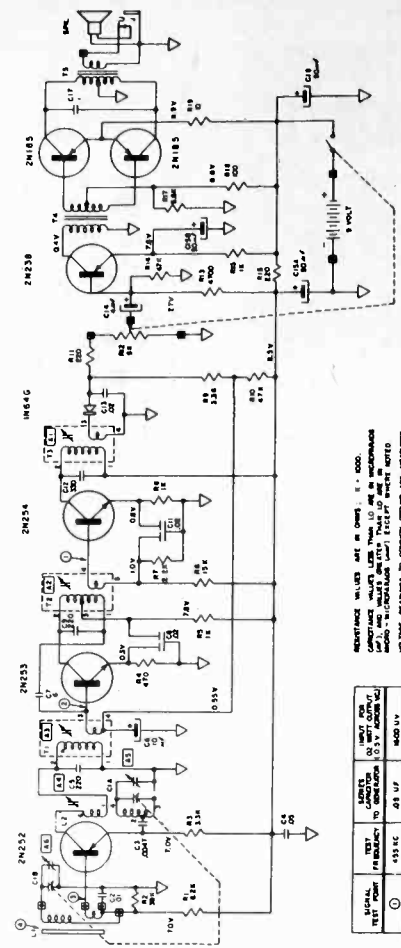
**POWER OUTPUT**  
Undistorted 75MW  
Maximum 125MW

## ALIGNMENT PROCEDURE

Output meter reading to indicate 20 milliwatts ..... 0.5V  
Output meter connection ..... Across speaker voice coil  
Connection of generator ground lead ..... Common Ground  
Generator Modulation ..... 30% 400 cycles  
Position of volume control ..... Fully Clockwise

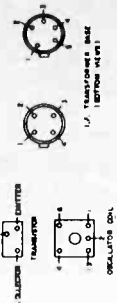
Position of Variable	Generator Frequency	Dummy Antenna Connections	Generator Connections	Trimmers Adj. in order shown	Function of Trimmer
Open	455 Kc		C1B	A1 (Top of T3) A2 (Top of T2) A3 (Top of T1)	I. F. I. F. I. F.
Open	1670 Kc	*Test Loop		A5	Oscillator
1400 Kc		*Test Loop		A6	Antenna
600 Kc		*Test Loop			Check Point

\* Standard Hazeltine Test Loop Model 1150 or 3 turns of wire about 6" in diameter placed about one foot from the set loop.  
The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the AVC action of the receiver ineffective.



SIGNAL TEST POINT	TEST FREQUENCY	TEST SIGNAL	CAPACITOR TO BE USED TO DEVELOPE 100 V. AC	RESISTOR TO BE USED TO DEVELOPE 100 V. AC
1	455 KC	49 UF	MOD UV	
2	455 KC	49 UF	80 UV	
3	455 KC	49 UF	4.5 UV	
4	1670 KC	100 UF	800 UV/M	

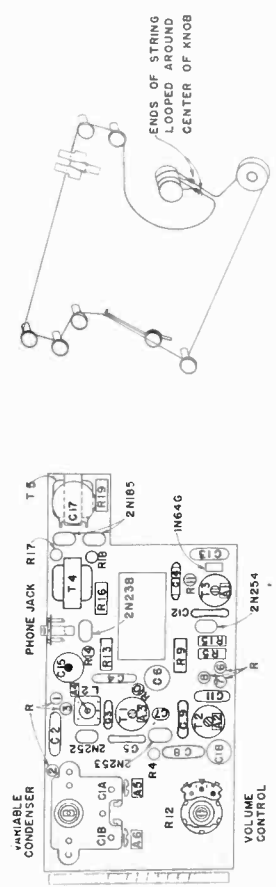
RESISTANCE VALUES ARE IN OHMS, K = 1,000  
CAPACITANCE VALUES ARE IN MICRO FARADS UNLESS OTHERWISE SPECIFIED  
RESISTOR VALUES IN PARENTHESIS ARE 1% TOLERANCE  
VOLUME RELAYED TO COMMON GROUND ARE SHOWN  
COMPONENTS WITH "R" PREFIX ARE TO BE USED FOR  
VOLUME CONTROL AT INITIAL ADJUSTMENT POSITION  
▽ - COMMON GROUND SYMBOL  
⊕ - INTERNAL CONNECTION TO REPTED ABOUT



MODEL 9577 44501 657

## PARTS LIST

SCHEMATIC LOCATION	PART NO.	DESCRIPTION	LIST	SCHEMATIC LOCATION	PART NO.	DESCRIPTION	LIST
C1	44293	Variable	3.75	L1	44511-1	Rod Antenna Assembly	2.10
C2		.01 uf., Disc.		L2	44583-1	Coil, Oscillator	2.10
C3		.0047 uf., Disc.		T1	44855-4	Transformer, I. F. 1st	2.00
C4		.001 uf., Disc.		T2	44855-5	Transformer, I. F. 2nd	2.00
C5,12		330 uf., Mica		T3	44889	Transformer, Input	2.00
C6	44279-6	10 uf./10V., Elect.	.85	T4	44391	Transformer, Output	2.50
C7		6 uf., Disc.					
C8,11		.02 uf., Dual Disc		<b>MISCELLANEOUS</b>			
C9		330 uf., Mica		44491-29	Cabinet Assembly, Ebony	8.75	
C10		330 uf., Mica		44491-31	Cabinet Assembly, Siamese-Pink	8.75	
C13	44396-1	.02 uf., Disc.	.80	44491-32	Cabinet Assembly, Siamese-White	8.75	
C14	44397-2	80-80 uf./10V., Elect.	1.50	44491-33	Knob, Tuning, Ebony	1.25	
C15		80 uf./10V., Elect.		44491-34	Knob, Volume, Ebony	1.25	
C16		80 uf./10V., Elect.		44491-35	Knob, Tuning, Siamese-Pink	1.25	
C17		80 uf./10V., Elect.		44491-36	Knob, Volume, Siamese-Pink	1.25	
C18	44279-7	80 uf./10V., Elect.	.80	44491-37	Knob, Volume, Siamese-White	1.25	
R1		RESISTORS		44491-38	Knob, Volume, Bone White	1.25	
R2		8200 ohm, 1/2W., 10%		44491-39	Pointer	1.25	
R3,9		39K., 1/2W., 5%		44491-40	Speaker, 2 3/4" P.S.I., 12 ohm	5.50	
R4		3300 ohm, 1/2W., 10%		44491-41	Control Volume & Switch (5000 ohm)	2.00	
R5,16		470 ohm, 1/2W., 10%		44491-42	Battery Snap Assembly - Male	1.25	
R6		15K., 1/2W., 5%		44491-43	Battery Snap Assembly - Female	1.25	
R7		2200 ohm, 1/2W., 10%		44491-44	Clip Assembly	1.00	
R8,10,14		47K., 1/2W., 5%		<b>Cabinet Assembly includes Cabinet Back, Cabinet Front with assembled Grille</b>			
R9,11,15		4700 ohm, 1/2W., 5%					
R12		5600 ohm, 1/2W., 5%					
R13		100 ohm, 1/2W., 5%					
R17		10 ohm, 1/2W., 10%					
R18							
R19							



# MODEL 3588

## SPECIFICATIONS

### CHASSIS 1. 45200

#### SPEAKERS

Type: Permanent Magnet  
Size: 4"

Voice Coil Impedance 6.4 ohms

#### POWER SUPPLY

6 - 1 1/2V "D" Size Cells  
Eveready, Burgess, NEDA,  
Ray-o-Vac

#### POWER OUTPUT

Undistorted 300 MW  
Maximum 450 MW

#### TRANSISTORS AND FUNCTIONS

2N121 Mixer-OSC  
2N194 1st & 2nd IF  
2N135 Driver  
2N321 or 2N283 or 2N270 Output

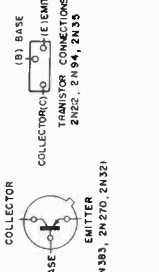
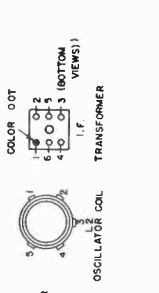
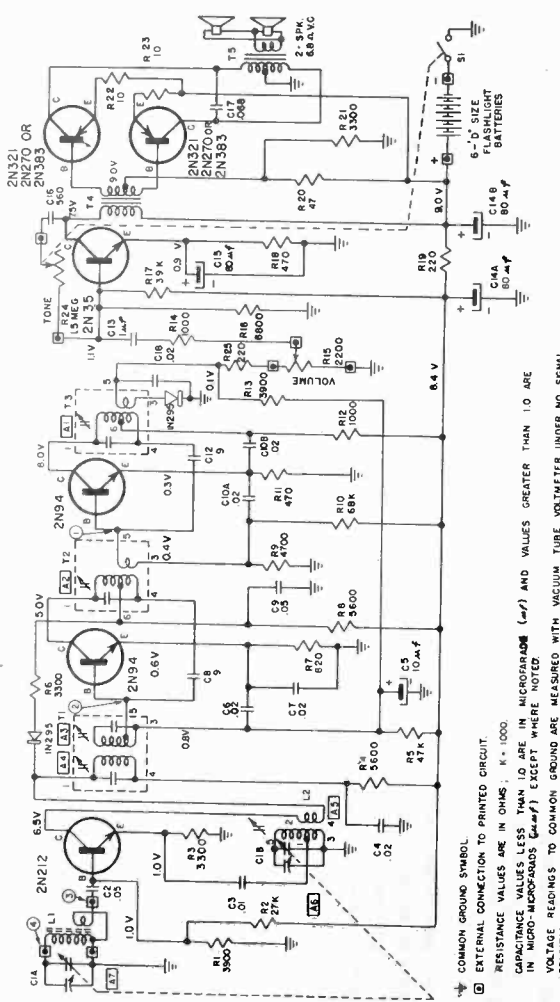
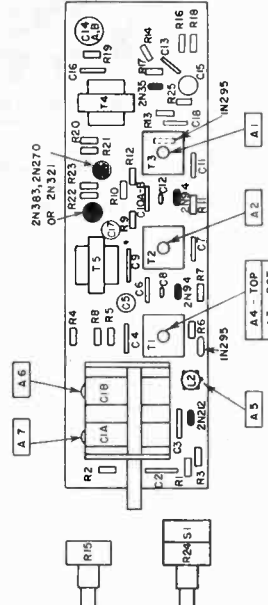
#### ALIGNMENT PROCEDURE

Output meter reading to indicate 50 milliwatts ..... 0.4V  
Output meter connection ..... Across speaker voice coil  
Connection of generator ground lead ..... Common Ground  
Generator Modulation ..... 30% 400 cycles  
Position of volume control ..... Fully clockwise  
Position of tone control ..... Maximum clockwise

Position of Variable	Generator Frequency	Dummy Antenna	Generator Connections	Trimmers Adj. in order shown for Max. Output	Function of Trimmer
Open	455 Kc	.05 µf	C1A	A1 (Top of T3) A2 (Top of T2) A3 (Bottom of T1) A4 (Top of T1)	I. F. I. F. I. F. I. F.
Open	1670 Kc		*Test Loop	A6	Oscillator
1400 Kc			*Test Loop	A7	Antenna
600 Kc			*Test Loop	Check Point	

\*Standard Hazeltine Test Loop Model 1150 or 3 turns of wire about 6" in diameter placed about one foot from the set loop.

The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the AVC action of the receiver ineffective.



COMMON GROUND SYMBOL	EXTERNAL CONNECTION TO PRINTED CIRCUIT
(Symbol)	(Symbol)

RESISTANCE VALUES ARE IN OHMS. R = 1000  
CAPACITANCE VALUES LESS THAN 10 ARE IN MICROFARADS (µF) AND VALUES GREATER THAN 10 ARE IN MICROFARADS (µF) EXCEPT WHERE NOTED  
VOLTAGE READINGS TO COMMON GROUND ARE MEASURED WITH MEDIUM TUBE VOLTMETER UNDER NO SIGNAL CONDITIONS WITH TUNING CAPACITOR CLOSED AND VOLUME CONTROL AT MAXIMUM COUNTERCLOCKWISE ROTATION

SIGNAL TEST POINT	TEST FREQUENCY	TEST SIGNAL (µV FOR 0.5 WATT OUTPUT)	TEST SIGNAL (µV FOR 300 MW OUTPUT)
1	455 KC	0.5 µV	2000 µV (2000 3Z)
2	455 KC	0.5 µV	5 µV
3	455 KC	0.5 µV	5 µV
4	4000	STANDARD LOOP	150 µV/M

SCHEMATIC LOCATION	PART NO.	DESCRIPTION	QUANTITY
C1A, B	45039-2	Variable	2.75
C2, 9	.05 µf., Disc.	Antenna Rod	45534-4
C3	.01 µf., Disc.	Coil, Oscillator	45783-3
C4, 6, 7, 18	.02 µf., Disc.	Transformer, 1st I. F.	44674
C5	10 µf., 10V., Elect.	Transformer, 2nd I. F.	44675
C8, 12	9 µf., Disc.	Transformer, 3rd I. F.	45700-1
C10A, B	.02 µf., Dual Disc.	Transformer, Input	44672
C13	1 µf., 3V., Disc.	Transformer, Output	44671-1
C14A, B	80-80 µf./10V., Elect.	MISCELLANEOUS	
C15	80 µf., 10V., Elect.	Cabinet Front Assembly, Ivory	*46226-67
C16	.00056 µf., Disc.	Cabinet Back, Gray	45433-502
C17	.068 µf., Tubular	Knob	45468-67
R1, 13	3900 ohm, 1/2W., 5%	Battery Carriage	45804-1
R2, 9	27K., 1/2W., 5%	Speaker, 4" P.M., 6.4 ohm v.c.	45600-3
R3, 6, 21	3300 ohm, 1/2W., 10%	Grille Assembly	*45505-3
R4, 8	5600 ohm, 1/2W., 5%	Pulley	45486-1
R5, 10	47K., 1/2W., 5%	Pointer	45457-1
R6	820 ohm, 1/2W., 5%	Chassis Base	45810-1
R7	4700 ohm, 1/2W., 10%	Battery Clip - Female	45811-1
R8	68K., 1/2W., 10%	Battery Clip - Male	45811-2
R9	470 ohm, 1/2W., 10%	Door	45543-50
R10	1000 ohm, 1/2W., 10%		
R11	6800 ohm, 1/2W., 10%		
R12	22K., 1/2W., 10%		
R13	220 ohm, 1/2W., 20%		
R14	47 ohm, 1/2W., 10%		
R15	10 ohm, 1/2W., 10%		
R16	Control, Volume, 2200 ohm		
R17	Control, Tone, 15 meg		
R18	Control, T. & S., 20%		
R19	220 ohm, 1/2W., 20%		
R20	47 ohm, 1/2W., 10%		
R21	10 ohm, 1/2W., 10%		
R22, 23	Control, T. & S., 20%		
R24	220 ohm, 1/2W., 20%		
R25			

#### COILS & TRANSFORMERS

LIST	DESCRIPTION	LIST
2.00	Antenna Rod	2.00
1.25	Coil, Oscillator	1.25
2.50	Transformer, 1st I. F.	2.50
2.00	Transformer, 2nd I. F.	2.00
2.00	Transformer, 3rd I. F.	2.00
3.00	Transformer, Input	3.00
2.75	Transformer, Output	2.75

#### MISCELLANEOUS

LIST	DESCRIPTION	LIST
4.00	Cabinet Front Assembly, Ivory	4.00
5.00	Cabinet Back, Gray	5.00
.30	Knob	.30
2.00	Battery Carriage	2.00
4.00	Speaker, 4" P.M., 6.4 ohm v.c.	4.00
3.00	Grille Assembly	3.00
.50	Pulley	.50
.25	Pointer	.25
1.00	Chassis Base	1.00
.25	Battery Clip - Female	.25
.25	Battery Clip - Male	.25
.60	Door	.60

#### RESISTORS

LIST	DESCRIPTION	LIST
1.13	3900 ohm, 1/2W., 5%	1.13
R2, 9	27K., 1/2W., 5%	R2, 9
R3, 6, 21	3300 ohm, 1/2W., 10%	R3, 6, 21
R4, 8	5600 ohm, 1/2W., 5%	R4, 8
R5, 10	47K., 1/2W., 5%	R5, 10
R6	820 ohm, 1/2W., 5%	R6
R7	4700 ohm, 1/2W., 10%	R7
R8	68K., 1/2W., 10%	R8
R9	470 ohm, 1/2W., 10%	R9
R10	1000 ohm, 1/2W., 10%	R10
R11	6800 ohm, 1/2W., 10%	R11
R12	22K., 1/2W., 10%	R12
R13	220 ohm, 1/2W., 20%	R13
R14	47 ohm, 1/2W., 10%	R14
R15	10 ohm, 1/2W., 10%	R15
R16	Control, Volume, 2200 ohm	R16
R17	Control, Tone, 15 meg	R17
R18	Control, T. & S., 20%	R18
R19	220 ohm, 1/2W., 20%	R19
R20	47 ohm, 1/2W., 10%	R20
R21	10 ohm, 1/2W., 10%	R21
R22, 23	Control, T. & S., 20%	R22, 23
R24	220 ohm, 1/2W., 20%	R24
R25		R25

\*Cabinet Front Assembly includes speaker baffle, grille cloth and nameplate.  
\*\* Grille Assembly includes speaker baffle, grille cloth and nameplate.

# THE BULOVA

POCKET-SIZE  
*ALL Transistor*  
BATTERY PORTABLE RADIO

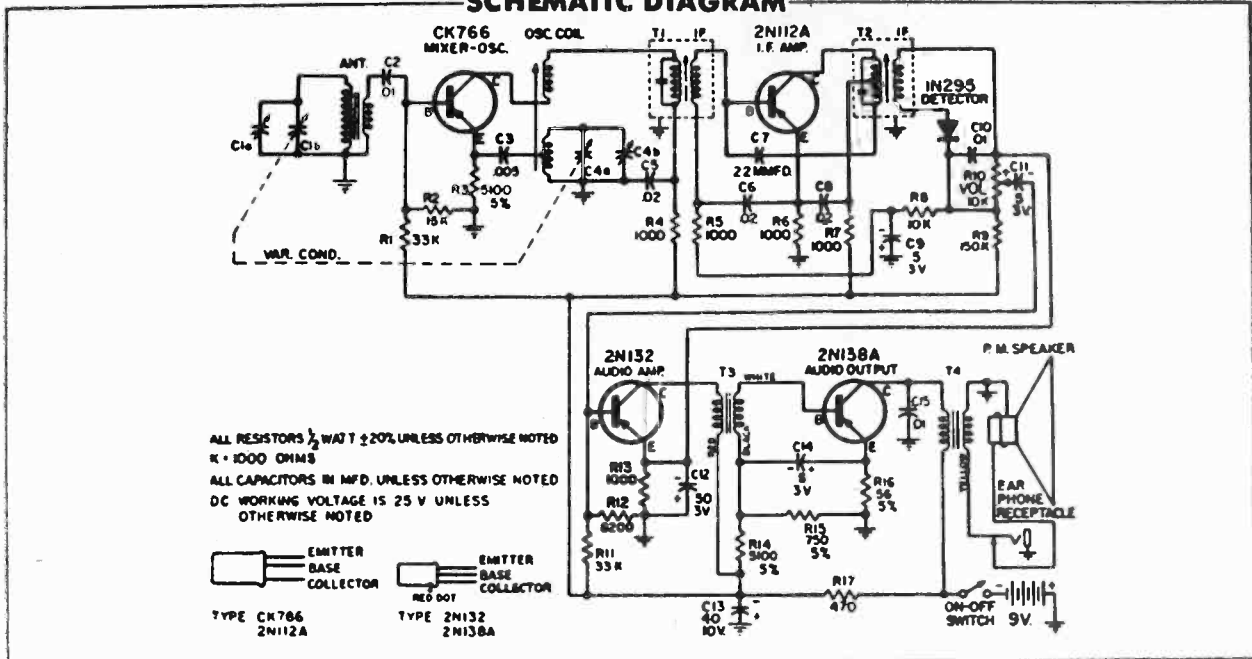
MODEL #270 SERIES

MODEL #290 SERIES

Built with Bulova's Match Precision

MODELS 270, 290, 620; Series

## SCHEMATIC DIAGRAM



557-270C

## ALIGNMENT PROCEDURE

- NOTES:**
1. Remove chassis from case.
  2. Connect 9-volt battery.
  3. Connect A.C. Voltmeter across speaker voice coil.
  4. Turn volume control to maximum.
  5. Adjust signal generator output, 30% modulation at 400 cycles, to obtain 0.3V. across speaker voice coil.

SIGNAL GENERATOR					OUTPUT METER	GANGED CAPACITY	ADJUST FOR MAXIMUM OUTPUT ON METER
CIRCUIT	FREQUENCY	COUPLING CAPACITY	CIRCUIT CONNECTION	GROUND SIDE			
I.F.	455KC	.05MF	To Base of Mixer	To Speaker Frame	Connect in parallel with speaker voice coil		T1, T2
Repeat above step two or three times for best results, keeping generator output in all cases as low as possible to prevent overloading of audio.							
Osc.	1640KC	.05MF	To Base of Mixer	To Speaker Frame	Connect in parallel with speaker voice coil	Open Gang (fully Clockwise)	C4b
CAUTION: Too high an output from signal generator may cause setting of trimmer on a spurious response.							
Osc.	535KC	.05MF	To Base of Mixer	To Speaker Frame	Connect in parallel with speaker voice coil.	Closed Gang (Fully counter-clockwise)	Osc. Coil Core
Osc.	1640KC	.05MF	To Base of Mixer	To Speaker Frame	Connect in parallel with speaker voice coil.	Open Gang (Fully clockwise)	C4b
Ant.	1400KC	Connect 3 turn loop to generator and place near Ant.			Connect in parallel with speaker voice coil.	Tune to 1400KC Signal	C1a (while rocking tuning gang)
Check for alignment and dial calibration at 1000KC and 600KC.							

DeWald Radio Manufacturing Corp.  
LONG ISLAND CITY 1, N.Y.  
U.S.A.

INSTRUCTION SHEET  
MODEL K-544A  
PORTABLE TRANSISTOR BATTERY RECEIVER

The model K-544A is a portable transistor battery receiver. This receiver uses the latest type transistors for best performance. The circuit used is designed for excellent reception and long battery life. The range coverage is 540-1680 Kilocycles.

- The receiver uses a supply of one 9 volt battery EVEREADY #246 OR EQUIVALENT
1. Pull back leather back straps to lift rear flap of cabinet. Place battery in position shown in illustration. Press battery clip firmly into the battery sockets.
  2. When closing rear flap, be sure battery is in proper position, that is with both snaps facing the top of cabinet.
  3. Close back by snapping leather catches.

OPERATION

The knob at the top is a combination on-off switch and volume control. When the knob is turned fully counter-clockwise, the receiver is "OFF". To turn the receiver "ON", rotate this knob in a clockwise direction. Further rotation in this direction increases the volume until the full output is obtained. The large knob on the right is the station selector or tuning knob.

As an added feature, an earphone and cable is available as an accessory item for use with the radio. When the earphone cable plug is inserted in the receptacle provided at right rear of cabinet, under flap, the set's speaker will automatically be disconnected and provide earphone reception only.

This Earphone and cable can be procured from the DeWald dealer from whom you purchased this receiver.

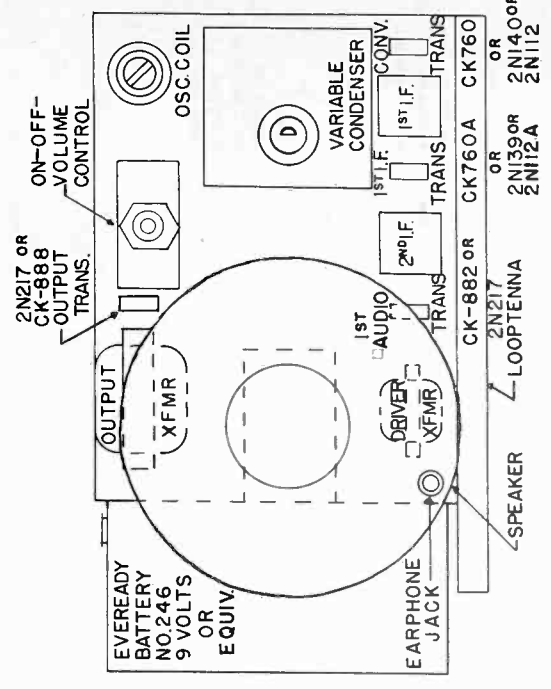
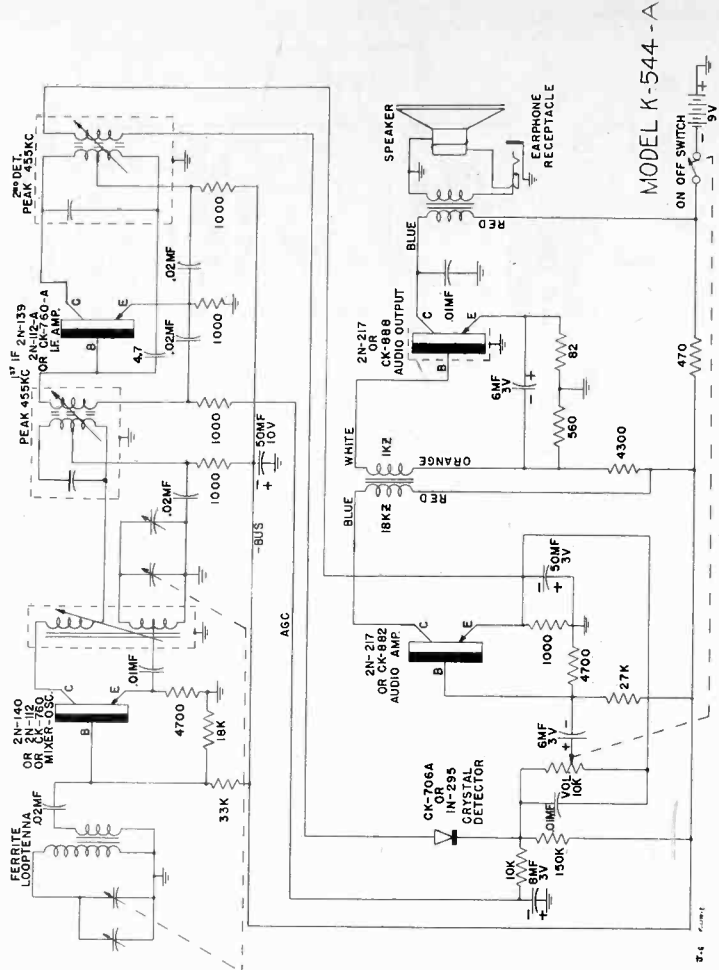
IMPORTANT

Be sure the receiver is turned off when not in use. Since the Bar Loop used in this receiver has a directional effect, it may be found necessary at times to turn the receiver to obtain best reception and a minimum of interference. If receiver is operated on a metal table or similar object, reception will improve if it is placed several inches above the table on a book or similar non-metallic object.

LIST OF REPLACEMENT PARTS

1st I.F.	I-131-3	Cabinet	C-445D	TRANSISTORS, Converter.	CK760/2N112
2nd I.F.	I-131-4	Speaker	S-712	Or	2N140
Osc. Coll.	O-137-E	Earphone Jack	#8570	CK760A/2N112A	CONV.
Bar Loop Ant.	L-138-E	Vol. Control Knob	K-447	Or	2N139
Var. Cond..	C-213	Tuning Knob	K-448A	Audio Driver	CK982 or 2N217
Electrolytic Cond.	E-221	Battery Cable	BC-510	Audio Output	CK988 or 2N217
Vol. Control	V-211			Diode	CK706/1N295

F-1277-B



DeWald Radio Manufacturing Corporation  
 Long Island City 1, New York

U. S. A.

INSTRUCTION SHEET

MODEL L-546

5-WAY MINIATURE PORTABLE TRANSISTOR BATTERY MULTI-AID RECEIVER

"RADIO - MATE"

The model L-546 "Radio-Mate" is a portable transistor battery receiver with many extra uses. It is a high powered pocket portable with good tone and sensitivity. There is a provision for individual listening by inserting a personal earphone through the hole in the cabinet under the "Multi-Aid" switch. Leaving the earphone plugged in and by sliding the "Radio-Multi-Aid" switch to Multi-Aid, this set is converted to a powerful, sensitive and efficient hearing aid. By plugging in a remote speaker into the earphone plug, this set is automatically transformed into an inter-com baby sitter or a sick room calling device. By plugging in the remote speaker and the Multi-Aid switch in the Radio Position this receiver will then deliver additional audio power. This receiver uses an extra long life low-cost single battery that is sufficient to furnish power for approximately six months. The battery used is EVEREADY #246 or EQUIVALENT. As an added feature the shoulder strap handle can be snapped to this unit.

To install the battery in the receiver proceed as follows:

1. Pull back leather back straps to lift rear flap of cabinet. Place battery in position shown in illustration. Press battery clip firmly into the battery sockets.
2. When closing rear flap, be sure battery is in proper position, that is with both snaps facing the top of the cabinet.
3. Close back by snapping leather catches.

OPERATION

The knob at the top is a combination on-off switch and volume control. When the knob is turned fully counter-clockwise, the receiver is "OFF". To turn the receiver "ON", rotate this knob in a clockwise direction. Further rotation in this direction increases the volume until the full output is obtained. The large knob on the right is the station selector or tuning knob.

When the earphone cable plug is inserted in the receptacle provided at right rear of cabinet, the set's speaker will automatically be disconnected and provide earphone reception.

When this receiver is being used as a hearing aid, this unit may be placed on a T. V. set, and by using the small personal ear phone any desired program may be heard by the "Hard of Hearing".

The following accessories can be obtained from the DeWald Dealer, where you purchased this receiver:

- Earphone and Cable ..... S-713 Attachment cable and plug for speaker.... C-512
- Remote speaker in cabinet..... S-714 Long Strap Handle..... H-466

IMPORTANT

Be sure the receiver is turned off when not in use. Since the bar loop used in this receiver has a directional effect, it may be found necessary at times to turn the receiver to obtain best reception and a minimum of interference. If receiver is operated on a metal table or similar object, reception will improve if it is placed several inches above the table on a book or similar non-metallic object.

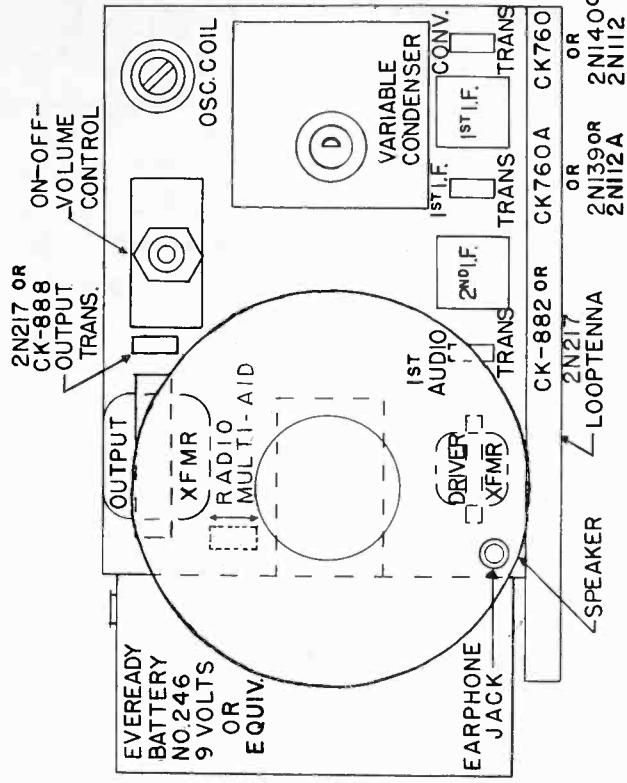
LIST OF REPLACEMENT PARTS

1st I.F. ....	L-131-3	Electrolytic Cond. ....	E-221	Speaker .....	S-712
2nd I.F. ....	L-131-4	Volume Control.....	V-311	Earphone Jack.....	8570
Osc. Coil .....	O-137	Cabinet .....	C-445E	Vol. Control Knob.....	K-447
Bar Loop Ant. ....	L-138A			Tuning Knob.....	K-464
Var. Cond. ....	C-219			Battery Cable .....	BC-510

Transistors

Converter.....	CK760-2N112 or 2N140
I.F. ....	CK760A/2N112A or 2N139
Audio Driver .....	CK882 or 2N217
Audio Output .....	CK888 or 2N217
Diode .....	CK706A/1N295

F-1282



DeWald RADIO MANUFACTURING CORP  
LONG ISLAND CITY 1, N. Y. • U.S.A.

INSTRUCTION SHEET

Model L-703

PORTABLE TRANSISTOR BATTERY RECEIVER

The model L-703 is a portable transistor battery receiver. This receiver uses the latest type transistors for best performance. The circuit used is designed for excellent reception and long battery life. The range coverage is 540-1650 Kilocycles.

The receiver uses a supply of one 9 volt battery. EVEREADY #276 OR EQUIVALENT.

To install the battery in the receiver, proceed as follows:

1. Open back cover by unsnapping tabs.
2. Connect battery clips firmly on battery.
3. Place battery on battery shelf.
4. Be careful not to break wires connected to bar loop antenna.
5. When closing rear cover, be sure battery is in proper position. Do not force cover as this may cause damage.

OPERATION

The knob on the left side from the front is a combination on-off switch and volume control. When the knob is turned fully counterclockwise, the receiver is "OFF." To turn the receiver "ON", rotate this knob in a clockwise direction. Further rotation in this direction increases the volume. The knob on the right is the station selector or tuning knob.

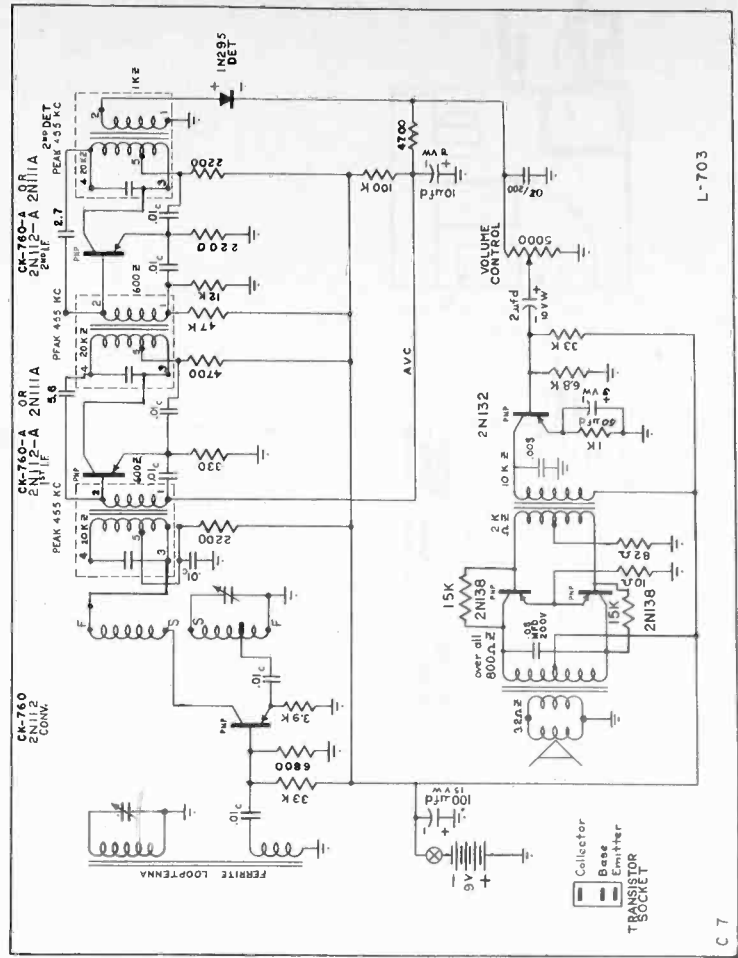
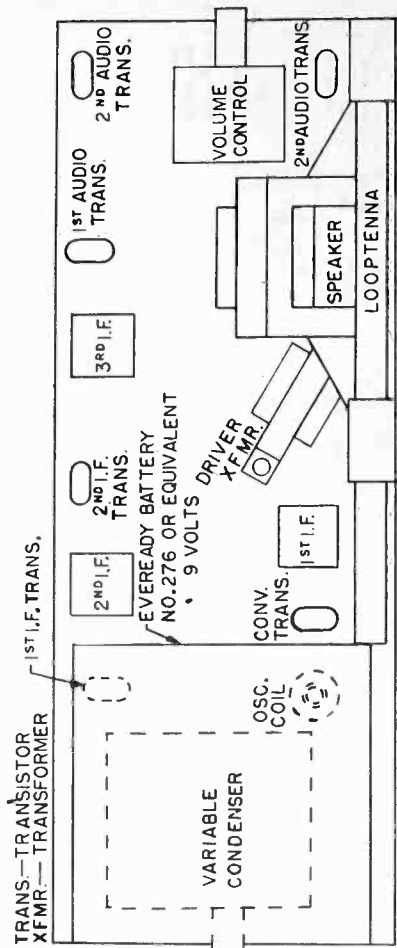
IMPORTANT

Be sure the receiver is turned off when not in use. Since the Bar Loop used in this receiver has a directional effect, it may be found necessary at times to turn the receiver to obtain best reception and a minimum of interference.

- LIST OF REPLACEMENT PARTS
- Volume Control V-310-1
  - Cabinet C-461
  - Speaker S-715
  - Vol. Control K-452-4
  - Tuning Knob K-467
  - Battery Cable BC-513

- 1st. I.F. I-139-1
- 2nd. I.F. I-139-2
- 3rd. I.F. I-139-3
- Osc. Coil O-149
- Bar Loop Ant. L-150
- Electrolytic Cond. E-216

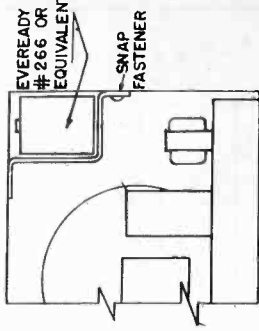
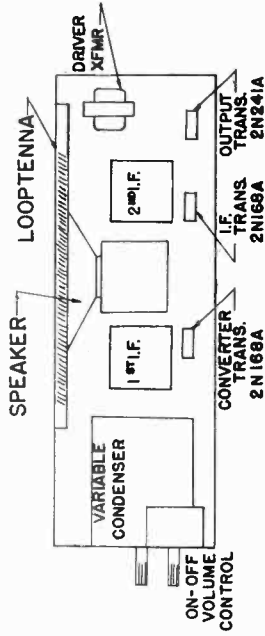
- Transistors CK760/2N112
- Converter CK760A/2N112A
- I.F. or CK759A/2N111A
- Audio Driver CK882/2N132
- P.P. Audio CK888/2N138
- Diode IN295



DeWald  
A Division of  
United Scientific Laboratories Inc.  
Long Island City 1, N.Y. U.S.A.

INSTRUCTION SHEET

MODEL L-414  
PORTABLE TRANSISTOR BATTERY RECEIVER



The Model L-414 is a portable transistor battery receiver. This receiver uses the latest type transistors for best performance. The circuit used is designed for excellent reception and long battery life. The range coverage is 540-1650 Kilocycles. This receiver is of the Reflex type. The three transistors definitely acts as a four transistor unit. The 2nd Transistor is used as an I.F. Amplifier and then as an audio driver.

The receiver uses a supply of one 9 volt battery. EVEREADY #266 or BURGESS #M6 or EQUIVALENT.

- To install the battery in the receiver, proceed as follows:
1. Pull back leather back straps to lift rear flap of cabinet. Place battery in position shown in illustration. Press battery clips firmly into the battery sockets. Snap battery strap in clip as shown in illustration.
  2. When closing rear flap, be sure battery is in proper position. Do not force cover as this may cause damage.

OPERATION

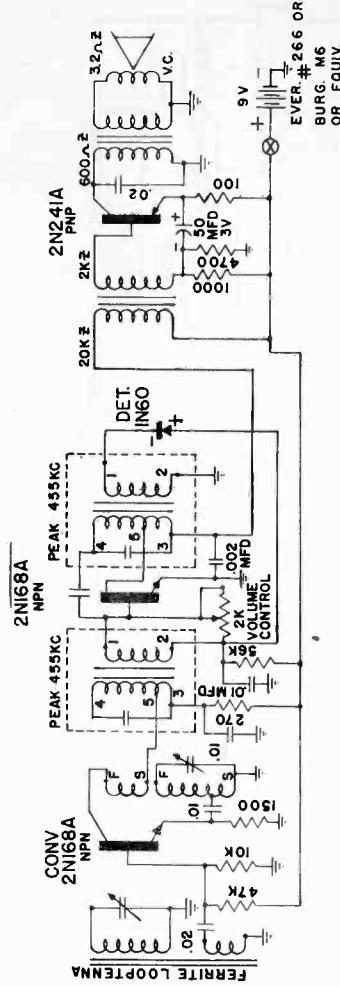
The top knob on the right side from the front is a combination on-off switch and volume control. When the small knob is turned fully counterclockwise, the receiver is "OFF". To turn the receiver "ON", rotate this knob in a clockwise direction. Further rotation in this direction increases the volume. The large knob on the right is the station selector or tuning knob.

IMPORTANT

Be sure the receiver is turned off when not in use. Since the bar loop used in this receiver has a directional effect, it may be found necessary at times to turn the receiver to obtain best reception and a minimum of interference.

LIST OF REPLACEMENT PARTS

1st I.F.	I-162-1	Speaker	S-716-1
2nd I.F.	I-162-1	Vol. Control Knob	K-405
Osc. Coil	O-159-1	Tuning Knob	K-467
Bar Loop Ant.	L-161-1	Battery Cable	BC-514
Electrolytic Cond.	E-221	TRANSISTORS	
Var. Cond.	V-217-4	Converter	2N168A
Driver Trans.	T-160-1	I.F.	2N168A
Vol. Control	V-317	Audio Output	2N241A
Cabinet	C-478	Diode	1N60

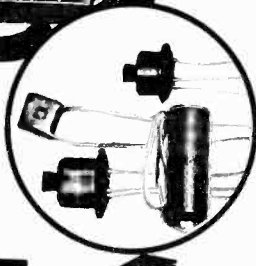
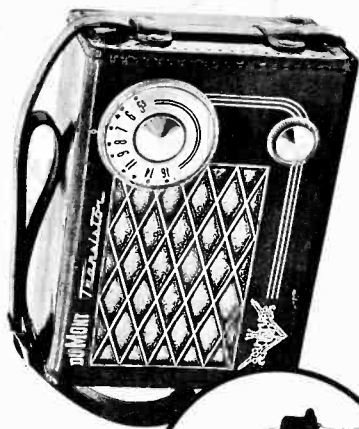


MODEL L-414



**DUMONT**

*the Transistor*



**MODEL 1210 (RA-902) SERVICE DATA SHEET**

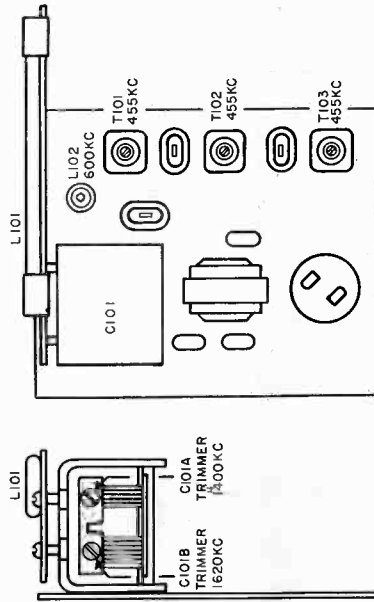
ELECTRICAL PARTS		MECHANICAL AND CABINET PARTS	
Symbol	Description	Part No.	Description
C102	Cap Yc AF 2 Section	02 251 840	Res FC 3.9K, 10%, 1/2W
C103	Cap Fc .01 mf, 30V Min.	02 251 950	Res FC 33K, 10%, 1/2W
C104	Cap Fc .05 mf, 30V Min.	02 251 910	Res FC 15K, 10%, 1/2W
C106	Cap Fc .05 mf, 30V Min.	02 251 770	Res FC 1K, 10%, 1/2W
C107	Cap Fc .1 mf, 30V Min.	02 251 870	Res FC 6.8K, 10%, 1/2W
C108	Cap Fc .05 mf, 30V Min.	02 251 750	Res FC 680 ohms, 10%, 1/2W
C109	Cap Fc .05 mf, 30V Min.	02 251 740	Res FC 27K, 10%, 1/2W
C110	Cap Fc .05 mf, 30V Min.	02 251 680	Res 180 ohms, 10%, 1/2W
C111	Cap Fc .1 mf, 30V Min.	02 100 870	Res 10K, 10%, 1/2W
C112	Cap F E 100 mf, 3V	02 100 870	Res 2W 8.2 ohms, 10%, 1/2W
C113	Cap F E 4 mf, 10V	02 310 011	Res F 100 ohms, Thermal
C114	Cap F E 100 mf, 10V	01 103 344	Switch, On-Off, Part of R127
C801	Crystr, 400	20 011 132	Transformer, IF
C802	Crystr, 400	20 011 152	Transformer, IF
L104	Antenna Oscillator	20 011 132	Transformer, AF Output
R101	Res FC 27K, 10%, 1/2W	26 005 100	Transistor, 2N168A
R102	Res FC 6.8K, 10%, 1/2W	26 005 140	Transistor, 2N168 or 2N293
R103	Res FC 1.5K, 10%, 1/2W	26 005 220	Transistor, 2N168 or 2N293
R104	Res FC 470 ohms, 10%, 1/2W	26 005 230	Transistor, 2N168 or 2N293
R105	Res FC 82K, 10%, 1/2W	26 005 230	Transistor, 2N168 or 2N293
R106	Res FC 6.8K, 10%, 1/2W	26 005 230	Transistor, 2N168 or 2N293
R109	Res FC 1K, 10%, 1/2W		

## ALIGNMENT INSTRUCTIONS

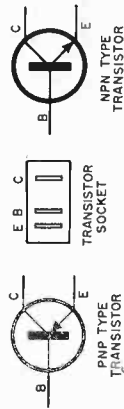
Turn volume control fully clockwise. Adjust the generator for the lowest signal necessary to obtain an output reading (no more than .5 volts across speaker voice coil). Make all adjustments with an insulated alignment tool. Caution: Do not remove or insert transistors while power is on.

Step	Signal Generator		Tuning Capacitor Setting	Output Meter Connection	Adjust
	Frequency	Connect to			
1	455 KC 400 cps AM Mod.	Loop, of several turns of wire placed near AM antenna	Maximum Capacity	AC meter across speaker voice coil	I. F. Transformers T103, T102 and T101 in this order for maximum output indication. Repeat once.
2	1620 KC 400 cps AM Mod.	As Above	Minimum Capacity	As Above	Oscillator trimmer capacitor of C101B until signal is heard, but don't attempt to tune for peak output. Note: If signal cannot be heard adjust antenna trimmer capacitor of C101A.
3	As Above	As Above, except move loop several feet away for very weak signal.	As Above	As Above	Antenna trimmer capacitor of C101A for maximum signal output. Retouch oscillator trimmer for maximum output.
4	600 KC 400 cps AM Mod.	As Above	Set tuning dial for strongest 600 KC signal	As Above	Oscillator coil, L102, rocking tuning capacitor back and forth until signal reaches maximum.
5	1400 KC 400 cps AM Mod.	As Above	Set tuning dial for strongest 1400 KC signal	As Above	Antenna trimmer capacitor of C101A, and at the same time rocking tuning capacitor back and forth until signal reaches maximum. Note: Repeat steps 4 and 5 if necessary.

NOTE: When the chassis and/or battery compartment are reinstalled in the case, tune the radio to a weak AM station above 1400 KC, and retouch the antenna trimmer capacitor, C101A, for peak performance.

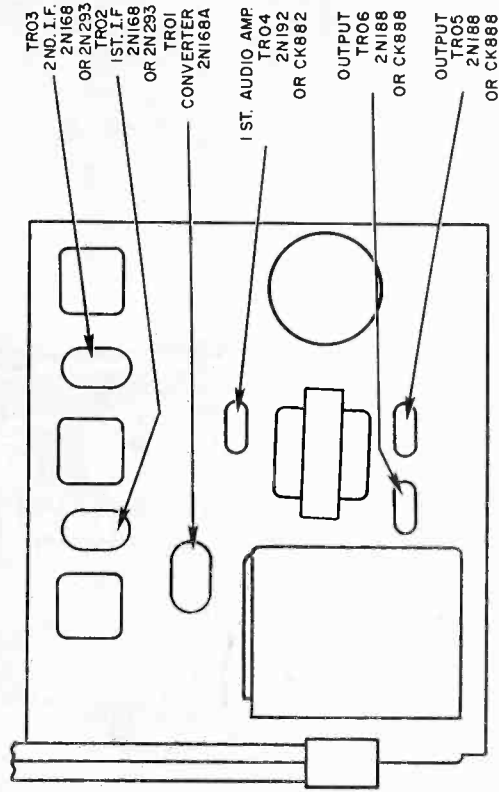


## NOTES

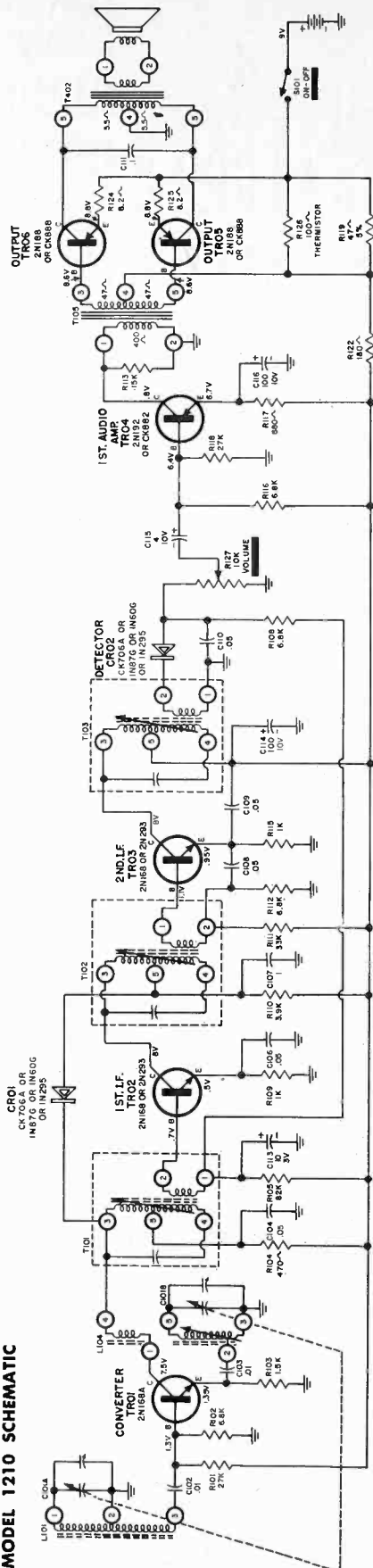


1. All voltages were measured with a VTVM. The radio was tuned between stations (no signal input) and the volume control was set at maximum.
2. Check transistors by substitution. Always turn the set off before removing a transistor from its socket.
3. Always remove the transistors, when checking to locate a component failure.
4. Capacitors employed in transistor circuits have a low voltage rating. Avoid the use of test equipment having potentials which are higher than the capacitor's rated value.
5. The same type transistors (either two 2N188s or two CK888s) should be used in the output stage, TR05 and TR06.
6. In some sets, C116 is a 50 mf 10V capacitor, part number 03 190 204.
7. The battery supply consists of six 1½ volts, "C" size flashlight batteries, connected in series.

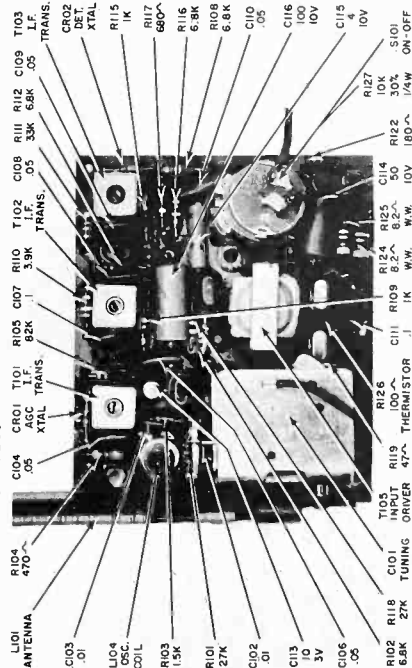
## TRANSISTOR LOCATION



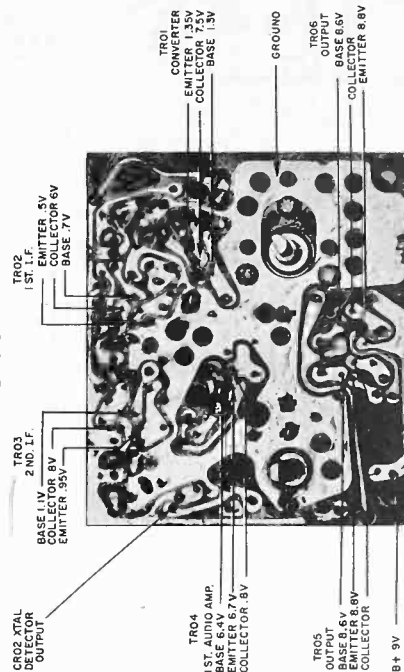
**MODEL 1210 SCHEMATIC**



**COMPONENT LOCATION**

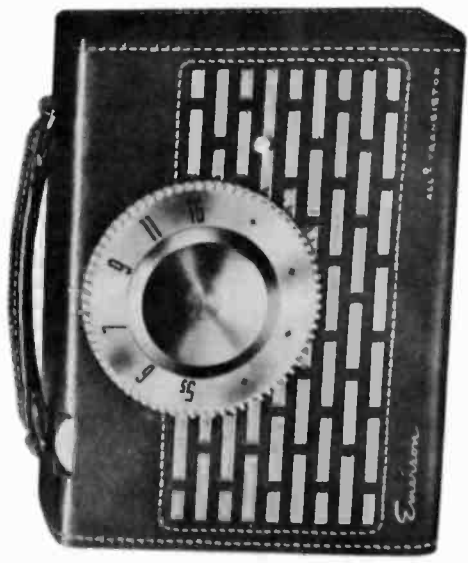


**UNDERCHASSIS VOLTAGE POINTS**



JUNE 1956

MODEL 855  
CHASSIS 120314



# Emerson

## TRANSISTOR PORTABLE RADIO

MODEL 855

**DESCRIPTION**

TYPE: Portable transistor (battery operated) superheterodyne.

FREQUENCY RANGE: 540-1650 kc.

TYPES OF TRANSISTORS AND CRYSTAL:

- Q1 - NPN Converter.
- Q2 - NPN 1st I.F. Amplifier.
- Q3 - NPN 2nd I.F. Amplifier.
- Q4 - PNP Audio Driver
- Q5 - PNP [Marched Transistors]
- Q6 - PNP [Audio Output]
- CR1 - 1N195 Diode Detector & A.V.C.

POWER SUPPLY:

Two-No. 276 (9V.) Eveready Energizers or equivalent.

CURRENT DRAIN:

8 ma to 30 ma depending on audio output power.

**GENERAL NOTES**

1. If replacements are made in the r-f section of the circuit, the receiver should be carefully realigned.
2. The receiver has a self-contained antenna and does not require additional antenna or ground connection.
3. The self-contained bar loop antenna has directional properties. For maximum signal pickup on weak stations it is recommended that the set be rotated through a quarter of a circle, leaving it in the position which provides maximum volume.
4. It is recommended that the batteries be removed as soon as they are exhausted or if the set is not to be operated for a few months or more. Make certain that the "on-off" switch is left in the "off" position.

**CHASSIS PARTS LIST - CHASSIS 120314**

Symbol	Part No.	Description	List Price	Symbol	Part No.	Description	List Price
C-1	928139	.01 MF Ceramic	30V.	R-13	340812	Carbon	1/2W. ±10%
C-2	900146	Variable Capacitor - R. F. Section	3.10	R-14	340572	Carbon	1/2W. ±10%
C-2A	Pr. of C-2	Trimmer - R. F. Section		R-15	340412	Carbon	1/2W. ±10%
C-3	Pr. of C-2	Variable Capacitor - Oscillator Section		R-16	340652	Carbon	1/2W. ±10%
C-3A	Pr. of C-2	Trimmer - Oscillator Section		R-17	340212	Carbon	1/2W. ±10%
C-3B	Pr. of C-2	Trimmer - Oscillator Section		R-18	351052	Carbon	1/2W. ±10%
C-4	928758	.01 MF Ceramic	30V.	R-19	350252	Carbon	1/2W. ±10%
C-5	928758	.01 MF Ceramic	30V.	R-20	340012	Carbon	1/2W. ±10%
C-6	928758	.02 MF Ceramic	30V.	R-21	340372	Carbon	1/2W. ±10%
C-7	928758	.01 MF Ceramic	30V.	L-1	700115	Bar Loop Antenna	2.30
C-8	928758	.01 MF Ceramic	30V.	L-2	716105	Oscillator Coil	1.15
C-9	928758	.01 MF Ceramic	30V.	Q-1	815009	Transistor - NPN	
C-10	925353	.20 MF Electrolytic	6V.	Q-2	815010	Transistor - NPN	
C-11	928758	.01 MF Ceramic	30V.	Q-3	815010	Transistor - NPN	
C-12	925352	5 MF Electrolytic	10V.	Q-4	815013	Transistor - PNP	
C-13	925351	100 MF Electrolytic	1.25	Q-5	815014	Transistor - PNP	
C-14	928757	.0033 MF Ceramic	30V.	Q-6	815014	Transistor - PNP	
C-15	Pr. of C-13	80 MF Electrolytic	10V.	CR-1	817038	Diode - 1N 295	1.15
C-16	Pr. of C-13	20 MF Electrolytic	10V.	SP-1	180144	Speaker - PM - 4"	3.65
C-17	922042	.04 MF Paper Molded	150V.	T-1	720249	1st I.F. Transformer	2.70
R-1	341012	150,000 Ohm Carbon	1/2W. ±10%	T-2	720249	2nd I.F. Transformer	2.70
R-2	340532	1,500 Ohm Carbon	1/2W. ±10%	T-3	720248	3rd I.F. Transformer	2.70
R-3	350332	220 Ohm Carbon	1/2W. ±20%	T-4	734128	P. P. Input Transformer	4.55
R-4	340932	68,000 Ohm Carbon	1/2W. ±10%	T-5	734129	P. P. Output Transformer	3.05
R-5	340372	330 Ohm Carbon	1/2W. ±10%				
R-6	350532	1,500 Ohm Carbon	1/2W. ±20%				
R-7	340772	15,000 Ohm Carbon	1/2W. ±10%				
R-8	340572	2,200 Ohm Carbon	1/2W. ±10%				
R-9	340492	1,000 Ohm Carbon	1/2W. ±10%				
R-10	352332	3,300 Ohm Carbon	1/2W. ±20%				
R-11	340612	2,200 Ohm Carbon	1/2W. ±10%				
R-12	390423	4,000 Ohm Volume Control	1.20				

Prices subject to change without notice.

**CABINET PARTS LIST - MODEL 855**

PART NUMBERS	DESCRIPTION	LIST PRICE
140761	Leather Cabinet - Red	14.30
140761A	Leather Cabinet - Blue	14.30
140761B	Leather Cabinet - Champagne	14.30
140761C	Leather Cabinet - Cinnamon	14.30
140761D	Leather Cabinet - Cardovan	14.30
460746	Tuning Knob - Light Tan	1.05
460705B	Volume Knob - Light Tan	.15
542280	Compression Ring - Knob	.05
412458	Chassis Mounting Bracket - L.H.	.15
412459	Chassis Mounting Bracket - R.H.	.10
265037	Spade Bolt	.85
470923	Baffle Front	.70
576085	Baffle Rear	.70

Prices subject to change without notice.

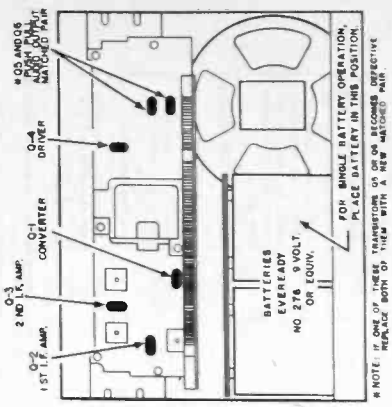


FIGURE 4 - TRANSISTOR AND BATTERY LOCATION DIAGRAM

ALIGNMENT INSTRUCTIONS

Volume control should be at maximum; output of signal generator should be no higher than necessary to obtain an output reading with a 30% audio modulated R.F. Use an insulated alignment screwdriver for adjusting.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1 .1 mfd.	High side to junction of L-1 & C-2. Low side to chassis.	455 KC.	Tuning condenser fully open.	Across voice coil.	T2, T3 and T1	Adjust for maximum output starting with T3.
2	Use a loop set per points and parts list 20" from center of bar loop ant. in set.	1650 KC.	Tuning condenser fully open.	Across voice coil.	C-3A (osc. trimmer) See note below	Fashion loop of several turns of wire and radiate signal into bar loop of receiver. Adjust for maximum output.
3	"	1400 KC.	Tune for maximum output.	Across voice coil.	C-2A (Ant. trimmer)	Adjust for maximum output.
4	"	600 KC.	Tuning condenser set for 600 KC.	Across voice coil.	Osc. slug in L-2	Rock the variable cond. each side of 600 KC while adj. osc. slug for maximum response.
5	"	1650 KC.	Tuning condenser fully open.	"	C-3A Osc. trimmer	If readjustment is necessary repeat steps 2 to 4 until no further improvement is noted.

NOTE: C-3A is the oscillator trimmer capacitor, physically located on the bottom side of the tuning capacitor when the chassis is mounted in its case. Both C-3A and C-2A can be reached through cutouts in the bottom covering board. C-3B is the alternate oscillator trimmer capacitor and is factory adjusted for minimum trimmer capacity requirements.

V. T. V. M. OHMMETER CHECK OF TRANSISTORS

An approximate check of the transistors may be made with a vacuum tube type of ohmmeter. They are checked as two separate crystal diodes might be checked, that is, by measuring the forward and reverse resistance of each section individually. Figures No. 2 and No. 3 shows the method of testing P-N-P and N-P-N types of transistors used in this receiver.

When the negative terminal of the ohmmeter (set on R x 10 scale) is connected to the base (B) terminal of a good PNP transistor and the positive terminal of the meter is connected to the collector (C) or emitter (E) terminals, you should measure a low resistance (in the order of 500 ohms or less).

When the positive terminal of the ohmmeter is connected to the base (B) terminal of a good PNP transistor and the negative terminal of the meter is connected to the collector (C) or emitter (E) terminals, you should measure a high inverse resistance in the order of 50K ohms or higher.

In the event your results are opposite from these, it is possible that the plus side of your meter is actually connected to the negative side of its internal battery.

PNP type transistors are checked in a similar manner except the applied polarities from the ohmmeter are reversed (see figure no. 3) to give same inverse and forward resistance results.

CAUTION

Use only a vacuum tube type of ohmmeter. The R x 10 scale must be used for all forward (low) resistance measurements. Do not use the R x 1 scale as this might damage the transistor. A shunt type ohmmeter should not be used. If in doubt as to the type of vacuum tube ohmmeter you have, place a 1,000 ohm resistor in series with it and subtract this 1,000 ohms from the reading obtained. If these instructions are not followed, damage to the transistors may result since some non-electronic type of ohmmeters use high internal battery voltages.

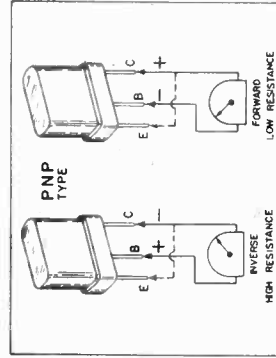


FIGURE 2 - PNP TYPE

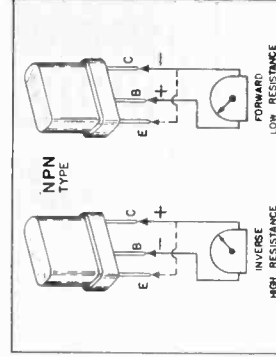
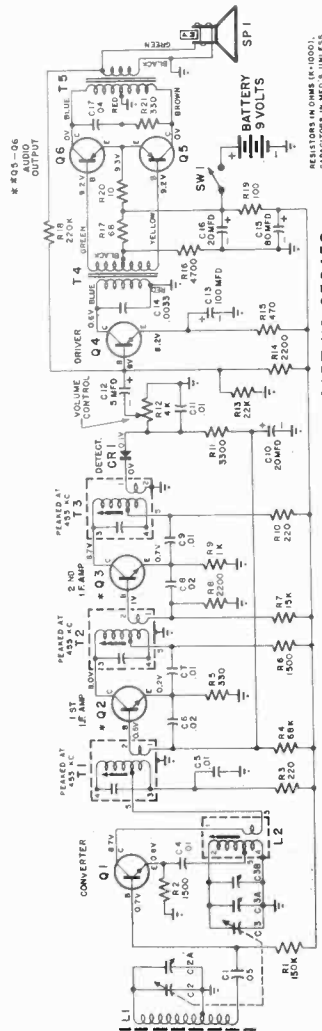


FIGURE 3 - NPN TYPE



RESISTORS IN OHMS (R), K (1000), M (1,000,000), OTHERWISE NOTED.

PART NO. 950452

CHASSIS NO. 120314

NOTES:  
1. IF ONE OF THE SUSPECTED TRANSISTORS OR ONE OF THE SUSPECTED DEFECTIVE REPAIRS BOTH OF THEM WITH A NEW MATCHED PAIR.  
2. EMERSON PART NO. 120314 IS A 2N146 TRANSISTOR FOR REPLACEMENT PURPOSES HOWEVER, OUR PT. NO. 815010 WILL BE A 2N146 TRANSISTOR.

RESISTANCE READINGS

(TURN SET OFF THEN REMOVE ALL TRANSISTORS BEFORE TAKING RESISTANCE READINGS)

SYMBOL	TRANSISTOR	TERMINAL B	TERMINAL C	TERMINAL E
Q-1	NPV CONVERTER	150K	3.4K	1500
Q-2	NPV I.F. AMP.	4K	4.8K	350
Q-3	NPV I.F. AMP.	1.9K	1K	3.4K
Q-4	PNP AUDIO DRIVER	4.5K	500	3.4K
Q-5	PNP AUDIO OUTPUT	3.2K	19	3.2K
Q-6	PNP MATCHED PAIR	3.2K	21	3.2K

RESISTANCE READINGS SHOWN ABOVE IN OHMS UNLESS OTHERWISE SPECIFIED

FIGURE 1 - SCHEMATIC DIAGRAM RADIO CHASSIS 120314

CONDITIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltages indicated are positive d.c., resistance is ohms, unless otherwise noted.
2. Measurements made with voltohmmeter or equivalent.
3. All measurements taken between points and chassis, unless otherwise indicated.
4. Before taking resistance measurements, turn on-off switch to the "off" position (or disconnect batteries). Then remove transistors.
5. Volume control at maximum, no signal applied for voltage measurements.
6. Nominal tolerance in component values makes possible a variation of  $\pm 15\%$  in readings.
7. K is Kilohms, MEG is megohms.

VOLTAGE AND RESISTANCE READINGS ARE SHOWN ON SCHEMATIC

Servicing Transistor Receivers

Since the failure rate of a transistor is far less than that of a receiving type tube, the transistor itself should be the last item to suspect. Before inserting a new transistor, all components in the suspected circuit should be carefully checked. Voltage measurement, signal tracing and signal injection methods of trouble shooting should be used.

Two PNP matched plug-in transistors (PT #815014) are used as a balanced push-pull class "B" audio output stage. This type of circuit yields greater audio output power at a much lower average battery drain. To optimize performance, these transistors are supplied as a matched pair. If one of these transistors becomes defective replace both of them with a new matched pair.

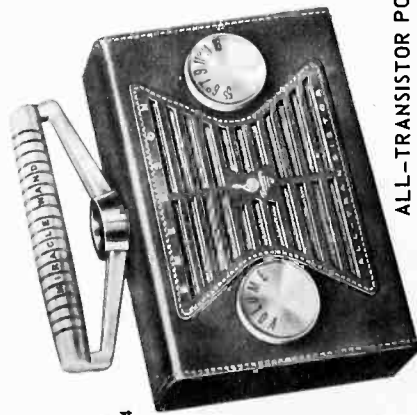
We suggest you adhere to the following service precautions:

- 1 - Remove transistor prior to soldering to transistor socket.
- 2 - Set must be turned "off" before putting in a new transistor.
- 3 - If only one 9 volt energizer is used while servicing, make sure unused energizer cable does not short to chassis.

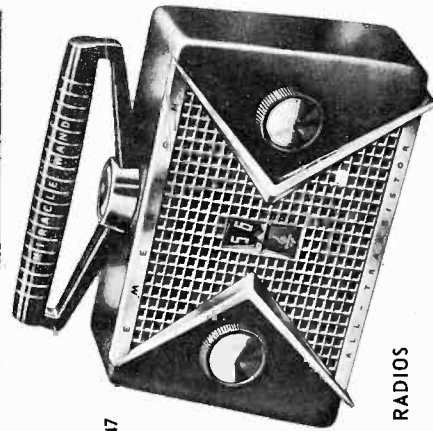
If you do not have a replacement transistor available, you can determine if the suspected transistor is actually defective by the test shown on page 3.

# Emerson Radio

AUGUST 1956  
MODEL 844  
CHASSIS 120309  
MODEL 847  
CHASSIS 120328



MODEL 844



MODEL 847

## DESCRIPTION

TYPE: All transistor superheterodyne battery portables with rotatable handle antenna.

FREQUENCY RANGE: 540-1650 kc.

TYPES OF TRANSISTORS AND CRYSTAL:

- Q1 - NPN Converter.
- Q2 - NPN 1st I.F. Amplifier.
- Q3 - NPN 2nd I.F. Amplifier.
- Q4 - PNP Audio Driver
- Q5 - PNP [Matched Transistors]
- Q6 - PNP [Audio Output]
- CR1 - IN295 Diode Detector & A.G.C.
- CR2 - Auxiliary A.G.C. Diode

POWER SUPPLY:

Two-No. 276 (9V.) Eveready Energizers or equivalent.

CURRENT DRAIN:

8 ma to 30 ma depending on audio output power.

## GENERAL NOTES

1. If replacements are made in the r-f section of the circuit, the receiver should be carefully realigned.
2. The receiver has a self-contained bar loop antenna located in a rotatable handle and does not require additional antenna or ground connection.
3. The self-contained bar loop antenna has directional properties. For maximum signal pickup on weak stations it is recommended that the handle be rotated through a quarter of a circle, leaving it in the position which provides maximum volume.
4. Two PNP matched push-in transistors (PT #815014) are used as a balanced plug-pull class "B" audio output stage. This type of circuit yields greater audio output power at a much lower average battery drain. To optimize performance, these transistors are supplied as a matched pair. If one of these transistors becomes defective replace both of them with a new matched pair. If desired the remaining good transistor may be used as replacement for Q4 (PNP audio driver).
5. It is recommended that the energizer (batteries) be removed as soon as they are exhausted or if the set is not to be operated for a few months or more.

## CHASSIS PARTS LIST FOR 120309 & 120328

Symbol	Part No.	Description	List Price	Symbol	Part No.	Description	List Price
C-1	928139	.05 MF Ceramic	.50	R-13	340812	22,000 OHM Carbon	1/2W ±10% .14
C-2	900134	Variable Capacitor - R.F. Sec. (Chas #120328 only)	3.40	R-14	340572	2,200 OHM Carbon	1/2W ±10% .14
C-2	900155	Variable Capacitor - R.F. Sec. (Chas #120309 only)	3.25	R-15	340412	4,700 OHM Carbon	1/2W ±10% .14
C-2A	Pl. of C-2	Trimmer - R.F. Section	3.25	R-16	340652	4,700 OHM Carbon	1/2W ±10% .14
C-3	Pl. of C-2	Variable Capacitor Section		R-17	340212	68 OHM Carbon	1/2W ±10% .14
C-3A	Pl. of C-2	Trimmer - Oscillator Section		R-18	351052	220,000 OHM Carbon	1/2W ±10% .14
C-3B	Pl. of C-2	Trimmer - Oscillator Section		R-19	380252	10 OHM Carbon	1/2W ±10% .14
C-4	928758	.01 MF Ceramic	.25	R-20	340012	10 OHM Carbon	1/2W ±10% .14
C-5	928758	.01 MF Ceramic	.25	R-21	340372	330 OHM Carbon	1/2W ±10% .14
C-6	928756	.02 MF Ceramic	.25	L-1	700116	Bar Loop Antenna	3.65
C-7	928756	.02 MF Ceramic	.25	L-2	716105	Oscillator Coil	1.15
C-8	928758	.02 MF Ceramic	.25	Q-1	815009	Transistor - NPN	
C-9	928758	.02 MF Ceramic	.25	Q-2	815010	Transistor - NPN	
C-10	925535	.20 MF Electrolytic	.45	Q-3	815010	Transistor - NPN	
C-11	928758	.01 MF Ceramic	.25	Q-4	815013	Transistor - PNP	
C-12	925532	5 MF Electrolytic	.75	Q-5	815014	Transistor - PNP	
C-13	925568	100 MF Electrolytic	1.25	Q-6	815014	Transistor - PNP Matched Pair	
C-14	928136	.001 MF Ceramic	.30V.	CR-1	817038	Diode - IN 295	
C-15	Pl. of C-13	80 MF Electrolytic	10V.	CR-2	817051	Diode	
C-16	Pl. of C-13	20 MF Electrolytic	10V.	SP-1	180144	Speaker - PM - 4"	3.65
C-17	922042	.04 MF Paper Milled	150V.	T-1	720249	1st I.F. Transformer	2.70
R-1	341012	150,000 OHM Carbon	1/2W ±10%	T-2	720249	2nd I.F. Transformer	2.70
R-2	340532	1,500 OHM Carbon	1/2W ±10%	T-3	720248	3rd I.F. Transformer	3.55
R-3	350332	220 OHM Carbon	1/2W ±10%	T-4	720248	4th I.F. Transformer	4.75
R-4	340932	68,000 OHM Carbon	1/2W ±10%	T-5	734129	P.P. Output Transformer	3.05
R-5	340372	330 OHM Carbon	1/2W ±10%				
R-6	340772	1,500 OHM Carbon	1/2W ±10%				
R-7	340772	1,500 OHM Carbon	1/2W ±10%				
R-8	340772	2,200 OHM Carbon	1/2W ±10%				
R-9	340492	1,000 OHM Carbon	1/2W ±10%				
R-10	350332	220 OHM Carbon	1/2W ±10%				
R-11	340612	3,300 OHM Carbon	1/2W ±10%				
R-12	390500	4,000 OHM Volume Control (Chas #120328 only)	1.10				
	390509	4,000 OHM Volume Control (Chas #120309 only)	1.10				

Prices subject to change without notice.

NOTE: Q-2, Q-3 may consist of (2) - 2N146 or (1) - 2N145 and (1) - 2N147. For replacement purposes Pt. #815010 (Q-2, Q-3) will be a 2N146.

ROTATABLE HANDLE - Component parts are shown in Fig. #6. The female end male handle sections are held together by 3 retainer clips (Pt. #541084) and cemented with Toluol Solvent.

## CABINET PARTS LIST FOR MODELS 844 & 847

Model	Description	List Price
844	Leather Cabinet (Cyan, Green, Maroon or Tan) Specify Color desired (List Less Handle)	11.00
X	Cabinets (Red, Blue, Green or Ginger) Specify Color Desired	7.55
981826	Male Handle (List Less Handle) (List following 3 Items - see Fig. 4)	
271035	Locknut	.40
271035	Blade Pin Bolt	.20
460776	Volume Knob - Blond	.45
460776	Volume Knob - Clear	.45
460776	Volume Knob - Clear	.45
460776	Station Dial Indicator Disc	.45
383789	Battery Cable	.30
353007	Spoke Bolt (Specify Length)	.15
472237	Compression Spring - Knob	.05
472237	Chassis Mounting Bracket - H	.15
412581	Chassis Mounting Bracket - N	.15

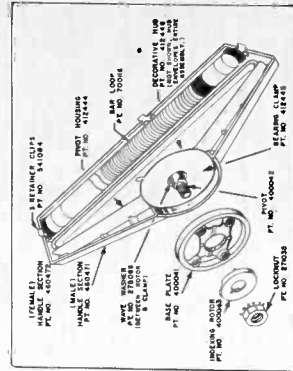


Figure 6 - ROTATABLE HANDLE SHOWING COMPONENT PARTS

**ALIGNMENT INSTRUCTIONS**

Volume control should be at maximum; output of R.F. signal generator (30% A.M. modulated) should be no higher than necessary to obtain a meter indication. Overload will make true peak readings difficult to find. Use an insulated alignment screwdriver for adjusting.

DIMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1 .1 mid.	High side to junction of L-1 & C-1 Low side to chassis.	455 KC.	Tuning condenser fully open.	Across voice coil.	T-1 (top & P-2) (Vol.)	Adjust for maximum output starting with T-3.
2	Use a loop set perpendicular to center of bar loop ant. in set.	1650 KC.	Tuning condenser fully open.	Across voice coil.	C-3A (osc. trimmer) See note below	Fashion loop of several turns of wire and radiate from loop of detector. Adjust for maximum output.
3	"	1400 KC.	Tune for maximum output.	Across voice coil.	CT-1 (Ant. trimmer)	Adjust for maximum output.
4	"	600 KC.	Tuning condenser set for 600 KC.	Across voice coil.	Osc. slug for L-2	Rock the variable cond. each side of 600 KC while adj. osc. slug for maximum response.
5	"	1650 KC.	Tuning condenser fully open.	"	CT-2 (Osc. trimmer)	If readjustment is necessary repeat steps 2 to 4 until desired improvement is noted.

NOTE: For optimum results, repeat entire alignment procedure.

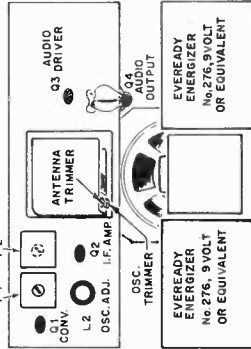


Figure 1 - TRANSISTOR & BATTERY LOCATION

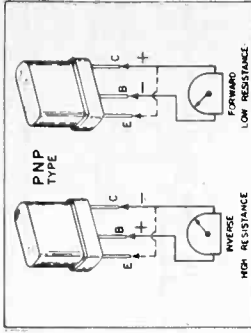


Figure 2 - PNP TYPE

**SERVICING TRANSISTOR RECEIVERS**

Since the failure rate of a transistor is far less than that of a receiving type tube, the transistor itself should be the last item to suspect. Before inserting a new transistor, all components in the suspect circuit should be carefully checked. Voltage measurement, signal tracing and signal injection methods of trouble shooting should be used. Remove transistor prior to soldering to a transistor socket and make certain set is turned "off" before inserting a transistor. If you do not have a replacement transistor available, you can determine if the suspected transistor is actually defective by the following method.

**V. T. V. M. OHMMETER CHECK OF TRANSISTORS**

An approximate check of the transistors may be made with a vacuum tube type of ohmmeter. They are checked as two separate crystal diodes might be checked, that is, by measuring the forward and inverse resistance of each section individually. Figures No. 2 shows the method of testing P-N-P type of transistors used in this receiver.

When the negative terminal of the ohmmeter (set on R x 10 scale) is connected to the base (B) terminal of a good PNP transistor and the positive terminal of the meter is connected to the collector (C) or emitter (E) terminals, you should measure a low resistance (in the order of 500 ohms or less).

When the positive terminal of the ohmmeter is connected to the base (B) terminal of a good PNP transistor and the negative terminal of the meter is connected to the collector (C) or emitter (E) terminals, you should measure a high inverse resistance in the order of 50K ohms or higher.

In the event your results are opposite from these, it is possible that the plus side of your meter is actually connected to the negative side of its internal battery.

**CAUTION**

Use only a vacuum tube type of ohmmeter. The R x 10 scale must be used for all forward (low) resistance measurements. Do not use the R x 1 scale as this might damage the transistor. A shunt type ohmmeter should not be used. If in doubt as to the type of vacuum tube ohmmeter you have, place a 1,000 ohm resistor in series with it and subtract this 1,000 ohms from the reading obtained. If these instructions are not followed, damage to the transistors may result since some non-electronic type of ohmmeters use high internal battery voltages.

\* Varying resistance - wait until meter settles

SYMBOL	TERMINAL B	TERMINAL C	TERMINAL E
Q1	* 6.4K	10 Ω	* 6.8K
Q2	26.0K	3 Ω	* 3.5K
Q3	* 6.0K	* 2.2K	* 3.5K
Q4	* 2.4K	500 Ω	* 2.6K

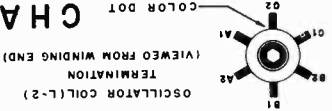
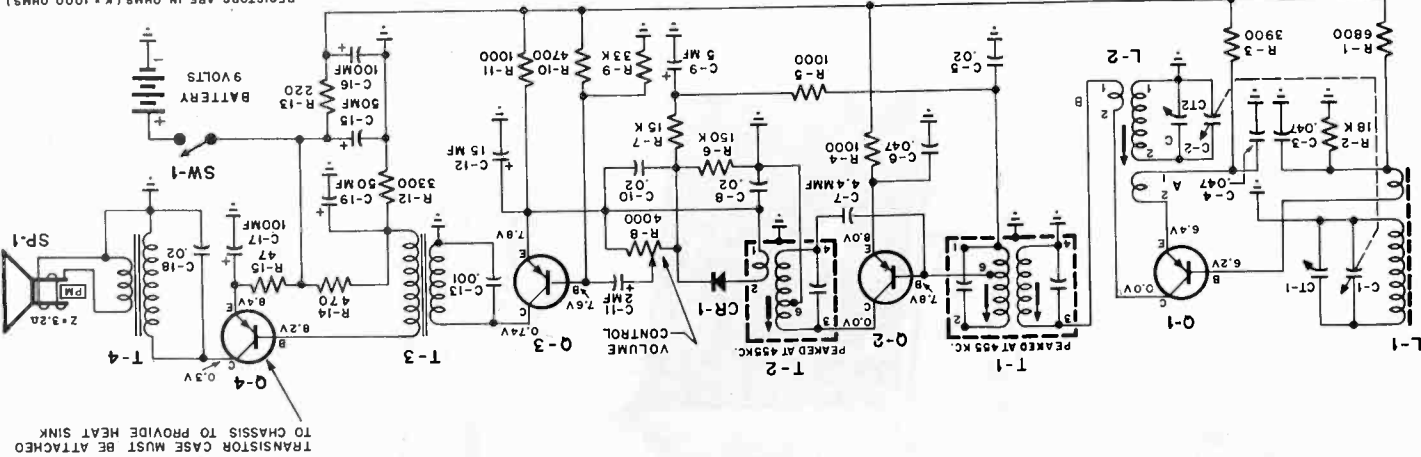
RESISTANCE READINGS, CHASSIS 120350

**CONDITIONS FOR VOLTAGE AND RESISTANCE READINGS**

1. Voltages indicated are positive d.c., resistance is ohms, unless otherwise noted.
2. Measurements made with voltohmmyst or equivalent.
3. All measurements taken between points and chassis, unless otherwise indicated.
4. Before taking resistance measurements, turn on-off switch to the "off" position (or disconnect batteries). Then remove transistors.
5. Volume control at maximum, no signal applied for voltage measurements.
6. Nominal tolerance in component values makes possible a variation of ± 15% in readings.
7. K is Kilohms, MEG is megohms.

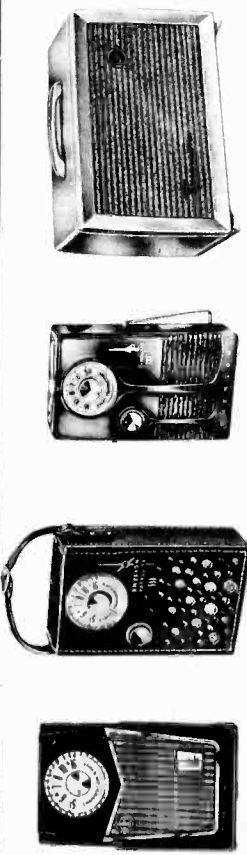
**CHASSIS NO. 120350**

RESISTORS ARE IN OHMS (K = 1000 OHMS) AND 1/2 WATT UNLESS OTHERWISE NOTED CAPACITORS ARE IN MFD'S, UNLESS OTHERWISE SPECIFIED.



MARCH, 1958  
 MODELS 888, 888R  
 CHASSIS 120374

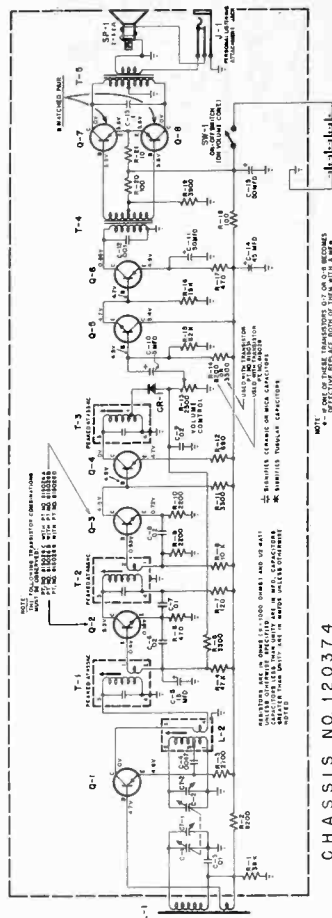
This note supersedes the Service Note covering the all-transistor portable Model 888 dated June 1957. The present issue contains basic 888 data and information pertinent to additional models and styles of the Model 888.



- MODEL 888 (PIONEER) SATELLITE  
 TYPE: All transistor superheterodyne battery portable.  
 FREQUENCY RANGE: 540 - 1650 kc.  
 TYPES OF TRANSISTORS AND CRYSTAL:  
 Q1 - PNP Converter  
 Q2 - NPN 1st I.F. amplifier  
 Q3 - NPN 2nd I.F. amplifier  
 Q4 - PNP 3rd I.F. amplifier  
 Q5 - NPN 1st audio amplifier  
 Q6 - PNP 2nd audio amplifier
- MODEL 888R  
 Q7 - PNP Matched Transistors  
 Q8 - PNP Audio Output  
 CR-1-IN460 or IN295 diode detector & A.V.C.  
 POWER SUPPLY: Four 1.5V Penlight Batteries (Ray-O-Vac #7-LP, Eveready #915 or equivalent).  
 OPTIONAL BATTERIES: (see general notes)  
 CURRENT DRAIN: 7ma to 40ma depending on audio output power.

GENERAL INFORMATION

- Basic Model 888 is an all-transistor portable which incorporates an etched circuit wiring board with a personal listening attachment jack. The circuit consists of four transistors and one germanium diode powered by four penlight-type 1½ volt batteries.\*
  - The nationally successful 120374 chassis is now available in additional, new and exciting models: 888 VANGUARD; utilizes the "Nevebreak" features of the original Model 888; also known as the Pioneer, in new cabinet styling. The tri-position handle that acts as an easel stand, carrying handle and which can fold away completely is retained.
  - 888 VANGUARD DELUXE: similar to the 888 VANGUARD but is provided with a Listening Attachment.
  - 888 SATELLITE: is contained in a genuine leather cabinet and uses a leather shoulder strap.
  - 888 SATELLITE DELUXE: similar to the 888 SATELLITE but is provided with a Listening Attachment.
  - 888 R (REMOTE): is a remote speaker housed in its own Ivory Cabinet and provided with a cable and plug for use with 888 batteries.
  - If replacements are made in the r-f section of the circuit, the receiver should be carefully realigned.
  - The receiver has a self-contained bar loop antenna and does not require additional antenna or ground connection.
  - The self-contained bar loop antenna has directional properties. For maximum signal pick-up on weak stations it is recommended that the set be rotated through a quarter of a circle, leaving it in the position which provides maximum volume.
- \* For those who desire longer life cells, Mercury or Rechargeable (Nickel-Cadmium) batteries are available through your distributor. Mercury batteries are life rated at several times that of the penlight type. Recommended Mercury cells are Eveready E-9 or equivalent.



CHASSIS NO. 120374

SCHEMATIC DIAGRAM, CHASSIS 120374  
 CONDITIONS FOR VOLTAGE READINGS

- Voltsages indicated are positive D.C.
  - Measurements taken with V.T.V.M.
  - All Measurements taken between points and chassis.
  - Volume control set for maximum volume.
  - Nominal tolerances in component values make possible a variation of ± 15% in readings.
- Caution - When taking voltage checks, avoid accidental shorting across transistor leads as they may cause transistor damage. Do not use a non-vacuum tube-type voltmeter as the relatively low shunt resistance of this type of voltmeter can easily disrupt the transistor bias and result in erroneous readings as well as damage to the transistor.

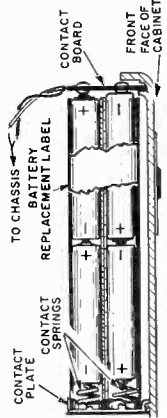


FIG. 1 - BATTERY POLARITY  
 BATTERY PACK LAYOUT SHOWN WITH POLARITIES FOR PENLIGHT AND RECHARGEABLE (NICKEL-CADMIUM) CELLS. MERCURY CELLS ARE PHYSICALLY REVERSED FROM ABOVE DRAWING BUT POLARITY REMAINS THE SAME.

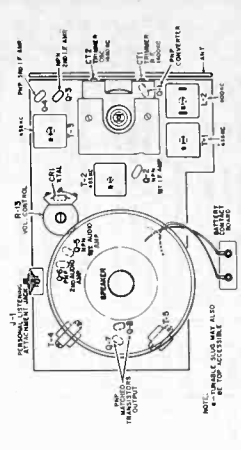


FIG. 2 - TRANSISTOR & ALIGNMENT POINT LOCATION

ALIGNMENT INSTRUCTIONS

Volume control should be at maximum; output of signal generator should be no higher than necessary to obtain output per reading with 0.30% audio modulated R.F. Use an insulated alignment screwdriver for adjusting.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1 .1 mfd.	High side to junction of L1 & C1. Low side to chassis.	455 KC.	Tuning condenser fully open.	Across voice coil.	T2, T3 and T1	Adjust for maximum output starting with T3.
2	Use a loop set perpendicular and center of bar loop ant. in set.	1650 KC.	Tuning condenser fully open.	Across voice coil.	CT2	Fashion loop of several turns of wire and radiate signal into bar loop of receiver. Adjust for maximum output.
3	"	1400 KC.	Tune for maximum output.	Across voice coil.	CT1 (Avt. trimmer)	Adjust for maximum output.
4	"	600 KC.	Tuning condenser for 600 KC.	Across voice coil.	Osc. plug in L-2.	Lock the variable cond. while adj. osc. plug for maximum response.
5	"	1650 KC.	Tuning condenser fully open.	"	CT2 Osc. trimmer	If readjustment is necessary repeat steps 2 to 4. Improvement is noted.

NOTE: For optimum results, repeat entire alignment procedure.



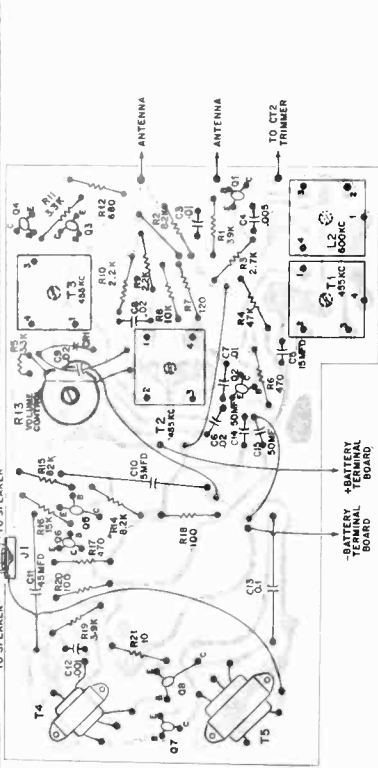


FIG. 3 - PRINTED CIRCUIT CHASSIS DIAGRAM  
SERVICING ALL TRANSISTOR RECEIVERS

Two PNP matched transistors (pr. #815030) are used as a balanced push-pull class "B" audio output stage. This type of circuit yields greater audio output power at a much lower average battery drain. To optimize performance, these transistors are supplied as a matched pair. If one of these transistors becomes defective, replace both of them with a new matched pair. Should Q-2 or Q-3 NPN transistors be replaced be sure and follow the transistor combination as shown on schematic for best results.

Since the failure rate of a transistor is far less than that of a receiving type tube, the transistor itself should be the last item to suspect. Before inserting a new transistor, all components in the suspected circuit should be carefully checked. Voltage measurements, signal tracing and signal injection methods of trouble shooting should be used. Resistance testing methods have severe limitations when applied to transistor circuits; consequently, they are not recommended. Should it become necessary to use resistance measurements, it is recommended to unsolder one terminal (of the suspected component) from the etched board before checking. When replacing transistors or components soldered to transistor leads, use extreme care as too much heat to the transistor leads cause damage to the transistor. The recommended method would be to grip the transistor lead between the etched board and the transistor body with long nose pliers before applying heat. A great deal of the heat will be absorbed by the pliers, thus protecting the transistor. As added precaution, use a small-tipped low-wattage (approx. 35 watts) soldering iron.

Should careful checking of all circuit components fail to reveal the defect, replace suspected transistor. If you do not have a replacement transistor available, then some form of transistor checking will become necessary. Inexpensive transistor checkers are now commercially available. If a transistor checker is not available, the following approximate resistance method may be used after the suspected transistor is unsoldered from the etched circuit board (use long-nose pliers to absorb some heat).

ADDITIONAL TRANSISTOR REPLACEMENT INFORMATION

It will be seen from the schematic drawing of the 888 that certain transistors are used in pairs and are associated with specific fixed resistors. Some individual transistors may likewise be used with specific resistors. This data and additional transistor substitution information is listed below for reference and convenience in ordering.

NOTES: 1.-Because of the small physical size of the transistors, the 1st three digits, "815", have been replaced by the letter, "E"; for Emerson. The "E" also signifies that these transistors have been made to our design tolerances.

2.-To improve the operation of Q1, at the high end, a resistor 680K,  $\pm 10\%$ ,  $\frac{1}{2}W$ , is added across pins 1 and 2 of L-2.

TRANSISTOR PAIRS	ASSOCIATED		TRANSISTOR ASSOCIATED	TRANSISTOR ASSOCIATED
	Q2	Q3		
815026C	680	815026E	3300	6800
815026B	680	815026D	8200	8200
815026B	680	815026F	4700	10,000

TRANSISTOR SUBSTITUTES	FOR USE NOS.	TRANSISTOR SUBSTITUTES	
		FOR USE	FOR USE NOS.
815026B	Q2/Q3	815033	Q5
815026A	Q2/Q3	815034	Q5
815026C	Q2/Q3	815035	Q5

V. T. V. M. OHMMETER CHECK OF TRANSISTORS

An approximate check of the transistor may be made with a vacuum tube type of ohmmeter. They are checked as two separate crystal diodes might be checked, that is, by measuring the forward and inverse resistance of each section individually. Figures No. 4 and No. 5 show the method of testing P-N-P and N-P-N types of transistors used in this receiver. When the negative terminal of the ohmmeter (set on R x 10 scale) is connected to the base (B) terminal of a good PNP transistor and the positive terminal of the meter is connected to the collector (C) or emitter (E) terminals, you should measure a low resistance (in the order of 500 ohms or less).

When the positive terminal of the ohmmeter is connected to the base (B) terminal of a good PNP transistor and the negative terminal of the meter is connected to the collector (C) or emitter (E) terminals, you should measure a high inverse resistance in the order of 50K ohms or higher.

In the event your results are opposite from these, it is possible that the plus side of your meter is actually connected to the negative side of its internal battery.

NPV type transistors are checked in a similar manner except the applied polarities from the ohmmeter are reversed (see figure no. 5) to give some inverse and forward resistance results.

CAUTION

Use only a vacuum tube type of ohmmeter. Use the R x 10 scale must be used for all forward (low R) resistance measurements. Do not use the R x 1 scale as this might damage the transistor. A short type ohmmeter should not be used. If in doubt as to the type of ohmmeter should be used, if you have, place a 1,000 ohm resistor in series with it and subtract this 1,000 ohms from the reading obtained.

If these instructions are not followed, damage to the transistors may result since some non-electronic type of ohmmeters use high internal battery voltages.

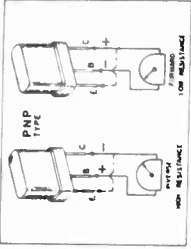


FIG. 4 - PNP TYPE

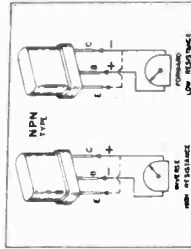


FIG. 5 - NPN TYPE

CHASSIS 120374 PARTS LIST

Symb.	Part No.	Description	List Price	Part No.	Description	List Price
C-1	900172	Variable Capacitor, R.F. Section	3.45	R-15	82,000 OHM - Carbon $\pm 10\%$ 1/2W.	.14
C-1	Pr. of C-1	Trimmer, R.F. Section		R-16	15,000 OHM - Carbon $\pm 10\%$ 1/2W.	.14
C-2	Pr. of C-1	Variable Capacitor, Osc. Section		R-17	470 OHM - Carbon $\pm 10\%$ 1/2W.	.14
C-3	928766	.01 MFD - Ceramic $\pm 20\%$ 30V.	.20	R-18	3,000 OHM - Carbon $\pm 20\%$ 1/2W.	.14
C-4	928767	.0047 MFD - Electrolytic 3V.	.20	R-19	100 OHM - Carbon $\pm 10\%$ 1/2W.	.14
C-5	925419	.15 MFD - Electrolytic 3V.	.70	R-20	100 OHM - Carbon $\pm 10\%$ 1/2W.	.14
C-6	928138	.02 MFD - Ceramic GMV 30V.	.25	R-22	880,000 OHM - Carbon $\pm 10\%$ 1/2W.	.14
C-7	928138	.02 MFD - Ceramic GMV 30V.	.25	Q-1	Transistor - Converter P - N - P	
C-8	928138	.02 MFD - Ceramic GMV 30V.	.25	Q-2	Transistor - 1st I.F. Amplifier N - P - N	
C-9	928138	.02 MFD - Ceramic GMV 30V.	.25	Q-3	Transistor - 2nd I.F. Amplifier N - P - N	
C-10	925421	45 MFD - Electrolytic 10V.	.70	Q-4	Transistor - 1st I.F. Amplifier P - N - P	
C-11	925421	45 MFD - Electrolytic 10V.	.70	Q-5	Transistor - 1st Audio Amplifier P - N - P	
C-12	928919	.001 MFD - Ceramic $\pm 20\%$	.20	Q-6	Transistor - 2nd Audio Amplifier P - N - P	
C-13	920795	.01 MFD - Paper $\pm 20\%$	.30	Q-7	Transistor - P.P. Audio Output P - N - P	
C-14	925422	50 MFD - Electrolytic 10V.	1.25	Q-8	Transistor - P.P. Audio Output P - N - P	
C-15	Pr. of C-14	50 MFD - Electrolytic 10V.		CR-1	Crystal Diode	1.05
R-1	340872	39,000 OHM - Carbon $\pm 10\%$ 1/2W.	.14	L-1	Barloop Antenna Oscillator Coil	1.55
R-2	340712	8,200 OHM - Carbon $\pm 10\%$ 1/2W.	.14	L-2	Oscillator Coil	1.90
R-3	340592	2,700 OHM - Carbon $\pm 10\%$ 1/2W.	.14	T-1	1st I.F. Transformer	1.25
R-4	340892	47,000 OHM - Carbon $\pm 10\%$ 1/2W.	.14	T-2	2nd I.F. Transformer	1.25
R-5	340612	3,300 OHM - Carbon $\pm 10\%$ 1/2W.	.14	T-3	3rd I.F. Transformer	1.30
R-6	340612	470 OHM - Carbon $\pm 10\%$ 1/2W.	.14	T-4	P.P. Input Transformer	2.10
R-7	350272	120 OHM - Carbon $\pm 20\%$ 1/2W.	.14	T-5	P.P. Output Transformer	1.80
R-8	340732	10,000 OHM - Carbon $\pm 10\%$ 1/2W.	.14	J-1	Etched Circuit Board (Less Comp.)	.65
R-9	340572	2,200 OHM - Carbon $\pm 10\%$ 1/2W.	.14	SP-1	Speaker 3 1/2" PM	3.70
R-10	340572	2,200 OHM - Carbon $\pm 10\%$ 1/2W.	.14			
R-11	340612	3,300 OHM - Carbon $\pm 10\%$ 1/2W.	.14			
R-12	340452	680 OHM - Carbon $\pm 10\%$ 1/2W.	.14			
R-13	390494	2,500 OHM - Volume Control	1.05			
R-14	340712 or 340612	8,200 OHM - Carbon $\pm 10\%$ 1/2W. or 3,300 OHM - Carbon $\pm 10\%$ 1/2W.	.14			

† See Schematic Diagram

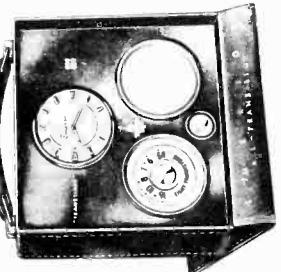
CABINET PARTS LIST, MODELS: 888 (PIONEER), SATELLITE, VANGUARD, 888R AND DELUXE VERSIONS\*\*

PART NUMBERS		DESCRIPTION		PART NUMBERS		DESCRIPTION	
888 (Pioneer)	Satellite	Vanguard	888R	888 (Pioneer)	Satellite	Vanguard	
N.B. Plastic	(Leather)	N.B. Plastic	Ivory	604047A	604047A	604047A	Dial Disc
N.B. Plastic	280291*	N.B. Plastic	280288*	600916	600916	461006	Tuning Knob
280288*	565451*	280288*	565451*	265135	265135	413203	Screw, Tuning Knob
412964A	412964A	412964A	412964A	460534	460534	413203	Press Inlay (tuning knob)
413147	413147	413147	413147	604053	604053	604053	Medallion (Emblem)
587158	587158	587158	587158	461000	461000	413245	Volume Knob
630217	630217	630217	630217	962150**	962150**	962150**	180187 Speaker (6" x 9")
				962145**	962145**	962145**	585235 Cord & Plug Assy
				962145**	962145**	962145**	580616 Masonite Bracket
				962145**	962145**	962145**	Underfilling Attachment

\*\*Not supplied with replacement cabinet ††NEVABREAK\*\* Plastic ††Optional accessory (Factory supplied with Deluxe Set) (see page 11)

JUNE, 1958  
MODEL 888  
"TRANSTIMER"  
CHASSIS 120416

**SPECIFICATIONS**  
TYPE: All transistor, superheterodyne battery portable.  
FREQUENCY RANGE: 540 - 1650 kc.  
TYPES OF TRANSISTORS AND CRYSTAL:  
Q1 - PNP Converter  
Q2 - NPN 1st I.F. amplifier  
Q3 - NPN 2nd I.F. amplifier  
Q4 - PNP 3rd I.F. amplifier  
Q5 - NPN 1st audio amplifier  
Q6 - PNP 2nd audio amplifier  
Q7 - PNP Matched Transistors  
Q8 - PNP Audio Output  
X1 - 1N60 or 1N295 diode detector & A.V.C.  
POWER SUPPLY: Four 1.5V "C" Type Batteries - equiv.)  
POWER SUPPLY: (Eveready #935, Ray-O-Vac #1LP or equiv.)  
CURRENT DRAIN: 7ma to 40ma depending on audio output power.



MODEL 888 "TRANSTIMER"

**GENERAL INFORMATION**

The 888 TransTimer combines an 8-transistor portable AM radio chassis and an independently operated 7-jewel precision clock in a luxurious genuine top-grain cowhide case. The radio chassis incorporates an etched circuit wiring board and utilizes 8-transistors and one germanium diode. As much as 400 hours of radio playing life can be expected from ordinary "C" type flashlight batteries because of the efficient circuitry and low current drain of the transistors and associated circuits. A personal listening attachment jack is accessible through an opening in the bottom of the cabinet. The colored protective coating on the underside of the board will take solder and need not be removed prior to any soldering operation. A single mercury battery can operate the clock continuously for a period of from three to five years. To start the clock, remove the fibre insulator (included for shipping) from between the battery and its contact and then rotate the entire set from left to right. To set the time, apply an outward pull to the time-set knob and turn in either direction (clockwise or counterclockwise). The clock is factory regulated and requires no adjustment.

**NOTE:** As with all transistorized equipment, do not place the TransTimer close to a hot radiator nor keep in an unventilated area such as the rear window shelf in an automobile. High heat may cause damage.

**DISASSEMBLY INFORMATION**

To Replace Radio Batteries:  
a. Remove (1) screws from the rear flap of cabinet.  
b. Replace (1) "C" battery (see photo in fig. 1, page 2). Use Eveready #935, Ray-O-Vac #1LP, or equivalent.  
c. Close rear flap.  
**CAUTION:** OBSERVE POLARITY OF BATTERIES.  
To Replace Clock Battery:  
a. Remove two (2) screws from rear flap of cabinet.  
b. Replace mercury "A-A" battery as shown in fig. 1, page 2. Use Eveready #E-9 (mercury), Mallory #ZM-9, or equivalent. c. Close rear flap.  
**CAUTION:** OBSERVE POLARITY OF BATTERY.

**CHASSIS REMOVAL**

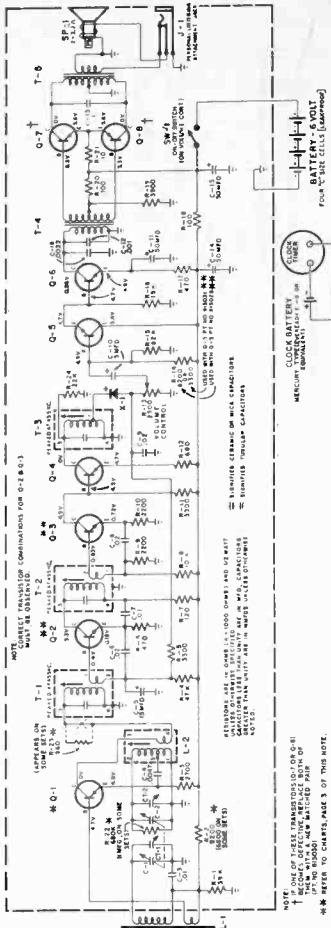
1. Open front flap.
2. Remove knurled tuning knob screw and tuning knob.
3. Unscrew the one (1) Phillips head screw located to the left of the tuning shaft (the screw becomes accessible upon removal of tuning knob).
4. Pull the volume control knob off shaft.
5. Reverse cabinet. Remove two screws, open rear flap. Chassis is now accessible.
6. Remove the two (2) hexagonal nut and rubber washer combinations. Two (2) power leads connect the chassis and the first and last batteries. These can be unsoldered for complete separation of the chassis or can be left connected for servicing as required in above procedures.
7. To reassemble chassis, reverse above procedures.

1. Remove clock battery from clip. 2. Remove rubber pads.
3. Unsolder two wire clock leads from battery clip terminals. 4. Pry speednut teeth up and lift off from stud. (See Fig. 1, page 2). 5. Clock may now be removed by pushing clock gently towards face of set (Support clock front with other hand).

To Remove Clock Face Crystal and Bezel:  
1. Remove clock as above.  
2. The bezel has been force-fitted into place and can be removed by resting clock face on both thumbs and pressing down on back edges of bezel with both thumbs. Removing bezel also frees clock crystal. To replace, reverse above procedures.

**NOTE: IN REPLACING CLOCK, ORIGINAL LEAD DRESS MUST BE ADHERED TO.**

Most components and all testing points are readily accessible upon removal of chassis from cabinet. Components located underneath the speaker or tuning capacitor can be easily reached after removing speaker and/or tuning capacitor from the etched board.  
To remove speaker, remove two speaker mounting screws located on bottom side of chassis and unsolder speaker leads.  
To remove tuning capacitor, remove two tuning capacitor mounting screws located on top of tuning capacitor housing bracket and unsolder oscillator lead from tuning capacitor.



SCHEMATIC DIAGRAM, CHASSIS 120416

**CONDITIONS FOR VOLTAGE READINGS**

1. Voltages indicated are positive D.C.
2. Measurements taken with V.T.V.M.
3. All Measurements taken between points and chassis.
4. Voltage measurements taken with:  
(a) Fresh 6 Volt battery supply. Four 1 1/2 Volt conventional "C" type cells.  
Note: Should Mercury batteries be used, an approximate lower voltage reading will be considered to be in the very normal. Bear in mind that the voltage supply will vary slightly with the type and condition of batteries used.

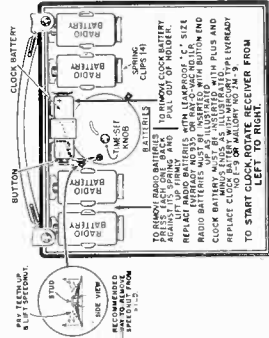


FIG. 1 - BATTERY & CLOCK INFORMATION

**ALIGNMENT INSTRUCTIONS**

Volume control should be at maximum; output of signal generator should be no higher than necessary to obtain an output reading with a 30% audio modulated R.F. Use an insulated alignment screwdriver for adjusting.

DIMMY ANTENNA	SIGNAL GENERATOR FREQUENCY	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1 .1 mfd.	High side to junction of L-1 & C-1. Low side to chassis.	455 K.C.	Tuning condenser fully open.	Across voice coil.	T2, T3 and T1	Adjust for maximum output reading with T3.
2	(Use a loop set perpendicular to center of bar loop ant. in set.)	1650 K.C.	Tuning condenser fully open.	Across voice coil.	CT2 (osc. trimmer) See note below	Fashion loop of several turns of wire and radiate signal into bar loop of receiver. Adjust for maximum output.
3	"	1400 K.C.	Tune for maximum output.	Across voice coil.	CT1 (Ant. trimmer)	Adjust for maximum output.
4	"	600 K.C.	Tuning condenser fully open.	Across voice coil.	Osc. trimmer in L-2	Hook the variable cond. on each side of 600 K.C. while osc. slug for maximum response.
5	"	1650 K.C.	Tuning condenser fully open.	"	CT2 (Osc. trimmer)	If readjustment is necessary, repeat entire alignment procedure.

FIG. 2 - ALIGNMENT POINTS & TRANSISTOR LOCATIONS

NPN type transistors are checked in a similar manner except the applied polarities from the ohmmeter are reversed (see figure no. 5) to give some inverse and forward resistance results.

**CAUTION**

Use only a vacuum tube type of ohmmeter. The R x 10 scale must be used for all forward (low) resistance measurements. Do not use the R x 1 scale as this might damage the transistor. A shunt type ohmmeter should not be used. If in doubt as to the type ohmmeter to use, refer to you have, place a 1,000 ohm resistor in series with it and subtract this 1,000 ohms from the reading obtained.

If these instructions are not followed, damage to the transistors may result since some non-electronic type of ohmmeters use high internal battery voltages.

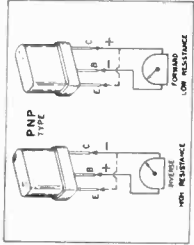


FIG. 4 - PNP TYPE

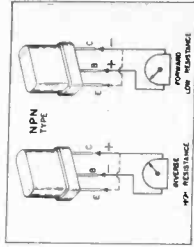


FIG. 5 - NPN TYPE

**CHASSIS 120416 PARTS LIST**

Symb.	Part No.	Description	List Price	Symb.	Part No.	Description	List Price
C-1	900172	Variable Capacitor, R. F. Section	3.45	R-15	340952	82,000 OHM - Carbon ±10% 1/2W.	.14
CT-1	Pt. of C-1	Trimmer, R. F. Section		R-16	340772	15,000 OHM - Carbon ±10% 1/2W.	.14
C-2	Pt. of C-1	Variable Capacitor, Osc. Section		R-17	340412	470 OHM - Carbon ±10% 1/2W.	.14
C-7-2	Pt. of C-1	Trimmer, Osc. Section		R-18	350252	100 OHM - Carbon ±20% 1/2W.	.14
C-3	928766	.01 MFD - Ceramic ±20% 30V.	.20	R-19	340632	3,900 OHM - Carbon ±10% 1/2W.	.14
C-4	928767	.01 MFD - Electrolytic 30V.	.70	R-20	340252	100 OHM - Carbon ±10% 1/2W.	.14
C-5	928519	15 MFD - Electrolytic 30V.	.25	R-21	340112	1 OHM - Carbon ±10% 1/2W.	.14
C-6	928138	.01 MFD - Ceramic GMV 30V.	.20	R-22	340112	1 OHM - Carbon ±10% 1/2W.	.14
C-7	928138	.02 MFD - Ceramic GMV 30V.	.25	R-23	340432	560 OHM - Carbon ±10% 1/2W.	.14
C-8	928138	.02 MFD - Ceramic GMV 30V.	.25	R-24	340432	560 OHM - Carbon ±10% 1/2W.	.14
C-9	928420	.02 MFD - Ceramic GMV 30V.	.25	Q-1	815025A	Transistor - Converter	P - N - P
C-10	928420	.02 MFD - Ceramic GMV 30V.	.25	Q-2	815025A	Transistor - 1st I.F. Amplifier	P - N - P
C-11	928421	.02 MFD - Ceramic GMV 30V.	.25	Q-3	815025A	Transistor - 2nd I.F. Amplifier	P - N - P
C-12	928919	.01 MFD - Electrolytic 10V.	.20	Q-4	815025A	Transistor - 3rd I.F. Amplifier	P - N - P
C-13	928919	.01 MFD - Electrolytic 10V.	.20	Q-5	815028 or 815031	Transistor - 1st Audio Amplifier	P - N - P
C-14	925422	.50 MFD - Electrolytic 10V.	1.25	Q-6	815029	Transistor - 2nd Audio Amplifier	P - N - P
C-15	Pt. of C-14	50 MFD - Electrolytic 10V.		Q-7	815030	Transistor - P. P. Audio Output	P - N - P
C-16	928921	27,000 OHM - Ceramic ±20% 30V.	.20	Q-8	815030	Transistor - P. P. Audio Output	P - N - P
R-1	340692	39,000 OHM - Carbon ±10% 1/2W.	.14	X-1	817069	Crystal Diode	1.05
R-2	340692	6,800 OHM - Carbon ±10% 1/2W.	.14	L-1	700139	Barloep Antenna	1.55
R-3	340692	2,700 OHM - Carbon ±10% 1/2W.	.14	L-2	716118	Oscillator Coil	1.90
R-4	340892	47,000 OHM - Carbon ±10% 1/2W.	.14	T-1	720302	1st I.F. Transformer	1.25
R-5	340812	3,300 OHM - Carbon ±10% 1/2W.	.14	T-2	720302	2nd I.F. Transformer	1.25
R-6	340812	470 OHM - Carbon ±10% 1/2W.	.14	T-3	720303	3rd I.F. Transformer	1.30
R-7	350272	120 OHM - Carbon ±10% 1/2W.	.14	T-4	734157	P. P. Input Transformer	2.10
R-8	340732	10,000 OHM - Carbon ±10% 1/2W.	.14	T-5	734158	P. P. Output Transformer	1.80
R-9	340572	2,200 OHM - Carbon ±10% 1/2W.	.14	J-1	508025	Etched Circuit Board (Less Comp.)	.65
R-10	340572	2,200 OHM - Carbon ±10% 1/2W.	.14	942318	Personal Listening Jack		
R-11	340612	3,300 OHM - Carbon ±10% 1/2W.	.14	962319	Battery Mounting Bd. Ass'y (Radio)		
R-12	340452	680 OHM - Carbon ±10% 1/2W.	.14	962319	Battery Mounting Bd. Ass'y (Clock)		
R-13	390494	2,500 OHM - Volume Control	1.05	SP-1	180175	Speaker 3 1/2" PM	3.70
R-14	340612	8,200 OHM - Carbon ±10% 1/2W.	.14				

NOTES: \* When a 815025 Transistor (Q1) is used, R2 is 8200 (#340712), R22 is 680K (#341172) and R23 is not used (shorted out).  
 †† Re-schematic diagram (Pg. 2) and charts (pg. 3).

**CABINET PARTS LIST, MODEL 888 TRANSMITTER**

Part No.	Description	Part No.	Description
265096	CABINET, LEATHER (SPECIFY COLOR)	471088	CLOCK
413252	SCREW, BACK FLAP	962322	CRYSTAL, CLOCK
547534	BEZEL (SPEAKER, GRILLE, RADIO DIAL)	962323	BEZEL, CLOCK
542149	ROLL PIN (FOR BEZEL)	342159	SPEEDNUT, CLOCK
413257	PERFORATED GRILLE	461026	KNOB, TUNING
413258	DIAL BACK PLATE	265135	SCREW, KNURLED (TUNING KNOB)
		461031	KNOB, VOLUME CONTROL
		365467	POST, FIBRE (CH. TO CABINET)

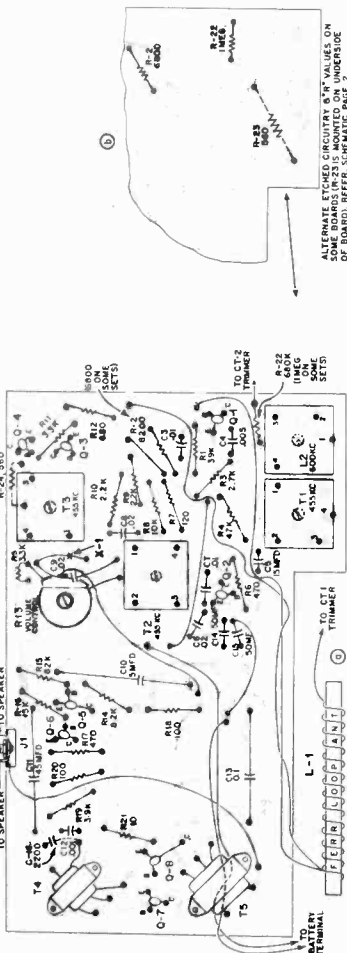


FIG. 3a-b - ETCHED PRINTED CIRCUIT CHASSIS DIAGRAMS

**SERVICING ALL TRANSISTOR RECEIVERS**

Two PNP matched transistors (pt. #815030) are used as a balanced push-pull class "B" audio output stage. This type of circuit yields greater audio output power at a much lower average battery drain. To optimize performance, these transistors are supplied as a matched pair. If one of these transistors becomes defective, replace both of them with a new matched pair. Should Q-2 or Q-3 NPN transistors be replaced be sure and follow the transistor combination as shown on schematic for best results.

Since the failure rate of a transistor is far less than that of a receiving type tube, the transistor itself should be the last item to suspect. Before inserting a new transistor, all components in the suspected circuit should be carefully checked. Voltage measurements, signal tracing and signal injection methods of trouble shooting should be used. Resistance testing methods have severe limitations when applied to transistor circuits; consequently, they are not recommended. Should it become necessary to use resistance measurements, it is recommended to unsolder one terminal (of the suspected component) from the etched board before checking. When replacing transistors or components soldered to transistor leads, use extreme care as too much heat to the transistor leads cause damage to the transistor. The recommended method would be to grip the transistor lead between the etched board and the transistor body with long nose pliers before applying heat. A great deal of the heat will be absorbed by the pliers, thus protecting the transistor. As added precaution, use a small-tipped low-wattage (approx. 35 watts) soldering iron.

Should careful checking of all circuit components fail to reveal the defect, replace suspected transistor. If you do not have a replacement transistor available, then some form of transistor checking will become necessary. Inexpensive transistor checkers are now commercially available. If a transistor checker is not available, the following approximate resistance method may be used after the suspected transistor is unsoldered from the etched circuit board (use long-nose pliers to absorb some heat).

**ADDITIONAL TRANSISTOR REPLACEMENT INFORMATION**

It will be seen from the schematic drawing of the 888 that certain transistors are used in pairs and are associated with specific resistors. Some individual transistors must likewise be used with specific resistors. This data and additional transistor substitution information is listed below for reference and convenience in ordering.

NOTE: Because of the small physical size of the transistors, the 1st three digits, "815", have been replaced by the letter, "E" for Emerson. The "E" also signifies that these transistors have been made to our design tolerances.

TRANSISTOR PAIRS	ASSOCIATED	TRANSISTOR PAIRS	ASSOCIATED	TRANSISTOR ASSOCIATED
Q2	R11	Q3	R12	R14
815026C	680	815026C	680	Q5
815026B	680	815026B	680	815033
815026B	680	815026F	330	815034
		815026C	330	815035

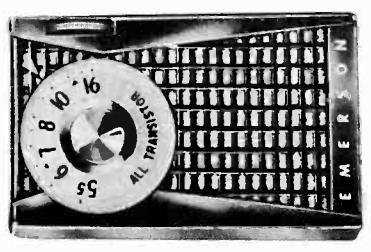
TRANSISTOR SUBSTITUTES	TRANSISTOR NOS.	FOR	USE	TRANSISTOR SUBSTITUTES	TRANSISTOR NOS.
815026B	Q2/Q3	815026B	No. Subst.	815033	Q5
815026A	Q2/Q3	815026F	Q5	815034	Q5
815026C	Q2/Q3	815031	815032	815035	Q5

**V. T. V.M. OHMMETER CHECK OF TRANSISTORS**

An approximate check of the transistors may be made with a vacuum tube type of ohmmeter. They are checked as two separate crystal diodes might be checked, that is, by measuring the forward and inverse resistance of each section individually. Figures No. 4 and No. 5 show the method of testing P-N-P and N-P-N types of transistors used in this receiver. When the negative terminal of the ohmmeter (set on R x 10 scale) is connected to the base (B) terminal of a good PNP transistor and the positive terminal of the meter is connected to the collector (C) or emitter (E) terminals, you should measure a low resistance (in the order of 500 ohms or less).

When the positive terminal of the ohmmeter is connected to the base (B) terminal of a good PNP transistor and the negative terminal of the meter is connected to the collector (C) or emitter (E) terminals, you should measure a high inverse resistance in the order of 50K ohms or higher. In the event your results are opposite from these, it is possible that the plus side of your meter is actually connected to the negative side of its internal battery.

MAY, 1958  
MODEL 999  
CHASSIS 120433B



MODEL 999

**SPECIFICATIONS**

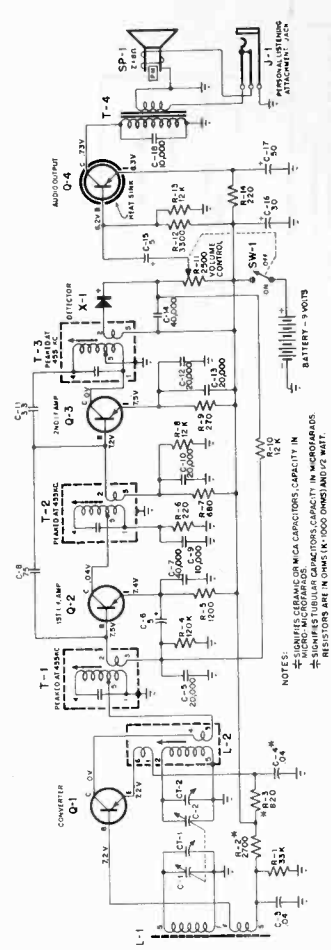
**TYPE:** All-transistor superheterodyne (battery operated).  
**FREQUENCY RANGE:** 530 - 1638 KC  
**TYPE OF TRANSISTORS AND CRYSTAL:**  
 Q-1: PNP Converter  
 Q-2: PNP 1st A.F. Amplifier  
 Q-3: PNP 2nd A.F. Amplifier  
 Q-4: PNP Audio Output  
 X-1: Diode detector and A.V.C.  
**POWER SUPPLY:**  
 One 9-volt battery, Eveready #216 or equivalent (for extra long life), use mercury battery, Eveready #146, or Mallory TR 146 R)  
**AVERAGE CURRENT DRAIN:**  
 10.5 ma, depending upon audio output.

**GENERAL INFORMATION**

Model 999 is an all-transistor vest pocket radio requiring a 9-volt battery supply. The radio incorporates an etched circuit wiring board and is equipped with a personal listening attachment jack. The circuit utilizes four (4) transistors and one (1) germanium diode.  
 The cabinet may be opened by inserting a small coin in the slot at the bottom of the cabinet and gently twisting the coin. If replacements are needed, the R-F section of the circuit, the receiver should be carefully realigned.  
 The receiver has a self-contained antenna and does not require additional antenna or ground connection.  
 The ferrite loop antenna has directional properties. For maximum signal pickup on weak stations it is recommended that the set be rotated through a quarter of a circle, leaving it in the position which provides maximum volume. It is recommended that the battery be removed as soon as it is exhausted or if the set is not to be operated for a few months or more. Make certain that the on-off switch is left in the "off" position. (Do not place radio close to a hot radiator or in an enclosed warm area such as the rear window shell in an automobile. High heat may cause damage).

**DISASSEMBLY INFORMATION**

- TO REPLACE BATTERY:**
1. Insert coin into slot located at bottom of cabinet, and twist to remove cabinet back.
  2. Lift out battery and remove battery connector.
  3. Attach battery connector to terminals of new battery.
  4. Insert battery connector exactly as illustrated on drawing which appears on inside of cabinet back. (Use fishpaper barrier, if new battery used).
- TO REMOVE CHASSIS:**
1. Unscrew tuning knob screw.
  2. Remove tuning knob.
  3. Remove screw (long) which becomes accessible upon removal of tuning knob.
  4. Open cabinet (note position of fishpaper barrier, if used).
  5. Remove screw (short) located at the foot of the battery.
- The chassis can be replaced by reversing the indicated steps.



SCHEMATIC DIAGRAM, CHASSIS 120433B

**CONDITIONS FOR VOLTAGE READINGS**

1. Voltages indicated on the schematic are positive D.C.
2. Measurements taken with V.T.V.M.
3. All measurements taken between points and chassis ground.
4. Measurement conditions:  
 (a) Fresh 9 volt battery supply. NOTE: Should Mercury or Nickel-Cadmium batteries be used, an approx. 15% lower voltage reading will be obtained from the battery supply which is considered to be perfectly normal. Bear in mind that the voltage supply will vary slightly with the type and condition of batteries used.  
 (b) Volume control set for maximum volume.  
 (c) Variable capacitor fully closed and no signal applied.  
 5. Normal tolerances in component values make possible a variation of ±15% in readings.  
**CAUTION:** When taking voltage checks, avoid accidentally shorting across transistor leads as this may cause transistor damage. Do not use a non-vacuum tube-type voltmeter as the relatively low shunt resistance of this type of voltmeter can easily disrupt the transistor bias and result in erroneous readings as well as damage to the transistor.  
**NOTE:** No resistance readings are given because of the possibility of applying excessive voltage to the transistor or to the capacitors during such a test. In addition, readings are not reliable since they depend upon the internal battery of meter.

**ALIGNMENT INSTRUCTIONS**

- CONDITIONS:**
1. Volume control - at maximum
  2. Signal generator - 30% audio modulated.
  3. Use an insulated alignment tool for adjustment.

COUPLING	SIGNAL GENERATOR		RADIO DIAL SETTING	OUTPUT METER CONNECTION	ADJUSTMENTS	REMARKS
	FREQUENCY	AMPLITUDE				
1. couple loosely	455 KC (modulated)		Tuning condenser fully opened (no interference)	Across voice coil	T3, T2, T1 (in given order)	Adjust for maximum output
2. couple loosely	1638 KC (modulated)		Tuning condenser fully opened (no interference)	Across voice coil	CT-2 (Osc. Trimmer, Trimmer)	Adjust for maximum output
3. couple loosely	600 KC (modulated)		Tune for max. output at 600 KC (SEE REMARKS)	Across voice coil	Padder slug in Osc. Trans.	Rock the variable cond. each side of 600 KC until for maximum output
4. couple loosely	1683 KC (modulated)		Fully open	Repeat step 2.	Repeat step 2.	Repeat step 2.
5. couple loosely	600 KC (modulated)		Tune for maximum output.	Repeat step 3.	Padder slug in Osc. Trans. L-2 (should require very little adjustment)	For optimum results, repeat entire alignment procedure (steps 1 - 5).

NOTE: Radiation into set can be achieved by placing generator leads near loop antenna.

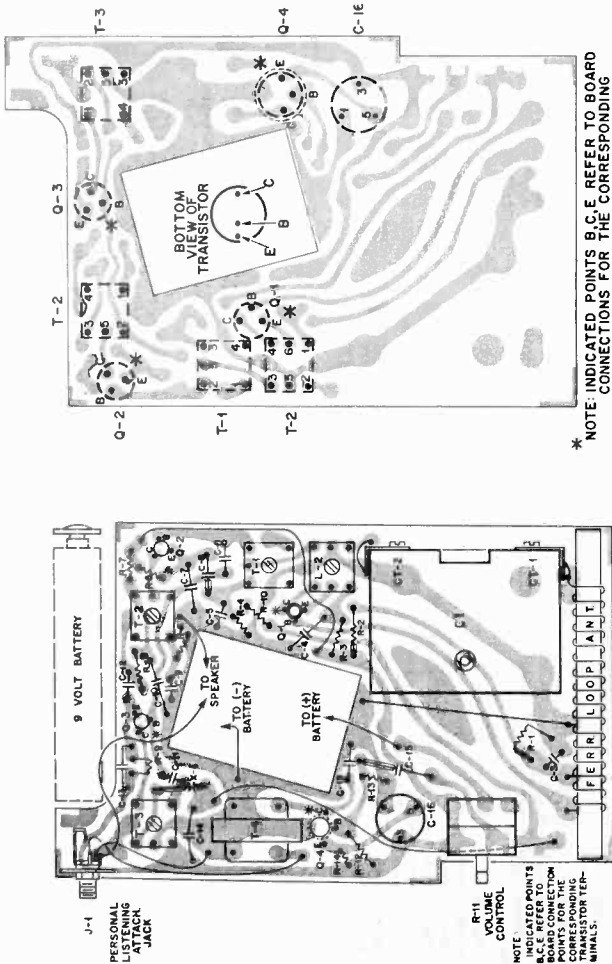


FIG. 1. PRINTED CIRCUIT CHASSIS DIAGRAM (TOP VIEW)

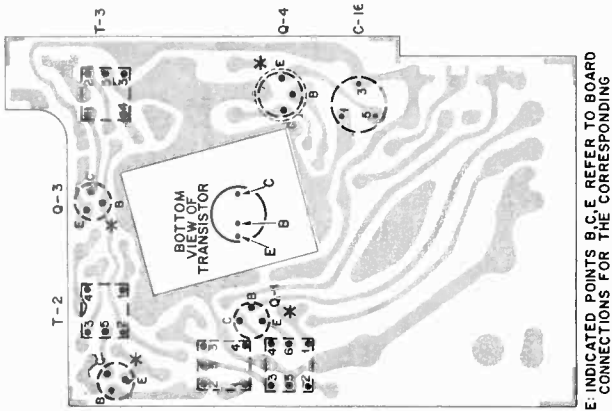


FIG. 2. PRINTED CIRCUIT CHASSIS DIAGRAM (BOTTOM VIEW)

SERVICING THE ALL-TRANSISTOR RECEIVER

Since the failure rate of a transistor is far less than that of a receiving type tube, the transistor itself should be the last item to suspect. Before inserting a new transistor, all components in the suspected circuit should be carefully checked. Voltage measurements, signal tracing and signal injection methods of trouble shooting should be used. Resistance testing methods have severe limitations when applied to transistor circuits; consequently, they are not recommended. Should it become necessary to use resistance measurements, it is recommended to unsolder one terminal (of the suspected component) from the etched board before checking. When replacing transistors or components soldered to transistor leads, use extreme care as too much heat to the transistor leads cause damage to the transistor. The recommended method would be to grip the transistor lead between the etched board and the transistor body with long nose pliers before applying heat. A great deal of the heat will be absorbed by the pliers, thus protecting the transistor. As added precaution, use a small-tipped low-wattage (approx. 35 watts) soldering iron.

Should careful checking of all circuit components fail to reveal the defect, replace suspected transistor. If you do not have a replacement transistor available, then some form of transistor checking will become necessary. Inexpensive transistor checkers are now commercially available. If a transistor checker is not available, the following approximate resistance method may be used after the suspected transistor is unsoldered from the etched circuit board (use long-nose pliers to absorb some heat).

V. T. V. M. OHMMETER CHECK OF TRANSISTORS

An approximate check of the transistors may be made with a vacuum tube type of ohmmeter. They are checked as two separate crystal diodes might be checked, that is, by measuring the forward and inverse resistance of each section individually. Figure No. 3 shows the method of testing P-N-P types of transistors used in this receiver.

When the negative terminal of the ohmmeter (set on R x 10 scale) is connected to the base (B) terminal of a good PNP transistor and the positive terminal of the meter is connected to the collector (C) or emitter (E) terminals, you should measure a low resistance (in the order of 500 ohms or less).

When the positive terminal of the ohmmeter is connected to the base (B) terminal of a good PNP transistor and the negative terminal of the meter is connected to the collector (C) or emitter (E) terminals, you should measure a high inverse resistance in the order of 50K ohms or higher.

In the event your results are opposite from these, it is possible that the plus side of your meter is actually connected to the negative side of its internal battery.

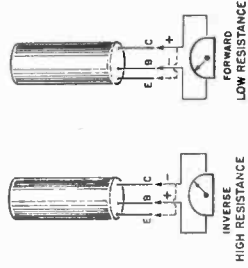


FIG. 3. PNP TYPE

**CAUTION**  
Use only a vacuum tube type of ohmmeter. The R x 10 scale must be used for all forward (low) resistance measurements. Do not use the R x 1 scale as this might damage the transistor. A short type ohmmeter should not be used. If in doubt as to the type of vacuum tube ohmmeter you have, place a 1,000 ohm resistor in series with it and subtract this 1,000 ohms from the reading obtained.

If these instructions are not followed, damage to the transistors may result, since some non-electronic type of ohmmeters use high internal battery voltages.

CHASSIS 120433B PARTS LIST

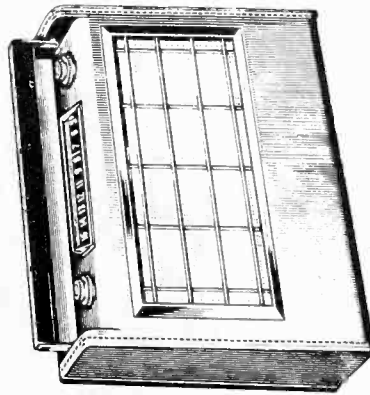
SYMB.	PART NO.	DESCRIPTION	SYMB.	PART NO.	DESCRIPTION
R-1	340852	33,000 OHM CARBON ±10%	C-13	928988	20,000 MMF - CERAMIC GMV
R-2	340592	2700(6800)* OHM CARBON ±10%	C-14	928983	40,000 MMF - CERAMIC GMV
R-3	340472	820(2700)* OHM CARBON ±10%	C-15	925446	5 MF - ELECTROLYTIC
R-4	340992	120,000 OHM CARBON ±10%	C-16	925445	30 MF - ELECTROLYTIC
R-5	340512	1,200 OHM CARBON ±10%	C-17	Pt. of C-16	50 MF - ELECTROLYTIC
R-6	350332	220 OHM CARBON ±20%	C-18	928137	10,000 MMF - CERAMIC GMV
R-7	340452	680 OHM CARBON ±10%	Q-1	815036	TRANSISTOR-CONVERTER
R-8	340752	12,000 OHM CARBON ±10%	Q-2	815037	TRANSISTOR - 1st I.F. AMP.
R-9	340352	270 OHM CARBON ±10%	Q-3	815037	TRANSISTOR - 2nd I.F. AMP.
R-10	340752	12,000 OHM CARBON ±10%	Q-4	815038	TRANSISTOR - AUDIO OUTPUT
R-11	390557	2,500 OHM Volume Control	X-1	817075	DIODE - DETECTOR
R-12	340612	3,300 OHM CARBON ±10%	L-1	700137	BAR LOOP ANTENNA
R-13	340752	12,000 OHM CARBON ±10%	L-2	716123	OSCILLATOR COIL
R-14	340332	220 OHM CARBON ±10%	T-1	720323	1st I.F. TRANSFORMER
C-1	900177	Variable Capacitor - R.F. Section	T-2	720324	2nd I.F. TRANSFORMER
C-1-1	Pt. of C-1	Trimmer - R.F. Section	T-3	720325	3rd I.F. TRANSFORMER
C-2	Pt. of C-1	Variable Capacitor - OSC. Section	T-4	734169	AUDIO OUTPUT TRANSFORMER
C-2-1	Pt. of C-1	Trimmer - OSC. Section			
C-3	923097	.04 MF - MYLAR +40%-20%			
C-4	923097	.04 MF - MYLAR +40%-20%			
C-5	(928988)*	(20,000 MMF* - CERAMIC GMV)	J-1	630231	ETCHED CIRCUIT BOARD
C-6	928988	20,000 MMF - CERAMIC GMV			
C-7	925449	5 MF - ELECTROLYTIC	SP-1	180186	EXTERNAL LISTENING JACK
C-8	928981	40,000 MMF - CERAMIC GMV			
C-9	928137	75 MMF - CERAMIC +5%			
C-10	928988	10,000 MMF - CERAMIC GMV	SW-1	Pt. of R-11	ON-OFF SWITCH (on Volume Control)
C-11	928988	20,000 MMF - CERAMIC GMV			
C-12	928988	3.3 MMF - CERAMIC ±5%			
		20,000 MMF - CERAMIC GMV			

CABINET PARTS LIST, MODEL 999

PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
461012	CABINET (SPECIFY COLOR)	461013	KNOB, VOLUME
265135	CABINET FRONT (SPECIFY COLOR)	471111	BAFFLE & GRILLE CLOTH ASSEMBLY
	CABINET BACK (SPECIFY COLOR)	180186	SPEAKER, 2 1/2"
	KNOB, TUNING	565484	FISH PAPER BARRIER (WHEN USED)
	SCREW, TUNING KNOB		

# Firestone Radio

TRANSISTOR  
PORTABLE



**STOCK No.** 4-C-34  
**CODE No.** 382-7-40900

BRITISH TAN

**SPECIFICATIONS**

**FREQUENCY RANGE**  
Broadcast 540-1620Kc  
IF 455Kc

**SPEAKER**  
Type: Permanent Magnet  
Size: 5 1/4"  
Voice Coil Impedance 3.2 ohms

**POWER SUPPLY**  
6 - 1 1/2 Volt "D" Size Cells

**POWER OUTPUT**  
Type: Push-Pull  
Undistorted 125 MW  
Maximum 250 MW

**TRANSISTORS AND FUNCTIONS**

2N212	Mixer
2N211	Oscillator
2N94	1st IF
2N94	2nd IF
2N35	Driver
2N214	Output
2N214	Output

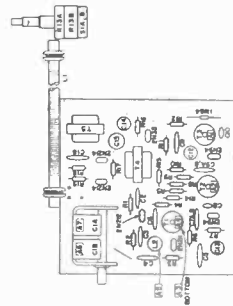
**ALIGNMENT PROCEDURE**

**PRELIMINARY**

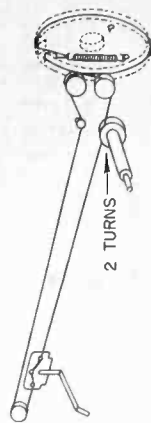
Output meter reading to indicate 50 milliwatts ..... 0.4V  
 Output meter connection ..... Across speaker voice coil  
 Connection of generator ground lead ..... Common Ground  
 Generator Modulation ..... 30% 40 cycles  
 Position of volume control ..... Fully Clockwise  
 Position of tone control ..... Maximum Clockwise

Position of Variable	Generator Frequency	Dummy Antenna	Generator Connections	Trimmers Adj. in order shown for Max. Output	Function of Trimmer
Open	455 Kc	.05 µf	C1A	A1, 2, 3, 4	I. F. Oscillator
Open	1670 Kc		*Test Loop	A6	Antenna
1400Kc	1400 Kc		*Test Loop	A7	
600Kc	600 Kc		*Test Loop	Check Point	

\*Standard Hazeltine Test Loop Model 1150 or 3 turns of wire about 6" in diameter placed about one foot from the set loop.  
 The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the AVC action of the receiver ineffective.  
**WARNING:** Since a DC voltage exists across the oscillator section (C1B) of the variable capacitor, it is recommended that the plates in this section not be adjusted unless absolutely necessary for calibration purposes.



POSITION WITH VARIABLE AT MAXIMUM CAPACITY



CODE 382-7-40900

ORDERING PARTS

Order parts from your Firestone Auto Supply parts warehouse, showing on your order Firestone stock number and code number, which may be taken from the front page of this manual, as well as the part number and description of part, which may be found in the parts list of this manual.

RETURNING DEFECTIVE PARTS

In-warranty, defective parts subject to adjustment should be returned to your District Office Service Department with Return Material Tag S1178 securely attached and completely filled out, and if claim is justified credit will be issued.

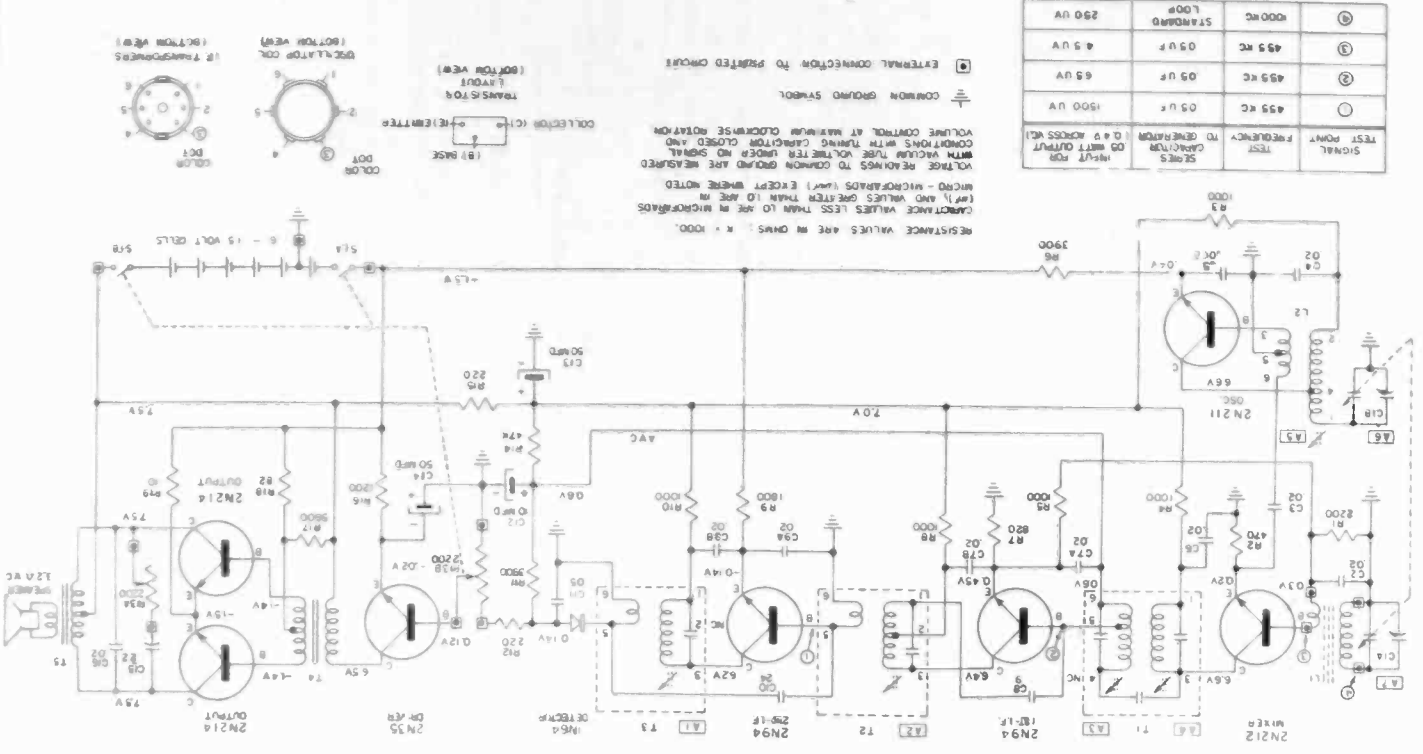
PARTS LIST

SCHEMATIC LOCATION	PART NO.	DESCRIPTION	QTY
C1A, B	* 43989	Variable	1.00
C1, 1, A, 15		81 uf. Disk	1.00
C1, 1, A, 16		81 uf. Disk	1.00
C1A, B, C, A, B	* 43990	81 uf. Disk	4.00
C1, 1, 1		81 uf. Disk	1.00
C1, 1, 2		81 uf. Disk	1.00
C1, 1, 3		81 uf. Disk	1.00
C1, 1, 4		81 uf. Disk	1.00
C1, 1, 5		81 uf. Disk	1.00
C1, 1, 6		81 uf. Disk	1.00
C1, 1, 7		81 uf. Disk	1.00
C1, 1, 8		81 uf. Disk	1.00
C1, 1, 9		81 uf. Disk	1.00
C1, 1, 10		81 uf. Disk	1.00
C1, 1, 11		81 uf. Disk	1.00
C1, 1, 12		81 uf. Disk	1.00
C1, 1, 13		81 uf. Disk	1.00
C1, 1, 14		81 uf. Disk	1.00
C1, 1, 15		81 uf. Disk	1.00
C1, 1, 16		81 uf. Disk	1.00
C1, 1, 17		81 uf. Disk	1.00
C1, 1, 18		81 uf. Disk	1.00
C1, 1, 19		81 uf. Disk	1.00
C1, 1, 20		81 uf. Disk	1.00
C1, 1, 21		81 uf. Disk	1.00
C1, 1, 22		81 uf. Disk	1.00
C1, 1, 23		81 uf. Disk	1.00
C1, 1, 24		81 uf. Disk	1.00
C1, 1, 25		81 uf. Disk	1.00
C1, 1, 26		81 uf. Disk	1.00
C1, 1, 27		81 uf. Disk	1.00
C1, 1, 28		81 uf. Disk	1.00
C1, 1, 29		81 uf. Disk	1.00
C1, 1, 30		81 uf. Disk	1.00
C1, 1, 31		81 uf. Disk	1.00
C1, 1, 32		81 uf. Disk	1.00
C1, 1, 33		81 uf. Disk	1.00
C1, 1, 34		81 uf. Disk	1.00
C1, 1, 35		81 uf. Disk	1.00
C1, 1, 36		81 uf. Disk	1.00
C1, 1, 37		81 uf. Disk	1.00
C1, 1, 38		81 uf. Disk	1.00
C1, 1, 39		81 uf. Disk	1.00
C1, 1, 40		81 uf. Disk	1.00
C1, 1, 41		81 uf. Disk	1.00
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C1, 1, 43		81 uf. Disk	1.00
C1, 1, 44		81 uf. Disk	1.00
C1, 1, 45		81 uf. Disk	1.00
C1, 1, 46		81 uf. Disk	1.00
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C1, 1, 48		81 uf. Disk	1.00
C1, 1, 49		81 uf. Disk	1.00
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C1, 1, 53		81 uf. Disk	1.00
C1, 1, 54		81 uf. Disk	1.00
C1, 1, 55		81 uf. Disk	1.00
C1, 1, 56		81 uf. Disk	1.00
C1, 1, 57		81 uf. Disk	1.00
C1, 1, 58		81 uf. Disk	1.00
C1, 1, 59		81 uf. Disk	1.00
C1, 1, 60		81 uf. Disk	1.00
C1, 1, 61		81 uf. Disk	1.00
C1, 1, 62		81 uf. Disk	1.00
C1, 1, 63		81 uf. Disk	1.00
C1, 1, 64		81 uf. Disk	1.00
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C1, 1, 72		81 uf. Disk	1.00
C1, 1, 73		81 uf. Disk	1.00
C1, 1, 74		81 uf. Disk	1.00
C1, 1, 75		81 uf. Disk	1.00
C1, 1, 76		81 uf. Disk	1.00
C1, 1, 77		81 uf. Disk	1.00
C1, 1, 78		81 uf. Disk	1.00
C1, 1, 79		81 uf. Disk	1.00
C1, 1, 80		81 uf. Disk	1.00
C1, 1, 81		81 uf. Disk	1.00
C1, 1, 82		81 uf. Disk	1.00
C1, 1, 83		81 uf. Disk	1.00
C1, 1, 84		81 uf. Disk	1.00
C1, 1, 85		81 uf. Disk	1.00
C1, 1, 86		81 uf. Disk	1.00
C1, 1, 87		81 uf. Disk	1.00
C1, 1, 88		81 uf. Disk	1.00
C1, 1, 89		81 uf. Disk	1.00
C1, 1, 90		81 uf. Disk	1.00
C1, 1, 91		81 uf. Disk	1.00
C1, 1, 92		81 uf. Disk	1.00
C1, 1, 93		81 uf. Disk	1.00
C1, 1, 94		81 uf. Disk	1.00
C1, 1, 95		81 uf. Disk	1.00
C1, 1, 96		81 uf. Disk	1.00
C1, 1, 97		81 uf. Disk	1.00
C1, 1, 98		81 uf. Disk	1.00
C1, 1, 99		81 uf. Disk	1.00
C1, 1, 100		81 uf. Disk	1.00

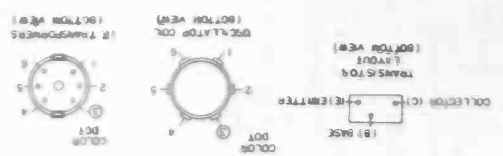
NOTE: All Capacitors and resistors not showing a part number may be replaced with any good quality replacement part of similar type and value. Such parts are readily available thru any local parts jobber.

\* Experience indicates that all items denoted with an asterisk are replacement parts that are not available thru parts jobbers. Orders for service requirements of these parts should be made thru your Firestone Parts Warehouse.

SCHEMATIC DIAGRAM FOR FIRESTONE RADIO STOCK NO. 4-C-34



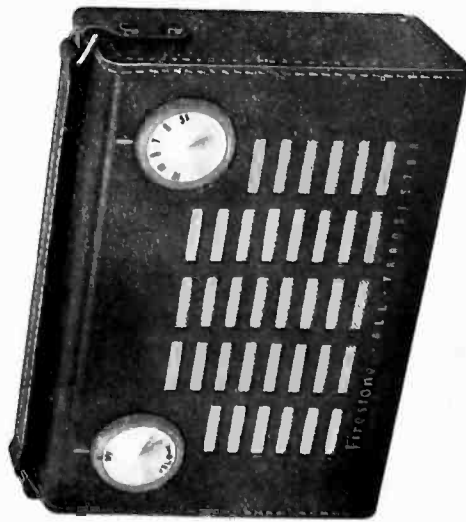
SIGNAL TEST POINT	TEST POINT REFERENCE TO GROUND OR ACROSS VOLTAGE	TEST POINT REFERENCE TO GROUND OR ACROSS VOLTAGE	TEST POINT REFERENCE TO GROUND OR ACROSS VOLTAGE
1	455 KC	0.5 V	1500 UV
2	455 KC	0.5 V	65 UV
3	455 KC	0.5 V	4.5 UV
4	4000 KC	STANDARD	250 UV



RESISTANCE VALUES ARE IN OHMS. K = 1000.  
 CAPACITANCE VALUES LESS THAN 100 P.F. ARE IN PICOFARADS.  
 (100 P.F. AND VALUES GREATER THAN 100 P.F. ARE IN MICROFARADS.)  
 VOLTAGE READINGS TO COMMON GROUND ARE MEASURED WITH VACUUM TUBE VOLTMETER UNDER NO SIGNAL AND COMMON CONNECTION TO PRELIMINARY CIRCUIT.  
 COMMON GROUND SYMBOL.  
 EXTERNAL CONNECTION TO PRELIMINARY CIRCUIT.

# Firestone

## RADIO



### Service Manual and Parts Catalog

STOCK NO. 4-C-33  
CODE NO. 120-7-PTR15

Cabinet Dimensions . . . . . 9 1/16" x 6 1/8" x 2 7/8"  
Weight . . . . . 4 lbs.  
Batteries Required . . . . . 6 size "D" cells

**SENSITIVITY** — 200 microvolts per meter average for 20 milliwatts output  
**SELECTIVITY** — 1000 KC, 21KC at 1000 X signal

**(USE LEAK-PROOF BATTERIES ONLY)**

Tuning Range . . . . . 540 to 1610 KC  
Intermediate Frequency . . . . . 455 KC  
Loud Speaker . . . . . 5 inch PM  
Voice Coil Impedance . . . . . 3.2 Ohm at 400 Cycles  
Power Output . . . . . Undistorted - 30 Milliwatts  
Maximum 50 Milliwatts

**TRANSISTOR COMPLEMENT**

- 2N252 — Converter
- 2N253 — 1st IF Amplifier
- 2N254 — 2nd IF Amplifier
- 2N238 — 1st Audio Driver
- 2N109 or 357 — Power Output

**SERVICE NOTES**

**TRANSISTOR SOCKET VOLTAGES**

Socket	Transistor in			Transistor Out		
	C	B	E	C	B	E
2N252	0	6.6	7.0	0	6.8	9.0
2N253	8.4	0.7	0.5	9.0	0.8	0
2N254	8.8	0.8	0.6	9.0	1.0	0
2N238	2.8	6.0	6.2	0	6.0	9.0
357 or 2N109	2.0	6.4	6.5	0	8.0	9.0

**CONTINUITY CHECKING**

**CAUTION: REMOVE ALL TRANSISTORS BEFORE MAKING CONTINUITY CHECKS.**

**BATTERY INSTALLATION**

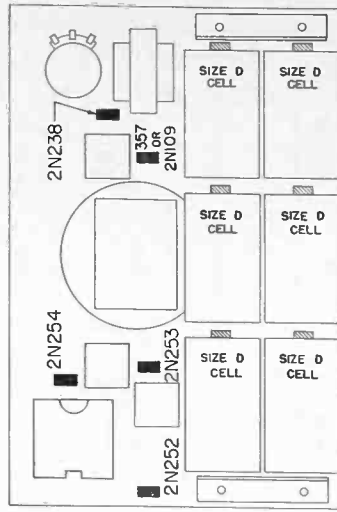
Batteries Required: 6 size "D" flashlight cells. **CAUTION:** Always use LEAK-PROOF batteries.

1. Open cabinet back by un-snapping the leather catch straps.
2. Load batteries into battery holder. All batteries must face in same direction.
3. Insert loaded battery holder into receiver. The battery tips **MUST** face to the **RIGHT** as shown in the illustration below. The left side of the holder (bottom of batteries) should be inserted first.

**ALIGNMENT PROCEDURE**

**Volume Control:** Maximum, all adjustments  
**Dummy Antenna:** .1 MFD in series with generator output lead  
**Signal Generator** ground connection to chassis.

Generator Frequency	Tuner Setting	Generator Connection	Adjust for Max Output
455 KC	Fully open	2N252 Base	T1 slug
455 KC	Fully open	2N252 Base	T3 slug
455 KC	Fully open	2N252 Base	T2 slug
1610 KC	Fully open	2N252 Base	Oscillator (CV 1-B)
1400 KC	Tune in signal from gen.	Loosely couple gen. to Antenna Loop	Antenna trimmer of gen. Antenna (CV 1-A)



**Firestone**  
STOCK NO. 4-C-33  
CODE NO. 120-7-PTR15  
DATE OF MFR.  
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**CAUTION**  
USE LEAK-PROOF BATTERIES ONLY



**HOW TO ORDER PARTS**

Order parts from your nearest Firestone Parts Supply Warehouse. When ordering parts, it is important that the correct code number and stock number be given with the correct part name and part number as shown in the parts list. (Number printed on the part if different from that shown on this list.) The stock and code number appears on the front cover of this booklet.

**PARTS LIST**

Ref. No.	Part No.	Description	List Price
<b>CONDENSERS</b>			
C1, C5	15-103	.01 MFD, 20% ceramic disc	.25
C11, C15	15-502	.005MFD ceramic disc	.25
C2, C12	20-406-01	40 MFD 10 VDCW electrolytic	1.25
C3, C9	15-503	.05 ceramic disc	.40
C4, C6, C7	15-503	6 MFD, 10 VDCW electrolytic	1.00
C8, C12	20-6	100 MFD, 10 VDCW electrolytic	1.50
C10, C13	20-107	.1 MFD 200 VDCW	.30
C14	30-104-2	Variable tuning condense	2.00
CV-1A, 1B	35A634		
<b>RESISTORS</b>			
R1	60-3935	39K ohms, 1/2 watt, 10%	.15
R2, R12	60-8225	8200 ohms, 1/2 watt, 10%	.15
R3, R10	60-3325	3300 ohms, 1/2 watt, 10%	.15
R4	60-6835	68K ohms, 1/2 watt, 10%	.15
R5	60-2225	1200 ohms, 1/2 watt, 10%	.15
R6, R9	60-4715	470 ohms, 1/2 watt, 10%	.15
R7, R18	60-2225	2200 ohms, 1/2 watt, 10%	.15
R8, R17	60-2235	22K ohm, 1/2 watt, 10%	.15
R14	60-2215	220 ohm, 1/2 watt, 10%	.15
R15, R16	60-4815	680 ohm, 1/2 watt, 10%	.15
R19	60-4705	470 ohm, 1/2 watt, 10%	.15
R11	80A635	Volume control with switch	1.50
<b>TRANSFORMERS &amp; COILS</b>			
*L1	10A675	Magna-Loop Antenna coil assembly	2.50
*T1, T4	14-17	Oscillator coil	2.00
*T2, T3	14-15	IF Coupler coil	2.00
*T3	14-16	IF Coil	2.00
*T5	75A636	Output transformer	1.90
<b>TRANSISTORS &amp; DIODES</b>			
D1, D2	1N295	Diode	1.25
	2N238	Transistor	4.90
	2N252	Transistor	4.90
	2N254	Transistor	4.00
<b>MISCELLANEOUS</b>			
*SP-1	*738457	Loudspeaker	4.80
	*1354441	Battery holder	1.00
	*478629	Tuning knob	.80
	*478629-1	Volume control knob	.80
	*50-15	Case	6.00

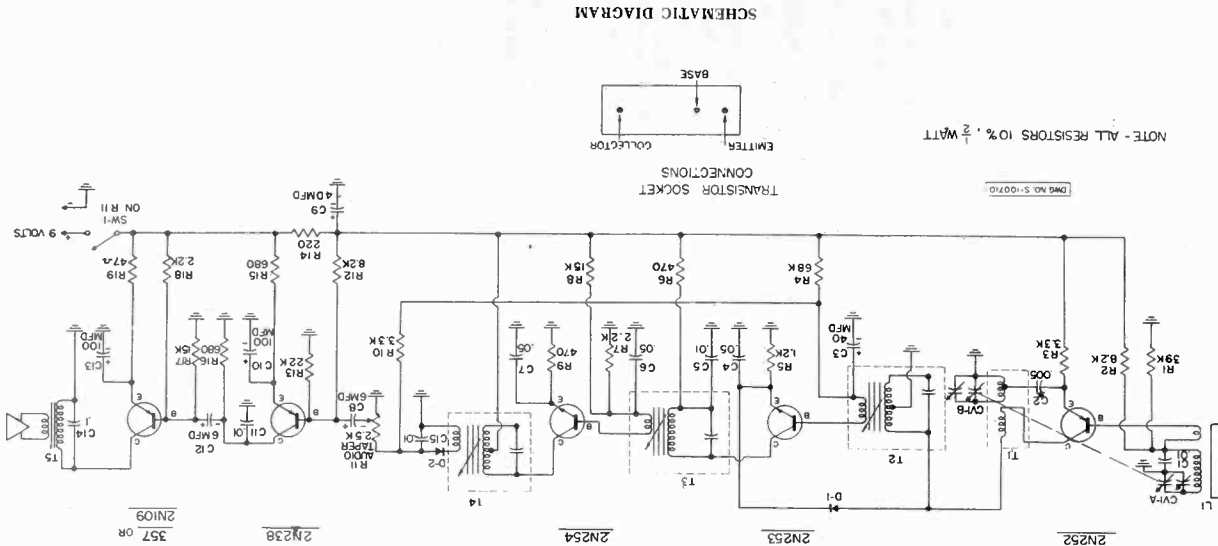
Prices subject to change without notice.

**REPLACEMENT PARTS LIST**

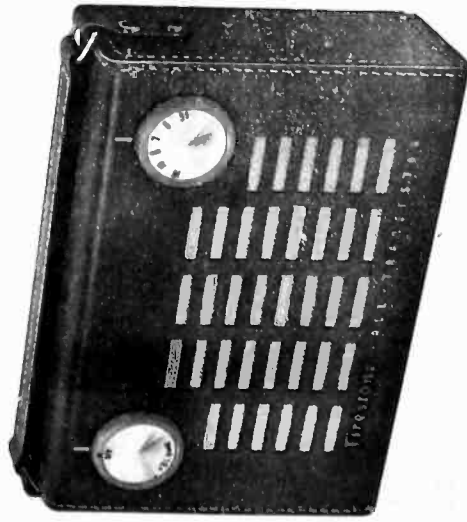
\*NOTE: Experience indicates that all items denoted by an asterisk are replacement parts that are not usually available through parts jobbers. Orders for service requirements of these parts should be made through your Firestone Parts Warehouse.

**HOW TO RETURN DEFECTIVE PARTS**

All parts on adjustments must be returned to your District Office Service Department with return material tag S1178 completely filled out. This radio is so constructed that it can be repaired locally by an experienced repairman.



# Firestone RADIO



## Service Manual and Parts Catalog

STOCK NO. 4-C-33  
CODE NO. 120-7-PTR15B

Cabinet Dimensions . . . . . 9 1/16" x 6 1/8" x 2 7/8"  
Weight . . . . . 4 lbs.  
Batteries Required . . . . . 6 size "D" cells  
(USE LEAK-PROOF BATTERIES ONLY)

Tuning Range . . . . . 510 to 1610 KC  
Intermediate Frequency . . . . . 455 KC  
Loud Speaker . . . . . 5 inch PAI  
Voice Coil Impedance . . . . . 32 Ohm at 100 Cycles  
Power Output . . . . . Undistorted - 250 Milliwatts  
Maximum 300 Milliwatts

SENSITIVITY — 150 microvolts per meter average  
for 50 milliwatts output  
SELECTIVITY — 1000 KC, 21KC at 1000 X signal

**TRANSISTOR COMPLEMENT**

- 2N112 — Converter
- 2N111A — 1st IF Amplifier
- 2N111A — 2nd IF Amplifier
- 2N132 — 1st Audio Driver
- 2N138A — Power Output (2)

**SERVICE NOTES**

**TRANSISTOR SOCKET VOLTAGES \***

Socket	Transistor in			Transistor Out		
	C	B	E	C	B	E
2N112	-6.5	-1.5	-1.5	-9.0	-2.0	0
2N111A 1st	-4.0	-1.0	-0.7	-9.0	0	0
2N111A 2nd	-7.0	-1.1	-1.1	9.0	-2.0	0
2N132	-5.5	-1.0	-1.0	-9.0	0	0
2N138A	-9.0	-0.5	0	-9.0	0	0

\* Note: Voltages measured with supply voltage 9.0 VDC and chassis at plus (+) potential.

**ALIGNMENT PROCEDURE**

Volume Control: Maximum, all adjustments  
Dummy Antenna: 1 MFD in series with generator output lead  
Signal Generator ground connection to chassis.

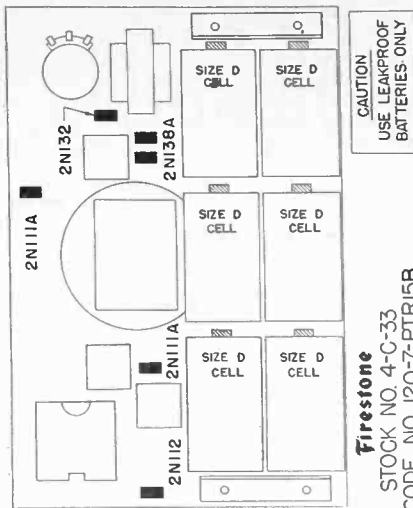
Generator Frequency	Tuner Setting	Generator Connection	Adjust for Max Output
455 KC	Fully open	2N112 Base	T3 slug
155 KC	Fully open	2N112 Base	T2 slug
155 KC	Fully open	2N112 Base	T1 slug
1610 KC	Full: open	2N112 Base	One trimmer of gang (CV 1B)
1400 KC	Tune in signal from gen.	Loosely couple gen. to Antenna Loop	Antenna trimmer of gang (CV 1A)

**CONTINUITY CHECKING**  
**CAUTION: REMOVE ALL TRANSISTORS BEFORE MAKING CONTINUITY CHECKS.**

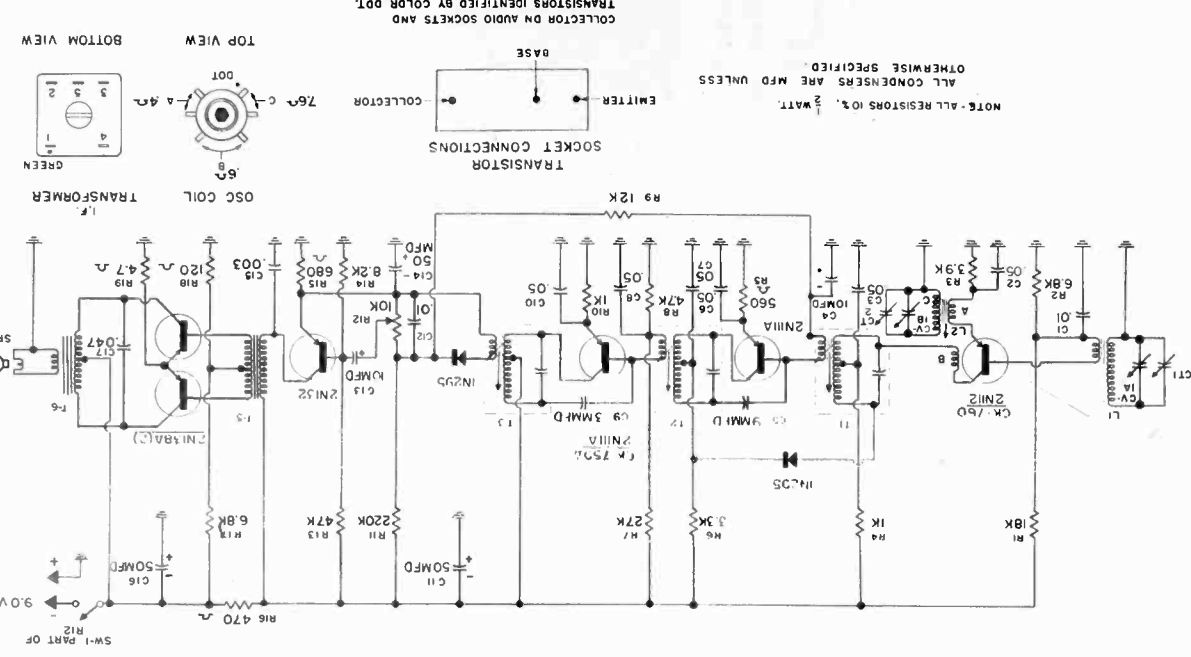
**BATTERY INSTALLATION**

- Batteries Required: 6 size "D" flashlight cells. **CAUTION:** Always use LEAK-PROOF batteries.
- Open cabinet back by un-snapping the leather catch strips.
  - Load batteries into battery holder. All batteries must face in same direction.
  - Insert padded battery holder into receiver. The battery tips **MUST** face to the **RIGHT** as shown in the illustration below. The left side of the holder (bottom of batteries) should be inserted first.

If receiver is to be stored for any length of time, remove batteries. Battery contact brackets are adjustable to allow for variations in battery sizes.



**Firestone**  
STOCK NO. 4-C-33  
CODE NO. 120-7-PTR15B  
DATE OF MFR.  
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**HOW TO ORDER PARTS**

Order parts from your nearest Firestone Parts Supply Warehouse. When ordering parts, it is important that the correct code number and stock number be given with the correct part name and part number as shown in the parts list. (Number printed on the part if different from that shown on this list.) The stock and code number appears on the front cover of this booklet.

**PARTS LIST**

Part No.	Description	List Price	Part No.	Description	List Price
C1, C12	.01 MFD, 20% ceramic disc	\$.25	D1, D2	IN295 Diode	1.25
C11, C15	.005 MFD ceramic disc	.25	2N112	Transistor	4.90
C2, C3, C6	.05 ceramic disc	.40	2N114	Transistor	4.90
C4, C8, C10	10 MFD 10 VDCW Electrolytic	1.00	2N132	Transistor	4.50
C4, C13	20-106-01		2N138A	Transistor	4.50
C11, C14	50 MFD, 13 VDCW	1.00			
C1, C15	.003 MFD, 20% ceramic disc	.25			
C15	Variable tuning condenser	2.00			
*C11, A, B	35A834	.30			
C7	15-3G	.30			
C8	9 MMFD 5% ceramic disc	.30			
C9	15-9G	.30			
C17	.047 MFD, 200 VDCW	.30			
R1	60-183S 18K ohms, 1/2 watt, 10%	.15			
R2, R17	60-682S 6800 ohms, 1/2 watt, 10%	.15			
R1	60-392S 3920 ohms, 1/2 watt, 10%	.15			
R4, R10	1K ohms, 1/2 watt, 10%	.15			
P5	60-564S 530 ohms, 1/2 watt, 10%	.15			
P6	60-272S 27K ohms, 1/2 watt, 10%	.15			
R7	60-472S 4700 ohms, 1/2 watt, 10%	.15			
R8	60-123S 12K ohms, 1/2 watt, 10%	.15			
R9	60-224S 22K ohms, 1/2 watt, 10%	.15			
R11	60-473S 47K ohms, 1/2 watt, 10%	.15			
R13	60-473S 47K ohms, 1/2 watt, 10%	.15			
R14	60-872S 8200 ohms, 1/2 watt, 10%	.15			
*R12	80A635A Volume control with switch	1.50			
R15	60-681S 680 ohms, 1/2 watt, 10%	.15			
R16	60-471S 470 ohms, 1/2 watt, 10%	.15			
R18	60-123S 12K ohms, 1/2 watt, 10%	.15			
R19	60-470S 4.7 ohms, 1/2 watt, 10%	.15			

**TRANSFORMERS & COILS**

Part No.	Description	List Price
*L1	10A575A Magna-Loop Antenna coil assembly	2.50
*L2	14A757 Oscillator coil	2.00
*I1	14-18 IF Coil, 1st	2.00
*I2	14-13 IF Coil, 2nd	2.00
*I3	14-23 IF Coil, 3rd	2.00
*I5	78A787 Input transformer	1.90
*I5	78A795 Output transformer	1.90

**TRANSISTORS & DIODES**

Part No.	Description	List Price
D1, D2	IN295 Diode	1.25
2N112	Transistor	4.90
2N114	Transistor	4.90
2N132	Transistor	4.50
2N138A	Transistor	4.50

**MISCELLANEOUS**

Part No.	Description	List Price
*S5-1	73B657 Loudspeaker	4.30
	135A641 Battery holder	1.00
	47B629 Tuning knob	.80
	47B629-1 Volume control knob	.80
	50-15 Case	6.00

Prices subject to change without notice.

**REPLACEMENT PARTS LIST**

\*NOTE: Experience indicates that all items denoted by an asterisk are replacement parts that are not usually available through parts jobsites.

Orders for service requirements of these parts should be made through your Firestone Parts Warehouse.

**HOW TO RETURN DEFECTIVE PARTS**

All parts on adjustments need be returned to your District Office Service Department with return material tag ST-18 completely filled out. This radio is so constructed that it can be repaired locally by an experienced repairman.

STOCK NO. 4-C-37

CODE NO. 1-8-6TR

**SPECIFICATIONS**

Cabinet Dimensions	Width 5", Height 6 1/2" Depth, 2 3/4"	Voice Coil Impedance	3.2 ohms at 400 cycles
Shipping Weight	2 pounds	Power Output	120 Milliwatts
Power Supply	Batteries	Tuning Range	Standard Broadcast Band
Battery Power Supply (6 Cells)	Eveready 915 or 1015 Burgess Type "Z"	Intermediate Frequency	455KC
Loud Speaker	4 In. P.M.	Transistor Complement	1 - Converter - 2N411 2 - IF Amplifier - 2N409 1 - Det. AYC - IN60 Diode 1 - Audio Driver - 2N405 2 - Power Amplifier - 2N407

**TO REMOVE CHASSIS**

1. Remove knobs
2. Remove two screws at sides of cabinet.
3. Open bottom flap on cabinet to slide chassis out.

**CAUTION:** If battery holder leads are unsoldered, avoid overheating plastic holder, as it will soften and permanently loosen terminal.

# Firestone

## TRANSISTOR PORTABLE RADIO

**ALIGNMENT**

**ALIGNMENT INSTRUCTIONS - READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT**

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting. Use battery power. Connect Output Meter across Voice Coil of Speaker.

Function	Generator Frequency	Dummy Antenna	Generator Conn.	Adjust	Remarks
1. I.F.	455KC	.1 Mfd Condenser in series with Gen. Lead	On Converter Base	T1, T2 T3	Adjust for Max. Output
2. Osc. Trimmer	1620KC		*Test Loop	C1-B	Variable Condenser Set for Minimum capacity
3. Ant. Trimmer	1400KC		*Test Loop	C1-A	Adjust for Max. Output
4. Osc. Slug	600KC		*Test Loop	L-2 Slug	Adjust for Max. Output while rocking Gang. Repeat steps 1, 2 & 3.

\* Standard Hazeltine Loop Model 1150 or 3 turns of wire about 6" diameter placed one foot from set.

STOCK NO. 4-C-37  
CODE NO. 1-8-6TR

CODE 1-8-6TR

**ORDERING PARTS**

Order parts from Your Firestone Auto Supply parts warehouse, showing on your order Firestone stock number and code number, which may be taken from the front page of this manual, as well as the part number and description of part, which may be found in the parts list of this manual.

**RETURNING DEFECTIVE PARTS**

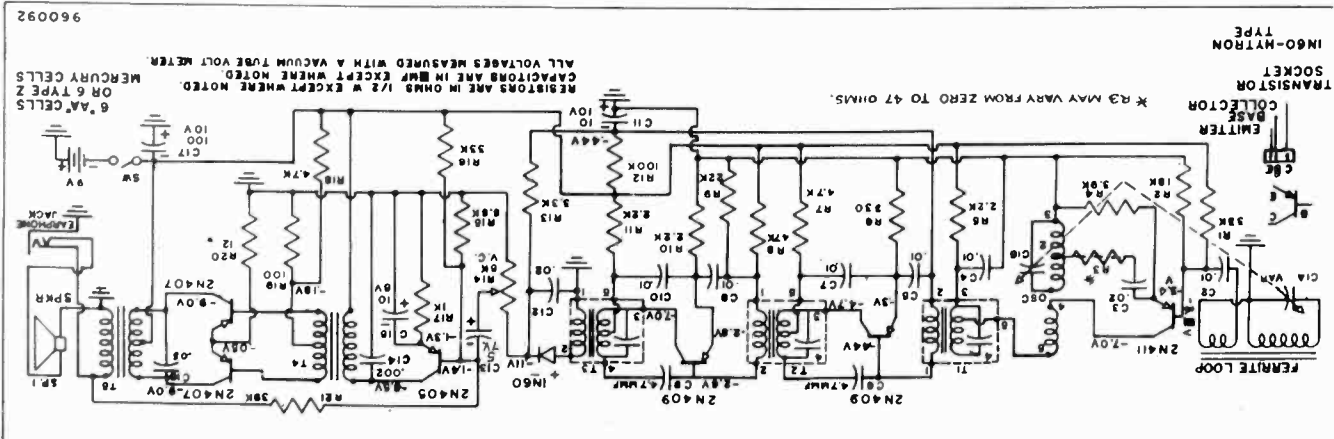
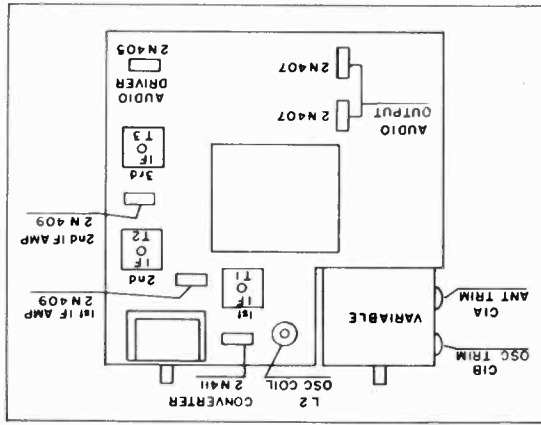
In-warranty, defective parts subject to adjustment should be returned to your District Office Service Department with Return Material Tag S1178 securely attached and completely filled out, and if claim is justified credit will be issued.

**PARTS LIST  
MODEL 4-C-37**

Schematic Location	Part No.	Description	List Price	Schematic Location	Part No.	Description	List Price
C1A, C1B	590038	Variable Condenser	\$2.40	C2, C4		.01 Mfd 30V Disc.	.10
C15	581032	51 MF, 7V Electrolytic	.55	C5, C7		.01 Mfd Dual Disc	.10
C11	581012	10 MF, 5V Electrolytic	.55	C8, C10		4.7 MMF 10% Cer. Tub	.10
C17	581013	10 MF, 10V Electrolytic	.60	C6, C9		.02 Mfd Disc.	.10
C17	581014	10 MF, 10V Electrolytic	.60	C3, C12		.05 Mfd 500V Disc	.10
R14	368102	Volume Control 5K	.85	C16		.002 Mfd 500V Disc	.10
T1-T2	450018	IF Transformer	1.80	R1		33K	.10
T3	450019	IF Transformer	1.80	R1, R16		18K	.10
T4	430270	Interstage Transformer	2.00	R2		SEE SCHEMATIC	.10
T5	430280	Output Transformer	2.00	R3		3.9 K ohm	.10
SP1	404008	4" Speaker, 3.2 VC, 1.47 oz.	3.80	R4		2.2 K ohm	.10
L2	455053	Oscillator Coil	.70	R5, R10, R11		4.7 K ohm	.10
L1	464020	Ferrite Loop	1.20	R7, R18		330 ohm	.10
	730101	Transistor Socket	.20	R6		47 K ohm	.10
	790036	Socket Clip	.80	R8		39 K ohm	.10
	732012	Jack	.60	R21		100 K ohm	.10
	359090	2N407 Transistor	4.40	R12		6.8 K ohm	.10
	359611	2N411 Transistor	4.40	R15		12 ohm	.10
	359010	2N409 Transistor	4.40	R20		100 ohm	.10
	359080	2N405 Transistor	4.40	R19		3.3 K ohm	.10
	359004	IN60 Diode	.95	R13		1 K ohm	.10
	200004	6 TR Case	9.95	R17			
	800056	Plastic Escutcheon	.85				
	270902	Tuning knob	.30				
	270901	Volume Knob	.30				
	990033	Battery Holder	1.50				

NOTE: All resistors 1/2W carbon, ±20% unless specified.

NOTE - All parts not having part number may be replaced with any standard replacement part of a similar type and value.



STOCK NO. 4-C-36

CODE NO. 1-8-5TR

SPECIFICATIONS

Cabinet Dimensions ..... Width 6-3/8" Height 5", Depth 2-5/8"  
 Shipping Weight ..... 1 1/2 pounds  
 Battery Power Supply ..... Eveready, 915 or 1015 (6 Cells)  
 Loud Speaker ..... Burgess Type "Z", 4 In. P.M.

Voice Coil Impedance ..... 3.2 ohms at 400 cycles  
 Power Output ..... 50 Milliwatts  
 Tuning Range ..... Standard Broadcast Band 540KC-1620KC  
 Intermediate Frequency ..... 455KC  
 Transistor Complement ..... 1-Converter-2N411  
 2-IF Amplifier-2N409  
 1-Det-AVC-IN60 Diode  
 1-Audio Driver-2N405  
 1-Power Amplifier-2N407

TO REMOVE CHASSIS

1. Lift handle and remove two screws at side of cabinet.
2. Remove screw at right corner of speaker inside of cabinet.
3. Remove nut on earphone socket on side of cabinet.

**CAUTION:** If battery holder leads are unsoldered, avoid overheating plastic holder, as it will soften and permanently loosen terminal.

# Firestone

## TRANSISTOR PORTABLE RADIO

STOCK NO. 4-C-36  
CODE NO. 1-8-5TR

ALIGNMENT

ALIGNMENT INSTRUCTIONS - READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Connect output meter across voice coil of speaker.

Function	Generator Frequency	Dummy Antenna	Generator Conn.	Adjust	Remarks
1. I.F.	455KC	.1 Mfd Condenser in series with Gen. Lead	On Converter Base	T1, T2, T3	Adjust for Max. Output
2. Osc. Trimmer	1620KC		*Test Loop	CI-B	Variable Condenser Set for Minimum Capacity
3. Ant. Trimmer	1400KC		*Test Loop	CI-A	Adjust for Max. Output
4. Osc Slug	600KC		*Test Loop	L-2 Slug	Adjust for Max. Output while Rocking Gang. Repeat steps 2, 3 & 4.

\*Standard Hazeltine Loop Model 11150 or 3 turns of wire about 6" diameter placed one foot from set.

**ORDERING PARTS**

Order parts from your Firestone Auto Supply parts warehouse, showing on your order Firestone stock number and code number, which may be taken from the front page of this manual, as well as the part number and description of part, which may be found in the parts list of this manual.

**RETURNING DEFECTIVE PARTS**

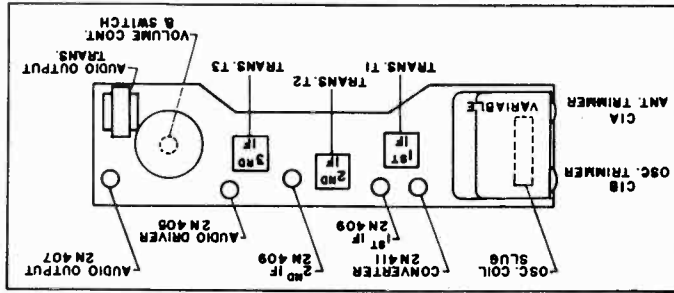
In-warranty, defective parts subject to adjustment should be returned to your District Office Service Department with Return Material Tag S1178 securely attached and completely filled out, and if claim is justified credit will be issued.

**PARTS LIST  
MODEL 4-C-36**

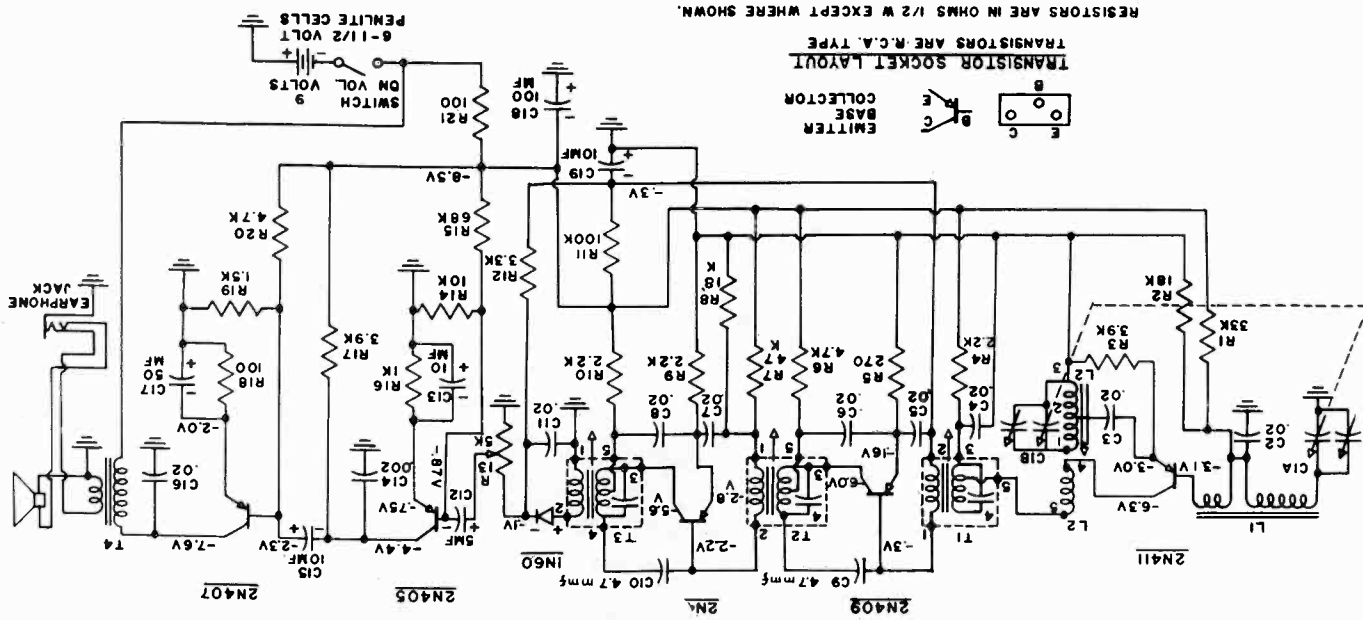
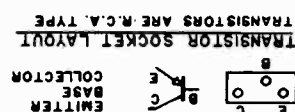
Schematic Location	Part No.	Description	List Price	Schematic Location	Part No.	Description	List Price
C1A, C1B	590043	Variable Condenser	\$2.40	C2, C3, C4	515011	.02MF - 30V	.25
C12	581025	5MF, 7V Electrolytic	.65	C5, C6, C7		4.7 Cer. Tub. ±10% .022-500V Disc.	.10
C13, C15, C19	581022	10MF, 12V Electrolytic	.65	C8, C11, C16			33K ohms
C18	581014	100MF 10V Electrolytic	.60	C9, C10	18K ohms	.10	
C17	581030	50MF 10V Electrolytic	.60	R1		3.9K ohms	.10
T1, T2	450018	I.F. Transformer	1.80	R2, R8	2.2K ohms		.10
T3	450019	I.F. Transformer	1.80	R3, R17		270 ohms	.10
T4	430410	Output Transformer	2.00	R4, R9, R10	47K ohms		.10
SP1	404014	4" Speaker 3.2 VC	3.10	R5		100K ohms	.10
L2	455062	1.00 oz. Mag. Oscillator Coil	.70	R6, R20	3.3K ohms		.10
L1	464022	Ferrite Loop Antenna Coil	1.40	R7		Volume Control 5K	.85
	730101	Transistor Socket	.80	R11	1K ohms		.10
	790036	Socket Clip	.10	R12		100 ohms	.10
	732015	Phone Jack	.55	R13	100 ohms		.10
	359010	2N409 Transistor	4.40	R14		100 ohms	.10
	359011	2N411 Transistor	4.40	R15	1.5K ohms		.10
	359090	2N407 Transistor	4.40	R16		100 ohms	.10
	359008	2N405 Transistor	4.40	R18, R21	1.5K ohms		.10
	359004	IN60 Diode	.95	R19			
	272337	Tuning Knob	.45				
	990031	Battery Holder Ass'y	1.50				
	250170	Case (Less Cover & Handle)	13.15				
	250171	White Back Cover	13.15				
	790086	Handle	.60				
	250172	Case (Less Cover Handle)	13.15				
	250173	Black Cover (Black)	13.15				

NOTE: All resistors are 1/2 W carbon ±20% unless specified.

NOTE - All parts not having part number may be replaced with any standard replacement part of similar type and value.



ALL VOLTAGES MEASURED WITH A VACUUM TUBE VOLT METER.  
CAPACITORS ARE IN MF EXCEPT WHERE SHOWN.  
RESISTORS ARE IN OHMS 1/2 W EXCEPT WHERE SHOWN.  
TRANSISTORS ARE M.C.A. TYPE



# GENERAL ELECTRIC

ER-S-P710  
COVERS  
MODELS  
P710A,B,C,C1  
P711A,B,C,C1

## TRANSISTOR RADIO RECEIVERS

(540-1600 KC., 455 KC., I.F.)

SPECIFICATIONS	
CABINET: (Plastic)	Ebony - P710A, B, C, C1 (prime) Turquoise - P711A, B, C, C1 (prime)
ELECTRICAL RATING:	6 Volts, D. C.
BATTERIES:	Carbon Pencils: (4) Eveready # 915 or (4) Burgess Z or (4) Mallory H15 Mercury Cells: (4) Eveready E9 or (4) Mallory Z89
OPERATING FREQUENCIES:	Tuning Range: 540 - 1600 KC IF Frequency: 455 KC
POWER OUTPUT:	Undistorted: 20 MH. Maximum: 35 MH.
SPEAKER:	2 3/4" PM 15 ohms
TRANSISTOR COMPLEMENT:	X1 Osc. Conv. 2N168A or 2N292 X2 Ist. I. F. 2N169, 2N313 or 2N169 X3 2nd. I. F. 2N188A or 2N320 X4 Output 2N321 or 2N241
GERMANIUM DIODES:	Detector (D1) 1N87



**P710, P711**  
unsolder the two tabs that hold the volume control to the metal chassis; unsolder the lead from the loudspeaker; unsolder the lead from the top lug of the tuning gang oscillator section and two loop leads to the chassis board; carefully bend the two mounting lugs on the speaker end of the circuit board and on the tuning condenser end; also unsolder the lug near the phone jack; then gently pull off the circuit board. The tuning condenser, loop antenna, and speaker will remain on the face of the metal chassis.

### COMPONENT REMOVAL

To remove the speaker from the radio, unsolder the one speaker lead and carefully bend over condenser C13 and remove spooler mounting screw.  
Remove the tuning condenser by unscrewing the two mounting screws located on the face of the metal chassis.  
To replace the volume control, unsolder the three volume control leads at the control and the two switch leads on the back of the control.

### TRANSISTOR REPLACEMENT

To replace X4, remove the speaker as described above.  
To remove X2, use needle nose pliers through the hole near the volume control.

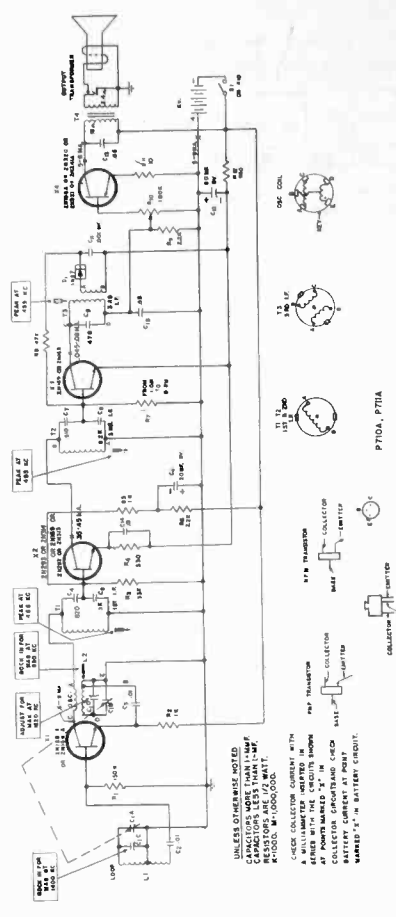
### EARPHONE JACK

An earphone jack for private listening is provided on the rear of this receiver. When the phone is in use the speaker is automatically silenced. The earphone jack, Cat. No. RS-1195 was used on the later sets. This earphone jack differs from the earphone jack, Cat. No. RJS-230 used previously on these models in the stud mounting end, the contacts, and terminals. The stud mounting on jack RS-1195 has a 1/4-32 thread and a larger diameter than RJS-230 which has a 1/4-40 thread.

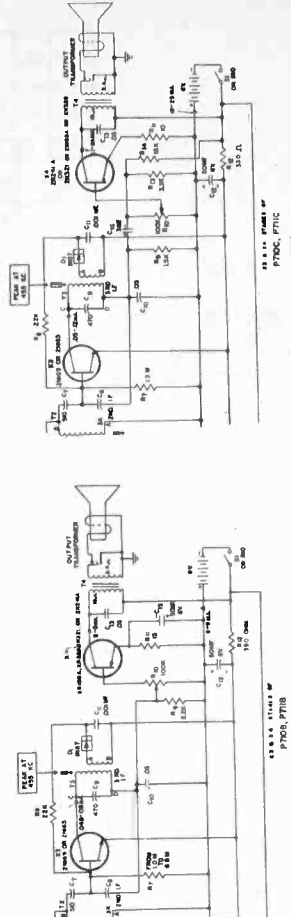
The three terminals on the later jack; the third terminal is ground which should not be used. The ground terminal should be left as it is, or bent up out of the way, or clipped off. If this terminal is left as it is or bent up out of the way, make sure that it will in no way short out components in close proximity to the replaced unit.  
These jacks are not interchangeable; therefore, always replace the jack with one of the same size.

### TROUBLE SHOOTING

A check of battery current drain will indicate if a receiver is operating properly. To measure the current drain, turn the receiver on, then swing up



P710A, P711A



P710B, P711B

### Production Changes

- P710B**  
C8-- 3000mmf., connected to junction of C9 and C10.  
C15-- 50mf., 6V, connected across R11  
R8-- 22K  
R12-- 390 ohms  
See FIG. A for X3 and X4 stages.  
P710C
- P710C**  
C8-- 3000mmf., connected to junction of C9 and C10.  
C16-- 3mf.  
R4-- 120 ohms  
R7-- 1.5 meg  
R8-- 22K  
R12-- 390 ohms  
R13-- 3.3K  
R14-- 18K  
See FIG. B for X3 and X4 stages.  
P710C1
- P710C1**  
C8-- 3000 mmf., connected to junction of C9 and C10.  
C17-- 3mf.  
R6-- 22K  
R17-- 4.7K  
R17 and C17 mounted to solder side of component board.  
See FIG. C for X3 and X4 stages.

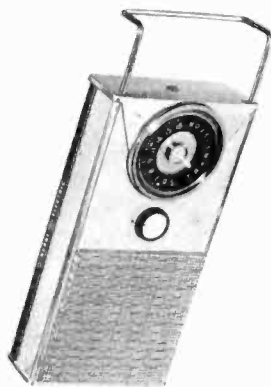


MODELS P715, B, D, P716, B, D

# GENERAL ELECTRIC

ER-S-P715  
COVERS  
MODELS  
P715-P716  
P715B-P716B  
P715D-P716D

TRANSISTOR RADIO RECEIVERS  
(540-1600 KC., 455 KC., 1-F.)



**SPECIFICATIONS**

<b>BATTERIES:</b>	(a) Carbon Pen-light cells; 2 Eveready #915 or 2 Mallory M15, or 2 Burgess #2 (b) Mercury Cells; 2 Eveready #E9 or Mallory #2M9 (c) Rechargeable Cells 2 Gould-National nickel-cadmium, AA cells, supplied with GE charger kit.
<b>TUNING RANGE:</b>	540 - 1620 KC
<b>IF FREQUENCY:</b>	455 KC
<b>POWER OUTPUT:</b>	Undistorted 100 Milliwatts Maximum 130 Milliwatts with 3 volts input.

**TO REMOVE CHASSIS FROM CASE**

1. Remove the end cap on the speaker end of the radio the same as you would to change the batteries. Do not unsolder the wire attached to the end cap, but unsolder the wire from the chassis bracket to the case.
2. With a pair of longnose pliers, straighten the metal tab holding the speaker grille in place.
3. Remove the speaker grille by folding it toward the handle end of the case.
4. Using case, pull out the speaker and unsolder the two leads.
5. Remove the volume knob by pulling it off. Turn the screw in the center of the tuning knob in a counterclockwise direction to remove it, then pull off the tuning knob.
6. Remove the two screws by the speaker hole and pull out the handle.
7. Take out the screw near the tuning shaft hole, also the screw on the end cap, handle end.
8. Slide the chassis toward the handle end about 1/2 inch to gain access to the loop connections.
9. Unsolder the 3 loop connections. Be sure to observe lead color coding.
10. Continue to slide the chassis out in this direction. Let the end cap with the wire attached follow the chassis through the case.

**NOTE:** Do not remove the loop unless it is found to be defective as this will affect the alignment of the receiver.

Earphone jack catalogue number RS-230 has a small mounting stud and RS-1195 has a large mounting stud. If it becomes necessary to replace the earphone jack, replace with jack having the same size stud. Jack RS-1195 also has a third terminal which is ground, cut this terminal off to prevent it from shorting out any adjacent components.

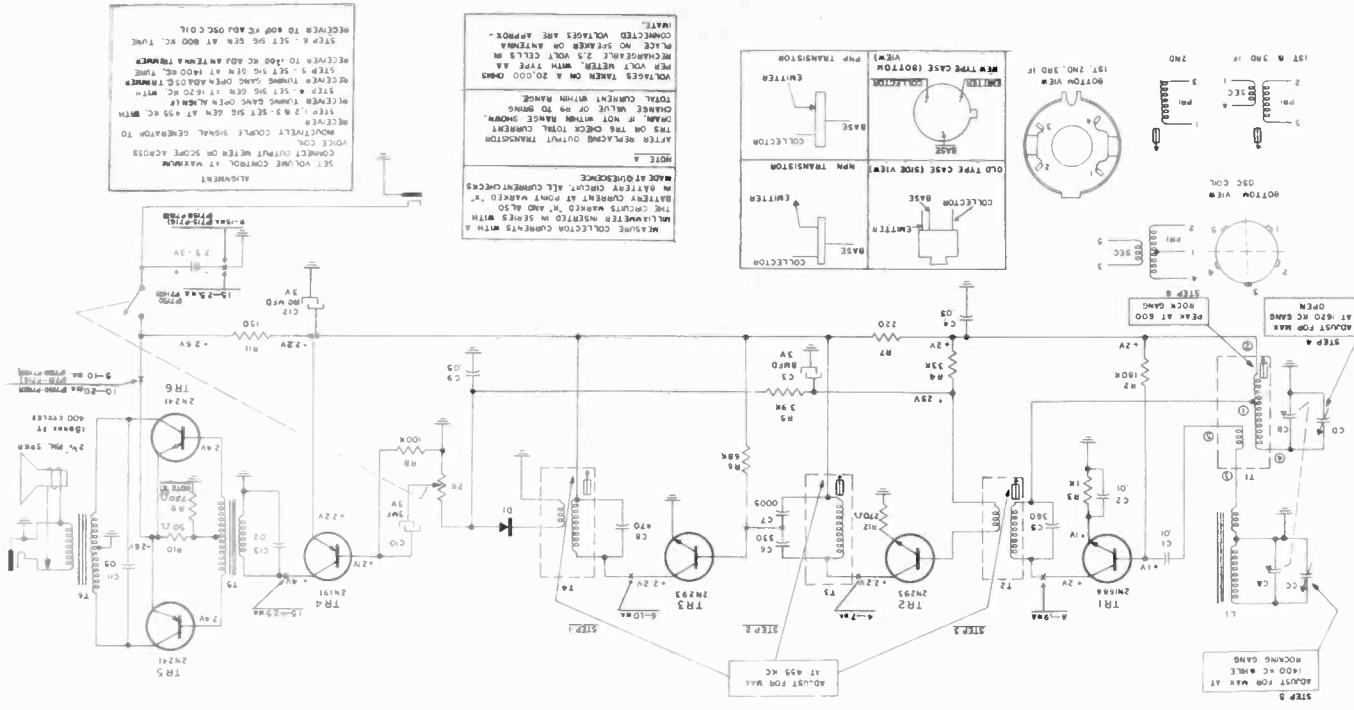
Intermittent battery contacts will cause motor-boating, intermittent audio and poor reception. Check the positive battery contact spring to be certain it is making firm contact with the battery. If the set contains Gould National rechargeable batteries, examine the positive battery caps for corrosion; if corrosion is evident, polish battery contacts with emery cloth. Some rechargeable batteries have a brass cap over the positive contact. Discard this cap and check for corrosion on the positive battery contact.

**REPLACEMENT PARTS LIST**

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
<b>CAPACITORS</b>			
n-RCE-260	C3	Elect. Cap. 5WV 3V	1.45
n-RCE-261	C10	Elect. Cap. 5WV 3V	1.45
n-RS-1459	C12	Elect. Cap. 100MFD 3V	1.10
n-RCT-105	C2A, B, C, D	Tuning Gang	5.15
n-RM-3186(1)	2	10 MFD	.20
n-RM-3309	C4, 9, 11	.05MFD	.50
n-RM-3310	C13	.02MFD	.35
n-RS-3311	C5, 6	200MFD	.40
n-RS-1335	C6	.360MFD P715D, P716D	.55
n-RM-1336	C6	.330MFD P715D, P716D	.55
n-RM-3312	C7	.001MFD	.20
n-RS-1337	C7	.0005MFD P715D, P716D	.25
n-RM-3313	C8	.470MFD	.70
<b>RESISTORS</b>			
n-RS-1194	R-10	120 ohms, Cur. Var.	.35
n-RS-1355	R-10	P715A, B P716A, B	.50
		50 ohms, Cur. Var.	
		P715D, P716D	
<b>COILS &amp; TRANSFORMERS</b>			
n-RLC147	T1	Oscillator Coil	1.30
n-RL-072	L1	Loop	1.40
n-RTL-211	T2	I. F. Trans. 1st.	1.65
n-RS-1334	T2	P715A, B P716A, B	2.15
		I. F. Trans. 2nd.	
n-RTL-212	T3	P715D, P716D	1.35
		I. F. Trans. 2nd.	
n-RS-1333	T3	P715A, B P716A, B	1.75
		I. F. Trans. 3rd.	
n-RTL-213	T4	P715D, P716D	1.65
n-RTL-210	T5	Driver Transformer	3.65
n-RTL-206	T6	Output Transformer	3.70

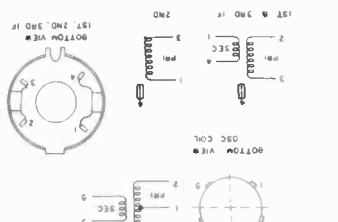
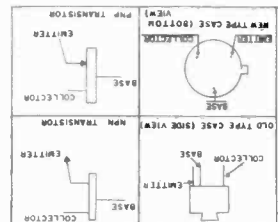
All components in the above schematic were used in Models P715D-P716D. Components used in other receivers in this series, that differ from the P715D-P716D, are listed below.

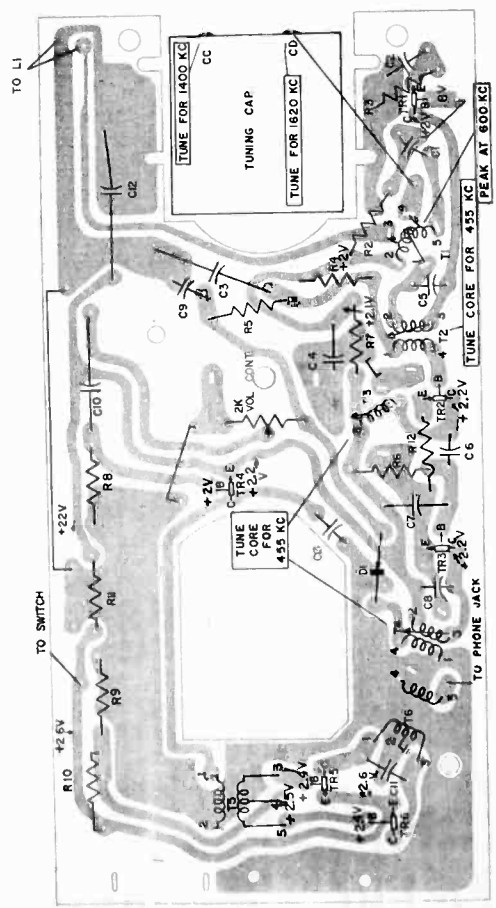
P715-P716	R4	R5	R8	R9	R10	R11	R12	C5	C6	C7
P715B-P716B	R4	R5	R8	R9	R10	R11	R12	C5	C6	C7



**ALIGNMENT**  
SET VOLUME CONTROL AT MAXIMUM  
CONNECT OUTPUT METER ON SCORE CROSS  
VOICE COIL  
RECEIVER TUNING RANGE FROM 540 KC. TO 1620 KC. WITH  
STEP 3 SET 915 OR 1400 KC. TUNE  
RECEIVER TO 1400 KC. AND ADJUST ANTENNA TUNING  
STEP 2 SET 915 OR 1400 KC. TUNE  
RECEIVER TO 1400 KC. AND ADJUST ANTENNA TUNING  
STEP 1 SET 915 OR 1400 KC. TUNE  
RECEIVER TO 1400 KC. AND ADJUST ANTENNA TUNING  
STEP 6 SET 915 OR 1400 KC. TUNE  
RECEIVER TO 1400 KC. AND ADJUST ANTENNA TUNING  
STEP 5 SET 915 OR 1400 KC. TUNE  
RECEIVER TO 1400 KC. AND ADJUST ANTENNA TUNING  
STEP 4 SET 915 OR 1400 KC. TUNE  
RECEIVER TO 1400 KC. AND ADJUST ANTENNA TUNING  
STEP 3 SET 915 OR 1400 KC. TUNE  
RECEIVER TO 1400 KC. AND ADJUST ANTENNA TUNING  
STEP 2 SET 915 OR 1400 KC. TUNE  
RECEIVER TO 1400 KC. AND ADJUST ANTENNA TUNING  
STEP 1 SET 915 OR 1400 KC. TUNE  
RECEIVER TO 1400 KC. AND ADJUST ANTENNA TUNING

**NOTE 1**  
AFTER REMOVING OUTPUT TRANSISTOR  
FROM THE CHASSIS TOTAL CURRENT  
DRAIN, IF NOT WITHIN RANGE SHOWN,  
CHANGE VALUE OF R4 TO BRING  
TOTAL CURRENT WITHIN RANGE.  
VOLTAGES TAKEN ON A 20,000 OHMS  
RESISTOR AT POINTS SHOWN.  
REPLACE NO SPEAKER ON ANTENNA.  
CONNECTED VOLTS ARE APPROX.  
BATTERY MADE AT DISCRETE





	COLUMN 1	COLUMN 2
OSC.	2N168A 2N164A	2N168A or 2N164A*
I. F.	2N165 2N169 2N292 2N293	2N169 or 2N165* 2N313* 2N314*
DRIVER	2N191 2N192 2N324* 2N323	2N192 or 2N324* 2N324* 2N323
OUTPUT	2N241 2N321*	2N241A or 2N321*

TRANSISTOR SUBSTITUTIONS

Column 1 lists all transistors originally used in G. E. Models P715A, B, D series radios. Column 2 lists substitutions for all these transistors by stages. Some transistors in Column 2 are marked with asterisk have a higher beta, they must be treated as regular replacements were in the past. That is, special attention should be given to correct biasing for satisfactory performance.

Model P715B - 2N217 (RCA) units in driver and output stages can be replaced by 2N192 or 2N324\* as driver and 2N241 or 2N321 as output, only if resistance values in receiver are as follows:

- R8-240K ohms
- R9-180K ohms
- R10-120 ohms

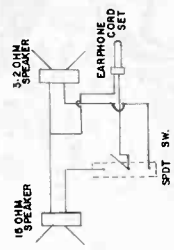
REPLACEMENT PARTS LIST (CONT'D.)

CAT. NO.	DESCRIPTION	LIST PRICE	CAT. NO.	DESCRIPTION	LIST PRICE
CABINET & APPEARANCE ITEMS					
n-RAC-213	Right End Cap.....	1.05	n-RAD-231	Bracket, Right End.....	1.10
n-RAC-214	Loop Cover.....	.75	n-RAD-232	Bracket, Phone & Chrg. Jack.....	.20
n-RAC-215	End Cap. Assem.....	1.05	n-RAD-233	Bracket, Batt. W/Bush. & Spring.....	.22
n-RAG-102	Speaker Cover, Gold, P715A, B, D.....	1.30	n-RAD-234	Bracket, Tube Strap.....	.04
n-RAG-103	Speaker Cover, Plaid, P716A, B, D.....	1.30	n-RS-1227	Battery Holder Tube.....	.15
n-RAV-1040	Cabinet W/Leatherette(Beige) P715A, B, D.....	5.40	n-RHS-194	Screw, Dial Tuning.....	.43
n-RAV-1041	Cabinet W/Leatherette(Black) P716A, B, D.....	5.40	n-RHS-195	Screw, Left End Fastener.....	.23
n-RDX-635	Tuning Dial.....	.80	n-RHS-196	Screw, Right End Fastener.....	.23
n-RS-1009	Leatherette P715A, B, D(Beige).....	.10	n-RJJ-019	Jack, Chrging.....	.90
n-RS-1010	Leatherette P716A, B, D(Black).....	.10	n-RMS-386	Spring, Battery Contact.....	.05
n-RHY-087	Handle.....	.45	n-RMS-389	Ring, Compression.....	.04
n-RIG-018	Speaker Gasket.....	.20	n-RS-1195	Jack, Carphone; Large Mfg. Stud.....	.90
n-RDK-636	Volume Control Knob.....	.35	RED-001	1N67 Diode (DI).....	1.90
n-ROP-043	Speaker.....	7.25			
POTENTIOMETER					
n-RR-420	2K Volume Control & Sw.....	1.90			

MISCELLANEOUS ITEMS

Bracket, Right End.....  
Bracket, Phone & Chrg. Jack.....  
Bracket, Batt. W/Bush. & Spring.....  
Bracket, Tube Strap.....  
Battery Holder Tube.....  
Screw, Dial Tuning.....  
Screw, Left End Fastener.....  
Screw, Right End Fastener.....  
Jack, Chrging.....  
Jack, Earphone, Small Mfg. Stud.....  
Spring, Battery Contact.....  
Ring, Compression.....  
Jack, Carphone; Large Mfg. Stud.....  
1N67 Diode (DI).....

Use the following test hook-up for P715 series, and all models with earphone jacks, to eliminate soldering and unloading of external speaker.



\*"n" - DENOTES ITEMS NOT PREVIOUSLY CATALOGED.  
PRICES ARE SUGGESTED LIST PRICES AND ARE SUBJECT TO CHANGE WITHOUT NOTICE.

ER-S-P725A  
COVERS  
MODELS  
P725A  
P726A



P725A, P726A

Transistoring can be accomplished with the steps out of the cabinet by working a splicer to the speaker leads. The batteries remain clipped on the chassis.

- RE ASSEMBLY:**
1. Check on-ET switch and earphone jack for continuity.
  2. Check battery voltage and battery contacts.
  3. Check all leads connecting antenna.
  4. Spin B1A.
  5. Check coil L1.
- REAL AUDIO:**
1. Check batteries for 6 volts, 3x.
  2. Check battery contacts.
  3. Check collector currents of the transistors.

- OSCILLATOR:**
1. Check B1.
  2. Check B2.
- B1 is a temperature compensating resistor and regulates the current flow to the wipers of B3 and B5. When soldering on the terminals of B15, heat just enough to complete the repair. After repairing, allow the resistor to reach ambient temperature before inserting the radio on.
- Intermittent sounds, unexplained, and poor reception is frequently caused by poor battery contact. Loose batteries and bent both the contact springs and binding springs located to increase their contact. Distortion may occur on the contacts of the battery chassis. This tends to insulate the battery from the battery contact springs, and increases electrical resistance. The terminals on the battery should be cleaned with emery cloth to insure positive electrical contact.

**ALIGNMENT**

The alignment procedure is similar to the alignment of a superheterodyne electron tube set. Turn top and bottom trims. The chassis has to be removed from the cabinet for 1. F. alignment.

1. F. alignment can be accomplished with the chassis in the cabinet.

Check the battery voltage for the maximum voltage output (6 volts) before proceeding with the alignment procedure.

**COVERS**

The covers are constructed for stability and freedom operation when mounting voltage at the terminal lead terminals. Be sure to observe correct voltage polarities as shown on the schematic. When repairing a defective transistor, be sure to observe correct lead positions, as shown in the schematic diagram in outline form.

After the set has been aligned and placed in the cabinet, check the antenna trimmer at P100C. Due to the inductive effect caused by the proximity of the grille when the cabinet is closed, a change in the trimmer may be necessary.

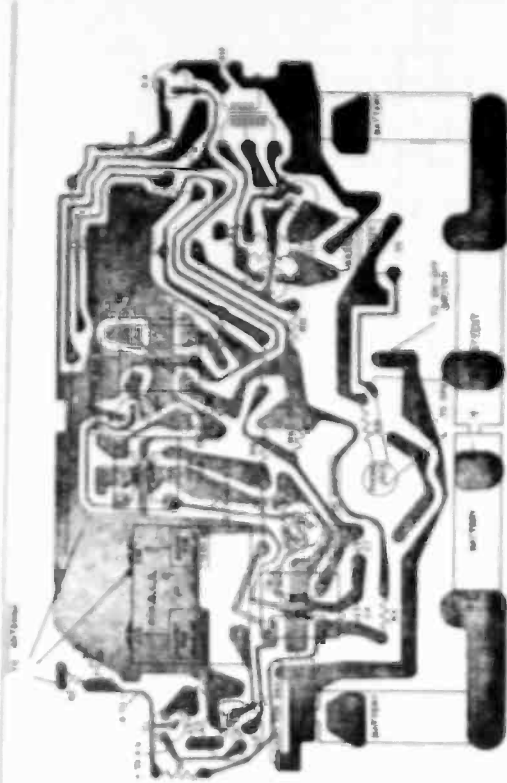
the most operating condition will be corrected. Open the cabinet and align by adjusting the trimmer. Then close the cabinet and speaker again, as shown in the procedure under the proper operating instructions to be attained.

**EXPLANATION OF COMPONENTS**

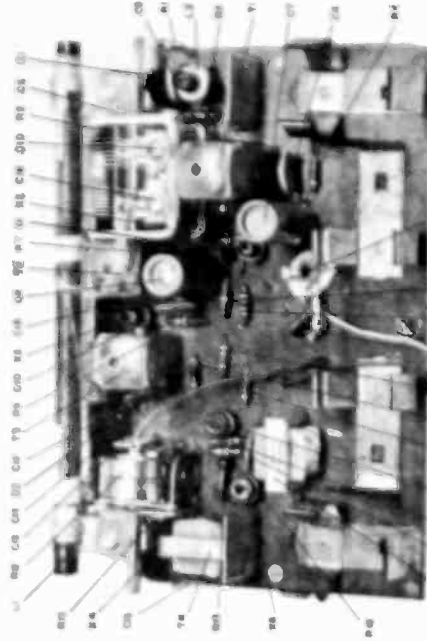
As an example of a defect in the part, place the mounting holes of all solder, the replacement part can then be inserted more easily and a better solder connection can be accomplished.

**CAUTION**

All components are mounted close to the chassis board leading the transistor, therefore, there should be soldering iron just long enough to heat the terminal and remove the component, as too much heat may damage a component. After completing a soldering operation, inspect B10 when the plated circuit of any other solder that may bring up bridge across nearby copper plated wiring.

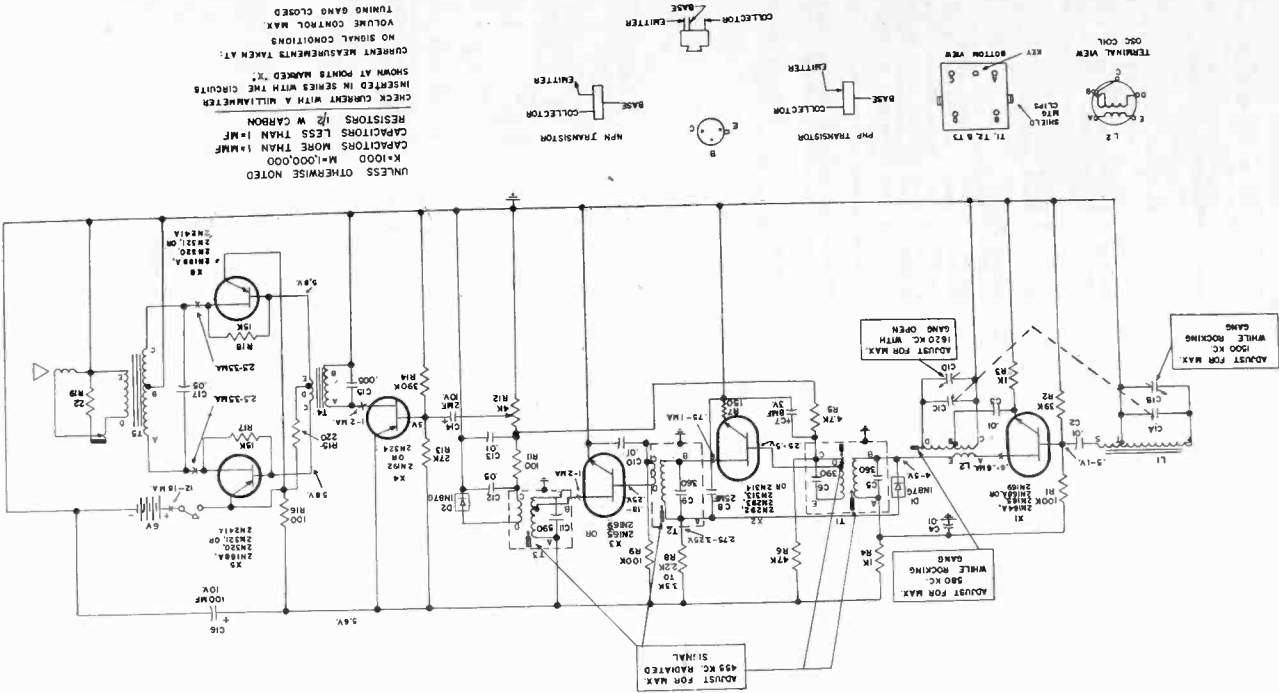


EXPLANATION OF COMPONENTS



TOP VIEW

UNLESS OTHERWISE NOTED  
 CAPACITORS MORE THAN 1 M.M.F.  
 CAPACITORS LESS THAN 1 M.M.F.  
 RESISTORS 1/2 W CARBON  
 CHECK CURRENT WITH A MILLIAMETER  
 INSERTED IN SERIES WITH THE CIRCUIT  
 SHOWN AT POINTS MARKED "X".  
 CURRENT MEASUREMENTS TAKEN AT:  
 NO SIGNAL CONDITIONS  
 VOLUME CONTROL MAX  
 TUNING GANG CLOSED



REPLACEMENT PARTS LIST  
 MODELS P725A, P726A

CAT. NO.	SYMBOL	DESCRIPTION	PRICE	CAT. NO.	DESCRIPTION	PRICE
CAPACITORS						
RS-1022	C2, 3, 4	.01mf., +150-07, 450V.	.30	n-RS-1076	Rivet, Battery clip, & Clamp.	.30
RS-1023	C1, 13	.005mf., +150-07, 450V.	.20	n-RS-1077	Battery bracket.	.05
RS-1024	C15, 17	.05mf., +80-25, 50V.	.10	n-RS-1078	Antenna Bracket, L.	.10
n-RS-1069	C1	Tuning Capacitor.	3.80	n-RS-1079	Antenna Bracket, R.	.03
n-RS-1087	C8, 4	2mf., +250-107, 10V.	1.15	n-RS-1088	Screw #6x5/16.	.05
n-RS-1089	C8	25mf., +250-107, 10V.	1.30	n-RS-1089	Screw #6x32x1/8.	.15
RCE-236	C7	8mf., +250-107, 3V.	1.20	n-RS-1188	Antenna Clamp.	.90
RCE-239	C16	100mf., +250%, 15V.	1.40	n-RS-1195	Phone Jack.	.05
				RHC-095	Tubular Ring.	.05
				ROP-036	Speaker.	5.00
RESISTOR						
RRW-165	R15	220ohms, +10%, Temp. Comp.	.45	CABINET & APPEARANCE ITEMS		
POTENTIOMETER						
n-RS-1081	RL2	Volume Control 4K, & Sw.	2.00	n-RB-1032	Cabinet Front (Tan) P725A.	7.95
				(assem.)	Grille.	
					Grille Pad.	
COILS & TRANSFORMERS						
n-RS-1082	T1	1st I.F. Transformer.	3.60	n-RB-1033	Cabinet Front (Turquoise) P726A.	7.95
n-RS-1083	T2	2nd I.F. Transformer.	2.55	(assem.)	Grille.	
n-RS-1084	T3	3rd I.F. Transformer.	2.55		Grille Pad.	
n-RS-1085	L2	Oscillator Coil.	1.60		Cabinet Hinge.	2.10
n-RS-1086	L1	Antenna.	2.05		Grille.	
n-RS-1103	T5	Output Transformer.	4.05		Nameplate.	.25
RLA-048	T4	Input Transformer.	6.15		Cabinet Hinge.	
MISCELLANEOUS						
n-RS-1067	Screw	Handle brace.	.10	n-RS-1061	Nameplate.	.75
n-RS-1072	Grille Pad.		.05	n-RS-1062	Handle, Bottom P725A.	
n-RS-1073	Handle Retainer.		.05	n-RS-1063	Handle, Ant. White P726A.	
n-RS-1074	Handle Friction Clip.		.03	n-RS-1064	Handle, Ant. White, L.H.	
n-RS-1075	Cabinet Catch.		.05	n-RS-1065	Handle, Ant. White, R.H.	
				n-RS-1066	Handle, Ant. White, P725A.	
				n-RS-1068	Tuning Knob, Brown, P725A.	
				n-RS-1069	Tuning Knob, Antique White, P726A.	
				n-RS-1070	Volume Knob, Brown, P725A.	
				n-RS-1071	Volume Knob, Antique White, P726A.	
					Adjust for Max. 455 KC. Radiated Signal.	
					Adjust for Max. 580 KC. While Rocking Gang.	
					Adjust for Max. 1000 KC. While Rocking Gang.	
					Adjust for Max. 1820 KC. With Gang Open.	
					Look for Max. 2000 KC. While Rocking Gang.	

"n" Denotes Parts Not Previously Cataloged

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 Prices Are Suggested List Prices And Subject To Change Without Notice.

# GENERAL ELECTRIC COMPANY

## PRELIMINARY SERVICE DATA

S-P725B  
COVERS  
MODELS  
P725B  
P726B

### SPECIFICATIONS

CABINET:	Plastic - Brown, P725B; Turquoise, P726B
ELECTRICAL BATING:	3 Batteries: Eveready #950, Burgess #28, or equivalent
POWER OUTPUT:	Undistorted: 225 milliwatts Maximum: 350 milliwatts
TRANSISTOR COMPLEMENT:	TR1 Oscillator-Conv. 2N168A or 2N164A TR2 1st. I. F. 2N293 TR3 2nd. I. F. 2N314 or 2N265 TR4 Audio Amplifier 2N270, 2N321 or 2N242A TR5 Audio Output 2N270, 2N321 or 2N242A TR6 Audio Output 2N270, 2N321 or 2N242A
GERMANIUM DIODE:	D1 Detector 1N87

### GENERAL INFORMATION

The models P725B and P726B are all transistor battery operated portable radios.  
The B+ is supplied by three 1 1/2 volt flashlight type batteries producing the total B+ of 4.5 volts.

### CHASSIS REMOVAL

1. Remove both knobs.
2. Remove the 3 batteries, two leads on the speaker.
3. Remove cabinet retainer strap.
4. Unsolder the 5 screws holding chassis to cabinet.

### TROUBLESHOOTING

A check of battery condition and total current drain of the receiver should be made first. All current measurements are made at quiescence with the receiver turned on, volume control at maximum, tuning gang closed, and with no signal conditions.

The total receiver current drain is 16 to 18 mils. This is measured by inserting a milliammeter in series with the batteries.

If an excessive total current drain is recorded, the individual collector currents of each transistor should be checked. An excessive current reading may mean a shorted transistor; no current will indicate that a transistor or associated circuit component is defective.

A single-edge razor blade is a satisfactory tool for cutting the copper circuit wiring so that a milliammeter can be inserted in series with the break to measure the current flow. After each current check is completed, solder the cut carefully to complete the circuit again.

### NO RECEPTION:

1. Check battery voltage and battery contacts.
2. Check on-off switch.
3. Check all antenna lead connections.
4. Check coil L1.

### WEAK AUDIO:

1. Check battery voltage for 4.5 volts.
2. Check battery current.
3. Check transistor collector currents.
4. Check alignment.

### INTERMITTENT:

1. Check battery contacts for corrosion.

2. Check solder connections on dip-soldered side of circuit board.

Intermittent audio, motorboating, and poor reception is frequently caused by poor battery contact. Remove batteries and bend both the contact springs and holding springs inward to increase their tension. Oxidation may occur on the contacts of the batteries themselves. This tends to insulate the batteries from the battery contact springs, and increase electrical resistance. The terminals on the batteries should be cleaned with emery cloth to insure positive electrical contact.  
After the set has been aligned and placed in the cabinet, recheck the antenna trimmer at 1500 KC. Due to the inductance effect caused by the proximity of the speaker when the cabinet is closed, a change in the speaker operating condition will be noticed. Open the cabinet and slightly adjust the trimmer, then close the cabinet and recheck again, continue the procedure until the proper operating performance is attained.

### TRANSISTOR REPLACEMENT

When measuring voltages at the transistor lead terminals, be sure to observe correct voltage polarities as shown on the schematic.

When replacing a defective transistor, be sure to observe correct lead positions, as shown on schematic diagram in outline form.

### REPLACEMENT OF COMPONENTS

After removing a defective part, clean the mounting holes of all solder; the replacement part can then be inserted more easily and a better solder connection can be accomplished. Apply a soldering iron just long enough to heat the terminal to remove the component. Too much heat may damage a component.

R15 is a thermistor (temperature compensating resistor) and regulates the current flow to the output transistors. After replacing R15, allow it to reach ambient temperature before turning the radio on.

### PRELIMINARY REPLACEMENT PARTS LIST

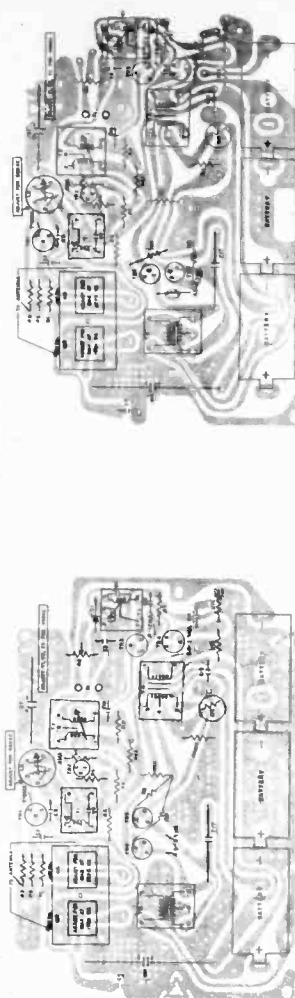
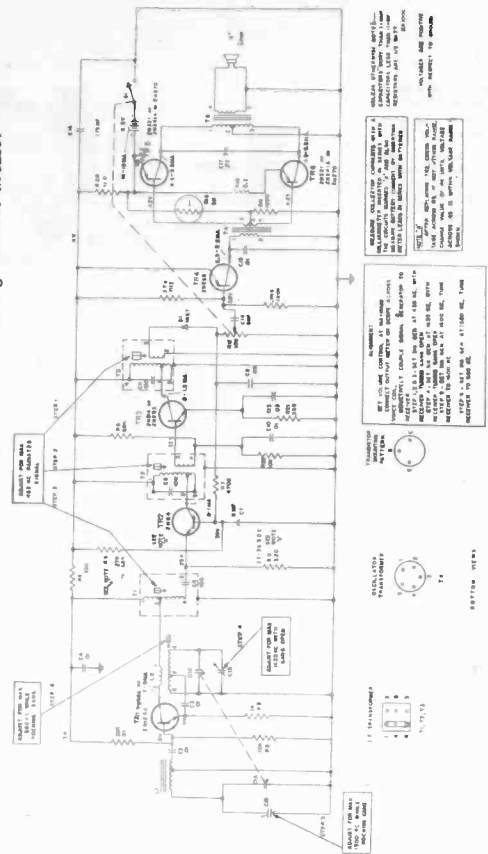
CAT. NO.	SYMBOL	DESCRIPTION	PRICE
CAPACITORS			
RS-1346	C1	Tuning Capacitor.....	3.55
	C2,3,4	.01mF., 450V.....	.30
RS-1022	C7	8mF., 10V.....	1.55
RCE-225	C8,13	.05mF., 50V.....	.50
RS-1024	C14	5mF., 10V.....	1.55
	C16	175mF., 6V.....	1.55
	C17	.22mF., 100V.....	
RESISTOR			
RS-1355	R15	50 ohms, thermistor.....	.50
POTENTIOMETER			
RS-1347	R12, S1	Volume Control, 10K & Sv.	1.85

PRELIMINARY REPLACEMENT PARTS LIST		PRICE
CAT. NO.	DESCRIPTION	PRICE
COILS & TRANSFORMERS		
RS-1348	Transformer, 1st. I. F.....	2.40
RS-1349	Transformer, 2nd. I. F.....	1.90
RS-1350	Transformer, 3rd. I. F.....	2.10
RS-1351	Coil, Oscillator.....	1.20
RS-1352	Transformer, Input.....	2.85
RS-1353	Transformer, Output.....	2.50
n-RS-1354	Antenna.....	1.90
MISCELLANEOUS		
RB-1057	Speaker, 4".....	5.45
RS-1065	Brace, Handle, L. H.....	.75
RS-1066	Brace, Handle, R. H.....	.75
RS-1067	Scrub, Handle.....	.25
RS-1072	Pad, Grille (Black paper).....	.05
RS-1073	Retainer, Handle.....	.05
RS-1074	Clip, Friction.....	.02
RS-1075	Catch, Cabinet.....	.02
RS-1088	Screws, #6-32x1/8 P. H.....	.02
RS-1089	Screws, #6-32x1/8 P. H.....	.02
RS-1188	Clamp, Antenna.....	.15
RS-1341	Battery Clip, Clamp & Rivet (Pos. end.).....	.30
RS-1342	Battery Clip, Clamp & Rivet (Neg. end.).....	.30
RS-1343	Battery Clip Holder, Clamps & Rivets.....	.90
RS-1344	Bracket, Antenna (R. H.).....	.70
RS-1345	Ring, Tubular.....	.05
RUC-095	Ring, (Compression) (for knobs).....	.05
MBS-272	Wall Hanger Button.....	.10
RS-1456	Wall Hanger Button.....	.10

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Prices Are Suggested List Prices And Subject To Change Without Notice.



# GENERAL ELECTRIC COMPANY

## PRELIMINARY SERVICE DATA

S-P750A  
COVERS  
MODEL  
P750A

### SPECIFICATIONS

CABINET:	Leather - P750A, Ginger
ELECTRICAL RATING:	3 Batteries: Eveready #950, Burgess #2R, or equivalent
POWER OUTPUT:	Undistorted: 225 milliwatts Maximum: 350 milliwatts
TRANSISTOR COMPONENTS:	TR1 Oscillator-Conv. 2N166A or 2N1664 TR2 1st. I. F. 2N294 TR3 2nd. I. F. 2N314 or 2N293 TR4 Audio Amplifier 2N265 TR5 Audio Output 2N270, 2N321 or 2N241A TR6 Audio Output 2N270, 2N321 or 2N241A
GERMANIUM DIODE:	D1 Detector 1N67

### GENERAL INFORMATION

The model P750A is an all transistor battery operated portable radio with leather cabinet. The B+ is supplied by three 1 1/2 volt flashlight type batteries producing the total B+ of 4.5 volts. Use saddlesoap to clean the leather portion of the cabinet.

1. Remove knobs.
2. Remove the batteries.
3. Remove the 5 screws holding chassis to the cabinet.
4. Lift circuit board out from circuit board springs. (When replacing chassis, slide the antenna edge of circuit board under circuit board holder retaining clips.)

### TROUBLESHOOTING

A check of battery condition and total current drain of the receiver should be made first. All current measurements are made at quiescence with the receiver turned on, volume control at maximum, tuning gang closed, and with no signal conditions.

The total receiver current drain is 16 to 18 milliamperes with the batteries.

If an excessive total current drain is recorded, the individual collector currents of each transistor should be checked. An excessive current reading may mean a shorted transistor; no current will indicate that a transistor or associated circuit components are defective.

A single-edge razor blade is a satisfactory tool for cutting the copper circuit wiring so that a milliammeter can be inserted in series with the break to measure the current flow. After each current check is completed, solder the cut carefully to complete the circuit again.

### NO RECEPTION:

1. Check battery voltage and battery contacts.
2. Check on-off switch.
3. Check all antenna lead connections.
4. Check coil L2.

### WEAK AUDIO:

1. Check battery voltage for 4.5 volts.
2. Check battery current.
3. Check transistor collector currents.
4. Check alignment.

### INTERMITTENT:

1. Check battery contacts for corrosion.

2. Check solder connections on dip-soldered side of circuit board.

Intermittent audio, motorboating, and poor reception is frequently caused by poor battery contact. Remove batteries and bend both the contact springs and holding springs inward to increase their tension. Oxidation may occur on the contacts of the batteries themselves. This tends to insulate the batteries from the battery contact springs, and increase electrical resistance. The terminals on the batteries should be cleaned with emery cloth to insure positive electrical contact.

After the set has been aligned and placed in the cabinet, recheck the antenna trimmer at 1500 KC. Due to the inductance effect caused by the proximity of the speaker when the cabinet is closed, a change in the peak operating condition will be noticed. Open the cabinet and slightly adjust the trimmer. Then close the cabinet and recheck again, continue the procedure until the proper operating performance is attained.

### TRANSISTOR REPLACEMENT

When measuring voltages at the transistor lead terminals, be sure to observe correct voltage polarities as shown on the schematic.

When replacing a defective transistor, be sure to observe correct lead positions, as shown on schematic diagram in outline form.

### REPLACEMENT OF COMPONENTS

After removing a defective part, clean the mounting holes of all solder; the replacement part can then be inserted more easily and a better solder connection can be accomplished. Apply a soldering iron just long enough to heat the terminal to remove the component. Too much heat may damage a component.

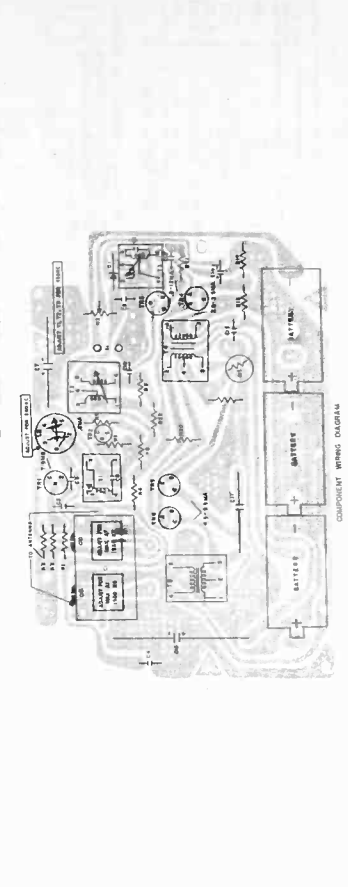
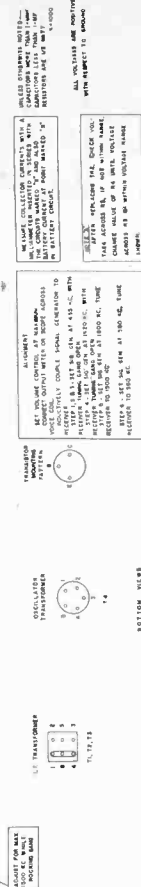
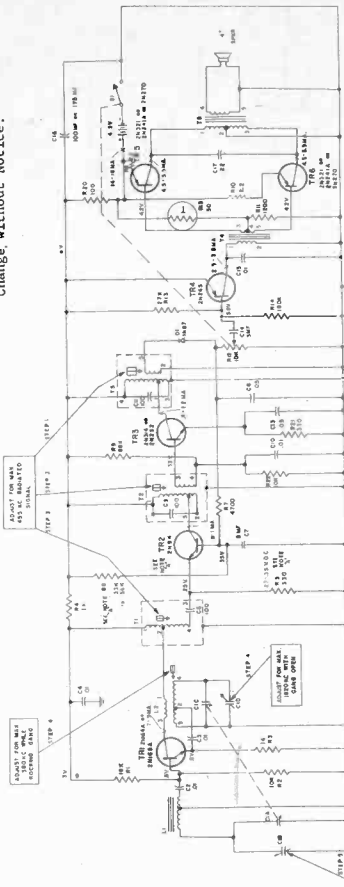
R15 is a thermistor (temperature compensating resistor) and regulates the current flow to the output transistors. After replacing R15, allow it to reach ambient temperature before turning the radio on.

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
n-RS-1423	C1	Tuning Capacitor.....	4.45
	C2,3,4	.01mf., 450V.	
	C7	8mf., 10V.	
	C8,13	.05mf., 50V.	
	C14	5mf., 10V.	
	C16	100mf., 10V. or 175mf., 6V.	
	C17	.22mf., 100V.	
n-RS-1355	R15	50 ohms, thermistor.....	.50
	R12, S1	POTENTIOMETER	
n-RS-1347		Volume Control, 10K & 5K.	1.65

### PRELIMINARY REPLACEMENT PARTS LIST CONT'D.

SYMBOL	DESCRIPTION	PRICE	DESCRIPTION	PRICE	
<b>COILS &amp; TRANSFORMERS</b>					
n-RS-1348	1st. I.F. Transformer.....	2.40	MISCELLANEOUS (CONT'D.)	.90	
n-RS-1349	2nd. I.F. Transformer.....	1.90			
n-RS-1350	3rd. I.F. Transformer.....	2.10			
n-RS-1351	Oscillator Coil.....	1.20			
n-RS-1352	Input Transformer.....	2.05			
n-RS-1353	Output Transformer.....	2.50	n-RB-1059	Cabinet (Leather).....	18.50
n-RS-1386	Antenna.....	1.90	n-RS-1301	Grille, Nameplate, & Medallion.....	1.65
<b>MISCELLANEOUS</b>					
RB-1057	Speaker 4".....	5.45	n-RS-1382	Medallion.....	.25
RS-1188	Antenna Clamp.....	.15	n-RS-1383	Volume Tuning Knob.....	.65
RS-1320	IF Meg. Clip.....	.04	n-RS-1385	Volume Knob.....	.35
n-RS-1341	Battery Clip (Pos. End), Clamp, & Rivet.....	.30	n-RS-1419	Vernier Tuning Knob.....	.25
n-RS-1342	Battery Clip (Neg. End), Clamp, & Rivet.....	.30			
n-RS-1343	Battery Clamp Holder, Clamps, & Rivets.....	.20			

\*n-RS - Denotes Parts Not Previously Cataloged  
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UNLESS OTHERWISE NOTED—  
RESISTORS ARE 5% TOLERANCE  
CAPACITORS ARE 5% TOLERANCE  
RESISTORS ARE 1/4 WATT  
CAPACITORS ARE 50VDC  
RESISTORS ARE 1/4 WATT  
CAPACITORS ARE 50VDC

SELECT THE MOST APPROPRIATE  
VALUES FOR THE RESISTORS  
AND CAPACITORS TO BE USED  
IN THE CIRCUIT

SET VOLUME CONTROL AT MAXIMUM  
CHECK FOR SHORTS OR OPEN CIRCUITS  
CHECK FOR CORRECT POLARITY OF ALL  
TRANSISTORS AND CAPACITORS  
CHECK FOR CORRECT POLARITY OF ALL  
TRANSISTORS AND CAPACITORS

ABOUT 100 MA  
OF DC SHOULD  
FLOW FROM  
THE BATTERY

ABOUT 100 MA  
OF DC SHOULD  
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S-P760A  
COVERS  
MODELS  
P760A  
P761A

PRELIMINARY SERVICE DATA

SPECIFICATION	
CABINET:	Plastic - Beige, P760A; Green, P761A
ELECTRICAL BATING:	4 Batteries; Eveready #950, Burgess #2R, or equivalent
POWER OUTPUT:	Undistorted: 80 milliwatts Maximum: 150 milliwatts
TRANSISTOR COMPLEMENT:	TR1 Oscillator-Conv. 2N164A or 2N164A TR2 1st. I. F. Ampl. 2N135 TR3 2nd. I. F. Ampl. 2N134 or 2N293 TR4 Audio Amplifier 2N192 or 2N324 TR5 Audio Output 2N270, 2N321 or 2N241A
GERMANIUM DIODE:	D1 Detector 1N87

**GENERAL INFORMATION**  
The models P760A and P761A are all transistor battery operated portable radios.  
The B+ is supplied by four 1 1/2 volt flash-light type batteries producing the total B+ of 6 volts.

**CHASSIS REMOVAL**  
1. Remove both knobs. 2. Remove the 4 batteries. 3. Remove cabinet retainer strap. 4. Unsolder the two leads on the speaker. 5. Unscrew the 7 screws holding chassis to cabinet.

**TROUBLESHOOTING**  
A check of battery condition and total current drain of the receiver should be made first. All current measurements are made at quiescence with the receiver turned on volume control at maximum, tuning gang closed, and with no-signal conditions.  
The total receiver current drain is 58 to 67 mAs. This is measured by inserting a milliammeter in series with the batteries.  
If an excessive total current drain is recorded, the individual collector currents of each transistor should be checked. An excessive current reading may mean a shorted transistor; no current will indicate a defective transistor or associated circuit components are defective.  
A single-edge razor blade is a satisfactory tool for cutting the copper circuit wiring so that a milliammeter can be inserted in series with the break to measure the current flow. After each current check is completed, solder the cut carefully to complete the circuit again.

**NO RECEPTION:**  
1. Check battery voltage and battery contacts.  
2. Check on-off switch.  
3. Check all antenna lead connections.  
4. Check coil L2.

**WEAK AUDIO:**  
1. Check battery voltage for 6 volts.  
2. Check transistor current.  
3. Check transistor collector currents.  
4. Check alignment.

**INTERMITTENT:**  
1. Check battery contacts for corrosion.  
2. Check solder connections on dip-soldered side of circuit board.  
Intermittent audio, motorboating, and poor reception is frequently caused by poor battery contact. Remove batteries and bend both the contact springs and holding springs inward to increase their tension. Oxidation may occur on the contacts of the batteries themselves.

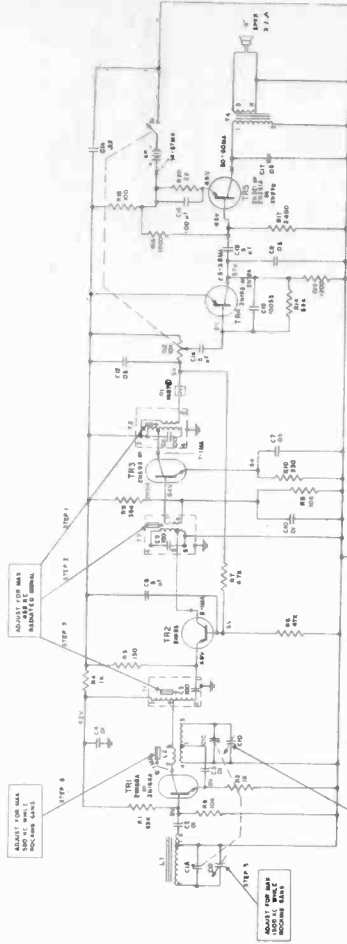
This tends to insulate the batteries from the battery contact springs, and increase electrical resistance. The terminals on the batteries should be cleaned with emery cloth to insure positive electrical contact. After the set has been aligned and placed in the cabinet, recheck the antenna trimmer at 1500 KC. Due to the inductance effect caused by the proximity of the speaker when the cabinet is closed, a change in the peak operating condition will be noticed. Open the cabinet and slightly adjust the trimmer, then close the cabinet and recheck again, continue the procedure until the proper operating performance is attained.

**TRANSISTOR REPLACEMENT**  
When measuring voltages at the transistor lead terminals, be sure to observe correct voltage polarities as shown on the schematic.  
When replacing a defective transistor, be sure to observe correct lead positions, as shown on the schematic diagram in outline form. When replacing TR2, mount carefully so that the transistor casing does not touch other circuit components.

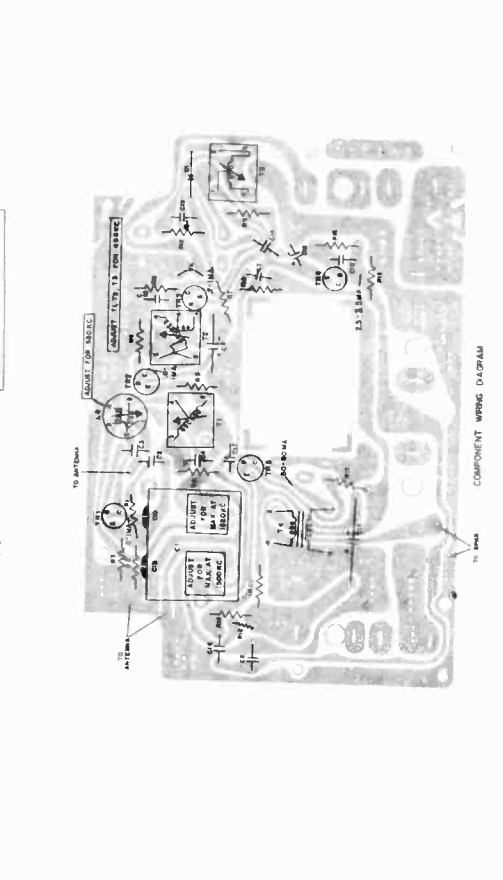
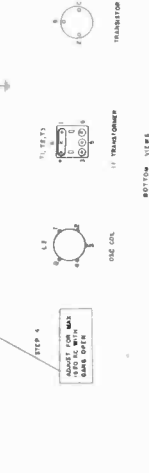
**REPLACEMENT OF COMPONENTS**  
After removing a defective part, clean the mounting holes of all solder; the replacement part can be inserted more easily and a better solder connection can be accomplished. Apply a soldering iron just long enough to heat the terminal to remove the component. Too much heat may damage a component.  
After replacing C12, "dress" capacitor so that it is parallel to the chassis board.

PRELIMINARY REPLACEMENT PARTS LIST (CONT'D.)		
CAT. NO.	DESCRIPTION	PRICE
n-RB-1060 (Assemb.)	Cabinet Front, Beige (P760A)	5.30
RS-1069	Tuning Knob	.85
RS-1071	Volume Knob	.75
n-RS-1390	Cabinet Clasp	.05
n-RS-1391	Grille	1.05
n-RS-1392	Handle & Decorative Strip	1.30
	Decorative Strip	.30
n-RB-1061 (Assemb.)	Cabinet Back, Beige	5.30
	Grille Pad	
	Cabinet Clasp (2)	
	Cabinet Hinge (2)	
	Cabinet Front, Green (P761A)	
	Grille Pad, Green	
	Grille	
	Cabinet Clasp (2)	
	Cabinet Hinge (2)	

<sup>1)</sup> Denotes Parts Not Previously Cataloged.  
All Parts Not Listed by Catalog Numbers Are Common Items, Obtainable From Radio Parts Jobbers. Prices Are Suggested List Prices And Subject To Change Without Notice.



**WARRANTY NOTICE**  
THIS SET IS COVERED BY A LIMITED WARRANTY. THE WARRANTY IS VOID IF THE SET IS OPENED OR REPAIRED BY ANYONE OTHER THAN A LICENSED RADIO SERVICE TECHNICIAN.  
REPAIRS WILL BE MADE AT 1500 KC. ONLY.  
REPAIRS WILL BE MADE AT 1500 KC. ONLY.  
REPAIRS WILL BE MADE AT 1500 KC. ONLY.



PRELIMINARY SERVICE DATA

S-P765-1  
COVERS  
MODELS  
P 765A, B  
P 766A, B

CABINET:	P765A, B Gold/ Beige-P766A, B Plaid/Black
DIMENSIONS:	6 21/32" x 3 15/32" x 1 7/32"
ELECTRICAL RATING:	2 1/2 to 3 Volts DC
BATTERIES:	(a) Carbon Pen-light cells: 2 Eveready #915, or 2 Burgess #2, or 2 Mallory M15 (b) Mercury Cells: 2 Eveready #59, or 2 Mallory #29 (c) Nickel Cadmium Cells: RECHARGEABLE CELLS 2 Gould #4A. The rechargeable cells are packed with the recharger carrying case accessory.
OPERATING FREQUENCIES:	Tuning range 560-1620KC IF Amplifier 455 KC.
POWER OUTPUT:	Undistorted - 100 Milliwatts Maximum - 150 Milliwatts, with 3 volts Input.
SPEAKER:	2 3/4" PM 15 Ohms @ 400 Cycles
PLUG & PLUG CHARGER:	Input 110 Volts AC 2.5 Watts 60 Cycles Output: See diagram page 2
TRANSISTOR COMPONENTS:	OSC. CONV. 2N166A or 2N168A T. F. 2N293 or 2N314 T. F. 2N293 or 2N314 1N87 Germanium Diode Det. 2N191 or 2N323 Driver 2N241 Audio Output 2N241 Audio Output 2N241

GENERAL INFORMATION

This receiver is of standard superheterodyne design, using a ferrite-core antenna loop. Conventional IF circuitry is used except in the second stage where a capacity divider is employed. A germanium diode is used as a detector ahead of the driver stage. Two 2N241 transistors are used in a Class B push-pull circuit in the output stage. The charging unit uses a step-down transformer and a diode in a half wave rectifier circuit to charge the nickel cadmium batteries.

TRANSISTOR REPLACEMENT

Transistors are hermetically sealed and relatively stable, therefore it is advisable to make a complete component check before a transistor is replaced. If a transistor is suspected to be at fault, it can be removed and checked on a reliable transistor tester. Use care when replacing the transistor, making sure its leads are in the correct holes on the circuit board. See the phantom diagram for correct positioning. Use care when soldering as excessive heat will damage the transistors and printed board. A .35 watt soldering iron is recommended.

ALIGNMENT:

To effect a proper alignment on this receiver, the same procedure is used as an ordinary superheterodyne electron tube set. It is advisable to check

battery voltage before alignment in order to obtain maximum sensitivity. The RF signal input should be kept at a minimum to avoid AVC action.

TROUBLE SHOOTING HINTS

Total battery current drain used by the receiver will give an indication of whether the transistors are operating normally. This current check is made at resonance. This means the tuning gang, all the way closed, and with no signal or noise being picked up. With the radio controls set accordingly, a current flow check between the battery end cap and the negative end of the battery should indicate properly operating transistors. If excessive total current is noted when this check is made, individual current checks should be made at the collector action of the suspected transistors.

We are including in the schematic of this radio the proper current ranges found at the various check points. A properly operating stage should not vary from these readings. An excessive current reading will likely mean a shorted transistor. If no current can be read, this will indicate an open transistor or other component in the circuit.

DEAD:

1. Check batteries.
2. Check speaker by substituting earphones.
3. Check earphone jack.
4. Check for broken antenna leads.

WEAK:

1. Check battery voltage: Gould batteries 2.5 volts; Carbon or Mercury batteries 3 volts.
2. Check R. F. alignment.
3. Check I. F. alignment.

DISTORTION:

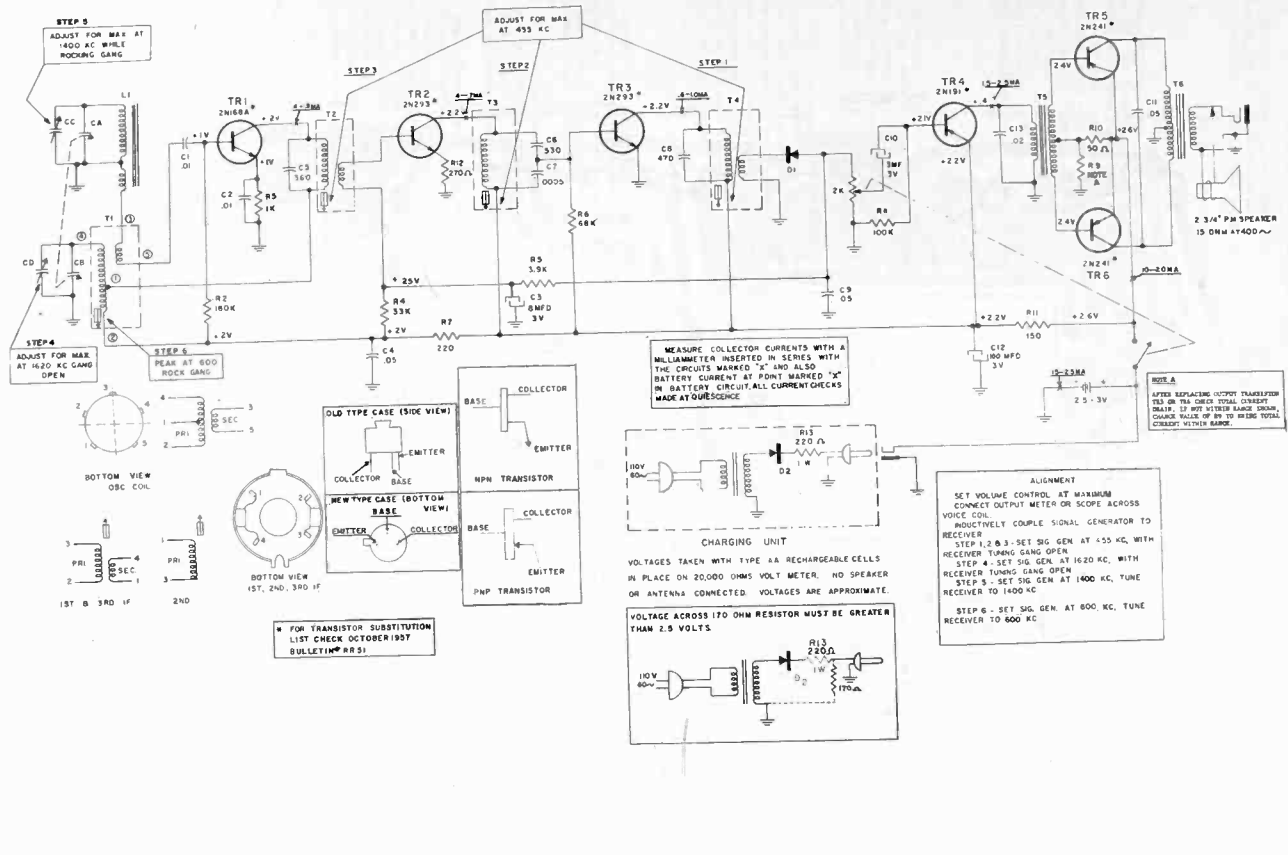
1. Check battery connection on end cap for corrosion.
2. Check battery voltages (same as for weak.)
3. Check I. F. alignment.
4. Check output transistors for proper match.

INTERMITTENT:

1. Check positive battery contact for good contact to battery.
2. Check Phillips screw holding tuning gang to circuit board.
3. Check solder connections on circuit board.

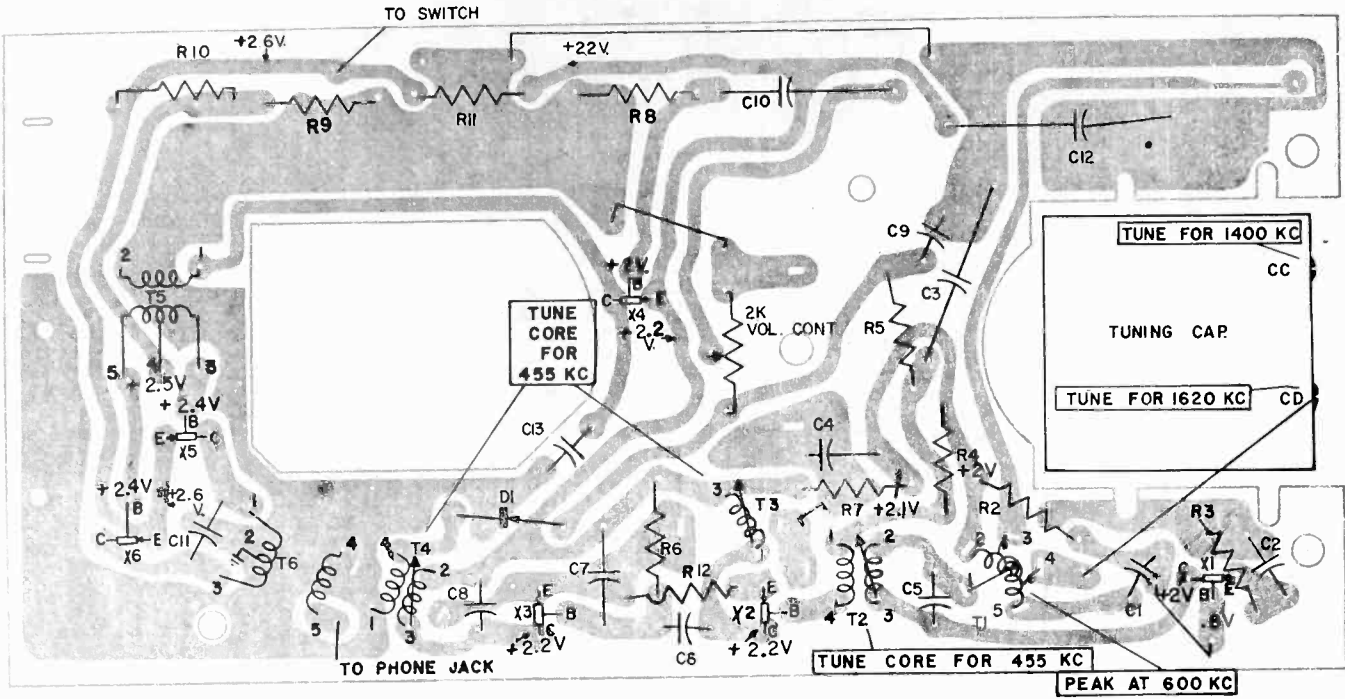
TO REMOVE CHASSIS FROM CASE

1. Remove the end cap on the speaker end of the radio the same as you would to change the batteries. Do not unsolder the wire attached to the end cap, but unsolder the wire from the chassis bracket to the case.
2. With a pair of longnose pliers, straighten the metal tab holding the speaker grille in place.
3. Remove the speaker grille by folding it up and toward the opposite end of the case.
4. Using care, pull out the speaker and unsolder the two leads.
5. Remove the volume knob by pulling it off. Turn the screw in the center of the tuning dial in a counterclockwise direction to remove it, then pull out the screw near the tuning shaft hole.
6. Take out the detector to remove it, then pull also the screw on the end cap tuning dial end.





MODELS P765A, B, P766A, B



CAT. NO.	DESCRIPTION	PRICE
MISCELLANEOUS ITEMS		
RAD-231	Bracket, Rt. end P765A, P766A.....	.10
RHM-043	"C" Washer P765B, P766B.....	.01
RS-1227	Tube, Battery.....	.15
RAD-232	Bracket, Phone & Charging Jack P765A.....	.20
RAD-233	Bracket, Battery.....	.20
RAD-234	Strap, Battery Tube.....	.04
RHS-194	Screw, Tuning Dial.....	.45
RHS-195	Screw, Left End Cap, P765A, P766A.....	.25
RHS-196	Screw, Right End Cap, P765A, P766A.....	.25
RHM-043	"C" Washer.....	.01
RJS-230	Jack, Phone.....	.90
RS-1231	Ring, Retaining P765A, P766A.....	.02
RMS-399	Ring, Compression.....	.02
n-RS-1420	Screw, Left End Cap, P765B, P766B.....	.25
n-RS-1421	Screw, Right End Cap, P765B, P766B.....	.25
n-RS-1422	Ring, Retaining P765B, P766B.....	.05
CABINET & APPEARANCE ITEMS		
n-RS-1357	Right End Cap, P765A, P766A.....	.60
n-RS-1468	Right End Cap, P765B, P766B.....	.60
n-BAC-214	Loop Cover.....	.75
n-RS-1356	End Cap Assembly.....	1.60
RAG-102	Speaker Cover, P765A, B.....	1.30
RAG-103	Speaker Cover, P766A, B.....	1.30
RAV-1040	Cabinet, w/Leatherette, P765A, B.....	5.40
RAV-1041	Cabinet, w/Leatherette, P766A, B.....	5.40
n-RS-1358	Tuning Dial.....	.70
RS-1009	Leatherette, P765A, P765B.....	.10
RS-1010	Leatherette, P766A, P766B.....	.10
n-RS-1359	Strap, Carrying Assem.....	1.05
RIG-018	Gasket, Speaker.....	.20
RDK-636	Knob, Volume Control.....	.35
RS-1039	Speaker.....	7.65
n-RS-1433	Bracket, Phone & Charging Jack P765B.....	.35
n-RS-1465	Acoustical Gasket, P765B, P766B.....	.35
Battery chargers, model P15A & P715C, are available for use with this receiver, as an accessory.		
CHARGING BOX PARTS		
RAF-009	Trim Strip, P715C.....	.50
RAH-007	Charger Housing, P715C.....	.20
RB-1035	Case, Charger, P15A.....	17.85
RAU-475	Case, Charger, P715C.....	4.30
RJB-083	Terminal Strip, P715C & P15A.....	.05
RTP-063	Charging Plug, P715C & P15A.....	.10
RTC-006	Transformer, P715C & P15A.....	2.30
RW-003	Power Cord, P715C & P15A.....	.90
RS-1068	1 Nickel Cad. Battery.....	4.25
RS-1199	Charging Plug Assem., P715C & P15A.....	1.00
RS-1111	Identification Plate, P715C.....	.70
RS-1198	Charger housing, P15A.....	.70
RS-1200	Identification Plate, P15A.....	.30

\*"h" DENOTES ITEMS NOT PREVIOUSLY CATALOGUED

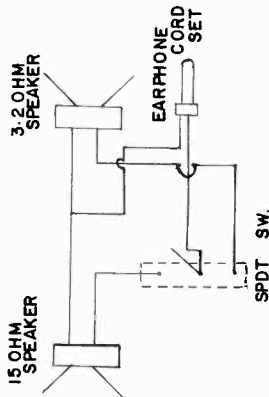
PRICES ARE SUGGESTED LIST PRICES AND ARE SUBJECT TO CHANGE WITHOUT NOTICE.

7. Slide the chassis toward the tuning dial end about 1/2 inch to gain access to the loop connections.  
 8. Unsolder the 3 loop connections. Be sure to observe lead color coding.  
 9. Continue to slide the chassis out in this direction. Let the end cap with the wire attached follow the chassis through the case.  
 NOTE: Do not remove the loop unless it is found to be defective, as this will affect the alignment of the receiver.

When repairing the chassis out of the cabinet, there is a jig available from the servicer. It has a loop attached which eliminates the removal of the loop from the cabinet.  
 The diagram below shows a convenient means of testing any of the various receiver models, including the P765 series, using earphone jacks. This arrangement provides a means of checking the audio output without soldering and unsoldering speakers.

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
CAPACITORS			
RCE-225	C3	Elect. 8MFD @3V	1.65
RS-1228	C10	Elect. 3MFD @3V	1.10
RS-1439	C12	Elect. 100MFD @3V	1.10
n-RS-1361	CA, B, C, D	Tuning Condenser 765B, 766B	4.20
	C1, 2	.01 MFD 450V	
	CA, 9, 11	.05MFD 50V	
	C3	.02 MFD 100V	
	C5	360 MFD 300V	
	C6	330 MFD 300V	
	C7	.0005 MFD 50V	
	C8	470 MFD 30V	
n-RS-1434	CA, B, C, D	Tuning Cap. P765A, P766A	4.20
POTENTIOMETER			
RRC-420		Vol. Con. 2K & Sw.....	1.90
COILS & TRANSFORMERS			
RLC-147	T1	Oscillator Coil.....	1.30
RLI-072	L1	Loop.....	1.40
RS-1334	T2	I.F. Transformer 1st.....	2.15
RS-1333	T3	I.F. Transformer 2nd.....	1.75
RTL-213	T4	I.F. Transformer 3rd.....	1.65
RTL-210	T5	Driver Transformer.....	3.65
FTO-206	T6	Output Transformer.....	3.70
RESISTOR			
RS-1355	R10	50 OHMS Current Var.....	.50

All resistors and capacitors not cataloged are common types obtainable from radio parts jobbers. Refer to schematic for symbols and values.





## GENERAL INFORMATION

Model Series P410 and P411 are Hoffman portable radios using the same basic radio chassis and cabinet. The major difference is the addition of the Hoffman Solar Battery Pack of Model Series P411. The P411 also uses rechargeable cells in place of the four standard dry cells used with Model Series P410. Both Model Series use the same transistorized chassis. To avoid any accidental damage to the transistors and printed wiring chassis board during repairs, study the reference data in this Service Data Note prior to performing any service repairs on these instruments.

### SPECIFICATIONS

Power Supply - Model Series P410 operates on 6VDC supplied by four (4) standard dry cells, size "C", Hoffman Part Number 930001. Model Series P411 operates on 6VDC supplied by Hoffman Solar Battery Power Pack Number 930301 in conjunction with four (4) rechargeable cells, Number 930002.

IF Frequency - 455 KC  
Frequency Range - 535 to 1605 KC  
Speaker Voice Coil Impedance - 8 ohms

### BATTERY INSTALLATION

Use a coin to remove the large screw in the center of the back of the radio and then remove the back cover. The batteries and hold them in position inside the radio. All four cells must be installed with the same polarity and installed in the radio in the direction indicated by the pattern stamped inside the radio cabinet.

Use four (4) standard dry cells, size "C", Hoffman Part Number 930001 for radio Model P410.

Use four (4) rechargeable cells, Hoffman Number 930002 for Solaradio Model P411.

**CAUTION:** Be sure the cells are installed with correct polarity as indicated in the radio cabinet or damage to the transistors will result.

### SEMICONDUCTOR COMPONENT

SC1	2N212	Converter, Transistor
SC2	2N216	1st IF, Transistor
SC3	2N216	2nd IF, Transistor
SC4	742002	Detector, Crystal Diode
SC5	2N35	AF Driver, Transistor
SC6	2N228	AF Output Amplifier, Transistor
SC7	2N228	AF Output Amplifier, Transistor
SC8	930301	Solar Battery Pack (P411)
SC9	742001	Crystal Diode (P411)

**NOTE:** The Solaradio handle is in the electrical circuit connecting the solar battery pack to the chassis. Keep the handle screws tightened so this electrical connection is not opened while using solar energy to charge the batteries or operate the Solaradio.

Although the transistor is far more rugged physically than a vacuum tube, it is, on the other hand, a very fragile device with respect to heat or to the application of improper DC biasing potentials. The transistor is a current sensitive device and any excessive current flow through it can cause considerable damage by the heat which is developed. It is important to be familiar with both the physical and electrical peculiarities of transistors in order that these adverse effects will not be accidentally introduced during service repair of the instrument.

### TOOLS

Since transistor and their associated components are extremely small in size, conventional-sized tools are frequently unsuitable for use. To supplement your other tools, use the smallest cutters and needle-nosed pliers available. Also include short and long shank screwdrivers with narrow blades. A soldering aid is another useful device. One end should have a notch for gripping wires and the other end should have a fine point.

### SOLAR RADIO OPERATION

The operation of the Solaradio is standard in all respects except for use of light as a source of power for battery charging. Switching from solar power to battery is taken care of automatically by the Solaradio. When operating the Solaradio outdoors, direct the solar cells toward the sun to utilize the solar energy. This will keep battery drain to a minimum. During night time operation, direct the solar cells toward the nearest incandescent lamp. For the most effective light energy pick up, the lamp should be in close proximity and of 100 to 300 watt rating.

All of the solar cells, located in the handle, must be exposed to the light while charging the batteries. Avoid excessive heat due to sun exposure without ventilation.

The storage batteries in the Solaradio should be kept fully charged for peak efficiency and long life. Keep the solar cells directed toward the sun whenever the Solaradio is used outdoors. After using indoors or in the shade, expose the solar cells to the outdoor sun light for about three or four times the period the Solaradio was in use. Bright sunlight is not necessary. If the sky is overcast, the highly sensitive solar cells will still pick up the sun's rays when properly directed toward the sun. The batteries must be recharged whenever the volume fades or distortion is evident on local radio stations.

# RADIO CHASSIS 1109 TRANSISTOR PORTABLE P410 & SOLARADIO P411

HOFFMAN RADIO-A DIVISION OF HOFFMAN ELECTRONICS CORPORATION  
P.O. BOX 2153, LOS ANGELES 54, CALIFORNIA

## REFERENCE DATA ... SERVICE PROCEDURES & CAUTIONS

### SERVICE CAUTIONS

There are several conditions which could result in excessive current flow through a transistor during service or repair of the instrument:

1. Leakage current from a defective soldering iron.
2. Current from an ohmmeter.
3. Induced current from a soldering gun.
4. Signal currents introduced by the AC component of the output from a battery eliminator.
5. Charging currents from line filter capacitors in signal generators.

To avoid possible damage from the above described types of excessive currents the following precautions should be observed when working with transistor type instruments:

1. Never use test instruments that employ transformerless power supplies.
2. Do not use an ohmmeter that passes more than 1MA with leads shorted. Observe polarity.
3. Use battery power to operate transistorized equipment unless otherwise specified by the maker.
4. Connect the ground terminals of all test equipment with a common ground wire.
5. Never ground the base element of a transistor.

### HEAT EFFECTS

In addition to the ill effects of excessive current, a transistor can also be permanently damaged by excessive heat. If a transistor socket is used, remove the transistor from any circuit that requires work with a soldering iron. If the transistor is soldered into the circuit, each lead of the transistor should be gripped with a pair of long-nosed pliers whenever an iron is applied to the solder joint associated with that lead. The pliers will act as a heat sink, and the heat will be dissipated before it reaches the body of the transistor.

The second factor that makes transistors sensitive to applied bias voltages is the extremely minute dimensions of the several elements and their very limited heat dissipating ability. Collector current is important in this respect because this current, while passing through the relatively high collector resistance, develops a certain amount of heat. If this heat, added to the ambient heat at which the transistor is operating, exceeds the maximum limits of the transistor, the collector current will rise. This will cause the collector current to rise, and the heat will be reduced proportionately. This is known as derating.

### COLLECTOR VOLTAGE

The maximum safe value of collector voltage is also important, since too high a value will lead to a reverse current breakdown. The point at which this occurs is known as the Zener voltage.

Thus, because of the foregoing limitations, the value

and the polarity of any voltages applied to the circuit must be scrutinized carefully. Make certain first that you have the right voltage, then check polarity before final connection is made to the circuit. If you are at all in doubt on the latter point, check the type of transistors being used. The p-n-p transistors require negative collector voltages and positive emitter voltages, both taken with respect to the base. In n-p-n transistors, the reverse situation holds.

Before the battery is connected to the circuit, the various transistors should be firmly in place. Never insert or remove a transistor when voltages are present. Always remove the voltage first to prevent damage from surge currents. If you are in doubt, insert a current meter in series with the collector circuit and then use a potentiometer arrangement to gradually apply the collector voltage. If the collector current begins to exceed the specified maximum, you know that something else in the circuit is at fault.

### SIGNAL GENERATOR USE

Another source of potential danger lies in the signal generator. When a signal is injected into a signal circuit, the signal should be low amplitude and gradually increase the generator output until the desired indications is obtained. Never inject strong signals into a transistor circuit, particularly into a low-level stage. Frequently, indirect rather than direct coupling methods of signal injection are advisable.

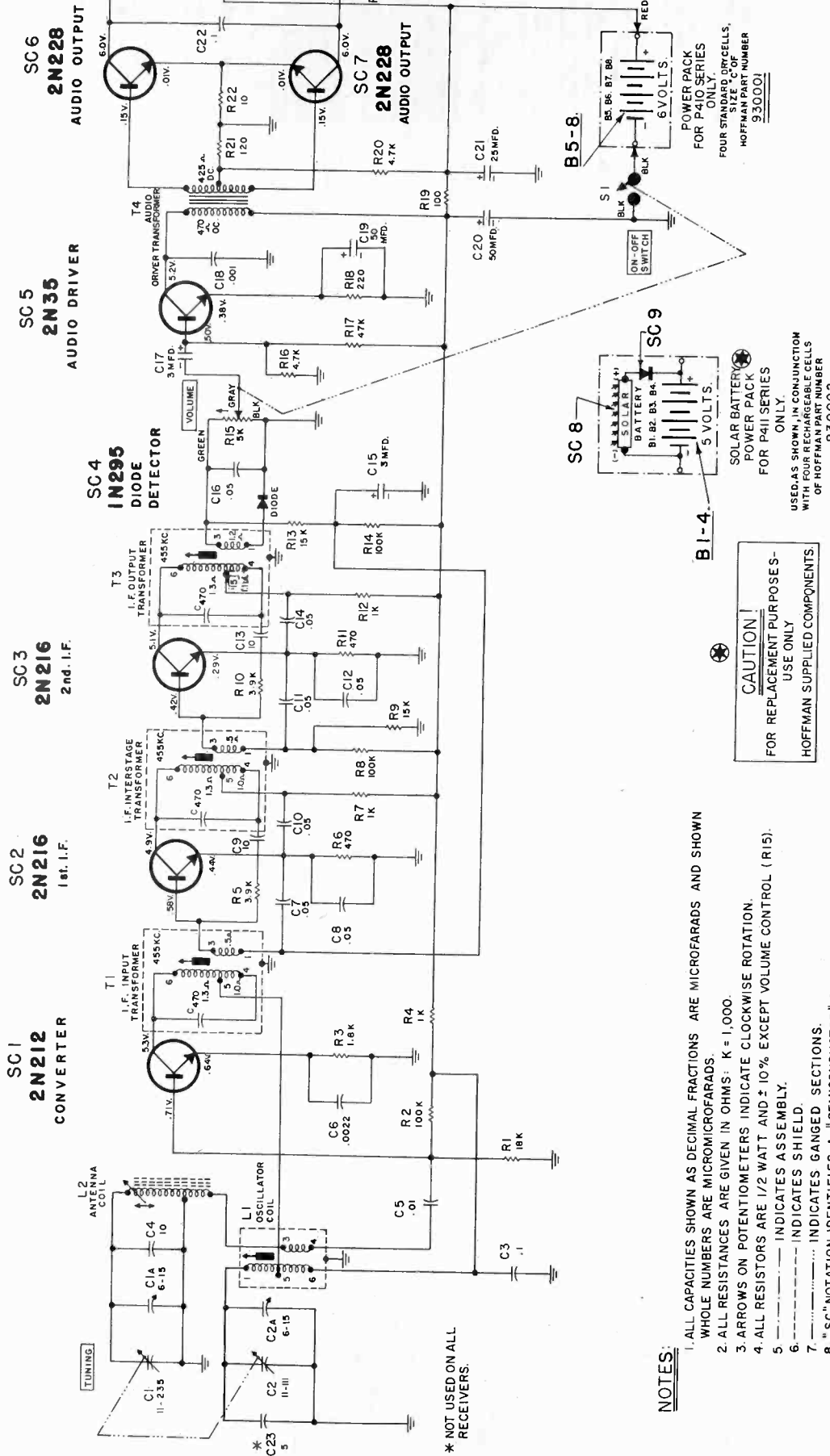
For example: Clip the "hot" lead from the generator to the insulated body of a nearby resistor or capacitor. The signal will then enter the circuit by radiation and capacitive coupling. This approach is widely practiced in television receiver alignment when a marker must be brought into the system without swamping the sweep signal.

### VOLTMETER USE

The sensitivity of a transistor to surge currents should be borne in mind when a voltmeter is being used to check voltages in a transistor receiver or instrument. Due to the close spacing of components, it is easy for the probe tip to accidentally touch two terminals at the same time if the technician is not exceptionally careful. This simple slip may result in a battery burnout or be responsible for a current surge through the transistor. For example: A surge current would occur if the probe made contact with both the collector and the emitter of the transistor.

### PROBING AND TESTING

Never use a screwdriver or any other metal tool to probe the chassis nor should the "screwdriver" click tests be used on any instrument that has a transistorized circuit.



\* NOT USED ON ALL RECEIVERS.

**NOTES:**

1. ALL CAPACITIES SHOWN AS DECIMAL FRACTIONS ARE MICROFARADS AND SHOWN WHOLE NUMBERS ARE MICROMICROFARADS.
  2. ALL RESISTANCES ARE GIVEN IN OHMS: K = 1,000
  3. ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.
  4. ALL RESISTORS ARE 1/2 WATT AND ± 10% EXCEPT VOLUME CONTROL (R15).
  5. ——— INDICATES ASSEMBLY.
  6. - - - - - INDICATES SHIELD.
  7. ······ INDICATES GANGED SECTIONS.
  8. "SC" NOTATION IDENTIFIES A "SEMICONDUCTOR" DEVICE.
  9. ALL VOLTAGE MEASUREMENTS REFERENCED TO A 6 VOLT SUPPLY UNDER NO SIGNAL CONDITION EMPLOYING A V.T.V.M.
- SOLAR RADIO MEASUREMENTS ARE REFERENCED TO 5 VOLTS AND WILL BE APPROXIMATELY 20% LESS THAN THOSE SHOWN.

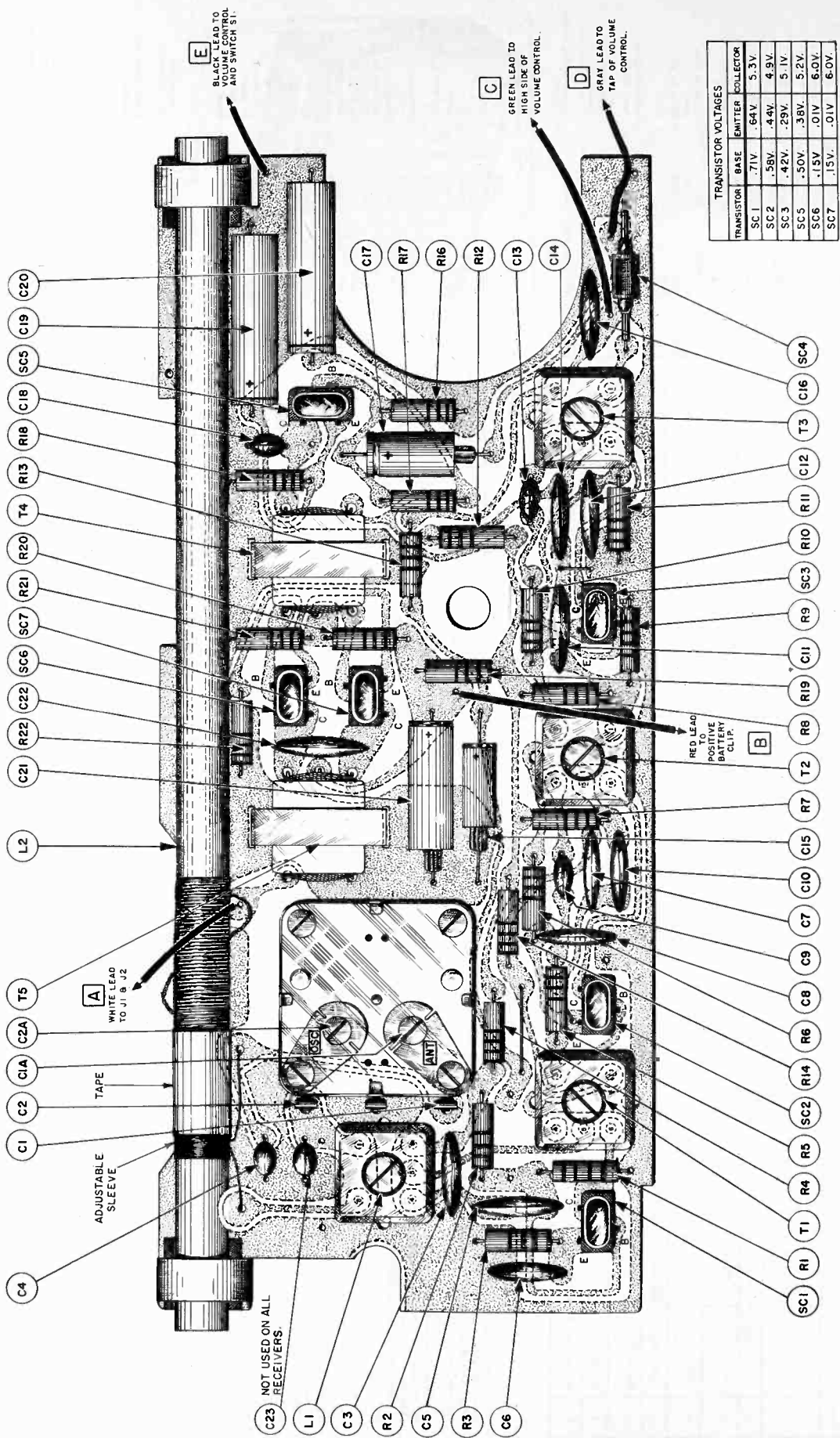
**CAUTION!**  
FOR REPLACEMENT PURPOSES—  
USE ONLY  
HOFFMAN SUPPLIED COMPONENTS.

**SC 8**  
SOLAR BATTERY  
POWER PACK  
FOR P411 SERIES  
ONLY  
USED AS SHOWN IN CONJUNCTION  
WITH FOUR RECHARGEABLE CELLS  
OF HOFFMAN PART NUMBER  
930002

**SC 9**  
POWER PACK  
FOR P410 SERIES  
ONLY  
FOUR STANDARD DRY CELLS,  
SIZE C OF  
HOFFMAN PART NUMBER  
930001

**I.F. TRANSFORMER  
BOTTOM VIEW  
(T1, T2, T3)  
ALSO OSC. COIL  
(L1)**

**SCHEMATIC DIAGRAM FOR HOFFMAN RADIO CHASSIS 1109**



PRINTED BOARD

TOP VIEW OF COMPONENT-WIRING DIAGRAM FOR CHASSIS 1109

# ALIGNMENT

Use a signal generator having output signals at the frequencies specified below. Loosely couple the signal to the ferrite rod antenna. Signal should be 30% AM at 400 CPS. Keep the signal at the lowest practical level during alignment. Use the radio's batteries as its power supply during alignment.

STEP	GENERATOR FREQUENCY	GENERATOR INPUT TO	RADIO DIAL SETTING	ADJUST	REMARKS
1.	455 KC	Loosely coupled to ferrite rod antenna	High End of Dial	T3, T2, T1	Adjust for maximum in the order listed.
2.	Repeat Step 1 until no further improvement is indicated				
3.	535 KC	Same as Step 1.	Low End of Dial	L1	Adjust oscillator coil for maximum.
4.	1620 KC	"	High End of Dial	C2A	Adjust the oscillator trimmer for maximum.
5.	Repeat Steps 3 and 4 until both end points show maximum output at 535 and 1620 KC respectively.				
6.	600 KC	Same as Step 1.	Tune in The Signal	Movable winding on antenna.	Adjust for maximum.
7.	1400 KC	"	"	C1A	"
8.	Repeat Steps 6 and 7 if necessary.				

## IF ALIGNMENT

1. An external speaker or 8 ohm load should be connected across the output terminals of the audio output transformer during alignment if the chassis has been removed from the cabinet.
2. Loosely couple the signal generator to the ferrite rod antenna. Several turns of wire across the signal generator output and located at such a distance as not to affect the antenna characteristics will be satisfactory.
3. Set the volume control to maximum. Adjust the tuning condenser wide open (high end of the dial).

NOTE: Use the radio batteries for the power supply during alignment. Do not use a 6 volt battery eliminator type source of power for the radio unless it is of the type approved for use with transistorized circuits. The AC component of the power supply could damage the transistors if excessive ripple is present.

4. Use a 455 KC carrier, 30% modulated at 400 CPS for IF alignment. Adjust the generator output for a low level audible signal at the speaker or for 5 milliwatts across the 8 ohm load if it is used in place of a speaker.
5. With an insulated screwdriver adjust the output, interstage, and input IF transformers (T3, T2, and T1) for maximum output. Decrease the signal generator output as required to maintain a low level output at the speaker or 5 milliwatts across the 8 ohm load.
6. Repeat step 5 until no further improvement is obtained.

## RF ALIGNMENT

Use the same set-up connections and general conditions as for the IF alignment of the radio.

1. Set the signal generator for a 535 KC signal. Turn the tuning condenser fully closed (low end of the dial).
2. Adjust the oscillator coil (L1) for maximum output.
3. Set the signal generator for a 1620 KC signal. Turn the tuning condenser wide open (high end of the dial).
4. Adjust the oscillator trimmer capacitor (C2A) for maximum output.
5. Repeat steps 2 through 4 until both settings of the tuning condenser give maximum output at 535 and 1620 KC.

## TRACKING

1. Set the signal generator for a 600 KC signal. Turn the tuning condenser to tune in the signal.
2. Adjust the movable section of the radio antenna, if necessary, for maximum output.
3. Set the signal generator for a 1400 KC signal. Tune in the signal on the radio.
4. Adjust the antenna trimmer (C1A) for maximum output while "rocking" the tuning condenser through the peak.
5. Repeat steps 1 through 4 until no further improvement is indicated.

# REPLACEMENT PARTS FOR MODELS P410 & P411

Part No.	Description	Part No.	Description
603508	Battery terminal (left)	851010	2200MMF
603509	Battery terminal (right)	851008	.05MF
603510	Battery terminal spring	847204	Same as C4
605002	Battery tube (Model 410)	851008	Same as C7
607003	Battery tube (Model 411)	851008	Same as C7
571005	Bracket, volume control	847204	Same as C4
571507	Bracket, speaker (3)	851008	Same as C7
397001	Cabinet easel	856008	3MF
603012	Easel plate	851008	Same as C7
288007	Handle (P410)	856008	Same as C15
288002	Handle bottom (P411)	851006	.001MF
290001	Handle ends (P411)	50MF	
288001	Handle top (P411)	Same as C19	
519001	Hoffman nameplate	856009	25MF
640002	Instruction book (radio)	851009	Same as C3
640004	Instruction book (Soloradio)	847205	5MF
248006	Nut, volume control	934012	Earphone Jack
215501	Screw, cabinet	934012	Same as J1
204881	Screw, dial cover	768005	Oscillator Coil
215502	Screw, handle (P411)	924001	Antenna
204884	Screw, speaker grill	708005	Loadspeaker, 8 ohm
212881	Screw, dial knob		2-1/2"
537001	Speaker grill		
619003	Tuning dial cover		
504001	Tuning dial knob		

NOTE: Unless otherwise noted, all of the following resistors are 10%, 1/2 watt, composition.

PART NUMBER	Description	Part No.	Description
R1	18K	814207	18K
R2	100K	814216	100K
R3	1.8K	814195	1.8K
R4	1K	814192	1K
R5	3.9K	814199	3.9K
R6	470 ohm	814188	470 ohm
R7	1K	814192	1K
R8	Same as R2	814216	Same as R2
R9	15K	814206	15K
R10	Same as R5	814199	Same as R5
R11	Same as R6	814188	Same as R6
R12	Same as R7	814192	Same as R7
R13	Same as R9	814206	Same as R9
R14	Same as R2	814216	Same as R2
R15	Same as R2	800008	Same as R2
R16	4.7K	814200	4.7K
R17	47K	814212	47K
R18	220 ohm	814184	220 ohm
R19	100 ohms	814180	100 ohms
R20	Same as R16	814200	Same as R16
R21	120 ohms	814181	120 ohms
R22	10 ohms	814168	10 ohms
R23	22 ohms	814172	22 ohms
R24	Same as R23	814172	Same as R23

## Controls

R15	Volume, 5K	800008	Volume, 5K
S1	On - Off Switch		On - Off Switch
C1	Tuning Capacitor Assembly	872001	Tuning Capacitor Assembly
C1A			
C2			
C2A			

## Transformers

T1	Input Transformer	760005	Input Transformer
T2	Interstage Transformer	760006	Interstage Transformer
T3	Output Transformer	760006	Output Transformer
T4	Audio Input Driver	726001	Audio Input Driver
T5	Audio Output	724007	Audio Output

## COMPONENT PARTS LIST

Symbol	Part No.	Description
B1	930002	Rechargeable Cells
B2	930002	Used with Model
B3	930002	Series P411
B4	930002	Only
B5	930001	Standard Dry Cells
B6	930001	Size "C"
B7	930001	Used with Model
B8	930001	Series P410 Only
C1	872001	Tuning Condenser Assembly
C1A		See Schematic Diagram
C2		Schematic Diagram For Values.

NOTE: Unless otherwise noted, all of the following capacitors are: (A) Ceramic disc, (100% -20% tolerance, 50 volt. (B) Electrolytic tubular, 50V.

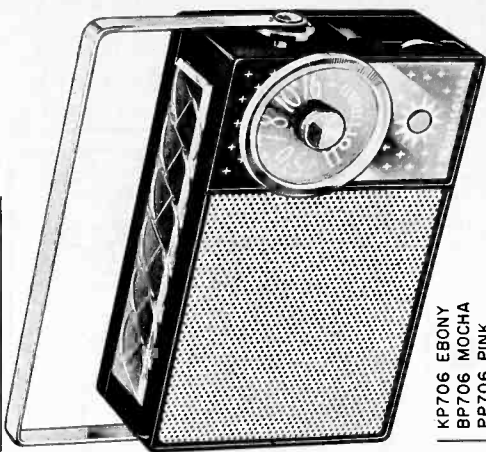
C3	851009	.1 MF
C4	847204	10MMF, 5% NPO
C5	851007	.01MF

# RADIO CHASSIS 1123

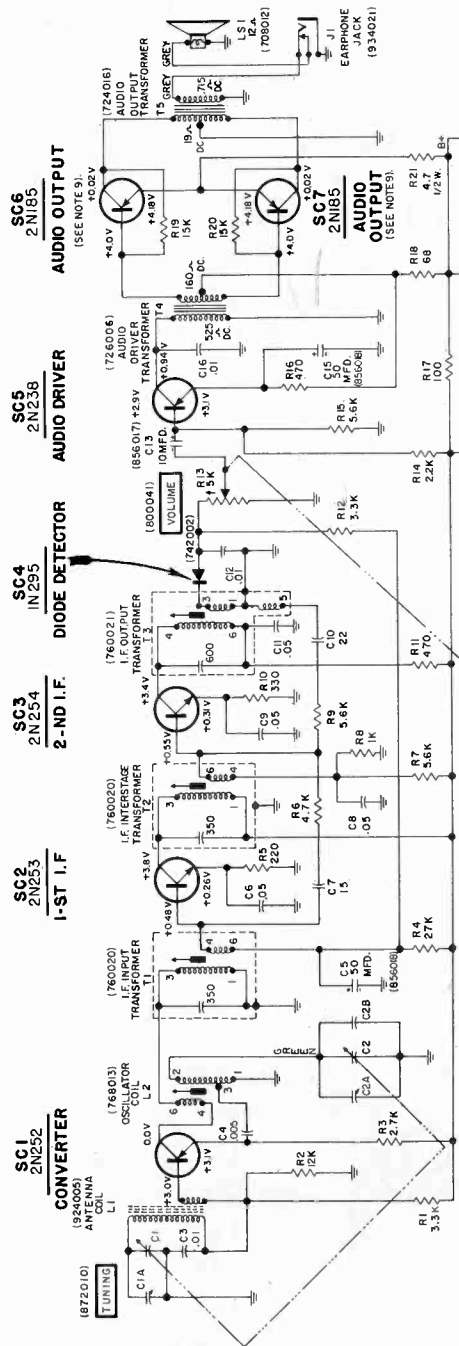
## SOLAR TRANSISTOR PORTABLE MODEL SERIES P706

HOFFMAN ELECTRONICS CORPORATION / CONSUMER PRODUCTS DIVISION  
P.O. BOX 2193, LOS ANGELES 34, CALIFORNIA

PRINTED IN U.S.A.



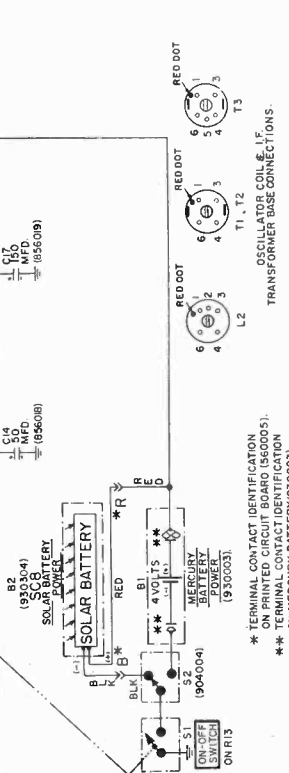
KP706 EBONY  
BP706 MOCHA  
RP706 PINK  
TP706 RED  
EP706 TURQUOISE  
FP706 ESPRESSO



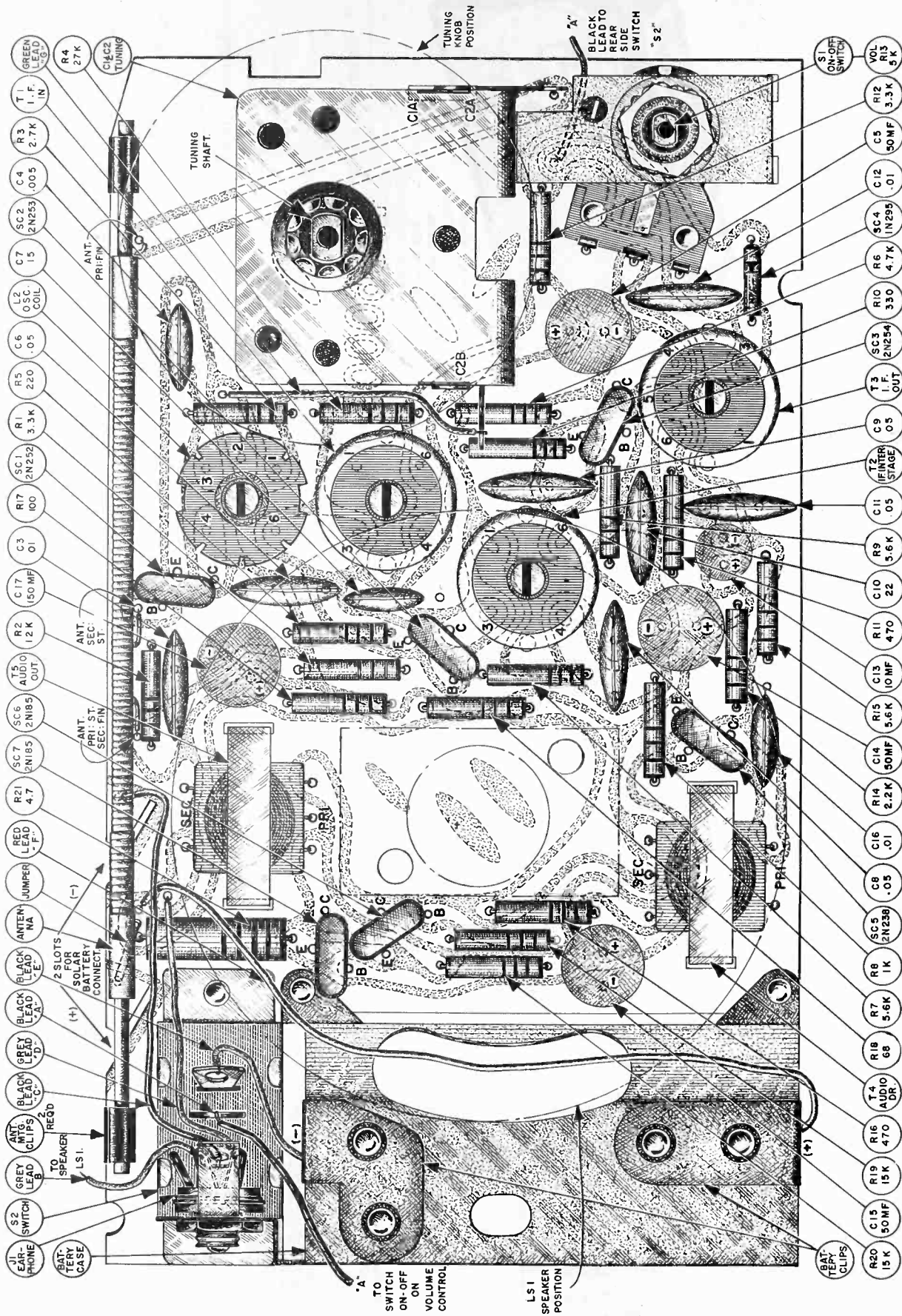
NUMBER	TYPE	CIRCUIT
2N252	PNP	CONVERTER
2N253	NPN	1st I-F AMPLIFIER
2N254	NPN	2nd I-F AMPLIFIER
2N295	---	CRYSTAL DIODE DETECTOR
2N238	PNP	AUDIO DRIVER
2N185	PNP	AUDIO OUTPUT
2N185	PNP	AUDIO OUTPUT

POWER SOURCES  
SOLAR PACK (H930304), Output test characteristics: 4.8V @25ma when terminated with 190 ohms and exposed to noontday sun or equivalent.  
MERCURY BATTERY (H930003), Mallory TR-233R @4V, Eveready E235 @4V or equivalent.  
CURRENT DRAIN, Idle @8ma, Maximum @35ma  
EARPHONE, Hoffman No. 958005

- NOTES:
- ALL CAPACITANCES SHOWN AS DECIMAL FRACTIONS ARE MICROFARADS AND SHOWN AS WHOLE NUMBERS ARE MICROMICROFARADS, UNLESS OTHERWISE NOTED.
  - RESISTANCES SHOWN AS WHOLE NUMBERS ARE OHMS, UNLESS OTHERWISE NOTED.
  - VOLTAGES MEASURED WITH A VTVM-RAKED OFF STATION VOLUME FULL ON.
  - ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.
  - ALL VOLTAGE MEASUREMENTS TO GROUND WITH NEW BATTERY - 4.5V UNDER LOAD.
  - INDICATES ASSEMBLY.
  - INDICATES SHIELD CONNECTIONS.
  - NUMERALS SHOWN IN PARENTHESES (XXXXX) INDICATE HOFFMAN PART NUMBER.
  - AUDIO OUTPUT TRANSISTORS SC6 AND SC7 ARE ELECTRICALLY MATCHED.



SCHEMATIC DIAGRAM FOR HOFFMAN SOLARADIO CHASSIS 1123



TOP VIEW OF COMPONENT -- WIRING LAYOUT FOR CHASSIS 1123

# REPLACEMENT PARTS - P706 RADIO

## ALIGNMENT

Use a signal generator having output signals at the frequencies specified below. Loosely couple the signal to the ferrite rod antenna. Signal should be 30% AM at 400 CPS. Keep the signal at the lowest practical level during alignment. Use the radio's batteries as its power supply during alignment.

STEP	GENERATOR FREQUENCY	GENERATOR INPUT TO	RADIO DIAL SETTING	ADJUST	REMARKS
1.	455 KC	Loosely coupled to ferrite rod antenna	High End of Dial	T3, T2, T1	Adjust for maximum in the order listed.
2.	Repeat Step 1 until no further improvement is indicated				
3.	535 KC	Same as Step 1.	Low End of Dial	L1	Adjust oscillator coil for maximum.
4.	1620 KC	"	High End of Dial	C2A	Adjust the oscillator trimmer for maximum.
5.	Repeat Steps 3 and 4 until both end points show maximum output at 535 and 1620 KC respectively.				
6.	1400 KC	Same as Step 1.	Tune in The Signal	C1A	Adjust for maximum.
7.	Repeat Steps 6 and 7 if necessary.				

### IF ALIGNMENT

1. An external speaker or 12 ohm load should be connected across the output terminals of the audio output transformer during alignment if the chassis has been removed from the cabinet.
2. Loosely couple the signal generator to the ferrite rod antenna. Several turns of wire across the signal generator output and located at such a distance as not to affect the antenna characteristics will be satisfactory.
3. Set the volume control to maximum. Adjust the tuning condenser wide open (high end of the dial).

NOTE: Use the radio batteries for the power supply during alignment. Do not use a 6 volt battery eliminator type source of power for the radio unless it is of the type approved for use with transistorized circuits. The AC component of the power supply could damage the transformers if excessive ripple is present.

4. Use a 455 KC carrier, 30% modulated at 400 CPS for IF alignment. Adjust the generator output for a low level audible signal at the speaker or for 5 milliwatts across the 12 ohm load if it is used in place of a speaker.
5. With an insulated screwdriver adjust the output, interstage, and input IF transformers (T3, T2, and T1) for maximum output. Decrease the signal generator output as required to maintain a low level output at the speaker or 5 milliwatts across the 12 ohm load.
6. Repeat step 5 until no further improvement is obtained.

### RF ALIGNMENT

Use the same set-up connections and general conditions as for the IF alignment of the radio.

1. Set the signal generator for a 535 KC signal. Turn the tuning condenser fully closed (low end of the dial).
2. Adjust the oscillator coil (L1) for maximum output.
3. Set the signal generator for a 1620 KC signal. Turn the tuning condenser wide open (high end of the dial).
4. Adjust the oscillator trimmer capacitor (C2A) for maximum output.

5. Repeat steps 2 through 4 until both settings of the tuning condenser give maximum output at 535 and 1620 KC.

### T R A C K I N G

- Use the same set-up connections and general conditions as for the IF and RF alignment.
1. Set the signal generator for a 1400 KC signal. Tune in the signal on the radio.
  2. Adjust the antenna trimmer (C1A) for maximum output while "rocking" the tuning condenser through the peak.
  3. Repeat steps 1 through 4 until no further improvement is indicated.

### COMPONENT REPLACEMENT PARTS

SYMBOL	PART NO.	DESCRIPTION
R1	812198	3-.3K, 10%
R2	812205	12K, 10%
R3	812197	2.7K, 10%
R4	812209	27K, 10%
R5	812184	4.7K, 10%
R6	812200	5.6K, 10%
R7	812201	1K, 10%
R8	812192	5.6K, 10%
R9	812201	330, 10%
R10	812188	470, 10%
R11	812198	3.3K, 10%
R12	812198	5K Volume Control w/SPST Switch
R13	800041	2.2K, 10%
R14	812196	5.6K, 10%
R15	812201	470, 10%
R16	812188	100, 10%
R17	812180	68, 10%
R18	812178	15K, 10%
R19	812206	15K, 10%
R20	812206	15K, 10%
R21	815170	4.7, 10%
C1	10.2 - 207.2 mmf Variable	
C1A	0 - 12 mmf Trimmer	
C2	10.5 - 103.3 mmf Variable	
C2A	0 - 12 mmf Trimmer	
C2B	12 mmf	
C3	0.1mfd, 20%, 100V	
C4	851501	0.05mfd, 20%, 100V
C5	856018	50mfd, 20%, 6WV
C6	851502	0.05mfd, 20%, 50V
C7	847210	15mmf, 5%, NPO
C8	851405	0.05mfd, 20%, 50V
C9	851405	0.05mfd, 20%, 50V
C10	847209	22mmf, 5%, NPO
C11	851405	0.05mfd, 20%, 50V
C12	851502	0.1mfd, 20%, 100V
C13	856017	50mfd, 20%, 6V
C14	856018	50mfd, 20%, 6V
C15	856018	50mfd, 20%, 6V
C16	851502	0.1mfd, 20%, 100V
C17	856019	150mfd, 20%, 6V

### TRANSFORMERS & COILS

SYMBOL	PART NO.	DESCRIPTION
T1	760020	IF Input Trans. (Shielded)
T2	760020	IF Interstage Trans. (Shielded)
T3	760021	IF Output Trans. (Shielded)
T4	762006	Audio Driver Trans. (Class B)
T5	724016	Audio Output Trans. (Class B)
L1	924005	Antenna Coil (Ferrite Core)
L2	768013	Oscillator Coil

### MISCELLANEOUS

SYMBOL	PART NO.	DESCRIPTION
J1	934021	Earphone Jack
LS1	708012	Speaker, 2-3/4", 12 ohm
S1	538002	Switch, SPST (Part of R13)
S2	904004	Switch, SPST Slide Lever
SC8	930304	Solar Pack Assembly - Complete
B1	930003	Mercury Battery - 4V
SC4	742002	IN295 Detector Diode

### CABINET REPLACEMENT PARTS

PART NO.	DESCRIPTION
371028	Radio Case Front - Black
371035	Radio Case Front - Mocha
371036	Radio Case Front - Pink
371037	Radio Case Front - Red
371038	Radio Case Front - Turquoise
371064	Radio Case Front - Espresso
371029	Case - Back Cover - Black
371039	Case - Back Cover - Mocha
371040	Case - Back Cover - Pink
371041	Case - Back Cover - Red
371042	Case - Back Cover - Turquoise
371065	Case - Back Cover - Espresso
371030	Battery Access Cover - Black
371043	Battery Access Cover - Mocha
371044	Battery Access Cover - Pink
371045	Battery Access Cover - Red
371046	Battery Access Cover - Turquoise
371066	Battery Access Cover - Espresso
371032	Swivel Trimmer Cover - Black
371051	Swivel Trimmer Cover - Mocha
371052	Swivel Trimmer Cover - Pink
371053	Swivel Trimmer Cover - Red
371054	Swivel Trimmer Cover - Turquoise
371068	Swivel Trimmer Cover - Espresso
371033	Retainer - Trimmer Cover - Black
371055	Retainer - Trimmer Cover - Mocha
371056	Retainer - Trimmer Cover - Pink
371057	Retainer - Trimmer Cover - Red
371058	Retainer - Trimmer Cover - Turquoise
371069	Retainer - Trimmer Cover - Espresso
506022	Knob - Power Source Switch - Black
506024	Knob - Power Source Switch - Mocha
506025	Knob - Power Source Switch - Pink
506026	Knob - Power Source Switch - Red
506027	Knob - Power Source Switch - Turquoise
506028	Knob - Power Source Switch - Espresso
371034	Retainer - Power Switch - Black
371039	Retainer - Power Switch - Mocha
371060	Retainer - Power Switch - Pink
371061	Retainer - Power Switch - Red
371062	Retainer - Power Switch - Turquoise
371063	Retainer - Power Switch - Espresso
504002	Knob - Station Selector
215504	Screw - Station Selector Knob
504003	Knob - Volume on/off Knob
208002	Screw - Volume on/off Knob
259153	Lockwasher - Volume Knob
288010	Handle - Carrying
452038	Control Panel - Etched Numerals
251302	Chrome Plug - Control Panel
195871	Screw - Back Cover Trimmer Cover
261506	Spring Washer - Trimmer Cover
371024	Handle Dial - L. H.
371024	Handle Dial - R. H.
504005	Chrome Knob - Battery Access Cover
603033	Spring - Retaining for 504005 Above
538002	Speaker Grille
261507	Spring Washer - Control Plate
204082	Speaker Mounting Screw
239174	Volume Control Nut



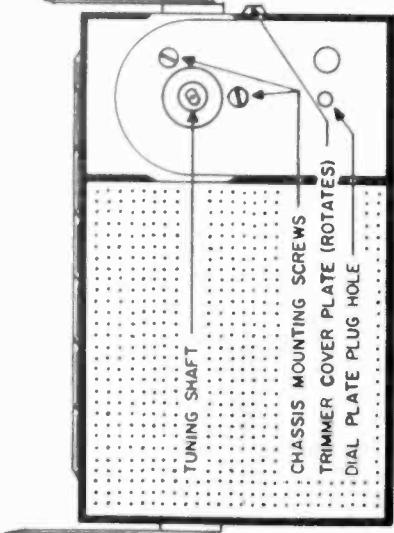


FIG. 1 - FRONT VIEW - DIAL PLATE REMOVED

**DISASSEMBLY INSTRUCTIONS**

1. Remove the dial indicator wheel by turning the center chrome nut counter clockwise until it is completely unscrewed.
2. Pry out chrome plug located at the center of the Solar Symbol below the dial.
3. Lift out the dial calibration plate, exposing two counter-sunk slotted head screws adjacent to the tuning shaft. Remove these two screws (see Fig. 1).
4. Remove the case back cover by removing the 4 corner screws. Remove the Mercury Battery.
5. Slide out the Solar Pack, unclipping its black and red leads after the Pack is out.
6. Remove the slotted head screw in the Mercury Battery compartment (See Fig. 2). The entire chassis may now be lifted from the case.
7. Remove speaker from chassis by unscrewing two slotted head screws in back of the speaker magnet (See Fig. 1). This eliminates the speaker ground, so a clip lead should be connected from speaker frame to the metal battery compartment.

**CAUTION** DO NOT ATTEMPT TO PRY OFF THE TRIMMER COVER PLATE (SEE FIG. 1). THIS PLATE ROTATES TO EXPOSE TWO ACCESS HOLES IN THE END OF THE CASE. FRONT HOLE TO OSCILLATOR TRIMMER CIA, REAR HOLE TO RF TRIMMER CIA.

**GENERAL INFORMATION**

The Model P706 Transolar Radio incorporates 6 transistors plus a diode detector. High level, low - distortion audio is provided by a pair of matched 2N185 transistors in push pull - driven by a 2N238 audio driver.

Power is supplied by one of two voltage sources:

1. A bank of Silicon Solar cells which are series connected to provide 4 volts under load, when exposed to sunlight or a strong incandescent lamp.
2. A Mercury Battery of the 4 volt type. This battery will play for over 100 hours continuously, and many times more when used intermittently.

In the P706, the Solar Pack does not charge the Mercury Battery, but is an independent power source which acts as a Battery Saver. Every hour of Solar power operation adds an hour to the usable life of the Mercury Battery. When the

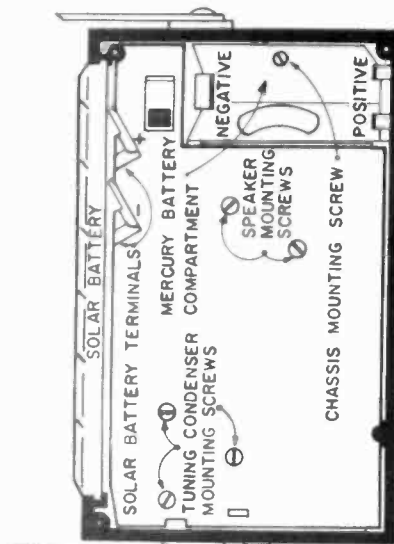


FIG. 2 - REAR VIEW - BACK COVER REMOVED

3. The two push pull audio transistors are a matched pair. If one fails, both should be replaced with a matched pair available through the local Hoffman Distributor. Failure of either 2N185 will cause distortion at all audio levels. Mismatched 2N185 transistors will cause distortion at low levels of volume.
4. Be sure of polarity of Solar Pack leads when reinstalling this unit. Reverse polarity will not only cause the set to be inoperative on Solar Power, but may damage transistors and filter capacitors. The red lead from the Solar Pack is always to the RIGHT looking at the BACK of the radio, and the letters "R" and "B" are stamped near their proper terminals.

**SERVICE INFORMATION**

A weak battery or light source will be the main sources of service on this unit. The audio output will be noticeably reduced if the power source is less than 3 volts under load, although the oscillator will function down to 1-3/4 volts.

**CIRCUIT TESTING** A completely inoperative unit should be checked as follows:

1. Switch from battery to Solar Power. If unit plays on neither power source, examine the Earphone Jack. This is a self shorting type when earphone plug is removed.
2. Note the two speaker mounting screws which mount the speaker to the board assembly. These screws provide the ground return for the speaker, and should be tight to make a good electrical connection.
3. Pull the chassis and touch the top of the volume control. If a click or hum is heard in the speaker, trouble is probably in the RF stages.
4. Inspect etched wiring and component connections carefully, then measure voltage on RF transistors using a VTVM. These voltages should approximate those shown on the Schematic Diagram.
5. Do not "click" test the stages with a metal tool. Loose coupling the output of a generator into each stage across its base connection - starting at a low output from the generator and slowly increasing the generator output.
6. Transistors may be checked with a commercial transistor checker, or new transistors substituted. Never take a transistor in or out of its circuit while the set is operating.

**CIRCUIT INFORMATION**

1. The network of C7, R6, R9 and C10 is a neutralizing circuit.
2. The low end winding of T3 (1 - 5 terminals) is a phase shift winding. If this winding or the neutralizing network are defective, a non-symmetrical IF bandpass will result.

**SOLAR CELLS**

The Solar Power Pack is a sealed unit which is designed for replacement instead of repair. It is easily removable with the back of the case removed. If the radio works satisfactorily in the Mercury Battery position, but not on Solar position, it would mean that the Solar Pack, or its clip connections, were defective. Do not leave the Solar Cell exposed to heat lamps or other heat radiating devices, as the lucite surface area will melt, and will not be acceptable under warranty replacement.

**EARPHONE JACK**

When an earphone, Hoffman No. 958005 is plugged into the earphone jack on the end of the case, the speaker is cut off and the sound transferred to the earphones. This affords a means of private listening in crowds or where outside noise level masks the sound from the speaker.

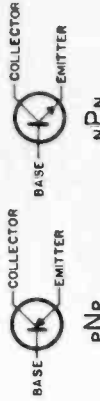
7. An ohmmeter check of transistorized radios should only be made with the transistor removed. The voltage of the ohmmeter could cause the transistor to conduct and give erroneous component readings because of the transistor shunt resistance. The use of a VTVM is recommended for resistance measurements to avoid battery voltage in excess of the transistor and filter capacitor ratings.
8. Any volt-ohmmeter being used to measure ohms should be checked as follows:
  - a. Polarity. If the positive meter lead is tied to the battery negative, the polarity of voltage would be wrong for the filter condensers in the transistor radio, as well as the transistors if they were in the circuit. Use a second voltmeter and measure polarity of ohms ranges on meter to be used.
  - b. Voltage across ohmmeter leads. Use a second voltmeter across the ohmmeter leads and measure the voltage on each range of the meter to be used. If voltage exceeds the 6 volt rating of the filters in the KP706 radio, it may damage the filters.

The popular Simpson Model 260 voltohmmeter, for example shows by means of a voltmeter that the internal polarity is correct as marked on the lead jacks. The RX1 scale has 1-1/2 volts across the ohmmeter leads as does the RX100 scale. However, the RX10,000 is over 4 volts and could cause trouble if used for too long a time. Actually, the highest value of resistor in the P706 is R4 which is only 27K ohms. Therefore, the RX1 or RX100 scales would be the only ranges needed if you wished to use a 20,000 ohm per voltmeter.

**TRANSISTOR INFORMATION**

Electrically a transistor can be compared with a vacuum tube triode with the BASE acting as the GRID, the EMITTER as the CATHODE, and the COLLECTOR as the PLATE.

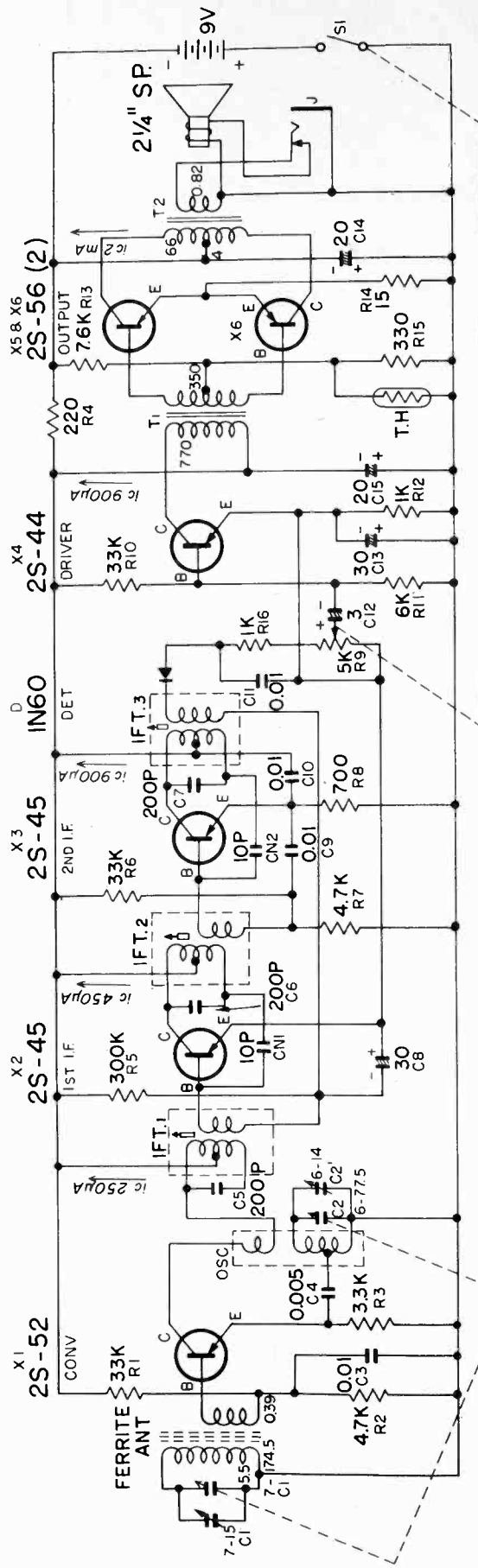
Physically the transistors in the P 706 have three leads (see below). The BASE is always the center lead. The EMITTER is always the lead closest to the BASE. This is to be expected since the grid and cathode of a vacuum tube are closely spaced. The COLLECTOR, then, is further away from the BASE than is the EMITTER - just as the plate is further away from the grid than is the cathode in a vacuum tube.



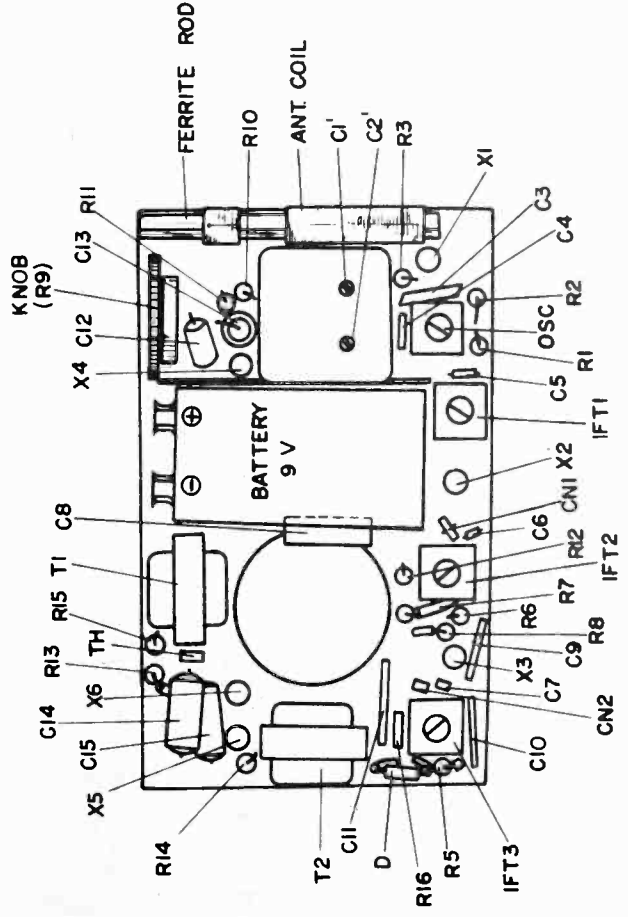
There are two basic types of transistors used in the P706, the PNP and the PNP. An easy way to distinguish between these types is to look at the arrow shown schematically on the EMITTER. If this arrow points IN, then the middle letter is "N" and the transistor is a PNP type.

The COLLECTOR is biased positive in an PNP type, negative in a PNP type. Notice that if the middle letter is "P", the COLLECTOR is POSITIVE; if the middle letter is "N", the COLLECTOR is negative. Actually, it can be seen that this is true by looking at the COLLECTOR of SC1 on the schematic diagram. Note that both the BASE and EMITTER are positive, while the COLLECTOR goes through L2 and T1 to ground - making the COLLECTOR negative with respect to both the BASE and EMITTER. Therefore, the 2N252 is a PNP type transistor.

AVC is applied only to the 1st IF stage, SC2. AVC to the transistor is reversed to that of a vacuum tube. As the station gets stronger, the AVC voltage becomes more positive in the P706. However, the AVC swing is hardly measurable with standard voltmeters (note C5, 50MFD across AVC bus).



NOTE: (1) 9V BATTERY JIS 006  
OR EVEREADY 216  
OR RCA VS 312  
(2) CURRENT VALUES INDICATED  
ARE MEASURED AT NO SIGNAL



NOTE: IN SOME CASES, C8 & C15  
WERE MOVED TO THE OPPOSITE SIDE

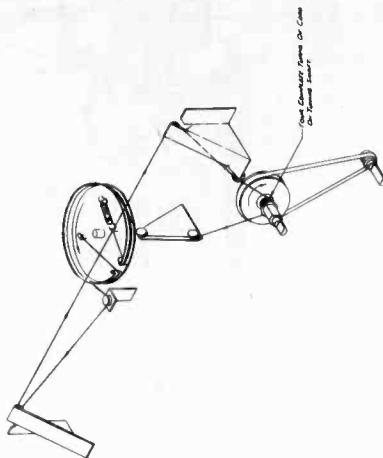


**REMOVAL OF CHASSIS**

Servicing the radio chassis requires removal of the chassis from the cabinet. The following instructions will enable you to remove the chassis.

1. Insert a screw driver in the two screws on the cabinet back and rotate these screws 90 degrees.
2. Tilt cabinet back out from top and lift up slightly and away from cabinet.
3. Unscrew the top of the telescoping antenna, unplug the telescoping antenna and remove the screw from the bottom of the cabinet that goes into the bottom of the telescoping antenna. Remove antenna.
4. Remove all knobs from front of cabinet.
5. Remove and unplug the battery.
6. Remove two screws from bottom of cabinet which fastens to chassis.
7. Remove the screws which fasten each corner of the top of the chassis to the cabinet.
8. Remove chassis.

**DIAL STRINGING DIAGRAM**



CHASSIS 50-01

# Magnavox

## RADIO CHASSIS - 50 SERIES

**IF ALIGNMENT**

Equipment required:

1. Signal Generator with AM Modulation
2. Oscilloscope
3. Alignment Tool, fabricated from square bakelite dowel tapered almost to a point (tapered end to be .060" square).

Connect a 10,000 ohm resistor to pin 5 of T1. Connect the signal generator through a .01 mid. capacitor to the other end of this resistor. Set volume control at minimum and adjust output of generator to produce approximately .1 volt peak to peak on scope. Maintain generator output at low level through alignment to prevent overload. Connect scope

to high side of volume control. A peak adjustment can be found at two "slug" locations on these coils. The correct peak is the first one reached when tuning the "slug" in from the extreme out position.

STEP	SET GENERATOR TO:	ADJUST
1	455KC	Top of T3-T2-T1 for maximum output
2	455KC	Bottom of T1 for minimum output

**RF ALIGNMENT**

Equipment required:

1. AM signal generator having frequency range of 550KC to 22.5MC.
2. Oscilloscope
3. Sweep generator having frequency range of 550KC to 22.5MC. Available frequency deviation between 100KC and 1MC.

Disconnect the telescoping antenna from the receptacle on the rear of Band Switch. When using either the AM signal generator or the sweep generator it is to be connected to the screw beside the receptacle for the telescoping antenna. This is the external antenna connection. Also, when using the sweep generator, the horizontal sweep from the generator is to be fed into the horizontal input connection on the scope. Before proceeding with the alignment instructions as out-

lined, the tuning gang should be completely closed and the dial pointer calibrated at the extreme low end of the dial.

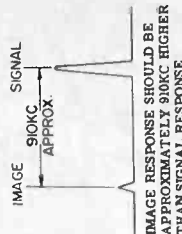
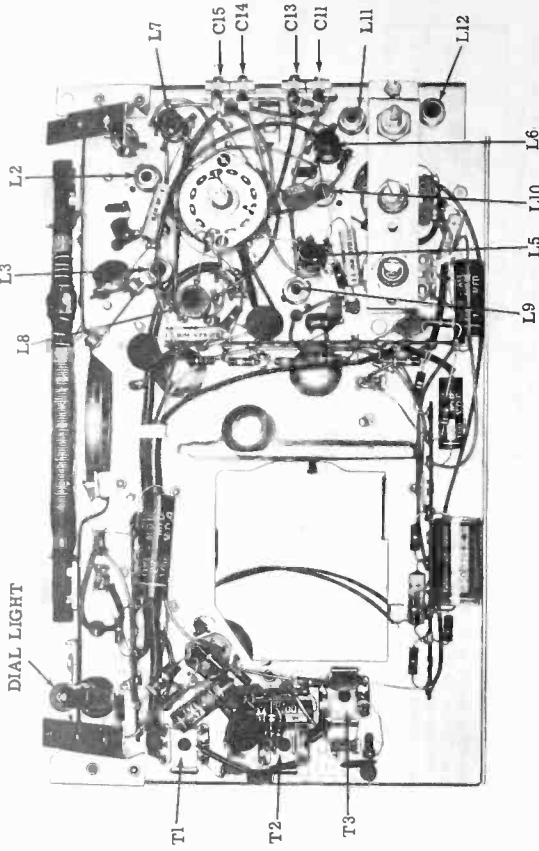
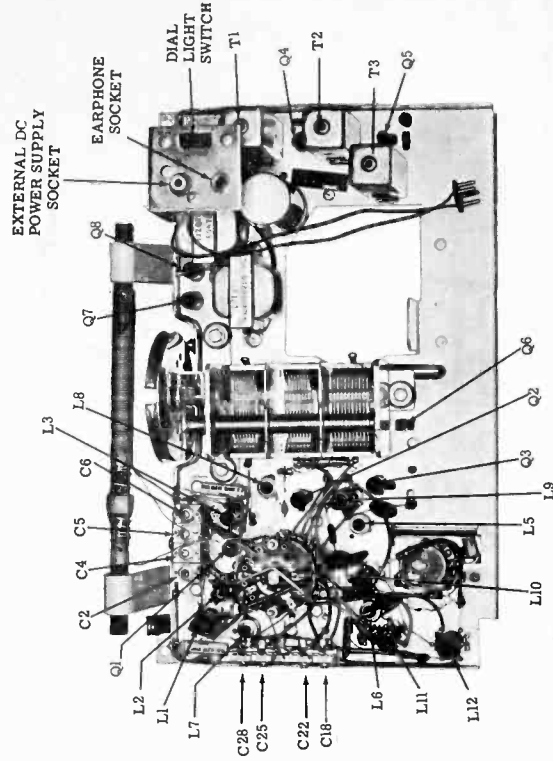


FIG. 1



FRONT VIEW CHASSIS LAYOUT



REAR VIEW CHASSIS LAYOUT

RF ALIGNMENT CHART					REMARKS
STEP	BAND SELECTOR SETTING	SET TUNING GANG TO	SET AM GENERATOR TO	SET SWEEP GENERATOR TO	
1	B	1400KC	1400KC	C28 for maximum amplitude	Sweep generator across band width to check and make sure image frequency is higher than signal frequency.
	1	4.2MC	4.2MC	C25 for maximum amplitude	
	2	11MC	11MC	C22 for maximum amplitude	
2	B	600KC	600KC	C18 for maximum amplitude	Sweep generator should be set for 1MC sweep width. If not, available adjust sweep generator center frequency to observe image response.
	1	1.8MC	1.8MC	L12 for maximum amplitude	
	2	5MC	5MC	L11 for maximum amplitude	
3	B	13MC	13MC	L10 for maximum amplitude	Repeat Steps 1 and 2 until no further adjustment is required.
	1	1400KC	1400KC	L9 for maximum amplitude	
	2	4.2MC	4.2MC	C15 & C6 for maximum response	
4	1	11MC	11MC	C14 & C5 for maximum response	Repeat Steps 1 and 2 until no further adjustment is required.
	2	22MC	22MC	C13 & C4 for maximum response	
	3	600KC	600KC	C11 & C2 for maximum response	
5	B	1.8MC	1.8MC	L8 & L4 for maximum response	Repeat Steps 1 and 2 until no further adjustment is required.
	1	5MC	5MC	L7 & L3 for maximum response	
	2	13MC	13MC	L6 & L2 for maximum response	
6	B	13MC	13MC	L5 & L1 for maximum response	Repeat Steps 1 and 2 until no further adjustment is required.
	1	4.2MC	4.2MC	L4 & C3 for maximum response	
	2	11MC	11MC	L3 & C4 for maximum response	

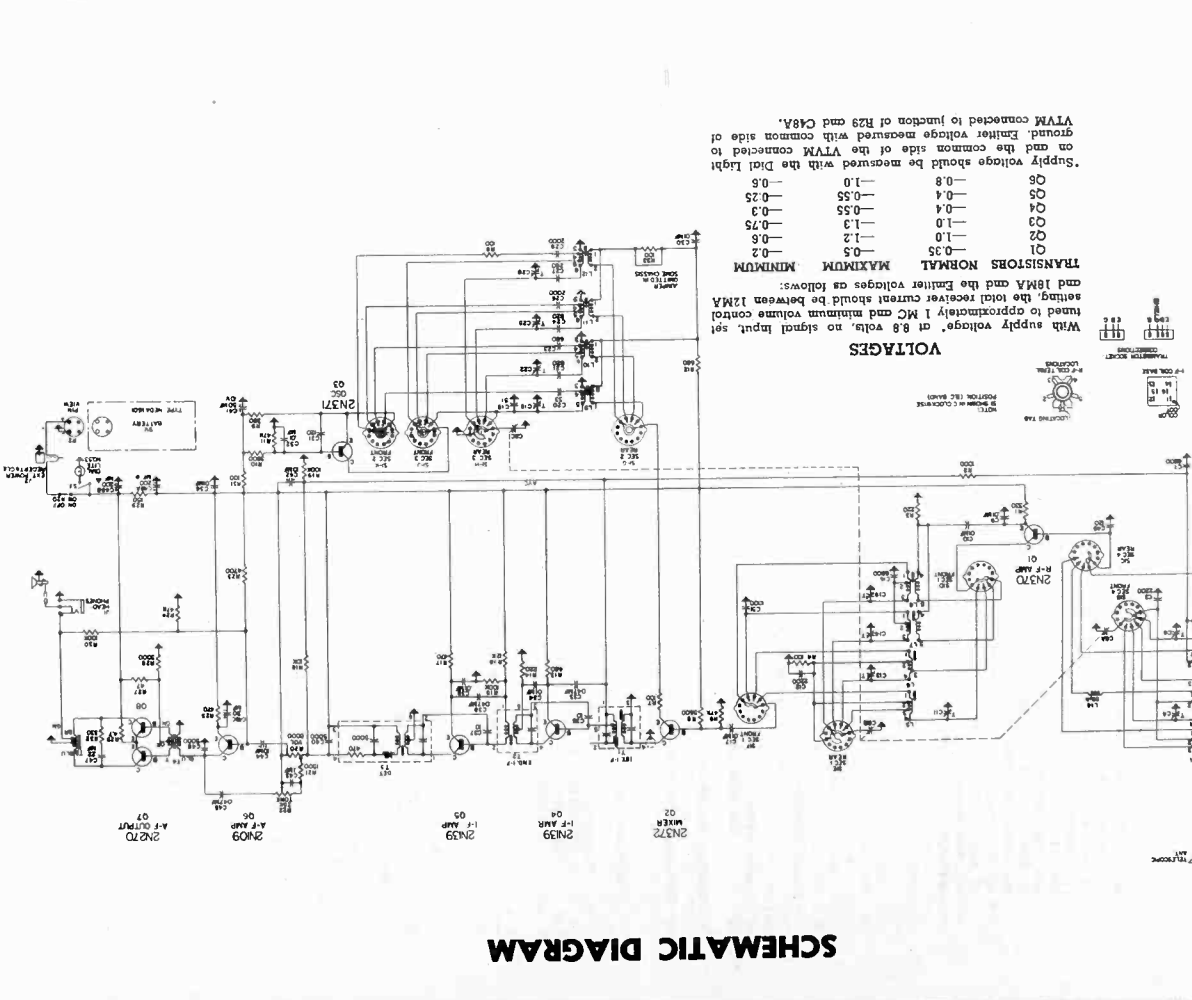
ALTERNATE ALIGNMENT

Whenever the specified equipment is available, the sweep generator alignment is recommended, however, there is an alternate method for the alignment of the RF and antenna trimmers and coils using a single generator. While this method is satisfactory for practical purposes, for optimum performance the sweep generator method for alignment should be used.

ALTERNATE METHOD OF ALIGNING RF & ANTENNA TRIMMERS AND COILS					REMARKS
STEP	BAND SWITCH SETTING	TUNING GANG SETTING	SIGNAL GENERATOR SETTING	ADJUST	
1	B	1400KC	1400KC	C15-6 for maximum amplitude	When making these adjustments the Generator should be fine-tuned either side of signal frequency and the trimmers adjusted for maximum output over band width.
	1	4.2MC	4.2MC	C14.5 for maximum amplitude	
	2	11MC	11MC	C13.4 for maximum amplitude	
2	B	600KC	600KC	C11.2 for maximum amplitude	When making these adjustments the Generator should be fine-tuned either side of signal frequency and the trimmers adjusted for maximum output over band width.
	1	1.8MC	1.8MC	L8.4 for maximum amplitude	
	2	5MC	5MC	L7.3 for maximum amplitude	
3	B	13MC	13MC	L6.2 for maximum amplitude	When making these adjustments the Generator should be fine-tuned either side of signal frequency and the trimmers adjusted for maximum output over band width.
	1	4.2MC	4.2MC	L5.1 for maximum amplitude	
	2	11MC	11MC	L4.1 for maximum amplitude	

**PARTS LIST**

SYMBOL	DESCRIPTION	PART NO.	LIST	SYMBOL	DESCRIPTION	PART NO.	LIST
T1	1st IF Transformer	360726-1	\$3.50	C15	Trimmer (part of C11)	250261-111	30
T2	2nd IF Transformer	360727-1	2.25	C16	Mylar, .0088 mf	250218-19	20
T3	3rd IF Transformer	360728-1	4.75	C17	Ceramic, .01 mf	250218-15	1.50
T4	Audio Driver Transformer	320282-1	2.75	C18	Oscillator Trimmer	260143-1	25
T5	Audio Output Transformer	320283-1	2.75	C19	Assembly	250224-432	20
L1	Ant. 3rd S.W. Band	360724-1	.85	C20	Silver Mica, 33 mmf ±5%	250224-432	50
L2	Ant. 2nd S.W. Band	360723-1	.85	C21	Silver Mica, 820 mmf	250226-358	20
L3	Ant. 1st S.W. Band	360722-1	.85	C22	Trimmer (part of C18)	250175-61	20
L4	AM Rod Antenna	360725-1	1.75	C23	Silver Mica, 820 mmf ±2%	250226-152	45
L5	RF 3rd S.W. Band	360721-1	.85	C25	Trimmer (part of C18)	250218-16	25
L6	RF 2nd S.W. Band	360734-1	1.25	C26	Silver Mica, 280	250226-169	30
L7	RF 1st S.W. Band	360733-1	.90	C27	Trimmer (part of C18)	250218-16	25
L8	RF AM Band	360732-1	.85	C28	Ceramic, 2000 mmf	250224-432	25
L9	Osc. 3rd S.W. Band	360731-1	1.30	C29	Ceramic, .01 mf	250218-19	20
L10	Osc. 2nd S.W. Band	360730-1	.30	C30	Silver Mica, 120 mmf	250261-21	35
L11	Osc. 1st S.W. Band	360729-1	.35	C31	Mylar, .047 mf	250218-19	20
L12	Csc. AM Band	360601-9		C32	Ceramic, .01 mf	250224-309	20
L13	RF Choke	360601-10		C33	Mylar, .047 mf	250218-19	20
L14	RF Choke	360601-10		C34	Ceramic, .01 mf	250224-309	20
R1	230094-147	(10) \$2.00		C35	Silver Mica, 10 mmf	250218-19	20
R2	230104-62	(10) 2.00		C36	Ceramic, .01 mf	250224-309	20
R3	230104-54	(10) 2.00		C37	Silver Mica, 10 mmf	250218-19	20
R4	230104-50	(10) 2.00		C38	Mylar, .047 mf	250261-21	35
R5	230104-82	(10) 2.00		C39	Ceramic, .01 mf	250218-19	20
R6	47 K	(10) 2.00		C40	Ceramic, 5000 mmf	250175-30	20
R7	100	(10) 2.00		C41	Electrolytic, 30 mf—10V	270027-31	2.00
R8	100	(10) 2.00		C42	Electrolytic, 10 mf—115V	270559-8	1.10
R9	390	(10) 2.00		C43	Mylar, .1 mf	250261-25	1.10
R10	390	(10) 2.00		C44	Electrolytic, 10 mf—115V	270559-8	1.10
R11	47 K	(10) 2.00		C45	Mylar, .047 mf	250261-21	35
R12	880	(10) 2.00		C46	Mylar, .22 mf	250175-30	20
R13	220	(10) 2.00		C47	Mylar, .22 mf	250261-29	20
R14	220	(10) 2.00		C48	Electrolytic 200, 200, 10 mf/10V	270023-29	2.50
R15	100 K	(10) 2.00		C49	Silver Mica, 120 mmf	250224-432	25
R16	12 K	(10) 2.00		C50	Ceramic, 470 mmf	250218-6	20
R17	470	(10) 2.00		C51	Ceramic, 1000 mmf	250218-28	20
R18	10 K	(10) 2.00					
R19	100 K ±5%	(10) 2.00					
R20	Volume Control (5 K)	230094-207	(10) 2.00				
R21	1500	230104-64	(10) 2.00				
R22	Tone Control (25 K)	230126-67	@ .50				
R23	4700	230104-70	(10) 2.00				
R24	47 K	230104-82	(10) 2.00				
R25	470	230104-58	(10) 2.00				
R26	3000 ±5%	230094-170	(10) 2.00				
R27	47 ±10%, 1 W	230094-127	(10) 2.00				
R28	150	230107-1	(10) 2.50				
R29	100 K	230104-52	(10) 2.00				
R30	100 K	230104-86	(10) 2.00				
R31	100	230104-50	(10) 2.00				
R32	330	230104-56	(10) 2.00				
C1	Ceramic, 15 mmf	250218-29	\$ .20				
C2	Antenna Trimmer	260142-1	1.60				
C3	Mylar, .0022 mf	250261-105	.30				
C4	Trimmer (part of C2)						
C5	Trimmer (part of C2)						
C6	Trimmer (part of C2)						
C7	Mylar, .0068 mf	250261-111	.30				
C8	Tuning Capacitor	260141-1	7.25				
C9	Ceramic, .01 mf	250218-19	.20				
C10	RF Trimmer Assembly	250218-19	.20				
C11	Mylar, .0022 mf	250261-105	1.30				
C12	Trimmer (part of C11)						
C13	Trimmer (part of C11)						
C14	Trimmer (part of C11)						



**SCHEMATIC DIAGRAM**

**VOLTAGES**

With supply voltage at 88 volts, no signal input, set tuned to approximately 1 Mc and minimum volume control setting, the total receiver current should be between 12MA and 18MA and the emitter voltages as follows:

TRANSISTORS	NORMAL	MINIMUM	MAXIMUM
Q1	0.35	0.5	0.2
Q2	1.2	1.2	1.2
Q3	1.0	1.0	1.0
Q4	0.75	0.75	0.75
Q5	0.55	0.55	0.55
Q6	0.8	0.8	0.8

Supply voltage should be measured with the Dial Light and the common side of the VTM connected to ground. Emitter voltage measured with common side of VTM connected to junction of R29 and C48A.

# RADIO CHASSIS - CR-729

## GENERAL

The CR-729 radio chassis is a six transistor superheterodyne type designed for use in battery operated pocket sized portable instruments. A receptacle is provided at the side of the chassis to accommodate a low impedance earphone. Insertion of the earphone will automatically disconnect the speaker. The chassis is powered by a single 4 volt battery having a useful life of approximately 200 hours. The circuit of this chassis consists of conventional wiring.

Original production chassis bear the suffix letters "AA" following the chassis model number stamped on the chassis. A circuit change is indicated by the first suffix letter; for example, CR-729BA.

A mechanical change is denoted by the 2nd suffix letter; for example, CR-729AB. Supplements to Service Bulletins will be issued identifying these changes as they occur in production.

## SPECIFICATIONS

Power supply . . . . . 4 volt mercury-type battery  
 Power output . . . . . 50 milliwatts (90 milliwatts max.)  
 Tuning frequency range . . . . . 535-1620 KC  
 Intermediate frequency . . . . . 455 KC

### Transistors:

Converter	2N172
CR-729AA	2N172
CR-729BA	2N253
CR-729CA	2N253

1st I-F Amplifier	2N146 or 2N145
CR-729AA	RO2 or RO3
CR-729BA	2N253
CR-729CA	2N253
2nd I-F Amplifier	2N146 or 2N147
CR-729AA	RO4 or RO3
CR-729BA	2N254
CR-729CA	2N254
Detector (Crystal Diode)	1N295
Audio Driver	1I 310

### Audio Output

CR-729AA	(2) 1I 352
CR-729BA	(2) 2N185
CR-729CA	(2) 2N185

## CIRCUIT DESCRIPTION

The CR-729 chassis employs six transistors and a crystal diode which replace the electron tubes normally used in conventional battery operated AM radios. Some of the advantages of transistors are small size, ability to withstand physical shock and vibration without damage, instant operation without warm-up time, no need for bulky filament batteries and since operating potentials are low, the plate battery can be made small in size while still providing long battery life. The transistors used in the CR-729 are of the plug-in type which provides for easy replacement and freedom from possible damage by heat that is often incurred when soldering the terminals directly into the circuits.

The antenna is a ferrite rod type inductively coupled to the base terminal of the 2N172 converter stage by means of a low impedance secondary winding. The antenna is tuned by section C-3A of the 2 gang tuning capacitor.

Collector to emitter feedback is accomplished by means of oscillator coil T-1

which consists of two windings and provides for the oscillator function of the 2N172 converter stage. The top winding of the oscillator coil (terminals 1-2) is the feedback winding. The bottom winding (terminals 3-5) is tuned by section C-3B of the tuning gang to establish the frequency of oscillation. Oscillator emitter current establishes oscillator bias by means of emitter coupling capacitor C-2 and emitter return resistor R-2. The function of the converter stage is threefold in that it acts as an amplifier for the antenna signal, an oscillator and a superheterodyne mixer which converts the antenna signal to an i-f frequency of 455 KC.

The i-f signal is taken from the converter collector terminal and coupled to the base terminal of the 1st i-f stage by means of 1st i-f transformer T-2. The primary of T-2 is slug tuned; the untuned secondary is a low impedance link which couples the high impedance primary to the relatively low impedance base to emitter circuit of the 1st i-f transistor. A sim-

ilar transformer T-3 couples the output (collector) of the first i-f stage to the input (base) of the second i-f stage. The second i-f stage drives a 1N295 crystal diode detector by means of bifilar transformer T-4 which is single tuned by a powdered iron core.

The first and second i-f transistors operate in a manner similar to triode r-f amplifiers and therefore require neutralization to prevent possible self oscillation. Neutralization is accomplished by feeding a portion of properly phased output signal back to the input. Capacitor C-6 in series with R-6 furnishes the feedback for the first stage; capacitor C-10 in series with R-10 furnishes the required feedback for the second stage. Since inter-electrode capacitances and gain factors vary between transistor types, it is essential that the i-f transistors be replaced with exact replacements. If this is not done, circuit oscillation or a loss of gain might be incurred.

A negative AVC voltage is fed back from the diode detector to the base connection of the first i-f stage to control its gain with changes in signal level. The total negative AVC voltage appears across the Volume control R-12. This negative voltage is used to buck the positive voltage developed across the 1st i-f base resistor R-3 which is returned to a positive bias. The AVC voltage thus reduces the amount of positive bias to the base connection of the 1st i-f stage and reduces the gain of the stage as required.

The audio voltage selected by the Volume control is coupled to the base connection of the audio driver stage V4 by a 10 mid.

## SERVICE INFORMATION

### SAFETY PRECAUTIONS

The following precautions should be exercised when servicing transistor radios:

1. Always replace with original type transistors.
2. Resistance measurements of chassis circuits should be made with the transistors removed from their sockets since the terminal voltage across the ohmmeter leads can cause conduction within the transistors causing erroneous readings. Also, EXCESSIVE OHM-METER TERMINAL VOLTAGES ACROSS A TRANSISTOR CAN CAUSE PERMANENT DAMAGE TO THE TRANSISTOR.

electrolytic capacitor C-13. This high value of coupling is made necessary by the relatively low input impedance of the driver stage. Since C-13 is an electrolytic particular attention should be given to its polarity should replacement become necessary.

The output of the driver stage is coupled to the push-pull output stage by means of driver transformer T-5 having a center tapped secondary. The output stage is a pair of push-pull transistors, V5 and V6 operated in class B. When operated in this manner, the output transistors are biased to cut-off and their inputs driven 180 degrees out of phase. When one transistor is driven in a positive direction, the other is driven negative such that only one of the output transistors conducts at a time and when no audio signal is applied, neither transistor conducts. This provides for good battery economy. However, it should be noted that total current in the output stage increases with audio signal level so that total battery life will be conserved if the Volume control is maintained at lowest useable setting.

Push-pull output transformer T-6 matches the output transistors to a 15 ohm speaker voice coil.

This instrument is equipped with an earphone jack located on the left side of the chassis. A low impedance earphone set, Part No. 580043-1, is available for use with this instrument. The instrument speaker is automatically disconnected when the earphone plug is inserted in the jack.

3. DO NOT SHORT ACROSS THE TERMINALS OF A TRANSISTOR WHILE THE RECEIVER IS OPERATING. Such practice may cause permanent damage to a transistor.

4. When soldering to a transistor socket first remove the transistor since EXCESSIVE HEAT FROM THE SOLDERING IRON CAN DESTROY THE TRANSISTOR.

5. Use a low wattage soldering iron with a small tip when removing or replacing components in the chassis. EXCESSIVE HEAT COULD CAUSE DAMAGE TO THE SMALL CIRCUIT COMPONENTS AND WIRING.

## ALIGNMENT

The output indicator may be an output meter across the speaker voice coil if test signal is modulated. Use a non-metallic screw driver for adjustments.

SIGNAL GENERATOR INPUT	SIGNAL GENERATOR FREQUENCY	TUNING CAPACITOR SETTING	ADJUSTMENTS	NOTES
High side to B (base) of V-1 thru 0.5 mfd. capacitor. Low side to chassis	455 KC.	Any point where no interfering signal is received	T-4, T-3 and T-2 i-f trimmers	Adjust for max. output
Radiating loop*	Exactly 1620 KC.	Exactly 1620 KC.	1620 KC. oscillator trimmer	Same
Same	Exactly 535 KC.	Exactly 535 KC.	535 KC. oscillator trimmer	Same
Same	Approx. 1400 KC.	Approx. 1400 KC.	1400 KC. antenna trimmer	Same

available from the rear of the chassis once the cabinet back and the small chassis shield plate are removed. The voltages shown in the table were measured with a vacuum tube voltmeter, however, a 20,000 ohm/volt meter may also be used with satisfactory results.

Standard servicing techniques may be used in servicing this chassis provided the precautions listed above are properly observed.

## CHASSIS REMOVAL

1. Unscrew brass button at center of tuning dial. Remove dial.
2. Remove the two chassis mounting screws under tuning dial.
3. Remove cabinet back by applying pressure at thumb slot in top of cabinet and gently moving the two sections apart. A slight upward lift on the back section will aid the removal.
4. Remove battery and chassis mounting screw located at center of battery container. Chassis may now be removed from case.

## BATTERY REPLACEMENT

An old or exhausted battery may damage the chassis if not removed from the instrument at the end of its useful life. If the radio is to stand unused for a long period, the battery should be removed to prevent possible damage to the instrument.

When installing, place the battery pull-out tape across battery container and install the 4 volt mercury battery into the container with the positive (+) terminal up. If the receiver does not operate try reversing the battery in the container.

Replace worn out battery with one of the following types or equivalent:

Magnavox No. 530043-1  
Mallory No. TR233R  
General No. 696  
Eveready No. 233

## SERVICING SUGGESTIONS

When a battery reaches the end of its useful life its internal resistance rises rapidly. For this reason, the terminal voltage of a battery should always be checked under load with receiver operating. If the battery voltage under load measures lower than 2.7 volts the battery should be replaced.

Weakness, distortion or no output may be caused by a damaged transistor. If it is believed that a transistor is defective, replacement with a new transistor, known to be good is the surest servicing check. Do not check transistors with an ohmmeter as damage to the transistor may result. An ohmmeter check measures the ability of a transistor to conduct current in one direction, and to resist current flow in the opposite direction. The resistance is low in the conduction direction in relation to the resistance in the non-conducting direction. Such a check is at best a crude one and is not recommended since the front to back resistance ratios differ widely among transistor types.

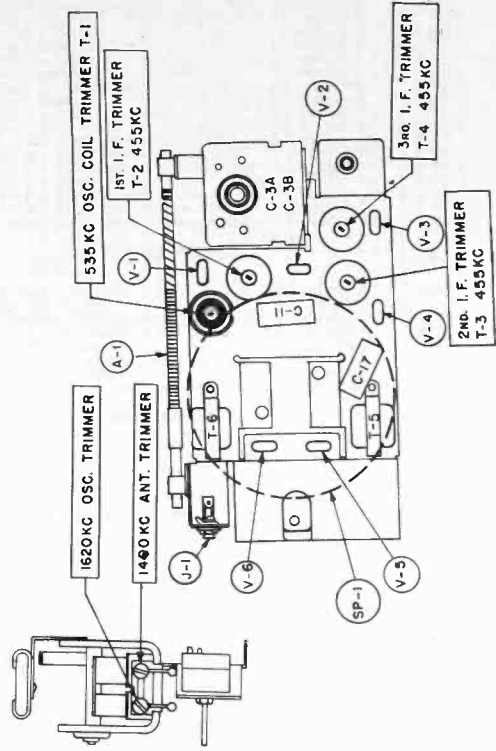
Several miniature electrolytic capacitors are used in this chassis. Should any one of these open, the receiver will exhibit oscillation, a loss of gain or both. The simplest means of checking for this condition is to bridge the suspected capacitor with another electrolytic while the receiver is turned on. This will indicate whether or not the suspected capacitor is defective. Be sure to observe capacitor polarity when making this check.

The total current drain from the battery when the receiver is operating with the Volume control set to zero is approximately 7.0 milliamperes, with a good battery. This current can be measured by placing the power switch in the off position and placing the milliammeter leads across the switch terminals. The total current will rise as the audio output is increased. At maximum volume the total current drain will increase to over 25 milliamperes. From this it can be seen that battery life can be extended by maintaining conservative settings of the Volume control.

The voltage readings of an average receiver are shown on the voltage chart beneath the schematic. These voltages are

\* Radiating loop may consist of a 5 turn coil approximately 2 inches in diameter connected across terminals of signal generator leads and loosely coupled to receiver loop antenna.

## CHASSIS LAYOUT





SYMBOL	DESCRIPTION	PART NO.	LIST
A1	Red Antenna (CR-729CA)	461512-1	1.90
TI	Oscillator Coil	361225-1	1.75
T2	Oscillator Coil (CR-729CA)	360708-1	2.00
T3	1st I-F Transformer	320814-1	3.00
T4	2nd I-F Transformer	320814-1	3.00
T5	3rd I-F Transformer	320815-1	3.00
T6	Audio Output Transformer	320813-1	4.25
C1	Mylar, .01 mfd. (CR-729CA)	250753-2	1.15
C2	Ceramic, .01 mfd.	250756-1	.30
C3	Mylar, .005 mfd. (CR-729CA)	250753-3	.15
C4	Tuning Capacitor	250606-1	3.00
C5	Mylar, .05 mfd.	250753-1	.25
C6	Ceramic, 10 mfd. (CR-729CA)	250756-1	.30
C7	Mylar, .05 mfd.	250753-1	.25
C8	Mylar, .05 mfd.	250753-1	.25
C9	Ceramic, .01 mfd. (CR-729CA)	250756-1	.30
C10	Ceramic, 10 mfd. (CR-729CA)	250175-44	.20
C11	Electrolytic, 50 mfd., 10V	250756-5	1.10
C12	Ceramic, .01 mfd.	250756-1	.30
C13	Electrolytic, 10 mfd., 10V	270559-3	1.10
C14	Electrolytic, 50 mfd., 10V	270559-5	1.10
C15	Electrolytic, 50 mfd., 10V	270559-5	1.10
C16	Ceramic, .01 mfd.	250756-1	.30
C17	Electrolytic, 50 mfd., 10V	270559-5	1.10
R1	3300 (CR-729CA)	330702-126	2.00
R2	2700 (CR-729CA)	330702-123	2.00
R3	30K	330702-125	2.00
R4	230	330702-114	2.00
R5	230	330702-114	2.00
R6	4700	330702-126	2.00

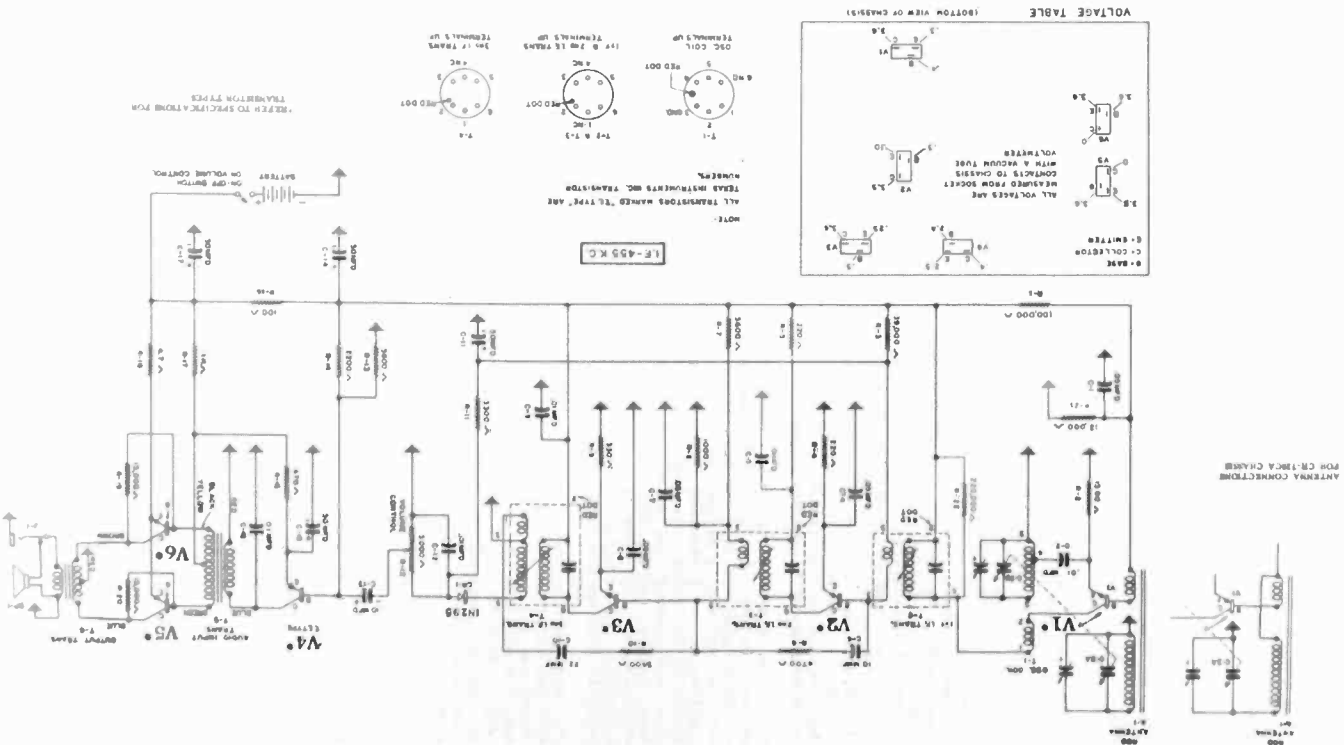
  

SYMBOL	DESCRIPTION	PART NO.	LIST
A1	5000	330702-129	2.00
R7	5000	330702-129	2.00
R8	1000	330702-122	2.00
R9	330	330702-116	2.00
R10	5000	330702-126	2.00
R11	3300	330702-129	2.00
R12	Volume Control w/switch	220662-1	2.00
R13	5000	330702-129	2.00
R14	2300	330702-124	2.00
R15	470	330702-118	2.00
R16	100	330702-110	2.00
R17	100 (CR-729CA)	330702-108	2.00
R18	4.7, 5% Wire Wound	330109-3	2.00
R19	15K	330702-133	2.00
R20	15K	330702-133	2.00
R21	15K	330702-133	2.00
R22	220K	330702-146	2.00
SPI	Battery	530043-1	2.75
CABINET PARTS			
R23	Battery container assy.	636386-2	.40
R24	Transistor socket	181563-1	.05
R25	Transistor socket retainer	181563-2	.05
R26	Telephone jack	181564-1	.65
R27	2 3/4" Pk speaker	530352-1	5.00
R28	Compression IN295 diode	530353-1	1.50
R29	Chassis shield	442290-2	2.75
MISCELLANEOUS			
R30	Battery container assy., Spring Green	884270-25	2.50
R31	Cabinet front assy., Mod	884270-28	2.50
R32	Cabinet front assy., Coral	884270-27	2.50
R33	Cabinet front assy., Ivory	884270-23	2.50
R34	Cabinet front assy., ForestGreen	884270-24	2.50
R35	Cabinet front assy., Black	884270-22	2.50
R36	Cabinet front assy., Turquoise	884270-26	2.50
R37	Back, Red	442295-1	.60
R38	Back, Black	442295-3	.60
R39	Back, Forest Green	442295-4	.60
R40	Back, Spring Green	442295-5	.60
R41	Back, Turquoise	442295-6	.60
R42	Back, Coral	442295-7	.60
R43	Speaker Grille	442293-1	.90
R44	Level	442293-3	.45
R45	Volume-On-Off knob	140772-2	1.00
R46	Tuning dial	106268-2	.15

PARTS LIST

CHASSIS	R-1	R-2	R-5	R-17	R-19	R-20	R-21	R-22	C-1	C-2	C-5	C-10
CR-729CA			OMIT	68	15K	15K	12K	OMIT	01	065	OMIT	22
CR-729BA			OMIT	68	15K	15K	OMIT	OMIT	05	01	OMIT	22
CR-729AA			100	OMIT	OMIT	220K	OMIT	OMIT	05	01	01	18

Replaced by Bus Wire



# RADIO CHASSIS — CR-744

## SPECIFICATIONS

Power supply . . . 4 V. mercury-type battery	2nd I-F amplifier . . . . . 2N218
Power output . . . . . 50 milliwatts (90 milliwatts max.)	2nd Detector (Crystal Diode) . . . 1N295
Tuning frequency range . . . 535-1620 KC	Audio Driver . . . . . 2N217
Intermediate frequency . . . . . 455 KC	Audio Output (push-pull stage) . . . (2) 2N217
Transistors:	Speaker . . . . . 2 1/2 inch PM
Converter . . . . . 2N219	Voice coil impedance . . . . . 11 ohms
1st I-F Amplifier . . . . . 2N218	at 1000 cycles

## GENERAL

The CR-744 radio chassis is a six transistor superheterodyne type designed for use in battery operated pocket sized portable instruments. A receptacle is provided at the side of the chassis to accommodate a low impedance earphone (Magnavox Part No. 580043-1). Insertion of the earphone will automatically disconnect the speaker. The chassis is powered by a single 4 volt battery having a useful life of approximately 200 hours. The circuit of this chassis consists of conventional components mounted on a printed wiring board.

## CIRCUIT DESCRIPTION

The CR-744 chassis employs six transistors and a crystal diode which replace the electron tubes normally used in conventional battery operated AM radios. Some of the advantages of transistors are small size, ability to withstand physical shock and vibration without damage, instant operation without warm-up time, no need for bulky filament batteries and long life. The battery is a 4 volt zinc plate battery providing long battery life.

The antenna (A1) is a ferrite rod type inductively coupled to the base terminal of the 2N219 converter stage by means of a low impedance secondary winding. The antenna is tuned by section C1A of the 2 gang tuning capacitor.

Collector to emitter feedback is accomplished by means of a resistor transformer (T1) which consists of 10 turns of #30 wire provides for the oscillator winding and the 2N219 converter stage. The top winding of the oscillator transformer (terminals 1-2) is the feedback winding. The center winding (terminals 5-6) is tuned by section C1B of the tuning gang to establish the frequency of oscillation. The third winding of T1 (terminal 3-4) provides the oscillator signal back into the collector bias circuit. Low impedance oscillator bias is established by capacitor (C3) and emitter returned by capacitor (C2) of the converter transistor R3. The function of the converter transistor R3 is to provide a signal to the antenna and a superheterodyne mixer which converts the antenna signal to an I-F frequency of 455 KC.

Original production chassis bear the suffix letter "A" following the chassis model number. The chassis wiring diagram circuit change is indicated by the first suffix letter; for example, CR-744BA.

A mechanical change is denoted by the 2nd suffix letter; for example, CR-744AB. Supplements to Service Bulletins will be issued identifying these changes as they occur in production.

The I-F signal is taken from the converter collector terminal and coupled to the base terminal of the 1st I-F stage by means of 1st I-F transformer T2. The primary of T2 is slug tuned; the untuned secondary is a low impedance link which couples the impedance primary to the relatively low impedance base to emitter circuit of the 1st I-F transistor. A similar transformer T3 couples the output (collector) of the 1st I-F stage to the input of the 2nd I-F stage. The input and output of the 2nd I-F stage are connected to the base and emitter of the 2nd I-F transistor. The 2nd I-F stage drives a 1N295 crystal diode detector by means of impedance matching transformer T4 which is single tuned by a powdered iron core.

The first and second I-F transistors operate in a manner similar to triode R-F amplifiers and therefore require neutralization to prevent possible self oscillation. Neutralization is accomplished by feeding a portion of properly phased output of the 1st I-F stage to the base of the 2nd I-F stage through capacitor C9 in series with R9 further to the 2nd I-F stage. R10 furnishes the required feedback for the second stage. Since input-electrode capacitances and gain factors vary between transistor types, it is essential that the I-F transistors be replaced with exact replacements. If this is not done, circuit oscillation or a loss of gain might be incurred.

A positive AVC voltage is fed back from the diode detector to the base connection of the first I-F stage to control its gain with changes in signal level. The total positive AVC voltage appears across the Volume control R12. This positive voltage

is used to back the negative voltage developed across the 1st I-F base resistor R3. The AVC voltage is derived from the positive bias to the base of the amount of negative bias to the base of the 1st I-F stage and reduces the gain of the stage as required.

The audio voltage selected by the Volume control is coupled to the base connection of the audio driver stage by a 4 mfd. electrolytic capacitor C12. This high value of coupling is made necessary by the relatively low input impedance of the driver transistor. Since C12 is an electrolytic capacitor, it should be given attention to its polarity should replacement become necessary.

The output of the driver stage is coupled to the push-pull output stage by means of driver transformer T-5 having a center tapped secondary. The output stage is a pair of push-pull transistors, operated in class B. When operated in this manner, the output transistors are biased near cut-off and their inputs driven 180 de-

grees out of phase. When one transistor is driven in a positive direction, the other is driven negative such that only one of the output transistors conducts at a time and no audio signal is applied, either to the speaker or to the earphone. This provides for transistor economy, however, it should be noted that the audio signal level increases with the output stage signal level so that total battery life will be conserved if the Volume control is maintained at lowest useable setting.

A 15,000 ohm resistor between the collector and base of each output transistor provides partial self-bias and degenerates feedback in the output stage for better stability and less distortion.

Push-pull output transformer T6 matches the output transistors to a 11 ohm speaker voice coil.

The push-pull output transistors are a carefully matched pair. Be sure the color dots on the transistors are the same color when replacement becomes necessary.

## SERVICE HINTS

If the battery voltage under load measures lower than 2.7 volts, the battery should be replaced.

Weakness, distortion or no output may be caused by a damaged transistor. If it is believed that a transistor is defective, replacement with a new transistor, known to be good is the surest servicing check. Do not check transistors with an ohmmeter as damage to the transistor may result. An ohmmeter check measures the ability of a transistor to conduct current in one direction; and to resist current flow in the opposite direction. The resistance is low in the conducting direction and high in the non-conducting direction. Such a check is at best a crude one and is not recommended since the front to back resistance ratio differs widely among transistor types.

Several miniature electrolytic capacitors are used in this chassis. Should any one of these open, the receiver will exhibit peculiarities, such as a gain or loss of signal, or a loss of audio gain or both. The easiest way to check for such a condition is to bridge the suspected capacitor with another electrolytic while the receiver is turned on. This will indicate whether or not the suspected capacitor is open. Be sure to observe capacitor polarity when making this check.

The total current drain from the battery when the receiver is operating with the Volume control set to zero is approximately 100 mA. This current can be measured by placing the power switch in the off position and placing the milliammeter leads across the switch terminals. The total current will rise as the audio output is increased. At maximum volume, the total current drain

## SAFETY PRECAUTIONS

The following precautions should be exercised when servicing transistor radios:

1. Always replace with original type Transistors.
2. Resistance measurements of chassis circuits should be made carefully since the terminal voltage across the ohmmeter leads can cause conduction within the transistors causing erroneous readings. Also, EXCESSIVE OHMMETER CURRENT CAN CAUSE PERMANENT DAMAGE TO THE TRANSISTOR.
3. DO NOT SHORT ACROSS THE TERMINALS OF A TRANSISTOR WHILE THE RECEIVER IS OPERATING. Such practice may cause permanent damage to a transistor.
4. When soldering to a transistor, grip the terminal lead between the solder point and the transistor with a pair of tweezers. Do not use a soldering iron on the heat sink. SOLDERING IRON CAN DESTROY THE TRANSISTOR.
5. Use a low wattage soldering iron with a small tip when removing or replacing components in the wiring board. EXCESSIVE HEAT COULD CAUSE DAMAGE TO THE SMALL CIRCUIT COMPONENTS AND WIRING.

## SERVICING SUGGESTIONS

When a battery reaches the end of its useful life, its internal resistance rises rapidly. For this reason, the terminal voltage of a battery should always be checked under load with receiver operat-

REPLACEMENT PARTS LIST

SYMBOL	DESCRIPTION	PART NO.	LIST PRICE
T1	Oscillator coil	361299-1	1.92
T2	1st I-F transformer	360710-1	2.22
T3	2nd I-F transformer	360711-1	2.25
T4	Diode I-F transformer	360712-1	6.75
T5	Input transformer	320817-1	3.30
T6	Output transformer	320818-1	2.10
COILS AND TRANSFORMERS			
R1	47 K ohm, 1/3 W	230702-139	.10
R2	200 ohm, 1/3 W	230702-142	.10
R3	420 ohm, 1/3 W	230702-171	.10
R4	330 ohm, 1/3 W	230702-172	.10
R5	27 K ohm, 1/3 W	230702-136	.10
R6	22 K ohm, 1/3 W	230702-135	.10
R7	4700 ohm, 1/3 W	230702-128	.10
R8	30 ohm, 1/3 W	230702-116	.10
R9	30 ohm, 1/3 W	230702-115	.10
R10	1200 ohm, 1/3 W	230702-125	.10
R11	1500 ohm, 1/3 W	230702-123	2.00
R12	5000 ohm, Volume-ON-Off control	230702-132	.10
R13	10 K ohm, 1/3 W	230702-138	.10
R14	27 K ohm, 1/3 W	230702-122	.10
R15	100 ohm, 1/3 W	230702-121	.10
R16	100 ohm, 1/3 W	230702-120	.10
R17	15 K ohm, 1/3 W	230702-133	.10
R18	15 K ohm, 1/3 W	230702-133	.10
R19	4.7 ohm, 1/2 W	230109-3	.15
R20	100 ohm, 1/3 W	230702-110	.10
RESISTORS			
C1	Trimmer	260606-2	3.00
C2	Ceramic disc, .05 mfd, 50 V	250758-3	.40
C3	Ceramic disc, .05 mfd, 50 V	250758-3	.40
C4	Ceramic disc, .05 mfd, 50 V	250758-3	.40
C5	Ceramic disc, .05 mfd, 50 V	250758-3	.40
C6	Electrolytic, 10 mfd/10 V	270559-6	1.15
C7	Ceramic disc, .05 mfd, 50 V	250758-3	.40
C8	Ceramic disc, .05 mfd, 50 V	250758-3	.40
C9	Ceramic disc, 110 mmf, 500 V	250175-56	.20
C10	Ceramic disc, .02 mfd, 50 V	250175-20	.40
C11	Electrolytic, 4 mfd/6 V	270559-7	1.10
C12	Ceramic disc, .01 mfd, 450 V	250175-6	.25
C13	Electrolytic, 50 mfd/10 V	270559-5	1.10
C14	Electrolytic, 50 mfd/10 V	270559-5	1.10
C15	Electrolytic, 50 mfd/10 V	270559-5	1.10
C16	Electrolytic, 50 mfd/10 V	270559-5	1.10
CAPACITORS			
J1	Earphone jack	181564-1	.65
S1	Speaker rod	360352-1	5.00
2N216	Audio output transistor	614006-1	6.10
2N217	Audio driver transistor	614006-1	6.10
2N218	I-F amplifier transistor	614007-1	6.35
2N219	Converter transistor	614008-1	6.50
	Battery	530043-1	2.75
MISCELLANEOUS			
MISCELLANEOUS CABINET PARTS LIST			
	Cabinet front assembly, Black	884270-22	2.50
	Cabinet front assembly, Ivory	884270-23	2.50
	Cabinet front assembly, Forest Green	884270-24	2.50
	Cabinet front assembly, Turquoise	884270-25	2.50
	Cabinet front assembly, Coral	884270-26	2.50
	Cabinet front assembly, Red	884270-27	2.50
	Cabinet front assembly, Black	884270-28	2.50
	Cabinet back, Ivory	441573-3	1.00
	Cabinet back, Forest Green	441573-4	1.00
	Cabinet back, Turquoise	441573-5	1.00
	Cabinet back, Coral	441573-6	1.00
	Cabinet back, Red	441573-7	1.00
	Volume control knob	140772-2	1.45
	Brass button for tuning knob	102468-2	.15
	*Includes jewel, grille and decor strip		

EARPHONE

This instrument is equipped with an earphone jack located on the left side of the chassis. A low impedance earphone set, Part No. 580043-1, is available for use with this instrument. The instrument speaker is automatically disconnected when the earphone plug is inserted in the jack.

BATTERY REPLACEMENT

An old or exhausted battery may damage the chassis if not removed from the instrument at the end of its useful life. If the radio is to stand unused for a long period, the battery should be removed to prevent possible damage to the instrument.

When installing, place the 4 volt mercury battery into container with the positive (+) terminal up. If the receiver does not operate, try reversing the battery in the container.

Replace worn out battery with one of the following types or equivalent:

- Magnavox No. 530043-1
- Hallory No. TR233R
- General No. 696
- Eveready No. 233
- RCA No. VS400

ALIGNMENT

The output indicator may be an output meter across the speaker voice coil if test signal is modulated. Use a non-metallic screw driver for adjustments.

SIGNAL GENERATOR INPUT	SIGNAL GENERATOR FREQUENCY	TUNING CAPACITOR SETTING	ADJUSTMENTS	NOTES
High side to B (use) of C-1 thru 0.5 mfd capacitor. Low side to chassis	455 KC.	Any point where no interfering signals received	T-4, T-3 and T-2, i-f trimmers	Adjust for max. output
Radiating loop*	Exactly 1620 KC.	Exactly 1620 KC.	1620 KC. oscillator trimmer	Same
Same	Exactly 535 KC.	Exactly 535 KC.	535 KC. oscillator trimmer	Same
Same	Approx. 1400 KC.	Approx. 1400 KC.	1400 KC. antenna trimmer	Same

\* Radiating loop may consist of a 5 turn coil approximately 2 inches in diameter connected across terminals of signal generator leads and loosely coupled to receiver loop antenna.

will increase to over 25 milliamperes. From this it can be seen that battery life can be extended by maintaining conservative settings of the Volume control.

The voltage readings of an average receiver are shown on the voltage chart beneath the schematic. These voltages are available from the rear of the chassis once the cabinet back is removed. The voltages shown in the table were measured with a vacuum tube voltmeter, however, a 20,000 ohm/volt meter may also be used with satisfactory results.

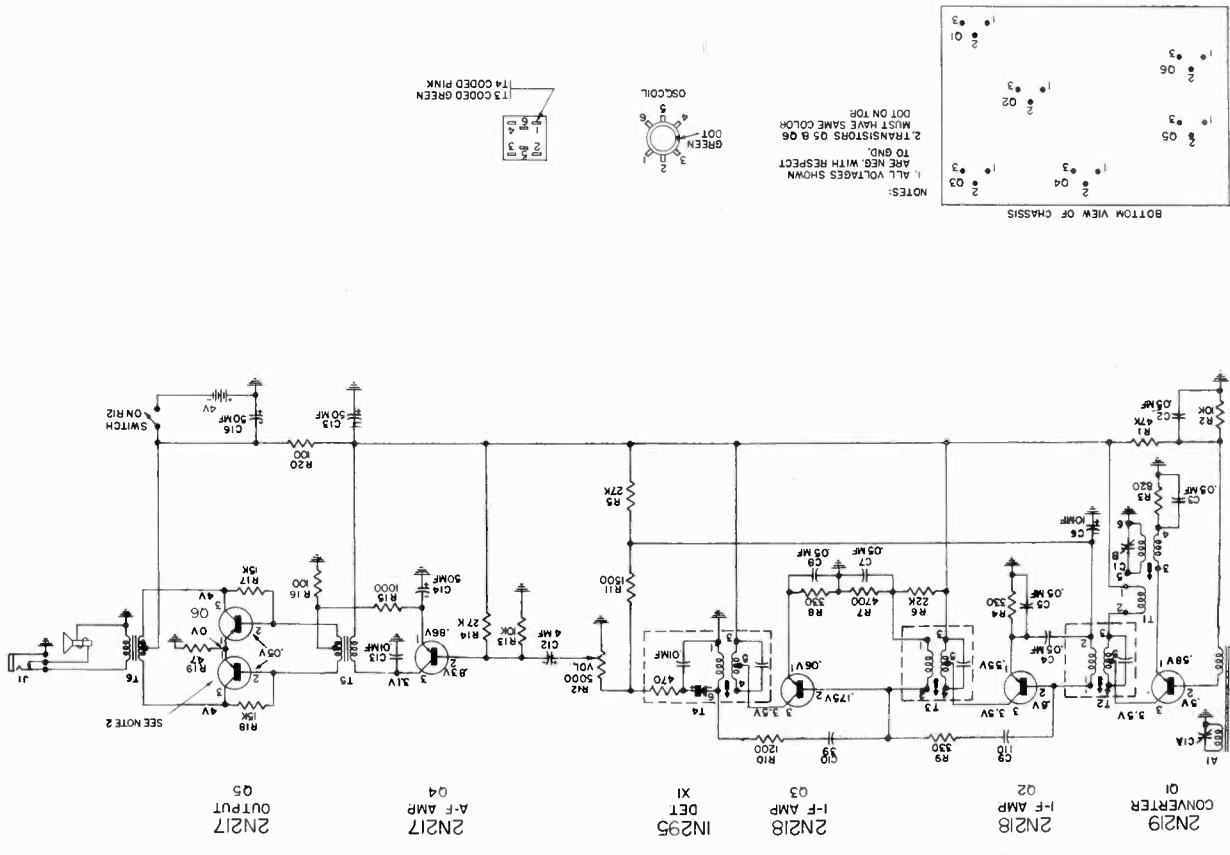
Standard servicing techniques may be used in servicing this chassis provided the precautions listed above are properly observed.

CHASSIS REMOVAL

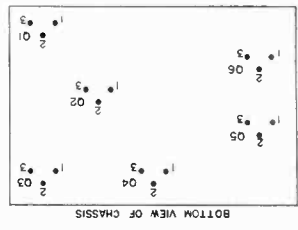
1. Unscrew brass button at center of tuning dial. Remove dial.
2. Remove the two chassis mounting screws under tuning dial.
3. Remove cabinet back by applying pressure at thumb slot in top of cabinet and gently moving the two sections apart. A slight upward lift on the back section will aid the removal.
4. Remove battery and chassis mounting screws located at center of battery compartment. Chassis may now be removed from case.



CHASSIS LAYOUT

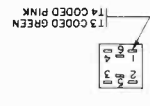
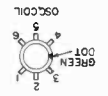


SCHEMATIC



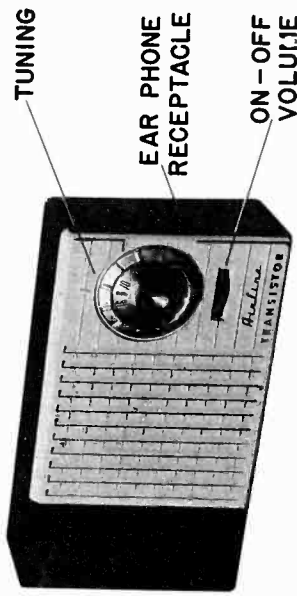
BOTTOM VIEW OF CHASSIS

- NOTES:
1. ALL VOLTAGES SHOWN ARE NEG WITH RESPECT TO GND.
  2. TRANSISTORS Q5 & Q6 MUST HAVE SAME COLOR DOT ON TOP.
  3. TRANSISTORS Q5 & Q6 MUST HAVE SAME COLOR DOT ON TOP.



MANUAL 556A  
TRANSISTOR  
RADIO  
MODEL NO.  
BR-1100A  
SERIAL NO. 65X  
62Z-555B\*

**WARDS TRANSISTOR RADIO**



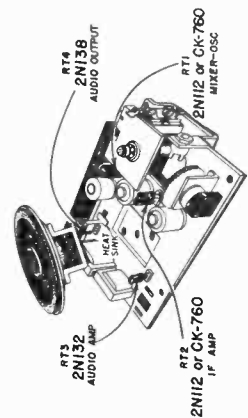
MODEL BR-1100A

**SPECIFICATIONS**

- Power Supply.....9 volts D.C. Power Output..... 20 m. w.
- Frequency Range.....540 to 1600 KC Speaker.....2 1/2" PM, V.C. impedance-15 ohms
- Intermediate Frequency.....455 KC Cabinet.....6 1/4" width, 1 3/8" depth, 3-3/8" height
- Selectivity.....At 1000 KC, 70 KC at 1000 X signal
- Sensitivity (2 mw ref).....800 u. v. per meter

**TRANSISTOR COMPLEMENT**

RT1	CK-760 or 2N112	Oscillator-Mixer
RT2	CK-760 or 2N112	1st. IF Amplifier
RT3	2N132	Audio Amplifier
RT4	2N138	Audio Output
	CK-706A	Crystal Detector



Top Chassis View

060 1144

M O N T G O M E R Y W A R D

**REMOVING CHASSIS FROM CASE**

1. Remove battery.
2. Remove tuning knob stud by turning counterclockwise and remove tuning knob.
3. Remove case cover mounting screw located behind tuning knob and remove case cover.
4. Remove three chassis mounting screws.
5. Carefully remove chassis from case allowing battery cable to slip through battery compartment hole.

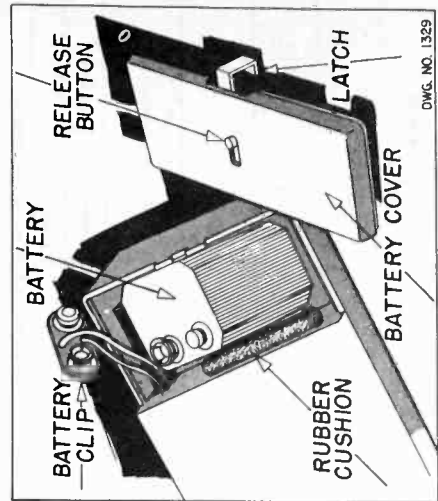
**BATTERY REPLACEMENT**

Since the receiver is small and compact, not every 9 volt battery will fit in the space provided. Listed below are five available types to be used for replacement.

WARDS	NO-92
BURGESS	NO-2N6
EVEREADY	NO-246
OLIN	NO-1707
RCA	VS-305

Approximately 100 hours performance can be experienced with the above batteries before replacement is required. Battery replacement should be performed when the sound output is noticed to be muffled or distorted with a decrease in total output or if a voltage measurement shows less than 6 volts. The battery voltage should be measured with the receiver turned on after at least 5 minutes of operation.

When battery replacement is necessary, remove battery cover by pushing release button upward, grasp latch and pull up and away from case. Remove old battery and un-snap battery cable. Snap battery cable on replacement battery and insert into case. Be sure rubber cushion is between battery and side wall of case to prevent battery movement. Insert battery cover in place and push latch down.



DWG. NO. 1329

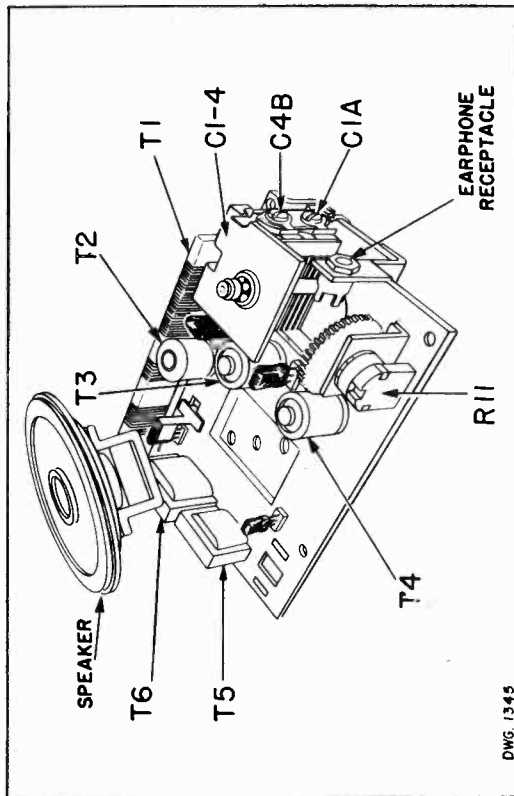
**BATTERY LOCATION**

**ALIGNMENT PROCEDURE**

- NOTES:** 1. Remove chassis from case.  
 2. Connect 9 volt battery.  
 3. Use output meter with 15 ohms impedance.  
 4. Turn volume control to maximum.  
 5. Signal generator output at 100 micovolts, 30% modulation at 400 cycles.

CIRCUIT	SIGNAL GENERATOR		GROUND SIDE	OUTPUT METER	GANGED CAPACITY	ADJUST FOR MAXIMUM OUTPUT ON METER
	FREQUENCY	COUPLING CAPACITY				
I.F.	455KC	.5MF	To Base of RT1	Connect in place of speaker	.....	T3, T4
Repeat above step two or three times for best results, keeping generator output in all cases as low as possible to prevent overloading of audio.						
Osc.	1620KC	.5MF	To Base of RT1	Connect in place of speaker	Open Gang (Fully clockwise)	C4B
<b>Caution:</b> Too high an output from signal generator may cause setting of trimmer on a spurious response.						
Osc.	535KC	.5MF	To Base of RT1	Connect in place of speaker	Closed Gang (Fully counter-clockwise)	T2
Osc.	1620KC	.5MF	To Base of RT1	Connect in place of speaker	Open Gang (Fully clockwise)	C4B
Ant.	1400KC	Connect 3 turn loop to generator and place near T1.		Connect in place of speaker	Ganged Condenser should be rocked	C1A

Check for alignment and dial calibration at 1000KC and 600KC.



DWG. 1345

**TRANSISTOR SERVICING**

The following information is presented as a guide to servicing transistor radios:

**VOLTAGE READINGS**

Because of the low battery potential, it is suggested that a VTVM be used to measure all circuit voltages. Voltage readings will vary with the strength of the signal being received, the battery voltage, and the type voltmeter being used. The voltage readings indicated on the schematic diagram were measured with a VTVM, no signal input, and with a battery voltage of 9 volts. Voltage readings will also vary with a change of transistors. The transistors conductivity varies to one transistor to another, therefore, voltage readings will differ. All voltage readings will be negative with respect to chassis due to the PNP type transistor employed.

**BATTERY REPLACEMENT**

The battery should be the first component checked when the radio is presented for service, since the battery voltage decreases with use and age. The battery voltage should be checked at the battery cable connections with the receiver turned on, and after at least five minutes of operation. Batteries have a tendency to reactivate (recharge) when not in use, and a true test of the batteries capabilities can not be determined until sufficient current has been drawn from the battery. If the battery is found to be dead, the receiver should be checked for a short circuit before the replacement battery is installed. Disconnect battery and measure resistance with an ohmmeter at the battery cable connections. Ohmmeter will indicate approximately 1700 ohms with positive lead to chassis, approximately 400 ohms with negative lead to chassis and approximately 4000 ohms with all transistors out of circuit with either meter lead to chassis. Battery replacement should be performed when the sound output is noticed to be muffled or distorted with a decrease in total output.

**OHMMETER READINGS**

When using an ohmmeter to check continuity and resistance readings, caution must be observed. It is important to know the internal battery voltage of the ohmmeter as damage could result due to excessive voltage being applied to the ohmmeter. It is also important to know the battery polarity of the meter leads. Incorrectly placing the meter leads across a lyric capacitor with a low working voltage may damage the capacitor due to excessive reverse current. If the meter battery voltage is greater than 12 volts, the high frequency transistor rating will be exceeded and may be damaged. A diode action will be experienced when attempting to check the resistance readings with the transistors in the circuit. It is advisable to remove all transistors from their sockets before making ohmmeter checks.

**SOLDERING**

Caution must be observed when using a soldering iron as excessive heat may easily damage a transistor. The transistors must be removed from their sockets before soldering at the socket pins. Heat may also damage other components such as 1/4 watt resistors. Therefore, dissipate the heat to the component by grasping the component lead with a pair of long nose pliers. A low wattage small diameter tip iron is suggested.

**TRANSISTORS**

If a transistor is suspected of being defective, substitution will be the only reliable check. Checking resistance readings of a transistor with an ohmmeter will indicate only a shorted or open transistor. When inserting a transistor in its socket, make sure the transistor's leads line up with the socket holes. Illustrations on the schematic diagram show the spacing between transistor's leads and the transistor sockets. Audio transistors have a red dot on the body of the transistor adjacent to the collector lead for identifying purposes. The red dot must line up with a paint dot on the chassis when the transistor is inserted into the socket. If a transistor substitution is made in the RF or IF circuit, realignment may be necessary. This is due to the difference in operating characteristics from one transistor to another.

**COMPONENT REPLACEMENT**

An important consideration is component replacement. Miniature as well as close tolerance components are used throughout the radio, therefore, all components must be replaced with exact duplicate parts.

**TROUBLE SHOOTING**

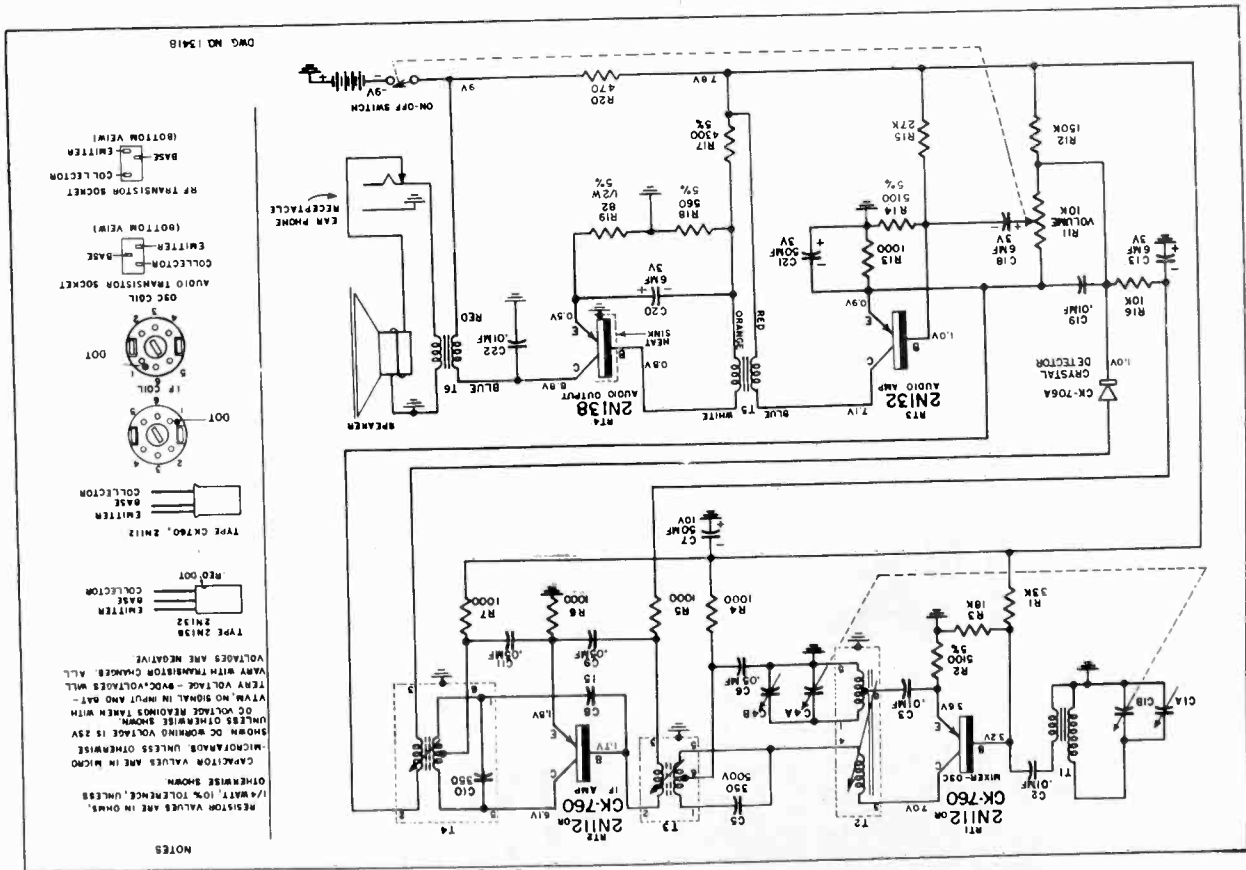
Trouble in a transistor radio can easily be isolated by using a signal generator and listening to the speaker. Circuit tracing from the base of the output stage back through the receiver to the antenna, should quickly reveal which stage is not functioning properly. When injecting the signal, use a 50 mfd lyric, negative to base, in the audio circuit, a .5 mfd capacitor in the IF or RF stages and inductive coupling to the antenna.

Caution must be observed not to accidentally short the collector circuit to the chassis, as damage to the transistor may result. Also, the practice of deliberately shorting a circuit to chassis to determine if voltage is present or to listen for a click in the speaker, must be avoided for the same reason.

# REPLACEMENT PARTS LIST

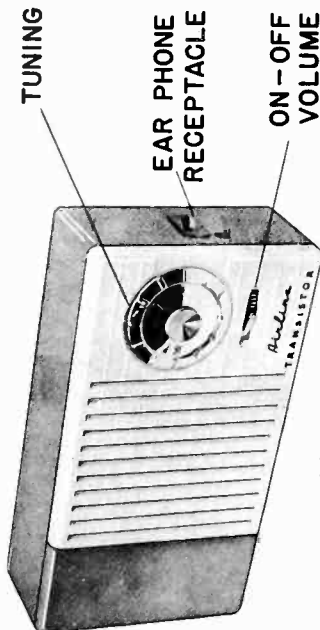
REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
R1	9B5-80	33K ohm, 1/4 watt, 10%	T4		<b>TRANSFORMERS</b>
R2	9B5-176	5100 ohm, 1/4 watt, 5%	T5	13B-26382	2nd IF Transformer
R3	9B5-77	1000 ohm, 1/4 watt, 10%	T6	12C-26467	Input Transformer
R4	9B5-26383	1000 ohm, 1/4 watt, 10%		12C-26539	Output Transformer
R5	9B5-6-7	1000 ohm, 1/4 watt, 10%			<b>MISCELLANEOUS</b>
R6	9B5-26383	One-off Volume control-10K ohm	44A-24374		Earphone receptacle
R7	9B5-88	150K ohm, 1/4 watt, 10%	20-26377		Volume control bracket
R8	9B5-42	1000 ohm, 1/4 watt, 10%	30F-25445		Volume knob screw
R9	9B5-176	5100 ohm, 1/4 watt, 5%	18A-26777		2.3/4" P.M. Speaker
R10	9B5-79	27K ohm, 1/4 watt, 10%	14A-26469		Battery Cable
R11	9B5-74	10K ohm, 1/4 watt, 10%	24-26376		Antenna spring clip
R12	9B5-174	4300 ohm, 1/4 watt, 10%	15B-26420		Transistor socket-large
R13	9B5-59	50 ohm, 1/4 watt, 5%	24-26548		Transistor socket-small
R14	9B1-49	82 ohm, 1/4 watt, 5%			Hear sink clip
R15	9B5-36	470 ohm, 1/4 watt, 10%			
R16					
R17					
R18					
R19					
R20					
CIAB-					
C1AB	8A-26659	Tuning condenser			<b>CABINET PARTS</b>
C2-3	8C-26457	.01 mfd, 25 volt, ceramic	5C-26938-A208		Case
C4	8N1-274	350 mfd, 500 volt, 5% mica	2C-26505		Handle plate
C5	8C-26459	.05 mfd, 10 volt, ceramic	62M-26504		Retainer pin
C6	8C-26454	.15 mfd, 5% lytic	5C-27217		Case cover
C7	8C-26454	.15 mfd, 5% lytic	200-26449-3-A208		Battery cover easy
C8	8G-26459	.05 mfd, 25 volt, ceramic	200-26449		Volume knob stud
C9	8G-26459	.05 mfd, 25 volt, ceramic	200-26449		Tuning knob stud
C10	8G-26459	.05 mfd, 25 volt, ceramic	5B-24356-A208		On-off volume knob
C11	8G-26459	.05 mfd, 25 volt, ceramic	25M-26538		* TRANSISTOR
C12	8C-26455	.01 mfd, 3 volt, lytic			
C13	8C-26455	.01 mfd, 3 volt, lytic			
C14	8C-26455	.01 mfd, 3 volt, lytic			
C15	8C-26455	.01 mfd, 3 volt, lytic			
C16	8C-26455	.01 mfd, 3 volt, lytic			
C17	8C-26455	.01 mfd, 3 volt, lytic			
C18	8C-26455	.01 mfd, 3 volt, lytic			
C19	8C-26455	.01 mfd, 3 volt, lytic			
C20	8C-26455	.01 mfd, 3 volt, lytic			
C21	8C-26453	.50 mfd, 3 volt, lytic			
C22	8G-26879	.01 mfd, 25 volt, ceramic			
C23					
T1	13E-26452	Rod Antenna	RT1	CK-760 or 2N112	Crystal detector
T2	13D-26379	Oscillator coil	RT2	CK-760 or 2N112	
T3	13A-26380	1st. IF Transformer	RT3	2N138	
T4			RT4	CK-706A	
* Transistors are to be purchased from manufacturer of radio.					

SCHEMATIC DIAGRAM



MANUAL 572A  
*Airline*  
 TRANSISTOR  
 RADIO  
 MODEL BR-1102A  
 SERIAL No. 75X  
 6Z7-5149B\*

**WARDS TRANSISTOR RADIO**



Model BR-1102A  
 Turquoise and White

**SPECIFICATIONS**

- Power Supply . . . . . 9 volts D.C.
- Frequency Range . . . . . 540 to 1600 KC
- Intermediate Frequency . . . . . 455 KC
- Selectivity, . . . . . At 1000 KC, 70 KC at 1000 X signal
- Sensitivity (2 mw ref) . . . . . 800 u.v. per meter
- Power Output, . . . . . 20 m. w.
- Speaker . . . . . 2-3/4" PM, V.C. impedance-15 ohms
- Cabinet . . . . . 6-1/4" width, 1-3/4" depth, 3-3/8" height

**TRANSISTOR COMPLEMENT**

- RT1 . . . . . 2N140 . . . . . Oscillator-Mixer
- RT2 . . . . . 2N139 . . . . . 1st. IF Amplifier
- RT3 . . . . . 2N109 . . . . . Audio Amplifier
- RT4 . . . . . 2N109 . . . . . Audio Output
- CK-706A . . . . . Crystal Detector

**SERVICE LETTER REMINDER**  
 Record number of Service Letters below that apply to models listed in this manual.

M O N T G O M E R Y W A R D

John F. Rider

**REMOVING CHASSIS FROM CASE**

1. Remove battery.
2. Remove tuning knob stud by turning counterclockwise and remove tuning knob.
3. Remove case cover mounting screw located behind tuning knob and remove case cover.
4. Remove three chassis mounting screws.
5. Carefully remove chassis from case allowing battery cable to slip through battery compartment hole.

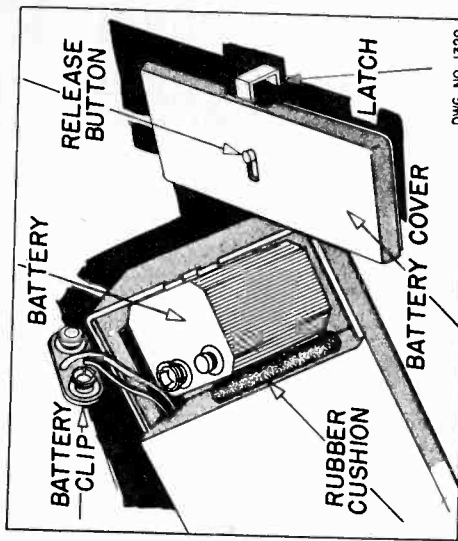
**BATTERY REPLACEMENT**

Since the receiver is small and compact, not every 9 volt battery will fit in the space provided. Listed below are five available types to be used for replacement.

- WARDS NO-92
- BURGESS NO-2N6
- EVEREADY NO-246
- OLIN NO-1707
- RCA VS-305

Approximately 100 hours performance can be experienced with the above batteries before replacement is required. Battery replacement should be performed when the sound output is noticed to be muffled or distorted with a decrease in total output or if a voltage measurement shows less than 6 volts. The battery voltage should be measured with the receiver turned on after at least 5 minutes of operation.

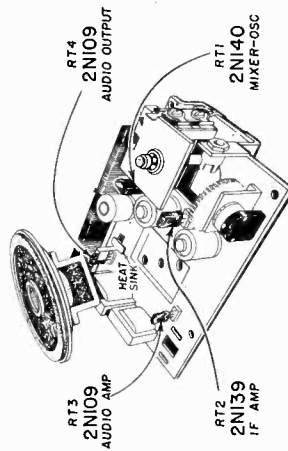
When battery replacement is necessary, remove battery cover by pushing release button upward, grasp latch and pull up and away from case. Remove old battery and un-snap battery cable. Snap battery cable on replacement battery and insert into case. Be sure rubber cushion is between battery and side wall of case to prevent battery movement. Insert battery cover in place and push latch down.



DWG. NO. 1329

**BATTERY LOCATION**

Top Chassis View



DWG 1344A



### TRANSISTOR SERVICING

The following information is presented as a guide to servicing transistor radios:

#### VOLTAGE READINGS

Because of the low battery potential, it is suggested that a VTVM be used to measure all circuit voltages. Voltage readings will vary with the strength of the signal being received, the battery voltage, and the type voltmeter being used. The voltage readings indicated on the schematic diagram were measured with a VTVM, no signal input, and with a battery voltage of 9 volts. Voltage readings will also vary with a change of transistors. The transistors conductivity varies to one transistor to another, therefore, voltage readings will differ. All voltage readings will be negative with respect to chassis due to the PNP type transistor employed.

#### BATTERY REPLACEMENT

The battery should be the first component checked when the radio is presented for service, since the battery voltage decreases with use and age. The battery voltage should be checked at the battery cable connections with the receiver turned on, and after at least five minutes of operation. Batteries have a tendency to reactivate (recharge) when not in use, and a true test of the battery capabilities can not be determined until sufficient current has been drawn from the battery. If the battery is found to be dead, the receiver should be checked for a short circuit before the replacement battery is installed. Disconnect battery and measure resistance with an ohmmeter at the battery cable connections. Ohmmeter will indicate approximately 1700 ohms with positive lead to chassis, approximately 400 ohms with negative lead to chassis and approximately 4000 ohms with all transistors out of circuit with either meter lead to chassis. Battery replacement should be performed when the sound output is noticed to be muffled or distorted with a decrease in total output.

#### OHMMETER READINGS

When using an ohmmeter to check continuity and resistance readings, caution must be observed. It is important to know the internal battery voltage of the ohmmeter as damage could result due to excessive voltage being applied to the ohmmeter. It is also important to know the battery polarity of the meter leads. Incorrectly placing the ohmmeter leads across a lyric capacitor with a low working voltage may damage the capacitor due to excessive reverse current. If the meter battery voltage is greater than 12 volts, the high frequency transistor rating will be exceeded and may be damaged. A diode action will be experienced when attempting to check the resistance readings with the transistors in the circuit. It is advisable to remove all transistors from their sockets before making ohmmeter checks.

#### SOLDERING

Caution must be observed when using a soldering iron as excessive heat may easily damage a transistor. The transistors must be removed from their sockets before soldering at the socket pins. Heat may also damage other components such as 1/4 watt resistors. Therefore, dissipate the heat to the component by grasping the component lead with a pair of long nose pliers. A low wattage small diameter tip iron is suggested.

#### TRANSISTORS

If a transistor is suspected of being defective, substitution will be the only reliable check. Checking resistance readings of a transistor with an ohmmeter will indicate only a shorted or open transistor. When inserting a transistor in its socket, make sure the transistor's leads line up with the socket holes. Illustrations on the schematic diagram show the spacing between transistor's leads and the transistor sockets. Audio transistors have a red dot on the body of the transistor adjacent to the collector lead for identifying purposes. The red dot must line up with a paint dot on the chassis when the transistor is inserted into the socket. If a transistor substitution is made in the RF or IF circuit, realignment may be necessary. This is due to the difference in operating characteristics from one transistor to another.

#### COMPONENT REPLACEMENT

An important consideration is component replacement. Miniature as well as close tolerance components are used throughout the radio, therefore, all components must be replaced with exact duplicate parts.

#### TROUBLE SHOOTING

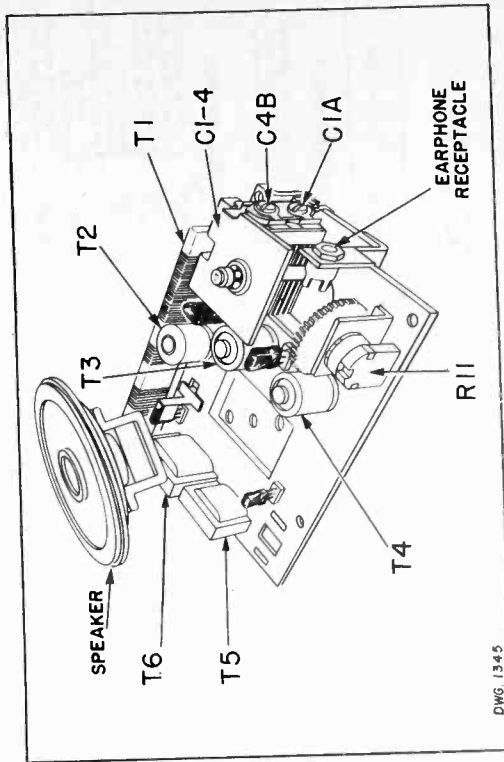
Trouble in a transistor radio can easily be isolated by using a signal generator and listening to the speaker. Circuit tracing from the base of the output stage back through the receiver to the antenna, should quickly reveal which stage is not functioning properly. When injecting the signal, use a 50 mid lyric, negative to base, in the audio circuit, a .5 mid capacitor in the IF or RF stages and inductive coupling to the antenna.

Caution must be observed not to accidentally short the collector circuit to the chassis, as damage to the transistor may result. Also, the practice of deliberately shorting a circuit to chassis to determine if voltage is present or to listen for a click in the speaker, must be avoided for the same reason.

### ALIGNMENT PROCEDURE

- NOTES:**
1. Remove chassis from case.
  2. Connect 9 volt battery.
  3. Use output meter with 15 ohms impedance.
  4. Turn volume control to maximum.
  5. Signal generator output at 100 microvolts, 30% modulation at 400 cycles.

CIRCUIT	SIGNAL GENERATOR		GROUND SIDE	OUTPUT METER	GANGED CAPACITY	ADJUST FOR MAXIMUM OUTPUT ON METER
	FREQUENCY	COUPLING CAPACITY				
I.F.	455KC	.5MF	To Base of RT1	Connect in place of speaker	.....	T3, T4
Repeat above step two or three times for best results, keeping generator output in all cases as low as possible to prevent overloading of audio.						
Osc.	1620KC	.5MF	To Base of RT1	Connect in place of speaker	Open Gang (Fully clockwise)	C4B
<b>Caution:</b> Too high an output from signal generator may cause setting of trimmer on a spurious response.						
Osc.	535KC	.5MF	To Base of RT1	Connect in place of speaker	Closed Gang (Fully clockwise)	T2
Osc.	1620KC	.5MF	To Base of RT1	Connect in place of speaker	Open Gang (Fully clockwise)	C4B
Ant.	1400KC	Connect 3 turn loop to generator and place near T1.	Connect 3 turn loop to generator and place near T1.	Connect in place of speaker	Ganged Condenser should be rocked	C1A
Check for alignment and dial calibration at 1000KC and 600KC.						



DWG. 1345



**MANUAL 575A**  
*Airline*  
**TRANSISTOR RADIO**  
**MODEL**  
 GTM 1108A  
 SERIAL NO.  
 75X  
 Form No. 622-576B



**MODEL GTM 1108A**  
 TAN

**GENERAL DESCRIPTION**

This Airline transistor radio is a five transistor portable broadcast superheterodyne receiver. A jack is provided for private earphone connection. It replaces the loudspeaker when a miniature plug is inserted through the hole in the back of the cabinet. This silences the speaker and allows the user to listen under conditions of high ambient noise, or situations in which operation of the speaker is undesirable. The receiver is housed in a leatherette case with carrying strap.

The receiver employs five junction type transistors. The converter, audio driver, and audio output transistors are of the PNP type, while the IF amplifiers employ NPN type transistors. The converter stage is an autodyne type mixer-oscillator. A tuned, high "Q" ferrite-core coil is used as an antenna. Two stages of IF amplification are used. The gain of the last IF amplifier is controlled by an Automatic Gain Control circuit.

A crystal diode functions as a detector and AGC source. The driver amplifies the audio signal and capacity couples it to the audio signal transistor. The audio output stage is operated Class "A". The speaker is a 2 1/4" PM type.

**ELECTRICAL SPECIFICATIONS**

- Frequency range ..... 540 to 1600 KC
- Intermediate Frequency ..... 455 KC
- Transistor Complement
  - 1 2N252 Converter
  - 1 2N253 1st IF Amp.
  - 1 2N254 2nd IF Amp.
  - 1 IN87G or IN295 Diode Detector
  - 1 2N228 Audio Driver
  - 1 2N291 Audio Output
- Power Output
  - Undistorted ..... .035 watts
  - Maximum ..... .060 watts
- Loudspeaker ..... 2 1/4" PM
- Power Supply:
  - Wards - 62-96 RCA-VS-300
  - Eveready - 226 Burgess D6
- Average current Drain ..... 17 ma.

**SERVICE LETTER REMINDER**

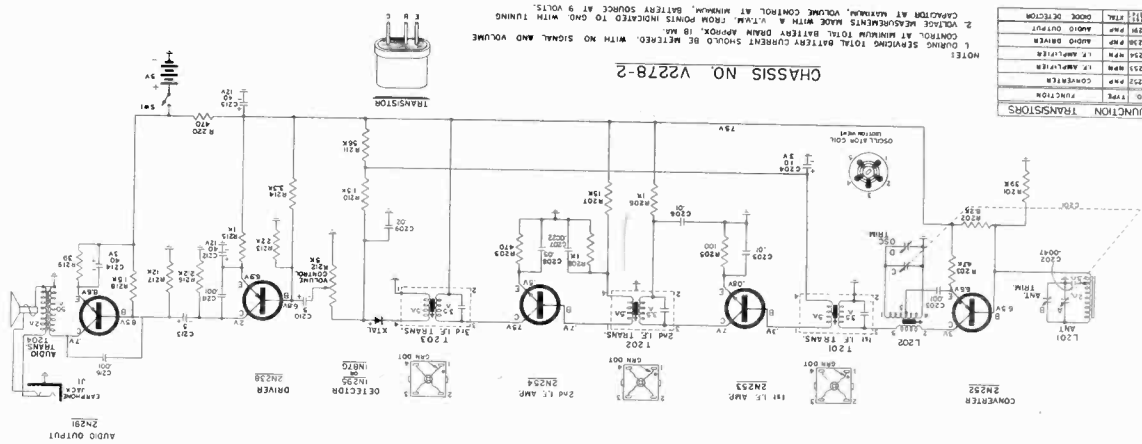
Record numbers of service letters below that apply to models listed in this manual.

**ALIGNMENT PROCEDURE**

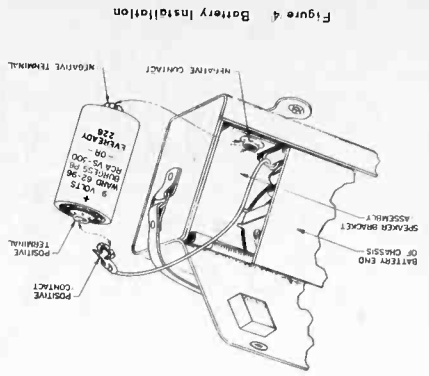
The following is required for aligning:

1. A signal generator capable of covering frequencies of 455 KC and the entire broadcast band with provisions for modulation. The test signal is injected by forming a 4 or 5 turn loop of wire, connecting it across the signal generator output cable, and placing near antenna loop L201
2. VTVM or output meter connected across voice coil.
3. A fiber aligning tool that snugly fits the slot in the I.F. transformer cores to prevent chipping of the slot.
4. Set the volume control to maximum.
5. Keep the output of the signal generator low enough to just give an indication on the VTVM or output meter. If the peak is broad or double peaking occurs when rocking the loop or decreasing the signal generator output is excessive. Either further decoupling of the generator loop or decreasing the signal output is necessary.
6. VTVM or output meter that the hand or any objects on the bench do not come in close contact with the antenna loop or detuning will occur and alignment will be incorrect.

Figure 1 Schematic Diagram



STEP	Frequency Setting	Connect Generator Output to:	Adjust for maximum
(1)	455 KC	loosely couple to L201	Remove speaker bracket assy. Set gang condenser fully open and adjust T202, T203 and T201 in order indicated.
(2)	1625 KC	loosely couple to L201	Replace speaker bracket assy. Adjust oscillator trimmer "D".
(3)	1400 KC	loosely couple to L201	Set gang condenser to 1400 KC and adjust antenna trimmer "B".
(4)	600 KC	loosely couple to L201	Set gang to 600 KC and adjust oscillator slug.
(5)	Repeat steps 2 & 3. Check the frequency range to insure that receiver will receive the full broadcast band.		

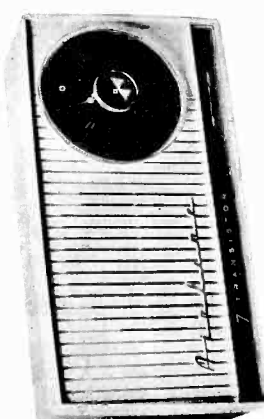




**BOARD REMOVAL**

1. Remove the screw located in center of the tuning knob. Turn the dial to the high frequency end and grip the tuning knob with one hand. Remove the screw by turning it in a counter clockwise direction. Do not cause any undue strain on the tuning capacitor.
2. Remove back of cabinet by loosening coin-slot screw on back. Remove the "Y" self tapping screw located at tuning condenser end of board.

**MANUAL 577A**  
*Arline*  
**TRANSISTOR RADIO**  
**MODEL**  
 GTM 1109A  
 SERIAL NO.  
 75X  
 Form No. 62-Z-578B\*



**MODEL GTM 1109A white - turquoise**

**GENERAL DESCRIPTION**

This Arline transistor radio is a seven transistor portable broadcast superheterodyne receiver. A jack is provided for private earphone connection. It replaces the loudspeaker when a miniature plug is inserted through the hole in the back of the receiver. This silences the speaker, and allows the user to listen under noisy conditions, or situations in which operation of the speaker is undesirable. The receiver is housed in an unbreakable plastic case and the back cover is removed by loosening the coin-slot screw on the back. The receiver employs seven junction type transistors. The converter, audio driver and audio output transistors are of the PNP type, while the IF amplifiers and detector employ NPN type transistors. The converter stage is an autodyne type mixer-oscillator. A tuned, high "Q" ferrite-core coil is used as an antenna. Two stages of IF amplification are used. The gain of the 1st IF amplifier is controlled by an Automatic Gain Control circuit.

A transistor functions as a power detector and AGC source. In addition to detecting the IF signal it also provides gain at audio frequencies. The driver stage amplifies the audio signal and transformer couples it to the two audio output transistors. These transistors are operated in push-pull with out-of-phase audio signals fed to the base of each transistor. Each transistor is operated class "B" and the alternate halves of the audio signal are combined in the output transformer and coupled to the 2 1/2" PM speaker.

**ELECTRICAL SPECIFICATIONS**

Frequency range	.....540 to 1600 KC
Intermediate Frequency	.....455 KC
Sensitivity	.....200uv per meter, 50mw output approx.
Selectivity	......8 KC at 6db bandwidth
Transistor Complement	
1 2N252	.....Converter
1 2N253	.....1st IF Amp.
1 2N254	.....2nd IF Amp.
1 880 or 2N94	.....Transistor Detector
1 2N238 or 310	.....Audio Driver
2 2N185 (matched pair)	.....Audio Output

Power Output	......075 watts
Undistorted	......140 watts
Maximum	......24" PM Round
Loudspeaker	.....2 1/2" PM Round
Voice Coil Impedance	.....12 ohms
Power Supply:	Wards - 62-96 RCA-VS - 300
	Eveready - 226 Burgess P6
Average current Drain (no signal)	.....6.5ma.
Approximate Battery Life	.....75 hours

**SERVICE LETTER REMINDER**

Record numbers of service letters below that apply to models listed in this manual.

3. Hold radio in the palm of the hand with the open back side up. Grip the board with the other hand and slide it down toward the tuning capacitor end of the cabinet, until the upper end of the speaker bracket is free of the plastic lip. Now raise this end of the bracket over lip and slide it out of the cabinet.
4. To insert the board into the cabinet, use the reverse procedure, being careful to lock the speaker bracket under both recesses provided in the cabinet front.

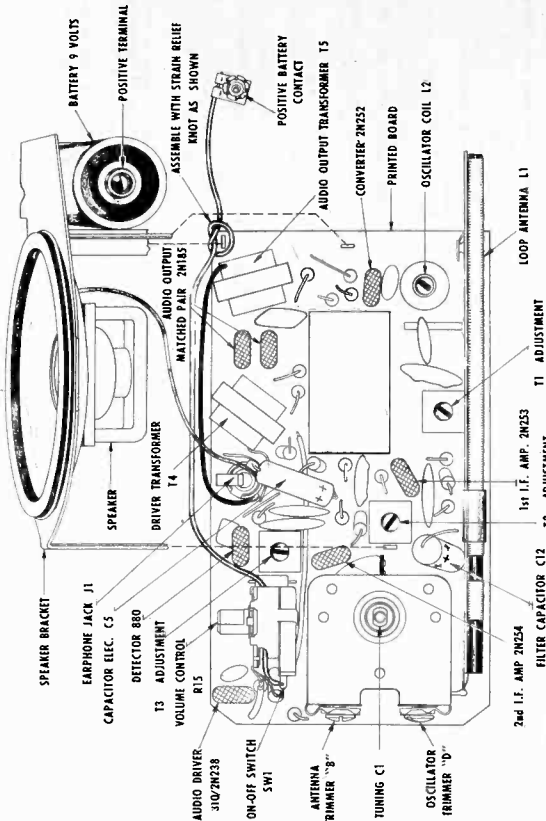


Figure 3 Top View Parts Layout

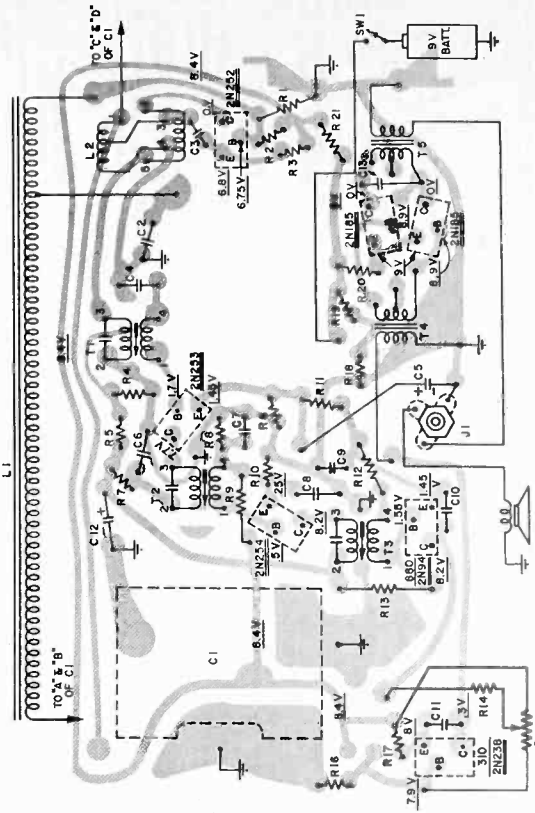


Figure 4 Bottom View of Printed Board Showing Top Components Symbolically

PARTS LIST

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
<b>TRANSFORMERS AND COILS</b>					
	310V012H03	Antenna - Iron Core Loop	L1	297V008H01	Transistor - converter
	230V026H01	Oscillator Coil	L2	297V002H04	Transistor - 1st IF
	235V014H01	1st I.F. Transformer	T1	297V002H05	Transistor - 2nd IF
	235V014H01	2nd I.F. Transformer	T2	880/2N94	Transistor - detector
	235V014H01	3rd I.F. Transformer	T3	310/2N238	Transistor - audio driver
	430V024H01	Audio Driver Transformer	T4	2N185 (2)	Transistors (Matched Pair - audio output)
	430V025H01	Audio Output Transformer	T5		
<b>TRANSISTORS</b>					
	2N252	Transistor - converter			
	2N254	Transistor - 1st IF			
	880/2N94	Transistor - detector			
	310/2N238	Transistor - audio driver			
	2N185 (2)	Transistors (Matched Pair - audio output)			
<b>MISCELLANEOUS</b>					
		Volume control mounting			
		Speaker mounting (Includes battery negative terminal less speaker)			
		Cabinet - (Includes back cover; less dial and escucheon)			
		Connector assembly - Battery positive terminal			
		Dial - calibration			
		Escucheon			
		Jack (J1) - for earphone			
		Knob - dial			
		Knob - On/off/volume			
		Screw - dial knob			
		Screw - 8/32" Cabinet back cover			
		Speaker - 2 1/2" PM (magnet weight .53 oz.) Round.			
		Switch on-off (SW1 - part of R15)			
		Case, carrying			

CAPACITORS

Ref. No.	Part No.	Description
C1A, B, C, D	330V005H01	Variable Gang
C2	.0047 mf 500V	Ceramic
C3	.01 mf 30V	Ceramic
C4	.01 mf 30V	Ceramic
C5	40 mf 3V	Electrolytic
C6	.01 mf 30V	Ceramic
C7	.002 mf 30V	Ceramic
C8	.05 mf 30V	Ceramic
C9	.01 mf 30V	Ceramic
C10	.01 mf 30V	Ceramic
C11	.001 mf 30V	Ceramic
C12	40 mf 12V	Electrolytic
C13	.05 mf 30V	Ceramic

RESISTORS

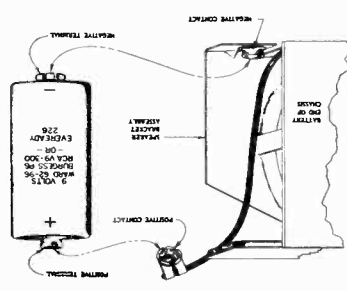
Ref. No.	Part No.	Watts
R1	39K	0.5 10% Carbon
R2	8.2K	0.5 10% Carbon
R3	4.7K	0.5 10% Carbon
R4	3.9K	0.5 10% Carbon
R5	15K	0.5 10% Carbon
R6	2.2K	0.5 10% Carbon
R7	1K	0.5 20% Carbon
R8	1K	0.5 10% Carbon
R9	15K	0.5 10% Carbon
R10	470	0.5 10% Carbon
R11	330	0.5 20% Carbon
R12	3.3K	0.5 10% Carbon
R13	350K	0.5 10% Carbon
R14	680	0.5 20% Carbon
R15	270V024H01	Volume Control and Switch
R16	82K	0.5 10% Carbon
R17	220	0.5 10% Carbon
R18	6.8K	0.5 10% Carbon
R19	100	0.5 10% Carbon
R20	10	0.5 10% Carbon
R21	220	0.5 20% Carbon

NOTE: USE UNIVERSAL PARTS WHERE PART NUMBERS ARE NOT LISTED. ORDER FROM (LRS).

SUGGESTED SERVICING HINTS

Make all voltage measurements with a VTVM and with tuning capacitor set for maximum capacity and the volume control at minimum. Battery current should be monitored at all times and should be approximately 6 milliamperes. Battery voltage should be at nine volts. The battery should be the first component checked when servicing. A weak battery can cause a decrease in gain and distortion. Check the battery potential with battery in receiver and set turned on. If all other circuit components have been checked and a faulty transistor is suspected, replacement of the transistor is the surest check. It is not advisable to check transistors with an ohmmeter as damage to them can result. Transistors should not be soldered or unsoldered in the circuit when voltage is applied to the circuit. When removing components from the printed board, including transistors, care must be taken to avoid damaging the board. Replacement of an IF transistor usually will have no effect on the overall alignment. In some cases IF alignment may be affected. For proper IF alignment procedure refer to the section on alignment.

FIGURE 2 BATTERY INSTALLATION



ALIGNMENT PROCEDURE

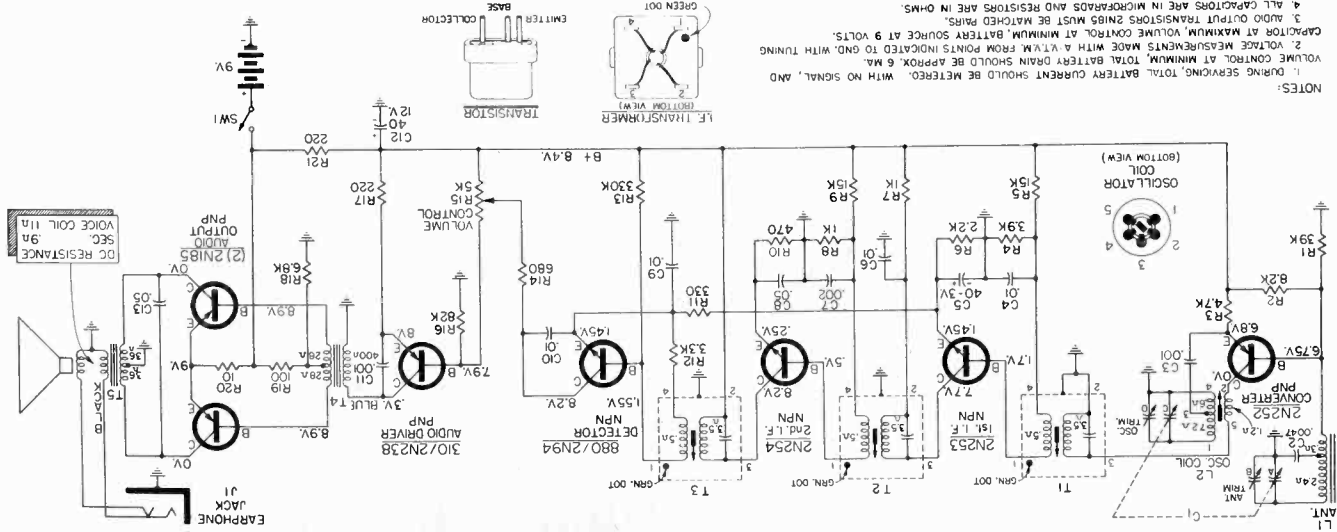
The following is required for aligning:

1. A signal generator capable of covering frequencies of 455 KC and the entire broadcast band with provisions for modulation. The test signal is injected by forming a or 5 turn loop of wire, connecting it across the signal generator output cable and placing near antenna loop L1.
2. VTVM or output meter connected across voice coil.
3. A fiber aligning tool that snugly fits the slot in the L.F. transformer core to prevent chipping of the slot.
4. Set the volume control to maximum.
5. Keep the output of the signal generator low enough to insure that receiver will receive the full broadcast band.

Remove speaker bracket assembly. Set gang condenser fully open and adjust T3, T2 and T1 in order indicated. Reduce generator output if necessary for T2 and T1 adjustments. Replace speaker bracket assembly. Adjust oscillator trimmer "D" loosely couple to L1. Set gang condenser to 1400 KC and adjust antenna trimmer "B" loosely couple to L1. 600 KC. Check the frequency range. Report steps 2 & 3. Check the frequency range. Adjust for maximum output.

CAUTION: Be sure during RF alignment that the hand, or any objects on the bench, do not come in close contact with the antenna loop, or detuning will occur and alignment will be incorrect.

Figure 1 Schematic Diagram



NOTES:

1. DURING SERVICING, TOTAL BATTERY CURRENT SHOULD BE MEASURED. WITH NO SIGNAL, AND VOLUME CONTROL AT MINIMUM, TOTAL BATTERY DRAIN SHOULD BE APPROX. 6 MA.
2. VOLTAGE MEASUREMENTS MADE WITH A VTVM FROM POINTS INDICATED TO GND. WITH TUNING CAPACITOR AT MAXIMUM.
3. AUDIO OUTPUT TRANSISTORS 2N185 MUST BE MATCHED PAIRS.
4. ALL CAPACITORS ARE IN MICROFARADS AND RESISTORS ARE IN OHMS.

**ALIGNMENT PROCEDURE**

The following is required for aligning:

1. A signal generator capable of covering frequencies of 455 KC and the entire broadcast band with provisions for modulation. The test signal is injected by forming a 4 or 5 turn loop of wire, connecting it across the signal generator output cable and placing near antenna loop T1.
  2. VTVM or output meter connected across voice coil.
  3. A fiber aligning tool that snugly fits the slot in the I.F. transformer cores to prevent chipping of the slot.
  4. Set the volume control to maximum.
  5. Keep the output of the signal generator low enough to just give an indication on the VTVM or output meter. If the peak is broad or double peaking occurs when rocking the IF slug adjustment, the signal generator output is excessive. Either further decoupling of the generator loop or decreasing the generator output is necessary.
- Caution**—Be sure during IF alignment that the hand or any objects on the bench do not come in close contact with the antenna loop or detuning will occur and alignment will be incorrect.

**MANUAL 582A**  
*Airline*  
**TRANSISTOR RADIO**  
**MODEL**  
**GEN-1106A**  
 SERIAL NO. 75X  
 FORM NO. 622-583B



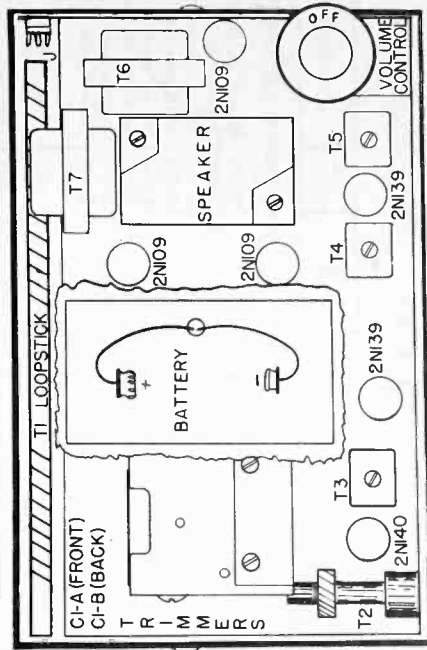
MODEL GEN-1106A TAN

**ELECTRICAL SPECIFICATIONS**

- FREQUENCY RANGE**.....540 to 1600 KC  
**INTERMEDIATE FREQUENCY**.....455 KC
- TRANSISTOR AND DIODE COMPONENT**
- 1 2N140.....Converter
  - 1 2N139.....1st IF Amp.
  - 1 2N139.....2nd IF Amp.
  - 1 1N295.....Diode Detector
  - 1 2N109.....Audio Driver
  - 2 2N109 (Matched Pair).....Audio Output
- POWER OUTPUT**
- Undistorted......08 Watts
  - Maximum......12 Watts
- LOUDSPEAKER**.....2 3/4" PM
- VOICE COIL IMPEDANCE**.....16 Ohms at 400 Cycles
- POWER SUPPLY—USE ONE OF THE FOLLOWING BATTERIES:**
- Wards—62-96.....RCA-YS—300
  - Eveready—226.....Burgess P6
- SENSITIVITY**—500 microvolts per meter for .025 watt output.
- SELECTION**—4.5 KC broad at 2 times signal at 1000 KC.  
 I.F. Base Sensitivity at 455 KC (with loop disconnected from converter) coupled to converter base.....about 10 to 15 microvolts.
- Battery Current drains at 400 cycles, 30% modulation**
- | AUDIO OUTPUT | CURRENT DRAIN     |
|--------------|-------------------|
| .010 Watts   | 6.6 Milliamperes  |
| .025 Watts   | 16.0 Milliamperes |
| .050 Watts   | 20.0 Milliamperes |
| .100 Watts   | 26.0 Milliamperes |
| .135 Watts   | 29.0 Milliamperes |
- SERVICE LETTER REMINDER**

Record numbers of Service Letters below that apply to models listed in this manual.

STEP	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO:	ADJUST FOR MAXIMUM
(1)	455 KC	loosely couple to T1	Set gang condenser fully open and adjust T5, T4 and T3 in order indicated. Reduce generator output if necessary for T5 and T4 adjustments.
(2)	1640 KC		Adjust oscillator trimmer "C1-B."
(3)	535 KC	loosely couple to T1	Set Gang Condenser fully closed. Adjust T2 Slug to locate generator signal. The low end should be 535 KC. If off more than 5 KC, it may be adjusting the slug within the oscillator. If oscillator slug is adjusted, step 2 must be repeated.
(4)	1400 KC		Set gang condenser to 1400 KC and adjust antenna trimmer "B."
(5)	600 KC		Set gang to 600 KC and adjust oscillator slug.
(6)	Repeat steps 2 & 3. Check the frequency range to insure that receiver will receive the full broadcast band.		
(7)	Tracking is checked at 600 and 1000 KC by bringing into close proximity of the loop a piece of ferrite rod, then a piece of brass. In either case, the output meter should show a decrease. An increase in output meter reading indicates a mistrack condition, which may be corrected by adjusting the turns of wire on the antenna rod. If adjustment on antenna rod is made, step 4 must be repeated.		



PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
		<b>RESISTORS</b>			<b>TRANSFORMERS AND COILS</b>
R1,R9	2.2 K	Ohms 1/2 Watt	T1	E6019	Antenna Loop (Ferrite Core)
R2,R11,R16	33 K	Ohms 1/2 Watt	T2	E6128	Oscillator Coil (with C-3, .01 mfd. Condenser)
R3,R12	1 K	Ohms 1/2 Watt	T3	E6215	1st. I.F. Transformer
R4	10 K	Ohms 1/2 Watt	T4	E6216	2nd. I.F. Transformer
R5	12 K	Ohms 1/2 Watt	T5	E6217	3rd. I.F. Transformer
R6,R10,R15	150 K	Ohms 1/2 Watt	T6	E1116	Interstage Audio Transformer
R7,R17	470	Ohms 1/2 Watt	T7	E1115	Output Transformer
R8	390	Ohms 1/2 Watt			
R13	1200	Ohms 1/2 Watt			
R14,SW1	2.5 K	Ohm Volume Control w/SPST Switch			
R18	100	Ohms 1/2 Watt			
R19	8.2 K	Ohms 1/2 Watt			
		<b>CONDENSERS</b>	J1	E1019	Speaker, P.M., 2 3/4"
C1A,C1B	Tuning Gong			E636	Phone Jack
C2,C4,C6	.02 mfd. GMV Discap			E4924	Hex Nut for Phone Jack
C7,C9,C10	See Ref. No. T2 - Part No. E6128			E189	Battery Clip, Female
C11,C13,C16	See Ref. No. T2 - Part No. E6128			E1810	Battery Clip, Male
C3	4 mfd. 6 Volts			E5053	Knob, Tuning
C5,C14	91 mmf. 5% Discap			E5054	Knob, Volume
C8	39 mmf. 5% Discap			E7032	Cabinet with Handle
C12	100 mfd. 10 Volts			E7613	Insulator, Battery
C15				E7614	Shield, Fishpaper

VOLTS IN RCA S.R.V.T.M.

VOLTAGE READING TAKEN WITH 9.0

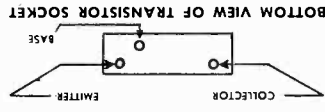
TERM #	RESISTANCE	VOLTAGE
13	29K	7
14	29K	7
15	0	0
16	6K	8.5
17	12K	0
18	14K	.55
19	1	0
20	0	0
21	5K	8.5
22	150	.15
23	20K	.85

TERM #	RESISTANCE	VOLTAGE
1	0	0
2	2K	1.9
3	17K	.52
4	0	0
5	6K	8.5
6	1K	6.5
7	14K	.5
8	470	.4
9	26K	7
10	0	0
11	8K	7.0
12	1K	.6

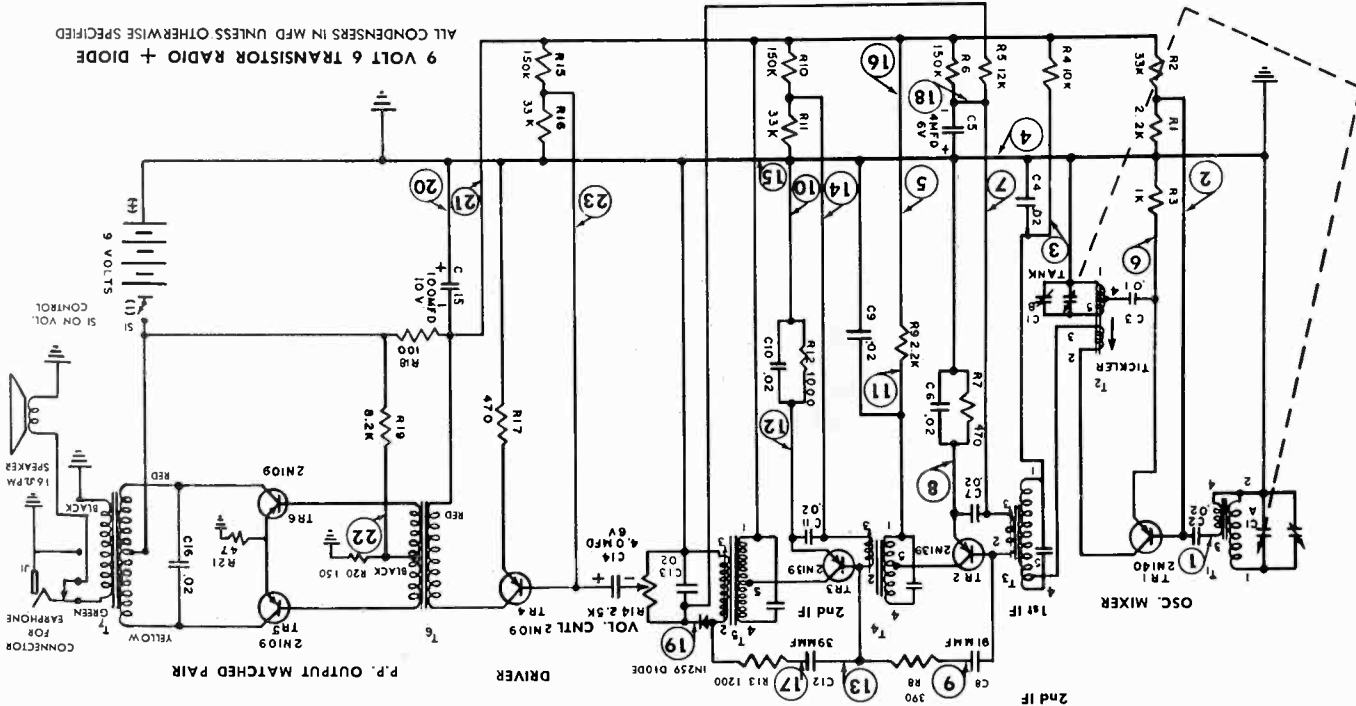
MODEL GEN-1106A

RESISTANCE MEASUREMENTS

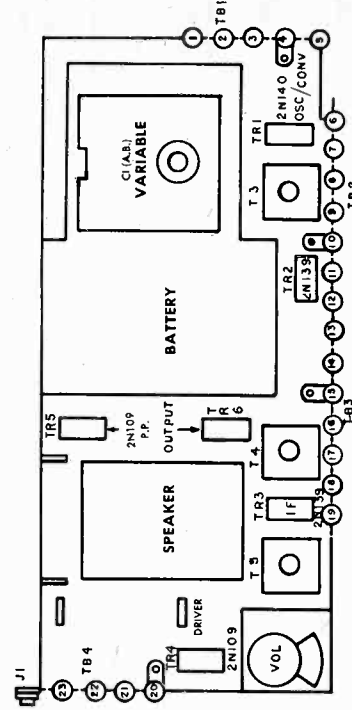
WINDING	SEC.	PRI.
T1 LOOP	1.2	1.0
T4 I.F.	1.0	.70
T2 O SC	3.4	1.0
T5 I.F.	1.4	1.4
T6 DRIVER	4.0	2.3
T7 OUTPUT	7.0	80.0
T3 I.F.	.6	3.5
T8 I.F.	1.0	3.5



9 VOLT 6 TRANSISTOR RADIO + DIODE  
ALL CONDENSERS IN MFD UNLESS OTHERWISE SPECIFIED



NOTE: USE UNIVERSAL PARTS WHERE PART NUMBERS ARE NOT SHOWN. ORDER FROM (I.R.S.)



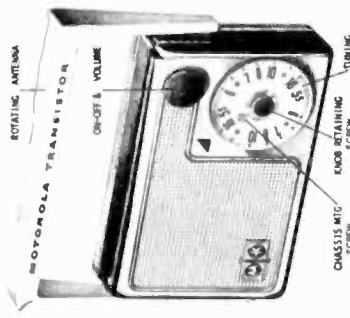
CHASSIS-BACK VIEW



HOME RADIO

MODEL  
56T1

CHASSIS  
HS-483



2N147 as 1st IF amp and a 2N145 as the 2nd IF amp. When replacing use the same type transistor that the set originally used.

\*\*\* Type 880 used in some sets; when replacing use R35.

TUNING RANGE - 530 to 1620 Kc IF - 455 Kc

GENERAL INFORMATION

TYPE - Pocket type portable superheterodyne radio using a plated circuit chassis and five transistors. An earphone socket is provided on rear of radio; insertion of earphone automatically disconnects speaker. A 15 ohm earphone for this radio (Motorola Part No. D-196) is available through Motorola Distributors.

POWER SUPPLY - Operates from one of the following or equivalent 9-volt self-contained batteries:  
Standard Type - Eveready 216, Burgess 206, General 179  
Mercury Type - Mallory TR146R, Eveready E146

TRANSISTOR COMPLEMENT

Ref No	Type	Part No	Function
V1	2N172*	48C124216	CONV
V2	2N146**	48C124211	1st IF AMP
	or 2N147**	48C124221	1st IF AMP
V3	2N145**	48C124218	2nd IF AMP
	or 2N145**	48C124220	2nd IF AMP
V4	R35***	48C124217	DET-AVC-AF AMP
V5	V4	48C124219	Pwr Amp

\* Type 830 used in some sets; when replacing use 2N172.  
\*\* Some sets use 2 of the 2N146 transistors; others use a

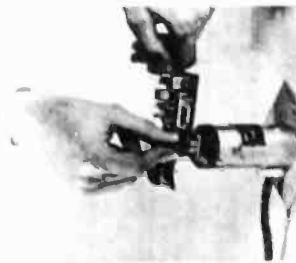
SERVICE NOTES

CIRCUIT DESCRIPTION

- The circuit of this chassis is conventional - there are no diodes or capacitors. Leads are plated on both sides of the circuit board by routing the usual connecting wires and making wiring more uniform.
- The metal plating extends through all the holes on the chassis, connecting circuits on the front with those on the rear.
- Reference to the schematic diagram and to chassis will permit the circuit to be traced easily.

SAFETY PRECAUTIONS

- Do not service the chassis on a metal plate because of the possibility of a short circuit.



Using Controlled Temperature Soldering Pot for Replacing Components

- Remove tuning knob retaining screw from the tuning knob and remove the tuning knob (see cover photo).
- Remove chassis mounting screw from under tuning knob (see cover photo).
- Open rear cover and unsolder grounding braid from top of 1st IF transformer and capacitor C13. Care should be taken so that the IF can is not overheated, otherwise damage to the IF transformer will result.
- Turn handle perpendicular to the plated chassis.

- Grasp handle near one of its two mounting bushings and pull out the rear cover under the round portion of the mounting bushing clear hole. Then lift the rear cover from this side of handle and chassis slightly out of cabinet. Perform the same procedure on the other mounting bushing, then lift handle, chassis and speaker plate out of cabinet.
- The plated chassis is separated from the speaker mounting plate as follows: loosen the gang mounting screws and with a small soldering iron (60 watts or less) separate gang oscillator stator terminal from plated chassis. Then unsolder the speaker terminal from the mounting support lug. USE ONLY A SMALL SOLDERING IRON - 60 WATTS OR LESS. Disconnect speaker, earphone jack and antenna leads as required.

HANDLE REPLACEMENT

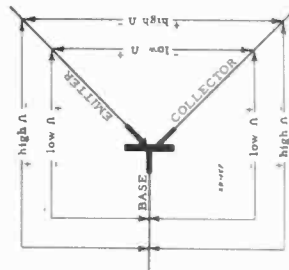
- Remove chassis and speaker mounting plate from cabinet as described under CHASSIS REMOVAL.
- Unsolder antenna leads from chassis.
- Turn handle perpendicular to chassis and slide out of handle clips.

CABINET CLEANING

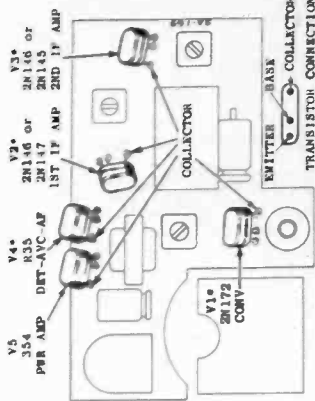
The bright metal portions of the cabinet are protected by a clear vinyl plastic coating. The metal portions of the cabinet may be cleaned with soft, dry cloth only; do not use any polishes. The plastic coating should be cleaned only with a quality Plastic Wall Tile Cleaner.

TRANSISTOR REPLACEMENT

- When replacing a transistor, the heat must be carried away from the transistor to prevent heat damage to the transistor.
- Grasp transistor leads with a pair of long-nose pliers to dissipate the heat, and dip into controlled temperature soldering pot.
- Lift transistor off of the chassis with the pliers.



PNP TYPE 354



\*See TRANSISTOR COMPLEMENT under GENERAL INFORMATION  
TRANSISTOR REPLACEMENT

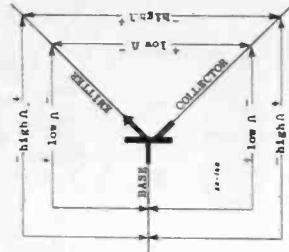
- Clean all the solder from the connecting holes.
- Place new transistor into the connecting holes.

- Grasp transistor leads with long-nose pliers to dissipate the heat, and solder the transistor to its connecting holes.
- When replacing a transistor, be sure it is wired into the chassis as shown in the illustration. The collector lead is spaced from emitter and base leads, thus serving to identify leads. See illustration.

TRANSISTOR CHECK

The transistors used in this radio can be expected to give unusually long trouble-free life, however, transistor checks may be made as follows: a coarse check of the collector-emitter junction should be made with an ohmmeter. DAMAGE TO THE TRANSISTOR USE IN OHMMETER WHOSE INTERNAL BATTERY VOLTAGE DOES NOT EXCEED 7.5 VOLTS. This check measures the ability of the transistor to conduct current in one direction, and to resist current flow in the opposite direction. The resistance in the conduction direction is low in relation to the resistance in the non-conduction direction. The two illustrations show the relative resistances for both the PNP type transistor and the NPN type transistors. The polarity signs shown in the illustrations indicate the direction of the current. Transistor must be disconnected from circuit during check.

A more positive check of the transistor is to replace a suspected transistor with one known to be good.



NPN TYPE 2N145, 2N146, 2N147, 2N172 AND R35

OHMMETER METHOD OF MAKING COARSE TRANSISTOR CHECKS

**ALIGNMENT**

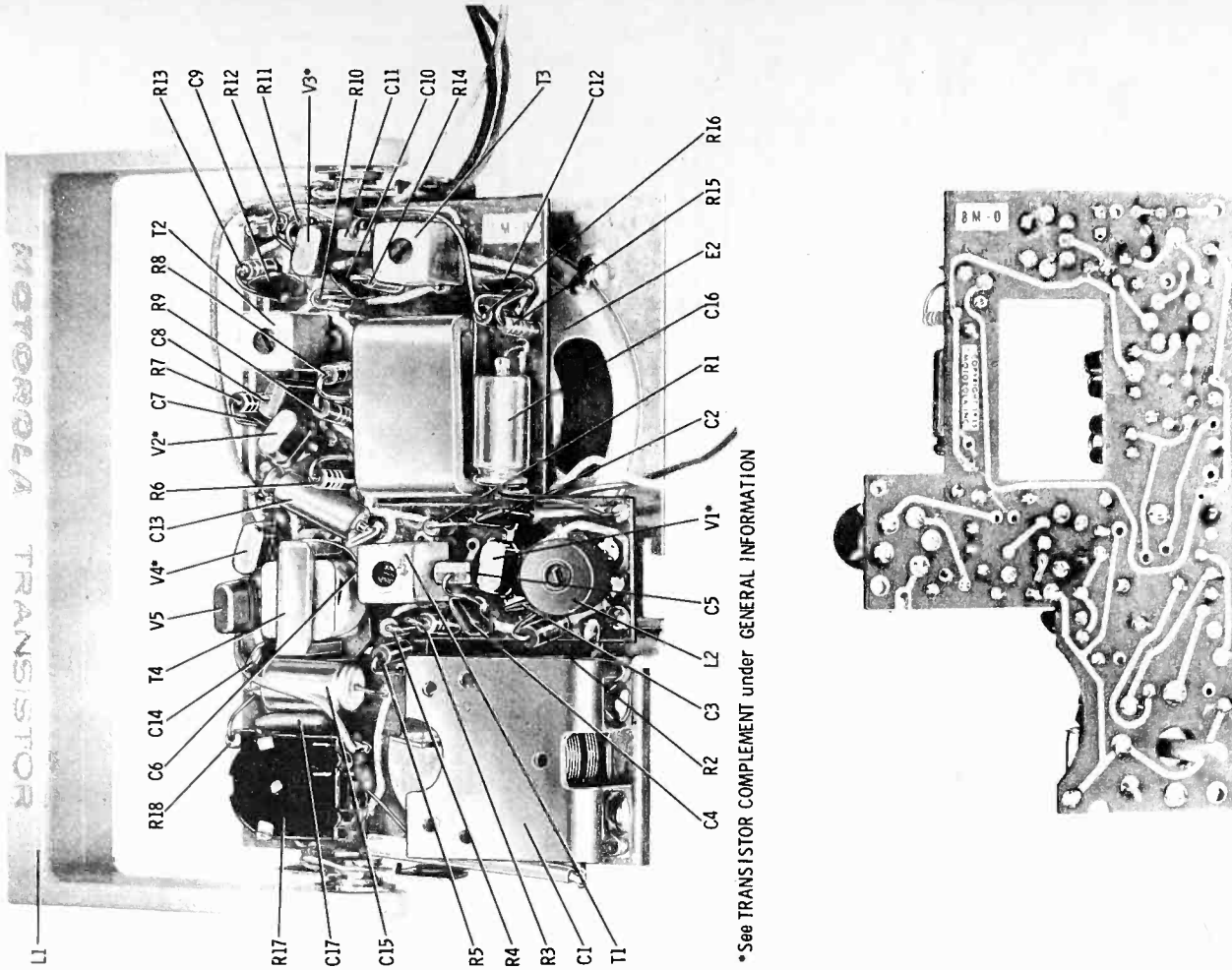
Connect an output meter across the green & black leads of the earphone jack (speaker voice coil). Set volume to maximum. Attenuate signal generator output to maintain 25 volts on output meter at all times to prevent overloading. Radio should be aligned while chassis is in cabinet. To adjust gang trimmers, construct and use wire tool shown below.

STEP	GENERATOR CONNECTION	GENERATOR FREQUENCY (400 cycle mod)	GANG SETTING	ADJUST	REMARKS
1.	Ant section of gang thru .1 mf capacitor & ground braid	455 Kc	Fully open	1, 2 and 3	Adjust for maximum.
2.	Radiation loop*	1620 Kc	Fully open	4	Adjust for maximum.
3.	Radiation loop*	1400 Kc	Tune for max	5	Adjust for maximum.

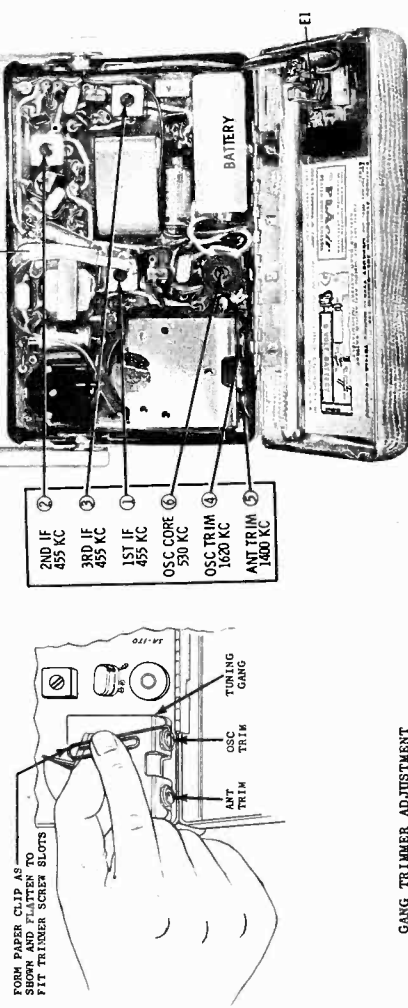
NOTE: Do not perform the following steps unless the oscillator core has been tampered with or associated components have been replaced. BEFORE PROCEEDING SET OSCILLATOR TRIMMER 1/4 TURN FROM ITS TIGHT POSITION.

4.	Radiation loop*	530 Kc	Fully closed	6	Adjust for maximum.
5.	Radiation loop*	1620 Kc	Fully open	4	Adjust for maximum.
6.	Repeat steps 4 and 5 until oscillator covers required range; step 5 should be last adjustment				
7.	Radiation loop*	1400 Kc	Tune for max	5	Adjust for maximum.

\*Connect generator output across 5" diameter, 5 turn loop and couple inductively to radio loop. Keep loops at least 12" apart.



\*See TRANSISTOR COMPLEMENT under GENERAL INFORMATION



GANG TRIMMER ADJUSTMENT TOOL DETAIL

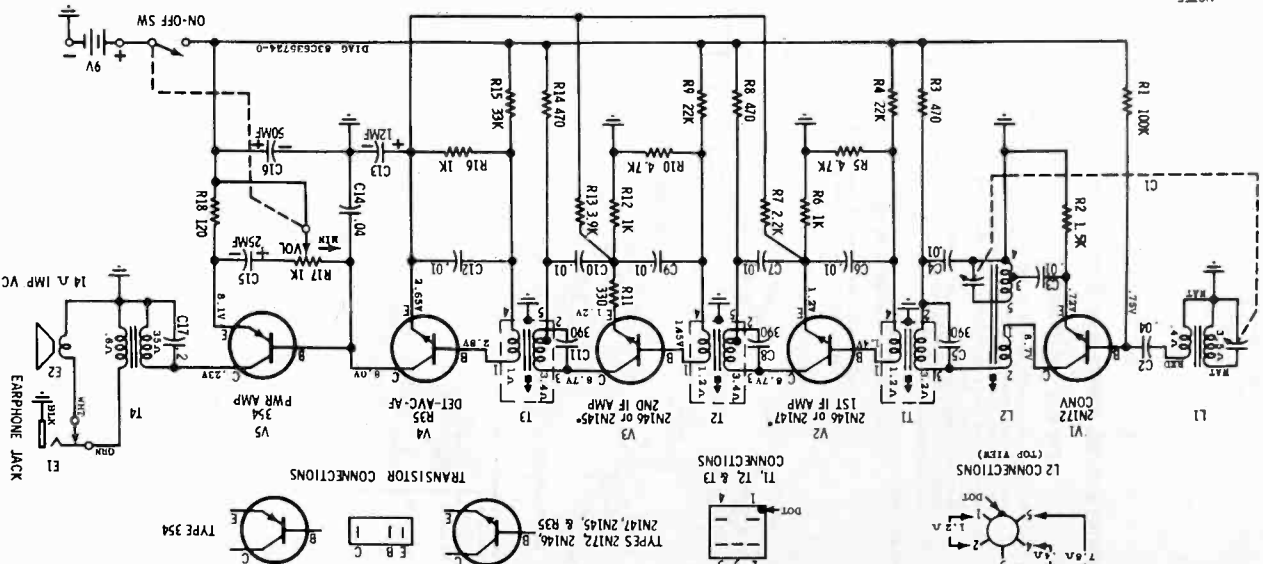
ALIGNMENT ADJUSTMENTS LOCATIONS

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description	List Price
R-16	6R6229	1000 10% 1/2W	.10
R-17	248635405	Vol Cont & Switch, 1000	.85
R-18	6R6551	120 10% 1/2W	.10
T-1	248635484	Trans 1st IF	2.10
T-2	248635483	Trans 2nd IF	2.30
T-3	248635482	Trans 3rd IF	2.15
T-4	248635469	Trans output	2.15
NOTE: See TRANSMITTER COMPONENTS under GENERAL INFORMATION			
V-1	48C124216	Transistor, type 2N172, 6PM	...
V-2	48C124218	Transistor, type 2N146, 6PM	...
V-3	48C124218	Transistor, type 2N146, 6PM	...
V-4	48C124220	Transistor, type 2N145, 6PM	...
V-5	48C124219	Transistor, type 2N145, 6PM	...
MECHANICAL PARTS			
E-1	144635579	Insulator, chassis	.03
E-2	137196	Screw machine, 4-40 x 1/8 (nominal)	.01
E-3	218635580	Strip, battery conn.	.50
CABINET PARTS			
C-1	168635619	Cabinet Back (5671)	...
C-2	168635619	Cabinet, complete; less grille (5671)	3.75
C-3	426356171	Grille, spring (holds cabinet closed)	...
C-4	19835697	Handle, cabinet; inclu ant.	4.00
C-5	248635520	Knob, tuning	.70
C-6	248635484	Knob, vol.	.25
C-7	457768	Blivet, 1/2 x 1/8 (mounts handle spring)	.01
C-8	28124332	Screw machine, 4-40 x 1/4 (mounts)	.02
C-9	346355525	Screw, tuning knob retaining	.25
C-10	424635566	Spring, handle	.10
ELECTRICAL PARTS			
C-1	218635410	Capacitor, variable; 20 pf	2.45
C-2	218635398	Capacitor, cer disc; .04 mf 10V	.25
C-3	218635404	Capacitor, cer disc; .01 mf 10V	.25
C-4	218635404	Capacitor, cer disc; .01 mf 10V	.25
C-5	218635404	Capacitor, cer disc; .01 mf 10V	.25
C-6	218635404	Capacitor, cer disc; .01 mf 10V	.25
C-7	218635404	Capacitor, cer disc; .01 mf 10V	.25
C-8	218635404	Capacitor, cer disc; .01 mf 10V	.25
C-9	218635404	Capacitor, cer disc; .01 mf 10V	.25
C-10	218635404	Capacitor, cer disc; .01 mf 10V	.25
C-11	218635404	Capacitor, cer disc; .01 mf 10V	.25
C-12	218635399	Capacitor, mid mica; 300 mf 500V	.50
C-13	218635406	Capacitor, electrolytic; 12 mf 6V	1.20
C-14	218635399	Capacitor, cer disc; .04 mf 10V	.45
C-15	218635409	Capacitor, electrolytic; 20 mf 10V	1.25
C-16	218635409	Capacitor, electrolytic; 20 mf 10V	1.25
C-17	218636014	Capacitor, cer disc; 2 mf 10V	.50
E-1	118635488	Jack, earphone	.85
E-2	508635397	Speaker, PM 2-3/4"; 14 ohm VC	5.85
L-1	248635394	See Handle Assm	1.65
L-2	248635394	Coil, 600	1.65
Resistors - Note: All resistors are insulated carbon type unless otherwise specified			
R-1	6R6031	100,000 10% 1/2W	.10
R-2	6R6038	1500 10% 1/2W	.10
R-3	6R6037	22,000 10% 1/2W	.10
R-4	6R6037	22,000 10% 1/2W	.10
R-5	6R6040	4700 10% 1/2W	.10
R-6	6R6039	2200 10% 1/2W	.10
R-7	6R6040	4700 10% 1/2W	.10
R-8	6R6040	4700 10% 1/2W	.10
R-9	6R6037	22,000 10% 1/2W	.10
R-10	6R6037	22,000 10% 1/2W	.10
R-11	6R6037	22,000 10% 1/2W	.10
R-12	6R6039	1000 10% 1/2W	.10
R-13	6R6039	3900 10% 1/2W	.10
R-14	6R6039	3900 10% 1/2W	.10
R-15	6R6040	31,000 10% 1/2W	.10

PRICES SUBJECT TO CHANGE WITHOUT NOTICE  
New Item, Appears in any List for First Time  
\*plus Federal Excise Tax at Current Rate  
\*\*Prices Furnished Upon Request



NOTES:  
Capacitors - Decimal values in MF, all others in MF unless otherwise specified.  
- In MF unless otherwise specified.  
Voltages - Measured from point indicated by braided lead (ground) with a VTVM. No signal input, vol. at max.  
Tuning range - 550 to 1620 Kc.  
IF - 455 Kc.  
Use either a gait of 2N146's for the 1st and 2nd IF amplifiers or a 2N147 for the 1st IF AMP and a 2N145 for the 2nd IF AMP. Use no other combinations.  
Resistances measured with transistor out of associated circuit.

HOME RADIO

- MODELS CHASSIS  
 6X28B HS-638  
 6X28N HS-638  
 6X28P HS-638  
 6X28W HS-638

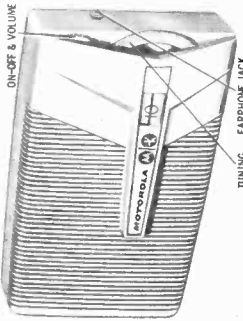
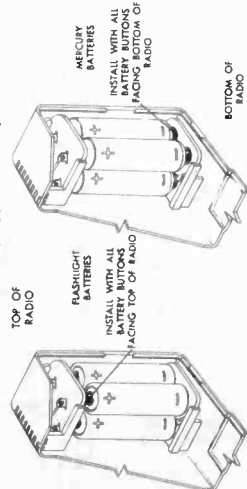
Power 8 Series

SUPERSEDES 6X28 PRELIMINARY SERVICE MANUAL PART NO. 68P642568

GENERAL INFORMATION

**TYPE** - Pocket type portable superheterodyne radio using a plated panel chassis, six transistors, and two radio tubes. An earphone jack is provided on side of radio; in series of earphone automatically disconnects speaker for private listening. A 2000 ohm accessory earphone (Motorola Part Number 50K640710 or 50K641488) is available through Motorola Dealers or Distributors.

**POWER SUPPLY** - Operates from four 1-1/2 volt batteries; use four of the following or equivalent:  
 Standard Flashlight Types - Eveready 015, Ray-O-Vac TLP or 7R, Burgess 930  
 Mercury Type - Mallory ZM-9



6X28 SERIES  
 TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TRANSISTOR COMPLEMENT -

Ref. No.	Type	Function
V1	2N412	Converter
V2	2N410	1st IF amp
V3	2N410	2nd IF amp
V4	*2N362, 2N408, 2N591 or 2N591-6M	Driver
V5	2N408	Power amp
V6	2N408	Power amp

\*See Replacement Parts List for replacement

INSTALLATION OF FLASHLIGHT OR MERCURY BATTERIES

Chassis Coding	Changes
HS-638A	Original chassis
HS-638B	C-12 (6 mf) changed to .08 mf and R-15 (6.8K) eliminated. This change was incorporated to reduce microphonics.
HS-638C	A jumper was added between the mounting lugs of T1 and T3; this was done to insure good continuity between the chassis ground points.
HS-638D	R-21 (390K) added across the primary of T-1

SERVICE NOTES

- When servicing this radio, probing with a screwdriver (checking for "clicks" from various points) must be avoided, because the transistors are susceptible to damage from this type of check. If the transistor BASE electrode is shorted to ground (either directly or through any other path) the BASE bias will be altered, allowing excessive current to flow through the transistor, causing permanent damage.
- Do not service the chassis on a metal plate because of the possibility of a short circuit.

CIRCUIT DESCRIPTION

- The circuit of this chassis is conventional - there are no built-in resistors or capacitors. Leads are plated on both sides of the chassis base, thereby replacing the usual connecting wires and making wiring more uniform.
  - The metal plating extends through all the holes on the chassis, connecting circuits on the front with those on the rear.
  - Reference to the chassis photographs, plated panel wiring diagrams, schematic diagram, and to chassis will permit the circuit to be traced easily.
- NOTE: To facilitate servicing, phantom views showing plated panel wiring of both sides of the chassis plus location

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part. Electronic parts of equivalent rating are not necessarily of equivalent standards. The components listed in this Service Manual are selected for reliability and applicability to the specific circuits involved. For maximum customer satisfaction and to insure that the exact Motorola parts replacement.

Ref. No.	Part Number	Description
C-1	19B640095	Capacitor, variable: 2 gang (mounts with 19B640095 which is mounted by means of 19B640095) including 19B640095, also order three 4-40 x 1/8 screws - Part No. 38122377
C-2	21B635399	Capacitor, cer disc: .04 mf 10V
C-3	21B637258	Capacitor, cer disc: .01 mf 10V
C-4	21B640366	Capacitor, electrolytic: .01 mf 3V
C-5	21B640366	Capacitor, cer disc: .01 mf 10V
C-6	21B640366	Capacitor, cer disc: .01 mf 10V
C-7	21B640366	Capacitor, cer disc: .01 mf 10V
C-8	21B640366	Capacitor, cer disc: .01 mf 10V
C-9	21B640366	Capacitor, cer disc: .01 mf 10V
C-10	21B640366	Capacitor, cer disc: .01 mf 10V
C-11	21B640366	Capacitor, cer disc: .01 mf 10V
C-12	21B640366	Capacitor, electrolytic: .04 mf 10V or 21B642443
C-13	21B640366	Capacitor, cer disc: .01 mf 10V (Prod Change HS-638B)
C-14	23B639917	Capacitor, electrolytic: 25mf/10V; 50mf/10V (Note: Some sets used separate electrolytics - see below)
C-14A	23B637758	Capacitor, electrolytic: 25 mf/3V (used with 23B635407 in some sets)
C-14B	23B635407	Capacitor, electrolytic: 50mf/10V (used with 23B637758 in some sets)
E-1	48K640754	Crystal Diode
E-2	48K640754	Jack, earphone
E-3	50B639916	Speaker, magnetic: 3000 Z at 1 Kc
L-1	24C640551	Ferrite Antenna
L-2	24C640552	Coil, osc
R-1	8K121620	Resistor: All resistors are insulated carbon type unless otherwise specified.
R-2	8K121620	3800 10% 1/2W
R-3	8K60400	680 10% 1/2W
R-4	8K12535	39,000 10% 1/2W
R-5	8K12535	39,000 10% 1/2W
R-6	8K127633	4700 10% 1/2W
R-7	8K121931	3900 10% 1/2W
R-8	8K127005	5600 10% 1/2W
R-9	8K127005	5600 10% 1/2W
R-10	8K122802	22,000 10% 1/2W
R-11	18B640084	Vol Control & Switch: 10,000Ω
R-12	8K118931	8200 10% 1/2W
R-13	8K127005	56,000 10% 1/2W
R-14	8K118930	6800 10% 1/2W (used on HS-638A only)
R-15	8K118930	6800 10% 1/2W
R-16	8R6326	100 10% 1/2W
R-17	8R6326	100 10% 1/2W
R-18	8K124668	10 10% 1/2W

Ref. No.	Part Number	Description
R-19	8R6089	2200 10% 1/2W
R-20	8R6089	2200 10% 1/2W
R-21	6R5846	390,000 10% 1/2W (Prod Change HS-638D)
T-1	24Y640365	Transformer, 1st IF: 455 Kc
T-2	24C640364	Transformer, 2nd IF: 455 Kc
T-3	24K640389	Transformer, 3rd IF: 455 Kc
T-4	25B640348	Transformer, driver
V-1	48L128098	Transistor, type 2N412: PNP (converter)
V-2	48L128098	Transistor, type 2N410: PNP (1st IF)
V-3	48L128098	Transistor, type 2N410: PNP (2nd IF)
V-4	48L124316	Transistor, type 2N408 or 2N591 (driver); Replaces 2N408, 2N408 & 2N591
V-5	48L128094	Transistor, type 2N408: PNP (per asp)
V-6	48L128094	Transistor, type 2N408: PNP (per asp)

MECHANICAL PARTS

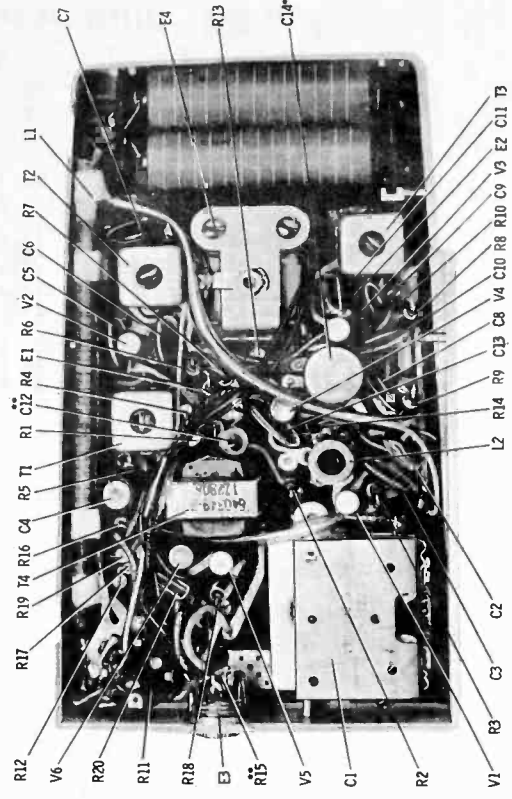
19B640708 Battery Contact Base - Use all components found on original board, and mention model number of this part in list, order by complete part number found in this part and mention model number of this set.  
 38122377 Screw, machine: 4-40 x 1/8 (source C1 to plated panel board - in some sets)

CABINET PARTS

19B642021 Cabinet Back: Blue (6X28B)  
 19B642022 Cabinet Back: Mocha (6X28B)  
 19B642023 Cabinet Back: Pink (6X28B)  
 19B642024 Cabinet Back: Antique White (6X28B)  
 19B642025 Cabinet Back: Blue; incl dial crystal (6X28B)  
 19B642026 Cabinet Front: Mocha; incl dial crystal (6X28B)  
 19B642027 Cabinet Front: Pink; incl dial crystal (6X28B)  
 19B642028 Cabinet Front: Antique White; incl dial crystal (6X28B)  
 61B640057 Crystal (6X28B)  
 36C640080 Knob, tuning  
 26B640051 Knob, vol  
 38121331 Screw, machine: 4-40 x 3/16 (spr stg)  
 487618 Washer, flat: (83 mtg)

LIMITED REPLACEMENT PARTS

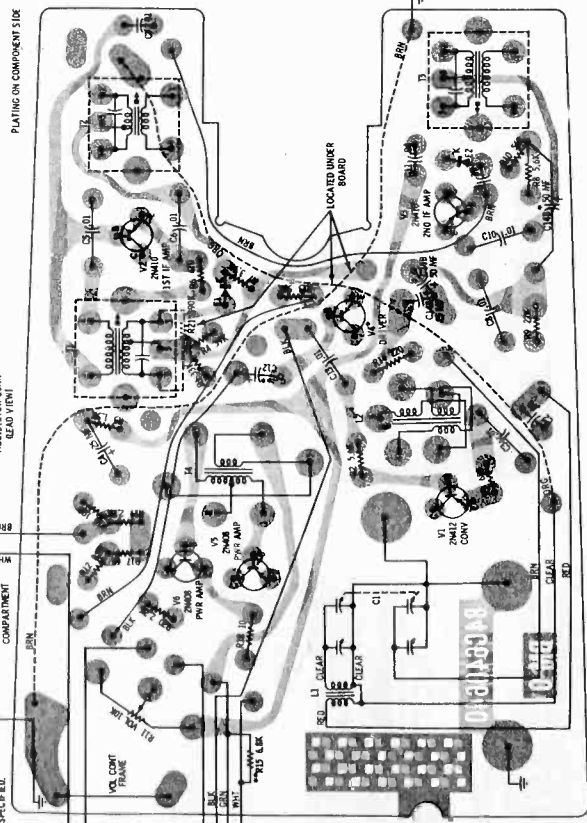
NOTE: The volume of replacement on the following parts is small, consequently, it is suggested that ordering be made in quantities of 100 or more. See Note at bottom of this page list.  
 13M128076 Cabinet dial crystal (2 or 3)  
 74B40087 Bracket, spr mtg  
 35B640053 Cloth, grille



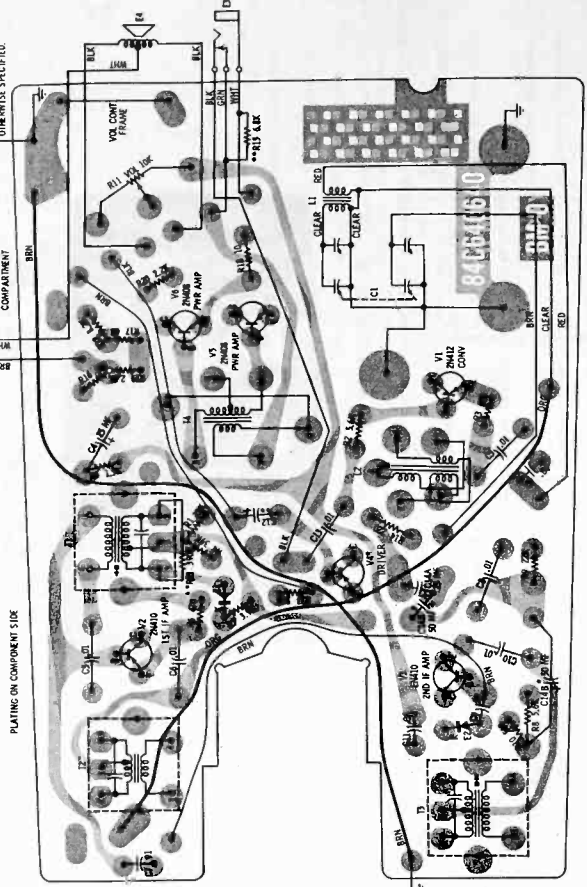
\*SEE REPLACEMENT PARTS LIST \*\*SEE PROD. CHANGES

PARTS LOCATION

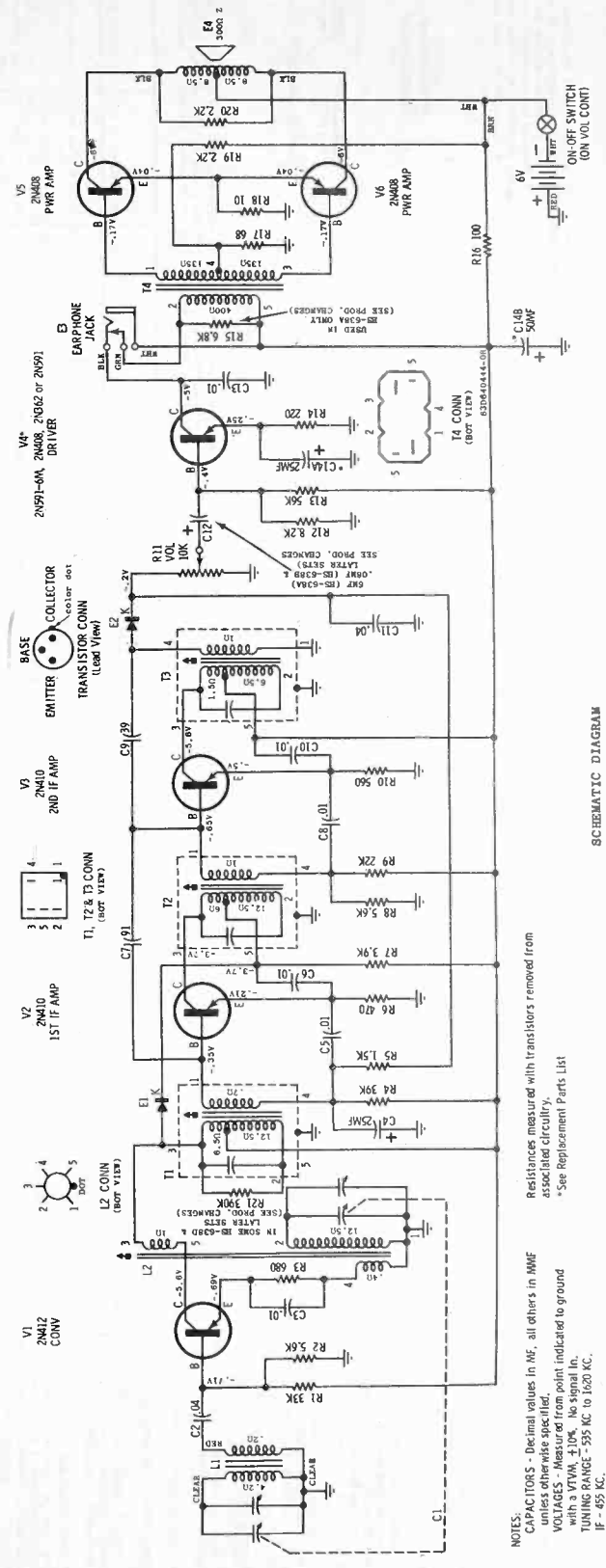
NOTES:  
 \*SEE REPLACEMENT PARTS LIST.  
 \*\*SEE PRODUCTION PART LIST.  
 CAPACITORS: DECIMAL VALUES IN MF. ALL OTHERS IN MMF UNLESS OTHERWISE SPECIFIED.  
 ON SCHEMATIC  
 ON-VOL. CONT.  
 BATTERY COMPARTMENT  
 ON SCHEMATIC  
 ON-VOL. CONT.  
 BATTERY COMPARTMENT



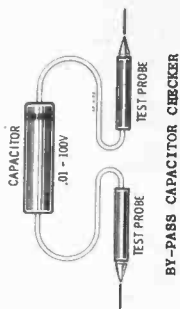
PLATED PANEL WIRING AS VIEWED FROM TOP (COMPONENT SIDE)



PLATED PANEL WIRING AS VIEWED FROM BOTTOM



One of the causes of weak receivers is open by-pass capacitors. To speed the checking of by-passes, a capacitor (shown in illustration) can be constructed. When using this aid, the chassis suspected by-pass capacitor. If by-pass is open, the output will increase. When checking in the audio section, an increase may not occur but the pitch of the sound will change.



defects can be located by resistance checks. An alternate process of locating a defective stage is by injecting a signal from stage to stage. A signal generator with a 400 cycle output can be used for this purpose as it has a source of RF and audio signals for checking the respective stages. Signals are injected between the transistor base electrode of each stage and chassis until the defective stage is located. Then the defective component is located by resistance measurements. This method will locate defects in stages caused by faults in the signal path in cases where the defect does not show up as a voltage reading difference. For example, a noise generator (see Note 1, Dec 1957 issue of Motorola Service News or Part No. 68P641210 Noise Generator Construction sheet) has been devised to replace the signal generator. The advantage of its use is the elimination of having to change its frequency when checking from the audio range to the RF stages. This is accomplished by having an output waveform of such characteristic that the fundamental frequency falls in the audio range, but contains strong harmonics usable in the RF stages.

**ALIGNMENT**

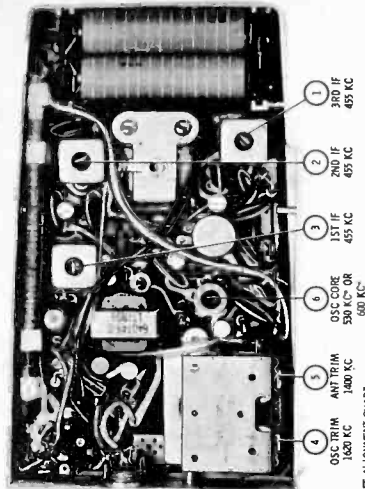
Connect an output meter across the speaker (black leads). Set volume to maximum. Attenuate signal generator output to maintain 4 volts on output meter at all times to prevent overloading. Radio should be aligned while chassis is in cabinet. To adjust gang trimmers, a paper clip, formed into an "L" shape can be used; flatten the shorter portion of the "L" to fit the gang screws.

STEP	GENERATOR CONNECTION	GENERATOR FREQUENCY (400 cycle mod)	GANG SETTING	ADJUST	REMARKS
1.	Ant section of gang thru .1 mf & ground	455 Kc	Fully open	1, 2 & 3*	Adjust for maximum**
2.	Radiation loop**	1620 Kc	Fully open	4	Adjust for maximum.
3.	Radiation loop**	1400 Kc	Tune for max	5	Adjust for maximum.
NOTE: Do not perform the following steps unless the oscillator core has been tampered with or associated components have been replaced. BEFORE PROCEEDING, SET OSCILLATOR TRIMMER 1/4 TURN FROM ITS TIGHT POSITION.					
4.	Radiation loop**	530 Kc	Fully closed	6	Adjust for maximum.
5.	Radiation loop**	1620 Kc	Fully open	4	Adjust for maximum.
6.	Repeat steps 4 and 5 until oscillator covers required range; step 5 should be last adjustment.				
7.	Radiation loop**	1400 Kc	Tune for max	5	Adjust for maximum.
8.	Radiation loop**	600 Kc	Tune for max	6	Adjust for maximum while rocking gang**

\*See Production Change HS-638D

\*\*Connect generator output across 5" diameter, 5-turn loop and couple inductively to receiver loop. Keep loops at least 1 1/2" apart.

\*\*\*If large adjustment is required, it will be necessary to repeat steps 4 through 8.



\*SEE ALIGNMENT CHART  
ALIGNMENT POINT LOCATIONS

**CARE OF CABINET**  
Cabinet may be cleaned by using a soft, dry cloth; do not use any polishes.

**TRANSISTOR REPLACEMENT**

When replacing a transistor, the heat must be carried away from the transistor to prevent heat damage to the transistor.

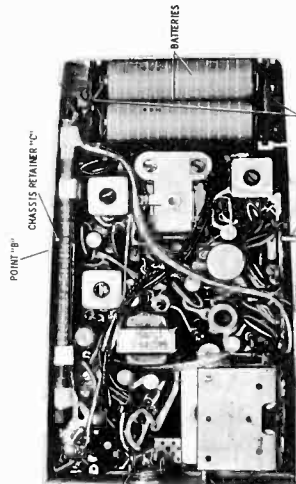
- Grasp transistor leads with a pair of long-nose pliers and dip the area in a soldering pot (such as that furnished by Motorola Parts Order Department) and remove transistor. In the absence of the recommended soldering pot, use a conventional high-heat soldering iron. However, perform the work rapidly since excessive heat will damage the plated panel board and components.
- Lift transistor off of the chassis with the pliers.
- Clean all the solder from the connecting holes.
- Place new transistor into the connecting holes (when replacing a transistor, be sure it is wired into the chassis correctly--see Plated Panel Wiring Diagram).
- Grasp transistor leads with long-nose pliers to dissipate the heat, avoid soldering the transistor to its connecting holes. (Use conventional high-heat soldering iron, however, perform the work rapidly since excessive heat will damage the plated panel board and components).

**TRANSISTOR CHECK**

Substituting a known good transistor for a suspected one is the simplest and most positive method of checking transistors.

**EMITTER RESISTOR VOLTAGES**

Voltages across the emitter resistors are provided on the schematic as an additional aid in servicing this receiver. A check of these voltages will indicate whether or not a transistor stage is functioning normally.



**REMOVAL OF PLATED PANEL CHASSIS**

**TRANSISTOR SERVICING INFORMATION**

In servicing transistor receivers, it will be found there are two main sources of failure, the bias networks and the signal paths. These sources can be checked with equipment now being used to service tube type receivers. The transistors can be checked by substitution or elimination. When a receiver is defective, the first step is to locate the defective stage. This is accomplished by checking the emitter resistor voltage drop or by injecting a signal from stage to stage. Missing the emitter resistor voltage drops will locate defects in the bias network or transistor. Signal injection will locate defects in the signal paths. A defective stage can be located by checking the voltage drops across the emitter resistors against those values shown on the schematic. These voltage drops give an in-

3. When making circuit resistance checks, transistor shunting paths may exist, which can, in some cases, cause erroneous readings or possible damage to transistors. Therefore, when checking resistances, it may be necessary to remove one or more transistors from associated circuits.

**COMPONENT REPLACEMENT**

1. Refer to "Plated Circuit Chassis Servicing Techniques" Manual (Motorola Part No. 68P639536) for recommended methods to lift chassis.

2. Volume Control Replacement - remove the defective volume control by first removing the chassis (see PLATED PANEL CHASSIS REMOVAL). Dip the control and shaft into a soldering pot (such as furnished by Motorola Parts Order Department) and lift the volume control off the chassis. Clean all the solder from the connecting holes with a small brush. Solder new control in place with a soldering iron. DO NOT DIP THE NEW CONTROL INTO A SOLDERING POT BECAUSE THE CONTROL SHAFT WILL BE DAMAGED BY SOLDER.

**PLATED PANEL CHASSIS REMOVAL**

- Remove cabinet back by inserting a coin into the cover opening slot and twisting until cabinet back is free.
- Remove earphone jack mounting nut and washer.
- From inside cabinet, remove batteries.
- Remove battery contact panels by pulling straight out (note position of rounded corners on panels to insure correct positioning when chassis is replaced later).
- Spread cabinet slightly at top and bottom (points A & B) until chassis is free of chassis retainers (C & D) at top and bottom of cabinet; then lift up chassis at speaker end of cabinet until it clears the chassis retainers (C & D - see REMOVAL OF PLATED PANEL CHASSIS detail).

6. Lift chassis up until it is slightly above speaker, then slide chassis over speaker, so that the chassis is free of chassis retainers (E & F) below earphone jack.

7. From under chassis, loosen speaker mounting screws until speaker mounting brackets are loose enough so that the speaker can be removed.

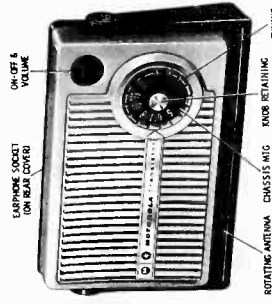
8. Lift chassis, speaker, and battery contact panels out of cabinet.

9. Before replacing chassis, mount speaker, then insert tuning gang end of chassis into cabinet, spread points A & B of cabinet, then lower other end of chassis into place under chassis retainers C & D (make certain battery leads are dressed under and away from antenna).

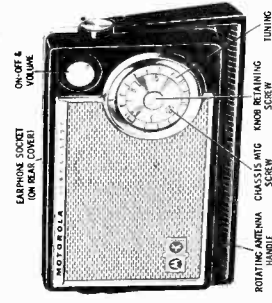
10. Place battery contact panels back into the cabinet slots with rounded corners of each panel facing in the same direction as originally found.

HOME RADIO

- MODELS**  
 6X31C Cerulean Blue & Beige  
 6X31N Beige  
 6X31R Red & Beige  
 6X32E Navy Blue
- CHASSIS**  
 HS-564  
 HS-564  
 HS-564  
 HS-563



6X31 SERIES

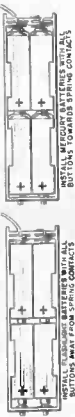


6X32 SERIES

GENERAL INFORMATION

**TYPE** - Pocket type portable, superheterodyne radio using a plated circuit board, six transistors. An earphone socket is provided on rear of radio; insertion of earphone automatically disconnects speaker. A 15 ohm earphone for this radio (Motorola Part No. D-196) is available through Motorola distributors.

**POWER SUPPLY** - Operates from four 1-1/2 volt flashlight batteries; use four of the following or equivalent:  
 Standard Flashlight Type - Eveready 1015, Ray-O-Vac 7LP or PK, Burgess Z, Mallory M45  
 Mercury Type - Mallory ZM-9



SERVICE NOTES

- CIRCUIT DESCRIPTION**
- The circuit of this chassis is conventional - there are no built-in resistors or capacitors. Leads are plated on both sides of the chassis base, thereby replacing the usual connecting wires and making wiring more uniform.
  - The metal plating extends through all the holes on the chassis, connecting circuits on the front with those on the rear.
  - Reference to the chassis photographs, plated panel wiring diagram, schematic diagram, and to chassis will permit the circuit to be traced easily.
- SERVICING PRECAUTIONS**
- When servicing this radio, probing with a screwdriver (checking for "clicks" from various points) must be avoided, because the transistors are susceptible to damage from this type of check. If the transistor BASE electrode is shorted to ground (either directly or through any path) the BASE bias will be altered, allowing excessive current to flow through the transistor, causing permanent damage. ON PNP TYPE TRANSISTORS (USED IN DRIVER & OUTPUT STAGES) THE BASE ELECTRODE IS CONNECTED TO THE SHELL OF THE TRANSISTOR, THEREFORE, CARE

SERVICE NOTES

- SHOULD BE TAKEN NOT TO SHORT THE SHELL OF THIS TYPE TO GROUND.
- Do not service the chassis on a metal plate because of the possibility of a short circuit.
  - When making circuit resistance checks, all transistors should be removed from circuits to avoid erroneous readings or possible damage to transistors.

COMPONENT REPLACEMENT

- Refer to "Plated Circuit Chassis Servicing Techniques" manual (Motorola Part No. 68P63636) for recommended tools and procedures to be used when servicing Motorola plated circuit chassis.
- Volume control replacement - remove the defective volume control by first removing the chassis (see CHASSIS REMOVAL). Dip the control and shaft into a soldering pot (such as furnished by Motorola Parts Orders Department) and lift the volume control off the chassis with the solder from the connecting noise abating iron. DO NOT DIP the volume control into a soldering pot BECAUSE THE CONTROL SHAFT WILL BE DAMAGED BY SOLDER.

CHASSIS REMOVAL

- Pull the volume control knob from front of radio.
- Remove tuning knob retaining screw from the tuning knob and remove the tuning knob (see cover photo).
- Remove chassis mounting screw from under tuning knob (see cover photo).
- Open rear cover and turn handle perpendicular to the plated chassis.
- Grasp handle near one of its two mounting bushings and pull out side of cabinet until the control shaft is on the mounting bushing. Turn the handle until the control shaft is on the handle and chassis slightly out of cabinet. Perform the same procedure on the other mounting bushing. Then lift handle, chassis and speaker plate out of cabinet.
- The plated chassis is separated from the speaker mounting plate as follows: unsolder the wire that connects from the gang to the plated chassis. Remove speaker, earphone jack, antenna & battery leads from plated chassis. Then unsolder one at a time the four chassis mounting support lugs.

HANDLE REPLACEMENT

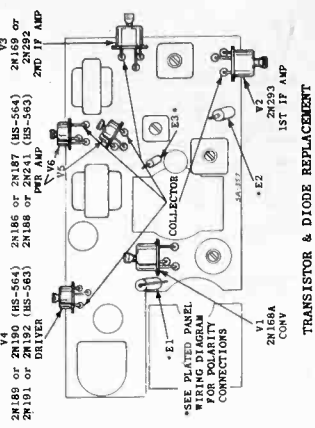
- Remove chassis and speaker mounting plate from cabinet as described under CHASSIS REMOVAL.
- Unsolder antenna leads from chassis.
- Turn handle perpendicular to chassis and slide out of handle clips.

CARE OF CABINET

Cabinet and handle may be cleaned by using a soft, dry cloth; do not use any polishes.

TRANSISTOR REPLACEMENT

- When replacing a transistor, the heat must be carried away from the transistor to prevent heat damage to the transistor.
- Grasp transistor leads with a pair of long-nose pliers to dissipate the heat, and dip into a soldering pot (such as that furnished by Motorola Parts Order Department).
  - Lift transistor off of the chassis with the pliers.



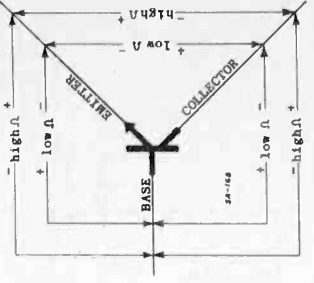
TRANSISTOR & DIODE REPLACEMENT

- Clean all the solder from the connecting holes.
  - Place new transistor into the connecting holes.
  - Grasp transistor leads with long-nose pliers to dissipate the heat, and solder the transistor to its connecting holes.
- When replacing a transistor, be sure it is wired into the chassis as shown in the illustration. The collector lead is spaced from emitter and base leads, thus serving to identify leads. See illustration.

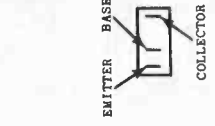
TRANSISTOR CHECK

The transistors used in this radio can be expected to give unusually long trouble-free life, however, transistor checks may be made as follows: a coarse check of the transistor can be made with an ohmmeter (TO PREVENT DAMAGE TO THE TRANSISTOR, USE DOES NOT EXCEED 7.5 INTERNAL BATTERY VOLTS; the ability of the transistor to resist current in one direction, and to resist current flow in the opposite direction. The resistance in the conduction direction is low in relation to the resistance in the non-conduction direction. The two illustrations show the relative resistances for both the PNP type transistor and the NPN type transistors. The polarity signs shown in the illustration indicate the polarity of the ohmmeter leads. Transistor must be disconnected from circuit during check.

A more positive check of the transistor is to replace a suspected transistor with one known to be good.

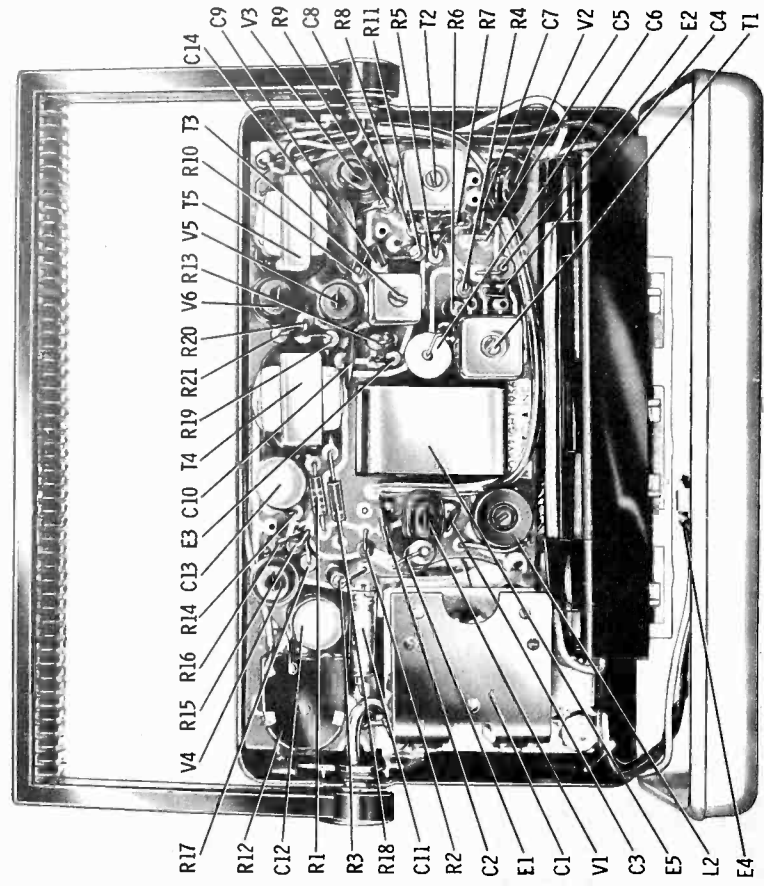


PNP TYPES 2N168A, 2N169, 2N292, 2N293

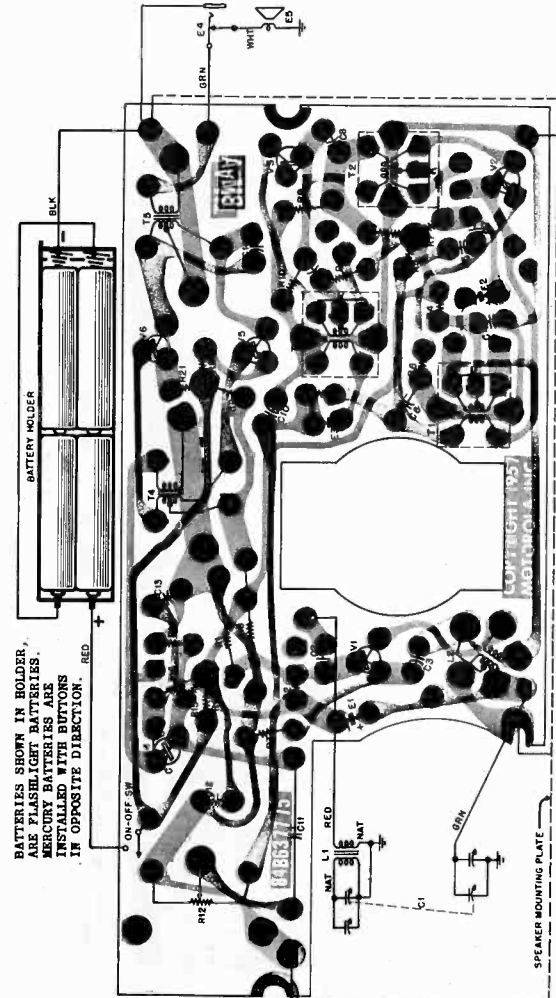


PNP TYPES 2N186, 2N187, 2N188, 2N189, 2N190, 2N191, 2N192, 2N241

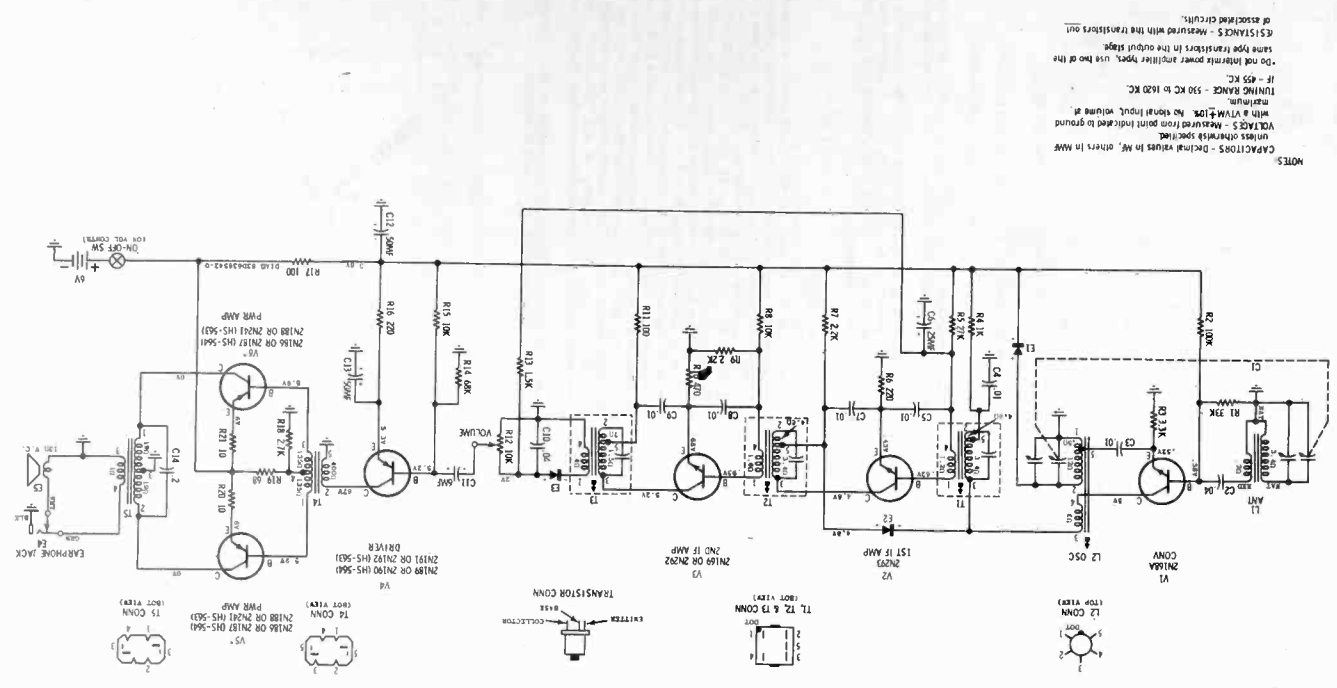
OHMMETER METHOD OF MAKING COARSE TRANSISTOR CHECKS



PARTS LOCATIONS



PLATED PANEL WIRING



SCHEMATIC DIAGRAM

NOTES:

CAPACITORS - Decimal values in MF, others in MWF.

VALUES - Measured from point indicated to ground.

MAXIMUM - with a VTM-10K. No signal input, volume at maximum.

TUNING RANGE - 550 KC to 1620 KC.

IF - 455 KC.

Do not interchange power amplifier tubes, use two of the same type transistors in the output stage.

RESISTANCES - Measured with the transistors out of associated circuits.

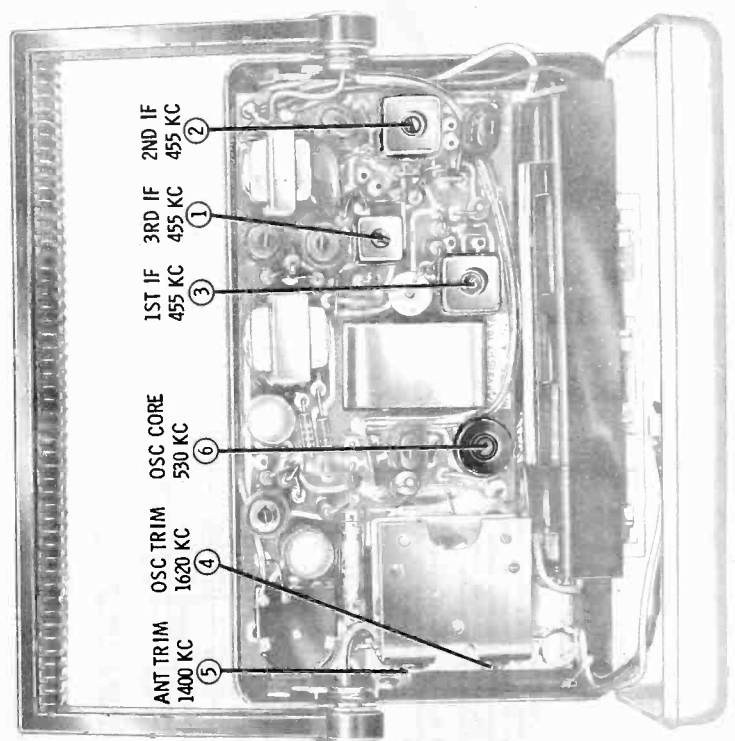


ALIGNMENT

Connect an output meter across the green & black leads of the earphone jack (speaker voice coil). Set volume to maximum. Attenuate signal generator output to maintain 8 volts on output meter. All steps to prevent overloading. Radio should be aligned while chassis is in cabinet. To adjust gang trimmers, a paper clip, formed into an "L" shape can be used. Flatten the shorter portion of the "L" to fit the gang screws.

STEP	GENERATOR FREQUENCY (400 cycle mod)	GANG SETTING	ADJUST	REMARKS
1.	455 Kc	Fully open	1, 2 & 3	Adjust for maximum.
2.	1620 Kc	Fully open	4	Adjust for maximum.
3.	1400 Kc	Tune for max	5	Adjust for maximum.
4.	450 Kc	Fully closed	6	Adjust for maximum.
5.	1620 Kc	Fully open	4	Adjust for maximum.
6.	Repeat steps 4 and 5 until oscillator covers required range; step 5 should be last adjustment.			
7.	1400 Kc	Tune for max	5	Adjust for maximum.

\*Connect generator output across 5" diameter, 5 turn loop and couple inductively to radio loop. Keep loops at least 12" apart.



ALIGNMENT LOCATIONS

REPLACEMENT PARTS LIST

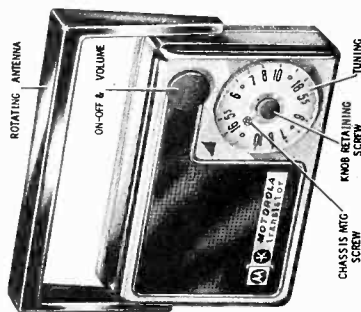
NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description	List Price
<b>ELECTRICAL PARTS</b>			
C-1	198635410	Capacitor, variable: 2 gang, 10V	2.75
C-2	218635399	Capacitor, cer disc: .01 mf 10V	.25
C-3	218635404	Capacitor, cer disc: .01 mf 10V	.25
C-4	218635404	Capacitor, cer disc: .01 mf 10V	.25
C-5	218635404	Capacitor, cer disc: .01 mf 10V	.25
C-6	218635404	Capacitor, cer disc: .01 mf 10V	.25
C-7	218635404	Capacitor, cer disc: .01 mf 10V	.25
C-8	218635404	Capacitor, cer disc: .01 mf 10V	.25
C-9	218635404	Capacitor, cer disc: .01 mf 10V	.25
C-10	218635404	Capacitor, cer disc: .01 mf 10V	.25
C-11	218635404	Capacitor, cer disc: .01 mf 10V	.25
C-12	218635404	Capacitor, cer disc: .01 mf 10V	.25
C-13	218635404	Capacitor, cer disc: .01 mf 10V	.25
C-14	218635404	Capacitor, cer disc: .01 mf 10V	.25
E-1	48K635691	Crystal Diode	1.50
E-2	48K635691	Crystal Diode	1.50
E-3	48K635691	Crystal Diode	1.50
E-4	48K635691	Crystal Diode	1.50
E-5	48K635691	Crystal Diode	1.50
J-1	48K635691	Jack, earphone, 2-3/4"; 13 ohm VC	3.75**
L-1	48K635691	See Handle Assembly	1.25
L-2	48K635691	See Handle Assembly	1.25
R-1	48K635691	Resistors - Note: All resistors are insulated carbon type unless otherwise specified	
R-2	48K635691	100,000 10% 1/2W	10
R-3	48K635691	100,000 10% 1/2W	10
R-4	48K635691	3300 10% 1/2W	10
R-5	48K635691	1000 10% 1/2W	10
R-6	48K635691	220 10% 1/2W	10
R-7	48K635691	220 10% 1/2W	10
R-8	48K635691	220 10% 1/2W	10
R-9	48K635691	220 10% 1/2W	10
R-10	48K635691	220 10% 1/2W	10
R-11	48K635691	220 10% 1/2W	10
R-12	48K635691	220 10% 1/2W	10
R-13	48K635691	220 10% 1/2W	10
R-14	48K635691	220 10% 1/2W	10
R-15	48K635691	220 10% 1/2W	10
R-16	48K635691	220 10% 1/2W	10
R-17	48K635691	220 10% 1/2W	10
R-18	48K635691	220 10% 1/2W	10
R-19	48K635691	220 10% 1/2W	10
R-20	48K635691	220 10% 1/2W	10
R-21	48K635691	220 10% 1/2W	10
T-1	48K635691	Transformer, 2nd IF: 455 Kc	2.30
T-2	48K635691	Transformer, 3rd IF: 455 Kc	2.30
T-3	48K635691	Transformer, 2nd IF: 455 Kc	2.30
T-4	48K635691	Transformer, 3rd IF: 455 Kc	2.30
T-5	48K635691	Transformer, output	3.10
NOTE: See TRANSISTOR COMPLIMENT under GENERAL INFORMATION			
V-1	48K635691	Transistor, type 2N168A; NPN (converter)	6.80
V-2	48K635691	Transistor, type 2N293; NPN (list IP)	6.55
V-3	48K635691	Transistor, type 2N293; NPN (2nd IF)	6.30
V-4	48K635691	Transistor, type 2N189; PNP (driver)	4.85
V-5	48K635691	Transistor, type 2N189; PNP (driver)	4.85
or			
V-6	48K635691	Transistor, type 2N190; PNP (driver)	4.85
V-7	48K635691	Transistor, type 2N190; PNP (driver)	4.85
<b>MECHANICAL PARTS</b>			
B-1	48K635691	Battery Retainer Asses: complete	.70
B-2	48K635691	Battery Retainer Asses: complete	.70
B-3	48K635691	Battery Retainer Asses: complete	.70
B-4	48K635691	Battery Retainer Asses: complete	.70
B-5	48K635691	Battery Retainer Asses: complete	.70
B-6	48K635691	Battery Retainer Asses: complete	.70
B-7	48K635691	Battery Retainer Asses: complete	.70
B-8	48K635691	Battery Retainer Asses: complete	.70
B-9	48K635691	Battery Retainer Asses: complete	.70
B-10	48K635691	Battery Retainer Asses: complete	.70
B-11	48K635691	Battery Retainer Asses: complete	.70
B-12	48K635691	Battery Retainer Asses: complete	.70
B-13	48K635691	Battery Retainer Asses: complete	.70
B-14	48K635691	Battery Retainer Asses: complete	.70
B-15	48K635691	Battery Retainer Asses: complete	.70
B-16	48K635691	Battery Retainer Asses: complete	.70
B-17	48K635691	Battery Retainer Asses: complete	.70
B-18	48K635691	Battery Retainer Asses: complete	.70
B-19	48K635691	Battery Retainer Asses: complete	.70
B-20	48K635691	Battery Retainer Asses: complete	.70
B-21	48K635691	Battery Retainer Asses: complete	.70
B-22	48K635691	Battery Retainer Asses: complete	.70
B-23	48K635691	Battery Retainer Asses: complete	.70
B-24	48K635691	Battery Retainer Asses: complete	.70
B-25	48K635691	Battery Retainer Asses: complete	.70
B-26	48K635691	Battery Retainer Asses: complete	.70
B-27	48K635691	Battery Retainer Asses: complete	.70
B-28	48K635691	Battery Retainer Asses: complete	.70
B-29	48K635691	Battery Retainer Asses: complete	.70
B-30	48K635691	Battery Retainer Asses: complete	.70
B-31	48K635691	Battery Retainer Asses: complete	.70
B-32	48K635691	Battery Retainer Asses: complete	.70
B-33	48K635691	Battery Retainer Asses: complete	.70
B-34	48K635691	Battery Retainer Asses: complete	.70
B-35	48K635691	Battery Retainer Asses: complete	.70
B-36	48K635691	Battery Retainer Asses: complete	.70
B-37	48K635691	Battery Retainer Asses: complete	.70
B-38	48K635691	Battery Retainer Asses: complete	.70
B-39	48K635691	Battery Retainer Asses: complete	.70
B-40	48K635691	Battery Retainer Asses: complete	.70
B-41	48K635691	Battery Retainer Asses: complete	.70
B-42	48K635691	Battery Retainer Asses: complete	.70
B-43	48K635691	Battery Retainer Asses: complete	.70
B-44	48K635691	Battery Retainer Asses: complete	.70
B-45	48K635691	Battery Retainer Asses: complete	.70
B-46	48K635691	Battery Retainer Asses: complete	.70
B-47	48K635691	Battery Retainer Asses: complete	.70
B-48	48K635691	Battery Retainer Asses: complete	.70
B-49	48K635691	Battery Retainer Asses: complete	.70
B-50	48K635691	Battery Retainer Asses: complete	.70
B-51	48K635691	Battery Retainer Asses: complete	.70
B-52	48K635691	Battery Retainer Asses: complete	.70
B-53	48K635691	Battery Retainer Asses: complete	.70
B-54	48K635691	Battery Retainer Asses: complete	.70
B-55	48K635691	Battery Retainer Asses: complete	.70
B-56	48K635691	Battery Retainer Asses: complete	.70
B-57	48K635691	Battery Retainer Asses: complete	.70
B-58	48K635691	Battery Retainer Asses: complete	.70
B-59	48K635691	Battery Retainer Asses: complete	.70
B-60	48K635691	Battery Retainer Asses: complete	.70
B-61	48K635691	Battery Retainer Asses: complete	.70
B-62	48K635691	Battery Retainer Asses: complete	.70
B-63	48K635691	Battery Retainer Asses: complete	.70
B-64	48K635691	Battery Retainer Asses: complete	.70
B-65	48K635691	Battery Retainer Asses: complete	.70
B-66	48K635691	Battery Retainer Asses: complete	.70
B-67	48K635691	Battery Retainer Asses: complete	.70
B-68	48K635691	Battery Retainer Asses: complete	.70
B-69	48K635691	Battery Retainer Asses: complete	.70
B-70	48K635691	Battery Retainer Asses: complete	.70

PRICES SUBJECT TO CHANGE WITHOUT NOTICE  
 \*See Item, Appears in any List, See  
 \*Plus Federal Excise Tax at Current Rate

HOME RADIO

MODEL 66T1  
CHASSIS HS-556



GENERAL INFORMATION

**TYPE** - Pocket type portable superheterodyne radio using a plated circuit chassis and six transistors. An earphone socket is provided on rear of radio; insertion of earphone automatically disconnects speaker. A 15 ohm earphone for this radio (Motorola Part No. D-196) is available through Motorola distributors.

**POWER SUPPLY** - Operates from four 1-1/2 volt flashlight or mercury batteries. Use four of the following or equivalent:

Standard Flashlight Type - Eveready 1015, Burgess Z, Ray-O-Vac 7LP or TR

Mercury Type - Mallory ZM-9

TRANSISTOR COMPLEMENT

Ref No.	Type	Part No.	Function
V1	2N172	48C124216	Converter
V2	2N146*	48C124218	Converter
V3	OR 2N145*	48C124220	1st IF amp
V4	OR 2N146*	48C124218	2nd IF amp
V5	OR 2N185 (354)*	48C124219	Driver
V6	OR 2N185 (354)*	48C124219	Power amp
V6	2N185	48C124219	Power amp

\*Some sets use 2 of the 2N146 transistors, others use a 2N145 as 1st IF amp and a 2N147 as the 2nd IF amp;

SERVICE NOTES

- Volume control replacement - remove the defective volume control by first removing the chassis (see CHASSIS REMOVAL). Dip the control shaft into a soldering pot (such as furnished by Motorola Parts Order Department) and lift the volume control off the assembly. Clean all the solder from the connecting holes with a small brush. Solder a new control in place with a soldering iron; DO NOT DIP THE NEW CONTROL INTO A SOLDERING POT BECAUSE THE CONTROL SHAFT WILL BE DAMAGED BY SOLDER.

- IF transformer replacement - when replacing the IF transformers, care should be taken to assure proper replacement types. Some sets use IF's that require an external 390 mmf capacitor (C4, C9, C12), wired across the primary of the transformer; other sets use IF's that have the capacitor built into the base of the transformer and do not require the use of an external capacitor. Although the IF's may be interchanged by either adding or eliminating the 390 mmf capacitor, it is recommended that they be replaced with the same type originally used; check the set's circuit to determine if it uses internal or external capacitor-type IF's.

CHASSIS REMOVAL

- Pull the volume control knob from front of radio.
- Remove tuning knob retaining screw from the tuning knob and remove the tuning knob (see cover photo).
- Remove chassis mounting screw from under tuning knob (see cover photo).
- Open rear cover and turn handle perpendicular to the plated chassis.

TRANSISTOR REPLACEMENT

- Grasp handle near one of its two mounting bushings and pull out from side of cabinet until the round portion of the mounting bushing fits into hole in side of cabinet, then lift this side of handle and slide slightly out of cabinet. Perform the same procedure on the other mounting bushing, then lift handle, chassis and speaker plate out of cabinet.

HANDLE REPLACEMENT

- Remove chassis and speaker mounting plate from cabinet as described under CHASSIS REMOVAL.
- Unsolder antenna leads from chassis and slide out of handle clips.
- Turn handle perpendicular to chassis and slide out of handle clips.

CARE OF CABINET

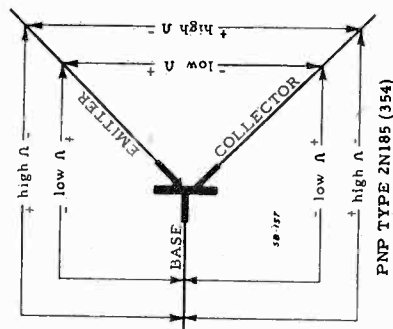
Cabinet and handle may be cleaned by using a soft, dry cloth; do not use any polishes.

TRANSISTOR REPLACEMENT

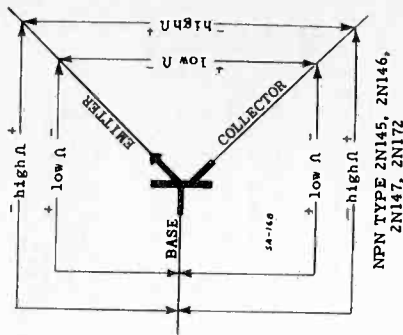
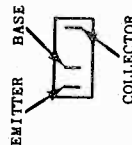
When replacing a transistor, the heat must be carried away from the transistor to prevent heat damage to the transistor.

- Grasp transistor leads with a pair of long-nose pliers to dissipate the heat, and dip into soldering pot (such as that furnished by Motorola Parts Order Department).
- Lift transistor off of the chassis with the pliers.
- Clean all the solder from the connecting holes.
- Place new transistor into the connecting holes.
- Grasp transistor leads with long-nose pliers to dissipate the heat, and solder the transistor to its connecting holes.

When replacing a transistor, be sure it is wired into the chassis as shown in the illustration. The collector lead is



PNP TYPE 2N185 (354)



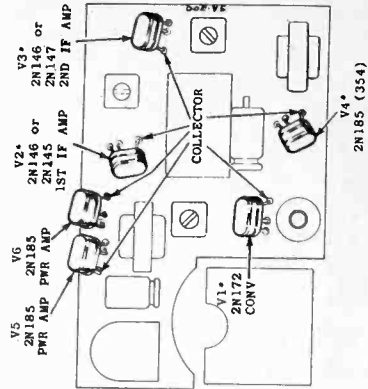
NPN TYPE 2N145, 2N146, 2N147, 2N172

OHMMETER METHOD OF MAKING COARSE TRANSISTOR CHECKS

The transistors used in this radio can be expected to give unusually long trouble-free life. However, transistor checks may be made as follows: a coarse check of a transistor can be made with an ohmmeter (TO PREVENT DAMAGE TO THE TRANSISTOR, USE AN OHMMETER WHOSE INTERNAL BATTERY VOLTAGE DOES NOT EXCEED 7.5 VOLTS). This check measures the ability of the transistor to conduct current in one direction, and to resist current flow in the opposite direction. The resistance in the conduction direction is low in relation to the resistance in the non-conduction direction. The two illustrations show the relative test circuit for both the PNP type transistor and the NPN type transistor. The polarity signs shown in the illustration indicate the polarity of the ohmmeter leads. Transistor must be disconnected from circuit during check.

A more positive check of the transistor is to replace a suspected transistor with one known to be good.

TRANSISTOR REPLACEMENT



\*See TRANSISTOR COMPLEMENT under GENERAL INFORMATION spaced from emitter and base leads, thus serving to identify leads. See illustration.

TRANSISTOR CHECK

The transistors used in this radio can be expected to give unusually long trouble-free life. However, transistor checks may be made as follows: a coarse check of a transistor can be made with an ohmmeter (TO PREVENT DAMAGE TO THE TRANSISTOR, USE AN OHMMETER WHOSE INTERNAL BATTERY VOLTAGE DOES NOT EXCEED 7.5 VOLTS). This check measures the ability of the transistor to conduct current in one direction, and to resist current flow in the opposite direction. The resistance in the conduction direction is low in relation to the resistance in the non-conduction direction. The two illustrations show the relative test circuit for both the PNP type transistor and the NPN type transistor. The polarity signs shown in the illustration indicate the polarity of the ohmmeter leads. Transistor must be disconnected from circuit during check.

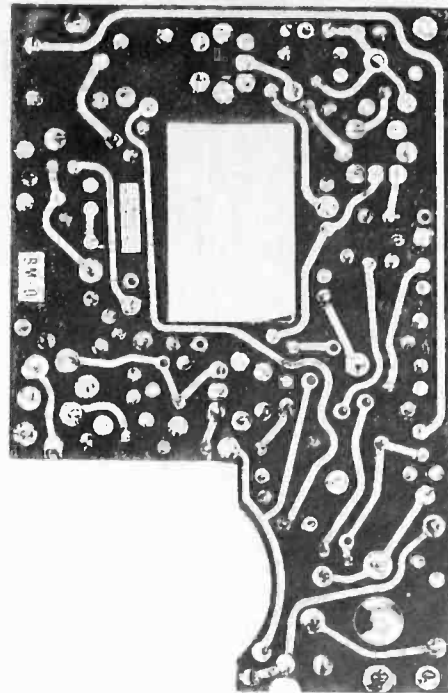
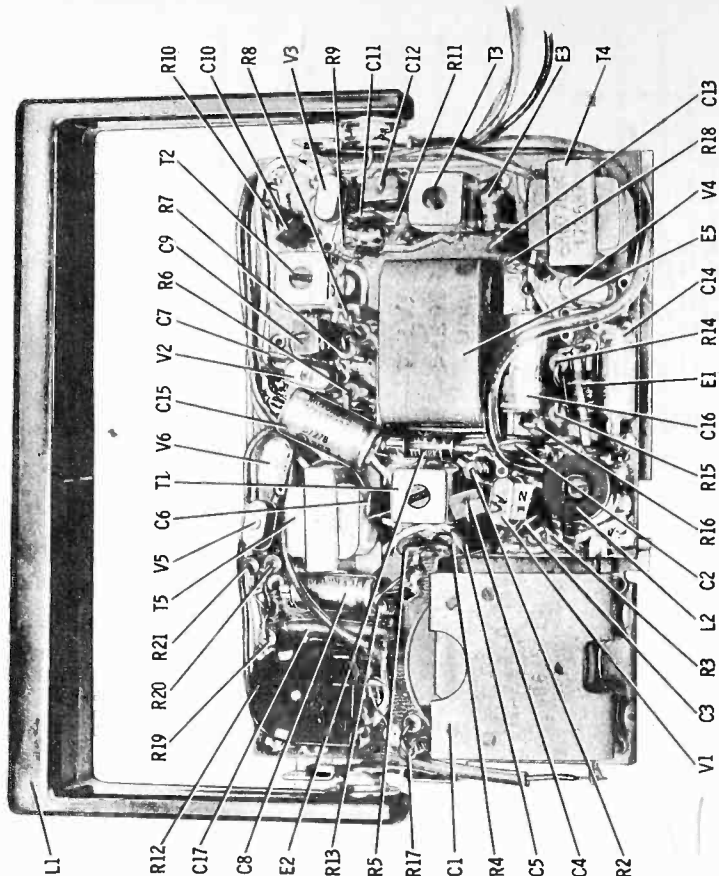
A more positive check of the transistor is to replace a suspected transistor with one known to be good.

**ALIGNMENT**

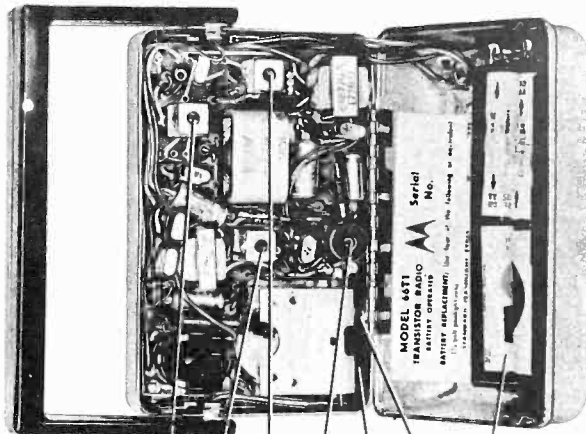
Connect an output meter across the green & black leads of the earphone jack (speaker voice coil). Set volume to maximum. Attenuate signal generator output to maintain .8 volts on output meter at all times to prevent overloading. Radio should be aligned while chassis is in cabinet. To adjust gang trimmers, construct and use wire tool shown below.

STEP	GENERATOR CONNECTION	GENERATOR FREQUENCY (400 cycle mod)	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT					
1.	Ant section of gang thru .1 mf capacitor & ground	455 Kc	Fully open	1, 2 & 3	Adjust for maximum.
RF ALIGNMENT					
2.	Radiation loop*	1620 Kc	Fully open	4	Adjust for maximum.
3.	Radiation loop*	1400 Kc	Tune for max	5	Adjust for maximum.
<b>NOTE:</b> Do not perform the following steps unless the oscillator core has been tampered with or associated components have been replaced. BEFORE PROCEEDING SET OSCILLATOR TRIMMER 1/4 TURN FROM ITS TIGHT POSITION.					
4.	Radiation loop*	530 Kc	Fully closed	6	Adjust for maximum.
5.	Radiation loop*	1620 Kc	Fully open	4	Adjust for maximum.
6.	Repeat steps 4 and 5 until oscillator covers required range; step 5 should be last adjustment.				
7.	Radiation loop*	1400 Kc	Tune for max	5	Adjust for maximum.

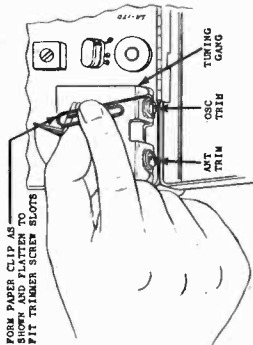
\*Connect generator output across 5" diameter, 5 turn loop and couple inductively to radio loop. Keep loops at least 12" apart.



PARTS LOCATION



ALIGNMENT ADJUSTMENTS LOCATION



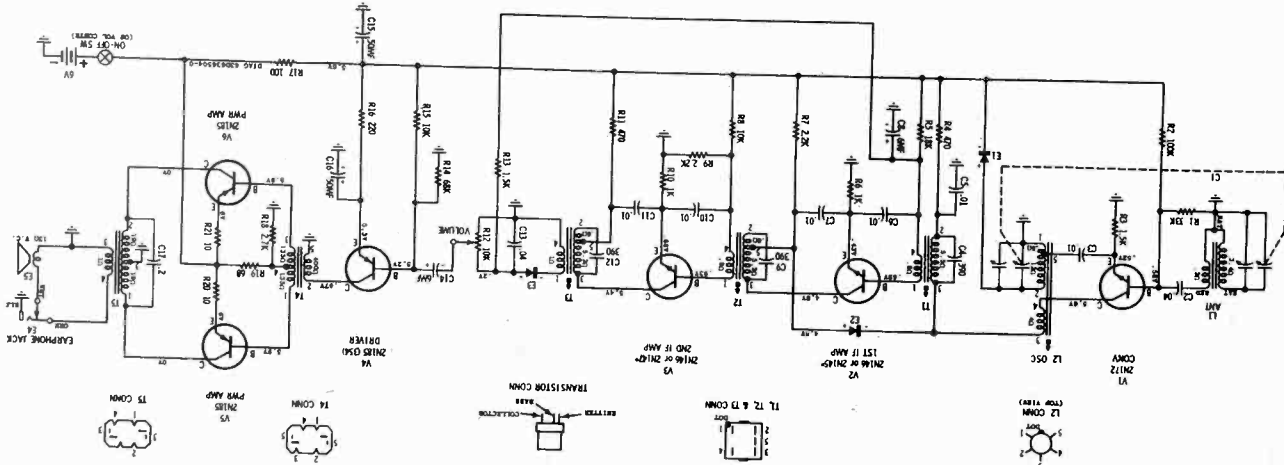
GANG TRIMMER ADJUSTMENT TOOL DETAIL

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Table with columns: Ref. No., Part No., Description, List Price, Part No., Description, List Price. Includes sections for ELECTRICAL PARTS, MECHANICAL PARTS, and CABINET PARTS.

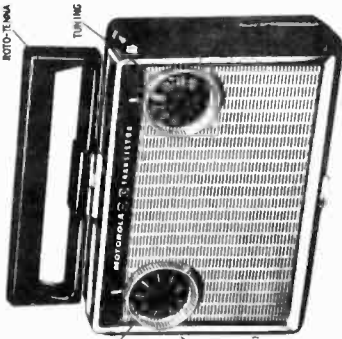
PRICES SUBJECT TO CHANGE WITHOUT NOTICE. New Items, Appears in any List for Part No. plus Federal Excise Tax at Current Rate. \*Prices Furnished Upon Request



SCHEMATIC DIAGRAM

# MOTOROLA Service Manual

HOME RADIO  
 MODELS  
 76T1 Charcoal  
 76T2 Brown  
 CHASSIS  
 HS-507



## GENERAL INFORMATION

**TYPE** - Portable superheterodyne radio using a plated circuit chassis and seven transistors. An earphone socket is provided on some models; insertion of earphone automatically disconnects speaker from radio.

**POWER SUPPLY** - Operates from two 9 volt batteries. Either two of the following or equivalent may be used: Eveready Z16; Burgess D6.

**NOTE:** This radio may be operated from one battery if desired; if operated from one battery, tape to prevent shorting of the other battery to the metal cabinet or radio components. Battery life, under such conditions, will be slightly less than half that obtained when two batteries are used.

## TRANSISTOR COMPLEMENT

Type	Part No.	Function
ZN140	48C124255	Converter
ZN139	48C124256	1st IF amp
ZN139	48C124256	2nd IF amp
ZN109	•	1st audio driver
ZN109	•	2nd audio driver
two ZN109	•	Push-pull power amp

\*Any color ZN109 transistors may be used in the 1st & 2nd audio driver stages; ZN109 transistors used in the push-pull output stage must be matched - i.e., both

## SERVICE NOTES

### CIRCUIT DESCRIPTION

- The circuit of this chassis is conventional - there are no vacuum tubes or capacitors. Leads are placed on both sides of the case, thereby reducing the usual connecting wires and making wiring more uniform.
- The metal plating extends through all the holes on the chassis, connecting circuits on the front with those on the rear.
- Reference to the chassis photographs, schematic diagram and to chassis will permit the circuit to be traced easily.

### SERVICING PRECAUTIONS

- When servicing this radio, probing with a screwdriver (checking for spark to ground or for "clicks" from various points) must be avoided, because the transistor stages are susceptible to damage from this type of check. If the transistor BASE electrode is shorted to ground (either directly or through any path) the BASE bias will be removed, allow-

### CHASSIS REMOVAL

- Remove control knobs from front of radio.
- Remove two Phillips head screws located under tuning knob; also remove pinnut located under volume control knob.
- Remove chassis from cabinet.

ing excessive current to flow through the transistor, causing permanent damage.

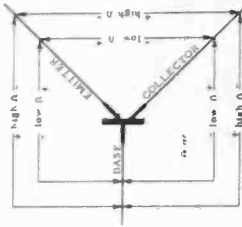
Do not service the chassis on a metal plate because of the possibility of a short circuit.

Refer to "Plated Circuit Chassis Servicing Techniques" manual (Motorola Part No. 68P616536) for recommended tools and procedures to be used when servicing Motorola plated circuit chassis.

When making circuit resistance checks, all transistors should be removed from circuits to avoid erroneous readings or possible damage to transistors.

## TRANSISTOR CHECK

The transistors used in this radio can be expected to give unusually long trouble-free life; however, transistor checks should be made at the following intervals: (1) Check transistors made with an ohmmeter (TO PREVENT DAMAGE TO THE TRANSISTOR, USE AN OHMMETER WHOSE INTERNAL BATTERY VOLTAGE DOES NOT EXCEED 7.5 VOLTS). This check measures the ability of the transistor to conduct current in one direction, and to resist current flow in the opposite direction. The resistance in the non-conductive direction is low in relation to the resistance in the conductive direction. The illustration shows the test procedure for the typical transistor used in the radio. The polarity is as shown in the illustration; the polarity of the ohmmeter leads. Transistor must be disconnected from circuit during check.



TRANSISTOR CONNECTIONS

REF. TYPE ZN109, ZN139, ZN140

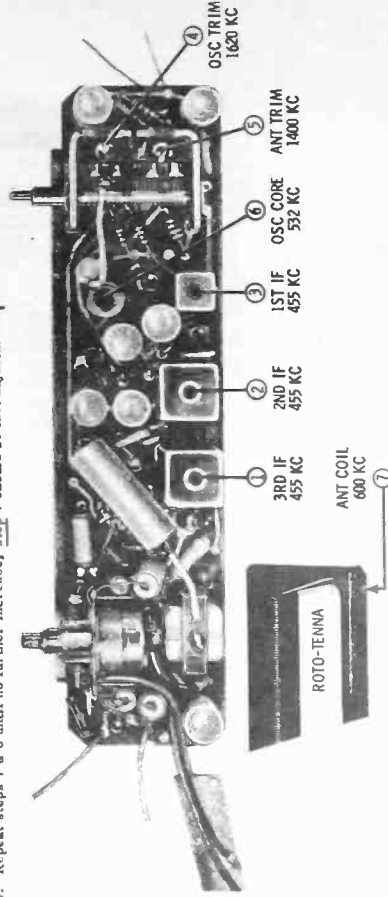
## OHMMETER METHOD OF MAKING COARSE TRANSISTOR CHECKS

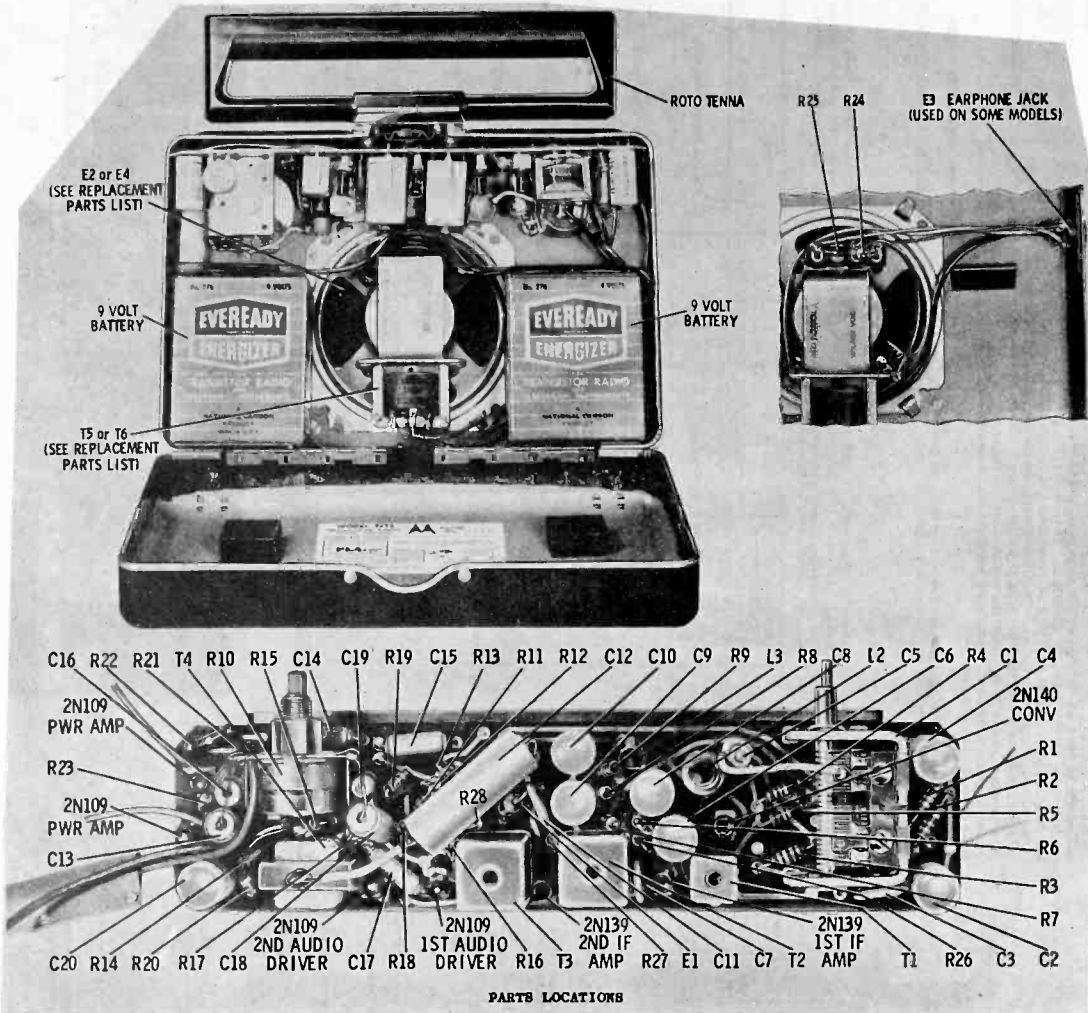
### ALIGNMENT

Connect generator output across .5" diameter, 5 turn loop and couple inductively to receiver loop. Keep radiation loop at least 12" from receiver antenna. Connect a low range output meter across the speaker voice coil and set volume control to maximum. Attenuate generator output to maintain .05 watts on output meter to prevent overloading the receiver. Use 3/32" hex alignment tool for osc core (6) adjustment, and a fibre screwdriver for all other adjustments.

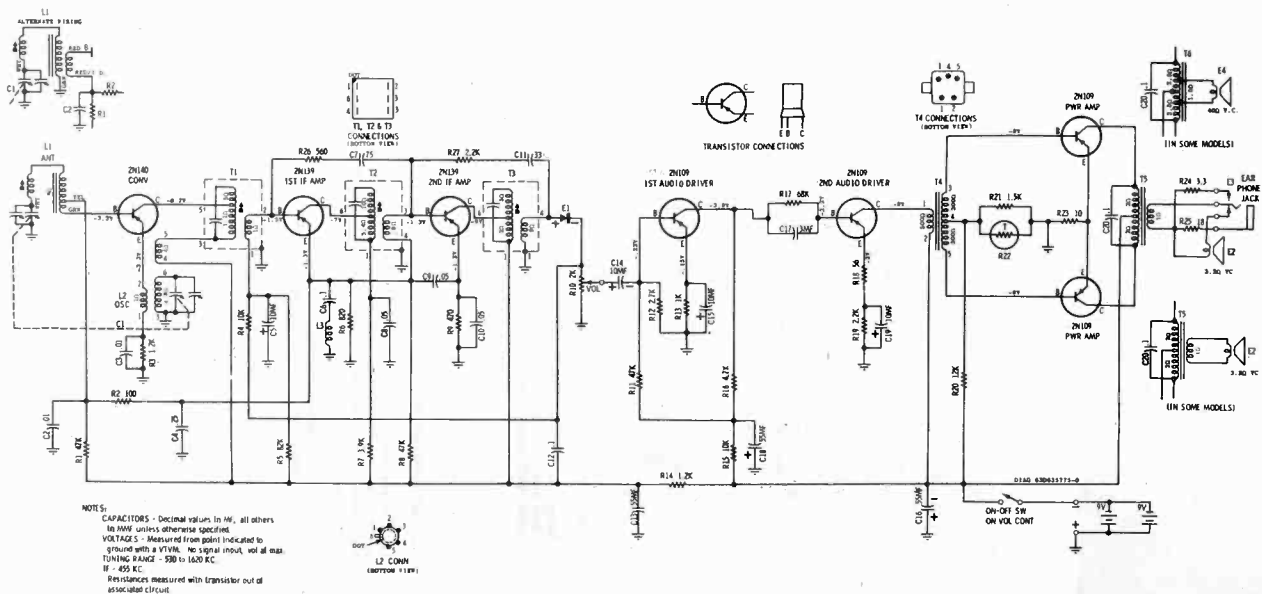
STEP	GENERATOR CONNECTION	GENERATOR FREQUENCY (400 r/cle mod)	GANG SETTING	ADJUST	REMARKS
1. IF ALIGNMENT	Radiation loop (see above)	5 Kc	Fully open	1, 2, 3	Adjust for maximum.
2. RF ALIGNMENT	Radiation loop (see above)	1620 Kc	Fully open	4	Adjust for maximum.
3.	"	1400 Kc	Tune for max	5	With chassis installed in cabinet, adjust for maximum.
4.	Radiation loop (see above)	1620 Kc	Fully open	4	Adjust for maximum.
5.	"	532 Kc	Fully closed	6	Adjust for maximum.
6.	Repeat steps 4 & 5 until oscillator covers required range; step 4 should be last adjustment.				With chassis installed in cabinet, adjust for maximum.
7.	Radiation loop (see above)	1400 Kc	Tune for max	5	With chassis installed in cabinet, adjust for maximum.
8.	"	600 Kc	Tune for max	7	With chassis installed in cabinet, adjust for maximum.
9.	Repeat steps 7 & 8 until no further increase; step 7 should be last adjustment				

NOTE: Do not perform the following steps unless the oscillator coil has been tempered with or replaced and does not track properly.





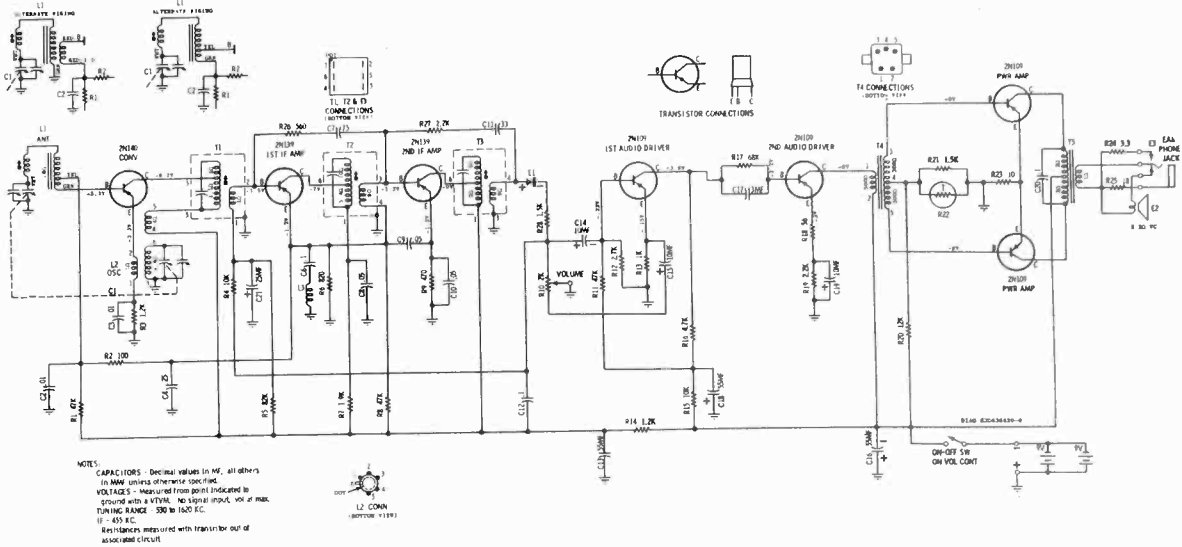
SCHEMATIC DIAGRAM NO. 1



NOTE:  
 CAPACITORS - Decimal value. In  $\mu$ F, all others  
 to 100V unless otherwise specified.  
 VOLTAGES - Measured from point indicated to  
 ground with a VVM. No signal input, vol at max  
 (LINE RANGE - 500 to 600 KC.  
 IF - 455 KC.  
 Resistances measured with transistor out of  
 associated circuit.



SCHEMATIC DIAGRAM NO. 2



REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description	List Price	Ref. No.	Part Number	Description	List Price
<b>ELECTRICAL PARTS</b>							
C-1	*19G536451	Capacitor, variable: 2-gang	3.30	R-18	6R5614	56 10% 1/2W	.10
C-2	*8K123413	Capacitor, paper tub: .01 mf 200V	.25	R-19	6R5659	2200 10% 1/2W	.10
C-3	*21K533472	Capacitor, cer disc: .01 mf 500V	.25	R-20	6R6394	12,000 10% 1/2W	.10
C-4	*8K122249	Capacitor, paper tub: 25 mf 100V	.25	R-21	6R6038	1500 10% 1/2W	.10
C-5	*23K636453	Capacitor, electrolytic: 10 mf 10V	1.25	R-22	*6A363448	Thermistor: 1950 @25°C	.50
C-6	*8K124831	Capacitor, paper tub: .1 mf 200V	.25	R-23	6R5621	10 10% 1/2W	.10
C-7	*21K124830	Capacitor, cer disc: 75 mf 500V	.25	R-24	6K124921	3.3 10% 1W (not in all sets)	.10
C-8	6B120842	Capacitor, paper tub: .05 mf 200V	.25	R-25	6K122947	18 10% 1/2W (not in all sets)	.10
C-9	6B120842	Capacitor, paper tub: .05 mf 200V	.25	R-26	6R6291	560 10% 1/2W	.10
C-10	6B120842	Capacitor, paper tub: .05 mf 200V	.25	R-27	6R6069	2200 10% 1/2W	.10
C-11	*21K124829	Capacitor, cer disc: 33 mf 500V	.25	R-28	6R6038	1500 10% 1/2W	.10
C-12	8R121573	Capacitor, paper tub: .1 mf 200V	.25	T-1	*24K636460	Transformer, 1st IF: 455 Ec	2.00
C-13	23K636455	Capacitor, electrolytic: 55 mf 6V	1.35	T-2	*24K636459	Transformer, 2nd IF: 455 Ec	1.80
C-14	23K636453	Capacitor, electrolytic: 10 mf 10V	1.25	T-3	*24K636458	Transformer, 3rd IF: 455 Ec	1.80
C-15	*23K636453	Capacitor, electrolytic: 10 mf 10V	1.25	T-4	*23B636462	Transformer, driver	3.75
C-16	23K636455	Capacitor, electrolytic: 55 mf 6V	1.35	T-5	*25B636828	Transformer, output (3.2A secondary)	2.25
C-17	*23B636452	Capacitor, electrolytic: 55 mf 6V	1.35	T-6	-	Transformer, output (400 secondary - see E-4-not repl separately)	-
C-18	23K636455	Capacitor, electrolytic: 55 mf 6V	1.35		*48C124255	Transistor, type 2N140: PNP (converter)	***
C-19	23K636453	Capacitor, electrolytic: 10 mf 10V	1.25		*48C124256	Transistor, type 2N139: PNP (IF)	***
C-20	8K124831	Capacitor, paper tub: .1 mf 200V	.25		*48C124258	Transistor, type 2N109: PNP (green code)	***
C-21	*23K636454	Capacitor, electrolytic: 25 mf 6V (some sets contained a 10 mf capacitor; when replacing, use a 25 mf)	1.25		*48K124276	Transistor, type 2N109: PNP (red code)	***
E-1	48K733204	Crystal Diode	.75		*48K124259	Transistor, type 2N109: PNP (white code)	***
E-2	*50C636827	Speaker, PM: 4"; 3.2 ohm VC; incl 8	4.55**		*48K124275	Transistor, type 2N109: PNP (yellow code)	***
E-3	*9K636826	Jack, earphone (not in all sets)	.90	<b>MECHANICAL PARTS</b>			
E-4	*50C636472	Speaker, PM: 4"; 40 ohm VC; incl 8 T-6 (in some sets)	4.55**		*31B636463	Connector, battery	.70
L-1	-	See Handle Assen.	-		*98B36449	Socket, 3-pin (transistor)	.30
L-2	*24B636666	Coil, oscillator	1.30	<b>CABINET PARTS</b>			
L-3	*24A636456	Coil, RF	.20		43K471634	Ball, steel: 3/16" dia (handle mtg)	.05
Resistors - Note: All resistors are insulated carbon type unless otherwise specified							
R-1	6R6048	47,000 10% 1/2W	.10		*1V636832	Cabinet: charcoal; loss ecutcheon & grille (76T1)	10.45**
R-2	6R6326	100 10% 1/2W	.10		*1V636833	Cabinet: brown; loss ecutcheon & grille (76T2)	10.45**
R-3	6R6303	1200 10% 1/2W	.10		42A633034	Clip, handle	.90
R-4	6R6320	10,000 10% 1/2W	.10		13K63979	Ecutcheon, handle mtg	3.80
R-5	6R6044	82,000 10% 1/2W	.10		*13D636268	Ecutcheon; loss grille	2.00
R-6	6R6289	820 10% 1/2W	.10		*33C636266	Ecutcheon; loss grille	2.00
R-7	6R6559	3900 10% 1/2W	.10		*1V636658	Handle Assen: black; incl ant (76T1)	5.35**
R-8	6R6048	47,000 10% 1/2W	.10		*1V636659	Handle Assen: brown; incl ant (76T2)	5.35**
R-9	6W6060	470 10% 1/2W	.10		*36C636224	Knob, dial scale (charcoal)	.50
R-10	*18B636450	Vol Cont & Switch: 2000Ω	1.55		*36C636225	Knob, tuning (clear)	.25
R-11	6R6048	47,000 10% 1/2W	.10		*36C636226	Knob, volume (charcoal)	1.10
R-12	6R5577	2700 10% 1/2W	.10		*13C636287	Modillion, cabinet (handle mtg)	.05
R-13	6R6229	1000 10% 1/2W	.10		28135968	Wt, hex: 1/4-28 x 3/8 (handle mtg)	.01
R-14	6R6383	1200 10% 1/2W	.10		2837001	Palnut: 3/8-32 (vol cont mtg)	.01
R-15	6R6320	10,000 10% 1/2W	.10		42A635272	Retainer, cover latch	.04
R-16	6R6060	4700 10% 1/2W	.10		*1A633035	Spring, cover latch	.02
R-17	6R6074	88,000 10% 1/2W	.10		*1A633069	Washer, dotent (handle mtg)	.05
					48124013	Washer, flat: 15/16-.390-.020 (handle mtg)	.05
					4A635270	Washer, locking (handle mtg)	.01

PRICES SUBJECT TO CHANGE WITHOUT NOTICE  
 \*New Item, Appears in any List for First Time  
 \*\*Plus Federal Excise Tax At Current Rate  
 \*\*\*Prices Furnished Upon Request



SUPERSEDES SERVICE MANUAL PART NO. 68P640465

### GENERAL INFORMATION

**TYPE** - Pocket type 2 band portable superheterodyne radio using a plated circuit chassis and six transistors. An earphone socket is provided on rear of radio; insertion of earphone automatically disconnects speaker. A 15 ohm earphone for this radio (Motorola Part No. D-196) is available through Motorola distributors.

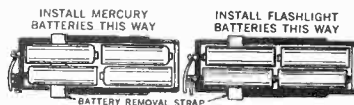
**6X39A-1** - Same as 6X39A except for plated panel board, two IF transformers, five capacitors and relocation of parts (see Replacement Parts List).

**6X39A-2** - Same as 6X39A-1 except for mechanical revision of handle, cabinet, and handle mounting spring (see Replacement Parts List).

**POWER SUPPLY** - Operates from four 1-1/2 volt batteries; use four of the following or equivalent:

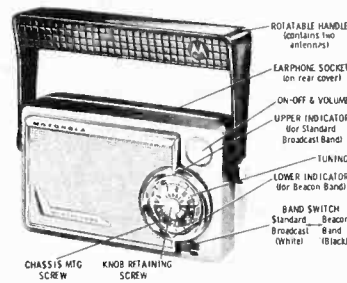
Flashlight Type - Eveready 1015, Ray-O-Vac 7LP or 7R, Burgess Z or 930, General 919

Mercury Type - Mallory ZM-9



### HOME RADIO WEATHERAMA SERIES

MODEL	CHASSIS
6X39A	HS-630
6X39A-1	HS-683
6X39A-2	HS-684



### TRANSISTOR COMPLEMENT

Ref. No.	Type	Function
V1	4JX2 A801	Converter
V2	2N293	1st IF amp
V3	2N169	2nd IF amp
V4	2N192	Driver
V5	2N241	Power amp
V6	2N241	Power amp

**TUNING RANGE** IF - 455 Kc  
Beacon Band - 200 to 420 Kc  
Broadcast Band - 535 to 1620 Kc

### SERVICE NOTES

#### CIRCUIT DESCRIPTION

- The circuit of this chassis is conventional - there are no built-in resistors or capacitors. Leads are plated on both sides of the chassis base, thereby replacing the usual connecting wires and making wiring more uniform.
- The metal plating extends through all the holes on the chassis, connecting circuits on the front with those on the rear.
- Reference to the chassis photographs, plated panel wiring diagram, schematic diagram, and to chassis will permit the circuit to be traced easily.

#### SERVICING PRECAUTIONS

- When servicing this radio, probing with a screwdriver (checking for "clicks" from various points) must be avoided, because the transistors are susceptible to damage from this type of check. If the transistor BASE electrode is shorted to ground (either directly or through any path) the BASE bias will be altered, allowing excessive current to flow through the transistor, causing permanent damage. ON PNP TYPE TRANSISTORS (USED IN DRIVER & OUTPUT STAGES) THE BASE ELECTRODE IS CONNECTED TO THE SHELL OF THE TRANSISTOR, THEREFORE CARE SHOULD BE TAKEN NOT TO SHORT THE SHELL OF THIS TYPE TO GROUND.

- Do not service the chassis on a metal plate because of the possibility of a short circuit.

- When making circuit resistance checks, all transistors should be removed from circuits to avoid erroneous readings or possible damage to transistors.

#### COMPONENT REPLACEMENT

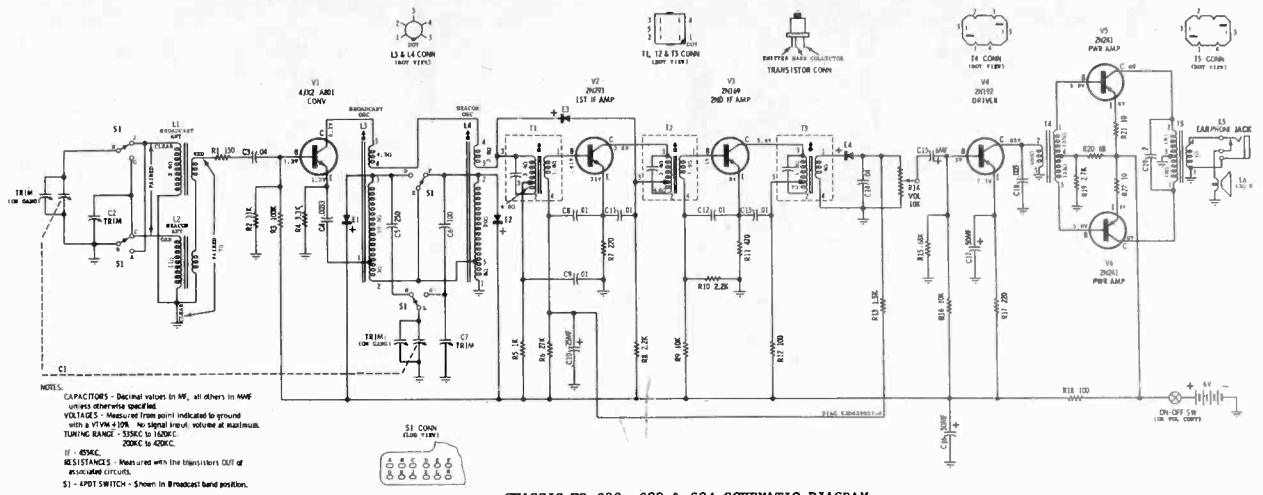
- Refer to "Plated Circuit Chassis Servicing Techniques" manual (Motorola Part No. 68P636536) for recommended tools and procedures to be used when servicing Motorola plated circuit chassis.

- Volume control replacement - remove the defective volume control by first removing the chassis (see CHASSIS REMOVAL). Dip the control and shaft into a soldering pot (such as furnished by Motorola Parts Orders Department) and lift the volume control off the chassis. Clean all the solder from the connecting holes with a small brush. Solder new control in place with a soldering iron; DO NOT DIP THE NEW CONTROL INTO A SOLDERING POT BECAUSE THE CONTROL SHAFT WILL BE DAMAGED BY SOLDER.

#### CHASSIS REMOVAL

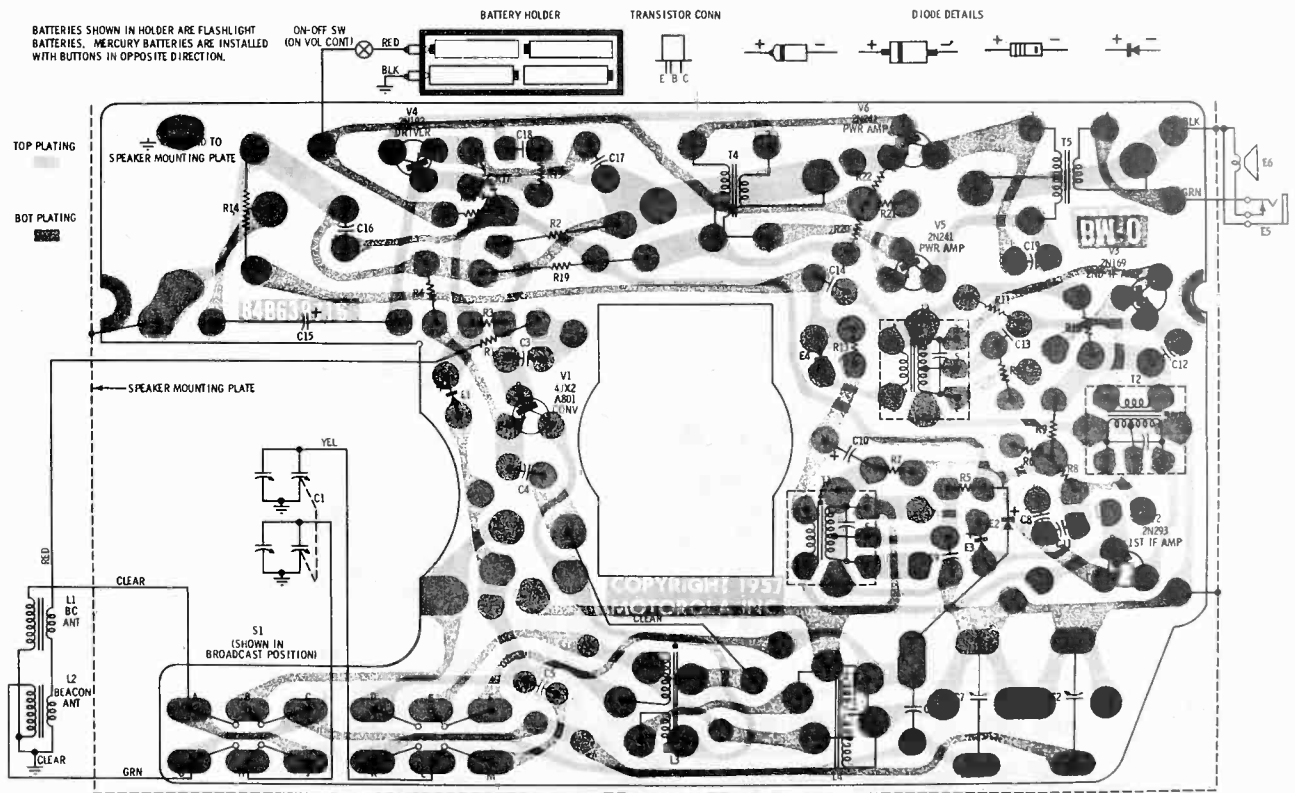
- Pull the volume control knob from front of radio.
- Remove tuning knob retaining screw from the tuning





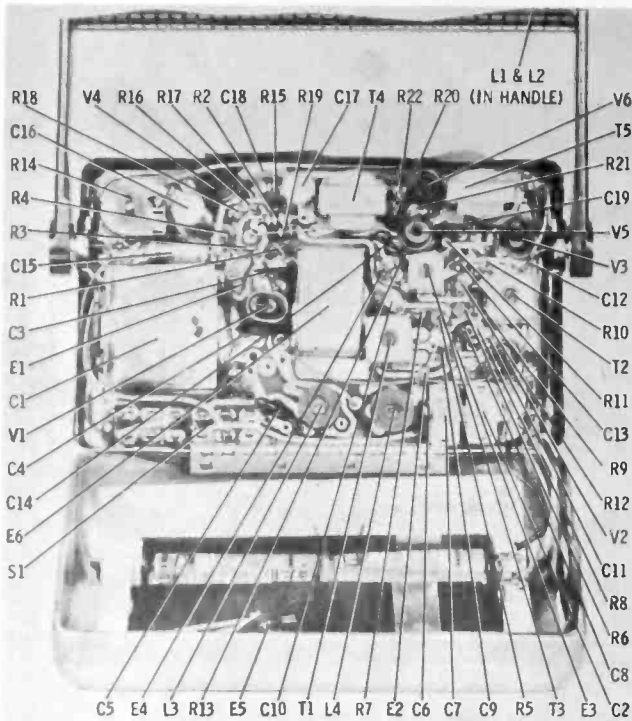
NOTES:  
 CAPACITORS - Decimal values in  $\mu F$ , all others in M $\mu F$  unless otherwise specified.  
 VOLTAGES - Measured from point indicated to ground with a VTVM at 10% No Signal Input, volume at maximum.  
 TUNING RANGE - 550KC to 1400KC; 200KC to 400KC.  
 IF - 450KC.  
 RESISTANCES - Measured with the transistors OUT of associated circuits.  
 S1 - 4PDT SWITCH - Shown in Broadcast band position.

CHASSIS HS-630, 683 & 684 SCHEMATIC DIAGRAM

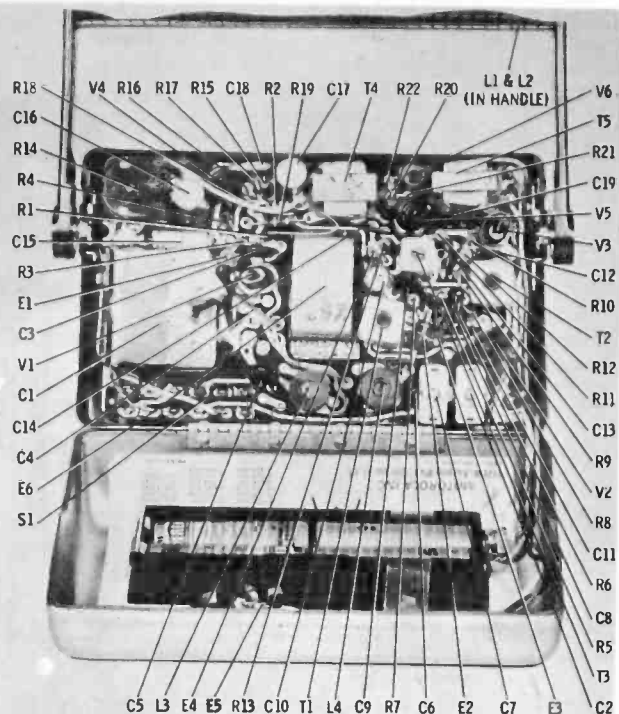


CHASSIS HS-630 PLATED PANEL WIRING

CHASSIS HS-630, -683, -684



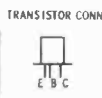
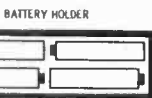
MODEL 6X39A (CH HS-630)  
PARTS LOCATIONS



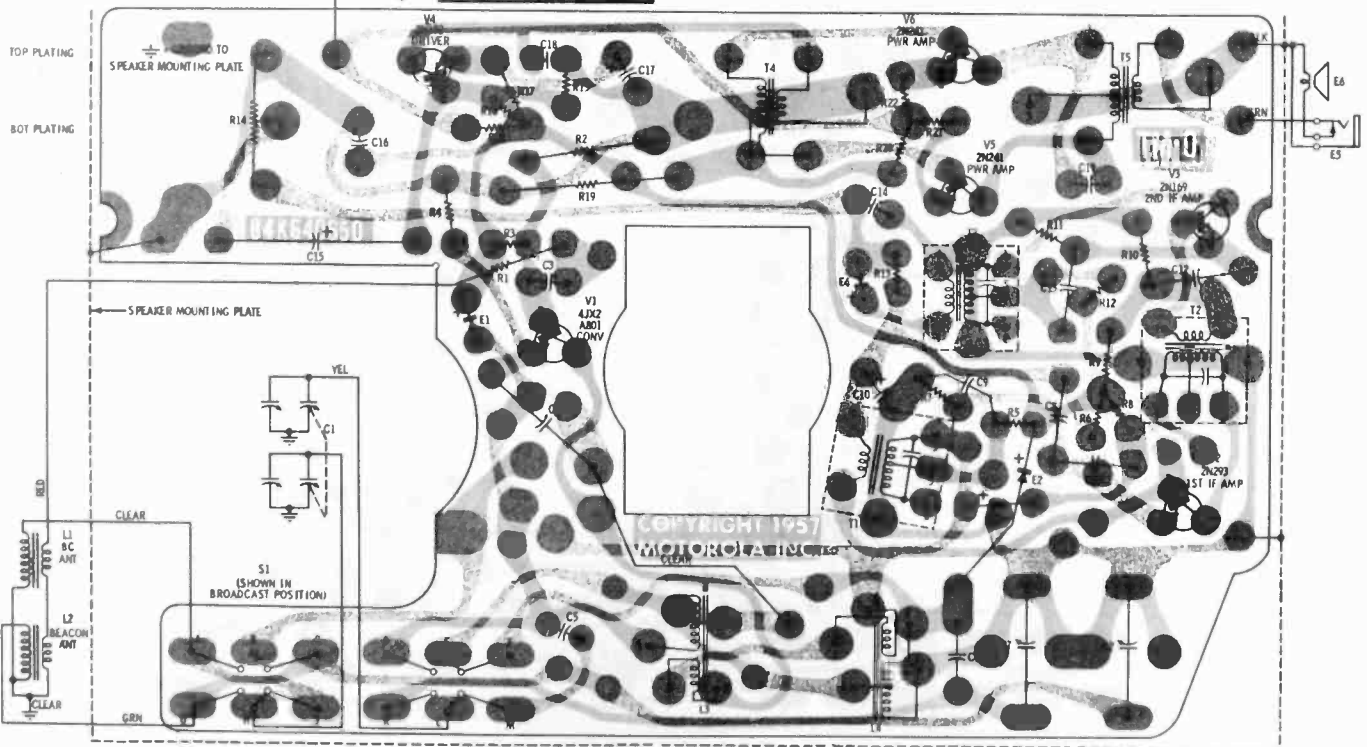
MODEL 6X39A-1 (CH HS-683) & 6X39A-2 (CH HS-684)  
PARTS LOCATIONS

BATTERIES SHOWN IN HOLDER ARE FLASHLIGHT BATTERIES. MERCURY BATTERIES ARE INSTALLED WITH BUTTONS IN OPPOSITE DIRECTION.

ON-OFF SW (ON VOL CONT)



DIODE DETAILS



CHASSIS HS-683 & 684 PLATED PANEL WIRING



HOME RADIO

MODELS	CHASSIS
7X23E	HS-688
7X24S	HS-688
7X24W	HS-688

POWER-10 SERIES

SUPERSEDES PRELIMINARY SERVICE MANUAL PART NO. 68P642521

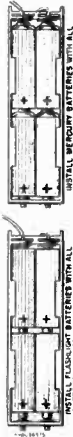
GENERAL INFORMATION

**TYPE** - Pocket type portable superheterodyne radio using a plated circuit chassis, seven transistors, and three diodes. An earphone socket is provided on rear of radio; insertion of earphone automatically disconnects speaker. A 15 ohm accessory earphone (Motorola Part No. 50D640709 or 50D641487) is available through Motorola Dealers or Distributors.

Models 7X23 and 7X24 use the same electrical chassis; these models differ externally (see Replacement Parts List).

**POWER SUPPLY** - Operates from four 1-1/2 volt batteries; use four of the following or equivalent:

Standard Flashlight Types---Eveready 1015, Ray-O-Vac 7LP or 7R, Burgess 930, Mallory M15; Mercury Type --- Mallory ZM-9.



INSTALLATION OF FLASHLIGHT OR MERCURY BATTERIES

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

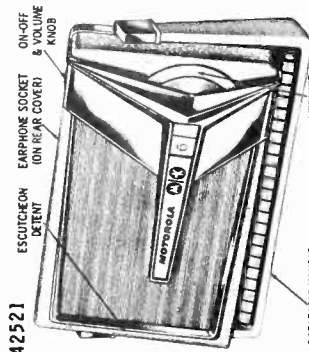
SERVICE NOTES

CIRCUIT DESCRIPTION

- The circuit of this chassis is conventional - there are no built-in resistors or capacitors. Leads are plated on both sides of the chassis base, thereby replacing the usual connecting wires and making wiring more uniform.
- The metal plating extends through all the holes on the chassis, connecting circuits on the front with those on the rear.
- Reference to the chassis photographs, plated panel wiring diagram, schematic diagram, and to chassis will permit the circuit to be traced easily.

SERVICING PRECAUTIONS

- When servicing this radio, probing with a screwdriver (checking for "clicks" from various points) must be avoided, because the transistors are susceptible to damage from this type of check. If the transistor BASE electrodes are shorted to ground (either directly or through any path), the BASE bias will be altered, thus causing permanent damage. ON PNP TYPE TRANSISTORS (USED IN DRIVER & OUTPUT STAGES) THE BASE ELECTRODE IS CONNECTED TO THE SHELL OF THE TRANSISTOR, THEREFORE CARE SHOULD BE TAKEN NOT TO SHORT THE SHELL OF THIS TYPE TO GROUND.
- Do not service the chassis on a metal plate because of the possibility of a short circuit.
- When making circuit resistance checks, remove the transistor from the suspected stage to avoid erroneous readings or possible damage to transistors.



MODEL 7X23 & 7X24 SERIES

TRANSISTOR COMPLEMENT

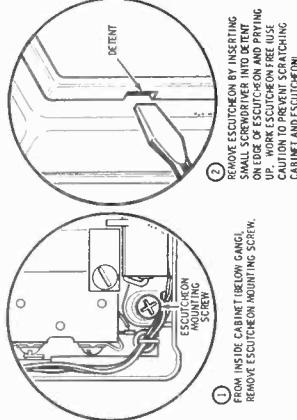
Ref. No.	Type	Function
V1	2N168A	RF amp
V2	2N168A	Converter
V3	2N293	1st IF amp
V4	2N293	2nd IF amp
V5	2N265	Driver
V6	2N241	Power amp
V7	2N241	Power amp

COMPONENT REPLACEMENT

Refer to "Plated Circuit Chassis Servicing Techniques" manual (Motorola Part No. 68P63536) for recommended tools and procedures to be used when servicing Motorola plated circuit chassis.

ESCUTCHEON & CHASSIS REMOVAL (see detail)

- From inside cabinet (below gang), remove escutcheon mounting screw (see detail).
- Remove escutcheon by inserting small screwdriver into detent on edge of escutcheon and prying up. Work escutcheon free (use caution to prevent scratching cabinet and escutcheon.)
- Remove dial and tuning knobs by pulling straight off.
- Remove chassis mounting screw.
- Turn handle perpendicular to component side of plated panel.
- Grasp handle near one of its two mounting bushings and pull out from side of cabinet until the round portion of mounting bushing clears hole in side of cabinet, then lift this side of handle and chassis slightly out of cabinet. Perform the same procedure on the other mounting bushing, then lift handle, chassis and speaker plate out of cabinet.
- Unacrew earphone jack.
- Separate the plated chassis from the speaker mounting plate as follows: unsolder the wire that connects the gang to the plated chassis. Unsolder speaker lug, green lead from



REMOVAL OF ESCUTCHEON AND CHASSIS

1. Remove chassis and speaker mounting plate from cabinet as described under ESCUTCHEON & CHASSIS REMOVAL.
2. Unsolder antenna leads from chassis.
3. Turn handle perpendicular to chassis and slide out of handle clips.

HANDLE REPLACEMENT

1. Remove chassis and speaker mounting plate from cabinet as described under ESCUTCHEON & CHASSIS REMOVAL.
2. Unsolder antenna leads from chassis.
3. Turn handle perpendicular to chassis and slide out of handle clips.

CARE OF CABINET

Cabinet and handle may be cleaned by using a soft, dry cloth; do not use any polishes.

TRANSISTOR REPLACEMENT

When replacing a transistor, the heat must be carried away from the transistor to prevent heat damage to the transistor.

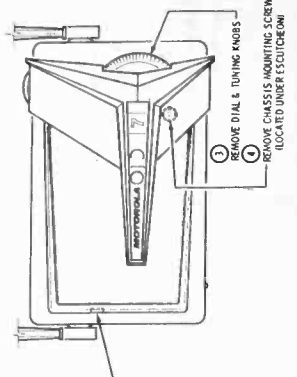
1. Grasp transistor leads with a pair of long-nose pliers to dissipate the heat, and slip into a soldering pot (such as that furnished by Motorola Parts Order Department). In the absence of the soldering pot, use a conventional high-heat soldering iron, however, be careful not to rapidly since excessive heat will damage the plated panel.

TRANSISTOR SERVICING INFORMATION

In servicing transistor receivers, it will be found there are two main sources of failure -- the bias networks and the signal paths. These sources can be checked with equipment now being used to service tube type receivers. The transistors can be checked by substitution or elimination.

When a receiver is defective, the first step is to locate the defective stage. This is accomplished by checking the emitter resistor voltage drops or by injecting a signal from a signal generator into the bias network of the transistor. Signal injection will locate defects in the signal paths.

A defective stage can be located by checking the voltage drops across the emitter resistors against those values shown on the schematic. These voltage drops give an indication of the current flowing through the stage when it is properly biased. A defective component in the bias network or a defective transistor will change the bias voltages causing the current to change which, in turn, will cause the emitter resistor voltage drops to change. Therefore, a voltage drop that is not in the order of that shown on the schematic will indicate a defective stage. The next step is to determine if the defect is in the bias network or the transistor. The most rapid way of checking this is to substitute a known good transistor in the defective stage. If the signal is restored, the defect is in the bias network. When a transistor is OK and the defect is in the bias network, make a transistor is not available for substitution, make a re-



REMOVAL OF ESCUTCHEON AND CHASSIS

1. Grasp escutcheon by inserting small screwdriver into detent on edge of escutcheon and prying up. Work escutcheon free (use caution to prevent scratching cabinet and escutcheon).
2. Work escutcheon free (use caution to prevent scratching cabinet and escutcheon).

REMOVAL OF ESCUTCHEON AND CHASSIS

1. Grasp escutcheon by inserting small screwdriver into detent on edge of escutcheon and prying up. Work escutcheon free (use caution to prevent scratching cabinet and escutcheon).
2. Work escutcheon free (use caution to prevent scratching cabinet and escutcheon).

REMOVAL OF ESCUTCHEON AND CHASSIS

When replacing a transistor, be sure it is wired into the chassis correctly. The collector lead is spaced from emitter and base leads, thus serving to identify leads. See plated panel wiring diagram.

TRANSISTOR CHECK

Substituting a known good transistor for a suspected one is the simplest and most positive method of checking transistors.

EMITTER RESISTOR VOLTAGES

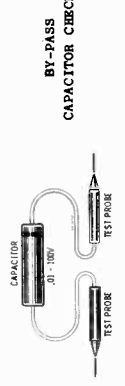
Voltages across the emitter resistors are provided on the schematic as an additional aid in servicing this receiver. A check of these voltages will indicate whether or not a transistor stage is functioning normally.

TRANSISTOR SERVICING INFORMATION

In servicing transistor receivers, it will be found there are two main sources of failure -- the bias networks and the signal paths. These sources can be checked with equipment now being used to service tube type receivers. The transistors can be checked by substitution or elimination.

When a receiver is defective, the first step is to locate the defective stage. This is accomplished by checking the emitter resistor voltage drops or by injecting a signal from a signal generator into the bias network of the transistor. Signal injection will locate defects in the signal paths.

A defective stage can be located by checking the voltage drops across the emitter resistors against those values shown on the schematic. These voltage drops give an indication of the current flowing through the stage when it is properly biased. A defective component in the bias network or a defective transistor will change the bias voltages causing the current to change which, in turn, will cause the emitter resistor voltage drops to change. Therefore, a voltage drop that is not in the order of that shown on the schematic will indicate a defective stage. The next step is to determine if the defect is in the bias network or the transistor. The most rapid way of checking this is to substitute a known good transistor in the defective stage. If the signal is restored, the defect is in the bias network. When a transistor is OK and the defect is in the bias network, make a transistor is not available for substitution, make a re-



**BY-PASS CAPACITOR CHECKER**

using this aid, parallel the suspected by-pass capacitor. If the by-pass is open, the output level will increase. When the by-pass is closed, the audio output level will decrease. But the pitch of the sound will change.

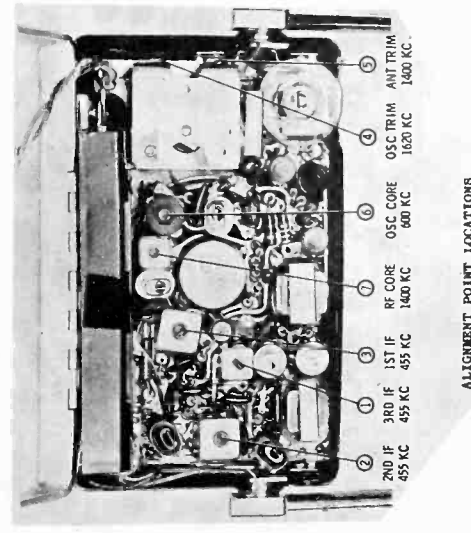
**ALIGNMENT**

Connect an output meter across the green & black leads of the earphone jack (speaker voice coil). Set volume to maximum. Attenuate signal generator output to maintain 8 volts on output meter at all times to prevent overloading. Radio should be aligned while chassis is warm. To adjust gang trimmers, a paper clip, formed into an "L" shape can be used. Flatten the shorter portion of the "L" to fit the gang screws.

STEP	GENERATOR FREQUENCY (400 cycle mod)	GANG SETTING	ADJUST	REMARKS
1.	455 Kc	Fully open	1, 2 & 3	Adjust for maximum.
2.	1620 Kc	Fully open	4	Adjust for maximum.
3.	1400 Kc	Tune for max	5	Adjust for maximum.
<b>NOTE:</b> Do not perform steps 4 thru 7 unless the oscillator core has been tampered with or associated components have been replaced. BEFORE PROCEEDING, SET OSCILLATOR TRIMMER 1/4 TURN FROM ITS TIGHT POSITION.				
4.	600 Kc	Tune for max	6	Adjust for maximum while rocking adjusting screw.
5.	1620 Kc	Fully open	4	Adjust for maximum.
6.	1400 Kc	Tune for max	5	Repeat steps 4 and 5 until oscillator covers required range; step 5 should be last adjustment.
<b>NOTE:</b> Do not perform step 8 unless the RF transformer (T1) has been tampered with or associated components have been replaced.				
8.	1400 Kc	Tune for max	7	Adjust for maximum.

\*Connect generator output across 5" diameter, 5 turn loop and couple inductively to radio loop. Keep loops at least 12" apart.

\*\*When performing this adjustment, the increased sensitivity may cause oscillation. If this occurs when the adjustment is made, turn the RF core slug clockwise until the oscillation ceases. No further adjustment is required.



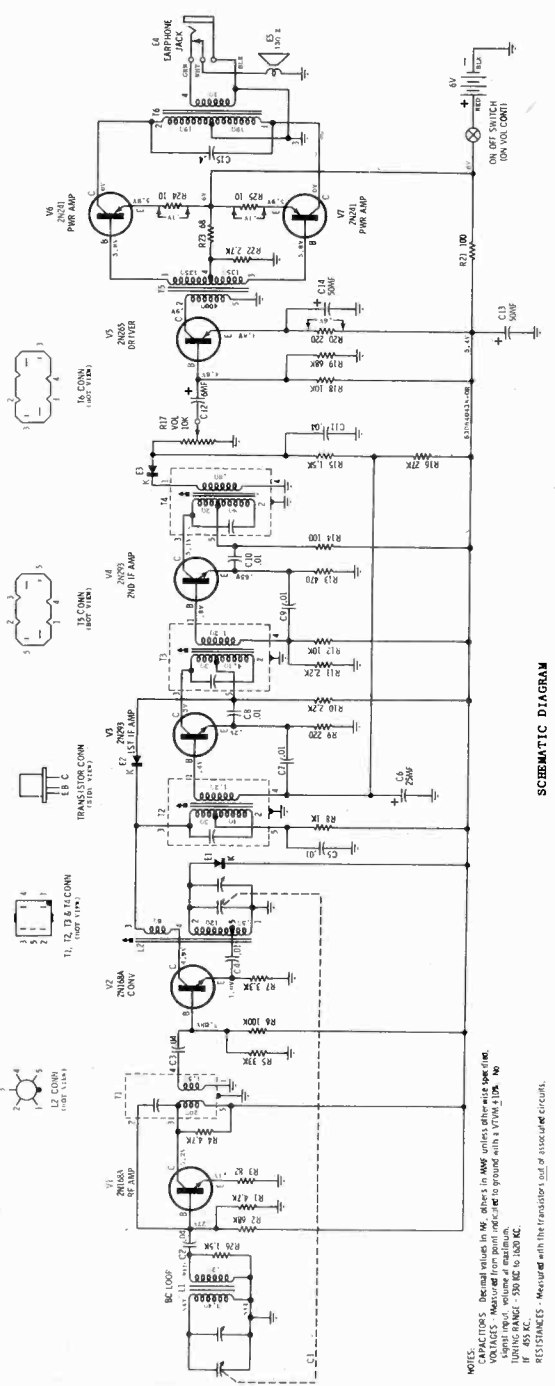
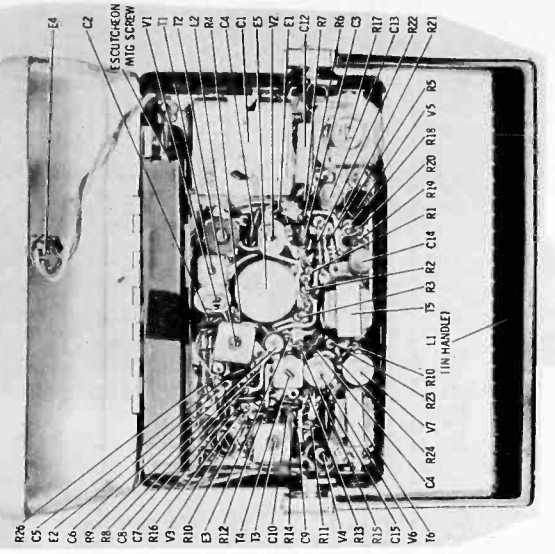
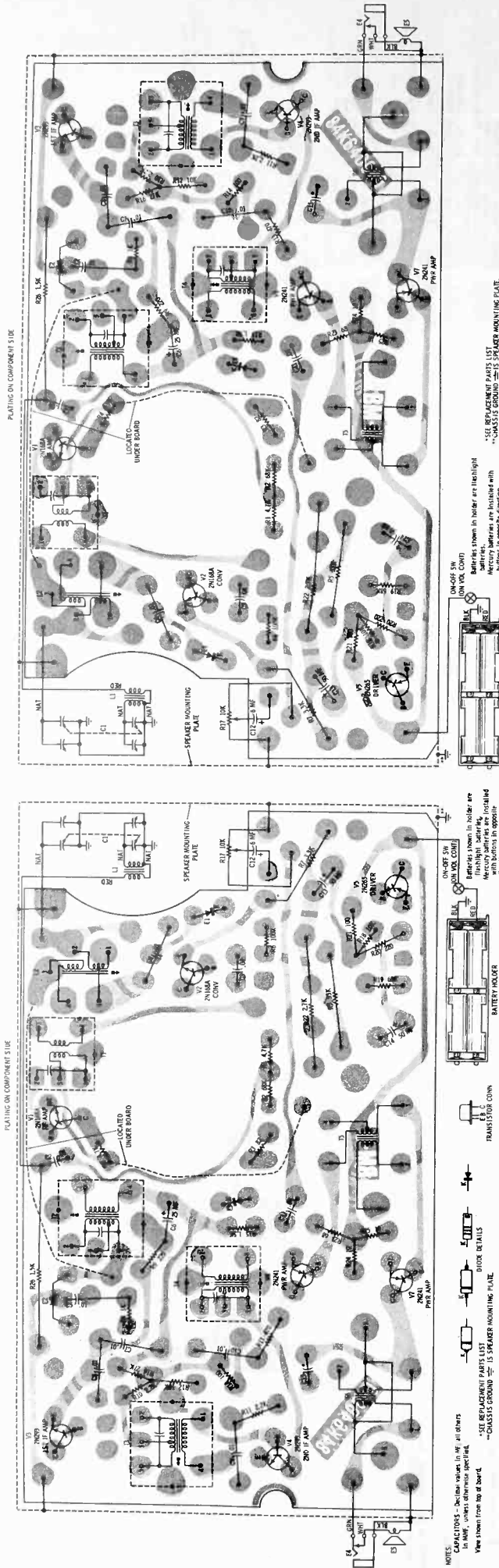
ALIGNMENT POINT LOCATIONS

**REPLACEMENT PARTS LIST**

**NOTE:** When ordering parts, specify model number of set in addition to part number and description of part. Electronic parts of equivalent rating are not necessarily of equivalent standards. The components listed in this Service Manual have been chosen for reliability and applicability to the specific Motorola parts replacement.

Ref. No.	Part Number	Description	Ref. No.	Part Number	Description
<b>ELECTRICAL PARTS</b>					
C-1	19840096	Capacitor, variable: 2 gang	V-5	48A12403	Transistor, type 2N265: PNP (driver)
C-2	21863599	Capacitor, cer disc: .04 mf 10V	V-6	48C12523	Transistor, type 2N241: PNP (per asp)
C-3	21863599	Capacitor, cer disc: .04 mf 10V	<b>MECHANICAL PARTS</b>		
C-4	21863599	Capacitor, cer disc: .04 mf 10V	15A640082	Cover, handle: Nickel (7223E)	
C-5	21863599	Capacitor, cer disc: .04 mf 10V	15K640370	Cover, handle: Gold (72245 & 72248)	
C-6	23637758	Capacitor, electrolytic: 25 mf .3V	19640381	Handle Assembly: Navy Blue; incl L1	
C-7	21863599	Capacitor, cer disc: .01 mf 10V	19641317	Handle Assembly: Brown; incl L1	
C-8	21863599	Capacitor, cer disc: .01 mf 10V	19640393	Handle Assembly: White; incl L1	
C-9	21863599	Capacitor, cer disc: .01 mf 10V	25128946	Nut, brk: 1/4-32 x 3/8 (vol cont mtg)	
C-10	21863599	Capacitor, cer disc: .01 mf 10V	84K60060	Plated Panel Board: less all components	
C-11	23637758	Capacitor, electrolytic: 50 mf 10V	557707	Washer, 1/2" x 1/8" (for use with handle assembly)	
C-12	23637758	Capacitor, electrolytic: 50 mf 10V	35123217	Washer, 1/2" x 1/8" (for use with handle assembly)	
C-13	23637758	Capacitor, electrolytic: 50 mf 10V	424640647	Spring, handle: 4-40 x 1/8 (Cl mtg)	
C-14	23637758	Capacitor, electrolytic: 50 mf 10V	<b>CABINET PARTS</b>		
C-15	21863599	Capacitor, cer disc: .04 mf 10V	19641392	Battery Retainer Assembly: complete	
E-1	48K40754	Crystal Diode	19641399	Cabinet Back: Silver (7223E)	
E-2	48K40754	Crystal Diode	19641400	Cabinet Back: Silver (72245)	
E-3	48K40754	Crystal Diode	19642015	Cabinet Back: Gold (72248)	
E-4	9863266	Jack, earphone	19641167	escutcheon (7223E): Navy Blue; less escutcheon (72245)	
E-5	58041011	Speaker, Pat. 2-3/4": 13 ohm VC	19641174	escutcheon (72245): Sun Tan (72245)	
L-1	24K641099	Coil, osc	19641175	escutcheon (72248): Navy Blue; less escutcheon (72245)	
L-2	24K641099	Coil, osc	19642006	escutcheon (72248): Navy Blue; less escutcheon (72245)	
R-1	6K121647	Resistor: 68,000 10% 1/2W	19642008	Cabinet Front: Sun Tan; less escutcheon (72245)	
R-2	6K121647	Resistor: 68,000 10% 1/2W	19642010	escutcheon (72248): Navy Blue; less escutcheon (72245)	
R-3	6K121647	Resistor: 68,000 10% 1/2W	45A639777	Clip, speed (escutcheon mtg)	
R-4	6K121647	Resistor: 68,000 10% 1/2W	618640268	Cylinder, 4015 at bottom of this part (116)	
R-5	6K121647	Resistor: 68,000 10% 1/2W	19642014	Escutcheon & Dial Crystal Assemblies (7223E)	
R-6	6K121647	Resistor: 68,000 10% 1/2W	19642015	Escutcheon & Dial Crystal Assemblies (72245)	
R-7	6K121725	Resistor: 100,000 10% 1/2W	136640268	Grille, cab (7223E)	
R-8	6K121725	Resistor: 100,000 10% 1/2W	136640367	Grille, cab (72245 & 72248)	
R-9	6K121725	Resistor: 100,000 10% 1/2W	368640278	Knob, dial (7223E, 72245, 72248)	
R-10	6K121725	Resistor: 100,000 10% 1/2W	368640278	Knob, vol (7223E, 72245, 72248)	
R-11	6K121725	Resistor: 100,000 10% 1/2W	35121432	Screw, machine: 4-40 x 1/4 (mounts escutcheon)	
R-12	6K121725	Resistor: 100,000 10% 1/2W	35121432	Screw, machine: 4-40 x 1/4 (mounts escutcheon)	
R-13	6K121725	Resistor: 100,000 10% 1/2W	35121432	Screw, machine: 4-40 x 1/4 (mounts escutcheon)	
R-14	6K121725	Resistor: 100,000 10% 1/2W	35121432	Screw, machine: 4-40 x 1/4 (mounts escutcheon)	
R-15	6K121725	Resistor: 100,000 10% 1/2W	35121432	Screw, machine: 4-40 x 1/4 (mounts escutcheon)	
R-16	6K121725	Resistor: 100,000 10% 1/2W	35121432	Screw, machine: 4-40 x 1/4 (mounts escutcheon)	
R-17	188640209	Vol Cont & Switch: 10,000	48A12403	Transistor, type 2N168A: NPN (RF)	
R-18	6K119932	Resistor: 10,000 10% 1/2W	48C12523	Transistor, type 2N285A: PNP (1st IF)	
R-19	6K119932	Resistor: 10,000 10% 1/2W	48K125236	Transistor, type 2N285A: PNP (2nd IF)	
R-20	6K1217099	Resistor: 220 10% 1/2W	48K125236	Transistor, type 2N285A: PNP (2nd IF)	
R-21	6K1217099	Resistor: 220 10% 1/2W	<b>LIMITED REPLACEMENT PARTS</b>		
R-22	6K1217099	Resistor: 220 10% 1/2W	Note: The volume of replacement on the following parts is small, as required, it is suggested that ordering be done only as required.		
R-23	6K1217099	Resistor: 220 10% 1/2W	116128076 Adhesive, dial crystal (2 ea. jar)		
R-24	6K1217099	Resistor: 220 10% 1/2W	19641318 Plate, speaker (1)		
R-25	6K1217099	Resistor: 220 10% 1/2W	19641318 Plate, speaker (2)		
R-26	6K1217099	Resistor: 220 10% 1/2W	268641159 Shield, chassis		
T-1	24K641016	Transformer, RF	48A12403 Transistor, type 2N265: PNP (driver)		
T-2	24K640526	Transformer, 1st IF: 455 KC	48C12523 Transistor, type 2N285A: PNP (1st IF)		
T-3	24K640526	Transformer, 2nd IF: 455 KC	48K125236 Transistor, type 2N285A: PNP (2nd IF)		
T-4	24K637483	Transformer, 3rd IF: 455 KC	48K125236 Transistor, type 2N285A: PNP (2nd IF)		
T-5	23K640349	Transformer, driver	48K125236 Transistor, type 2N285A: PNP (2nd IF)		
T-6	23K637642	Transformer, output	48K125236 Transistor, type 2N285A: PNP (2nd IF)		
V-1	48C125233	Transistor, type 2N168A: NPN (RF)	48K125236 Transistor, type 2N285A: PNP (2nd IF)		
V-2	48C125233	Transistor, type 2N168A: NPN (RF)	48K125236 Transistor, type 2N285A: PNP (2nd IF)		
V-3	48C125233	Transistor, type 2N168A: NPN (RF)	48K125236 Transistor, type 2N285A: PNP (2nd IF)		
V-4	48K125236	Transistor, type 2N285A: PNP (2nd IF)	48K125236 Transistor, type 2N285A: PNP (2nd IF)		

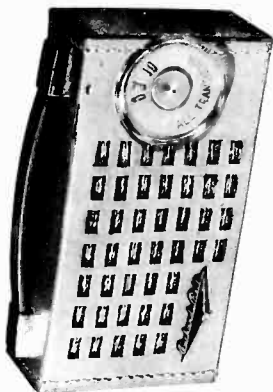
See Item, Appears in any List for First Time



Manual BC-45  
Sept. 11, 1957

**SERVICE MANUAL**

**MODEL 6RT1 PORTABLE TRANSISTOR RADIO**



Model 6RT1

**SPEAKER DATA:**

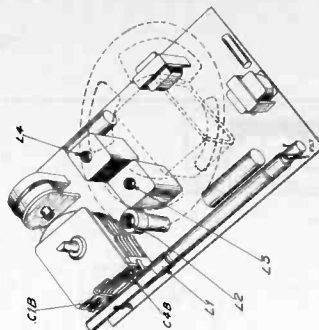
Type, permanent magnet dynamic  
Cone diameter, 2 3/4 in.  
Voice coil impedance, 12 ohms at 1000 cycles  
Magnet: 0.68 oz. Alnico V

**DC RESISTANCE MEASUREMENTS:**

- 1st I-F Coil: Primary, 3.8 ohms  
Secondary, 0.7 ohms
- 2nd I-F Coil: Primary, 3.5 ohms total, 1.5 ohms tap  
Secondary, 1 ohm
- Oscillator Coil: Primary, 0.8 ohms  
Secondary, 6.3 ohms
- Ferroloop antenna: Primary, 1.4 ohms  
Secondary, 0.1 ohm

**ALIGNMENT PROCEDURE:**

Alignment is accomplished by following the steps in the chart below. Connect output meter to speaker voice coil. Connect test oscillator across antenna section of variable condenser (C-1) for step one. Ground lead of generator goes to chassis. For other steps, couple generator loosely to ferroloop with three or four turns of wire. Each adjustment should be made using a minimum input signal.



Adjustments, Model 6RT1

Leave speaker in place; adjust L-2, L-3, & L-4 from rear.

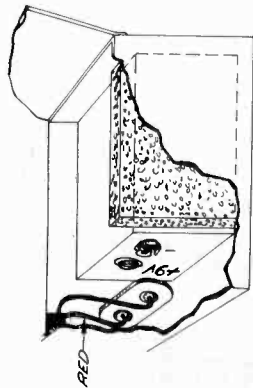
Manual BC-49  
(Supplement to BC-45)  
Nov. 1, 1957

**SUPPLEMENTARY INFORMATION**

**MODEL 6RT1 PORTABLE TRANSISTOR RADIO**

The information on this sheet is in addition to the information contained in manual BC-45. Revised figures are given for case width and total weight.

**BATTERY INSTALLATION**



Single Battery

**CABINET**

The leather case is available in three colors: walnut brown, golden tan, and sierra white. Cabinet dimensions are: 3 1/8 high x 6 1/4 wd x 1 5/8 dp (width increased 3/4). Weight of set (incl. battery): 1 1/4 lb.

**BATTERY**

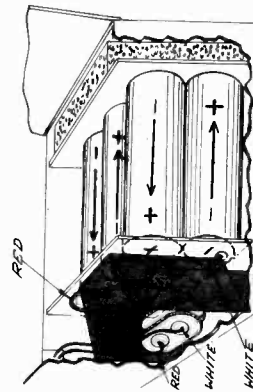
In addition to the batteries listed in service manual BC-45, six 1 1/2 volt penlite cells may be used. These may be either mercury cells or the conventional carbon type, but CARE MUST BE TAKEN TO OBSERVE THE PROPER POLARITY, as the top (button) terminal is + in the carbon, and - in the mercury cell.

The illustrations show single battery as well as penlite installation.

Components used only with the penlite cells are battery container assembly 10605 and spacer (fish-paper) 82096.

**ADDITIONAL SERVICE DATA**

The voltages in the following chart were measured with VTVM to common ground (positive), with no signal, and with volume control at maximum.



Penlite Batteries

**VOLTAGE CHART**

Transistor	Emitter	Base	Collector
Mixer - Osc X-1	-2.50	-2.35	-7.90
I-F Amplifier X-2	-1.10	-1.20	-7.30
Audio Ampl X-3	-1.55	-1.65	-7.80
Audio Output X-4 and X-5	-0.05	-1.70	-8.85
Diode Detector Cathode: -			1.60

**BATTERY CURRENT:**

No signal, 9 ma  
Output 25 mw, 15 ma  
Max output, 24 ma

**GENERAL DESCRIPTION:**

Model 6RT1 is an all transistor, battery powered, superheterodyne radio receiver, contained in a portable leather case. The antenna is a ferroloop mounted on the chassis. There are two controls, the tuning knob, and the volume control with on-off switch. Six semiconductors are used; five transistors and one diode.

**SPECIFICATIONS:**

**DIMENSIONS AND WEIGHT:**  
3 1/8 high x 6 1/4 wd x 1 5/8 dp  
Weight: 1 1/4 lb

**BATTERY DATA:**

One battery only is required, which may be of the usual carbon type, or the longer lasting mercury cell. Voltage is 9 volts. The following batteries may be used:

- PACKARD-BELL pt no. . . . . 16010
- Mallory pt no. . . . . M1602
- RCA pt no. . . . . VS305
- Burgess pt no. . . . . 2N6
- Approximate battery life: carbon, 100 hrs; mercury, 225 hrs.

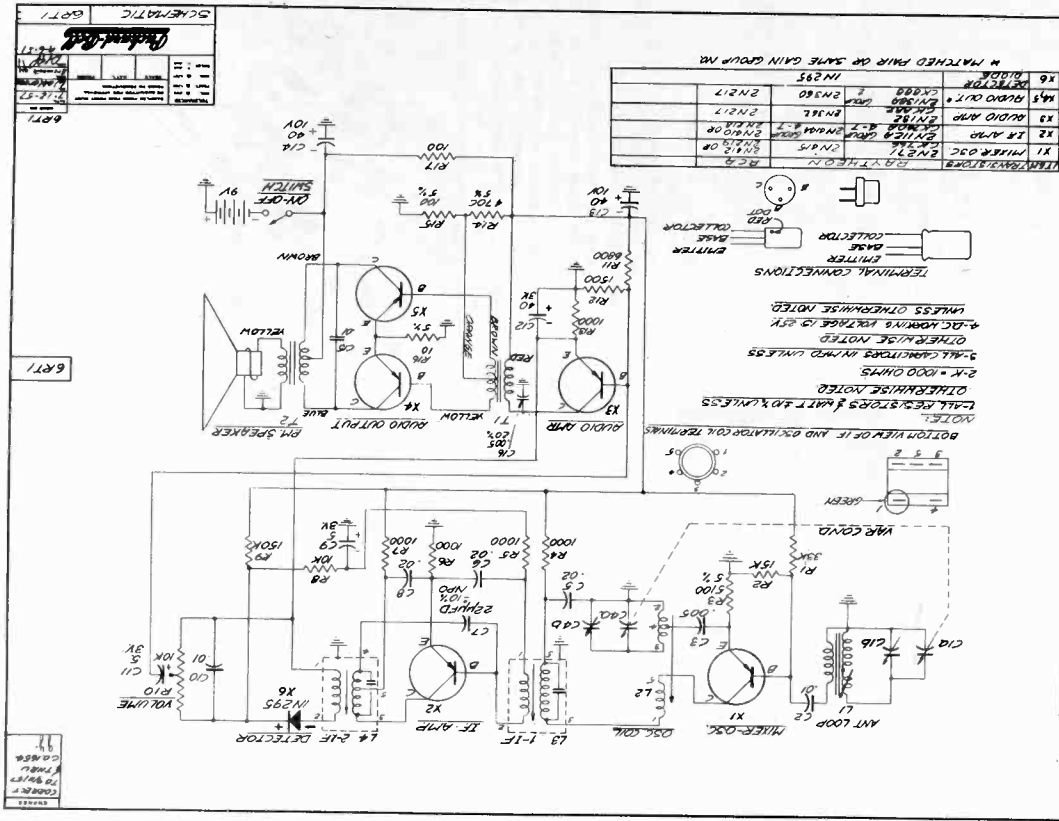
**POWER OUTPUT:**

Undistorted: 70 milliwatts  
Maximum: 115 milliwatts

**TUNING FREQUENCY RANGE:**

535 to 1620 kc

Schematic, 6RT1 Transistor Radio.



Step	Connect Test Oscillator To	Test Oscillator Frequency	Radio Dial Setting	Adjust
1.	Variable, antenna section	455 kc	535 kc	L-3 & L-4 for MAX
2.	Couple to loop	600 kc	600 kc	L-2 (osc) for MAX
3.	Couple to loop	1620 kc	1620 kc	C-4B for MAX
4.	Repeat steps two and three and check calibration at low end of dial (535 kc)			
5.	Couple to loop	1500 kc	Tune to test osc. signal	C-1B for MAX
6.	Couple to loop	600 kc	600 kc	L-1 (loop) for MAX

TABLE OF REPLACEABLE PARTS

REFERENCE SYMBOL	DESCRIPTION	PACKARD-BELL PART NUMBER	REFERENCE SYMBOL	DESCRIPTION	PACKARD-BELL PART NUMBER
<b>CAPACITORS</b>					
Working voltage of capacitors = 25 minimum unless noted					
NFO = Zero temperature coefficient					
R-10	Control, volume, w/switch	25051B	R-11	10,000 ohms, 30%	73035
R-12	6800 ohms, 10%	73027	R-13	1500 ohms, 10%	73033-1
R-14	Same as R-4	73013-1	R-15	100 ohms, 5%	73001-1
R-16	10 ohms, 5%	73013-1	R-17	100 ohms, 10%	73013-1
<b>COILS</b>					
L-1	Antenna, ferroloop	29356A	L-2	Oscillator coil	29233B
L-3	1st I-F coil	29094B	L-4	2nd I-F coil	29095B
<b>TRANSFORMERS</b>					
T-1	Audio driver	89484B	T-2	Audio output	89485B
<b>SEMICONDUCTORS</b>					
(Transistors and diodes)					
See table on schematic diagram.					

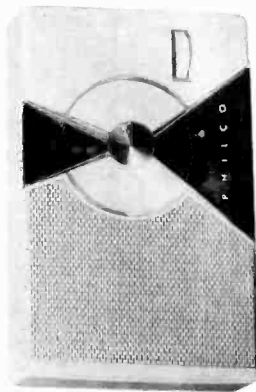
REFERENCE SYMBOL	DESCRIPTION	PACKARD-BELL PART NUMBER
<b>RESISTORS</b>		
All resistors 1/2 watt		
R-1	33,000 ohms, 10%	73043
R-2	15,000 ohms, 10%	73039
R-3	5100 ohms, 5%	73080-1
R-4	1000 ohms, 10%	73025
R-5	Same as R-4	
R-6	Same as R-4	
R-7	Same as R-4	
R-8	10,000 ohms, 10%	73037
R-9	150,000 ohms, 10%	73051
<b>MISCELLANEOUS PARTS</b>		
Battery:		
See "BATTERY DATA" under SPECIFICATIONS		
	Board, printed circuit	14170B
	Case, leather	21147A
	Clip, antenna	28213B
	Cover, chassis	34083B
	Knob, tuning	52228A
	Knob, volume	52222A
	Plug, battery	66051
	Speaker, 2 3/4", 12-ohm	83119C



PHILCO PORTABLE RADIO



TRANSISTOR MODEL T-7, CODE 126



MODEL T-7, CODE 126

ALIGNMENT PROCEDURE

**GENERAL**—Allow the test equipment to warm up for fifteen minutes before starting the alignment procedure.

**OUTPUT INDICATOR**—Connect the output indicator (a 1000-ohm-per-volt, r-c voltmeter, or an oscilloscope) across the voice-coil terminals.

**SIGNAL GENERATOR**—Use an AM r-f signal generator. Connect the ground lead to chassis, and connect the output lead as indicated in the alignment chart.

**OUTPUT LEVEL**—Attenuate the signal-generator output throughout the alignment so as to maintain the output level below .8 volt.

**RADIO CONTROLS**—Set the volume control to maximum. Set the tuning control as indicated in the alignment chart. During alignment of the

radio, the batteries should be in the same position with respect to the chassis and the loop antenna as they normally are in the cabinet.

SERVICE NOTES

When signal tracing, inject signal at transistor collector and limit input to keep signal across speaker below 0.8 volts.

Normally, the transistors should be the last item suspected.

If C15 opens serious audio oscillation will result.

Dress lead from top, center, frame lug of gang to end ground lug is important to reduce beat. See base layout for lead dress.

ALIGNMENT CHART

STEP	SIGNAL GENERATOR CONNECTION TO RADIO		RADIO SPECIAL INSTRUCTIONS		ADJUST
	DIAL SETTING	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	455 kc.	Tuning gang fully open.	Adjust for maximum output in order given.	TC3-3rd i-f pri. TC4-2nd i-f pri. TC5-1st i-f sec. TC2-1st i-f pri.	
2	600 kc.	Adjust for maximum output. Rock tuning lever while making this adjustment.	Adjust for maximum output.	TC1-osc. core	
3	1620 kc.	(Tuning gang fully open)	Adjust for maximum output.	C1B-osc. trimmer	
4	1400 kc.	Adjust for maximum output.	Adjust for maximum output.	C1A-antenna trimmer	
5	Repeat steps 2, 3 and 4 until no further improvement is obtained. Always stop on step 4.				

NOTE 1. Use a 6-to-8-um, 6-inch-diameter loop made up of insulated wire. Connect to generator terminals, and place about one foot from radio loop.

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REPLACEMENT PARTS LIST — MODEL T-7, CODE 126

Reference Symbol	Description	Service Part No.	Description	Reference Symbol	Service Part No.
C1	Condenser, tuning gang	31-2782	Resistor, IF B+ de-coupling, 82 ohms	R15	66-0823340
C2	Condenser, antenna coupling 470 mmf. ceramic	62-147001001	Resistor, detector output IF filter, 330 ohms	R16	66-1138240
C3	Condenser, diode bias by-pass, .01 mfd. ceramic disk	30-1238-2	Resistor, audio feedback, 470 ohms	R17	66-1773340
C4	Condenser, osc. coupling, .005 mfd. ceramic disk	30-1238-20	Resistor, output bias, 47 ohms, 5%	R18	66-0773240
C5	Condenser, 1st IF base by-pass, .01 mfd. ceramic disk	30-1238-2	Resistor, output emitters, 2.2 ohms	R19	66-1273360
C6	Condenser, 1st IF emitter by-pass, .04 mfd	30-1280-1	Resistor, output bias, 1000 ohms, 5%	R20	66-2108240
C7	Condenser, 1st IF neutralizing, 12 mmf. ceramic	62-012300001	Resistor, B+ filter 150 ohms	R21	66-1138240
C8	Condenser, 2nd IF neutralizing, 8 mmf. ceramic	30-1251-10	Volume Control, 15,000 ohms, with on-off switch	R22	66-9334360
C9	Condenser, 2nd IF base by-pass, .01 mfd. ceramic disk	30-1238-2	Resistor, AVC load, 2700 ohms	R24	66-2273340
C10	Condenser, B+ de-coupling, .1 mfd	30-1280	Switch, On-Off	S1	Part of R23
C11	Condenser, 2nd det. IF filter, .02 mfd. ceramic disk	30-1238-3	Transformer, oscillator	T1	31-4663
C12	Condenser, electrolytic, AVC filter, 100 mfd	30-3288-2	Transformer, audio input	T2	31-8743
C13	Condenser, electrolytic, AVC filter, 100 mfd	30-3288-2	Transformer, audio intermediate	T3	31-8741
C14	Condenser, electrolytic, B+ filter, 100 mfd	30-3288-2	Transformer, audio output	T4	31-8743
C15	Condenser, electrolytic, 1st audio emitter, 100 mfd	30-3288-2	Crystal diode, type IN57	X1	31-4845
J1	Jack, phone listening	63-1975-3	Choke, antenna isolation, wound on R1	XTAL	34-8028
L5028L	Transformer, 1st audio	34-6001-3	Transformer, 1st IF	Z1	31-4708-4
L5113L	Transformer, converter and 2nd detector, 2 used	34-6000-3	Transformer, 2nd IF	Z2	31-4708-5
L5114L	Transformer, 1st and 2nd IF amp., 2 used	34-6000-4	Transformer, 3rd IF	Z3	31-4708-6
LA1	Antenna coil	31-4668	Printed Panel		34-6248
LS1	Speaker	36-1664-2			
R1	Resistor, antenna isolation, used on coil form for A1	Part of X1			
R2	Resistor, diode bias, 820 ohms	66-1023340			
R3	Resistor, diode bias, 1000 ohms	66-2108340			
R4	Resistor, converter bias, 33,000 ohms	66-3308340			
R5	Resistor, converter bias, 22,000 ohms	66-3228340			
R6	Resistor, converter stabilizer, 4700 ohms	66-2773340			
R7	Resistor, 1st IF AVC, 680 ohms	66-1668340			
R8	Resistor, audio feedback, 270 ohms	66-1023340			
R9	Resistor, 1st IF emitter, 820 ohms	66-1023340			
R10	Resistor, 1st IF emitter return, 820 ohms	66-1023340			
R11	Resistor, 2nd IF bias, 100,000 ohms	66-4109340			
R12	Resistor, detector bias, 4700 ohms	66-2473340			
R13	Resistor, detector bias, 270 ohms	66-1273340			
R14	Resistor, detector stabilizer, 62 ohms	61-0823340			

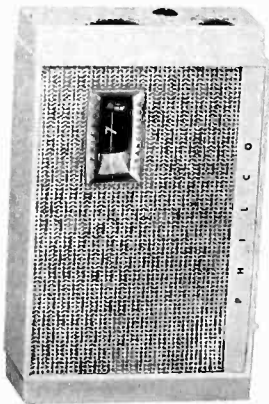
CABINET PARTS

Description	Reference Symbol	Service Part No.
Cabinet, Lustrite Ivory & Black		42-0024-1
Back		11191-1
Base		28-1317
Grille		38-1256-1
Knob, tuning		34-6231
Knob, volume		54-6256-1
Cabinet, Redwood		11191-2
Back		42-0024-2
Base		28-1317
Grille		38-1256-2
Knob, tuning		34-6231-1
Knob, volume		54-6256-1
Case, leather carrying		11223
Contact, battery		28-1323
Spring, battery		28-1296-1



- PHILCO TRANSISTOR RADIOS

MODEL T-500 - CODE 124



MODEL T-500 - CODE 124

ALIGNMENT PROCEDURE

**GENERAL**—Allow the test equipment to warm up for fifteen minutes before starting the alignment procedure.

**OUTPUT INDICATOR**—Connect the output indicator (a 1000-ohm-per-volt, a-c voltmeter, or an oscilloscope) across the voice-coil terminals.

**SIGNAL GENERATOR**—Use an AM F-1 signal generator. Connect the ground lead to chassis, and connect the output lead as indicated in the alignment chart.

**OUTPUT LEVEL**—Attenuate the signal-generator output throughout the alignment so as to maintain the output level below .275 volts.

**RADIO CONTROLS**—Set the volume control to maximum. Set the tuning control as indicated in the alignment chart.

SPECIFICATIONS

**CIRCUIT**—Five transistor superheterodyne.

**AUDIO OUTPUT**—25 milliwatts.

**BATTERY VOLTAGE AND TYPE**—6.0 volts from 4 penlight cells, type "AA", P-15, or mercury type "AA", P-9.

**FREQUENCY COVERAGE**—535 to 1620 KC. INTERMEDIATE FREQUENCY—455 KC.

**ANTENNA**—Self-contained magnecor, high-impedance loop.

**CABINET**—Styrene cabinet, leather carrying case optional.

**SPEAKER**—2-3/4 in. pm., 14 ohm voice coil. Jack provided for optional private listening attachment.

ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Panel must be removed from cabinet. Connect signal generator through a .1 μf condenser to antenna section of gang. Use the least generator signal necessary to give an output indication.	455 KC	Tuning gang fully open.	Adjust for maximum output in order given.	Z3—3rd IF Z2—2nd IF Z1—1st IF
2	Use radiating loop (See note 1 below).	1620 KC	1620 KC	Pre-set C2A (Ant.) 1/2 turn from right. Adjust for maximum output.	C1B—osc. trimmer
3	Same as step 2.	1400 KC	1400 KC	Adjust for maximum output.	C1A—ant. trimmer
4	Same as step 2. Panel MUST be re-mounted in cabinet.	600 KC	600 KC	Adjust for maximum output. Rock tuning gang while making this adjustment.	T1—osc. core
5	Repeat steps 2, 3 and 4 until no further improvement is obtained. Always stop on step 2.				

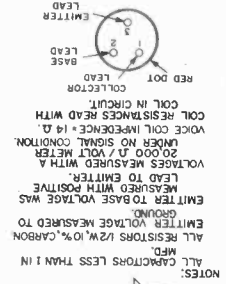
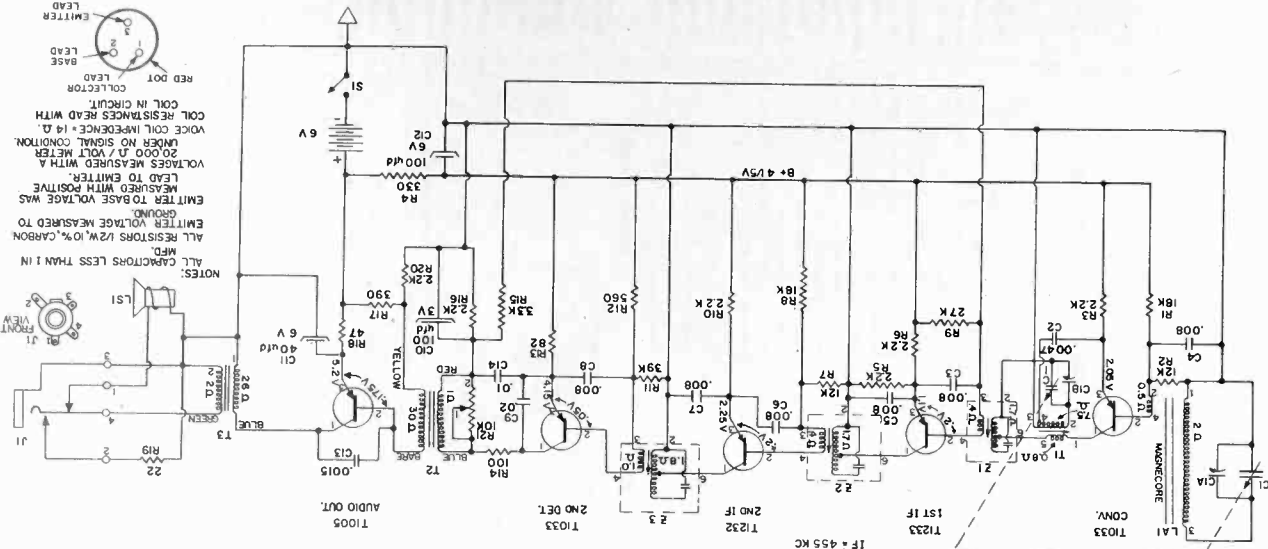
**NOTE 1.** Use a 6-10-8 turn, 6-inch diameter loop made up of insulated wire. Connect to generator terminals, and place about one foot from radio loop.

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REPLACEMENT PARTS LIST - MODEL T-500, CODE 124

Reference Symbol	Description	Service Part No.	Reference Symbol	Description	Service Part No.
C1	Condenser, tuning gang	31-2788	R16	Resistor, AGC delay, 2200 ohms	66-228240
C2	Condenser, osc. coupling, .0047 mfd, ceramic disk	30-1262-2	R17	Resistor, audio output base bias, 390 ohms	66-1588340
C3	Condenser, 1st IF base, .008 mfd, ceramic disk	30-1262-1	R18	Resistor, output emitter, 47 ohms	66-0793140
C4	Condenser, conv. base by-pass, .008 mfd, ceramic disk	30-1262-1	R19	Resistor, audio dropping, private listening, 22 ohms	66-0238340
C5	Condenser, 1st IF emitter by-pass, .008 mfd, ceramic disk	30-1262-1	R20	Resistor, audio output base return, 2200 ohms	66-228240
C6	Condenser, 2nd IF base, .008 mfd, ceramic disk	30-1262-1	R21	Volume control, with on-off switch, 10,000 ohms	35-15822
C7	Condenser, 2nd IF emitter by-pass, .008 mfd, ceramic disk	30-1262-1	S1	Switch, on-off	Part of R1
C8	Condenser, 2nd det. base, .008 mfd, ceramic disk	30-1262-1	T1	Oscillator transformer	32-4655-3
C9	Condenser, 2nd det. by-pass, .02 mfd, ceramic disk	30-1238-5	T2	Audio input transformer	31-8820
C10	Condenser, electrolytic, AVC filter, 100 mfd, 3V	30-2588-7	T3	Audio output transformer	31-8819
C11	Condenser, electrolytic, output emitter, 40 mfd, 6V	30-2588-3	T1005	Transistor, audio output	34-6001-14
C12	Condenser, electrolytic, B+ filter, 100 mfd, 6V	30-2588-4	T1003	Transistor, converter and 2nd detector, 2 used	34-6000-3
C13	Condenser, hi-cut tone compensation, .0015, ceramic disk	30-1262-8	T1203	Transistor, 2nd IF	34-6000-12
C14	Condenser, AGC filter, .01 mfd, ceramic disk	30-1238-1	Z1	Transformer, 1st IF	32-4708-7
J1	Jack, private listening	42-1975-4	Z2	Transformer, 2nd IF	31-4708-7
LA1	Antenna asy.	76-10204	Z3	Transformer, 3rd IF	32-4708-8
L51	Speaker	36-1664-3		Printed panel	54-6447
R1	Resistor, converter bias, 18,000 ohms	66-3188340	<b>CABINET PARTS</b>		
R2	Resistor, converter bias, 12,000 ohms	66-3188340	Description	Service Part No.	
R3	Resistor, converter emitter, 2200 ohms	66-228240	Cabinet, basic ivory and black	11268	
R4	Resistor, battery filter, 330 ohms	66-138240	Cabinet, pink and black	11268-1	
R5	Resistor, 1st IF emitter return, 2200 ohms	66-228240	Cabinet, back	54-6485-1	
R6	Resistor, 1st IF emitter bias, 2200 ohms	66-228240	Base	28-11972	
R7	Resistor, 2nd IF base bias, 12,000 ohms	66-3188340	Grille	28-11972	
R8	Resistor, 2nd IF base bias, 18,000 ohms	66-3188340	Knob, tuning	54-6486-1	
R9	Resistor, 1st IF base bias, 27,000 ohms	66-228240	Knob, volume	54-6487-1	
R10	Resistor, 2nd IF emitter, 2200 ohms	66-228240	Private listening unit	316-8006	
R11	Resistor, 2nd det. base bias, 39,000 ohms	66-2588340	Plug and cable assembly only, private listening	421-0024-1	
R12	Resistor, 2nd det. base bias, 500 ohms	66-1668340	Spring, cabinet latch	28-11855	
R13	Resistor, 2nd det. emitter, 82 ohms	66-0828340	Bracket, latch spring anti	31W-8971	
R14	Resistor, 2nd det. IF filter, 100 ohms	66-1108340	Bracket, speaker mounting, 1 used	38-1546	
R15	Resistor, AGC filter, 3300 ohms	66-228240	Battery contact assembly, 2 used	78-10198	

Schematic Diagram of Model T-500 - Code 124



NOTES:  
 ALL CAPACITORS LESS THAN 1 IN MFD.  
 ALL RESISTORS 1/2W, 10% CARBON GROUND.  
 EMITTER VOLTAGE MEASURED TO EMITTER TO BASE VOLTAGE WAS MEASURED WITH A LEAD TO EMITTER.  
 VOLTAGES MEASURED WITH A 20,000 Ω/VOLT METER UNDER NO SIGNAL CONDITION.  
 VOICE COIL IMPEDANCE 14 Ω.  
 COIL RESISTANCES READ WITH COIL IN CIRCUIT.  
 COLLECTOR LEAD  
 BASE LEAD  
 EMITTER LEAD

**REDUCTION OF HARMONIC BEAT**  
 The dress (position) of capacitor C9 will affect the harmonic beat content. In cases where the beat is noticeable, position C9 so that it is perpendicular to the magnecore antenna. Lead shown coiled around C9 and the 2nd detector transformer is a neutralization loop to reduce harmonic beat. The ends solder to the points indicated on the foil side of the printed panel. The dress of the black lead from the on-off switch to the ground tie lug, L10, is important in reducing harmonic beat. See composite panel view above.

**SERVICE NOTES**  
 When signal tracing, inject signal at transistor collector and limit input to keep signal across speaker below 0.275 volts. Normally, the transistors should be the last item suspected.

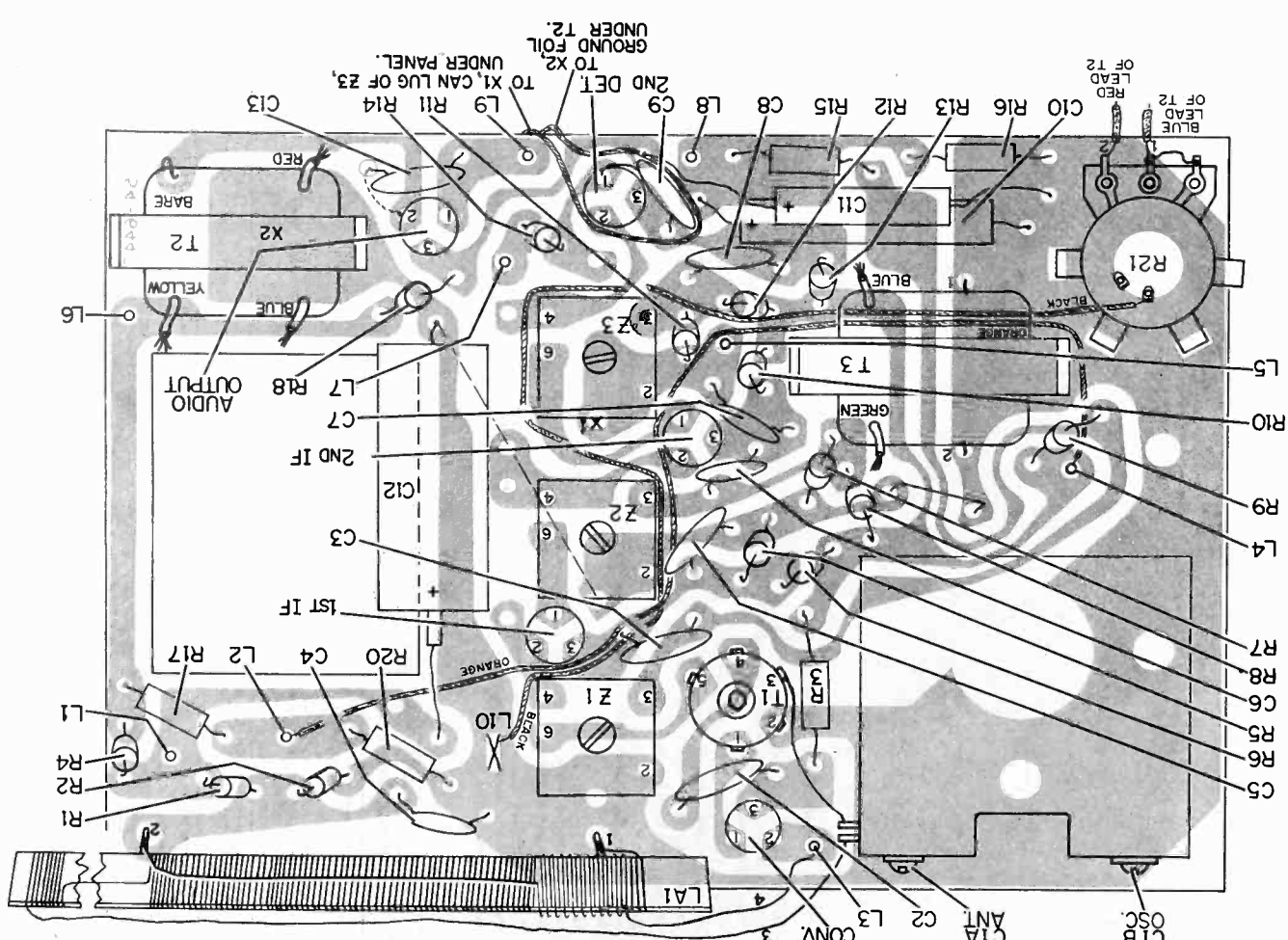
**TERMINAL LUG IDENTIFICATION**

- L1 Orange jumper to L4, 5 volt B+.
- L2 Yellow lead to T2.
- L3 To short antenna lead no. 4.
- L4 Orange jumper to L1, 4.5 volt B+.
- L5 Black jumper to ground lug L10.
- L6 Black lead to positive battery terminal (6 volts).
- L7 Green lead to arm of R21.
- L8 Orange lead to end (No. 2) of R21.
- L9 Blue lead of T3.
- L10 Ground lug; black lead to speaker, black lead to L5 and black lead to on-off switch.

**PRIVATE LISTENING JACK TERMINAL LEADS**

- Terminal 1—Brown lead to speaker.
- Terminal 2—One end of R19, P.T. shunt resistor.
- Terminal 3—Black ground lead to on-off switch and other end of R19.
- Terminal 4—Green lead of T3.

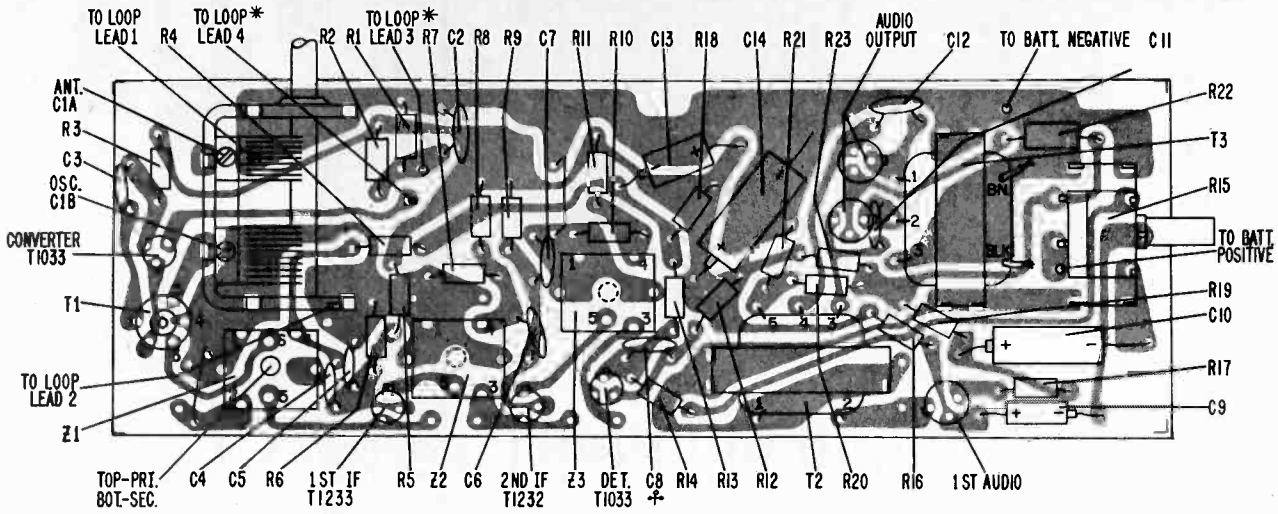
NOTE: C14 wires under the panel, from L8 to the junction of C9 and the emitter (No. 3) of the 2nd detector.



Composite Panel View, Showing Parts Placement

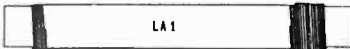
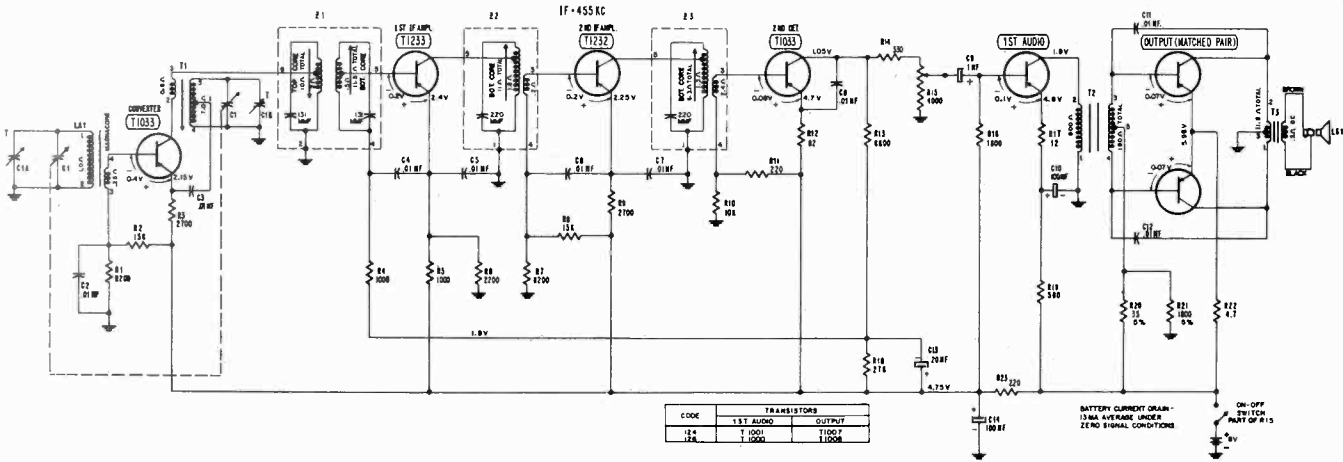


MODELS T-700X, T-701, Codes 124, 126



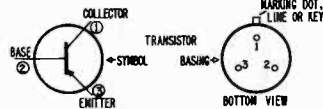
\* LOOP LEADS 3 & 4 DRESS BETWEEN EDGE OF PRINTED PANEL & MASONITE FRONT PLATE & CONNECT TO TIE LUGS INDICATED ON FOIL SIDE OF PANEL.  
 † SEE "SERVICE NOTES" ON FACING PAGE FOR DRESS OF C8.

Composite Panel View — Showing Parts Replacement and Tuning Adjustments



ANTENNA LEAD IDENTIFICATION T-700X ONLY. FOR T-701 SEE PAGE 4.

\* VOLTAGES READ UNDER NO SIGNAL CONDITIONS WITH A 20,000 PER VOLT METER. COIL RESISTANCES READ WITH COIL CONNECTED IN THE CIRCUIT.



Schematic Diagram of Models T-700X and T-701 — Codes 124 and 126

SERVICE NOTES

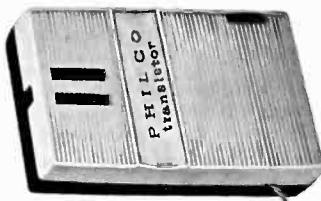
When signal tracing, inject signal at transistor collector and limit input to keep signal across speaker below 0.4 volts.  
 Normally, the transistors should be the last item suspected.

The dress (position) of condenser C8 may be helpful in reducing harmonic whistle when encountered. C8 may be bent over toward R14 and the detector transistor. In sets where C8 is in this bent position, do not disturb.

PHILCO TRANSISTOR RADIO



MODEL T-3 — CODES 124, 126, 128 & 130



MODEL T-3

**SPECIFICATIONS**

- CIRCUIT**—Three transistor T.R.F. with crystal detector.
- BATTERY VOLTAGE AND TYPE**—2.6 volts from 2 type P-630 mercury cells.
- FREQUENCY MINIMUM COVERAGL**—550 to 1550 KC.
- ANTENNA**—Self-contained magnetec, high-impedance loop.
- CABINET**—Plastic, shirt-pocket type.
- EARPHONE**—Private listening unit only.

**ALIGNMENT PROCEDURE**

**GENERAL**—Allow the test equipment to warm up for fifteen minutes before starting the alignment procedure.

**OUTPUT INDICATOR**—Connect the output indicator (a V.T.V.M. using the low voltage AC range or a calibrated oscilloscope) across the ear phone terminals.

**SIGNAL GENERATOR**—Use an AM r-f signal generator. Radiate the signal to the radio antenna. Use a 6 to 8 turn, 6-inch diameter loop made up of insulated wire. Connect to generator terminals and place about one foot from the radio antenna.

**OUTPUT LEVEL**—During alignment, attenuate the signal-generator output so as to maintain the output level at 0.63 volts.

**RADIO CONTROLS**—Set the volume control to maximum. Set the antenna tuning knob (the right-hand knob with the dial scale) to 600 KC. Without moving the antenna tuning, adjust the RF tuning knob to the mid-position of its fine-tuning range. **DO NOT DISTURB** the radio tuning once it is set.

**Step #1**—Set generator to 600 KC. Adjust the core of T<sub>1</sub> (the 1st RF transformer) for peak. Rock the generator — **NOT** the radio tuning — and adjust for maximum.

**Step #2**—Set generator to 600 KC. Adjust the core of T<sub>2</sub> (the 2nd RF transformer) for maximum. This transformer is very broad; there will be only a slight peak. The core may not extend above the top of the can.

PHILCO TRANSISTOR RADIO MODEL T-3 — CODES 124, 126, 128 & 130

PR-3216

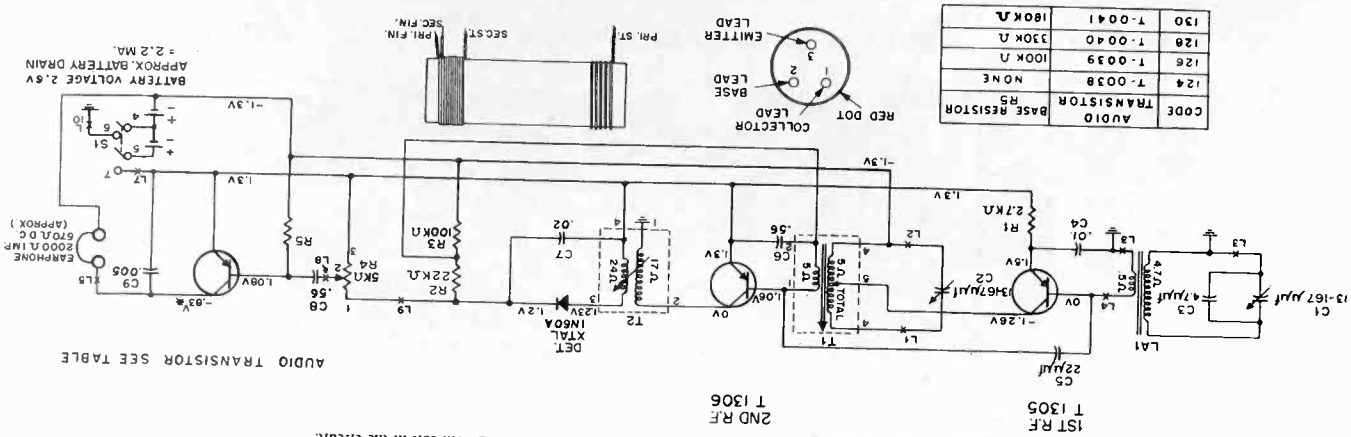
**REPLACEMENT PARTS LIST**

Reference Symbol	Description	Service Part No.
C1	Condenser, antenna tuning, 13,170 mmf	Part of 76-10038
C2	Condenser, 1st RF tuning, 13,170 mmf	Part of 76-10038
C3	Condenser, antenna shunt, 4.7 mmf	30-1231-5
C4	Condenser, 1st RF emitter by-pass, .01 mfd	30-1372-2
C5	Condenser, neutralization, 22 mmf	62-0224408011
C6	Condenser, 2nd RF emitter by-pass, .56 mfd	30-1374-3
C7	Condenser, diode by-pass, .02 mfd	30-1375-3
C8	Condenser, audio coupling, .56 mfd	30-1375-1
C9	Condenser, audio coupling, .005 mfd	30-1375-1
LA1	Antenna coil magnetec	66-211814-0
R1	Resistor, 1st RF emitter, 2700 ohms	66-211814-0
R2	Resistor, 2nd RF bias, 22,000 ohms	66-232834-0
R3	Resistor, 2nd RF bias, 100,000 ohms	66-4110124-0
R4	Volume Control, 5000 ohms	33-5382-4
R5	Resistor, output base	with transistor T-0039, Code 124, none used
		with transistor T-0028, Code 126, 100K ohms 66-410934-0
		with transistor T-0028, Code 128, 330K ohms 66-433334-0
		with transistor T-0041, Code 130, 100K ohms 66-4110124-0
S1	Switch, on-off	32-4782-1
T1	Transformer, 1st RF	32-4782-2
T2	Transformer, 2nd RF	32-4782-2
T-1305	Transformer, 1st RF	34-6000-16
T-1306	Transformer, 2nd RF	34-6000-17
T-1307	Transformer, audio, see note page 3	34-6001-21
XTAL	Crystal, code, type 1N50A	34-8022-3
	Printed Panel	34-8076

**MISCELLANEOUS PARTS**

Description	Service Part No.
Cabinet	81-0007
Contact, battery	28-1337
Ear Phone and cord only	32-6007
Cord and plug only	41-4276
Knob, volume	54-6682-1
Radio tuning knob (a) included only	76-10038
Nameplate	64-5588
Spring, battery, 2 used	38-13370

Schematic Diagram of Model T-3



CODE	TRANSISTOR	BASE RESISTOR	AUDIO
124	T-0038	NONE	
126	T-0039	100K $\Omega$	
128	T-0040	330K $\Omega$	
130	T-0041	180K $\Omega$	

AUDIO TRANSISTOR SEE TABLE

All resistors  $\frac{1}{2}$  watt, carbon.  
 All condenser values in  $\mu$ fd unless otherwise stated.  
 Voltages measured with a V.T.V.M. from point indicated to ground, under "No Signal" condition, with volume control.  
 \*Audio collector voltage may vary between  $-6$  and  $-1.0$  volt depending upon the transistor.  
 Coil resistances measured with coil in the circuit.

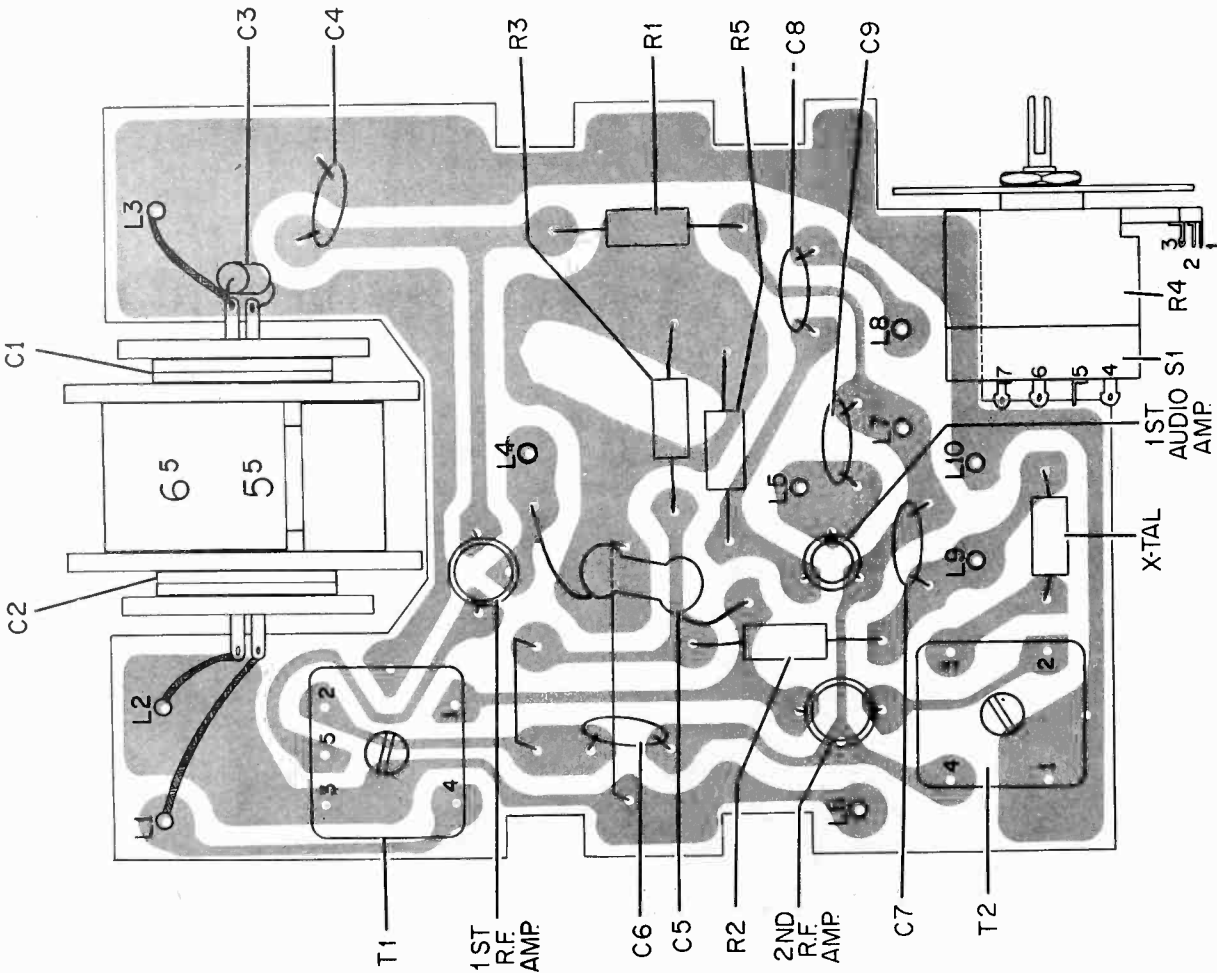
NOTES

The only differences between the four codes are the audio transistor type and the value of the audio base resistor. These value differences are indicated in the chart below. Code 124, using transistor T-0038, omits the resistor, R5; for the other codes, the value of R5 is as stated.  
 For audio transistor replacement purposes, only one type is used, the T-0041 of code 130, part number 34-6001-21. When this transistor is used as replacement in codes 124, 126 or 128, R5 must be changed in value as indicated in the chart.  
 There will be no difference in performance between the four audio transistors provided the base resistor, R5, is of the correct value.  
**SHIELDING**  
 To suppress possible regeneration, the leads of T1 are shielded by wrapping a small piece of aluminum tape around the can so as to cover the cut-outs. When replacing be careful not to cause shorts.

AUDIO TRANSISTOR - CODE VARIATIONS

PANEL-WIRE TERMINAL IDENTIFICATION

- L1 Braid from RF tuning, C2, to T1 lug 4.
- L2 Braid from RF tuning, C2, to T1 lug 3.
- L3 Braid from ant. tuning, C1, red lead and plain lead from LA1 to ground.
- L4 Red lead from LA1 to 1st RF base.
- L5 Private listening unit to audio collector.
- L6 Green lead from battery,  $-1.3$  volt.
- L7 Bare lead from S1 lug 7,  $+1.3$  volt. A black lead wires across the control from S1 lug 7 to R4 lug 3.
- L8 Red lead to arm of volume control, lug 2 of R4.
- L9 Brown lead to high side of R4, lug 1.
- L10 Bare wire from S1 lug 6, to ground.



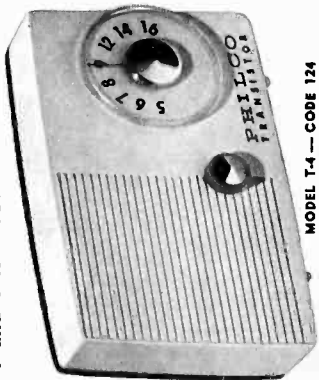
Composite Panel View, Showing Parts Placement





PHILCO TRANSISTOR RADIOS

MODELS T-4 and T-4J - CODE 124



MODEL T-4 - CODE 124

ALIGNMENT PROCEDURE

**GENERAL**—Allow the test equipment to warm up for fifteen minutes before starting the alignment procedure.

**OUTPUT INDICATOR**—Connect the output indicator (a 1000-ohm-per-volt, a-c voltmeter, or an oscilloscope) across the voice-coil terminals.

**SIGNAL GENERATOR**—Use an AM r-f signal generator. Connect the ground lead to chassis, and connect the output lead as indicated in the alignment chart.

**OUTPUT LEVEL**—Attenuate the signal-generator output throughout the alignment so as to maintain the output level below .275 volts.

**RADIO CONTROLS**—Set the volume control to maximum. Set the tuning control as indicated in the alignment chart.

SPECIFICATIONS

**CIRCUIT**—Four transistor superheterodyne with diode detector.

**AUDIO OUTPUT**—25 milliwatts.

**BATTERY VOLTAGE AND TYPE**—6.0 volts from 4 penlight cells, type "AA", P-15, or mercury type "AA", P-9.

**FREQUENCY COVERAGE**—535 to 1620 KC.

**ANTENNA**—Self-contained magnector, high-impedance loop.

**CABINET**—Styrene cabinet.

**SPEAKER**—2.3/4 in. pm., 14 ohm voice coil. Jack provided in model T-4J for optional private listening attachment.

ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Panel must be removed from cabinet. Connect signal generator through a .1 uf condenser to antenna section of gang. Use the least generator signal necessary to give an output indication.	455 KC	Tuning gang fully open.	Adjust for maximum output in order given.	Z3—3rd IF Z2—2nd IF Z1—1st IF
2	Use radiating loop (See note 1 below).	1620 KC	1620 KC (gang fully open)	Pre-set C2A (Ant.) 1/2 turn from tight. Adjust for maximum output.	C1B—osc. trimmer
3	Same as step 2.	1400 KC	1400 KC	Adjust for maximum output.	C1A—ant. trimmer
4	Same as step 2. Panel MUST be re-mounted in cabinet.	600 KC	600 KC	Adjust for maximum output. Rock tuning gang while making in this adjustment.	T1—osc. core
5	Repeat steps 2, 3 and 4 until no further improvement is obtained. Always stop on step 2.				

NOTE 1. Use a 6-to-8 turn, 6-inch diameter loop made up of insulated wire. Connect to generator terminals, and place about one foot from radio loop.

PHILCO TRANSISTOR RADIO MODELS T-4 and T-4J - CODE 124

PR-3217

REPLACEMENT PARTS LIST - MODELS T-4 and T-4J, CODE 124

Reference Designation	Description	Service Part No.	Part No. Service
C1	Condenser, tuning gang	30-2786-1	34-6011-1
C2	Condenser, .008 mfd, ceramic disc	30-1282-1	34-6011-2
C3	Condenser, .008 mfd, ceramic disc	30-1282-1	34-6001-17
C4	Condenser, electrolytic, .008 mfd, ceramic disc	30-1282-1	
C5	Condenser, electrolytic, .01 mfd, ceramic disc	30-1284-18	
C6	Condenser, 2nd IF coupling, 330 mmf, mica	30-2588	
C7	Condenser, 2nd IF tank, 3300 mmf, ceramic	30-1282-42	
C8	Condenser, 2nd IF tank, 470 mmf, mica	30-1284-18	
C9	Condenser, IF by-pass, .008 mfd, ceramic disc	30-1282-1	
C10	Condenser, 2nd detector by-pass, .02 mfd, ceramic	30-1272-3	
C11	Condenser, electrolytic, audio coupling, 1 mfd, 6 w.v.	30-2591-8	
C12	Condenser, electrolytic, audio coupling, 1 mfd, 6 w.v.	30-2591-8	
C13	Condenser, electrolytic, audio coupling, 5 mfd, 6 w.v.	30-2591-7	
C14	Condenser, electrolytic, battery by-pass, 1000 uf, 6 w.v.	30-2589-4	
C15	Condenser, HF by-pass, .01 mfd, ceramic disc	30-1282-2	
C16	Condenser, HF cut, .0015 mfd, ceramic disc	30-1282-8	
C17	Condenser, electrolytic, output by-pass, 43 mfd, 6 w.v.	30-2585-3	
T1	Jack, private listening, T4J only	62-182-4	
L1	Inductor assembly	30-1261-5	
R1	Resistor, antenna tank, 15,000 ohms	66-3158340	
R2	Resistor, antenna tank, 4700 ohms	66-2478340	
R3	Resistor, converter base bias, 2200 ohms	66-2228340	
R4	Resistor, AVC filter, 33000 ohms	66-3338340	
R5	Resistor, 2nd IF base, 2200 ohms	66-2228340	
R6	Resistor, 2nd IF base, 27K to 390K ohms	See Notes	
R7	Resistor, audio dropping, 1000 to 5000 ohms	See Notes	
R8	Resistor, audio control, 10,000 ohms	66-1109340	
R9	Resistor, AVC delay, 3300 ohms	66-2228340	
R10	Resistor, AVC delay, 3300 ohms	66-2228340	
R11	Resistor, 2nd IF audio load, 560 ohms	66-1568340	
R12	Resistor, output base, 4700 ohms	66-2478340	
R13	Resistor, B + dropping, 220 ohms	66-1228340	
R14	Resistor, output base bias, 1000 ohms	66-2108340	
R15	Resistor, output emitter bias, 47 ohms	66-0478340	
R16	Resistor, output emitter bias, 47 ohms	66-0478340	
S1	Switch, on-off	66-0228340	
T1	Oscillator transformer	Part of R8	
T2	Output transformer	33-4669-5	
XTAL	Crystal diode, 2nd det., type 1N60A	33-8819-1	
Z1	Transformer, 1st IF	34-6022-3	
Z2	Transformer, 2nd IF	33-4760-1	
Z3	Transformer, 3rd IF	33-4760-3	
	Printed Panel	54-5333	
	Converter - 2N232		34-6011-1
	1st IF - 2N553		34-6011-2
	Reflex (2nd) IF - R186, Transistor - Resistor Kit		34-6001-17
	See Notes		
	Audio - 2N185		
	Cabinet, Ivory and Black, T4		31-0002
	Cabinet, Aqua, T4		31-0002-1
	Cabinet, Ebony, T4J		31-0002-4
	Beck Cabinet		34-6629-1
	Battery barrier and felt casey.		34-1214
	Contact, battery		34-1213
	Knob, volume		34-6650-1
	Knob, cabinet spring		3W3871
	Spring, battery		28-1230-1
	Spring, battery		28-1230-2
	Spring, cabinet		28-11935

**T-4J PRIVATE LISTENING JACK TERMINAL LEADS**

- Terminal 1—Brown lead to speaker.
- Terminal 2—One end of R16, P.L. shunt resistor.
- Terminal 3—Black ground lead to on-off switch and other end of R16.
- Terminal 4—Green lead of T3.

**SERVICE NOTES**

When signal tracing, inject signal at transistor collector and limit input to keep signal across speaker below 0.275 volts.

Normally, the transistors should be the last item suspected.

**SCHEMATIC NOTES**

Due to 2nd IF transistor variations the values of resistors R6 and R7 must be selected, within limits, for optimum performance.

When transistor R186 is defective, kit number 324-8003 must be ordered. This kit contains a R186 transistor and two resistors (R6 and R7) properly matched. All three components must be replaced.

The stage may be checked as follows:  
The value of R6 is selected to allow the 2nd IF transistor collector to draw 2 millamps. This is checked by measuring the voltage across R1, the 560 ohm collector return resistor. This voltage should be 1.12 volts, with a tolerance of approximately  $\pm .12$  volts. The value of R6 falls within the limits of 27K to 390K.

All resistors are 1/2 watt, 10%, carbon.

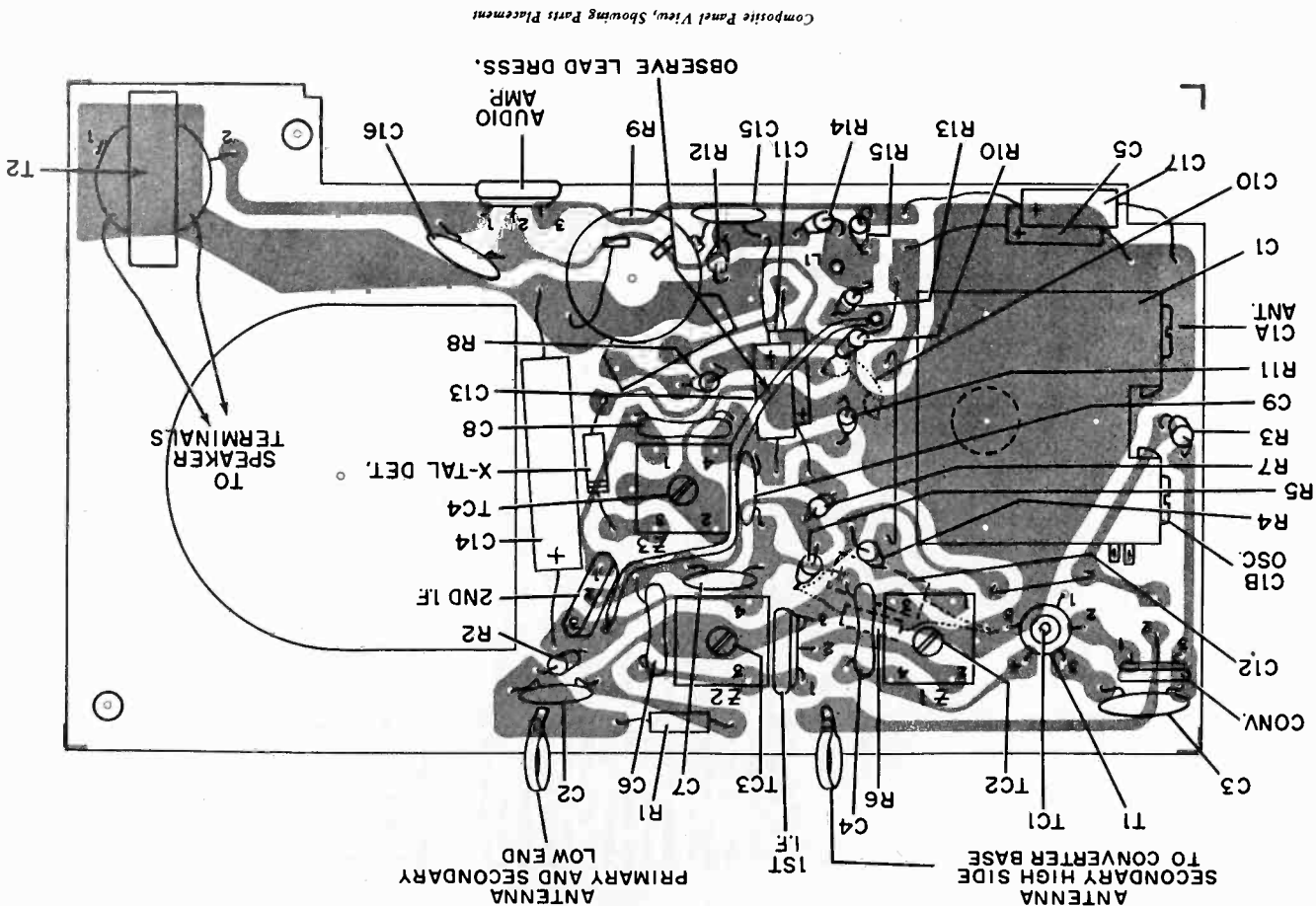
Coil resistances read with coil in circuit.

Voice coil impedance = 14 ohms.

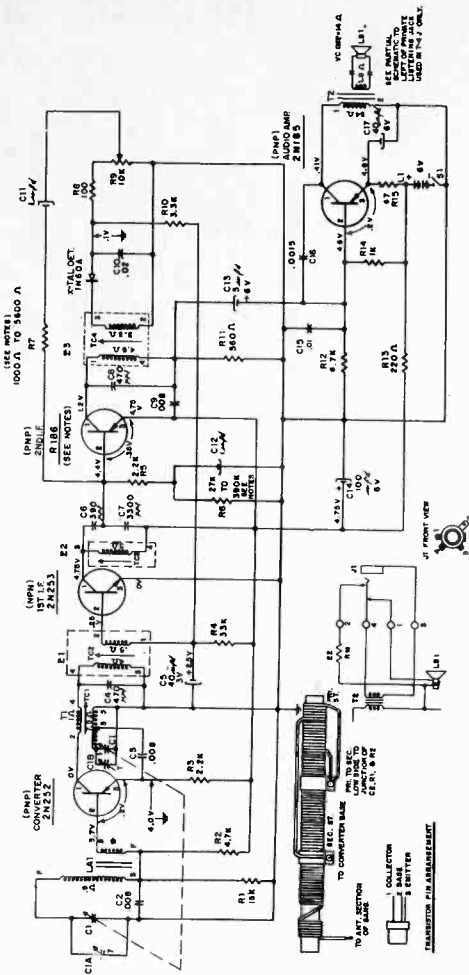
Volages measured to ground with a 20,000 ohms/volt meter under no signal condition.

Emitter to base volages were measured with positive lead to emitter, except for the 1st IF which is an NPN type and measured with the positive lead to the base.

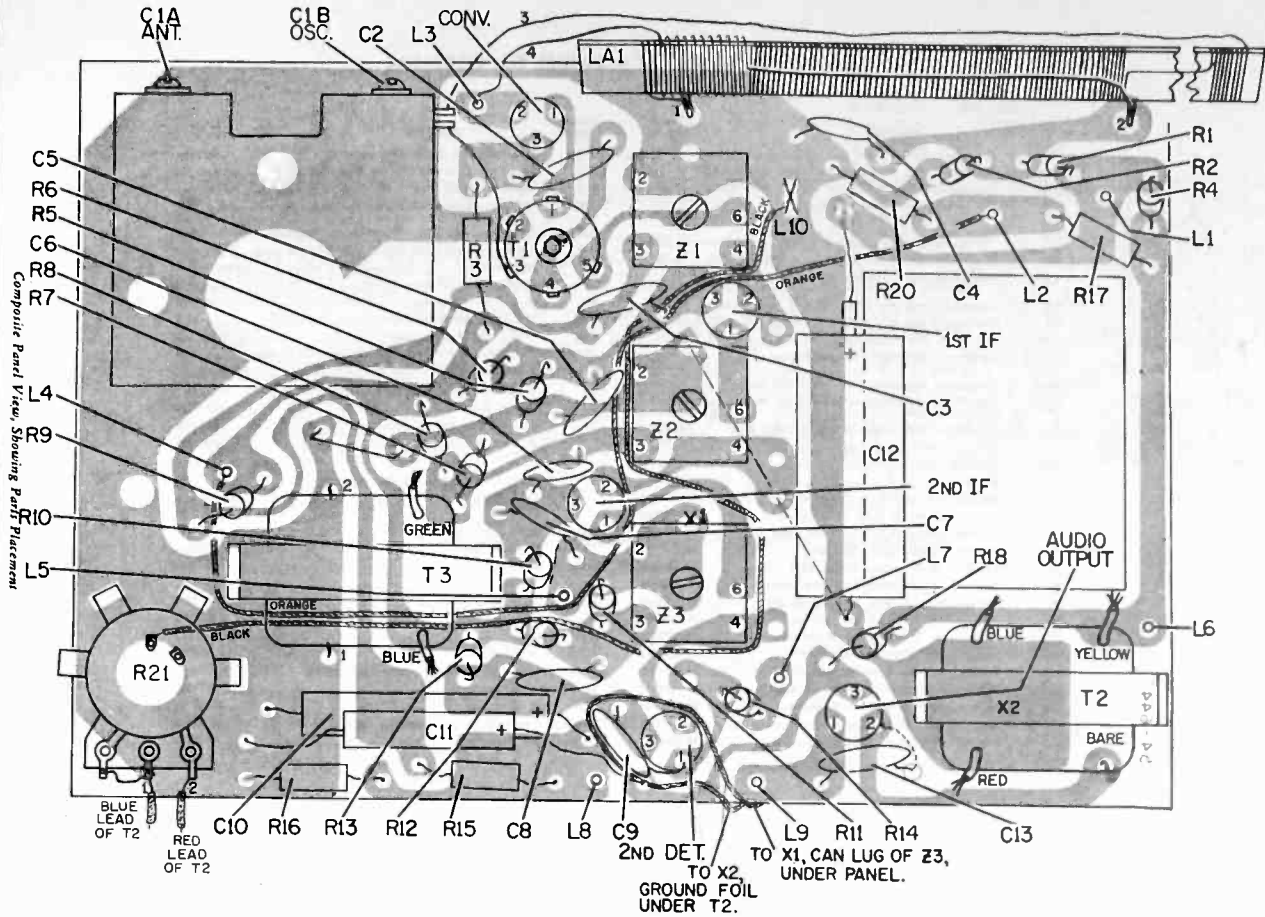
Run #51 — to improve low end sensitivity. The value of R1 was changed to 15,000 ohms, part number 66-3158340. Some few sets may have a 10,000 ohm resistor for R1.



Composite Panel View, Showing Parts Placement



Schematic Diagram of Models T-4 & T-4J - Code 124



PHILCO TRANSISTOR RADIO MODEL T-5 — CODE 124

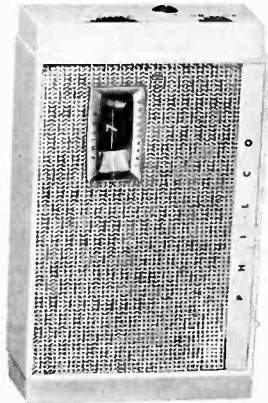
PR-3218



PHILCO TRANSISTOR RADIOS

SERVICE MANUAL

MODEL T-5 — CODE 124



MODEL T-5 — CODE 124

ALIGNMENT PROCEDURE

**GENERAL**—Allow the test equipment to warm up for fifteen minutes before starting the alignment procedure.

**OUTPUT INDICATOR**—Connect the output indicator (a 1000-ohm-per-volt, a-c voltmeter, or an oscilloscope) across the voice-coil terminals.

**SIGNAL GENERATOR**—Use an AM r-f signal generator. Connect the ground lead to chassis, and connect the output lead as indicated in the alignment chart.

**OUTPUT LEVEL**—Attenuate the signal-generator output throughout the alignment so as to maintain the output level below .275 volts.

**RADIO CONTROLS**—Set the volume control to maximum. Set the tuning control as indicated in the alignment chart.

SPECIFICATIONS

**CIRCUIT**—Five transistor superheterodyne.

**AUDIO OUTPUT**—25 milliwatts.

**BATTERY VOLTAGE AND TYPE**—6.0 volts from 4 penlight cells, type "AA", P-15, or mercury type "AA", P-9.

**FREQUENCY COVERAGE**—535 to 1620 KC.

**INTERMEDIATE FREQUENCY**—455 KC.

**ANTENNA**—Self-contained magnecor, high-impedance loop.

**CABINET**—Styrene cabinet, leather carrying case optional.

**SPEAKER**—2 3/4 in. pm., 14 ohm voice coil. Jack provided for optional private listening attachment.

ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Panel must be removed from rear of radio. Connect signal generator through antenna section of gang. Use the least generator signal necessary to give an output indication.	455 KC	Tuning gang fully open.	Adjust for maximum output in order given.	Z3—3rd IF Z2—2nd IF Z1—1st IF
2	Use radiating loop (See note 1 below).	1620 KC	1620 KC (Ant. fully open)	Pre-set C2A (Ant.) 1/2 turn from fully open. Adjust for maximum output.	C1B—osc. trimmer
3	Same as step 2.	1400 KC	1400 KC	Adjust for maximum output.	C1A—ant. trimmer
4	Same as step 2. Panel MUST be re-mounted in cabinet.	600 KC	600 KC	Adjust for maximum output. Rock tuning gang while making this adjustment.	T1—osc. core
5	Repeat steps 2, 3 and 4 until no further improvement is obtained. Always stop on step 2.				

NOTE 1. Use a 6-1/8 turn, 6-inch diameter loop made up of insulated wire. Connect to generator terminals, and place about one foot from radio loop.

REPLACEMENT PARTS LIST — MODEL T-5, CODE 124

Reference Symbol	Description	Service Part No.	Reference Symbol	Description	Service Part No.																												
C1	Condenser, tuning gang	31-2788	R16	Resistor, AGC delay, 2200 ohms	66-2228340																												
C2	Condenser, osc. coupling, .0047 mfd, ceramic disk	30-1262-2	R17	Resistor, audio output base bias, 390 ohms	66-1398340																												
C3	Condenser, 1st IF base, .008 mfd, ceramic disk	30-1262-1	R18	Resistor, output emitter, 47 ohms	66-0478340																												
C4	Condenser, conv. base by-pass, .008 mfd, ceramic disk	30-1262-1	R19	Resistor, audio dropping, private listening, 22 ohms	66-0228340																												
C5	Condenser, 1st IF emitter by-pass, .008 mfd, ceramic disk	30-1262-1	R20	Resistor, audio output base return, 2200 ohms	66-2228340																												
C6	Condenser, 2nd IF base, .008 mfd, ceramic disk	30-1262-1	R21	Volume control, with on-off switch, 10,000 ohms	33-5583-2																												
C7	Condenser, 2nd IF emitter by-pass, .008 mfd, ceramic disk	30-1262-1	S1	Switch, on-off	Part of R21																												
C8	Condenser, 2nd det. base, .008 mfd, ceramic disk	30-1262-1	T1	Oscillator transformer	32-4669-3																												
C9	Condenser, 2nd det. by-pass, .02 mfd, ceramic disk	30-1238-5	T2	Audio input transformer	32-8820																												
C10	Condenser, electrolytic, AVC filter, 100 mfd, 3V	30-2588-2	T3	Audio output transformer	32-8819																												
C11	Condenser, electrolytic, output emitter, 40 mfd, 6V	30-2588-3	T1005	Transistor, audio output	34-8001-14																												
C12	Condenser, electrolytic, B+ filter, 100 mfd, 6V	30-2588-4	T1033	Transistor, converter aud. 2nd detector, 2 used	34-6000-3																												
C13	Condenser, hi-cut tone compensation, .0015, ceramic disk	30-1262-8	T1233	Transistor, 1st and 2nd IF	34-8000-12																												
C14	Condenser, AGC filter, .01 mfd, ceramic disk	30-1238-1	Z1	Transformer, 1st IF	32-4708-7																												
J1	Jack, private listening	42-1973-4	Z2	Transformer, 2nd IF	32-4708-7																												
LA1	Antenna assy.	76-10204	Z3	Transformer, 3rd IF	32-4708-8																												
LS1	Speaker	36-1664-3		Printed panel	54-6447																												
R1	Resistor, converter bias, 18,000 ohms	66-3188340	<b>CABINET PARTS</b> <table border="1"> <thead> <tr> <th>Description</th> <th>Service Part No.</th> </tr> </thead> <tbody> <tr> <td>Cabinet, lustre ivory and black</td> <td>11268</td> </tr> <tr> <td>Cabinet, pink and black</td> <td>11268-1</td> </tr> <tr> <td>Cabinet, back</td> <td>54-6485-1</td> </tr> <tr> <td>Screws</td> <td>28-11973</td> </tr> <tr> <td>Grille</td> <td>28-11972</td> </tr> <tr> <td>Knob, tuning</td> <td>54-6486-1</td> </tr> <tr> <td>Knob, volume</td> <td>54-6487-1</td> </tr> <tr> <td>Private listening unit</td> <td>328-8006</td> </tr> <tr> <td>Plug and cable assembly only, private listening</td> <td>421-0024-1</td> </tr> <tr> <td>Spring, cabinet latch</td> <td>28-11955</td> </tr> <tr> <td>Rivet, latch spring mtg.</td> <td>2W36671</td> </tr> <tr> <td>Bracket, speaker mounting, 2 used</td> <td>28-11948</td> </tr> <tr> <td>Battery contact assembly, 2 used</td> <td>76-10198</td> </tr> </tbody> </table>			Description	Service Part No.	Cabinet, lustre ivory and black	11268	Cabinet, pink and black	11268-1	Cabinet, back	54-6485-1	Screws	28-11973	Grille	28-11972	Knob, tuning	54-6486-1	Knob, volume	54-6487-1	Private listening unit	328-8006	Plug and cable assembly only, private listening	421-0024-1	Spring, cabinet latch	28-11955	Rivet, latch spring mtg.	2W36671	Bracket, speaker mounting, 2 used	28-11948	Battery contact assembly, 2 used	76-10198
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Battery contact assembly, 2 used	76-10198																																
R2	Resistor, converter bias, 12,000 ohms	66-3128340																															
R3	Resistor, converter emitter, 2200 ohms	66-2228340																															
R4	Resistor, battery filter, 330 ohms	66-1338340																															
R5	Resistor, 1st IF emitter return, 2200 ohms	66-2228340																															
R6	Resistor, 1st IF emitter bias, 2200 ohms	66-2228340																															
R7	Resistor, 2nd IF, base bias, 12,000 ohms	66-3128340																															
R8	Resistor, 2nd IF, base bias, 18,000 ohms	66-3188340																															
R9	Resistor, 1st IF base bias, 27,000 ohms	66-3278340																															
R10	Resistor, 2nd IF emitter, 2200 ohms	66-2228340																															
R11	Resistor, 2nd det. base bias, 39,000 ohms	66-3398340																															
R12	Resistor, 2nd det. base bias, 560 ohms	66-1568340																															
R13	Resistor, 2nd det. emitter, 82 ohms	66-0828340																															
R14	Resistor, 2nd det. IF filter, 100 ohms	66-1108340																															
R15	Resistor, AGC filter, 3300 ohms	66-2338340																															

TERMINAL LUG IDENTIFICATION

- L1 Orange jumper to L4, 5 volt B+.
- L2 Yellow lead to T2.
- L3 To short antenna lead no. 4.
- L4 Orange jumper to L1, 4.5 volt B+.
- L5 Black jumper to ground lug L10.
- L6 Black lead to positive battery terminal (6 volts).
- L7 Green lead to arm of R21.
- L8 Orange lead to end (No. 2) of R21.
- L9 Blue lead of T3.
- L10 Ground lug: black lead to speaker, black lead to L5 and black lead to on-off switch.

PRIVATE LISTENING JACK TERMINAL LEADS

- Terminal 1—Brown lead to speaker.
- Terminal 2—One end of R19, P.L. shunt resistor.
- Terminal 3—Black ground lead to on-off switch and other end of R19.
- Terminal 4—Green lead of T3.

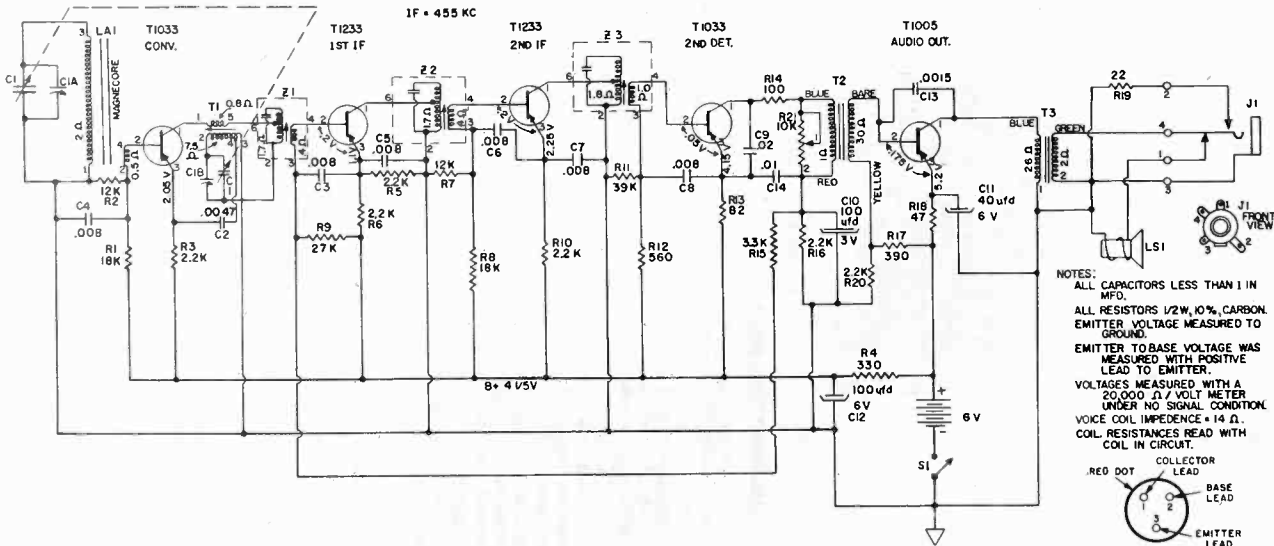
NOTE: C14 wires under the panel, from L8 to the junction of C9 and the emitter (No. 3) of the 2nd detector.

SERVICE NOTES

When signal tracing, inject signal at transistor collector and limit input to keep signal across speaker below 0.275 volts. Normally, the transistors should be the last item suspected.

REDUCTION OF HARMONIC BEAT

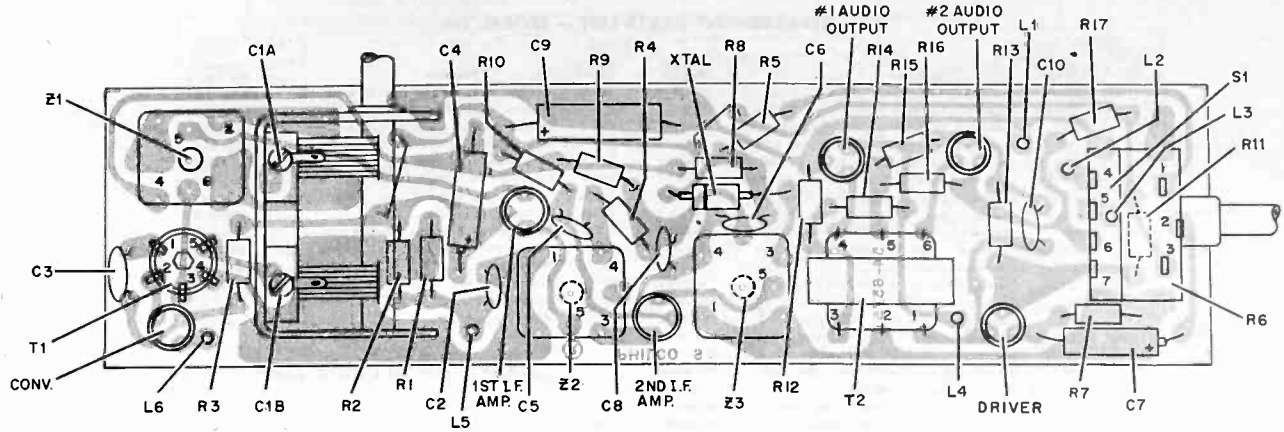
The dress (position) of capacitor C9 will affect the harmonic beat content. In cases where the beat is noticeable, position C9 so that it is perpendicular to the magnecor antenna. Lead shown coiled around C9 and the 2nd detector transistor is a neutralization loop to reduce harmonic beat. The ends solder to the points indicated, on the foil side of the printed panel. The dress of the black lead from the on-off switch to the ground tie lug, L10, is important in reducing harmonic beat. See composite panel view above. The dress of the orange lead from L4 to L2 is also important in reducing harmonic beat. See composite panel view above.



NOTES:  
 ALL CAPACITORS LESS THAN 1 IN WFO.  
 ALL RESISTORS 1/2W, 10%, CARBON EMITTER VOLTAGE MEASURED TO GROUND.  
 EMITTER TO BASE VOLTAGE WAS MEASURED WITH POSITIVE LEAD TO EMITTER.  
 VOLTAGES MEASURED WITH A 20,000 Ω / VOLT METER UNDER NO SIGNAL CONDITION.  
 VOICE COIL IMPEDANCE = 14 Ω.  
 COIL RESISTANCES READ WITH COIL IN CIRCUIT.

RED DOT COLLECTOR LEAD  
 1 BASE LEAD  
 2  
 3 EMITTER LEAD

Schematic Diagram of Model T-5 — Code 124



Composite Panel View — Showing Parts Replacement and Tuning Adjustments

**WIRING TERMINAL LUG IDENTIFICATION**

- L1 Black lead, battery ground.
- L2 Orange lead, 1.5V battery.
- L3 Red lead, 3.0V battery.
- L4 Orange lead, audio output to speaker.
- L5 Antenna lead, low side of secondary, lead #3.
- L6 Antenna lead, high side of secondary, lead #4.
- Antenna lead, high side of primary to ant. section of gang, lead #1.
- Antenna lead, low side of primary to gang ground lug, lead #2.
- Red lead from speaker to terminal #7 of S1.

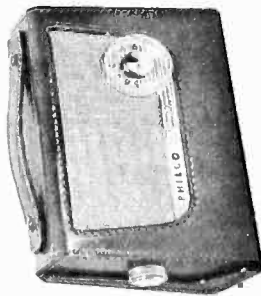
**PHILCO TRANSISTOR RADIO — MODEL T-6 — CODE 124**

PR-3215



**PHILCO TRANSISTOR RADIO SERVICE MANUAL**

MODEL T-6 — CODE 124



Model T-6

**ALIGNMENT PROCEDURE**

**GENERAL**—Allow the test equipment to warm up for fifteen minutes before starting the alignment procedure.

**OUTPUT INDICATOR** — Connect the output indicator (a 1000-ohm-per-volt, a-c voltmeter or an oscilloscope) across the voice-coil terminals.

**SIGNAL GENERATOR**—Use an AM r-f signal generator. Connect the ground lead to chassis, and connect the output lead as indicated in the alignment chart.

**OUTPUT LEVEL**—Attenuate the signal-generator output throughout the alignment so as to maintain the output level below .7 volt.

**RADIO CONTROLS**—Set the volume control to maximum. Set the tuning control as indicated in the alignment chart.

**SPECIFICATIONS**

**CIRCUIT**—Six transistors superheterodyne plus crystal diode detector.

**AUDIO OUTPUT**—0.1 watt.

**BATTERY VOLTAGE AND TYPE**—3.0 volts from 2 standard "D" cells.

**FREQUENCY COVERAGE**—535 - 1620 KC.

**INTERMEDIATE FREQUENCY**—455 KC.

**ANTENNA**—Self-contained magnecor, high-impedance loop.

**CABINET**—Leather-like Portable.

**SPEAKER**—3-1/2" pm., 9 ohm voice coil.

**ALIGNMENT CHART**

STEP	SIGNAL GENERATOR CONNECTION TO RADIO	DIAL SETTING	RADIO	
			DIAL SETTING	SPECIAL INSTRUCTIONS
1	Connect signal generator through a .1-uf. condenser to ant. section of gang.	455 kc.	Tuning gang fully open.	Adjust for maximum output in order given. Z3—3rd i-f pri. Z2—2nd i-f pri. Z1—1st i-f sec. (Bottom Core) Z1—1st i-f pri. (Top Core)
2	Use radiating loop. (See NOTE 1 below).	600 kc.	600 kc.	Adjust for maximum output. Rock tuning gang while making this adjustment. T1—osc. core
3	Same as step 2.	1620 kc.	1620 kc. (Tuning gang fully open)	Adjust for maximum output. C1B—osc. trimmer
4	Same as step 2.	1400 kc.	1400 kc.	Adjust for maximum output. C1A—antenna trimmer
5	Repeat steps 2, 3 and 4 until no further improvement is obtained. Always stop on step 4.			

NOTE 1. Use a 6-to-8-turn, 6-inch diameter loop made up of insulated wire. Connect to generator terminals, and place about one foot from radio loop.

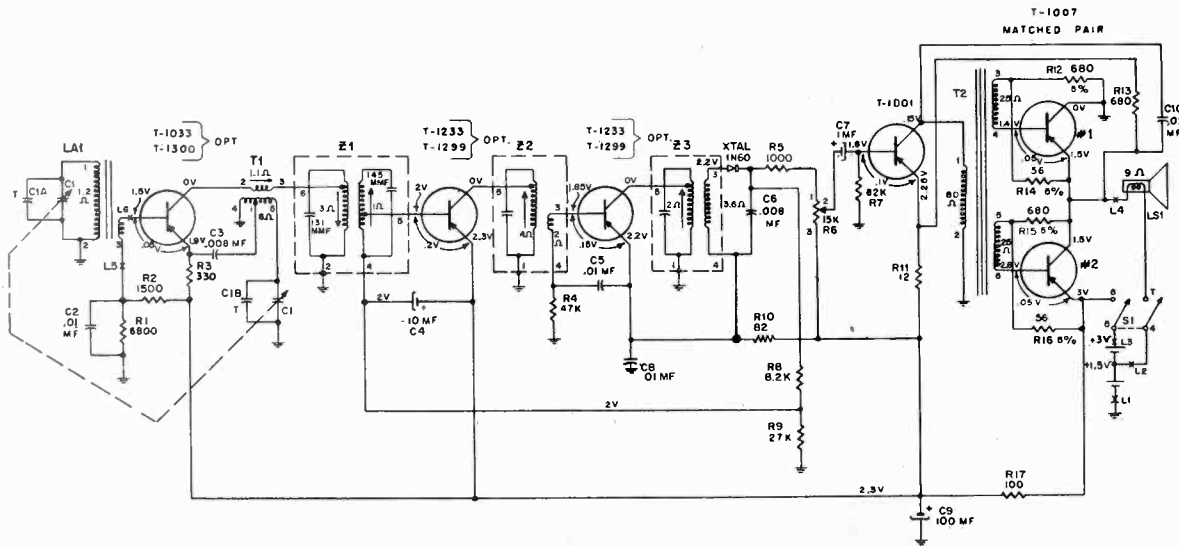
REPLACEMENT PARTS LIST — MODEL T-6

Reference Symbol	Description	Service Part No.
C1	Condenser, tuning gang	31-2783-12
C2	Condenser, converter base by-pass, .01 mfd, disk	30-1272-2
C3	Condenser, oscillator injection, .008 mfd, disk	30-1262-1
C4	Condenser, electrolytic, A.V.C. by-pass, 10 mfd, 6V	30-2581-3
C5	Condenser, 2nd IF base by-pass, .01 mfd, disk	30-1272-2
C6	Condenser, detector IF by-pass, .008 mfd, disk	30-1262-1
C7	Condenser, electrolytic, coupling, 1 mfd, 6V	30-2581-5
C8	Condenser, 2nd IF emitter by-pass, .01 mfd, disk	30-1272-2
C9	Condenser, electrolytic, supply filter, 100 mfd, 3V	30-2588-2
C10	Condenser, audio feed-back, .02 mfd, disk	30-1238-5
LA1	Antenna, magnecore	32-4668-5
LS1	Speaker, 3-1/2 in., 9 ohm, pm	36-1652-1
R1	Resistor, converter bias, 6800 ohms	66-2688340
R2	Resistor, converter bias, 1500 ohms	66-2158340
R3	Resistor, converter emitter, 330 ohm	66-1338340
R4	Resistor, 2nd IF bias, 47,000 ohms	66-3478340
R5	Resistor, 2nd detector IF filter, 1000 ohms	66-2108340
R6	Volume Control, 15,000 ohms	33-5575-14
R7	Resistor, driver base bias, 82,000 ohms	66-3828340
R8	Resistor, A.V.C. filter, 8200 ohms	66-2828340
R9	Resistor, A.V.C. load and diode bias, 27,000 ohms	66-3278340
R10	Resistor, 2nd IF supply de-coupling, 82 ohms	66-0828340
R11	Resistor, driver supply de-coupling, 12 ohms	66-0128340
R12	Resistor, audio output bias, 680 ohms, 5%	66-1688240
R13	Resistor, audio feedback, 680 ohms	66-1688240
R14	Resistor, audio output bias, 56 ohms, 5%	66-0568240
R15	Resistor, audio output bias, 680 ohms, 5%	66-1688240

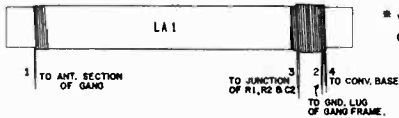
Reference Symbol	Description	Service Part No.
R16	Resistor, audio output bias, 56 ohms, 5%	66-0568240
R17	Resistor, supply filter, 100 ohms	66-1108340
S1	Switch, on-off	Part of R6
T1	Coil, oscillator	32-4668-2
T2	Transformer, audio driver	32-8838-2
T-1033	Transistor, converter	34-6000-3
T-1233	Transistor, 1st & 2nd IF amp., 2 used	34-6000-12
T-1001	Transistor, 1st audio	34-6001-18
T-1007	Transistor, audio output, matched pair	34-6008
XTAL	Crystal diode, type 1N60, 2nd detector	324-0006-3
Z1	Transformer, 1st IF	32-4738-4
Z2	Transformer, 2nd IF	32-4738-5
Z3	Transformer, 3rd IF	32-4738-3
	Printed Panel	54-6575

CABINET & MISCELLANEOUS PARTS

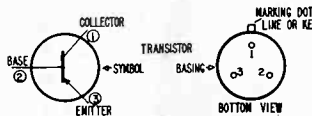
Description	Service Part No.
Cabinet, tan saddle, T-6	51-0006
Dial scale and nameplate	54-5383
Grille	28-12343
Handle	54-6205-16
Studs, handle mtg., 2 used	28-10907
Knob, tuning	54-6624-3
Knob, volume	54-6289-11
Spring, center battery contact	28-12250



Schematic Diagram of Model T-6 — Code 124



\* VOLTAGES READ UNDER NO SIGNAL CONDITIONS WITH A 20,000 PER VOLT METER. COIL RESISTANCES READ WITH COIL CONNECTED IN THE CIRCUIT.



SERVICE NOTES

When signal tracing, inject signal at transistor collector and limit input to keep signal across speaker below 0.4 volts.

Normally, the transistors should be the last item suspected.

The dress (position) of condenser C8 may be

helpful in reducing harmonic whistle when encountered. C8 may be bent over toward R14 and the detector transistor. In sets where C8 is in this bent position, do not disturb.

TRANSISTOR OPTIONS

As shown on the schematic, each of the first

three stages may use any one of several transistors as original equipment. These options are to facilitate production schedules.

For replacement purposes only one type is indicated in the parts list for each stage. This type should be ordered regardless of the original used.

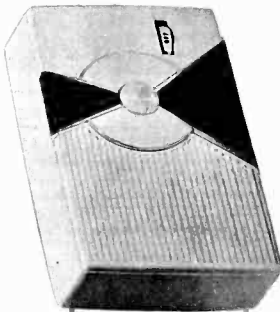
**PHILCO PORTABLE RADIO SERVICE MANUAL**

TRANSISTOR MODEL T-7X, CODE 128



**SPECIFICATIONS**

**CIRCUIT**—Seven transistor superheterodyne.  
**CABINET**—Plastic, personal portable cabinet. Leather carrying case optional.  
**FREQUENCY COVERAGE**—535 to 1620 KC.  
**INTERMEDIATE FREQUENCY**—455 KC.  
**ANTENNA**—Self-contained magnecor, high-impedance loop.  
**SPEAKER**—2-3/4 in. pm., 8 ohm voice coil impedance. Jack provided for optional private listening attachment, part number 326-8006.  
**BATTERY SUPPLY**—2 standard "D" cells, in 3 volt supply center tapped at 1 1/2 volts. Battery type P-907 or P-920 (metal clad).



MODEL T-7X, CODE 128

**ALIGNMENT PROCEDURE**

**GENERAL**—Allow the test equipment to warm up for fifteen minutes before starting the alignment procedure.  
**OUTPUT INDICATOR**—Connect the output indicator (a 1000-ohm-per-volt, a-c voltmeter, or an oscilloscope) across the voice-coil terminals.  
**SIGNAL GENERATOR**—Use an AM r-f signal generator. Connect the ground lead to chassis, and connect the output lead as indicated in the alignment chart.  
**OUTPUT LEVEL**—Attenuate the signal-generator output throughout the alignment so as to maintain the output level below .6 volt.  
**RADIO CONTROLS**—Set the volume control to maximum. Set the tuning control as indicated in

the alignment chart. During alignment of the radio, the batteries should be in the same position with respect to the chassis and the loop antenna as they normally are in the cabinet.

**SERVICE NOTES**

When signal tracing, inject signal at transistor collector and limit input to keep signal across speaker below .6 volts.  
 Normally, the transistors should be the last item suspected.  
 If C12 opens serious audio oscillation will result.  
 Dress of black lead from top, center, frame lug of gang, to end ground lug is important to reduce beat. See base layout for lead dress.

**ALIGNMENT CHART**

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Connect signal generator through a .1-uf. condenser to ant. section of gang.	455 kc.	Tuning gang fully open.	Adjust for maximum output in order given.	TC5—3rd i-f pri. TC4—2nd i-f pri. TC3—1st i-f sec. TC2—1st i-f pri.
2	Use radiating loop. (See NOTE 1 below)	600 kc.	600 kc.	Adjust for maximum output. Rock tuning gang while making this adjustment.	TC1—osc. core
3	Same as step 2.	1620 kc.	1620 kc. (Tuning gang fully open)	Adjust for maximum output.	C1B—osc. trimmer
4	Same as step 2.	1400 kc.	1400 kc.	Adjust for maximum output.	C1A—antenna trimmer
5	Repeat steps 2, 3 and 4 until no further improvement is obtained. Always stop on step 4.				

NOTE 1. Use a 6-to-8-turn, 6-inch-diameter loop made up of insulated wire. Connect to generator terminals, and place about one foot from radio loop.

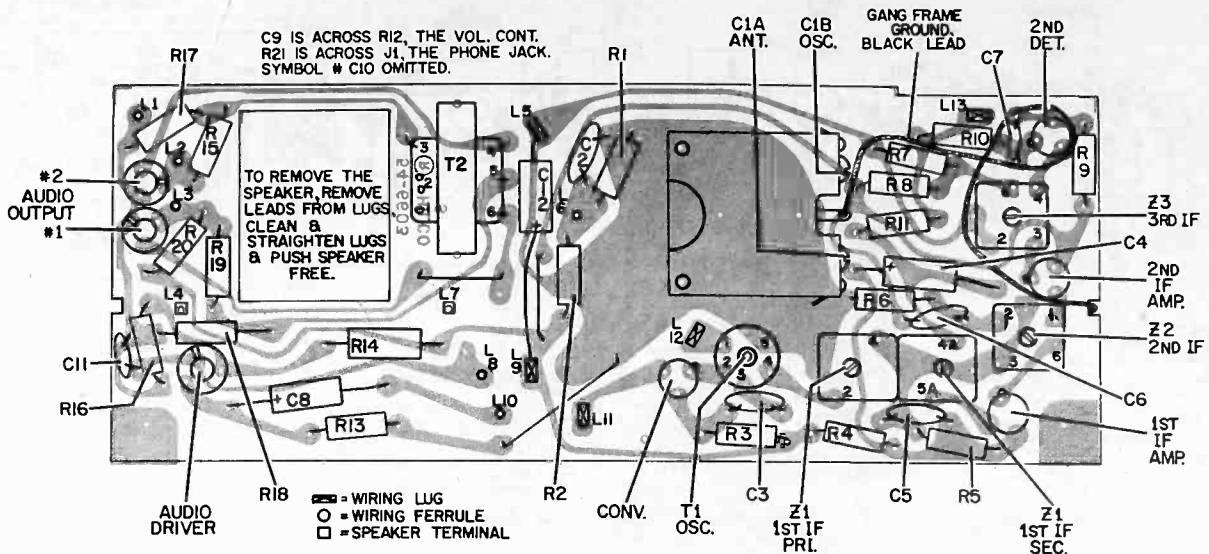


Figure 1 — Composite Panel View, Showing Parts Replacement and Tuning Adjustments

**TERMINAL LUG IDENTIFICATION**

- L1 Yellow lead to terminal #1 of J1 and yellow lead to speaker lug #L4.
- L2 Black lead to frame ground lug adjacent to L5.
- L3 Red lead to switch lug #1.
- L4 Speaker voice coil terminal, yellow lead to L1.
- L5 Panel ground. Black leads from gang frame and T2 (#1), bare wire to frame ground lug and ground end of C12.
- L6 Antenna (LA1) secondary finish.
- L7 Speaker voice coil terminal, green lead to terminal #3 of J1.
- L8 Red lead of T2 to driver collector.
- L9 B+ end of C12.
- L10 Green lead to arm of volume control, R12.
- L11 Antenna (LA1) secondary to converter base.
- L12 Blue lead to oscillator section of gang.
- L13 Blue lead to top of volume control.

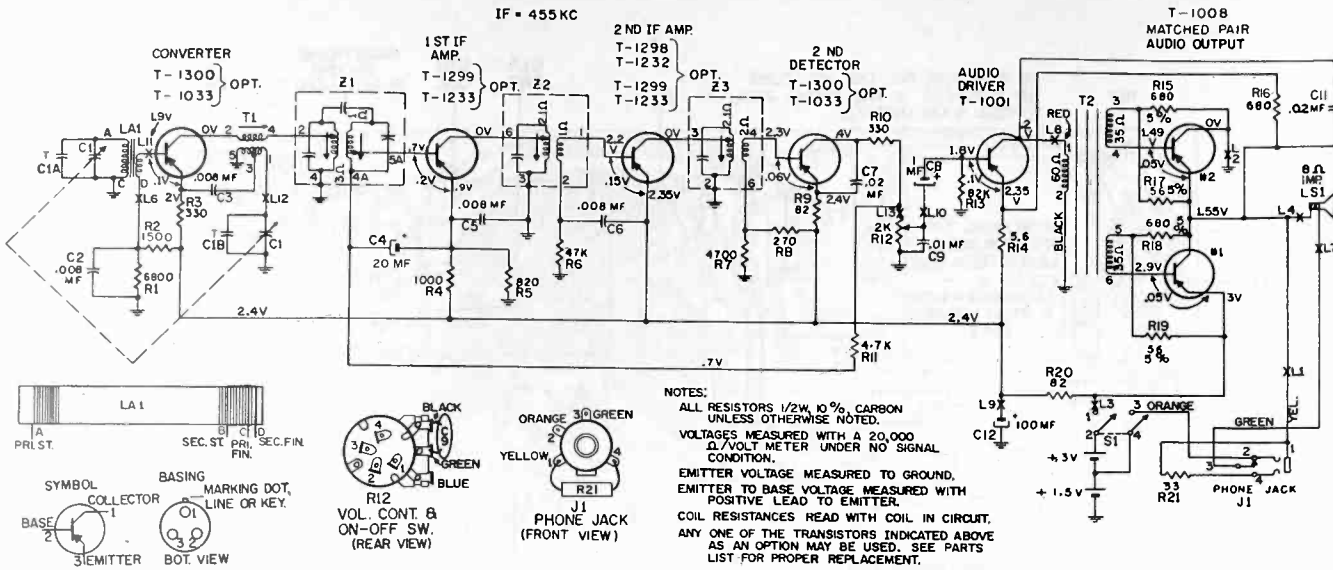


Figure 2 — Schematic Diagram of Philco Transistor Portable Model T-7X, Code 128

TRANSISTOR OPTIONS

As shown on the schematic, each of the first three stages may use any one of several transistors as original equipment. These options are to facilitate production schedules.

For replacement purposes only one type is indicated in the parts list for each stage. This type should be ordered regardless of the original used.

REPLACEMENT PARTS LIST — MODEL T-7X, CODE 128

Reference Symbol	Description	Service Part No.	Reference Symbol	Description	Service Part No.
C1	Condenser, variable tuning gang	31-2782	R16	Resistor, audio feedback, 680 ohms	66-1688340
C2	Condenser, converter base by-pass, .008 mid. disk	30-1282-1	R17	Resistor, output bias, 56 ohms, 5%	66-0568240
C3	Condenser, oscillator coupling, .008 mfd. disk	30-1262-1	R18	Resistor, output bias, 680 ohms, 5%	66-1688240
C4	Condenser, AVC filter, electrolytic, 10 mfd	30-2588-1	R19	Resistor, output bias, 56 ohms, 5%	66-0568240
C5	Condenser, 1st IF emitter by-pass, .008 mid. disk	30-1262-1	R20	Resistor, supply filter, 82 ohms	66-0828340
C6	Condenser, 2nd IF base by-pass, .008 mid. disk	30-1262-1	R21	Resistor, output load, 33 ohms	66-0338340
C7	Condenser, detector filter, .02 mid. disk	30-1238-5	S1	Switch, on-off	Part of R12
C8	Condenser, audio coupling, electrolytic, 1 mfd	30-2591-5	T1	Transformer, oscillator	32-4668-4
C9	Condenser, IF filter, .01 mid. disk	30-1238-6	T2	Transformer, audio driver	32-8938-1
C11	Condenser, audio feedback, .02 mid. disk	30-1238-5	Z1	Transformer, 1st IF	32-4708-9
C12	Condenser, supply filter, electrolytic, 100 mfd	30-2588-2	Z2	Transformer, 2nd IF	32-4708-10
J1	Jack, private listening	42-1975-4	Z3	Transformer, 3rd IF	32-4708-11
LA1	Antenna, coil, magnecore	32-4668-4		Printed Panel	54-6603
LS1	Speaker, 8 ohms impedance	35-1684-4	T-1033	Transistor, converter and 2nd detector, 2 used	34-6000-3
R1	Resistor, converter bias, 6800 ohms	66-2688340	T-1232	Transistor, 2nd IF amplifier	34-6000-11
R2	Resistor, converter bias, 1500 ohms	66-2158340	T-1233	Transistor, 1st IF amplifier	34-6000-12
R3	Resistor, converter emitter, 330 ohms	66-1338340	T-1001	Transistor, audio driver	34-6001-18
R4	Resistor, 1st IF emitter, 1000 ohms	66-2108340	T-1008	Transistor, audio output, matched pair	34-6009
R5	Resistor, 1st IF bias, 820 ohms	66-1828340			
R6	Resistor, 2nd IF bias, 47,000 ohms	66-3478340			
R7	Resistor, detector bias, 4700 ohms	66-2478340			
R8	Resistor, detector bias, 270 ohms	66-1278340			
R9	Resistor, detector emitter, 82 ohms	66-0828340			
R10	Resistor, detector filter, 330 ohms	66-1338340			
R11	Resistor, AVC filter, 4700 ohms	66-2478340			
R12	Volume control, 2000 ohms with on-off switch	33-5583-3			
R13	Resistor, 1st audio bias, 82,000 ohms	66-3828340			
R14	Resistor, 1st audio emitter, 5.6 ohms	66-9563360			
R15	Resistor, output bias, 680 ohms, 5%	66-1688240			

CABINET PARTS

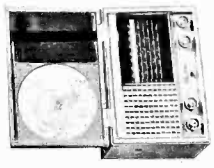
Description	Service Part No.
Cabinet, lustre ivory and black	11181-5
Bezel	28-11217
Knob, tuning	54-6257
Knob, volume	54-8256-1
Spring, cabinet latch	28-11955
Carrying Case, leather	11223
Insulator & battery contact, battery center tap	78-10458
Private listening unit	328-8006
Cord only, private listening unit	421-0024-1
Spring, battery contact	28-10961-1



# PHILCO TRANSISTOR RADIO SERVICE MANUAL



## MODEL T-9 TRANS-WORLD PORTABLE



Model T-9

### SPECIFICATIONS

CABINET—Leatherlike, plastic covered wood portable.  
CIRCUIT—Nine transistor superheterodyne.  
FREQUENCY COVERAGE—540KC to 18.2 MC in Seven Bands.

- Broadcast — 540KC - 1620KC
- Short Wave 1 — 2.0MC - 4.0MC
- Short Wave 2 — 4.0MC - 8.0MC
- 31 Meter Spread Band — 9.4MC - 9.9MC
- 25 Meter Spread Band — 11.4MC - 12.0MC
- 19 Meter Spread Band — 14.8MC - 15.6MC
- 10 Meter Spread Band — 17.2MC - 18.2MC

TUNING AND DIAL SCALE—Fly-wheel tuning drive with 15 to 1 drive ratio. Slide-rule dial with movable logging scale driven by band selector. Momentary flood dial lighting. Six-gang tuning condenser, three sections for BC, SW1 and SW2, and three sections for the four spread bands.

INTERMEDIATE FREQUENCY—455KC.  
ANTENNAS—Built-in Magnecore for BC and SW1. Built-in 63-in. collapsible whip for short wave. Provision for connecting an external antenna.

AUDIO OUTPUT—0.25 watts.  
SPEAKER—5 1/2 in. round PM with 3.2 ohm voice coil. Jack provided for connection of head phones.

-tone CONTROL—Continuously variable treble cut.  
BATTERY SUPPLY—6 standard "D" cells. 4 cells used as a 6 volt supply and 2 cells for a separate stabilized oscillator supply to assure minimum frequency variation. Storage space for 4 spare cells is also provided.

### SERVICE REMOVAL OF BAND SWITCH AND COIL PLATE ASSEMBLIES

The Switch Assembly, part number 328-0142, includes the drive shaft, gears, pulley, brackets and the components and wiring within the switch or between switch and coils. This assembly does not include the leads to exposed switch lugs or components C2, C13, C16, C17, C18, C21, R6, R7 or X1.

### REMOVAL OF SWITCH AND COIL PLATE ASSEMBLY FROM CHASSIS

- (1) Remove front plate. Remove control knobs. Disconnect orange/white lead from dial light switch. Disconnect black/white leads from chassis at speaker terminal. Disconnect red/white lead from phone jack. Remove screws mounting front plate and speaker assembly from chassis.
- (2) Disconnect leads from switch and coil plate assembly at their chassis or printed panel terminals. At printed panel — leads from L6 to L15; see page six for color and junction identification. From TB1, antenna panel — white/orange lead from #1 and red lead from #2. From magnecore antenna terminal lead — brown/white, red, skip (ground) and orange,

## PHILCO TRANSISTOR RADIO — MODEL T-9 TRANS-WORLD PORTABLE

PR-3162

### ALIGNMENT PROCEDURE

GENERAL—Allow test equipment to warm up for fifteen minutes before starting alignment procedure.  
OUTPUT INDICATOR—Connect the output indicator (a 20,000 ohm/volt meter or an oscilloscope) across the speaker voice coil terminals.

OUTPUT LEVEL—Attenuate the signal generator output during alignment to maintain the receivers' output level below .4 volt.

SIGNAL GENERATOR—Use an AM r-f signal generator (400 cycle, 30% modulated). Connect as follows:  
I-F Alignment — Step #1 — through a .05 mfd condenser to mixer base, tie lug L8.

BC R-F Alignment — Steps #2 to #5 — Radiating loop; 6 to 8 turns, 6 inch diameter loop made up of insulated wire. Connect across generator terminals and place about one foot from BC magnecore.

SW and Band Spread Alignment — Steps #6 to #20 — Dummy antenna; 22mfd condenser (critical value) in series with a 6.8 ohm resistor. The dummy antenna is connected in series with the generator output lead to terminal #1 of the antenna panel (the whip is disconnected).

RADIO CONTROLS—Volume control to maximum. Tone control fully clockwise (minimum treble cut). Band switch and tuning control as indicated in chart.  
POINTER INDEXING—Before performing alignment, pointer must be accurately indexed. Left hand edge of pointer must be aligned with the left hand end of the horizontal scale lines.

### ALIGNMENT NOTES

NOTE 1. On the BC, SW1 and SW2 bands the oscillator is on the high side. To check for proper oscillator adjustment feed in the image frequency; the image should be twice the I-F (910KC) above the frequency to which tuned.

On the four band spread ranges (31M, 25M, 19M and 16M) the oscillator is on the low side. To check for proper adjustment feed in the image frequency; 910KC below the frequency to which tuned.

NOTE 2. In a very limited number of sets, VC11 is located on the tuning gang. In all later sets VC11 is located, as shown, on the coil and trimmer plate. See figure 1 below.

Z2 Z3 Z1 PRI. Z2 SEC. Z1 PRI. LA1 PRI. VC11 TRIMMER SEE NOTE 2

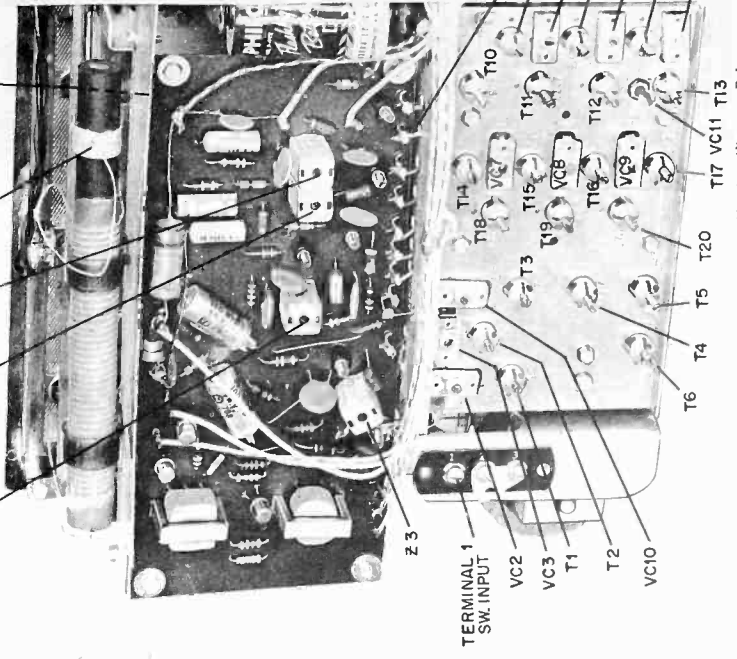


Figure 1. Printed Panel and Coil Plate, Showing Alignment Points

### REMOVAL OF SWITCH ASSEMBLY FROM COIL PLATE ASSEMBLY

Remove the two interstage switch shields. Each has three 1/4 in. drive screws through coil plate and two drive screws to switch brackets.  
(1) Transfer components C2, C13, C16, C17, C18, C21, R6, R7 and X1 from the old switch to the new replacement assembly.

(2) Transfer all floating leads from the old switch to the replacement with the exception of the red lead (that has been connected to terminal 2 of TB1) that wires to WS-1(R) 3 (a dummy lug), one end of C1. This lead and condenser are mounted on the replacement.

(3) Disconnect all remaining leads from top switch lugs numbers 7 to 12. See figure 5 on page 5. Also disconnect the following leads: from WS-1(F) 6, WS-2(F) 6, WS-2(R) 5, WS-3(F) 5 and 4, WS-4(F) 5 and 4, WS-5(F) 6 and WS-6(F) 6.

(4) All remaining leads between switch assembly and coil plate assembly are to be disconnected at the coil plate terminals. This includes C10 and R2.  
(5) The drive screw mounting the shaft bracket to coil plate is removed and the switch removed. It may be found convenient to remove the screw, thus freeing the switch assembly, before step 4.

ALIGNMENT CHART

STEP	SIGNAL GENERATOR	BAND SWITCH	DIAL SETTING	RADIO	SPECIAL INSTRUCTIONS	ADJUST
1	CONNECTION TO RADIO Through a .05 mfd condenser to mixer base, L8. Ground lead to chassis.	BC	455 kc.	Tuning gang fully open.	Adjust, in order given, for max. output.	Z3—3rd I-F Pri. Z2—2nd I-F Pri. Z1—1st I-F Sec. Z1—1st I-F Pri. VC4—BC osc.
2	Radiating loop; see "Signal Generator" in procedure above.	BC	1620 kc.	1620 kc.	Adjust for max. output. Oscillator is tuned to high side; see Note 1 on page 2.	T7—BC osc. core
3	Same as step 2.	BC	580 kc.	580 kc.	Adjust for max. output. This is the osc. tracking adjustment; repeat steps 2 and 3 until no further adjustment is necessary.	VC7—BC R-F VC10—BC Ant.
4	Same as step 2.	BC	1500 kc.	1500 kc.	Adjust for max. output. Adjust LA1 primary by sliding on magnecore. Coil is held in place by wax. Gently heat to move. Repeat steps 4 and 5 until no further improvement is noted.	T14—BC R-F core LA1—BC magne. Pri.
5	Same as step 2.	BC	580 kc.	580 kc.	Adjust for max. output. Oscillator is tuned to high side; see Note 1 on page 2.	VC5—SW1 osc.
6	Through a dummy antenna. See "Signal Generator" in procedure above.	SW1	4 mc.	4 mc.	Adjust for max. output. This is the osc. tracking adjustment; repeat steps 6 and 7 until no further adjustment is necessary.	T8—SW1 osc. core
7	Same as step 6.	SW1	2 mc.	2 mc.	Adjust for max. output. This is the osc. tracking adjustment; repeat steps 6 and 7 until no further adjustment is necessary.	T8—SW1 osc. core
8	Same as step 6.	SW1	4 mc.	4 mc.	Adjust for max. output.	VC8—SW1 R-F VC2—SW1 Ant.
9	Same as step 6.	SW1	2 mc.	2 mc.	Adjust for max. output. Repeat steps 8 and 9 until no further adjustment is necessary.	T15—SW1 R-F core T1—SW1 Ant. core
10	Same as step 6.	SW2	8 mc.	8 mc.	Adjust for max. output. Oscillator is tuned to high side; see Note 2 on page 2.	VC6—SW2 osc.
11	Same as step 6.	SW2	4 mc.	4 mc.	Adjust for max. output. This is the osc. tracking adjustment; repeat steps 10 and 11 until no further adjustment is necessary.	T9—SW2 osc. core
12	Same as step 6.	SW2	8 mc.	8 mc.	Adjust for max. output.	VC9—SW2 R-F VC3—SW2 Ant.
13	Same as step 6.	SW2	4 mc.	4 mc.	Adjust for max. output. Repeat steps 12 and 13 until no further adjustment is necessary.	T16—SW2 R-F core T2—SW2 Ant. core
14	Same as step 6.	16 meter	18.2 mc.	18.2 mc.	Adjust for max. output. Oscillator is tuned to low side; see Note 1 on page 2.	VC11—Spread osc. See Note 2.
15	Same as step 6.	16 meter	17.2 mc.	17.2 mc.	Adjust for max. output. Repeat steps 14 and 15 until no further adjustment is necessary.	T13—16M osc. core VC11
16	Same as step 6.	16 meter	17.7 mc.	17.7 mc.	Adjust for max. output.	T20—16M R-F core T6—16M Ant. core
17	Same as step 6.	16 meter	17.7 mc.	17.7 mc.	Adjust for max. output.	T12—19M osc. core See Note 1.
18	Same as step 6.	19 meter	15.2 mc.	15.2 mc.	Adjust for max. output.	T19—19M R-F core T5—19M Ant. core T11—25M osc. core See Note 1.
19	Same as step 6.	25 meter	11.7 mc.	11.7 mc.	Adjust for max. output.	T18—25M R-F core T4—25M Ant. core T10—31M osc. core See Note 1.
20	Same as step 6.	31 meter	9.7 mc.	9.7 mc.	Adjust for max. output.	T17—31M R-F core T3—31M Ant. core

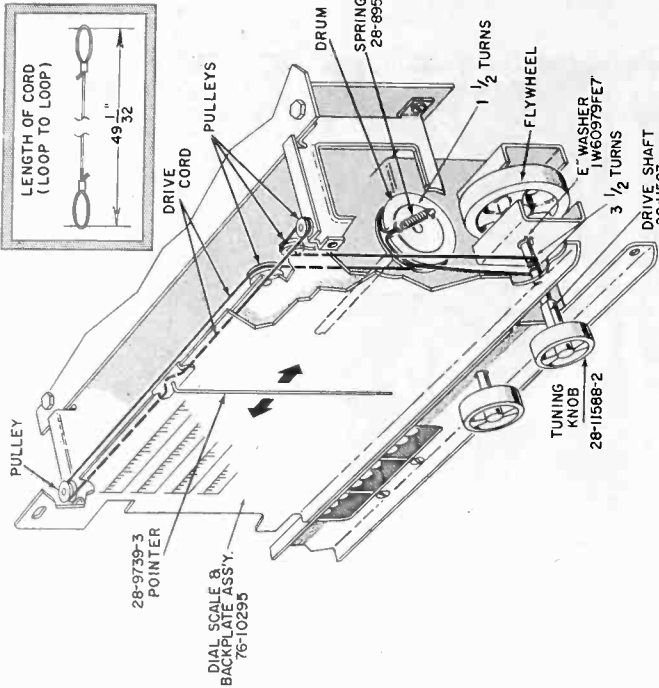


Figure 2. Tuning Drive Cord Stringing Detail

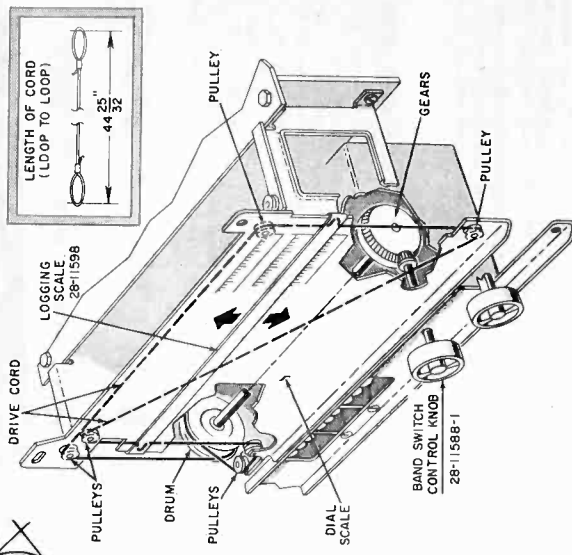
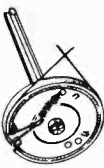


Figure 3. Logging Scale (Band Indicator) Drive Cord Stringing Detail

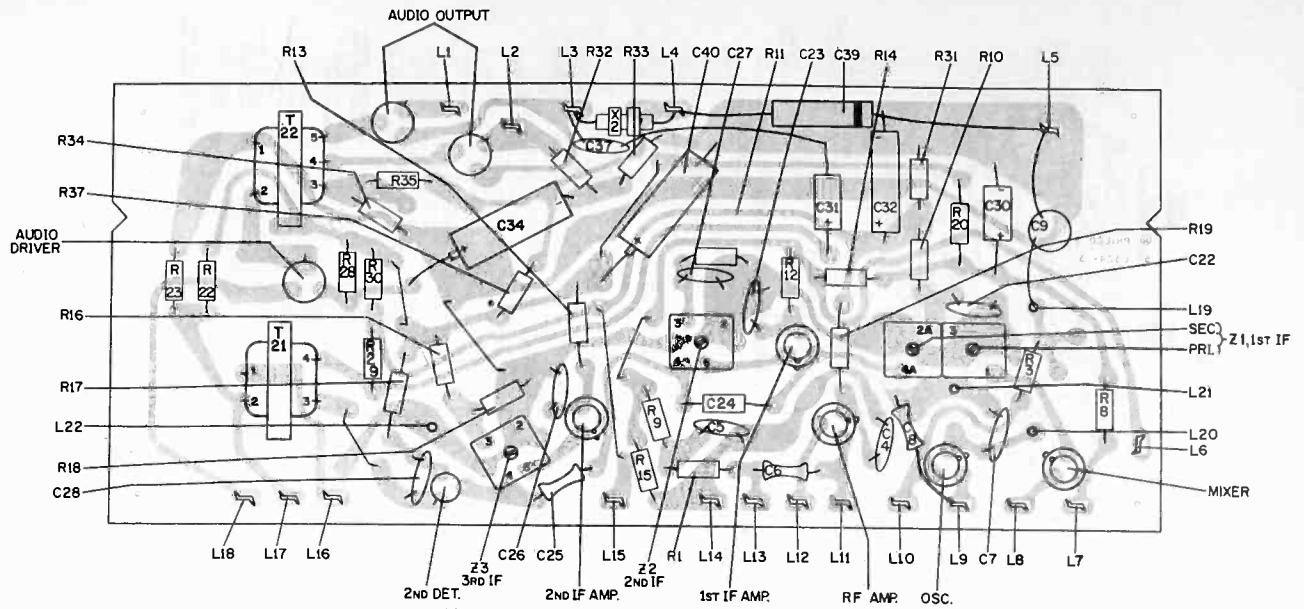


Figure 7. Composite Panel View — Showing Parts Placement

**PRINTED PANEL TERMINAL LUG IDENTIFICATION**

- L1 —To brown lead of audio output transformer.
- L2 —To red lead of audio output transformer.
- L3 —To audio output emitters.
- L4 —To 6V supply.
- L5 —To chassis ground.
- L6 —Mixer emitter supply to WS6-R 4 and C15, orange.
- L7 —Mixer emitter to WS6-F 11 (D), C17 and R5, brown.
- L8 —Mixer base to WS3-F 11, yellow.

- L9 —Oscillator collector to WS5-R 4, yellow/white.
- L10 —Oscillator emitter to WS5-R 10, white.
- L11 —R-F amp. collector to WS4-R 5, green.
- L12 —R-F amp. emitter to WS2-R 9 (D) and X1, red.
- L13 —From junction of R1 and C6 to antenna coils, orange.
- L14 —To chassis ground.
- L15 —Mixer base supply (1.8V) to WS3-R 9 (D) and R6, green.

- L16 —To volume control.
- L17 —To arm of volume control.
- L18 —To top of tone control.
- L19 —To 1-1/2V oscillator supply from on-off switch.
- L20 —To 1-1/2V oscillator bias supply.
- L21 —Wired from under panel, a panel ground point.
- L22 —To chassis ground.

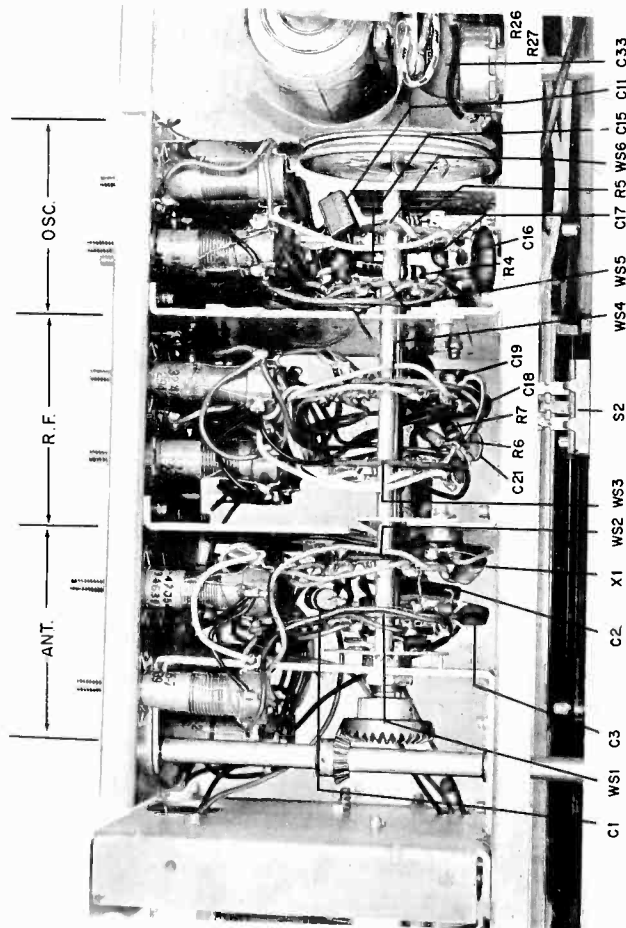
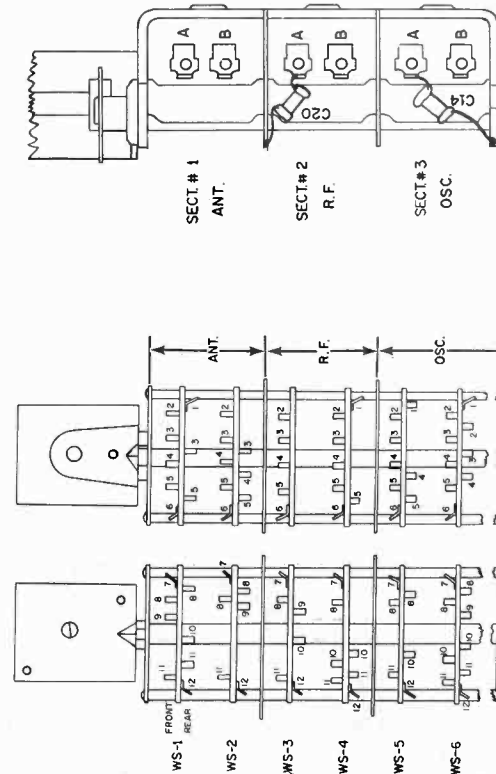


Figure 4. Component Location in Band Switch Wiring Assembly



"A" IS BAND SPREAD SECTION.  
"B" IS BC, SW1 & SW2 SECTION.  
IN EARLY PROD. SECT. 3A HAS A TRIMMER, VC11.

Figure 6. Top View, VC1 Identification

Figure 5. Band Switch, Showing Wafer and Lug Numbering



REPLACEMENT PARTS LIST

NOTE: Part numbers below may not be identical with those on factory parts. The values substituted in any case are so chosen that the operation will be unchanged. When ordering replacements, use only the "Service Part No."

Table with columns: Reference Symbol, Description, Service Part No., and Service Part No. (repeated). Lists various electronic components like capacitors, resistors, coils, and transistors.

MISCELLANEOUS PARTS LIST

Table with columns: Description, Service Part No., and Service Part No. (repeated). Lists miscellaneous parts like switches, brackets, and mechanical components.

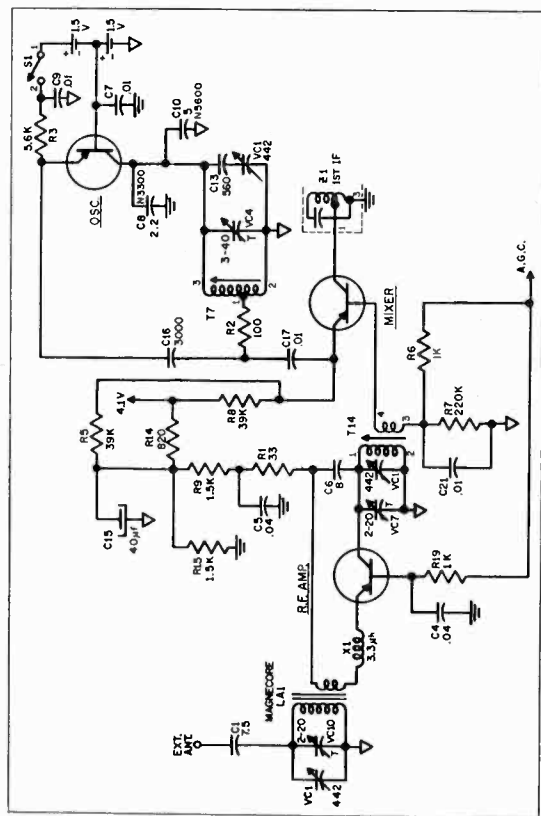


Figure 9. Partial Schematic Showing BROADCAST Ant., R.F. Osc. and Mixer Circuits (SW1 and SW2 are similar except for Coils and Trimmers)

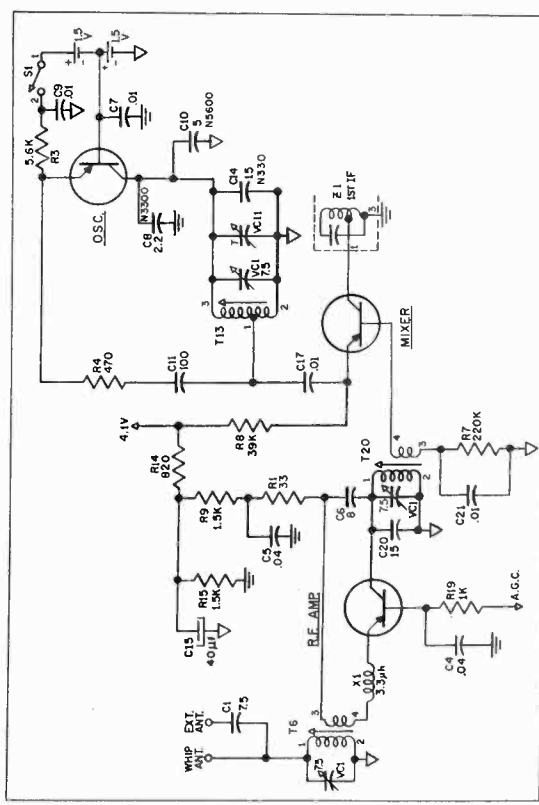
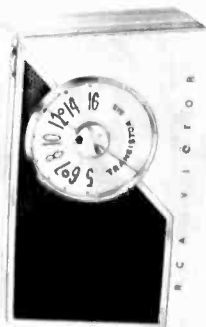


Figure 10. Partial Schematic Showing 16 METER Ant., R.F. Osc. and Mixer Circuits (Other Spread Bands similar except for Coils)

**Battery-Operated Pocket Radio**  
**MODEL 7-BT-9J**  
 Chassis No. RC-1159  
**SERVICE DATA**  
 — 1955 No. 37 —



The "Transistor Six"

**SPECIFICATIONS**

<b>TUNING RANGE</b> .....	540-1,600 kc
<b>INTERMEDIATE FREQUENCY</b> .....	455 kc
<b>TRANSISTOR COMPLEMENT:</b>	
(1) Type 2N35.....	Converter
(2) Type 2N34.....	1st I-F Amp
(3) Type 2N34.....	2nd I-F Amp
(4) Type 2N109.....	Audio Driver
(5) Type 2N109.....	Push-pull Output
(6) Type 2N109.....	Push-pull Output
A Type 1N235 crystal diode is used as 2nd detector.	
<b>BATTERY:</b>	
Type No. VS-300.....	9 volts
Current consumption (with no signal).....	Approx. 6 ma
Useful life (intermittent service).....	Approx. 75 hours
<b>LOUDSPEAKER:</b>	
Size and type.....	2 1/2" P.M.
Voice coil impedance.....	12 ohms at 1,000 cycles
Provision is made for connection of a low impedance earphone if desired. RCA earphone accessory Number RC-203 is recommended.	
<b>POWER OUTPUT:</b>	
Undistorted.....	65 milliwatts
Maximum.....	100 milliwatts
<b>DIMENSIONS:</b>	
Height.....	3 3/8"
Width.....	5 3/8"
Depth.....	1 1/4"
<b>WEIGHT:</b>	
Approximately one pound including battery.	

**IMPORTANT**

THE PROCEDURE TO BE USED IN SERVICING TRANSISTOR RADIOS IS VERY MUCH THE SAME AS USED WITH VACUUM TUBE RADIOS ALTHOUGH CERTAIN PRECAUTIONS MUST BE OBSERVED. THE SERVICE HINTS GIVEN ON PAGE 2 SHOULD BE CAREFULLY READ BEFORE ATTEMPTING TO SERVICE THIS RADIO RECEIVER.

**DESCRIPTION**

The "Transistor Six" is, as its name implies, a radio receiver using six transistors instead of vacuum tubes. A superheterodyne circuit is used consisting of: converter, two stages of I-F amplification, crystal diode detector, audio driver and push-pull class B output. A 2 1/2" speaker is used for normal listening; a jack for earphone connection is provided when use is desired without disturbing nearby persons.

**CIRCUIT CHANGES**

The following circuit changes in Models 7-BT-9J have been made during production in the order given:

- Shortly after start of production R20 (390 ohms) was added in parallel with R19. At the same time R19 was changed from a normal value of 150 ohms to 270 ohms.
- A few receivers have been made in which R11 (2nd I-F output circuit) has been replaced by a jumper wire.
- R5 was changed from 22K to 47K and R6 was omitted—both resistors are in the AGC circuit. R17 was changed from 12K to 10K  $\pm 5\%$  and R20 is now 390 ohms  $\pm 5\%$  instead of  $\pm 10\%$ —both resistors are in the output bias circuit.
- An additional filter capacitor (C18 45 mid) was added in parallel with C15 (45 mid). This change minimizes possibility of audio regeneration on loud volume.
- Resistor R2 (emitter circuit of converter) was changed in value from 390 ohms to 560 ohms.  
 Due to tolerances in transistor manufacture, a regenerative squeal or spurious oscillation may occur. The above resistor change reduces the forward bias and results in greater stability.
- In order to provide greater interchangeability of Type 2N35 transistors (converter) and improve the operation of the receiver under conditions of strong signals, the following changes were made:  
 (a) The lead connecting R3 (1500 ohm) to the emitter (E) of Q2 (1st I-F amp.) is removed.  
 (b) R3 is replaced by a 150,000 ohm resistor, one of the resistor leads is extended to the junction of R1-R18 (+ 9 v. buss).

(c) A crystal diode (Type # 1N235 or # 1N60, Stock No. 101615) is connected from the collector (c) of Q2 to Term. #4 of T4 (3rd I-F trms.). The cathode (cath., green or -) of the crystal diode is connected to the collector of Q2.

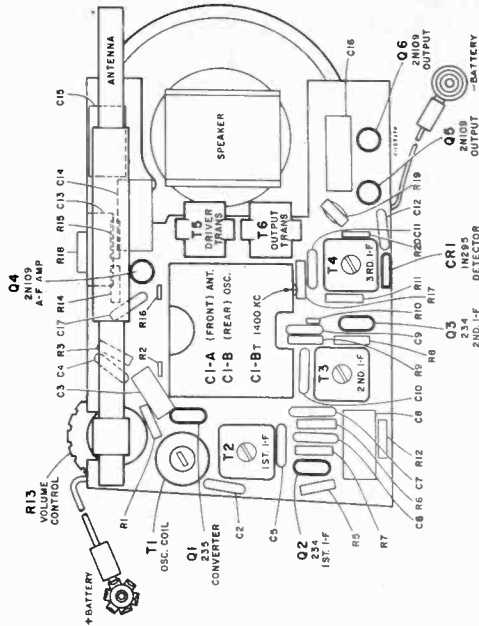
**ALIGNMENT PROCEDURE**

**Output Meter Alignment**—If this method is used, connect the meter across the voice coil and turn the receiver volume control to maximum.

**Tone Oscillator**—For all alignment operations, connect the low side of the test oscillator to the "common negative" wiring and keep the oscillator output as low as possible to avoid AVC action.

Step	Connect High Side of Sig. Gen. to	Sig. Output	Dial Pointer Setting	Adjust for Max. Output
1	#2 terminal of ant. assembly L1	455 kc	Quiet point near 1600 kc	T4 3rd I-F T3 2nd I-F T2 1st I-F
2		Repeat Step 1		
3	Short wire placed near antenna	1400 kc	1400 kc rock gang	trimmer* C1-B (osc.)
4	radiated signal	600 kc	600 kc rock gang	T1 osc coil
5		Repeat Steps 3 and 4		

\* Oscillator trimmer is located on bottom of gang.



**EARPHONE CONNECTION**  
 Only a low impedance earphone (under 200 ohms) should be connected to the earphone terminals. Num. RCA accessory earphone Number BK-203 is recommended.

Chassis Components  
 View from  
 Back Side

**SERVICE HINTS**

- Oscillator performance can not be judged by measurement of a-c voltage developed across a resistor. Measure the oscillator signal strength with an a-c voltmeter at the base of Q1 (base contact) will give an indication of oscillator performance.
- Voltage measurements should be made only with a sensitive voltmeter, such as an RCA VoltOhmmeter®.
- Interchanging transistors in the I-F stages may necessitate readjustment.
- A transistor should always be removed from its socket before using a soldering iron on socket terminals.
- Prevent possibility of the crystal diode detector (CR1) shorting to the can of the 3rd I-F transformer (T4) if a piece of tape should be placed on the can of the I-F transformer adjacent to CR1.

**Audio Instability**

A few cases have been found in which this radio has exhibited a tendency towards instability. This instability is noticeable on an audio "squeal" or "motor boating" especially on high volume.

- The condition may result from one or more of the following:
- A battery with a higher than normal internal resistance. This is most evident when the battery is nearing the end of its useful life.
  - High resistance joints. This may develop at the rivets where the battery leads are fastened to the circuit board. Soldering across the rivets to the printed wiring joints will help. Another possible place of high resistance joints is the tuning condenser mounting screws. The screws should be tight against the printed wiring to insure a low impedance joint.
  - A low capacity filter condenser C15 may cause the condition. Increased capacity can be had by using two capacitors in parallel. This change was made during production (C16 added).
  - One end of R18 was originally connected directly to R1 (indirectly to C15). This was changed very shortly after start of production to connect directly to C15. This provided more effective filtering.

**Earphone Connections**

The output transformer secondary GREEN and BLACK leads have been interchanged in late production. The GREEN lead is connected to the plate of the speaker voice coil, the BLACK lead is connected to the leaf contact of the jack. The BLUE lead to the switch contact is unchanged.

**General Information**

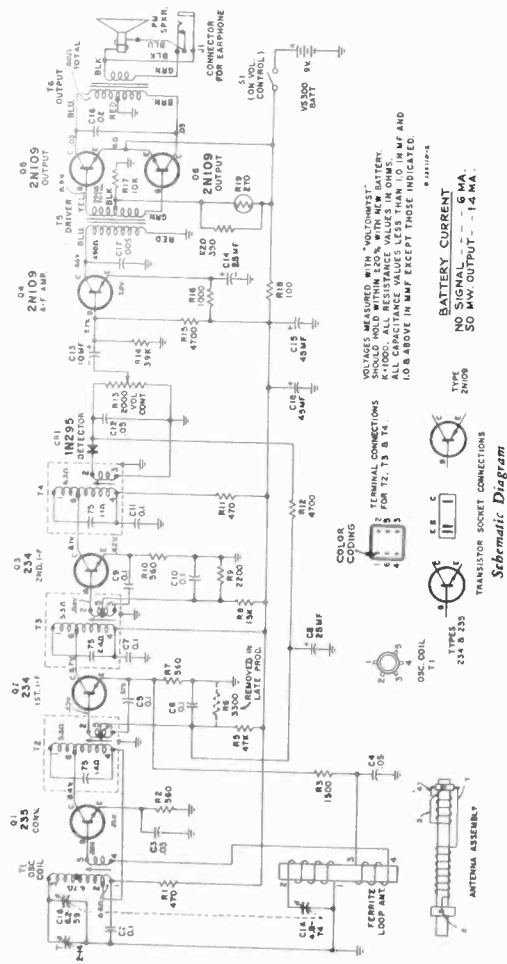
Extreme care should be used to avoid accidental shorting of transistor elements to circuit ground. This is especially true of the output transistors; if the junction of R17/R18 should be accidentally grounded for a few seconds, the output transistors would be permanently damaged.

It is possible to damage a transistor when testing circuit components. Since a transistor needs only low voltage applied to its terminals for conduction, testing continuity of a circuit which includes a transistor can result in misleading continuity indications. To avoid transistor damage and misleading continuity indications, remove the transistor from its socket before making continuity tests of its circuit.

The first thing to check when the receiver is inoperative is the battery. With the receiver turned on, a new battery should give 9 volts although the receiver can be expected to operate on any battery which checks between 6 volts and 9 volts.

To check for a circuit defect which would cause excessive battery drain, an overall current measurement and supplementary voltage measurements should be made. For reasons explained below, continuity measurements can be misleading.

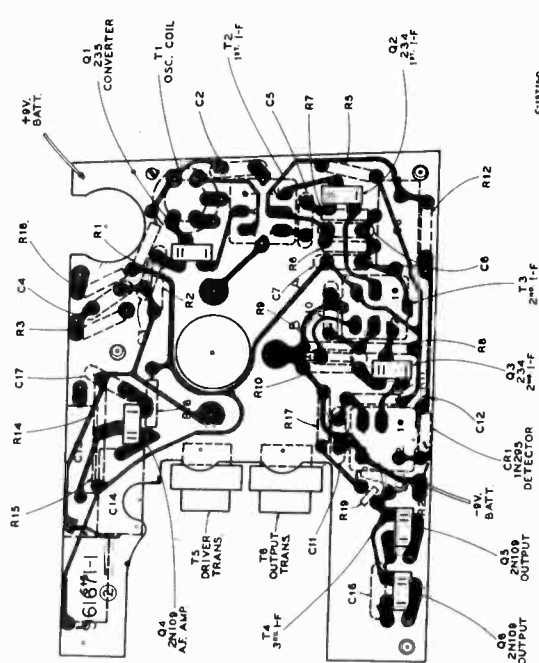
- Signal tracing by injection of a signal from a signal generator is done on transistor radios in exactly the same manner as has been done for many years with the conventional vacuum tube radios. The signal generator should be connected as in past practice) in series with a capacitor to avoid shorting out bias voltages. With the transistors used in this receiver, the BASE is the signal input terminal (corresponding to signal grid of tubes), the COLLECTOR is the signal output terminal (corresponding to plate of tubes) and the EMITTER is the common terminal (corresponding to cathode of tubes).
- The output of this receiver is of the "Class B" type. "Class B" systems have been seldom used in home radios for the past several years. It should be noted that in "Class B" output the battery current increases noticeably with increased signal input.
- The polarity of the AVC voltage measured at the volume control end of CR1 will be slightly positive with signal input will not harm electrolytic capacitor C6. Application of a signal from a signal generator to the input (B) of Q1 will stop oscillator action (I-F signal can not be injected at this point although 455 kc I-F signal can be injected).



**CRITICAL LEAD DRESS**

- Dress leads and components at gang so as not to interfere with rotor planes.
- Dress lead from antenna to gang ant. terminal away from metal parts as far as practicable.
- Check for possible solder shorts to volume control knob from printed circuit wiring.
- Antenna terminal of gang must be bent to insure clearance to output transformer.

- Dress BATT lead from ON-OFF switch to battery under positive (+) lead of C6.
- Dress antenna rod to clear end of case and such that antenna terminal does not interfere with closing of case back.
- Capacitor C12 should be dressed tightly against the can of the 3rd I-F transformer (T4). A rubber band may be used for the purpose.



REFER TO PAGE 2 FOR DESCRIPTION OF CIRCUIT CHANGES

The assembly represented above is viewed from the wiring side of the chassis. The extra wiring on the rear side of the board, as presented in "phantom" view superimposed on the component layout of the reverse side.

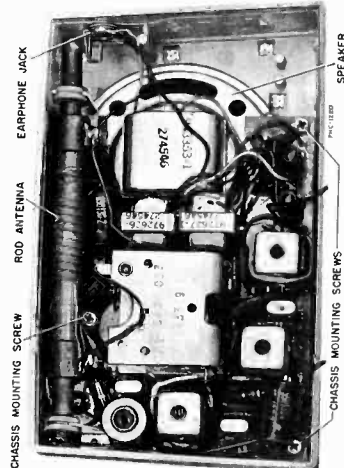
Partial Schematic Diagram Illustrating Circuit Change No. 6.

**SPEAKER REMOVAL**

Care should be exercised in removal of the speaker to prevent possibility of breaking the printed wiring board. The speaker is secured to the printed wiring board by a lance on the speaker frame. This lance projects through a hole in the board close to the two output transistors. In factory assembly, the lance is pushed through the hole and twisted slightly, a connecting wire is then soldered to the lance.

**To Remove the Speaker:**

1. Open the case by inserting the edges of a coin into the notch at the juncture of the back cover and case front—twist to separate case.
2. Unsnap battery connectors and remove battery
3. Remove the special decorative screw which is the center of the tuning dial knob.



Speaker Mounting Screws

**Turning Knob Removal**

A special decorative screw at the center of the knob must be removed before the plastic part of the knob can be removed.

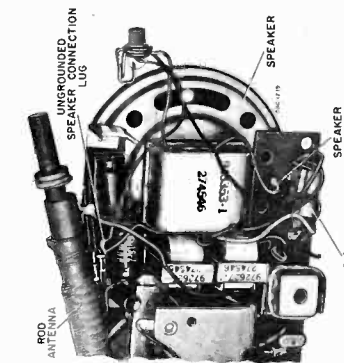
The screw is put on only finger tight when the radio is made, but the plastic takes on a "set" and considerable effort is often required to remove the screw. A piece of adhesive tape applied to the screw will permit more turning effort to be applied.

**Revised Chassis Mounting**

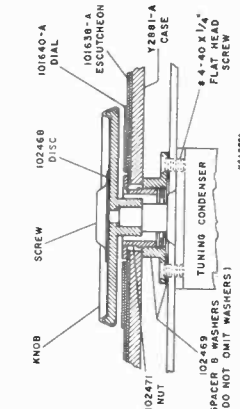
In late production of the above model, a spacer is used between the circuit board and the case front. The spacer is secured to the circuit board by two of the screws used to mount the tuning capacitor. The spacer is secured to the case front by a special nut.

The new assembly is illustrated at right.

4. Remove the hex nut holding the earphone jack to the case—refer to illustration below.
5. Remove the three cross-recessed screws holding the chassis to the case—lift chassis out of case.
6. Remove the ferrite rod antenna from its mounting—it is not necessary to unsolder leads.
7. Remove the two leads from the ungrounded speaker connection lug—shake excess solder off the lug.
8. Remove the two output transistors and push C16 aside to permit access to the lance which holds the speaker to the board—refer to illustration below.
9. Remove connecting lead from lance and twist lance into alignment with hole in board.
10. While heating the lance with a soldering iron—push the lance through the hole in the board. If it is found desirable to pry speaker away from board, be careful not to damage printed wiring on underside of board.



Speaker Mounting



Revised Chassis Mounting

Refer to replacement parts list on page 6 for information regarding interchangeability of parts.

**REPLACEMENT PARTS**

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION	
C1A, C1B	101617	CHASSIS ASSEMBLY RC-1159	T1	101622	Coil—Oscillator coil with adjustable core	
C2	101610		Capacitor—Variable tuning capacitor	T2	101625	Transformer—1st I.F. transformer
C3	101698		Capacitor—Fixed, ceramic, 0.1 mf. +100% -20%, 30 v.	T3	101623	Transformer—2nd I.F. transformer
C4	101611		Capacitor—Fixed, paper, 0.03 mf. ±10%, 200 v.	T4	101618	Transformer—3rd I.F. transformer
C5, C6, C7	101614		Capacitor—Fixed, ceramic, 0.05 mf. +100% -20%, 30 v.	T5	101624	Transformer—Driver transformer
C8	101610		Capacitor—Same as C2	T6	101628	Transformer—Output transformer
C9, C10, C11	101614		Capacitor—Electrolytic, 25 mf., -10, +250%, 10 v.			Bracket—L.H. antenna assembly mtg. bracket
C12	101611		Capacitor—Same as C2			Bracket—R.H. antenna assembly mtg. bracket
C13	101613		Capacitor—Same as C4			Connector—Battery clip assembly, female, with terminal (positive)
C14	101614		Capacitor—Electrolytic, 10 mf., -10, +250%, 10 v.			Connector—Battery clip assembly, male, with terminal (negative)
C15	101793		Capacitor—Same as C8			Control—Rubber grommet for mounting antenna assembly (2 req'd)
C16	101612		Capacitor—Electrolytic, 45 mf., -15, +100%, 200 v.			Spacer—Chassis mounting spacer and two washers
C17	101742		Capacitor—Fixed, paper, 0.005 mf. ±10%, 200 v.			Socket—Transistor socket
C18	101793		Same as C15			Washer—Metal spacer for volume control (2 req'd)
CR1	101615		Rectifier—Crystal diode, Type 1N295			<b>SPEAKER ASSEMBLY</b> 943333-1
J1	101641		Jack—Miniature earphone jack with washer and nut			Speaker—2 1/2" PM speaker—complete with cone and voice coil (12 ohms)
L1	101626	Antenna—Ferrite rod antenna assembly			<b>MISCELLANEOUS</b>	
Q1	101679	Transistor—Type 235—Converter (1 req'd)			Case—Case back—non-breakable	
Q2, Q3	101678	Transistor—Type 234—I.F. amplifier (2 req'd)			Impac—gray	
Q4, Q5, Q6	101677	Transistor—Type 2N109 1st A.F. & P.P. output (3 req'd)			Case—Case from—non-breakable	
R1	502147	Resistor—Fixed, composition, 470 ohm, ±10%, 1/2 w.			Impac—gray—less grille, dial	
R2	101743	Resistor—Fixed, composition, 560 ohm, ±10%, 1/10 w.			Dial—Polished aluminum control dial with markings	
R3	502215	Resistor—Fixed, composition, 1500 ohm, ±10%, 1/2 w.			Disc—Decorative brass disc for dial	
R5	502347	Resistor—Fixed, composition, 47,000 ohm, ±10%, 1/2 w.			Escutcheon—Case front mounting escutcheon—for grille and dial—polished aluminum	
R6	502333	Resistor—Fixed, composition, 3300 ohm, ±10%, 1/2 w.			Grille—Perforated aluminum grille—Knob—"On-Off" and volume control knob—brass finish	
R7	502156	Resistor—Fixed, composition, 560 ohm, ±10%, 1/2 w.			Knob—Tuning control knob assembly with brass ring	
R8	502315	Resistor—Fixed, composition, 15,000 ohm, ±10%, 1/2 w.			Nut—W-24 special nut—external threads—for chassis mounting	
R9	502222	Resistor—Fixed, composition, 2200 ohm, ±10%, 1/2 w.			Screw—Special retaining screw for tuning knob	
R10	101743	Resistor—Fixed, composition, 560 ohm, ±10%, 1/10 w.			NOTE: The stock numbers appearing above with a subscript letter may be used to replace the corresponding parts on the chassis. However, the reverse is not true. The "A" parts are required in conjunction with the use of the chassis mounting spacer and nut. The decorative brass disc (102469) should be used in conjunction with 101640-A. The washer or nut for the chassis mounting spacer is used.	
R11	502147	Resistor—Same as R1			<b>RE-203 EARPHONE</b> (Accessory)	
R12	502247	Resistor—Fixed, composition, 4700 ohm, ±10%, 1/2 w.			Cord—Connecting cord (5 ft.) complete with connectors	
R13	101616	Control—Volume control and "on-off" switch (includes S1)			Frame—Mounting frame (clear plastic)	
R14	502339	Resistor—Fixed, composition, 39,000 ohm, ±10%, 1/2 w.			Earpiece—Earpiece (128 ohm)—less connecting cord and frame	
R15	502247	Resistor—Same as R12				
R16	101608	Resistor—Fixed, composition, 1000 ohm, ±10%, 1/10 w.				
R17	502310	Resistor—Fixed, composition, 10,000 ohm, ±5%, 1/2 w.				
R18	502110	Resistor—Fixed, composition, 100 ohm, ±10%, 1/2 w.				
R19	101822	Resistor—Temperature compensated 72°C, with negative temperature coefficient, 1/2 w. composition, 390 ohm, ±5%, 1/2 w.				
R20	30498	Resistor—Fixed, composition, 390 ohm, ±5%, 1/2 w.				
S1		Part of R13				

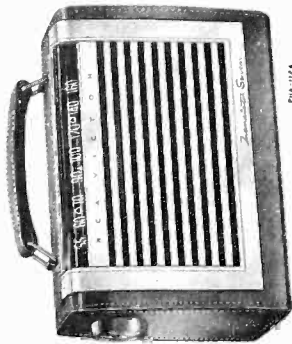
APPLY TO YOUR RCA DISTRIBUTOR FOR PRICES OF REPLACEMENT PARTS



**Battery-Operated Portable Radio**  
**MODEL 7-BT-10K**  
 Chassis No. RC-1156

**SERVICE DATA**

— 1955 No. 38 —



The "Transistor Seven"  
 Model 7-BT-10K  
 Tan Leather with Aluminum Grille

**SPECIFICATIONS**

<b>TUNING RANGE</b> .....	540-1600 kc
<b>INTERMEDIATE FREQUENCY</b> .....	455 kc
<b>TRANSISTOR COMPLEMENT</b>	
1. Type 2N35 .....	Converter
2. Type 2N34 .....	1st I-F Amplifier
3. Type 2N34 .....	2nd I-F Amplifier
4. Type 2N109 .....	1st A-F Amplifier
5. Type 2N109 .....	Audio Driver
6. Type 2N109 .....	Push-pull Output
7. Type 2N109 .....	Push-pull Output
A type 1N295 crystal diode is used as 2nd detector.	
<b>LOUDSPEAKER</b>	
Size and Type .....	4" x 6" PM
Voice coil impedance .....	3.2 ohms at 400 cycles
<b>WEIGHT</b> .....	Approximately 5 1/4 pounds including battery
<b>HEIGHT</b> .....	7 1/4"
<b>WIDTH</b> .....	10"
<b>DEPTH</b> .....	4" bottom, 3" top
<b>TUNING DRIVE RATIO</b> .....	6 1/2:1 (3 1/4 turns of knob)
<b>POWER OUTPUT</b>	
Undistorted .....	250 milliwatts
Maximum .....	300 milliwatts
<b>BATTERY</b>	
RCA Type No. VS 301 .....	9 volts
Current consumption (with no signal) .....	Approx. 9 ma.
Approx. useful life .....	500 hours intermittent service

**DESCRIPTION**

The "Transistor Seven" is, as its name implies, a radio receiver using seven transistors instead of vacuum tubes. A superheterodyne circuit is used consisting of: converter, two stages of i-f amplification, crystal diode detector, a-f amplifier, audio driver and push-pull class-B output. Automatic gain control is used on the 1st i-f and converter stages. A ferrite rod antenna provides high signal pickup and excellent image rejection. The i-f transformers are of permeability tuned design for high gain and maximum stability. A permeability tuned oscillator coil is used to obtain close tracking throughout the entire tuning range. To obtain adequate control of volume with strong signals, a dual volume control is used. A 4" x 6" speaker is used to provide excellent tone quality.

A conventional metal chassis is used and is housed in a genuine leather case. To insure stability, the case is an inch wider at the bottom than at the top.

Although the weight is approximately the same as previous lightweight portables, the type VS-301 battery will provide more than 500 hours of service under normal operating conditions.

**IMPORTANT**

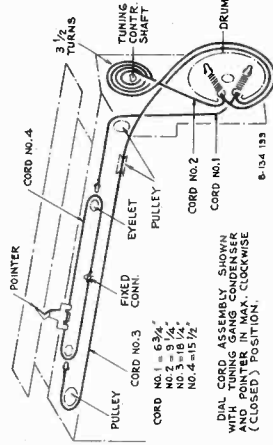
THE PROCEDURE TO BE FOLLOWED IN SERVICING TRANSISTOR RADIOS IS VERY MUCH THE SAME AS FOR VACUUM TUBE RADIOS ALTHOUGH CERTAIN PRECAUTIONS MUST BE OBSERVED. THE SERVICE HINTS GIVEN ON PAGE 3 SHOULD BE CAREFULLY READ BEFORE ATTEMPTING TO SERVICE THIS RADIO RECEIVER.

**Alignment Procedure**

**Output Meter Alignment**—If this method is used, connect the meter across the voice coil and turn the receiver volume control to maximum.

**Test Oscillator**—For all alignment operations, connect the low side of the test oscillator to the receiver chassis and keep the oscillator output as low as possible to avoid AVC action.

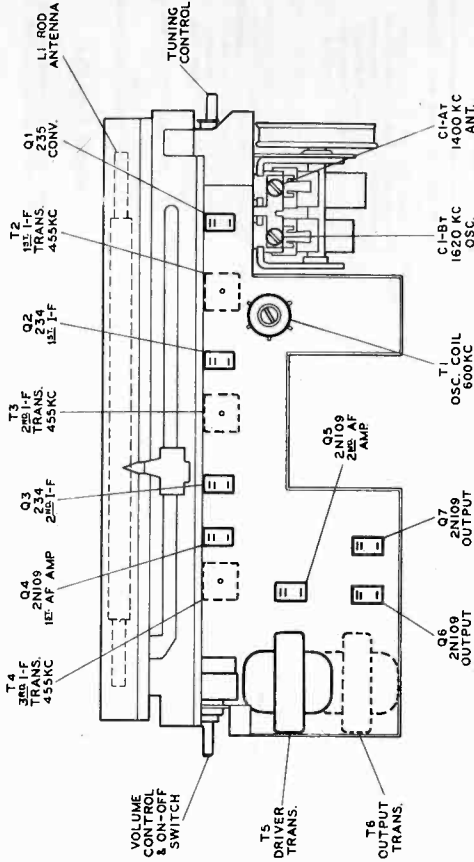
It should be noted that AGC voltage is applied in full to the 1st i-f amplifier stage and in part to the converter. A positive voltage (in respect to chassis ground) is applied to the BASE terminal of all transistors when no signal is applied. When signal is applied, the BASE terminal of the converter and 1st i-f transistors (Q1 and Q2) will become less positive.



**CRITICAL LEAD DRESS**

1. Dress all bus and non-insulated pigtail leads away from chassis ground and other components to prevent shorts.
2. Dress crystal diode 1N295 direct and with pigtail leads short as possible.
3. Dress loop antenna leads direct and away from chassis, all other insulated leads down against chassis.
4. Bus lead from back of dial mounting to chassis apron should be short as possible.
5. Dress R21 (thermistor) away from all other components.

**Tuning Drive Cords**

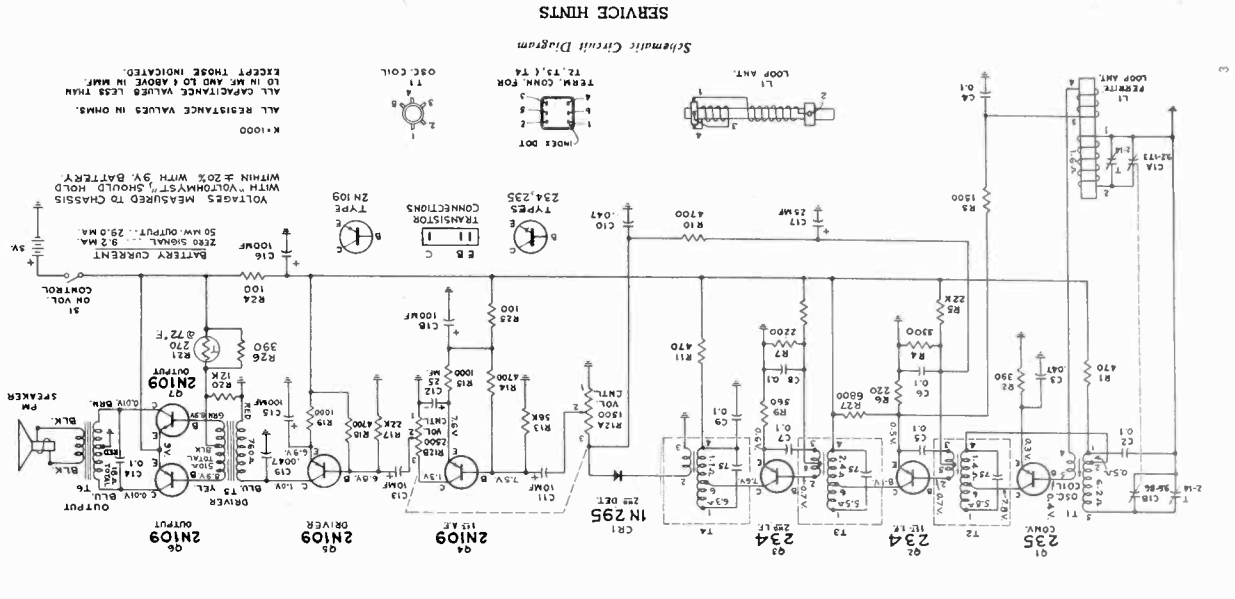


Transistor, Major Component and Trimmer Locations

REPLACEMENT PARTS

SYMBOL No.	STOCK No.	DESCRIPTION	SYMBOL No.	STOCK No.	DESCRIPTION
C1A, C1B	101653	Capacitor—Variable tuning capacitor	R21	101822	Resistor—Temperature compensated resistor (thermistor), 270 ohms at 72° F., 40 ohms at 160° F.
C2	79251	Capacitor—Fixed, paper, 0.1 mf., ±20%, 200 v.	R24, R25	502110	Resistor—Fixed, composition, 100 ohms, ±10%, ½ w.
C3	78921A	Capacitor—Fixed, paper, 0.047 mf., ±10%, 200 v.	R26	30498	Resistor—Fixed, composition, 390 ohms, ±10%, ½ w.
C4 to C9 incl.	79251	Capacitor—Same as C2	R27	502268	Resistor—Fixed, composition, 6800 ohms, ±10%, ½ w.
C10	78921A	Capacitor—Same as C3	S1	—	Switch—On-off switch—part of R12 volume control
C11	101613	Capacitor—Electrolytic, 10 mf., -10 +250%, 10 v.	T1	101661	Coil—Oscillator coil with adjustable core
C12	101614	Capacitor—Electrolytic, 25 mf., -10 +250%, 10 v.	T2	101658	Transformer—1st I.F. transformer
C13	101613	Capacitor—Same as C11	T3	101659	Transformer—2nd I.F. transformer
C14	79251	Capacitor—Same as C2	T4	101660	Transformer—3rd I.F. transformer
C15, C16	101724	Capacitor—Electrolytic, 100 mf., +250 20% 25 v.	T5	101656	Transformer—Driver transformer
C17	101614	Capacitor—Same as C12	T6	101657	Transformer—Output transformer
C18	101724	Capacitor—Same as C15		101737	Connector—4 contact male connector for battery cable assembly (2 contacts used)
C19	100063	Capacitor—Fixed, paper, 0.0047 mf., ±20%, 200 v.		72953	Cord—Dial cord (see illustration for lengths required)
CR1	101615	Resistor—Crystal diode, Type No. IN235		101651	Dial—Aluminum dial scale with calibration numerals
L1	101650	Antenna—Ferrite antenna assembly		78097	Eyelet—Dial cord eyelet (2 req'd)
Q1	101579	Transistor—Type 235 converter (1 req'd)		100096	Grommet—Rubber grommet for mounting ferrite antenna rod
Q2, Q3	101678	Transistor—Type 234—1st and 2nd I.F. amplifier (2 req'd)		79775	Nut—Speed nut for antenna support (2 req'd)
Q4 to Q7 incl.	101677	Transistor—Type 2N109—1st A.F. Driver and Output (4 req'd)		101665	Nut—Speed nut, retainer for dial (2 req'd)
R1	592147	Resistor—Fixed, composition, 470 ohms, ±10%, ½ w.		79745	Plate—Dial backplate assembly
R2	30498	Resistor—Fixed, composition, 390 ohms, ±10%, ½ w.		101644	Pointer—Dial pointer assembly
R3	502215	Resistor—Fixed, composition, 1,500 ohms, ±10%, ½ w.		101663	Pulley—Dial cord pulley
R4	502233	Resistor—Fixed, composition, 1,500 ohms, ±10%, ½ w.		79743	Shaft—Tuning control shaft
R5	502222	Resistor—Fixed, composition, 3,300 ohms, ±10%, ½ w.		101647	Socket—Transistor socket with retaining ring (7 req'd)
R6	502122	Resistor—Fixed, composition, 220 ohms, ±10%, ½ w.		72540	Spring—Dial cord tension spring (2 req'd)
R7	502222	Resistor—Fixed, composition, 2,200 ohms, ±10%, ½ w.		101649	Support—Polyethylene antenna assembly support
R8	502315	Resistor—Fixed, composition, 15,000 ohms, ±10%, ½ w.		77585	Washer—"C" type, retaining washer for shaft (RCA-79743)
R9	502146	Resistor—Same as R6		101654	Speaker—"x 6" P.M. speaker cone with cone and voice coil (2 ohms)
R10	502247	Resistor—Fixed, composition, 4,700 ohms, ±10%, ½ w.			MISCELLANEOUS
R11	502147	Resistor—Same as R1		76412	Clip—"C" type clip for mounting chassis to cabinet (2 req'd)
R12A, R12B	101655	Control—Volume control with "On-Off" switch (S1)		101652	Escutcheon—Tuning control escutcheon
R13	502356	Resistor—Fixed, composition, 56,000 ohms, ±10%, ½ w.		101642	Grille—Cabinet front grille—polished aluminum with plastic window—less backplate with studs
R14	502247	Resistor—Same as R10		101646	Handle—Leather carrying handle
R15	502210	Resistor—Fixed, composition, 1,000 ohms, ±10%, ½ w.		101662	Knob—Control knob—non-breakable "Impac"—tan—with spring (2 req'd)
R17	502322	Resistor—Same as R5		101645	Link—Handle retaining link (2 req'd)
R18	502247	Resistor—Same as R10		101740	Spacer—Aluminum spacer for handle (2 req'd)
R19	502210	Resistor—Same as R15		101069	Spring—Retaining spring clip for knob
R20	502312	Resistor—Fixed, composition, 12,000 ohms, ±10%, ½ w.			

APPLY TO YOUR RCA DISTRIBUTOR FOR PRICES OF REPLACEMENT PARTS



SERVICE HINTS

- The first thing to check when the receiver is inoperative is the battery. With the receiver turned on, a new battery should last 9 hours although the receiver can be expected to operate with a battery which lasts 6 volts or more.
- To check for a circuit defect which would cause excessive battery drain, an overall current measurement and amperometric voltage measurements should be made. For reasons explained below, continuity measurements can be misleading.
- Signal tracing by injection of a signal from a signal generator is done on transistor radios in exactly the same manner as has been done for many years with the conventional vacuum tube radio. The signal generator should be connected in parallel with a capacitor to avoid arcing out the vacuum tube. With the signal input terminal (corresponding to BASE in the signal input terminal (corresponding to BASE in the signal input terminal) of the receiver, the signal grid of tubes), the COLLECTOR is the signal output terminal (corresponding to plate of tubes), and the EMITTER is the common terminal (corresponding to cathode of tubes).
- The "Class B" output used in this receiver is a system which, although not new, has been seldom used in home radios for the past several years. It should be noted that in "Class B" output the battery current increases greatly with increased signal input to the "Class B" tubes.
- Extreme care should be used to avoid accidental shorting of transistor elements to circuit ground. This is especially true of the output transistors. If the junction of R2-R1 should be accidentally grounded for a low second, the output transistors would be permanently damaged.
- The polarity of the AGC voltage measured at the volume control end of CR1 will be slightly positive with negative control and CR1 will be slightly positive with negative control. Application of a signal from a signal generator to the input (B) of Q1 will stop oscillator action (R-F signal can not be injected at this point although 455 kc I-F signal can be injected).
- Application of a signal from a signal generator to the input (B) of Q1 will stop oscillator action (R-F signal can not be injected at this point although 455 kc I-F signal can be injected).

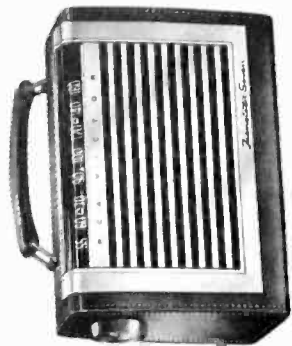
Battery-Operated Portable Radio

MODEL 8-BT-10K

Chassis No. RC-1156A

SERVICE DATA

— 1956 No. 15 —



The "Transistor Seven"  
Model 8-BT-10K  
Tan Leather with Aluminum Grille

SPECIFICATIONS

<b>TUNING RANGE</b> .....	540-1600 kc
<b>INTERMEDIATE FREQUENCY</b> .....	455 kc
<b>TRANSISTOR COMPLEMENT</b>	
1. RCA 2N140	Converter
2. RCA 2N139	1st I-F Amplifier
3. RCA 2N109	2nd I-F Amplifier
4. RCA 2N109	1st A-F Amplifier
5. RCA 2N109	Audio Driver
6. RCA 2N109	Push-pull Output
7. RCA 2N109	Push-pull Output
A type 1N295 crystal diode is used as 2nd detector.	
<b>LOUDSPEAKER</b>	
Size and Type	4" x 6" PM
Voices coil impedance	3.2 ohms at 400 cycles
<b>BATTERY</b>	
RCA Type No. VS 301	8 volts (tapped)
Current consumption (with sp. signal)	Approx. 8 ma.
Approx. useful life	300 hours intermittent service
<b>TUNING DRIVE RATIO</b> .....	6 1/2:1 (3/4 turns of knob)
<b>POWER OUTPUT</b>	
Undistorted	250 milliwatts
Maximum	300 milliwatts
<b>DIMENSIONS</b>	
Height	7 1/4"
Width	10"
Depth	4" bottom, 3" top
<b>WEIGHT</b> .....	Approximately 5 1/4 pounds including battery

DESCRIPTION

The "Transistor Seven" is, as its name implies, a radio receiver using seven transistors instead of vacuum tubes. A superheterodyne circuit is used consisting of: converter, two stages of i-f amplification, crystal diode detector, g-i amplifier, audio driver and push-pull class-B output. Automatic gain control is used on both the 1st and 2nd i-f stages.

A ferrite rod antenna provides high signal pickup and excellent image rejection. The i-f transformers are of permeability tuned design for high gain and maximum stability. A permeability tuned oscillator coil is used to obtain close tracking throughout the entire tuning range. To attain high stability and transistor interchangeability, separate AGC lines are used to the two i-f stages. A 4" x 6" speaker is used to provide excellent tone quality.

A conventional metal chassis is used and is housed in a genuine leather case. To insure stability, the case is attached wider at the bottom than at the top.

IMPORTANT

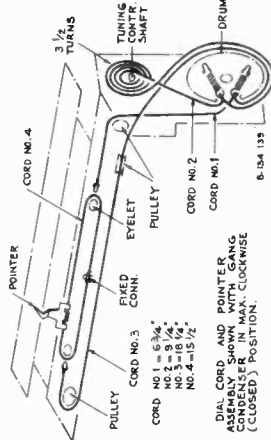
Although the weight is approximately the same as previous lightweight portables, the type VS-301 battery will provide more than 300 hours of service under normal operating conditions.

THE PROCEDURE TO BE FOLLOWED IN SERVICING TRANSISTOR RADIOS IS VERY MUCH THE SAME AS FOR VACUUM TUBE RADIOS ALTHOUGH CERTAIN PRECAUTIONS MUST BE OBSERVED. THE SERVICE HINTS GIVEN ON PAGE 3 SHOULD BE CAREFULLY READ BEFORE ATTEMPTING TO SERVICE THIS RADIO RECEIVER.

**Alignment Procedure**  
Output Meter Alignment—If this method is used, connect the meter across the voice coil and turn the receiver volume control to maximum.

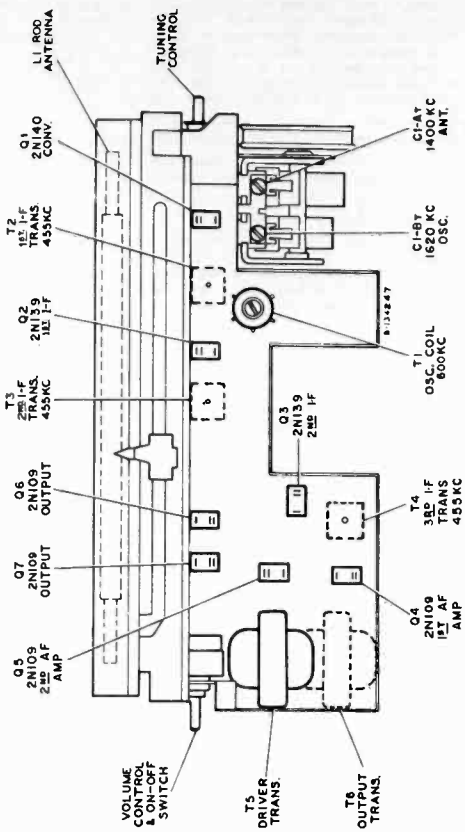
**Test Oscillator**—For all alignment operations, connect the low side of the test oscillator to the receiver chassis and keep the oscillator output as low as possible to avoid AGC action.

It should be noted that AGC voltage is applied in full to the two i-f amplifier stages. A negative voltage (in respect to chassis ground) is applied to the BASE terminal of all transistors when no signal is applied. When signal is applied, the BASE terminal of the 1st and 2nd i-f transistors (Q2 and Q3) will become less negative.



Tuning Drive Cords

- CRITICAL LEAD DRESS**
1. Dress all bus and non-insulated pigtail leads away from chassis ground and other components to prevent shorts.
  2. Dress crystal diode 1N295 direct and with pigtail leads short as possible.
  3. Dress loop antenna leads direct and away from chassis, all other insulated leads down against chassis.
  4. Bus lead from back of dial mounting to chassis apron should be short as possible.
  5. Dress R14 (thermistor) away from all other components.



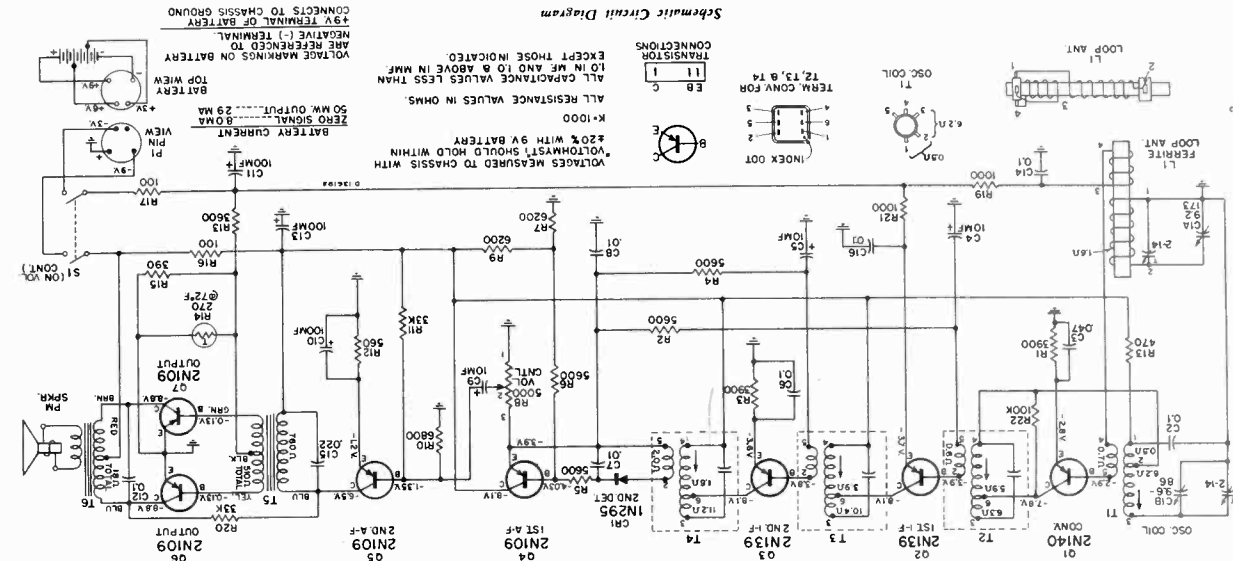
Transistor, Major Component and Trimmer Locations

REPLACEMENT PARTS

SYMBOL NO.	DESCRIPTION	SYMBOL NO.	DESCRIPTION	SYMBOL NO.	DESCRIPTION
	<b>CHASSIS ASSEMBLY RC-1156A</b>				
C1A, C1B	Capacitor—Variable tuning capacitor for	R22	Resistor—Fixed, composition, 100,000 ohms, ±10%, 1/2 w.	S02410	Resistor—Fixed, composition, 100,000 ohms, ±10%, 1/2 w.
C2	Capacitor—Fixed, paper, 0.1 mf., ±20%, 200 v.	S1	Part of R8	102628	Coil—Oscillator coil
C3	Capacitor—Fixed, paper, 0.047 mf., ±10%, 200 v.	T1	Transformer—1st I.F. transformer	102766	Transformer—1st I.F. transformer
C4, C5	Capacitor—Electrolytic, 10 mf., ±10%, +250%, 10 v.	T2	Transformer—2nd I.F. transformer	102631	Transformer—2nd I.F. transformer
C6	Same as C2	T3	Transformer—3rd I.F. transformer	102632	Transformer—3rd I.F. transformer
C7, C8	Capacitor—Fixed, paper, 0.01 mf., ±10%, 200 v.	T4	Transformer—Driver transformer	102633	Transformer—Driver transformer
C9	Same as C4	T5	Transformer—Output transformer	101656	Transformer—Output transformer
C10, C11	Capacitor—Electrolytic, 100 mf., 25 v.	T6	Bushing—Metal bushing for station selector shaft	101657	Bushing—Metal bushing for station selector shaft
C12	Same as C2	72953	Cord—Dial drive cord (see illustration for lengths required)	102630	Cord—Dial drive cord (see illustration for lengths required)
C13	Same as C10	101651	Dial—Aluminum tuning dial with calibration numerals	72953	Dial—Aluminum tuning dial with calibration numerals
C14	Same as C2	78097	Eyelet—Dial drive cord eyelet	101651	Eyelet—Dial drive cord eyelet
C15	Capacitor—Fixed, paper, 0.022 mf., ±10%, 200 v.	100882	Grommet—Rubber grommet for mounting ferrite antenna rod	78097	Grommet—Rubber grommet for mounting ferrite antenna rod
C16	Same as C2	79775	Nut—Speednut for antenna support	79775	Nut—Speednut for antenna support
C17	Rectifier—Crystal diode Type 1N295	101665	Retainer—Retainer for dial	101665	Retainer—Retainer for dial
L1	Antenna—Ferrite antenna assembly	101644	Pointer—Dial pointer assembly	101644	Pointer—Dial pointer assembly
P1	Connector—4 contact male connector for battery cable	79745	Plate—Dial back plate assembly	79745	Plate—Dial back plate assembly
R1	Resistor—Fixed, composition, 3900 ohms, ±10%, 1/2 w.	101663	Pulley—Dial drive cord pulley	101663	Pulley—Dial drive cord pulley
R2	Resistor—Fixed, composition, 5600 ohms, ±5%, 1/2 w.	102629	Socket—Transistor socket with retaining ring	102629	Socket—Transistor socket with retaining ring
R3	Same as R1	72540	Spring—Dial cord tension spring (2 req'd)	72540	Spring—Dial cord tension spring (2 req'd)
R4, R5, R6	Same as R2	101649	Support—Polystyrene antenna assembly support	101649	Support—Polystyrene antenna assembly support
R7	Resistor—Fixed, composition, 6200 ohms, ±5%, 1/2 w.	77585	Washer—"C" type retaining washer for station selector shaft	77585	Washer—"C" type retaining washer for station selector shaft
R8	Control—Volume control with "on-off" switch. Includes S1	<b>SPEAKER ASSEMBLY 972283-6</b>			
R9	Same as R7	102634	Speaker—"4" x 6" PM speaker complete with cone	102634	Speaker—"4" x 6" PM speaker complete with cone
R10	Resistor—Fixed, composition, 6800 ohms, ±10%, 1/2 w.	<b>MISCELLANEOUS</b>			
R11	Resistor—Fixed, composition, 33,000 ohms, ±10%, 1/2 w.	76412	Clip—"C" type clip for mounting chassis to cabinet (2 req'd)	76412	Clip—"C" type clip for mounting chassis to cabinet (2 req'd)
R12	Resistor—Fixed, composition, 560 ohms, ±10%, 1/2 w.	101652	Excuteon—Tuning control excuteon—aluminum—with calibration marks	101652	Excuteon—Tuning control excuteon—aluminum—with calibration marks
R13	Resistor—Fixed, composition, 3600 ohms, ±10%, 1/2 w.	101642	Grille—Cabinet grille with plastic window—polished aluminum—loss bore plate	101642	Grille—Cabinet grille with plastic window—polished aluminum—loss bore plate
R14	Resistor—Temperature compensated resistor (thermistor) 270 ohms at 72°F., 40 ohms at 150°F.	101646	Handle—Leather carrying handle	101646	Handle—Leather carrying handle
R15	Resistor—Fixed, composition, 390 ohms, ±5%, 1/2 w.	101662	Knob—Tuning control knob with spring	101662	Knob—Tuning control knob with spring
R16, R17	Resistor—Fixed, composition, 100 ohms, ±10%, 1/2 w.	102635	Knob—Volume control knob with spring	102635	Knob—Volume control knob with spring
R18	Resistor—Fixed, composition, 470 ohms, ±10%, 1/2 w.	101645	Link—Handle retaining link	101645	Link—Handle retaining link
R19	Resistor—Fixed, composition, 1000 ohms, ±10%, 1/2 w.	101740	Spacer—Aluminum spacer for carrying handle	101740	Spacer—Aluminum spacer for carrying handle
R20	Same as R11	101069	Spring—Retaining spring for control knob	101069	Spring—Retaining spring for control knob
R21	Same as R19				

- The first thing to check when the receiver is inoperative is the battery. With the receiver turned on, a new battery should last 9 volts although the receiver can be used in home radios for the part several years if seldom.
- "Class B" output circuits have been seldom used in home radios for the part several years if seldom. Note that in "Class B" output the battery current in-circuit increases greatly with increased signal input to the "Class B" tubes.
- Extreme care should be used to avoid accidental shorting of transistor elements to circuit ground. This is especially true of the output transistors. If the junction of R13, R14 should be accidentally grounded for a low second, the output transistors would be permanently damaged.
- With no signal input, the AGC source as measured at the top of the volume control will be 3.9 volts negative in respect to ground. Reversed signal voltage will make this point LESS NEGATIVE in respect to chassis ground. Application of a signal from a signal generator to the input (B) of Q1 will stop oscillator action (R-F signal can not be injected at this point although 455 kc I-F signal can be injected).
- Signal tracing by injection of a signal from a signal generator is done on transistor radios in exactly the same manner as has been done for many years with the conventional vacuum tube radios. The signal generator should be connected (as in part practice) in series with a capacitor to avoid shorting out bias voltage. With the transistors used in this receiver, the BASE is the signal terminal (corresponding to the emitter grid of tubes), the COLLECTOR is the signal output terminal (corresponding to plate of tubes), and the EMITTER is the common terminal (corresponding to cathode of tubes).
- To check for a circuit defect which would cause excessive battery drain, an overall current measurement and supplementary voltage measurements should be made. For reasons explained below, continuity measurements can be misleading.
- Signal tracing by injection of a signal from a signal generator is done on transistor radios in exactly the same manner as has been done for many years with the conventional vacuum tube radios. The signal generator should be connected (as in part practice) in series with a capacitor to avoid shorting out bias voltage. With the transistors used in this receiver, the BASE is the signal terminal (corresponding to the emitter grid of tubes), the COLLECTOR is the signal output terminal (corresponding to plate of tubes), and the EMITTER is the common terminal (corresponding to cathode of tubes).

SCHEMATIC HINTS



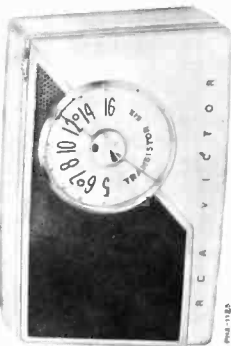
- Oscillator performance can not be judged by measurement of a d-c voltage developed across a resistor. Measurement of oscillator strength with an a-c voltmeter at the input of Q1 (Base contact) will give an indication of oscillator performance.
- Voltage measurements should be made only with a sensitive voltmeter, such as an RCA VoltOhmyst.
- Interchanging transistors in the I-F stages may necessitate readjustment.
- A transistor should always be removed from its socket before using a soldering iron on socket terminals.
- It is possible to damage a transistor when testing circuit continuity. Since a transistor needs only low voltage applied to its terminals for conduction, testing continuity of a circuit which includes a transistor can result in misleading continuity indications. To avoid transistor damage and misleading continuity indications, remove the transistor from its socket before making continuity tests of its circuit.

**Battery-Operated Pocket Radio**  
**MODELS 8-BT-9E, 8-BT-9J**

Chassis No. RC-1164

**SERVICE DATA**

— 1956 No. 19 —



*The "Transistor Six"*  
Model 8-BT-9E  
Antique White  
Model 8-BT-9J  
Gray

**SPECIFICATIONS**

**TUNING RANGE** ..... 540-1,600 kc  
**INTERMEDIATE FREQUENCY** ..... 455 kc  
**TRANSISTOR FREQUENCY** ..... 2 3/4" P.M.  
Provision is made for connection of a low impedance earphone if desired. RCA earphone accessory Number RK-203 is recommended.

**POWER OUTPUT:**  
Undistorted ..... 60 milliwatts  
Maximum ..... 100 milliwatts

**DIMENSIONS:**  
Height ..... 3 3/8"  
Width ..... 5 1/8"  
Depth ..... 1 1/4"

**WEIGHT:**  
Approximately one pound including battery.

**IMPORTANT**

THE PROCEDURE TO BE USED IN SERVICING TRANSISTOR RADIOS IS VERY MUCH THE SAME AS USED WITH VACUUM TUBE RADIOS ALTHOUGH CERTAIN PRECAUTIONS MUST BE OBSERVED. THE SERVICE HINTS GIVEN ON PAGE 2 SHOULD BE CAREFULLY READ BEFORE ATTEMPTING TO SERVICE THIS RADIO RECEIVER.

**DESCRIPTION**

The "Transistor Six" is, as its name implies, a radio receiver using six transistors instead of vacuum tubes. A superheterodyne circuit is used consisting of: converter, two stages of i-f amplification, crystal diode detector, audio driver and push-pull class-B output. A 2 3/4" speaker is used for normal listening; a jack for earphone connection is provided when use is desired without disturbing nearby persons.

**SERVICE HINTS**

6. Oscillator performance can not be judged by measurement of a d-c voltage developed across a resistor. Measurement of oscillator voltage with an a-c voltmeter to the input of Q1 (base contact) will give an indication of oscillator performance.
7. Voltage measurements should be made only with a sensitive voltmeter, such as an RCA VoltOhmMast.
8. Interchanging transistors in the i-f stages may necessitate readjustment.
9. A transistor should always be removed from its socket before using a soldering iron on socket terminals.

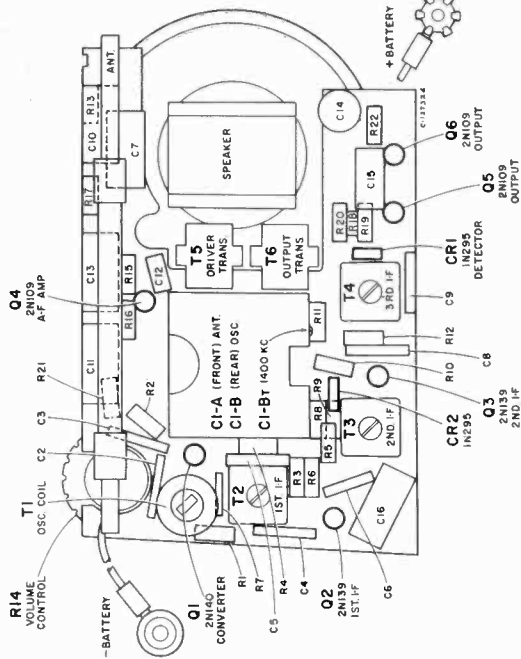
**ALIGNMENT PROCEDURE**

**Output Meter Alignment**—If this method is used, connect the meter across the voice coil and turn the receiver volume control to maximum.

**Test Oscillator**—For all alignment operations, connect the low side of the test oscillator to the "common positive" wiring and keep the oscillator output as low as possible to avoid AVC action.

Step	Connect High Side of Gen. to —	Sig. Gen. Output	Dial Pointer Setting	Adjust for Max. Output
1	#2 terminal of ant. assembly L1	455 kc	Quiet Point near 1600 kc	T4 and I-F T3 and I-F T2 and I-F
2		Repeat Step 1		
3	Short wire placed near antenna or radiated signal	1400 kc	1400 kc rock gang	trimmer* C1-B (osc.)
4		600 kc	600 kc rock gang	T1 osc. coil
5		Repeat Steps 3 and 4		

\*Oscillator trimmer is located on bottom of gang.



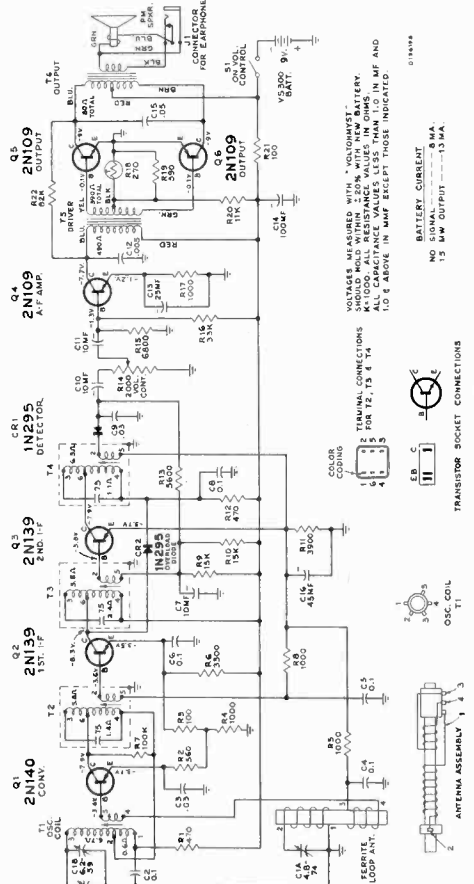
**EARPHONE CONNECTION**  
Only a low impedance earphone (under 200 ohms) should be connected into the earphone jack. RCA accessory earphone Number RK-203 is recommended.

Chassis Components View from Back Side

REPLACEMENT PARTS

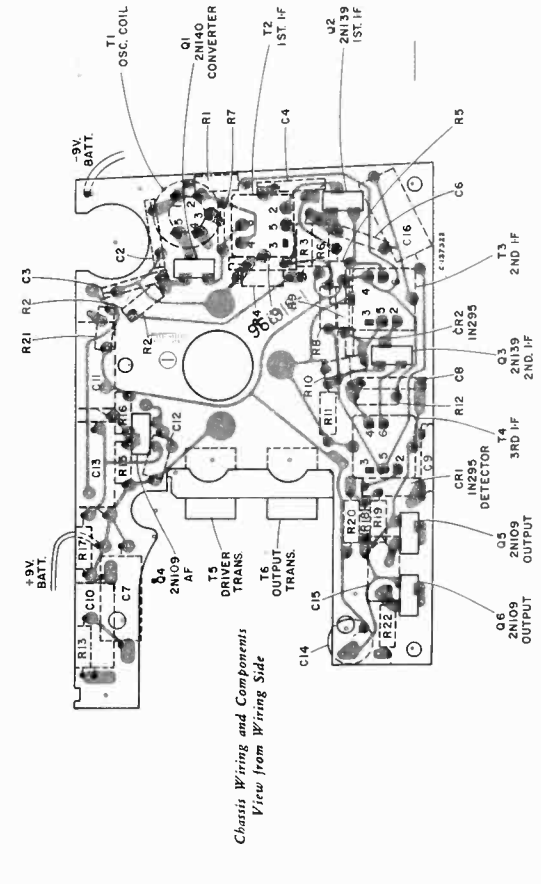
SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
C1A, C1B	101617	CHASSIS ASSEMBLY RC-1164			
C2	101610	Capacitor—Fixed, ceramic, 0.1 mf.		101627	Bracket—Antenna assembly mg.
C3	101658	Capacitor—Fixed, ceramic, 0.03 mf.		101630	Connector—Battery clip assembly—female with terminal (positive)
C4 to C6	103014	Capacitor—Fixed, ceramic, 0.1 mf.		101631	Connector—Battery clip assembly—male with terminal (negative)
C7	103014	Capacitor—Fixed, ceramic, 0.1 mf.		101621	Grommet—Rubber grommet for mg. antenna assembly.
C8	103014	Capacitor—Fixed, ceramic, 0.1 mf.		103141	Insulator—Paper insulator between speaker and circuit board.
C9	101698	Same as C4		70309	Nut—1/8" x 1/4" (brass) for mounting volume control.
C10, C11	101613	Same as C3		103360	Screw—#1.80 x 1/4" R. H. screw (brass) for mounting volume control.
C12	101742	Capacitor—Fixed, paper, 0.005 mf.		101629	Socket—Transistor socket.
C13	101614	Capacitor—Electrolytic, 25 mf., 10 v.		103361	Washer—#0 flat washer (brass) for mounting volume control.
C14	103015	Capacitor—Electrolytic, 100 mf., -10%, +250%, 10 v.		101620	Washer—Metal spacer washer for volume control.
C15	103013	Capacitor—Fixed, paper, 0.05 mf.			
C16	101793	Capacitor—Electrolytic, 45 mf., 10 v.			
CR1, CR2	101615	Rect.—Crystal diode IN295		103023	SPEAKER ASSEMBLY 94333-2
J1	101641	Jack—Miniature telephone jack with washer and nut antenna assembly.			
L1	103016	Antenna—Fertite rod antenna assembly.			
R1	502147	Resistor—Fixed, composition, 470 ohm, ±10%, 1/2 w.		Y4040	MISCELLANEOUS
R2	502156	Resistor—Fixed, composition, 560 ohm, ±5%, 1/2 w.			
R3	502110	Resistor—Fixed, composition, 100 ohm, ±5%, 1/2 w.		Y4041	Case—Case iron and case back—non-breakable "Impac" gray—less grille, dial and escutcheon for Model 887F.
R4, R5	502210	Resistor—Fixed, composition, 1000 ohm, ±5%, 1/2 w.			Case—Case iron and case back—non-breakable "Impac" white—less grille, dial and escutcheon for Model 887F.
R6	502233	Resistor—Fixed, composition, 3300 ohm, ±5%, 1/2 w.		103146	Dial—Aluminum control dial—polished and gold anodized with markings—for Model 887F.
R7	103022	Resistor—Fixed, composition, 100,000 ohm, ±10%, 1/10 w.		101640-A	Dial—Aluminum control dial—polished and gold anodized with markings—for Model 887F.
R8	502210	Resistor—Fixed, composition, 15,000 ohm, ±10%, 1/10 w.			Disc—Decorative aluminum disc for dial—stain etched and black anodize.
R9	502315	Resistor—Fixed, composition, 3900 ohm, ±10%, 1/2 w.		103143	Escutcheon—Case front mounting escutcheon—for dial and grille—stain chromium anodized.
R11	502239	Resistor—Fixed, composition, 3900 ohm, ±10%, 1/2 w.		103145	Grille—Perforated aluminum grille—stain chromium anodized.
R12	502147	Same as R1		103144	Grille—Perforated aluminum grille for Model 887F.
R13	502256	Resistor—Fixed, composition, 5600 ohm, ±10%, 1/2 w.			Knob—"On-Off" and volume control knob—brass finish.
R14	101616	Control—Volume control and "on-off" switch (with knob screw) plastic (SI)		101635	Knob—Volume control knob assembly with knob.
R15	502268	Resistor—Fixed, composition, 6800 ohm, ±10%, 1/2 w.		102471	Nut—1/8" x 1/4" special nut—external threaded for chassis mounting.
R16	502333	Resistor—Fixed, composition, 33,000 ohm, ±10%, 1/2 w.		101636-A	Screw—Special retaining screw for tuning control knob.
R17	502210	Resistor—Temperature compensated, 270 ohm, ±10%, 1/4 w.		103173	Screw—Volume control knob retaining screw.
R18	103021	Resistor—Fixed, composition, 390 ohm, ±5%, 1/2 w.		102470	Spacer—Chassis mounting spacer.
R19	502139	Resistor—Fixed, composition, 390 ohm, ±5%, 1/2 w.			RE-203 EARPHONE (Accessory)
R20	502311	Resistor—Fixed, composition, 11,000 ohm, ±5%, 1/2 w.			Cord—Connecting cord (5 ft.), complete with connectors.
R21	502210	Same as R3		101837	Frame—Mounting frame (clear plastic) for perpiece (128 ohm)—less Earphone (128 ohm)—less connecting cord and frame.
R22	502382	Resistor—Fixed, composition, 82,000 ohm, ±10%, 1/2 w.		101838	
S1	103017	Part of R14.		101839	
T1		Coil—Oscillator coil with adjustable core.			
T2	103018	Transformer—1st I.F. transformer.			
T3	103019	Transformer—2nd I.F. transformer.			
T4	103020	Transformer—3rd I.F. transformer.			
T5	101618	Transformer—Driver transformer.			
T6	101619	Transformer—Output transformer.			
	101628	Bracket—Antenna assembly mg. bracket L. H.			

APPLY TO YOUR RCA DISTRIBUTOR FOR PRICES OF REPLACEMENT PARTS



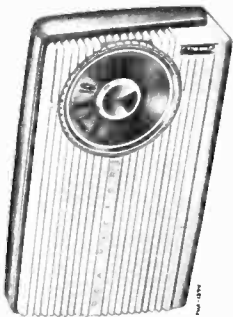
Schematic Diagram

- CRITICAL LEAD DRESS**
- Dress leads and components at gang so as not to interfere with rotor plates.
  - Dress lead from antenna to gang ant. terminal away from metal parts as far as practicable.
  - Check for possible solder shorts to volume control knob from printed circuit wiring.
  - Antenna terminal of gang must be bent to insure clearance to output transformer.
  - Dress "B" lead from ON-OFF switch to battery under positive (+) lead of C16.
  - Dress antenna rod to clear end of case and such that antenna terminal does not interfere with closing of case back.



The assembly represented above is viewed from the wiring side of the printed wiring on the near side of the board, as presented in the "phantom" view superimposed on the component layout of the reverse side.

Component replacement, when necessary, should be made following the techniques outlined in RCA Radio and Victor Service Tips, Volume 1, Issue 2, August 26, 1955.



# Battery-Operated Pocket Radio

## 8-BT-7 Series, 8-BT-8 Series

Chassis No. RC-1169, RC-1169A

# SERVICE DATA

— 1956 No. 28 —

**8-BT-7 Series—The "Winston"**  
 Model 8-BT-7LE  
 Turquoise & Antique White  
 Model 8-BT-7J  
 Gray & Antique White

**8-BT-8 Series—The "Sutton"**  
 Model 8-BT-8EF  
 Pink & Antique White  
 Model 8-BT-8JE  
 Gray & Antique White

### SPECIFICATIONS

<b>TUNING RANGE</b> .....	540-1600 kc
<b>INTERMEDIATE FREQUENCY</b> .....	455 kc
<b>TRANSISTOR COMPLEMENT:</b>	
(1) Type 2N140	Converter
(2) Type 2N139	I-F Amplifier
(3) Type 2N109	Audio Driver
(4) Type 2N109	Output
A type 1N60 crystal diode is used as 2nd detector.	
A type 1N60 crystal diode is used as overload diode.	
<b>BATTERY:</b>	
Type No. VS-300	9 volts
Current consumption (with no signal)	Approx. 16 ma
Useful life (intermittent service)	Approx. 55 hours

### IMPORTANT

THE PROCEDURE TO BE USED IN SERVICING TRANSISTOR RADIOS IS VERY MUCH THE SAME AS USED WITH VACUUM TUBE RADIOS ALTHOUGH CERTAIN PRECAUTIONS MUST BE OBSERVED. THE SERVICE HINTS GIVEN ON PAGE 2 SHOULD BE CAREFULLY READ BEFORE ATTEMPTING TO SERVICE THIS RADIO RECEIVER.

### DESCRIPTION

These instruments are radio receivers using four transistors instead of vacuum tubes. A superheterodyne circuit is used consisting of: converter, i-f amplifier, crystal diode detector, audio driver and class-A output. A 2 1/2" speaker is used for normal listening; a jack for earphone connection is provided (on 8-BT-8 Series only) when used is desired without disturbing nearby persons.

A printed circuit type of chassis is used to obtain light weight and compact size. The complete receiver including batteries weighs approximately one pound and is designed to be carried in a coat pocket. The case is made of non-breakable "Impac".

Power is obtained from a 9-volt battery having a life expectancy of 55 hours. The volume control circuit provides a high minimum volume level and thus minimizes the possibility of the set being turned on when not in use.

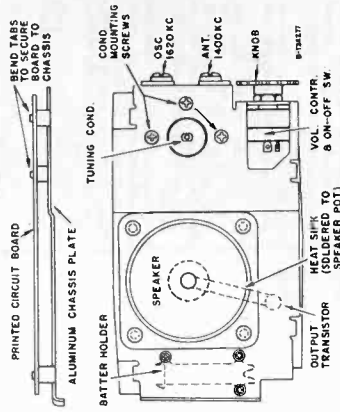
### SERVICE HINTS

- The first thing to check when the receiver is inoperative, is the battery. With the receiver turned on, a new battery should show 9 volts although the receiver can be expected to operate on any battery which checks between 6 volts and 9 volts.
- To check for a circuit defect which would cause excessive battery drain, an overall current measurement and supplementary voltage measurements should be made. For reasons explained on page 3, continuity measurements can be misleading.
- Signal tracing by injection of a signal from a signal generator is done on transistor radios in exactly the same manner as has been done for many years with the conventional vacuum tube radios. The signal generator should be connected (as in past practice) in series with a capacitor to avoid shorting out bias voltages. With the transistors used in this receiver, the BIAS is the signal input terminal (corresponding to signal grid of tubes), the COLLECTOR is the signal output terminal (corresponding to plate of tubes) and the EMITTER is the common terminal (corresponding to cathode of tubes).
- Application of a signal from a signal generator to the input (B) of Q1 will stop oscillator action (R.F. signal can not be injected at this point although 455 kc I-F signal can not be injected).
- Oscillator performance can not be judged by measurement of a d-c voltage developed across a resistor. Measurement of oscillator signal strength with an i-f voltmeter at the input of Q1 (base contact) will give an indication of oscillator performance. The oscillator signal injection should be approximately 0.15 volts r.m.s. at 1400 kc. as measured with an i-f type of VTVM or 0.42 volts p-p. as measured on a calibrated oscilloscope.
- Voltage measurements should be made only with a sensitive voltmeter, such as an RCA VoltOhmmeter®.

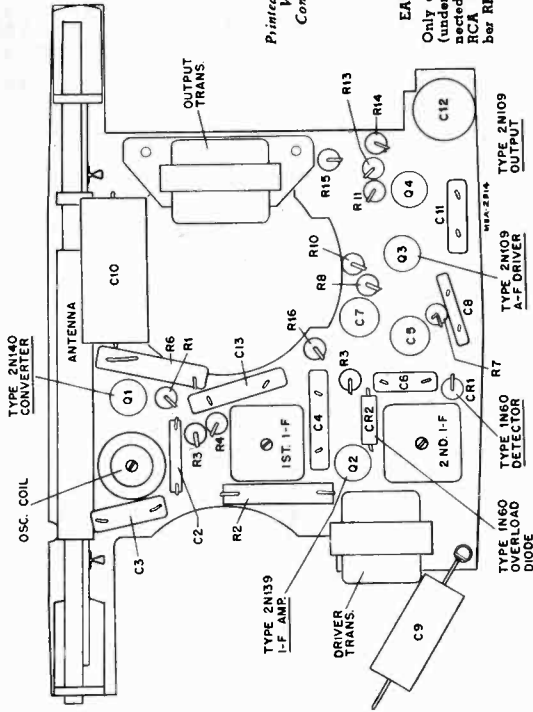
### ALIGNMENT PROCEDURE

**Test Oscillator**—For all alignment operations, connect the low side of the test oscillator to the "common positive" winding and keep the oscillator output as low as possible to avoid ACC action.

Step	Connect High Side Sliding Gen. to	Sig. C. Output	Dial Pointer Settling	Adjust for Max. Output
1	Connection lug of C1-B (rear section of gang) in series with .01 mfd	455 kc	Quiet point near 1600 kc	I.F. trimmer T3 12
2		1620 kc	gang fully open	osc. trimmer C1-A
3	Short wire placed near antenna for radiated signal.	1400 kc	1400 kc signal	ant. trimmer C1-B
4		600 kc	600 kc signal (rock gang)	osc. coil T1
5	Repeat steps 2, 3 and 4			



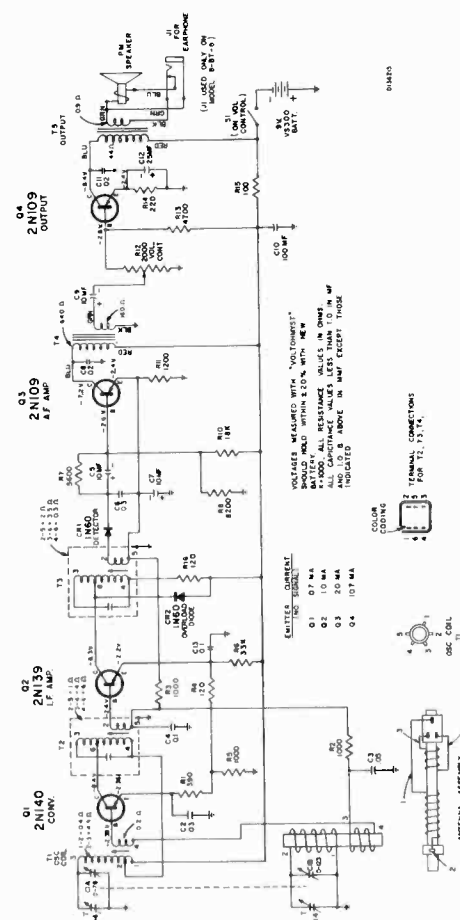
Complete Chassis Assembly



Printed Circuit Board View from Component Side

**EARPHONE CONNECTION**  
 Only a low impedance earphone (under 200 ohms) should be connected into the earphone jack. RCA accessory earphone Number RE-203 is recommended.

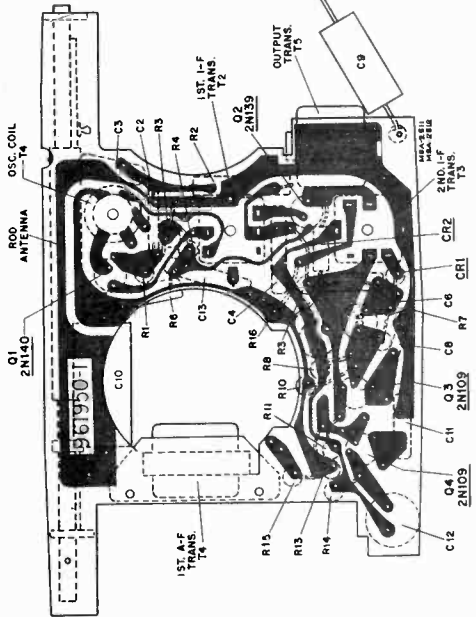
8-BT-7 Series, 8-BT-8 Series



Schematic Diagram

**General Information**  
 Extreme care should be used to avoid accidental shorting of transistor elements to circuit ground. This is especially true of the output transistor when testing circuit. It is possible to damage the transistor when testing circuit. Since the transistor needs only low voltage applied to its terminals for conduction, testing continuity of a circuit which includes a transistor can result in misleading continuity indications. To avoid transistor damage

and misleading continuity indications, resistance measurement of a component should be made only after disconnecting a lead of the component. This is necessary to prevent a transistor being a conducting circuit in parallel with the component being tested.  
 It is essential that soldering at transistor terminals be done quickly and with a small soldering iron which is both hot and clean. Prolonged or excessive heat may permanently damage transistors.



Printed Circuit Board Wiring and Components View from Writing Side

FOR ACCESS TO PRINTED WIRING

Remove heat sink from output transistor. Disconnect leads to speaker and earphone jack.  
 Twist the board mounting lugs of the metal chassis so that they will pass through the holes in the board. When reassembling the set install the wire more than sufficient to hold board to the metal chassis.  
 Separate the circuit board from the metal chassis at the battery end allowing it to "hinge" at the gang condenser end.

The assembly represented above is viewed from the writing side of the printed wiring on the near side of the board, is presented in "phantom" view superimposed on the component layout of the reverse side.

CRITICAL LEAD DRESS

1. Dress C<sub>1</sub> to clear gang rotor plates.
2. Dress two leads from coupling winding (term. #3 and #4) on loop down to printed circuit board.
3. Dress C<sub>10</sub> towards speaker pot (away from loop).
4. Dress lead from oscillator coil to gang through slot in board. This lead to be as short as practical but still consistent with Note 5.
5. All leads to gang and volume control should be of sufficient length to permit the separation of the printed circuit board from the metal chassis by "jacking" the circuit board. Only the speaker leads and ear piece jack will require disconnecting.
6. Dress leads to ear piece jack between metal chassis and printed circuit board.
7. Cut component leads protruding through board, especially around speaker, as short as possible to avoid short circuits to metal chassis and speaker.

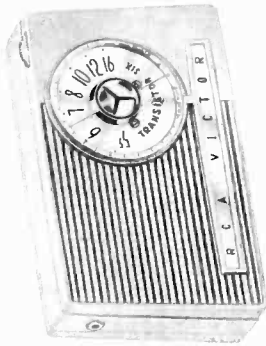
REPLACEMENT PARTS

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
C1A, C1B	103288	CHASSIS ASSEMBLY RC-1169, RC-1169A	T4	103394	Transformer—Audio interstage transformer
C2	101698		Capacitor—Variable tuning capacitor	T5	103395
C3	103360	Capacitor—Fixed, ceramic, 0.03 mfd., ±10%, 30 v.		103467	Clip—Battery retaining clip
C4	103014	Capacitor—Fixed, ceramic, 0.05 mfd., ±10%, 30 v.		103608	Clip—Battery contact clip—formed wire—positive
C5	103382	Capacitor—Fixed, ceramic, 0.1 mfd., ±10%, 30 v.		101631	Connector—Battery clip and lead assembly—male—negative
C6	101698	Capacitor—Electrolytic, 10 mfd., 10 v., ±10%, 20%. 30 v.		103392	Insulator—Phenolic insulator—antenna mg.
C7	103382	Same as C5		103402	Nut—1/4" 32 hex nut—vol. control mg.
C8	103379	Capacitor—Fixed, ceramic, 0.02 mfd., ±20%, 30 v.		103389	Sink—Output transformer heat sink
C9	101613	Capacitor—Electrolytic, 10 mfd., 10 v., ±10%, 25%. 100 mfd., 10 v.		103391	SPEAKER ASSEMBLY 94986-1
C10	103400	Capacitor—Electrolytic, 100 mfd., ±10%, 25%. 10 v.		Y4064	MISCELLANEOUS
C11	103379	Same as C8		Y4063	Case—Case front and back—non-breakable iron plate for Model 8B7LE & 8B7E
C12	103381	Capacitor—Electrolytic, 25 mfd., 10 v.		Y4062	Case—Case front and back—non-breakable "Impac"—charcoal gray and enameled white for Model 8B7LE & 8B7E
C13	103014	Same as C4		Y4065	Case—Case front and back—non-breakable "Impac"—pink and antique white for Model 8B7LE & 8B7E
CR1, CR2	101615	Rectifier—Crystal diode rectifier, type 1N60		103441	Case—Case front and back—non-breakable "Impac"—two-tone gray for Model 8B77
J1	103635	Jack—Earphone jack for Model 8B7E		103390	Knob—Tuning control knob with retaining screw for Models 8B7LE & 8B7E
L1	103399	Antenna—Ferrite antenna assembly		103384	Knob—Volume control knob with set screw
R1	30498	Resistor—Fixed, composition, 390 ohm, ±5%, 1/2 w.		103383	Nameplate—"RCA Victor" nameplate for case front—Model 8B7LE & 8B7E
R2, R3	502210	Resistor—Fixed, composition, 1000 ohm, ±5%, 1/2 w.		103401	Screw—#4-40 x 1/4" set screw for volume control knob
R4	502112	Resistor—Fixed, composition, 120 ohm, ±5%, 1/2 w.		103385	Screw—Tuning control knob retaining screw for Models 8B7LE & 8B7E
R5	502210	Same as R2		103442	Screw—Tuning control knob retaining screw for Models 8B7LE & 8B7E
R6	502333	Resistor—Fixed, composition, 33,000 ohm, ±5%, 1/2 w.			
R7	502256	Resistor—Fixed, composition, 5600 ohm, ±10%, 1/2 w.			
R8	502282	Resistor—Fixed, composition, 8200 ohm, ±10%, 1/2 w.			
R10	502318	Resistor—Fixed, composition, 18,000 ohm, ±10%, 1/2 w.			
R11	502212	Resistor—Fixed, composition, 1200 ohm, ±10%, 1/2 w.			
R12	103398	Control—Volume control and "on-off" switch (S1)			
R13	502247	Resistor—Fixed, composition, 4700 ohm, ±10%, 1/2 w.			
R14	502122	Resistor—Fixed, composition, 220 ohm, ±10%, 1/2 w.			
R15	502110	Resistor—Fixed, composition, 100 ohm, ±10%, 1/2 w.			
R16	502112	Resistor—Fixed, composition, 120 ohm, ±10%, 1/2 w.			
S1	103398	Part of R12		101837	RE-203 EARPHONE (Accessory)
T1	103393	Coil—Oscillator coil		101838	Cord—Connecting cord (5 ft.) compatible with connectors
T2	103396	Transformer—1st I.F. transformer		101839	Frame—Mounting frame (clear plastic) for earpiece
T3	103397	Transformer—2nd I.F. transformer			Earpiece—Earpiece (128 ohm)—less connecting cord and frame

APPLY TO YOUR RCA DISTRIBUTOR FOR PRICES OF REPLACEMENT PARTS



**Battery-Operated Pocket Radio**  
**MODEL 9-BT-9 Series**  
 Chassis No. RC-1164A, RC-1164B  
**SERVICE DATA**  
 — 1957 No. 3 —



*The "Transistor Six"*  
 Model 9-BT-9 Series  
 Model 9-BT-9E Antique White  
 Model 9-BT-9H Green  
 Model 9-BT-9J Gray

**SPECIFICATIONS**

<b>TUNING RANGE</b> .....	540-1,600 kc
<b>INTERMEDIATE FREQUENCY</b> .....	455 kc
<b>TRANSISTOR COMPLEMENT:</b>	
(1) Type 2N140 or 2N411	Converter
(2) Type 2N139 or 2N409	1st I-F Amp.
(3) Type 2N139 or 2N409	2nd I-F Amp.
(4) Type 2N109 or 2N407	Audio Driver
(5) Type 2N109 or 2N407	Push-pull Output
(6) Type 2N109 or 2N407	Push-pull Output
A crystal diode is used as 2nd detector.	
A crystal diode is used as overload diode.	
<b>BATTERY:</b>	
Type No. VS-300	9 volts
Current consumption (with no signal)	Approx. 8 ma
Useful life (intermittent service)	Approx. 75 hours

**IMPORTANT**

THE PROCEDURE TO BE USED IN SERVICING TRANSISTOR RADIOS IS VERY MUCH THE SAME AS USED WITH VACUUM TUBE RADIOS ALTHOUGH CERTAIN PRECAUTIONS MUST BE OBSERVED. THE SERVICE HINTS GIVEN ON PAGE 2 SHOULD BE CAREFULLY READ BEFORE ATTEMPTING TO SERVICE THIS RADIO RECEIVER.

**DESCRIPTION**

The "Transistor Six" is, as its name implies, a radio receiver using six transistors instead of vacuum tubes. A superheterodyne circuit is used consisting of: converter, two stages of I-F amplification, crystal diode detector, audio driver and push-pull class-B output. A 2 1/2" speaker is used for normal listening; a jack for earphone connection is provided when use is desired without disturbing nearby persons.

A printed circuit type of chassis is used to obtain light weight and compact size. The complete receiver including batteries weighs approximately one pound and is designed to be carried in a coat pocket. The case is made of non-breakable "Impac".

Power is obtained from a 9-volt battery having a life expectancy of 75 hours. The volume control circuit is designed to provide a high minimum volume level and thus minimize possibility of the set being turned on when not in use.

**SERVICE HINTS**

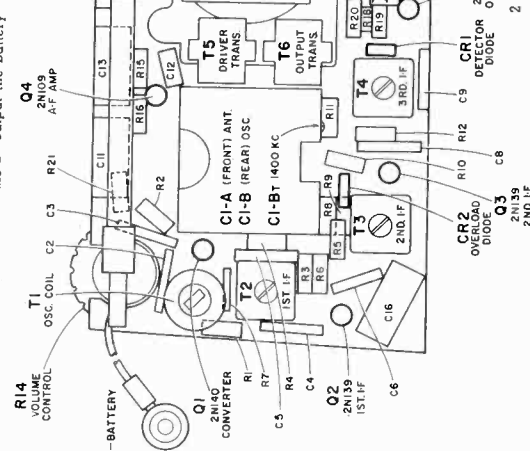
**Recommended Test Procedure**  
 Use signal tracing or signal injection as basic test procedure in conjunction with voltage measurements. Make step-by-step check by injecting signal from signal generator. Start with a high-gain oscillator (at least .03 volts/inch). Oscillator action must be stopped in order to measure RF signal converter. Base since oscillator signal also appears at this point. Oscillator action can be stopped by touching a finger to oscillator section of the tuning condenser.

**NOTE:** All transformers are step-down type and will show voltage loss from primary to secondary.

Extreme care should be used to avoid accidental shorting of transistor elements to circuit ground. This is especially true of the output transistors; if the junction of R18-R19-R20 should be accidentally grounded for a few seconds, the output transistors would be permanently damaged.

It is possible to damage a transistor when testing circuit continuity. Since a transistor needs only low voltage applied to its terminals for conduction, testing continuity at a circuit which includes a transistor can result in misleading continuity indications. To avoid transistor damage and misleading continuity indications, remove the transistor from the chassis before making continuity tests of its circuit.

1. The first thing to check when the receiver is inoperative, is the battery. With the receiver turned on, a new battery should show 9 volts although the receiver can be expected to operate on any battery which checks between 6 volts and 9 volts.
2. To check for a circuit defect which would cause excessive battery drain, an overall current measurement and supplementary voltage measurements should be made, or reasons explained above, continuity measurements can be misleading.
3. Signal tracing by injection of a signal from a signal generator is done on transistor radios in exactly the same manner as with conventional vacuum tube receivers. The signal generator should be connected (as in past years) in series with a capacitor to avoid shorting out the receiver. With the transistors used in this receiver, the BASE of the signal input terminal (corresponding to signal output terminal of the COLLECTOR in tube sets) and the EMITTER is the common terminal (corresponding to cathode of tubes).
4. The output of this receiver is of the "Class B" type. It should be noted that in "Class B" output the battery



current increases noticeably with increased signal input. Refer to the schematic diagram for current specifications.

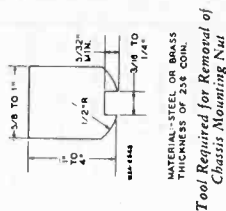
5. Application of a signal from a signal generator to the input (B) of Q1 will stop oscillator action. (R-F signal can not be injected at this point although 455 kc I-F signal can be injected).
6. Measurement of oscillator signal strength with an oscilloscope at the input of Q1 (base contact) will give an indication of oscillator performance. Voltage should be 0.20 to 0.70 volts peak-to-peak.
7. D.C. measurements should be made only with a sensitive voltmeter, such as an RCA VoltOhmMast.
8. Interchanging transistors in the I-F stages may necessitate readjustment.
9. The transistors and the printed wiring board can be readily damaged by excessive heat. When soldering on the printed wiring board, use a soldering iron which is HOT and CLEAN. The soldering operation can then be completed quickly with a minimum of heat radiation to components.

**ALIGNMENT PROCEDURE**

**Test Oscillator**—For all alignment operations, connect the low side of the test oscillator to the common positive" wiring and keep the oscillator output as low as possible to avoid AVC action.

Step	Connect High Side of Sig. Gen. to —	Sig. Gen. Output	Dial Pointer Setting	Adjust for Max. Output
1	#2 terminal of ant. assembly L1	455 kc	1600 kc	T4 3rd I-F point near 1600 kc T2 1st I-F
2				Repeat Step 1
3	Short wire placed near antenna for radiated signal	1400 kc	1400 kc	1400 kc rock gang C1-B (osc.)
4		600 kc	600 kc	600 kc rock gang T1 osc. coil
5				Repeat Steps 3 and 4

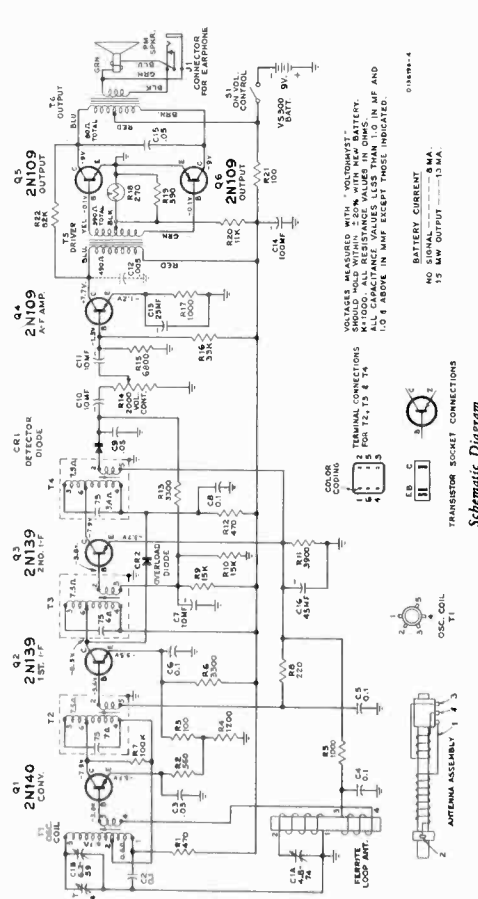
\* Oscillator trimmer is located on bottom of gang.



Tool Required for Removal of Chassis Mounting Nut

**EARPHONE CONNECTION**  
 Only a low impedance earphone (under 200 ohms) should be connected into the earphone socket. RCA accessory earphone Number RK-203 is recommended.

Chassis Components New From Back Side

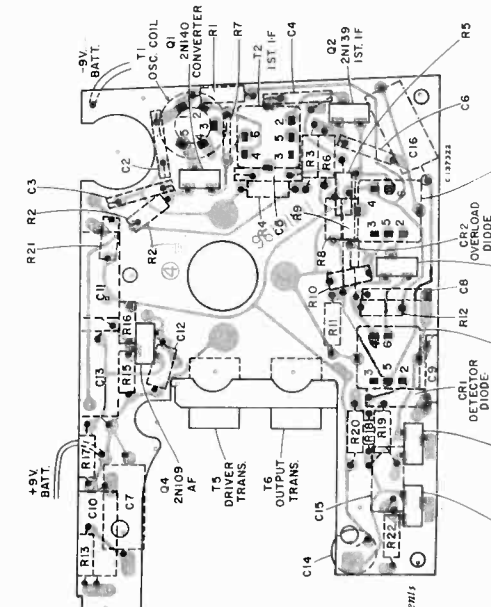


**CRITICAL LEAD DRESS**

1. Dress leads and components at gang so as not to interfere with rotor plates.
2. Dress lead from antenna to gang am. terminal away from metal parts as far as practicable.
3. Check for possible solder shorts to volume control knob from printed circuit wiring.

**Schematic Diagram**

4. Antenna terminal of gang must be bent to insure clearance to output transformer.
5. Dress "B-" lead from ON-OFF switch to battery under positive (+) lead of C16.
6. Dress antenna rod to clear end of case and such that antenna terminal does not interfere with -losing of case back.



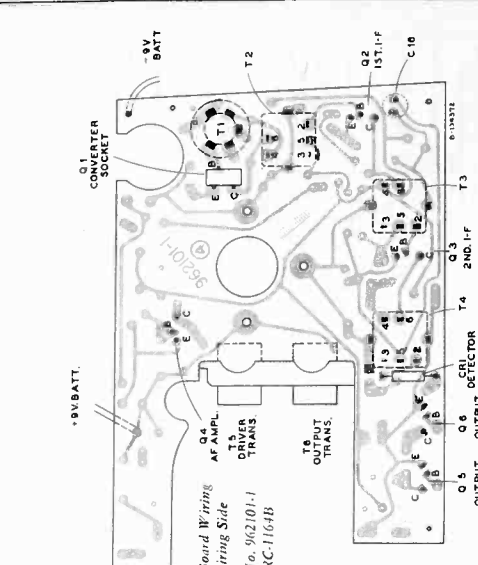
**ALTERNATE TRANSISTORS**

- 2N140 Converter
- 2N411 I-F Amp.
- 2N139 I-F Amp.
- 2N409 Audio Amp.
- 2N109 & Output

**Printed Circuit Board Wiring and Components View from Wiring Side**

Circuit Board No. 961919-1  
Chassis No. RC-1164A

The assembly represented above is viewed from the wiring side of the printed wiring. On the rear side of the board, as presented in "phantom" view superimposed on the component layout of the reverse side.



**Production Changes**

1. R4 was 1000 ohms.
2. R5 was 220 ohms.
3. C9 was .005 mf.
4. C12 (.005 mf.) removed—it was connected from collector of Q4 to gnd.
5. C16 (.45 mf.) was a wire-in type of capacitor in early production. It may be either a wire-in type or upright type in late production.

**SERVICE PROBLEMS AND REMEDIES**

**Distorted Only On Weak Stations Or Only On Strong Stations**  
When distortion is present and varies with the strength of the station signals, it indicates an abnormal condition in the circuit of those transistors whose bias is AGC controlled.

Distortion only on weak stations is most often due to unsatisfactory operation of the detector. The diode should have a slight initial forward bias. Check for presence of this bias voltage; check to see that polarity does not reverse with signal and that AGC voltage with signal is of proper magnitude. If emitter voltage should decrease with increase of signal.

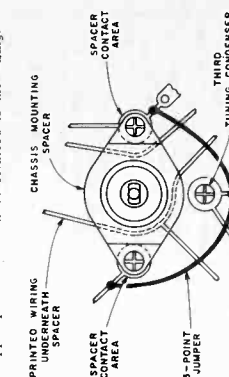
Distortion on strong stations indicates that the transistors are being driven to cutoff by a strong AGC voltage. An overload diode is used to reduce the gain of an IF circuit only on strong signals. Check terminal voltages and the overload diode. Transistor radios will not handle large variations of signal as well as vacuum tube radios, and it may be that on excessively strong signals the best solution is to turn the radio so that the antenna will pick up less signal.

**Regeneration**

An IF transistor having exceptionally high gain may cause regeneration on weak signals. A possible correction for this difficulty is to interchange the two IF transistors—reassignment is advisable after any change of transistors in the IF circuit.

1. If a type 2N140 transistor is used in place of a type 2N139 transistor, regeneration may occur. Check for use of correct type of transistor.
2. Two specific types of regenerative squeal have been found in the Transistor Six. The first type in which the audible sound can be controlled by the volume control has had several causes which were as follows:
  1. High internal battery resistance. A new battery corrects the trouble.
  2. High resistance riveted connections at battery leads on printed board. This trouble can be overcome by soldering the rivets to the printed wiring.
  3. High resistance connections between mounting spacer and transistor radios. This can be corrected by the frequency and intensity of the squeal when the tuning capacitor and mounting screws are first loosened and then tightened. The spacer and the mounting screws are in the tuning condenser "ground" circuit and elec-

tralytic action between the copper wiring and the die-cast zinc spacer results in corrosion and high resistance joints. The 3-point wire jumper should be soldered between the tuning condenser and the tuning condenser mounting screws. The spacers now being used are copper plated and can be soldered to the wiring.



4. Stripped tuning condenser mounting screw. The third tuning condenser mounting screw is also used as part of the tuning condenser "ground" circuit. The screw must be long enough to hold securely in the condenser and yet not long enough to touch the tuning condenser plates.
5. Resin joint at tuning condenser mounting screw. The resin joint at the tuning condenser mounting screw above is soldered to the printed wiring. Some cases of poor soldering have resulted in rosin joints.
6. The mounting lugs of IF transformers T3 and T4 are used for ground interconnection. Loose rivets can result in intermittent regeneration. Solder a jumper wire between the two mounting lugs of each can.

**No Signal**  
In cases of "no signal," the first step is to check battery voltage. The battery should be replaced on batteries as low as 5 volts. If the battery is O.K., check terminal voltages. There can be short-circuits in transistor radios just as in any other radio. One significant difference is that in a transistor radio, there is insufficient power to burn a resistor.

REPLACEMENT PARTS

SYMBOL NO.	SYMBOL NO.	SYMBOL NO.	DESCRIPTION	SYMBOL NO.	DESCRIPTION	STOCK NO.
C1A, C1B	101617	R22	CHASSIS ASSEMBLY RC-1164A, RC-1164B	502382	Resistor—Fixed, composition, 82,000 ohm, ±10%, 1/2 w.	502382
C2	101610	S1	Capacitor—Variable tuning capacitor	103017	Part of R14. Coil—Oscillator coil with adjustable core.	103017
C3	101698	T2	Capacitor—Fixed, ceramic, 0.1 mfd., ±20%, 30 v.	103018	Transformer—1st I.F. transformer.	103018
C4 to C6	103014	T3	Capacitor—Fixed, ceramic, 0.03 mfd., ±20%, 30 v.	103019	Transformer—2nd I.F. transformer.	103019
C7	101613	T4	Capacitor—Fixed, ceramic, 0.1 mfd., ±100%—20%, 30 v.	103020	Transformer—Driver transformer.	103020
C8	103014	T5	Capacitor—Electrolytic, 10 mfd., 10 v. Same as C4	103021	Transformer—Output transformer.	103021
C9	101698	T6	Capacitor—Fixed, ceramic, 0.05 mfd., ±20%, 100 v.—Late Prod.	101627	Bracket L—Antenna assembly mfg.	101627
C10, C11	101613		Capacitor—Fixed, paper, 0.005 mfd., ±10%, 200 v.—omitted in Late Prod.	101630	Bracket R—Antenna assembly mfg.	101630
C12	101742		Capacitor—Electrolytic, 25 mfd., 10 v. Capacitor—Electrolytic, 100 mfd., ±20%, 100 v.	101631	Connector—Battery clip assembly—female — with terminal (positive connection).	101631
C13	101614		Capacitor—Fixed, ceramic, 0.05 mfd., ±20%, 100 v.	101633	Connector—Battery clip assembly—male — with terminal (negative connection).	101633
C14	103015		Capacitor—Fixed, ceramic, 0.05 mfd., ±20%, 100 v.	101637	Grommet—Rubber grommet for mfg. antenna assembly.	101637
C15	103380		Capacitor—Fixed, ceramic, 0.05 mfd., ±20%, 100 v.	103093	Insulator—Paper insulator between knob—On-Off circuit board.	103093
C16	101793		Capacitor—Electrolytic, 45 mfd., 10 v.—wire-in type	103360	Knob—On-Off—brass finish volume control knob—hex nut (brass) for mounting volume control.	103360
C16	104338		Capacitor—Electrolytic, 45 mfd., 10 v.	103360	Screw—#0-80 x 1/4", R. H. screw (brass) for mounting volume control.	103360
CR1, CR2	101615		Rectifier—Crystal diode	103173	Screw—Volume control knob retaining screw.	103173
J1	101641		Jack—Miniature earphone jack with washer and nut.	101629	Socket—Transistor socket.	101629
L1	103016		Antenna—Ferrite rod antenna assembly	103683	Spacer—Chassis mounting spacer	103683
R1	502147		Resistor—Fixed, composition, 470 ohm, ±10%, 1/2 w.		SPEAKER ASSEMBLY 943353-2	
R2	502156		Resistor—Fixed, composition, 560 ohm, ±5%, 1/2 w.		Speaker—2 1/4" PM speaker—complete with cone.	
R3	502110		Resistor—Fixed, composition, 100 ohm, ±5%, 1/2 w.		MISCELLANEOUS	
R4	502210		Resistor—Fixed, composition, 100 ohm, ±5%, 1/2 w.—Early Prod.		Case—Case front & back assembly—antique while "Impact" for Model 9B73E	
R4	502212		Resistor—Fixed, composition, 1200 ohm, ±5%, 1/2 w.—Late Prod.		Case—Case front & back assembly—gray—Impact for Model 9B73J	
R5	502122		Resistor—Fixed, composition, 220 ohm, ±10%, 1/2 w.—Early Prod.		Case—Case front & back assembly—gray—Impact for Model 9B73J	
R5	502210		Resistor—Fixed, composition, 1000 ohm, ±10%, 1/2 w.—Late Prod.		Case—Case front & back assembly—gray—Impact for Model 9B73H	
R6	502233		Resistor—Fixed, composition, 3300 ohm, ±5%, 1/2 w.		Case—Case front & back assembly—gray—Impact for Model 9B73H	
R7	103022		Resistor—Fixed, composition, 100,000 ohm, ±10%, 1/2 w.		Case—Case front & back assembly—gray—Impact for Model 9B73H	
R8	502122		Same as R5, in Early Prod.		Cloth—Speaker grille cloth—white—for Model 9B73E	
R9, R10	502315		Resistor—Fixed, composition, 15,000 ohm, ±10%, 1/2 w.		Cloth—Speaker grille cloth—gray—for Model 9B73J	
R11	502239		Resistor—Fixed, composition, 3900 ohm, ±10%, 1/2 w.		Cloth—Speaker grille cloth—green—for Model 9B73H	
R12	502147		Same as R1		Dial—Tuning control dial	
R13	502233		Resistor—Fixed, composition, 3300 ohm, ±10%, 1/2 w.		Knob—Tuning control knob	
R14	101616		Control—Volume control and "on-off" switch (with knob screw) Includes S1.		Nameplate—"RCA Victor" nameplate	
R15	502268		Resistor—Fixed, composition, 6800 ohm, ±10%, 1/2 w.		Nut—# 4-1/4" blister head, chassis mounting screw (3 req'd)	
R16	502333		Resistor—Fixed, composition, 33,000 ohm, ±10%, 1/2 w.		Nut—# 4-24 special nut—external threaded for chassis mounting	
R17	502210		Same as R4, in Early Prod.		Screw—Special retaining screw for tuning control knob	
R18	103021		Resistor—Temperature compensated, 270 ohm, ±10%, 1/2 w.		RE-203 EARPHONE (Accessories)	
R19	502139		Resistor—Fixed, composition, 390 ohm, ±5%, 1/2 w.		Cord—Connecting cord (5 ft.) complete with connectors	
R20	502311		Resistor—Fixed, composition, 11,000 ohm, ±5%, 1/2 w.		File with connectors	
R21	502110		Same as R3		File with connectors (clear plastic) for earpiece (clear plastic)	

APPLY TO YOUR RCA DISTRIBUTOR FOR PRICES OF REPLACEMENT PARTS

After finding out where the distortion originates, a voltage check (especially bias voltage) will assist in pin-pointing the trouble.

One type of audio distortion is regeneration due to low capacity filters and/or high resistance joints.

Because the output transformers are in a "Class B" circuit, even a small change in bias may result in distortion. The no-signal emitter or collector current of each of the output transformers should be 1.5 to 2 ma with a new battery. A bias voltage of -0.1 v. is required at that current drain.

Negative feedback is used to reduce distortion, the feedback resistor R22 is 82K. If the resistor is connected to the wrong output collector, the distortion will be increased instead of decreased. This tells us that the YEL and GRN leads of the driver transformer must not be interchanged and neither should the BLUE and RED leads be reversed. Some transformers had incorrect color coding.

A simple case of low output and distortion has resulted from one pin of one output transformer being bent at right angles and not in its socket; the other two pins held the transformer in place.

In factory production, selected pairs of transformers are used for Class "B" output. Mismatched transformers will result in some distortion, this may or may not be noticeable during listening. Transformers may be matched by injecting audio signal into the volume control and measuring the audio signal from the output collector to ground. Matched transformers will give matched output signal.

**Intermittents**

The causes and correction of intermittent signal conditions are no different in transistor radios than in vacuum tube radio.

The following suggestions may be of assistance:

1. Open in printed wiring—go over suspected wiring with soldering iron and solder.
2. Weak battery or new battery with high internal impedance—measure voltage with set turned on, shunt battery with electrolytic capacitor; replace the battery if found defective.
3. Stand-up electrolytic capacitor may have broken connection in wax base—try shunting the capacitor with an external capacitor, replacing if found defective.
4. Instances of intermittent short-circuit of C14 (100 mfd.) have been found to result from the chassis mounting spacer short-circuiting to the printed wiring underneath the spacer (refer to the illustration on page 4).

Any chassis that is removed from its case should be examined and any spacer on which the two mounting bosses are of unequal height should be replaced.

**Short Battery Life**

The first thing to do is measure total battery current at no-signal, normal signal and with the set turned off.

If the current drain at no-signal is excessive, check the electrolytic capacitors across the battery supply; if current drain at normal signal is excessive, the output bias should be closely checked.

There should be no measurable current flowing when the set is turned off.

**Spurious Responses**

Spurious responses such as tweets and birdies have been found to occur in the converter circuit. The condition is due to excessive gain in the oscillator signal. Quite often the simplest check and correction is to try another converter transformer.

The oscillator voltage can be checked with an oscilloscope or an RF type of vacuum tube voltmeter and should be within the limits of 0.20 to 0.70 volts (across the converter base. Excessive oscillator voltage can be most easily overcome by shunting the oscillator coil (primary tuned circuit) with a one-megohm resistor.

Chirping noises, caused by fluorescent lights may be eliminated by addition of a 0.15 capacitor from center tap of output transformer primary to "ground."

Transistors have no filaments to burn out, but lead wires can be broken. Battery leads and phone jack leads are the most likely source of such trouble. Transistors themselves should be the last items suspected.

If a quick check of terminal voltages indicates that a short-circuit is not the cause of trouble, it is suggested that signal injection be used to localize the defect as being in one specific stage. There can be breaks in printed wiring which would cause signal stoppage, but any such breaks, which would not materially affect terminal voltages, are highly unlikely.

**Weak RF/IF Signal**

Transistor life in normal service has no known limit; service deterioration is so negligible as to be dismissed without further thought.

In all cases of RF/IF low sensitivity, first check terminal voltages. Although voltages may vary widely without greatly affecting stage gain, the bias voltages should all have the same polarity and variation. The bias voltages are the most difficult to vary. A "forward" bias of 0.15 v. will have a slight decrease in gain when operating with a bias of 0.12 volt but may have a great decrease in gain when operated with a bias of 0.10 volt. If a large voltage discrepancy is found it will be necessary to remove transistors before making resistance measurements in localizing the trouble.

Where a transistor stage shows low gain, shunt each bypass capacitor in that stage with another capacitor to detect open capacitors.

Alignment should be checked in all cases of low RF/IF sensitivity. There is only one core to each IF transformer but in some cases two peaks may be reached, one peak being higher than the other. If a transformer can not be peaked, it may have to be replaced—first check transformer terminal connections. The following are alignment suggestions:

1. IF transformer will not peak at 455KC—may be either defect in transformer or defective transistor (IF or converter)—try replacing transistor before changing transformer. An open bypass capacitor in the circuit of that transformer could give an unsatisfactory peaking condition.
2. IF transformers may be peaked incorrectly—maximum gain is obtained when cores are peaked at the "lambert set in" peak.

Other possibilities of low RF/IF sensitivity are as follows:

1. Incorrect transistor—if type 2N139 is used in place of specified type 2N140, conversion gain will be down and oscillator section may fail to operate when battery voltage is down slightly.
2. Resistor value change in oscillator or converter stage—measure oscillator a.c. voltage at O1 base (should be 0.20 to 0.70 volts p-p)—measure d.c. voltages—remove transistors and check resistors in converter circuit; if transistors are soldered in, unsolder one end of suspected resistor and measure without removing transistors.
3. Detector diode reversed—output is down slightly. Check by noting polarity of AGC voltage at the diode source. AGC line voltage at the diode will become more positive (or less negative) in respect to circuit ground with signal increase.

**Weak Audio Signal**

Just as with low RF/IF sensitivity conditions, when a weak audio signal condition is encountered, check terminal voltages first. If terminal voltages check satisfactory, try signal injection.

Possible causes of weak audio signal are:

1. Detonated electrolytic capacitors, both bypass and coupling.
2. Wrong connections on transformer leads.
3. Internally shorted turns in transformer.

**Audio Distortion**

If audio distortion is present, the best way to find out where the distortion originates is by using an oscilloscope.

**SERVICE HINTS**

**General Information**  
 Extreme care should be used to avoid accidental shorting of transistor elements to circuit ground. This is especially true of the output transistors; if the junction of RB1-R15-R20 should be accidentally grounded for a few seconds, the output transistors would be permanently damaged.  
 It is possible to damage a transistor when testing circuit continuity. Since the signal generator has a low voltage output, it is possible for conduction, testing continuity of a circuit which includes a transistor, can result in misleading continuity indications. To avoid transistor damage and misleading continuity indications, remove the transistor from the chassis before making continuity tests of its circuit.  
 1. When the receiver is inoperative, the first thing to do is check the batteries. The voltage at the two battery lead terminals, with the receiver turned on, should be approximately 4 1/2 volts with new batteries. The receiver can be expected to operate if the total battery voltage checks between 3 volts and 4 1/2 volts with the proper polarity. Check the polarity of every cell; every cell is marked in the right direction (topward).  
 2. To check for circuit defects which would cause excessive battery drain, check current measurements and supplementary voltage measurements should be made. For reasons explained above, continuity measurements can be misleading.  
 3. Signal tracing by injection of a signal from a signal generator is done on transistor radios in exactly the same manner as with the conventional vacuum tube radios. The signal generator should be connected (as in past practice) in series with a capacitor to avoid shorting out bias voltages. With the transistors used in this receiver, the BASE is the signal input terminal. Corresponding to signal grid of tubes), the emitter is the plate of the signal output terminal. The common terminal (corresponding to cathode of tubes).  
 4. The output of this receiver is of the "Class B" type. It should be noted that in "Class B" output the battery current increases noticeably with increased signal input. See current specifications on schematic diagram.  
 5. Transistors and the printed circuit board can be damaged by excessive heat. Whenever soldering is necessary on the printed circuit board use a soldering iron which

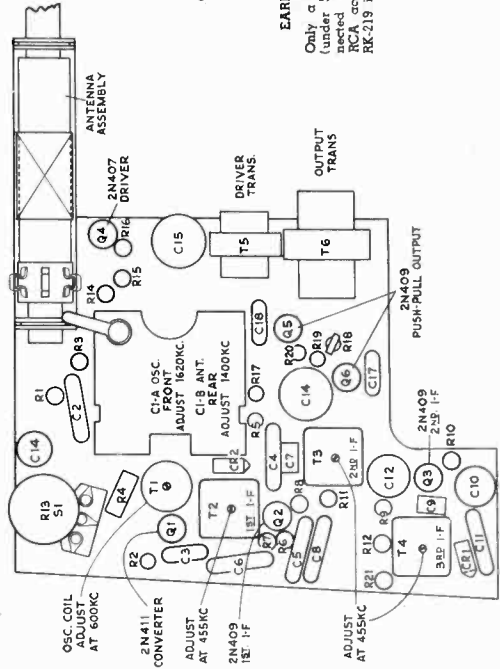
is both HOT AND CLEAN. This minimizes the amount of heat which will be radiated from the point of soldering.  
 6. Oscillator injection voltage can be measured at the emitter terminal of Q1 with the use of an oscilloscope or R-F type of VTVM. The injection voltage should be approximately 0.12 volts r.m.s. (0.34 v. peak to peak) in the middle of the tuning range (near 1600 kc).  
 7. D-c voltage measurements should be made only with a sensitive voltmeter, such as an RCA VoltOhmMeter®.  
 8. Interchanging transistors in the I-F stages may necessitate readjustment.

**ALIGNMENT PROCEDURE**

**Test Oscillator.**—For all alignment operations, connect the low side of the test oscillator to the "common positive" wiring and keep the oscillator output as low as possible to avoid AVC action.

Step	Connect High Side of Sig. Gen. to —	Sig. Gen. Output	Dial Pointer Setting	Adjust for Max. Output
1	#2 terminal of ant. assembly L1	455 kc	Quiet point near 1600 kc	T4 3rd I.F. T5 2nd I.F. T2 1st I.F.
2			Repeat Step 1	
3		1620 kc	Gang fully open	trimmer C1-A* (osc.)
4	Short wire placed in antenna for radiated signal	1400 kc	1400 kc	trimmer C1-B (ant.)
5		600 kc	600 kc	T1 rock gang osc. coil
6			Repeat Steps 3, 4 and 5	

\* Oscillator trimmer is located on front section of gang.  
 Ant. trimmer is located on rear section of gang.



Chassis Components View from Back Side

**EARPHONE CONNECTION**

Only a low impedance earphone (under 50 ohms) should be connected into the earphone jack. RCA accessory earphone Number RK-219 is recommended.

**Battery-Operated Portable Radio**  
**MODELS 1-BT-41,**  
**1-BT-46, 1-BT-48**

Chassis No. RC-1181

**SERVICE DATA**

— 1957 No. 35 —



Model 1-BT-41  
Antique White



Model 1-BT-46  
Charcoal

The "Jetstream"™

Model 1-BT-48  
Razzer

**SPECIFICATIONS**

**TUNING RANGE** 540-1,600 kc  
**INTERMEDIATE FREQUENCY** 455 kc  
**LOUDSPEAKER** Size and type ..... 4" P.M.  
 Voice coil impedance ..... 3.2 ohms  
 Provision is made for connection of a low impedance earphone if desired. RCA earphone accessory Number RK-219 is recommended.  
**POWER OUTPUT** Undistorted ..... 100 milliwatts  
 Maximum ..... 150 milliwatts  
**DIMENSIONS** Height ..... 5 1/4" Width ..... 8" Depth ..... 2 1/4"  
**WEIGHT** Approximately two pounds including batteries.  
 batteries weighs approximately two pounds. The case is made of simulated cowhide.  
 The receiver is powered by three "C" size dry cells (RCA Type JS-035). The case is designed for easy removal of a cap on the side of the case. Expected useful life of the batteries is in excess of 100 hours with intermittent service.

**DESCRIPTION**

The "Jetstream" is a radio receiver using six transistors instead of vacuum tubes. A superheterodyne circuit is used consisting of: converter, two stages of I-F amplification, crystal diode detector, audio driver and push-pull class-B output. A 4" speaker is used for normal listening; a jack for earphone connection is provided when use is desired without disturbing nearby persons.  
 A printed circuit type of chassis is used to obtain light weight and compact size. The complete receiver including

**IMPORTANT**

THE PROCEDURE TO BE USED IN SERVICING TRAN-  
 SISTOR RADIOS IS VERY MUCH THE SAME AS USED  
 WITH VACUUM TUBE RADIOS. ALTHOUGH CERTAIN  
 PRECAUTIONS MUST BE OBSERVED, THE SERVICE  
 HINTS GIVEN ON PAGE 2 SHOULD BE CAREFULLY  
 READ BEFORE ATTEMPTING TO SERVICE THIS RADIO  
 RECEIVER.

**SUPPLEMENTARY INFORMATION**

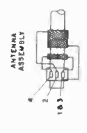
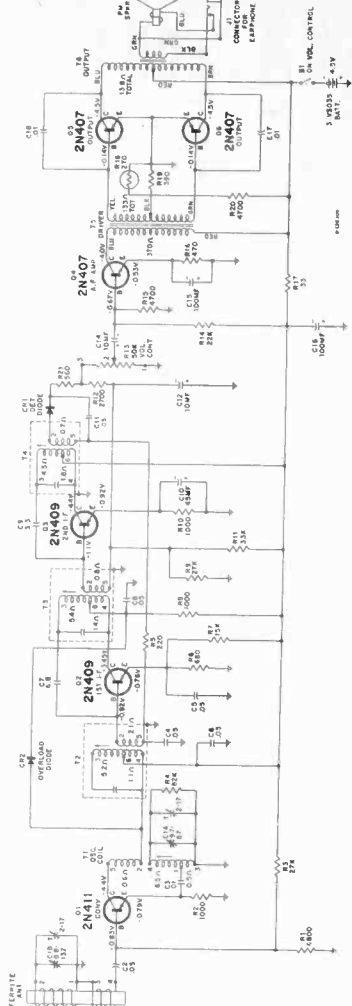
Issue	Subject

List related Supplements and Service Tips above.

REPLACEMENT PARTS

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
C1A, C1B	105732	CHASSIS ASSEMBLY RC-1181	105751	105751	Board — Printed circuit board chassis assembly including fixed resistors and capacitors, I.F. transformers, oscillator coil and antenna mtg. bracket, less transistors, tuning capacitor, volume control antenna, driver and output transformers
C2	105715	Capacitor—Variable tuning capacitor ±100%	105719	105719	Bracket—Antenna mounting bracket
C3	105716	Capacitor—Fixed, ceramic, 0.05 ml., ±20%	101311	101311	Grommet—Rubber grommet for mounting antenna (2 req'd)
C4, C5, C6	105717	Capacitor—Fixed, ceramic, 0.01 ml., ±20%	103402	103402	Nut—¼" x 32 hex nut for mounting volume control
C7	105718	Capacitor—Fixed, ceramic, 0.05 ml., ±20%	79696A	79696A	SPEAKER ASSEMBLY with cone
C8	105715	Capacitor—Fixed, ceramic, 0.01 ml., ±20%			MISCELLANEOUS ASSEMBLY
C9	71503	Capacitor—Fixed, ceramic, 0.01 ml., ±20%	105741	105741	Cap—Phenolic battery cap — antique white — for Model 1B741
C10	104338	Capacitor—Electrolytic, 45 ml., 10 v., ±20%	105742	105742	Cap—Phenolic battery cap — charcoal — for Model 1B746
C11	105380	Capacitor—Fixed, ceramic, 0.05 ml., ±20%	105740	105740	Cap—Phenolic battery cap — russet — for Model 1B748
C12	103382	Capacitor—Electrolytic, 10 ml., 10 v., ±20%	X4304	X4304	Case—Case assembly — less grille, escutcheon and mounting plate, handle, links and supports — antique white — for Model 1B741
C14	103382	Capacitor—Electrolytic, 10 ml., 10 v., ±20%	X4305	X4305	Case—Case assembly — less grille, escutcheon and mounting plate, handle, links and supports — charcoal — for Model 1B746
C15, C16	103015	Capacitor—Electrolytic, 100 ml., 10 v., ±20%	X4303	X4303	Case—Case assembly — less grille, escutcheon and mounting plate, handle, links and supports — russet — for Model 1B748
C17, C18	105716	Capacitor—Fixed, ceramic, 0.05 ml., ±20%	105721	105721	Clip—Retaining clip for battery case
CR1, CR2	101615	Rectifier—Crystal diode	105722	105722	Escutcheon—Case escutcheon and grille assembly for Model 1B741
L1, L2	105730	Antenna—Ferrite antenna assembly — less grommets	105738	105738	Escutcheon—Case escutcheon and grille assembly for Models 1B746 and 1B748
R1	502288	Resistor—Fixed, composition, 6800 ohms, ±10%, ½ w.	105735	105735	Escutcheon—"Oil" escutcheon for volume control knob
R2	502210	Resistor—Fixed, composition, 1000 ohms, ±10%, ½ w.	101641	101641	Jack—Earphone jack with washer and nut
R3	502327	Resistor—Fixed, composition, 27,000 ohms, ±10%, ½ w.	105748	105748	Handle—Carrying handle — antique white — for Model 1B741
R4	502382	Resistor—Fixed, composition, 82,000 ohms, ±10%, ½ w.	105749	105749	Handle—Carrying handle — charcoal — for Model 1B746
R5	502122	Resistor—Fixed, composition, 220 ohms, ±10%, ½ w.	105747	105747	Handle—Carrying handle — russet — for Model 1B748
R6	502168	Resistor—Fixed, composition, 680 ohms, ±10%, ½ w.	105729	105729	Knob—Tuning control knob with calibration marks — less decorative retaining screw
R7	502315	Resistor—Fixed, composition, 15,000 ohms, ±10%, ½ w.	105736	105736	Knob—Volume control knob (2 req'd)
R8	502210	Same as R2	101645	101645	Link—Carrying handle link (2 req'd)
R9	502327	Same as R3	105733	105733	Nut—Push-on type retaining nut for case escutcheon and grille assembly (2 req'd)
R10	502210	Same as R2	105734	105734	Nut—Speed nut (retainer) for case back flap (2 req'd)
R11	502333	Resistor—Fixed, composition, 33,000 ohms, ±10%, ½ w.	105737	105737	Screw—Decorative retaining screw for tuning control knob
R12	502227	Resistor—Fixed, composition, 2700 ohms, ±10%, ½ w.	105720	105720	Spring—Control spring for battery cap
R13	105728	Control—Volume control with on-off switch — includes S1	105743	105743	Spring—Flat bronze spring for battery case
R14	502322	Resistor—Fixed, composition, 22,000 ohms, ±10%, ½ w.	105750	105750	Support—Metal support with mounting plate for carrying handle
R15	502247	Resistor—Fixed, composition, 4700 ohms, ±10%, ½ w.			
R16	502147	Resistor—Fixed, composition, 470 ohms, ±10%, ½ w.			
R17	502033	Resistor—Fixed, composition, 33 ohms, ±10%, ½ w.			
R18	103021	Resistor—Temp. compensated, 270 ohms, ±10%, @ 25° C., 39.7 ohms, ±15%, @ 75° C., ½ w.			
R19	502139	Resistor—Fixed, composition, 390 ohms, ±5%, ½ w.			
R20	502247	Resistor—Fixed, composition, 4700 ohms, ±10%, ½ w.			
R21	502156	Resistor—Fixed, composition, 560 ohms, ±10%, ½ w.			
S1	105728	Part of R13			
T1	105726	Coil—Oscillator coil			
T2	105723	Transformer—1st I.F. transformer			
T3	105724	Transformer—2nd I.F. transformer			
T4	105725	Transformer—3rd I.F. transformer			
T5	105727	Transformer—Driver transformer			
T6	105731	Transformer—Output transformer			

APPLY TO YOUR RCA DISTRIBUTOR FOR PRICES OF REPLACEMENT PARTS



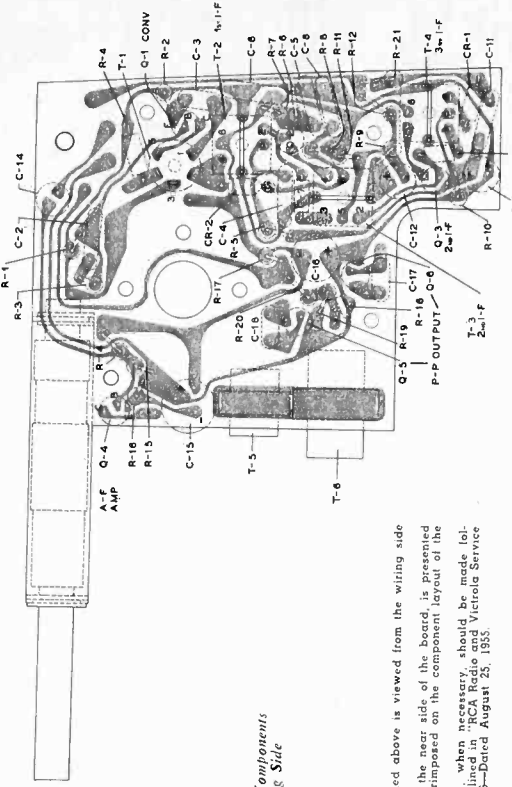
VOLAGES MEASURED WITH "MILIBOMBY" SHOULD HOLD WITHIN 10% WITH NO BATTERY. ALL CHARACTERISTICS SHOULD BE WITHIN 10% OF ABOVE IN ALL EXCEPT THOSE INDICATED.

TOTAL BATTERY CURRENT  
NO SIGNAL — 84 mA  
75 MHz OUTPUT — 24 mA  
30 MHz OUTPUT — 33 mA

Schematic Diagram

CRITICAL LEAD DRESS

1. Dress C18 away from gang plates.
2. Dress audio transformer leads down towards printed circuit board.



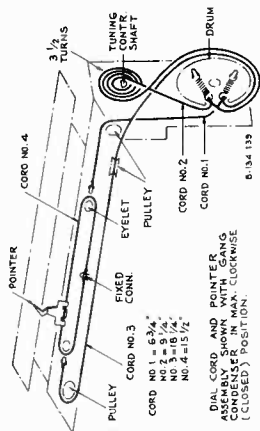
Chassis Wiring and Components View from Wiring Side

The assembly represented above is viewed from the wiring side of the board. The wiring on the rear side of the board is presented in "phantom" view superimposed on the component layout of the reverse side.  
Component replacement, when necessary, should be made following the techniques outlined in "RCA Radio and Victrola Service Tips" Volume VI—Issue 6—Dated August 25, 1955

1-BT-58

**Alignment Procedure**

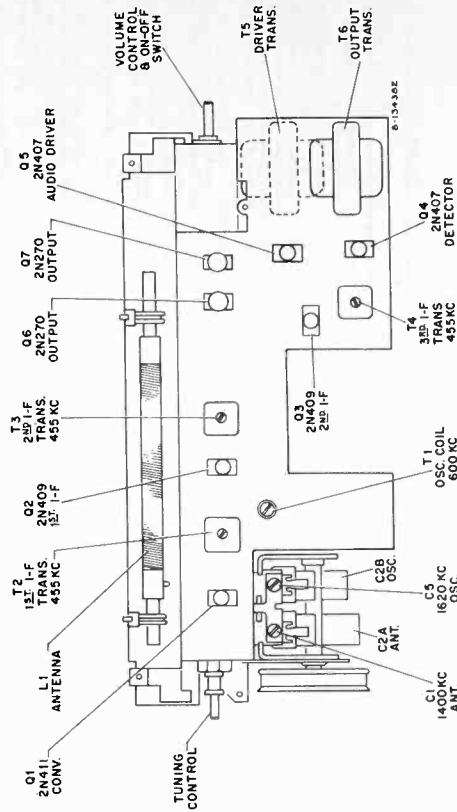
**Output Indicator**—Connect an output meter across the voice coil and turn the receiver volume control to maximum.  
**Test Oscillator**—For all alignment operations, connect the low side of the test oscillator to the receiver chassis and keep the oscillator output as low as possible to avoid AGC action.



**CRITICAL LEAD DRESS**

1. Dress all bus and non-insulated pigtail leads away from chassis ground and other components to prevent shorts.
2. Dress loop antenna leads direct and away from chassis, all other insulated leads direct against chassis.
3. Dress RT1 (thermistor) away from all other components associated with the detector circuit, to limit 910 kc "weep."
4. Maintain reasonably short pigtail leads on components associated with the detector circuit.
5. Insure good grounding of shield cover.
6. Dress components which are enclosed in shielded compartment in such manner that short circuits are prevented.

**Tuning Drive Cords**

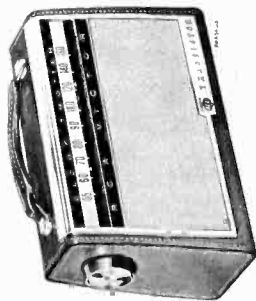


Transistor, Major Component and Trimmer Locations

**RCA VICTOR**  
 Battery-Operated Portable Radio  
**MODEL 1-BT-58**  
 Chassis No. RC-1156B  
**SERVICE DATA**

— 1958 No. 4 —  
 PREPARED BY COMMERCIAL SERVICE  
 RCA SERVICE COMPANY  
 CAMDEN 8, N. J.

FOR  
 RCA VICTOR RADIO AND "VICTROLA" DIVISION  
**RADIO CORPORATION OF AMERICA**



The "Globe Trotter"  
 Model 1-BT-58  
 Trim Simulated Leather with Aluminum Grille

**SPECIFICATIONS**

<b>TUNING RANGE</b>	540-1600 kc	1 1/2 volts each
<b>INTERMEDIATE FREQUENCY</b>	455 kc	Approx. 11.5 ma.
<b>TRANSISTOR COMPLEMENT</b>		Approx. useful life 250 hours at 2 hrs. per day
1. RCA 2N411	Converter	
2. RCA 2N409	1st I-F Amplifier	
3. RCA 2N407	2nd I-F Amplifier	
4. RCA 2N407	Detector	
5. RCA 2N407	Audio Driver	
6. RCA 2N270	Push-pull Output	
7. RCA 2N270	Push-pull Output	
	A crystal diode is used as overload limiter.	
<b>LOUDSPEAKER</b>		
Size and Type	4" x 6" PM	
Voice coil impedance	3.2 ohms at 400 cycles	
<b>TUNING DRIVE RATIO</b>	6 1/2:1 (3 1/4 turns of knob)	
<b>POWER OUTPUT</b>		
Undistorted	200 milliwatts	
Maximum	300 milliwatts	
<b>DIMENSIONS</b>		
Height	6 1/4"	Depth
Width	10"	4" bottom, 3" top
<b>WEIGHT</b>	Approximately 4 pounds including batteries	

**DESCRIPTION**

Batteries are accessible for replacement by removal of the cap on the case end and inserting similarly to loading a flashlight.

Model 1-BT-58 is a radio receiver using seven transistors instead of vacuum tubes. A superheterodyne circuit is used consisting of: converter, two stages of i-f amplification, detector, audio driver and push-pull class-B output. It was designed to operate on 4 1/2 volts battery power, supplied by three standard "D" size flashlight cells.

A ferrite rod antenna provides high signal pickup and excellent image rejection. The i-f transformers are of permittivity type and are shielded to prevent feedback. A variable capacitor is used to tune the i-f stages. A tracking throughout the entire tuning range, A 4" x 6" speaker is used to provide excellent tone quality. The output stage is temperature compensated by use of a "thermistor." This receiver features neutralized i-f stages and improved AGC system by use of the transistor detector. An AGC controlled germanium crystal diode is used to prevent large signal overload.

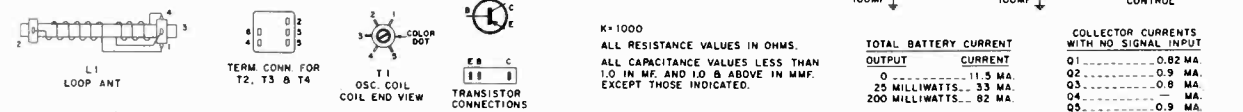
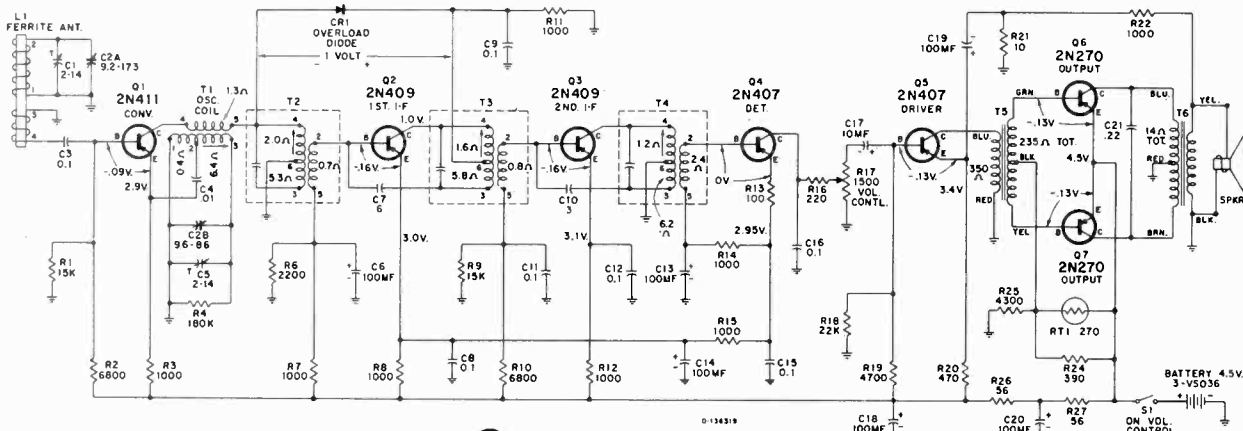
A conventional metal chassis is used and is housed in a simulated leather case. For stability, the case is an inch wider at the bottom than at the top. Although the weight is less than previous lightweight vacuum tube portables, the three flashlight cells will provide more than 250 hours of service under normal operating con-

REPLACEMENT PARTS

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
C1	101653	Part of C2A	T1	105901	Coil—Oscillator coil complete with ferrite core
C2A, C2B	79251	Capacitor—Variable tuning capacitor (includes C1 and C2)	T2	105904	Transformer—1st I.F. transformer
C3	79251	Capacitor—Fixed, paper, 0.1 mf.	T3	105905	Transformer—2nd I.F. transformer
C4	101000	Capacitor—Fixed, paper, 0.01 mf.	T4	105906	Transformer—3rd I.F. transformer
C5	103400	Part of C2B	T5	105909	Transformer—Driver transformer
C6	74182	Capacitor—Fixed, electrolytic, 100 mf., 10 v.	T6	102630	Bushing—Metal bushing for station selector shaft
C7	79251	Capacitor—Fixed, ceramic, 6.0 mmf.		72953	Coil—Dial drive cord (250 ft., see note on length required)
C8, C9	79251	Same as C3		105896	Dial—Tuning control dial with callibrations
C10	77277	Capacitor—Fixed, ceramic, 3.0 mmf.		78097	Eyelet—Dial drive cord eyelet
C11, C12	79251	Same as C3		100082	Grommet—Rubber grommet for mounting ferrite antenna rod (2 req'd)
C13, C14	103400	Same as C6		79745	Plate—Dial backplate assembly with pulleys
C15, C16	79251	Same as C3		105909	Painter—Dial pointer assembly
C17	101613	Capacitor—Fixed, electrolytic, 10 mf., 10 v.		72602	Pulley— $\frac{1}{32}$ " O.D. aluminum pulley for I.H. end of dial backplate
C18, C19	103400	Same as C6		101663	Pulley— $\frac{1}{4}$ " O.D. aluminum pulley for R.H. end of dial backplate or for chassis
C20	100650	Capacitor—Fixed, paper, 0.22 mf., $\pm 10\%$ , 200 v.		79775	Nut—Speednut, retainer for antenna support (2 req'd)
C21	101615	Rectifier—Crystal diode rectifier (overload)		101665	Nut—Speednut, retainer for dial (2 req'd)
CR1	101650	Antenna—Ferrite antenna assembly		102629	Shaft—Station selector shaft
R1	502315	Resistor—Fixed, composition, 15,000 ohms, $\pm 10\%$ , $\frac{1}{2}$ w.		101647	Socket—Transistor socket with retaining ring—for Q1 thru Q7 incl.
R2	502268	Resistor—Fixed, composition, 6800 ohms, $\pm 10\%$ , $\frac{1}{2}$ w.		72540	Spring—Dial cord tension spring (2 req'd)
R3	502210	Resistor—Fixed, composition, 1000 ohms, $\pm 10\%$ , $\frac{1}{2}$ w.		101649	Support—Polystyrene support for antenna assembly
R4	502418	Resistor—Fixed, composition, 180,000 ohms, $\pm 10\%$ , $\frac{1}{2}$ w.		77585	Washer—"C" type retaining washer for station selector shaft
R6	502222	Resistor—Fixed, composition, 2200 ohms, $\pm 10\%$ , $\frac{1}{2}$ w.		102634	SPEAKER ASSEMBLY Speakers—4 x 6" P.M. speaker complete with cone
R7, R8	502210	Same as R3		X4530	MISCELLANEOUS Cabinet—Natural russet vinyl covered cabinet assembly — less handle, support and links
R9	502315	Same as R1		105897	Cap—Plastic battery case
R10	502268	Same as R2		105898	Clip—"C" type clip for mounting chassis to cabinet (2 req'd)
R11, R12	502210	Same as R3		105722	Clip—Retaining clip for battery case
R13	502110	Resistor—Fixed, composition, 100 ohms, $\pm 10\%$ , $\frac{1}{2}$ w.		105907	Escutcheon—Cabinet front escutcheon
R14, R15	502210	Same as R3		105892	Grille—Cabinet grille and plate weld assembly — less window and escutcheon
R16	502122	Resistor—Fixed, composition, 220 ohms, $\pm 10\%$ , $\frac{1}{2}$ w.		105893	Handle—Carrying handle for cabinet
R17	105894	Control—Volume control (includes S1)		105902	Knob—Tuning control knob — with spring
R18	502322	Resistor—Fixed, composition, 22,000 ohms, $\pm 10\%$ , $\frac{1}{2}$ w.		105903	Knob—Volume control knob — with spring
R19	502247	Resistor—Fixed, composition, 4700 ohms, $\pm 10\%$ , $\frac{1}{2}$ w.		101645	Link—Carrying handle link (2 req'd)
R20	502147	Resistor—Fixed, composition, 470 ohms, $\pm 10\%$ , $\frac{1}{2}$ w.		105734	Link—Support link for case back cover (2 req'd)
R21	502010	Resistor—Fixed, composition, 10 ohms, $\pm 10\%$ , $\frac{1}{2}$ w.		105908	Spring—Conical spring for battery cap
R22	502210	Same as R3		101069	Spring—Retaining spring for control knobs
R23	502139	Resistor—Fixed, composition, 390 ohms, $\pm 10\%$ , $\frac{1}{2}$ w.		105750	Support—Metal support with mounting plate for carrying handle
R24	32478	Resistor—Fixed, composition, 4300 ohms, $\pm 5\%$ , $\frac{1}{2}$ w.		105895	Window—Dial window
R25	502056	Resistor—Fixed, composition, 56 ohms, $\pm 10\%$ , $\frac{1}{2}$ w.			
R26, R27	103021	Resistor—Temperature compensated resistor (Thermistor) 270 ohms, at 77°F., 39.7 ohms, at 167°F.			
RT1	—	Switch—On-off switch—part of R17—stock # 105894			
S1	—	—			

APPLY TO YOUR RCA DISTRIBUTOR FOR PRICES OF REPLACEMENT PARTS

1-BT-58



Schematic Circuit Diagram  
SERVICE HINTS

- The first thing to check when the receiver is inoperative, is the battery. With the receiver turned on, a new battery should test 4½ volts although the receiver can be expected to operate with a battery which tests 3 volts or more.
- To check for a circuit defect which would cause excessive battery drain, an overall current measurement and supplementary voltage measurements should be made. For reasons explained below, continuity measurements can be misleading.
- Signal tracing by injection of a signal from a signal generator is done on transistor radios in exactly the same manner as has been done for many years with the conventional vacuum tube radios. The signal generator should be connected (as in past practice) in series with a capacitor to avoid shorting out bias voltages. With the transistors used in this receiver, the BASE is the signal input terminal (corresponding to signal grid of tubes), the COLLECTOR is the signal output terminal (corresponding to plate of tubes), and the EMITTER is the common terminal (corresponding to cathode of tubes).
- The output circuit used in this receiver is of the "Class B" type. "Class B" output circuits have seldom been used in home radios for the past several years. It should be noted that in "Class B" output the battery current increases greatly with increased signal input to the "Class B" tubes.
- Extreme care should be used to avoid accidental shorting of transistor elements to circuit ground. This is especially true of the output transistors; if the junction of R24-R25 should be accidentally grounded for a few seconds, the output transistors would be permanently damaged.
- With no signal input, the AGC source as measured at the top of the volume control, will be 3.9 volts negative in respect to ground. Rectified signal voltage will make this point LESS NEGATIVE in respect to chassis ground.
- Do not remove any transistor from its socket (or reinsert it) when the set is turned on.
- Oscillator performance can not be judged by measurement of a d-c voltage developed across a resistor. Measurement of oscillator signal strength with an a-c voltmeter at the emitter terminal of Q1 will give an indication of oscillator performance.
- Voltage measurements should be made only with a sensitive voltmeter, such as an RCA VoltOhmyst®.
- Interchanging transistors in the I-F stages may necessitate realignment.
- A transistor should always be removed from its socket before using a soldering iron on socket terminals.
- It is possible to damage a transistor when testing circuit continuity. Since a transistor needs only low voltage applied to its terminals for conduction, testing continuity of a circuit which includes a transistor can result in misleading continuity indications. To avoid transistor damage and misleading continuity indications, remove the transistor from its socket before making continuity tests of its circuit.

TOTAL BATTERY CURRENT	OUTPUT CURRENT	COLLECTOR CURRENTS WITH NO SIGNAL INPUT
25 MILLIWATTS... 33 MA	Q1..... 0.82 MA	Q1..... 0.82 MA
200 MILLIWATTS... 82 MA	Q2..... 11.5 MA	Q2..... 0.9 MA
	Q3..... 0.9 MA	Q3..... 0.9 MA
	Q4..... 1.1 MA	Q4..... 1.1 MA
	Q5..... 0.9 MA	Q5..... 0.9 MA
	Q6+Q7..... 5.2 MA	Q6+Q7..... 5.2 MA

# RCA VICTOR

Battery-Operated Table Radio

## MODEL 9-TX-2

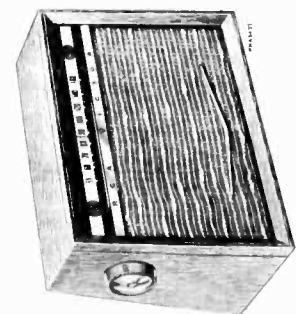
Chassis No. RC-1156C

### SERVICE DATA

— 1958 No. 8 —

PREPARED BY COMMERCIAL SERVICE  
RCA SERVICE COMPANY  
CAMDEN 8, N. J.

FOR  
RCA VICTOR RADIO AND "VICTROLA" DIVISION  
RADIO CORPORATION OF AMERICA



The "Starliner"  
Model 9-TX-2  
Mahogany, Oak, Birch or Walnut

SPECIFICATIONS	
<b>TUNING RANGE</b>	540-1600 kc
<b>INTERMEDIATE FREQUENCY</b>	455 kc
<b>TRANSISTOR COMPLEMENT</b>	Converter 1st I-F Amplifier 2nd I-F Amplifier Detector Audio Driver Push-pull Output Push-pull Output A crystal diode is used as overload limiter.
<b>LOUDSPEAKER</b>	Size and Type 4" x 6" PM Voice coil impedance 3.2 ohms at 400 cycles
<b>TUNING DRIVE RATIO</b>	6 1/2:1 (3 1/4 turns of knob)
<b>POWER OUTPUT</b>	Undistorted 200 milliwatts Maximum 300 milliwatts
<b>DIMENSIONS</b>	Height 7 1/2" Width 10 1/4" Depth 5 1/4" WEIGHT Approximately 8 pounds including batteries

**DESCRIPTION**

Model 9-TX-2 is a radio receiver using seven transistors instead of vacuum tubes. A superheterodyne circuit is used consisting of: converter, two stages of I-F amplification, detector, audio driver and push-pull class-B output. It was designed to operate on 4 1/2 volt battery power, supplied by an RCA Type No. VS 321 battery. This battery is housed inside the cabinet and has a useful life of approximately 1500 hours under normal operating conditions.

A ferrite rod antenna provides high signal pickup and excellent image rejection. The I-F transformers are of permeability tuned design for high gain and maximum stability. A permeability tuned oscillator coil is used to obtain close tracking throughout the entire tuning range. A 4" x 6" speaker is used to provide excellent tone quality. The output stage is temperature compensated by use of a "thermistor." This receiver features neutralized I-F stages and improved AGC system by use of the transistor detector. An AGC controlled germanium crystal diode is used to prevent large signal overload.

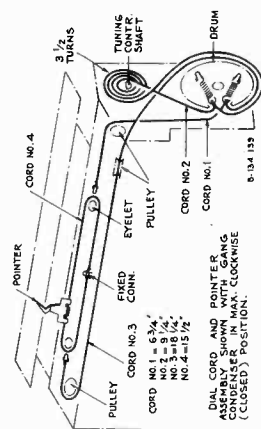
A conventional metal chassis is used and is housed in a table model cabinet available in four finishes.

9-TX-2

**Alignment Procedure**

**Output Indicator**—Connect an output meter across the voice coil and turn the receiver volume control to maximum.

**Test Oscillator**—For all alignment operations, connect the low side of the test oscillator to the receiver chassis and keep the oscillator output as low as possible to avoid AGC action.

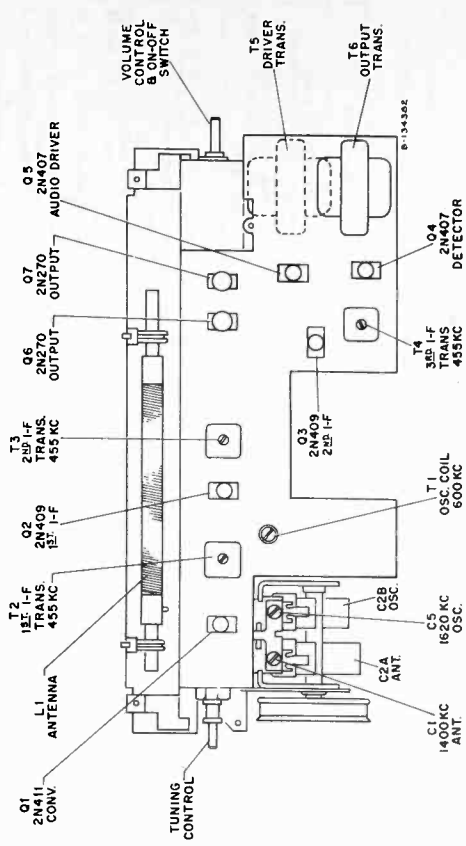


**Tuning Drive Cords**

Step	Connect High Side of Sig. Gen. to —	Sig. Gen. Output	Dial Pointer Setting	Adjust for Max Output
1	Connection lug of C1-A (front section of gang) in series with .005 micro	455 kc	Quiet point near 1600 kc	I.F. trimmer, T3, T4, T2
2		1620 kc	gang fully open	osc. trimmer CS (rear section of gang)
3	Short wire placed near antenna for radiated signal	1400 kc	1400 kc signal	ant. trimmer CI (front section of gang)
4		600 kc	600 kc signal (front gang)	osc. coil T1
5				Repeat steps 2, 3 and 4

**CRITICAL LEAD DRESS**

- Dress all bus and non-insulated pigtail leads away from chassis ground and other components to prevent shorts.
- Dress loop antenna leads direct and away from chassis, all other insulated leads down against chassis.
- Dress RT1 (thermistor) away from all other components.
- Maintain reasonably short pigtail leads on components associated with the detector circuit, to limit 910 kc "bleed."
- Insure good grounding of shield cover.
- Dress components which are enclosed in shielded compartment in such manner that short circuits are prevented.



Transistor, Major Component and Trimmer Locations

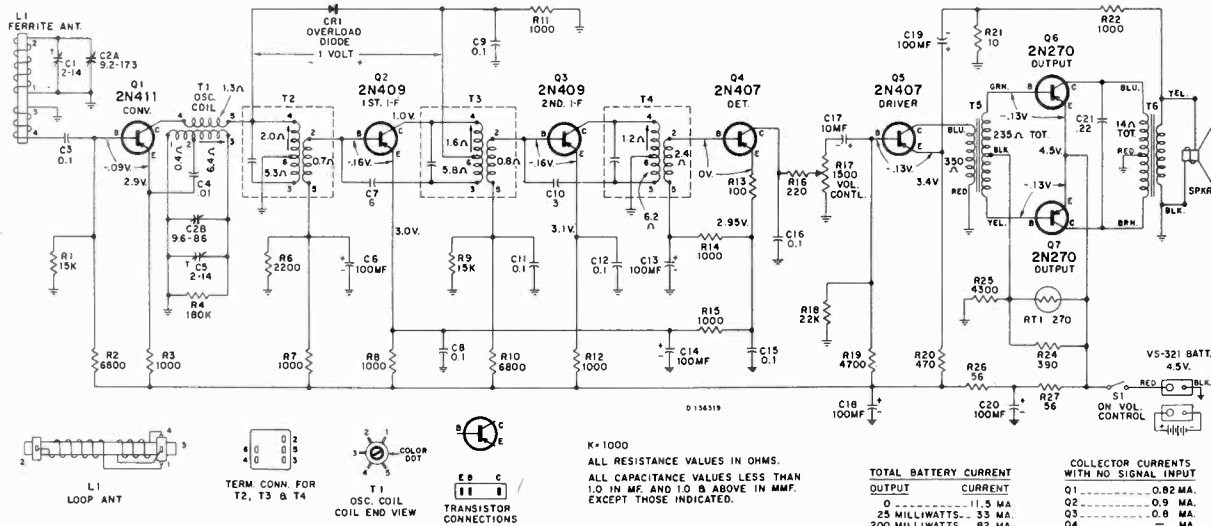


REPLACEMENT PARTS

SYMBOL NO.	SYMBOL NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
C1	C2A, C2B	Part of C2A, RC-1156C	T3	105905	Transformer—2nd I.F. transformer
C3		Capacitor—Variable tuning capacitor (includes C1 and C3)	T4	105906	Transformer—3rd I.F. transformer
C4		Capacitor—Fixed, paper, 0.1 mfd., ±20%, 200 v.	T5	105909	Transformer—Driver transformer
C5		Capacitor—Fixed, paper, 0.01 mfd., ±10%, 200 v.	T6	102630	Bushing—Metal bushing for station selector arm
C6		Capacitor—Fixed, electrolytic, 100 mfd., 10 v.		38776	Conector for battery cable
C7		Capacitor—Fixed, ceramic, 6.0 mfd., ±1.0 mfd., 500 v., Coef.-0.		72953	Cord—Dial drive cord (230 ft., see illustration for lengths required)
C8, C9		Same as C3		105977	Dial—Tuning control dial with coil-brations
C10		Capacitor—Fixed, ceramic, 3.0 mfd., ±1.0 mfd., 500 v., Coef.-0.		78097	Eyelet—Dial drive cord eyelet
C11, C12		Same as C3		100082	Grommet—Rubber grommet for mounting ferrite antenna rod (2 req'd)
C13, C14		Same as C3		101665	Nut—Speednut, retainer for dial (2 req'd)
C15, C16		Same as C3		79775	Nut—Speednut, retainer for antenna support (2 req'd)
C17		Capacitor—Fixed, electrolytic, 10 mfd., 10 v.		105986	Plate—Dial backplate assembly with Pulley—Dial pointer assembly
C18, C19		Same as C6		72602	Pulley—1/2" O.D. aluminum pulley for L.H. end of dial backplate
C20		Capacitor—Fixed, paper, 0.22 mfd., ±10%, 200 v.		101663	Pulley—1/2" O.D. aluminum pulley for R.H. end of dial backplate or for chassis
C21		Rectifier—Crystal diode rectifier (overload diode)		102629	Shaft—Station selector shaft
CRI		Antenna—Ferrite antenna assembly		101647	Socket—Transistor socket with retaining ring for Q1 thru Q7 incl.
L1		Resistor—Fixed, composition, 15,000 ohms, ±10%, 1/2 w.		72540	Spring—Dial cord tension spring (2 req'd)
R1		Resistor—Fixed, composition, 6800 ohms, ±10%, 1/2 w.		101649	Support—Polystyrene support for antenna assembly
R2		Resistor—Fixed, composition, 1000 ohms, ±10%, 1/2 w.		77585	Washer—C type retaining washer for station selector shaft
R3		Resistor—Fixed, composition, 180,000 ohms, ±10%, 1/2 w.		102634	SPEAKER ASSEMBLY
R4		Resistor—Fixed, composition, 2200 ohms, ±10%, 1/2 w.			Speaker—4" x 6" P.M. speaker complete with cone
R5		Same as R1			MISCELLANEOUS
R6		Same as R2		X3962	Back—Cabinet back cover (interchangeable only stocked for replacement)
R7, R8		Same as R3		X4338	Cabinet—Birch cabinet for Model 9TX2
R9		Same as R3		X4336	Cabinet—Mahogany cabinet for Model 9TX2
R10		Same as R3		X4339	Cabinet—Oak cabinet for Model 9TX2
R11, R12		Same as R3		X4337	Cabinet—Walnut cabinet for Model 9TX2
R13		Resistor—Fixed, composition, 100 ohms, ±10%, 1/2 w.		76412	Clip—"C" type clip for mounting chassis to cabinet (2 req'd)
R14, R15		Resistor—Fixed, composition, 220 ohms, ±10%, 1/2 w.		X3963	Cloth—Cabinet grille cloth
R16		Resistor—Fixed, composition, 470 ohms, ±10%, 1/2 w.		105978	Knob—Tuning control knob with spring for birch cabinet
R17		Control—Volume control (Includes S1)		105982	Knob—Tuning control knob with spring for mahogany cabinet
R18		Resistor—Fixed, composition, 100 ohms, ±10%, 1/2 w.		105980	Knob—Tuning control knob with spring for walnut end oak cabinets
R19		Resistor—Fixed, composition, 4700 ohms, ±10%, 1/2 w.		105979	Knob—Volume control knob with spring for birch cabinet
R20		Resistor—Fixed, composition, 470 ohms, ±10%, 1/2 w.		105983	Knob—Volume control knob with spring for mahogany cabinet
R21		Resistor—Fixed, composition, 10 ohms, ±10%, 1/2 w.		105981	Knob—Volume control knob with spring for walnut end oak cabinets
R22		Resistor—Fixed, composition, 390 ohms, ±10%, 1/2 w.		105976	Nameplate—"RCA Victor" nameplate for cabinet front
R24		Resistor—Fixed, composition, 4300 ohms, ±5%, 1/2 w.		104241	Ornament—"V" shaped ornament for cabinet front
R25		Resistor—Fixed, composition, 4300 ohms, ±5%, 1/2 w.		101089	Spring—Retaining spring for control dial
R26, R27		Resistor—Fixed, composition, 56 ohms, ±10%, 1/2 w.		105985	Window—Control dial window
R28		Resistor—Temperature compensated resistor (Thermistor) 270 ohms, at 77°F., 387 ohms, at 167°F.			
RT1		Switch—On-off switch—part of R17—stock #105894			
S1		Coil—Oscillator coil complete with ferrite core			
T1		Transformer—at I.F. transformer			
T2		Transformer—at I.F. transformer			

APPLY TO YOUR RCA DISTRIBUTOR FOR PRICES OF REPLACEMENT PARTS

3-TX-2



VOLTAGES MEASURED TO CHASSIS GROUND EXCEPT AS INDICATED, AND SHOULD HOLD WITHIN ±20% WITH NEW BATTERIES.

Schematic Circuit Diagram

SERVICE HINTS

- The first thing to check when the receiver is inoperative, is the battery. With the receiver turned on, a new battery should test 4½ volts although the receiver can be expected to operate with a battery which tests 3 volts or more.
- To check for a circuit defect which would cause excessive battery drain, an overall current measurement and supplementary voltage measurements should be made. For reasons explained below, continuity measurements can be misleading.
- Signal tracing by injection of a signal from a signal generator is done on transistor radios in exactly the same manner as has been done for many years with the conventional vacuum tube radios. The signal generator should be connected (as in past practice) in series with a capacitor to avoid shorting out bias voltages. With the transistors used in this receiver, the BASE is the signal input terminal (corresponding to signal grid of tubes), the COLLECTOR is the signal output terminal (corresponding to plate of tubes), and the EMITTER is the common terminal (corresponding to cathode of tubes).
- The output circuit used in this receiver is of the "Class B" type. "Class B" output circuits have been seldom used in home radios for the past several years. It should be noted that in "Class B" output the battery current increases greatly with increased signal input to the "Class B" tubes.
- Extreme care should be used to avoid accidental shorting of transistor elements to circuit ground. This is especially true of the output transistors; if the junction of R24-R25 should be accidentally grounded for a few seconds, the output transistors would be permanently damaged.
- A one-volt reverse bias is applied to CRI (overload diode) under conditions of no signal input; this bias prevents it from conducting. The reverse bias is the voltage drop across R11 and it decreases with signal increase. The overload diode will thereby conduct on strong signals.
- Do not remove any transistor from its socket (or reinsert it) when the set is turned on.
- Oscillator performance can not be judged by measurement of a d-c voltage developed across a resistor. Measurement of oscillator signal strength with an a-c voltmeter at the emitter terminal of Q1 will give an indication of oscillator performance.
- Voltage measurements should be made only with a sensitive voltmeter, such as an RCA VoltOhmyst®.
- Interchanging transistors in the I-F stages may necessitate realignment.
- A transistor should always be removed from its socket before using a soldering iron on socket terminals.
- It is possible to damage a transistor when testing circuit continuity. Since a transistor needs only low voltage applied to its terminals for conduction, testing continuity of a circuit which includes a transistor can result in misleading continuity indications. To avoid transistor damage and misleading continuity indications, remove the transistor from its socket before making continuity tests of its circuit.



# RCA VICTOR

Transistorized Personal Radio

## MODEL 1-BT-2 SERIES

Chassis No. RC-1187

Battery Charger  
**MODEL BC-3** MODEL BCS-4  
 Battery Charger/Speaker

## SERVICE DATA

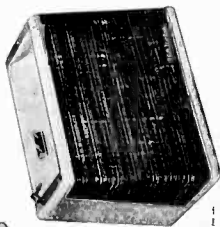
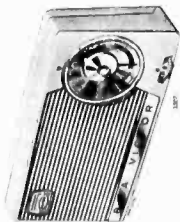
— 1958 No. 9 —

PREPARED BY COMMERCIAL SERVICE  
 RCA SERVICE COMPANY  
 A DIVISION OF

**RADIO CORPORATION OF AMERICA**  
 CAMDEN 8, N. J.

1-BT-2 Series  
 The "Transistor Super"

Model 1-BT-21  
 Antique White  
 Model 1-BT-24  
 Green and White  
 Model 1-BT-29  
 Two-Tone Blue



Model BC-3

The "Deluxe Transistor Charger"



Model BCS-4

The "Transistor Super"

### SPECIFICATIONS

<b>TUNING RANGE</b>	540-1,600 kc	<b>LOUDSPEAKER</b>	1-BT-2 Series
<b>INTERMEDIATE FREQUENCY</b>	£ 455 kc	Size and type	2 1/4" P.M.
<b>TRANSISTOR COMPLEMENT</b>		Voice coil impedance	12 ohms
(1) RCA 2N412	Converter	Provision is made for connection of a low impedance earphone or external speaker if desired.	
(2) RCA 2N410	1st I-F Amp.		
(3) RCA 2N410	2nd I-F Amp.		
(4) RCA 2N408	Audio Driver		
(5) RCA 2N408	Push-pull Output		
(6) RCA 2N408	Push-pull Output		
A crystal diode is used as 2nd detector.		Size and type	Model BCS-4
A crystal diode is used as overload diode.		Voice coil impedance	12 ohms
<b>BATTERY</b>		<b>TUNING DRIVE RATIO</b>	1:1 (direct drive)
Four RCA type No. VS-034 (penlite)	1 1/2 volts each	<b>AUDIO POWER OUTPUT</b>	
Current consumption (with no signal)	Approx. 8 ma	Undistorted	85 milliwatts
Useful life (intermittent service)	Approx. 22 hours	Maximum	110 milliwatts
RCA RCB-2 (rechargeable) or RCA RC-2 (intermittent service)	4.8 volts	<b>DIMENSIONS</b>	
Use per-charge (intermittent service)	Approx. 25 hours	1-BT-2:	Height 3 1/2" Width 7 1/2" Depth 1 1/4"
<b>POWER SUPPLY RATING (Model BC-3 or BCS-4)</b>		BC-3:	Height 3 1/2" Width 5 3/4" Depth 4"
115 volts	60 cycles	BCS-4:	Height 6 1/2" Width 9" Depth 5 3/4"
		<b>WEIGHT (Model 1-BT-2)</b>	
		Approximately 1 1/2 pounds including batteries.	

### DESCRIPTION

The "1-BT-2 Series" are radio receivers having six transistors and two crystal diodes. The superheterodyne circuit consists of converter, detector, 1st I-F amplifier, 2nd I-F amplifier, audio driver and push-pull Class B output. A 2 1/4" wide speaker is used for normal listening; a lack for earphone or external speaker connection is also provided.

The receiver is powered by either four "penlite" cells, or a rechargeable battery RCA Type RCB-2. A removable section at the rear of the case provides access to the batteries. Four "penlite" dry batteries provide approximately 22 hours intermittent service. The rechargeable battery provides approximately 25 hours intermittent service from one overnight charge. The RCA Battery Charger Model BC-3 or BCS-4 is socketed at the back of the case and is used to connect the radio to either of the two charger units.

A printed circuit type of chassis is used to obtain light weight and compact size. The complete receiver, including batteries weighs approximately 1 1/2 pounds. The "Impac" case combines durability with smart appearance.

### 1-BT-2 Series

#### IMPORTANT

THE PROCEDURE TO BE USED IN SERVICING TRANSISTOR RADIOS IS VERY MUCH THE SAME AS USED WITH VACUUM TUBE RADIOS ALTHOUGH CERTAIN PRECAUTIONS MUST BE OBSERVED. THE SERVICE HINTS GIVEN ON PAGE 3 SHOULD BE CAREFULLY READ BEFORE ATTEMPTING TO SERVICE THIS RADIO RECEIVER.

#### ALIGNMENT PROCEDURE

Test Oscillator—For all alignment operations, connect the low side of the test oscillator to the "common negative" wiring and keep the oscillator output as low as possible to avoid A.G.C. action.

Step	Connect High Side of Sig. Gen. to —	Sig. Gen. Output	Dial Pointer Setting	Adjust for Max. Output
1	# 2 terminal of ant. assembly L1	455 kc	Quiet point 1600 kc	T4 3rd I-F point T3 2nd I-F T2 1st I-F
2			Repeat Step 1	
3		1620 kc	Gang fully open	osc. trimmer C20
4	Short wire placed near antenna for radiated signal	1400 kc	1400 kc	ant. trimmer C19
5		600 kc	600 kc	osc. coil T1
6			Repeat Steps 3, 4 and 5	

### BATTERIES

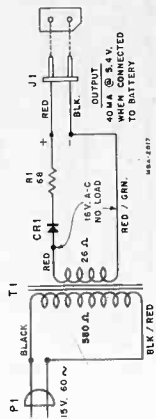
Rechargeable cells are designed to be used either with four replaceable cells of "penlite" cells or with a single rechargeable battery (Type RCB-2).

When four replaceable cells are used, they are first placed in a plastic carrying case with batteries is then placed in a battery compartment at the back of the radio. This compartment has a removable cover which is held in place by a sliding clip. The "penlite" cells may be either the regular dry cell batteries (RCA VS-034) or mercury cells (RCA VS-313).

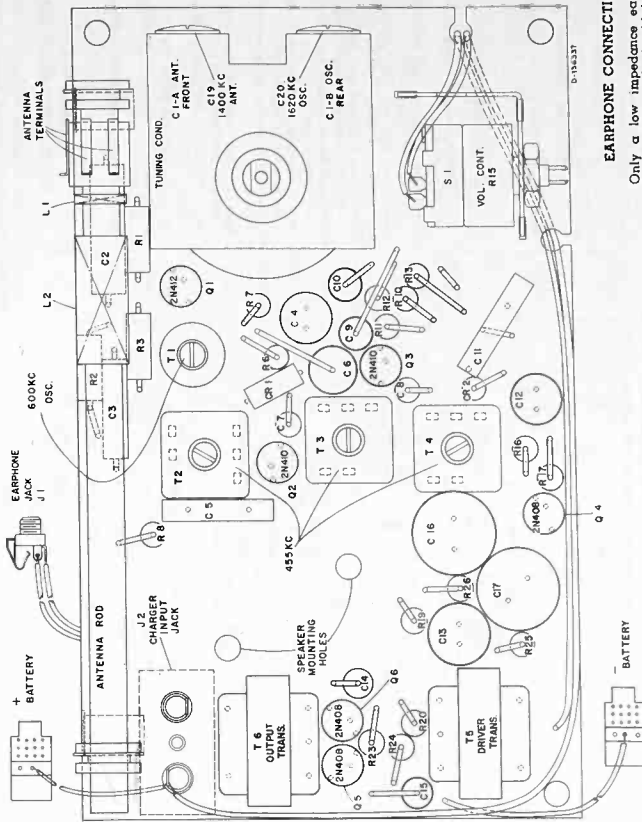
The rechargeable battery (Type RCB-2) is intended to be used in conjunction with RCA Battery Charger Model BC-3 or BCS-4. An alignment charging (12 hours) should provide approximately 25 hours service.

### CRITICAL LEAD DRESS

1. Dress leads at volume control away from gang and towards volume control mounting bracket.
2. Dress C10 so as to clear rotor plates of gang condenser.



Schematic Diagram of Battery Charger Unit



Circuit Board Assembly

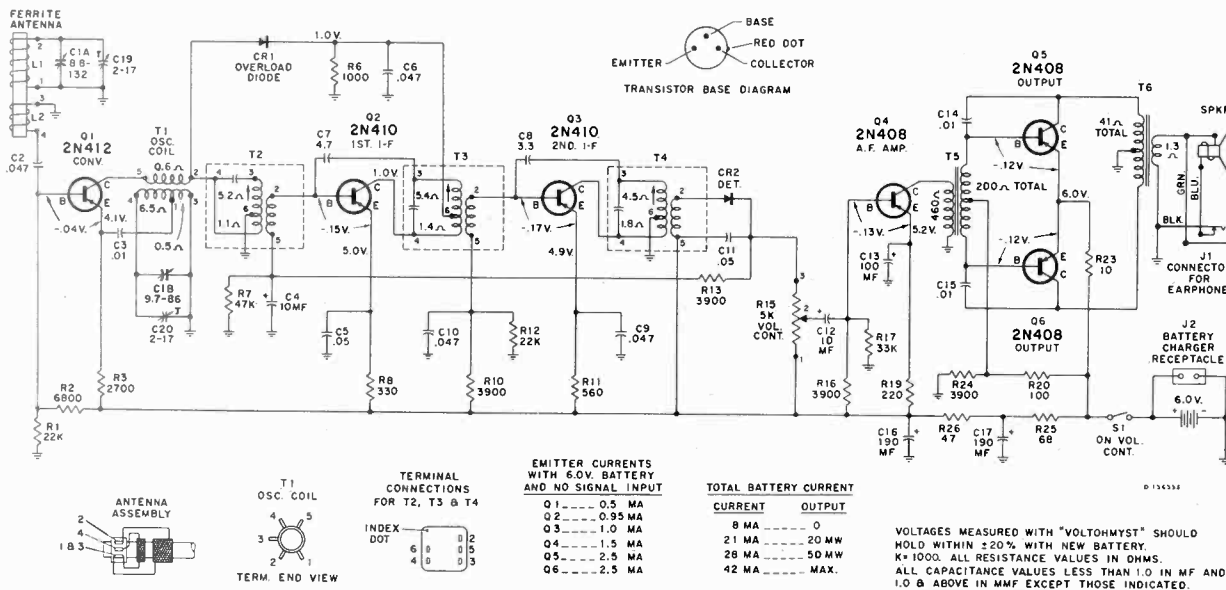
### EARPHONE CONNECTION

Only a low impedance earphone (under 50 ohms) should be connected into the earphone jack. RCA accessory earphone Number RK-219 is recommended.

REPLACEMENT PARTS

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
<b>CHASSIS ASSEMBLY RC-1187</b>					
<b>CAPACITORS</b>					
C1A, C1B	106404	Variable tuning capacitor with trimmers C19 and C20		106400	<b>SPEAKER ASSEMBLY</b> Speaker—2 1/4" P.M. speaker complete with cone
C2	106500	Fixed, plastic film, 0.047 mf., ±20%, 50 v.		106412	<b>MISCELLANEOUS</b> Case—Battery case for "penlite" cells — LESS battery contact
C3	106501	Fixed, plastic film, 0.01 mf., ±20%, 50 v.		Y7020	Case—Case front and case back—"Impac" —white— for Model 1B721
C4	103382	Electrolytic, 10 mf., 10 v.		Y7021	Case—Case front and case back—"Impac" —white— for Model 1B724
C5	105715	Fixed, ceramic, 0.05 mf., ±100%, —20%		Y7022	Case—Case front and case back—"Impac" —white and green— for Model 1B724
C6	106500	Fixed, plastic film, 0.047 mf., ±20%, 50 v.		106413	Case—Case front and case back—"Impac" —white— for Model 1B729
C7	102235	Fixed, beaded lead, 4.7 mf., ±10%, 300 v.		106423	Contact—Battery contacts for inside of battery case (1 set)
C8	71503	Fixed, plastic film, 0.047 mf., ±20%, 50 v.		106409	Door—Case battery door—white only carried in stock for replacement
C9, C10	106500	Fixed, plastic film, 0.047 mf., ±20%, 50 v.		106410	Knob—Tuning control knob with retaining screw
C11	103380	Fixed, ceramic, 0.05 mf., ±20%, 100 v.		106411	Knob—Volume control knob—white — for Models 1B721 and 1B724
C12	103382	Electrolytic, 10 mf., 10 v.		106408	Knob—Volume control knob — blue — for Model 1B729
C13	106442	Electrolytic, 10 mf., 10 v.		106407	Motif—"Transicharg Super" Motif Nameplate—"RCA Victor" nameplate for case front
C14, C15	106501	Fixed, plastic film, 0.01 mf., ±20%, 50 v.		106414	Screw—Tuning control knob retaining screw
C16, C17	106443	Fixed, plastic film, 0.01 mf., ±20%, 50 v.			
C18, C20	106404	Part of CIA, C1B			
CR1, CR2	101613	RECTIFIER—Crystal diode rectifier			
J1	106503	JACK—Earphone jack			
J2	106401	CONNECTOR—2 contact female connector for auxiliary charger unit			
L1, L2	106403	ANTENNA—Ferrite antenna rod			
<b>RESISTORS</b>					
R1	502322	Fixed, composition, 22,000 ohms, ±10%		106340	<b>MODEL BC-3</b> Rectifier—Selenium rectifier
R2	502268	Fixed, composition, 6800 ohms, ±10%		106345	Connector—2-contact male connector for output cable
R3	502227	Fixed, composition, 2700 ohms, ±10%		70392	Cable—AC power cable and plug
R6	502210	Fixed, composition, 1000 ohms, ±10%		502058	Resistor—Fixed, composition, 68 ohms, 10%, 1/2 w.
R7	502347	Fixed, composition, 47,000 ohms, ±10%		106341	Transformer—Power transformer, 117 v. 60 cycle input
R8	502133	Fixed, composition, 330 ohms, ±10%		Y7016	Cabinet—Plastic cabinet—white
R10	502239	Fixed, composition, 3900 ohms, ±10%		106339	Cover—Phenolic bottom cover for cabinet
R11	502156	Fixed, composition, 360 ohms, ±10%		106342	Stud—Retaining stud for male connector (1)
R12	502322	Fixed, composition, 22,000 ohms, ±10%			
R13	502239	Fixed, composition, 3900 ohms, ±10%			
R15	106402	Volume control with "on-off" switch (S1 included)			
R16	502239	Fixed, composition, 3900 ohms, ±10%			
R17	502333	Fixed, composition, 33,000 ohms, ±10%			
R19	502122	Fixed, composition, 220 ohms, ±10%			
R20	502110	Fixed, composition, 100 ohms, ±10%			
R23	502010	Fixed, composition, 10 ohms, ±10%, 1/2 w.			
R24	502239	Fixed, composition, 3900 ohms, ±10%			
R25	502068	Fixed, composition, 68 ohms, ±20%, 1/2 w.			
R26	502047	Fixed, composition, 47 ohms, ±10%, 1/2 w.			
S1	105726	Part of R15			
T1	105723	Coll. Oscillator coil			
T2	105724	Transformer—2nd IF transformer			
T3	105724	Transformer—3rd IF transformer			
T4	105725	Transformer—Driver transformer			
T5	106406	Transformer—Output transformer			
T6	106430	Circuit—Printed chassis assembly — LESS antenna, brackets and grommets, speaker and spacer, tuning capacitor, transistors, volume control and bracket, earphone jack and misc. hardware			
	101621	Grommet—Rubber grommet for mounting ferrite antenna rod (2 req'd)			
	103402	Nut—Hex nut (0.230"-32) special — for mounting volume control			

APPLY TO YOUR RCA DISTRIBUTOR FOR PRICES OF REPLACEMENT PARTS



Schematic Diagram

SERVICE HINTS

Extreme care should be used to avoid accidental shorting of transistor elements to circuit ground. This is especially true of the output transistors; if the junction of R20-R24 should be accidentally grounded for a few seconds, the output transistors would be permanently damaged.

It is possible to damage a transistor when testing circuit continuity. Since a transistor needs only low voltage applied to its terminals for conduction, testing continuity of a circuit which includes a transistor can result in misleading continuity indications. To avoid transistor damage and misleading continuity indications, remove the transistor from the chassis before making continuity tests of its circuit.

- When the receiver is inoperative, the first thing to do is check the batteries. The voltage at the two battery lead terminals, with the receiver turned on, should be approximately 6 volts with new dry batteries. The receiver can be expected to operate if the total battery voltage checks between 3.6 volts and 6 volts with the proper polarity. Check to make sure that every cell is inserted in the right direction (top up/down).
- To check for a circuit defect which would cause excessive battery drain, an overall current measurement and supplementary voltage measurements should be made. For reasons explained above, continuity measurements can be misleading.

- Signal tracing by injection of a signal from a signal generator is done on transistor radios in exactly the same manner as with the conventional vacuum tube radios. The signal generator should be connected (as in past practice) in series with a capacitor to avoid shorting out bias voltages. With the transistors used in this receiver, the BASE is the signal input terminal (corresponding to signal grid of tubes), the COLLECTOR is the signal output terminal (corresponding to plate of tubes), and the EMITTER is the common terminal (corresponding to cathode of tubes).
- The output of this receiver is of the "Class B" type. It should be noted that in "Class B" output the battery current increases noticeably with increased signal input. See current specifications on schematic diagram.
- Transistors and the printed circuit board can be damaged by excessive heat. Whenever soldering is necessary on the printed circuit board, use a soldering iron which is both HOT AND CLEAN. This minimizes the amount of heat which will be radiated from the point of soldering.
- Oscillator injection voltage can be measured at the emitter terminal of Q1 with the use of an oscilloscope or RF type of VTVM. The injection voltage should be approximately 0.12 volts r.m.s. (0.34 v. peak to peak) in the middle of the tuning range (near 1000 kc).
- D-c voltage measurements should be made only with a sensitive voltmeter, such as an RCA VoltOhmyst®.
- Interchanging transistors in the I-F stages may necessitate realignment.

1-BT-2 Series

# RCA VICTOR

Transistorized Personal Radio

**MODEL 1-BT-3 Series**

Chassis No. RC-1187A

**Battery Charger Battery Charger/Speaker**

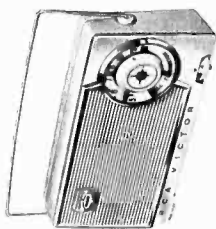
**MODEL BC-3 MODEL BCS-4**

## SERVICE DATA

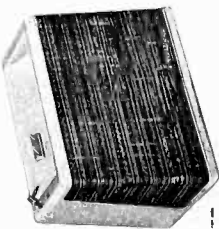
— 1958 No. 10 —

PREPARED BY COMMERCIAL SERVICE  
RCA SERVICE COMPANY

A DIVISION OF  
**RADIO CORPORATION OF AMERICA**  
CAMDEN 8, N. J.



Model BCS-4  
The "Deluxe Transcharger"



Model BC-3  
The "Transcharger"

- 1-BT-3 Series
- The "Transistorized Deluxe"
- Model 1-BT-32
- Pink and White
- Model 1-BT-34
- Green and White
- Model 1-BT-36
- Black and White

**1-BT-3 Series**

**IMPORTANT**

THE PROCEDURE TO BE USED IN SERVICING TRANSISTOR RADIOS IS VERY MUCH THE SAME AS USED WITH VACUUM TUBE RADIOS ALTHOUGH CERTAIN PRECAUTIONS MUST BE OBSERVED. THE SERVICE HINTS GIVEN ON PAGE 3 SHOULD BE CAREFULLY READ BEFORE ATTEMPTING TO SERVICE THIS RADIO RECEIVER.

**ALIGNMENT PROCEDURE**

**Test Oscillator.** For all alignment operations, connect the low side of the test oscillator to the "common negative" wiring and keep the oscillator output as low as possible to avoid AGC action.

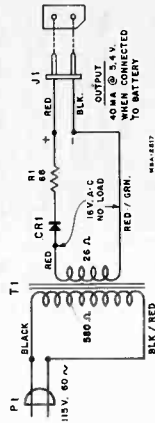
Step	Connect High Side of Sig. Gen. to —	Sig. Gen. Output	Dial Pointer Setting	Adjust for Max. Output
1	#2 terminal of ant. assembly L1	455 kc	Quiet point near 1600 kc	T4 3rd LF T2 2nd LF T2 1st LF
2		Repeat Step 1		
3		1620 kc	Gang fully open	osc. trimmer C20
4	Short wire placed near antenna for received signal	1400 kc	1400 kc	ant. trimmer C19
5		600 kc	600 kc rock gang	T1
6		Repeat Steps 3, 4 and 5		osc. coil

**BATTERIES**

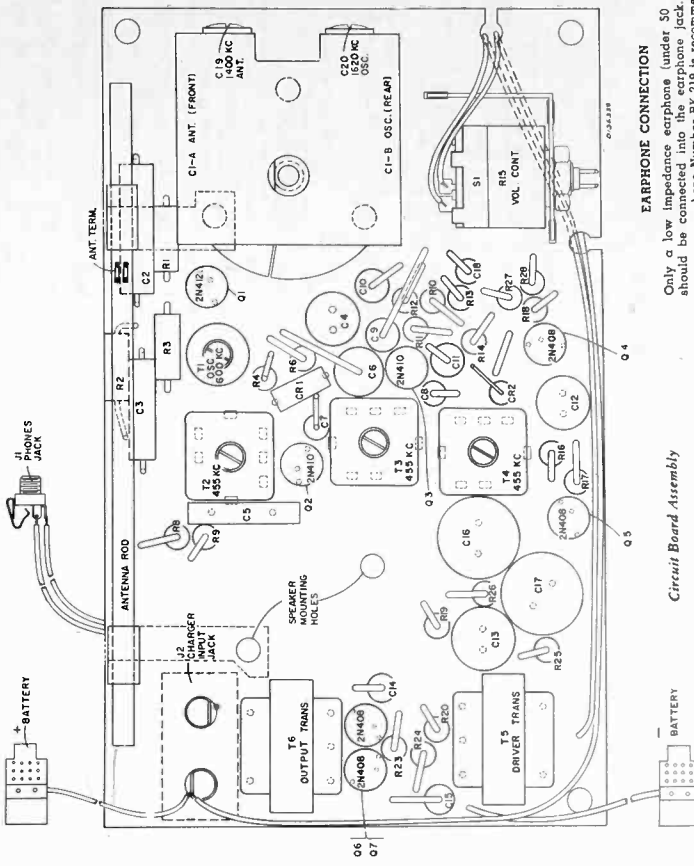
Radios of the 1-BT-3 Series are designed to be used either with four replaceable "penlite" size or with a single rechargeable battery (Type RC-2).  
When four replaceable cells are used, they are first placed in a plastic case. The plastic case with batteries is then placed in the battery compartment at the back of the radio. This compartment has a removable cover which is held in place by a sliding clip.  
The "penlite" cells may be either the regular dry cell batteries (RCA VS 034) or mercury cells (RCA VS RC-2). It is intended to be used in conjunction with RCA Battery Charger Models BC-3 or BCS-4. An over-charging (12 hours) should provide approximately 25 hours service.

**CRITICAL LEAD DRESS**

1. Dress leads at volume control away from gang and towards volume control mounting bracket.
2. Dress C10 so as to clear rotor plates of gang condensers.



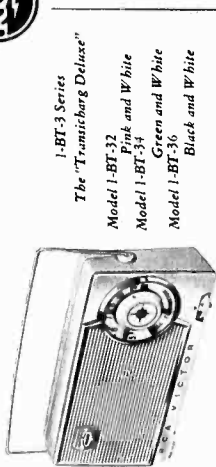
Schematic Diagram of Battery Charger Unit



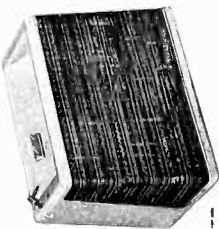
Earphone Connection

Only a low impedance earphone (under 50 ohms) should be connected to the earphone jack. RCA accessory earphone Number RK-219 is recommended.

Circuit Board Assembly



Model BCS-4  
The "Deluxe Transcharger"



Model BC-3  
The "Transcharger"

**SPECIFICATIONS**

- TUNING RANGE** ..... 540-1,600 kc
- INTERMEDIATE FREQUENCY** ..... 455 kc
- TRANSISTOR COMPLEMENT**
  - (1) RCA 2N412 ..... Converter
  - (2) RCA 2N410 ..... 1st LF Amp.
  - (3) RCA 2N410 ..... 2nd LF Amp.
  - (4) RCA 2N408 ..... A. F. Amplifier
  - (5) RCA 2N408 ..... Audio Driver
  - (6) RCA 2N408 ..... Push-pull Output
  - (7) RCA 2N408 ..... Push-pull Output
- A crystal diode is used as 2nd detector.
- A crystal diode is used as overload diode.
- BATTERY**
  - Four RCA Type No. VS-034 (penlite) ..... 1 1/2 volts each
  - Current consumption (with no signal) ..... Approx. 9 ma
  - Useful life (intermittent service) ..... Approx. 22 hours
  - RCA RC-2 (rechargeable) ..... 4.8 volts
  - Use per charge (intermittent service) ..... Approx. 25 hours
- LOUDSPEAKER**
  - 1-BT-3 Series ..... 2 3/4" P.M.
  - Size and type ..... 12 ohms
  - Voice coil impedance ..... Provision is made for connection of a low impedance earphone or external speaker if desired.
  - Model BCS-4 ..... 4" P.M.
  - Size and type ..... 12 ohms
  - Voice coil impedance ..... 60 cycles
  - POWER SUPPLY RATING (Model BC-3 or BCS-4) ..... 6:1 (3 turns of knob)
  - TUNING DRIVE RATIO ..... .85 milliwatts
  - Undistorted ..... 110 milliwatts
  - Maximum
  - DIMENSIONS**
    - 1-BT-3: Height ..... 3 1/2" Width ..... 7 1/4" Depth ..... 1 3/4"
    - BC-3: Height ..... 3 1/2" Width ..... 5 1/4" Depth ..... 4"
    - BCS-4: Height ..... 6 1/2" Width ..... 9" Depth ..... 5 3/4"
  - WEIGHT (Model 1-BT-3)** ..... Approximately 1 1/2 pounds including batteries.

**DESCRIPTION**

Models BC-3 and BCS-4 are battery charger units intended for use with radios of the 1-BT-3 Series. Model BC-3 is a battery charger only whereas Model BCS-4 is a combination of battery charger and external 4 inch speaker.

The receiver is powered by either four "penlite cells" or a rechargeable battery RCA Type RC-2. A removable section at the rear of the case provides access to the batteries. Four "penlite" dry batteries provide approximately 22 hours intermittent service. The rechargeable battery provides approximately 25 hours intermittent service from one overnight charge from RCA battery charger units Model BC-3 or BCS-4. A socket at the back of the case is used to connect the radio to either of the two charger units.

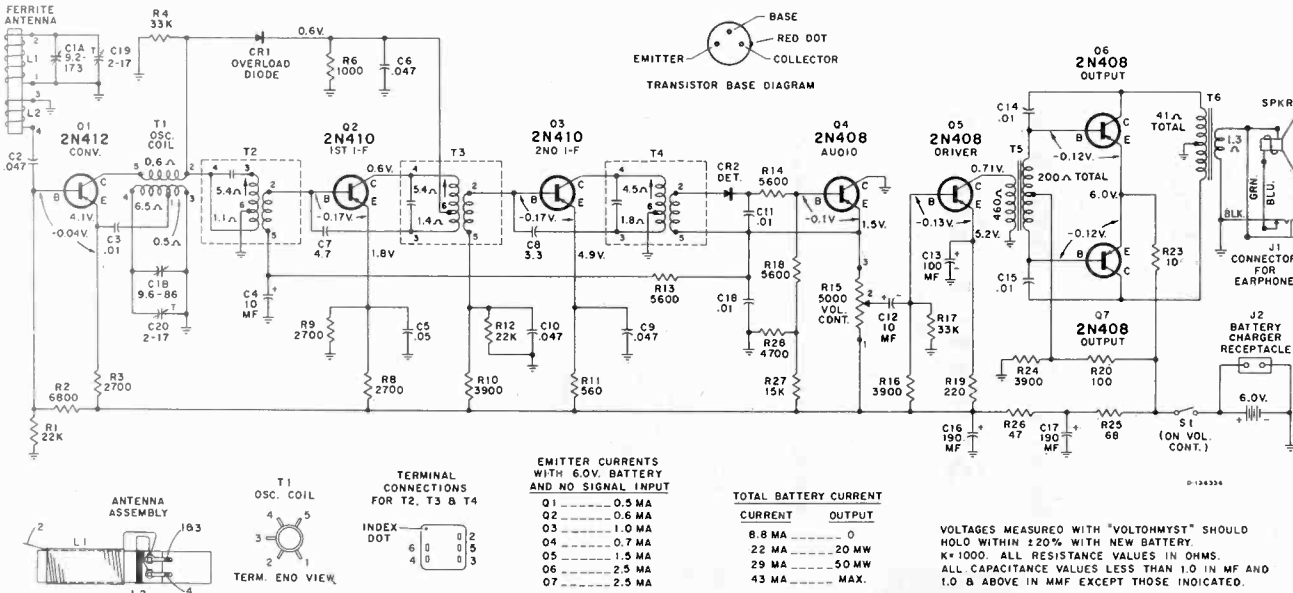
A pinned circuit type of chassis is used to obtain light weight and compact size. The complete receiver including batteries weighs approximately 1 1/2 pounds. The "Impac" case with metal handle combines durability with smart appearance.

1-BT-3 Series

REPLACEMENT PARTS

SYMBOL NO.	NO. STOCK	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
C1A, C1B	106415	Variable tuning capacitor with trimmers C19 and C20	TS	106406	Transformer—Driver transformer
C2	106500	Fixed, plastic film, 0.047 mfd., ±20%, 50 v.	T6	106405	Transformer—Output transformer
C3	106501	Fixed, plastic film, 0.01 mfd., ±20%, 50 v.		106163	Bracket—Antenna mg. (1 pair)
C4	106502	Fixed, plastic film, 0.01 mfd., ±20%, 50 v.		106431	Circuit—Printed chassis assembly—less antenna brackets and grommets, speaker, volume control, capacitor, ear-phones jack and mike hardware
C5	103715	Fixed, ceramic, 0.05 mfd., +100%, -20%			Nut—Hex nut 0.250" 32 special—for mounting volume control
C6	106500	Fixed, plastic film, 0.047 mfd., ±20%, 50 v.			<b>SPEAKER ASSEMBLY</b>
C7	102245	Fixed, headed lead, 4.7 mmf., ±10%, 500 v.		106400	Speaker—2 1/4" PM speaker, complete with cone
C8	71503	Fixed, headed lead, 3.3 mmf., ±10%, 500 v.			<b>MISCELLANEOUS</b>
C9, C10	106500	Fixed, plastic film, 0.047 mfd., ±20%, 50 v.		106412	Case—Battery case for "penlite" cells—less battery contacts
C11	106501	Fixed, plastic film, 0.01 mfd., ±20%, 50 v.		Y7017	Case—Case front and case back—"Impac"—white and pink—for Model 1B732
C12	103382	Electrolytic, 10 mfd., 10 v.		Y7018	Case—Case front and case back—"Impac"—white and green—for Model 1B734
C13	106442	Fixed, plastic film, 0.01 mfd., ±20%, 50 v.		Y7019	Case—White and white—for Model 1B734
C14, C15	106501	Fixed, plastic film, 0.01 mfd., ±20%, 50 v.		106413	Contact—Battery contacts for inside of battery case (1 set)
C16, C17	106433	Fixed, plastic film, 0.01 mfd., ±20%, 50 v.		106423	Door—Case battery door—white only carried in stock for replacement
C18, C19	106501	Fixed, plastic film, 0.01 mfd., ±20%, 50 v.		106419	Escutcheon—Case front escutcheon
C20	106501	Fixed, plastic film, 0.01 mfd., ±20%, 50 v.		106422	Handle—Carrying handle
CR1, CR2	101615	Rectifier—Crystal diode rectifier		106417	Knob—Tuning indicator control knob with spring
J1	106801	Locking one jack female connector for battery charger unit		106421	Knob—Verner tuning control knob, gray—for Model 1B736
J2	106764	Antenna—Ferrite antenna, less brackets		106420	Knob—Verner tuning control knob, white for Model 1B732, 1B734
L1, L2	502322	RESISTORS		106418	Knob—Volume control knob—gray—for Model 1B736
R1	502268	Fixed, composition, 22,000 ohms, ±10%, 1/2 w.		106410	Knob—Volume control knob—white—for Models 1B732 and 1B734
R2	502268	Fixed, composition, 6800 ohms, ±10%, 1/2 w.		106416	Mold—Transicharg Deluxe mold
R3	502227	Fixed, composition, 2700 ohms, ±10%, 1/2 w.		101069	Spring—Retaining spring for tuning indicator knob
R4	502333	Fixed, composition, 33,000 ohms, ±10%, 1/2 w.			<b>MODEL BC3</b>
R6	502210	Fixed, composition, 1000 ohms, ±10%, 1/2 w.			<b>BATTERY RECHARGER UNIT</b>
R8, R9	502227	Fixed, composition, 2700 ohms, ±10%, 1/2 w.		106340	Rectifier—Selenium rectifier
R10	502239	Fixed, composition, 3900 ohms, ±10%, 1/2 w.		106345	Connector—2-contact male connector for output cable
R11	502156	Fixed, composition, 560 ohms, ±10%, 1/2 w.		70392	Cable—AC power cable and plug
R12	502322	Fixed, composition, 22,000 ohms, ±10%, 1/2 w.		502068	Resistor—Fixed composition, 68 ohms, ±10%, 1/2 w.
R13, R14	502256	Fixed, composition, 5600 ohms, ±10%, 1/2 w.		106341	Transformer—Power transformer, 117 v., 60 cycle input
R15	106402	Volume control with "on-off" switch—includes S1		Y7016	Cover—Plastic cabinet, white
R16	502239	Fixed, composition, 3900 ohms, ±10%, 1/2 w.		106339	Cover—Phenolic bottom cover for cabinet
R17	502333	Fixed, composition, 33,000 ohms, ±10%, 1/2 w.		106342	Stud—Retaining stud for male connector (1)
R18	502256	Fixed, composition, 5600 ohms, ±10%, 1/2 w.			<b>MODEL BC4</b>
R19	502122	Fixed, composition, 220 ohms, ±10%, 1/2 w.			<b>BATTERY RECHARGER SPEAKER</b>
R20	502110	Fixed, composition, 100 ohms, ±10%, 1/2 w.		106340	Rectifier—Selenium rectifier
R22	502010	Fixed, composition, 10 ohms, ±10%, 1/2 w.		106345	Connector—2-contact male connector—charger output
R24	502239	Fixed, composition, 3900 ohms, ±10%, 1/2 w.		70392	Cable—AC power input cable with plug
R25	502068	Fixed, composition, 68 ohms, ±20%, 1/2 w.		502068	Resistor—Fixed composition, 68 ohms, ±10%, 1/2 w.
R26	502047	Fixed, composition, 47 ohms, ±20%, 1/2 w.		106341	Transformer—Power transformer, 115 v., 60 cycle input
R27	502315	Fixed, composition, 15,000 ohms, ±5%, 1/2 w.		106341	Transformer—Power transformer, 115 v., 60 cycle input
R28	502247	Fixed, composition, 4700 ohms, ±5%, 1/2 w.		106339	Cable—Plug and cable for speaker
S1	105726	Part of R15		106502	Cable—White polyethylene foot for cabinet (not cabinet bottom cover)
T2	105723	Coil—Oscillator coil		104836	Nameplate—"RCA Victor" nameplate
T3	105724	Transformer—1st IF transformer		106545	Speaker—4" PM speaker complete with cone
T4	105725	Transformer—3rd IF transformer		106342	Stud—Retaining stud for male connector (1)

APPLY TO YOUR RCA DISTRIBUTOR FOR PRICES OF REPLACEMENT PARTS



SERVICE HINTS

Extreme care should be used to avoid accidental shorting of transistor elements to circuit ground. This is especially true of the output transistors; if the junction of R20-R24 should be accidentally grounded for a few seconds, the output transistors would be permanently damaged.

It is possible to damage a transistor when testing circuit continuity. Since a transistor needs only low voltage applied to its terminals for conduction, testing continuity of a circuit which includes a transistor can result in misleading continuity indications. To avoid transistor damage and misleading continuity indications, remove the transistor from the chassis before making continuity tests of its circuit.

- When the receiver is inoperative, the first thing to do is check the batteries. The voltage at the two battery lead terminals, with the receiver turned on, should be approximately 6 volts with new dry batteries. The receiver can be expected to operate if the total battery voltage checks between 3.6 volts and 6 volts with the proper polarity. Check to make sure that every cell is inserted in the right direction (top upward).
- To check for a circuit defect which would cause excessive battery drain, an overall current measurement and supplementary voltage measurements should be made. For reasons explained above, continuity measurements can be misleading.

- Signal tracing by injection of a signal from a signal generator is done on transistor radios in exactly the same manner as with the conventional vacuum tube radios. The signal generator should be connected (as in past practice) in series with a capacitor to avoid shorting out bias voltages. With the transistors used in this receiver, the BASE is the signal input terminal (corresponding to signal grid of tubes), the COLLECTOR is the signal output terminal (corresponding to plate of tubes), and the EMITTER is the common terminal (corresponding to cathode of tubes).
- The output of this receiver is of the "Class B" type. It should be noted that in "Class B" output the battery current increases noticeably with increased signal input. See current specifications on schematic diagram.
- Transistors and the printed circuit board can be damaged by excessive heat. Whenever soldering is necessary on the printed circuit board, use a soldering iron which is both HOT AND CLEAN. This minimizes the amount of heat which will be radiated from the point of soldering.
- Oscillator injection voltage can be measured at the emitter terminal of Q1 with the use of an oscilloscope or R-F type VTVM. The injection voltage should be approximately 0.12 volts r.m.s. (0.34 v. peak to peak) in the middle of the tuning range (near 1000 kc).
- D.c. voltage measurements should be made only with a sensitive voltmeter, such as an RCA VoltOhmyst®.
- Interchanging transistors in the I-F stages may necessitate realignment.

Series 1-BT-3

1-MBT-6

**SERVICE HINTS**

Extreme care should be used to avoid accidental shorting of transistor elements to circuit ground. This is especially true of the output transistors; if the junction of R23-R25-RT1 should be accidentally grounded for a few seconds, the output transistors would be permanently damaged.

It is possible to damage a transistor when testing circuit continuity. Since a transistor needs only low voltage applied to its terminals for conduction, testing continuity with an ohmmeter is inadvisable. To avoid transistor damage and misleading continuity indications, remove the transistor from the chassis before making continuity tests of its circuit.

When the receiver is inoperative, the first thing to do is check the batteries. The voltage at the two battery lead terminals, with the receiver turned on, should be approximately 13 1/2 volts with new batteries. The receiver can be expected to operate if these initial battery voltage checks between 9 volts and 15 1/2 volts with the proper polarity. If the voltage is below 9 volts, the BATTERY is the problem. Check to make sure that every cell is inserted in the right direction.

To check for a circuit defect which would cause excessive battery drain, an overall current measurement and supplementary voltage measurements should be made. For reasons explained above, continuity measurements can be misleading.

Signal tracing by injection of a signal from a signal generator is done on transistor radios in exactly the same manner as with the conventional vacuum tube radios. The signal generator should be connected (as in past practice) in series with a capacitor to avoid shorting out bias voltages. With the transistors used in this receiver, the BASE is the signal input terminal (corresponding to signal grid of tubes), the COLLECTOR is the signal output terminal (corresponding to plate of tubes), and the BATTERY is the common terminal (corresponding to cathode of tubes).

The output of this receiver is of the "Class B" type. It should be noted that in "Class B" output the battery current increases noticeably with increased signal input. See current specifications on schematic diagram.

Oscillator injection voltage can be measured at the emitter terminal of Q3 with the use of an oscilloscope or RF type of VTVM. The injection voltage should be as shown on the schematic diagram.

Dc voltage measurements should be made only with a sensitive voltmeter, such as an RCA VoltOhmyst.®

Interchanging transistors in the IF stages may necessitate realignment.



**9-Transistor 7-Band Portable Radio**

**MODEL 1-MBT-6**

Chassis No. RC-1184

**SERVICE DATA**

— 1958 No. 11 —

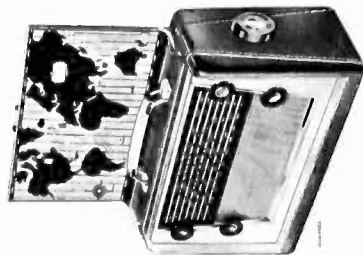
PREPARED BY COMMERCIAL SERVICE

RCA SERVICE COMPANY

A DIVISION OF

**RADIO CORPORATION OF AMERICA**

CAMDEN 8, N. J.



Model 1-MBT-6

The "Strato-World III" Black Leatherette

**SPECIFICATIONS**

**BATTERY**

Nine RCA VS-036 1 1/2 v. each (13 1/2 v. total)  
 Current consumption (with no signal) Approx. 16 ma  
 Approx. useful life 400 hrs. at 2 hrs. per day

**LOUDSPEAKER**

Size and type 5 1/4" inch P.M.  
 Voice coil impedance 3.2 ohms

**POWER OUTPUT**

Undistorted 300 mw.  
 Maximum 400 mw.

**TUNING DRIVE RATIO**

7:1 (3 3/4 turns of knob)

**WEIGHT (WITH BATTERIES)**

Approx. 15 lbs.

**DIMENSIONS (OVERALL)**

Height 8" Width 14 1/2" Depth 5 1/2"

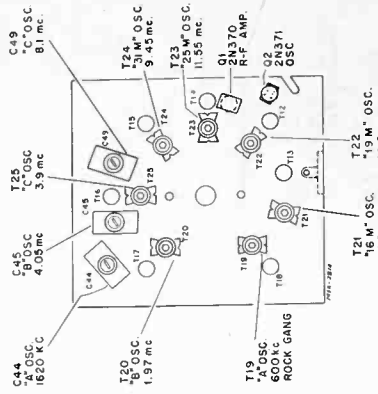
**DESCRIPTION**

Model 1-MBT-6 is an all-transistorized seven-band radio receiver in a leatherette-covered luggage style case. The instrument operates from battery power supplied from 9 "D"-size flashlight cells. These flashlight cells are contained in a battery box which slides in beneath the main chassis.

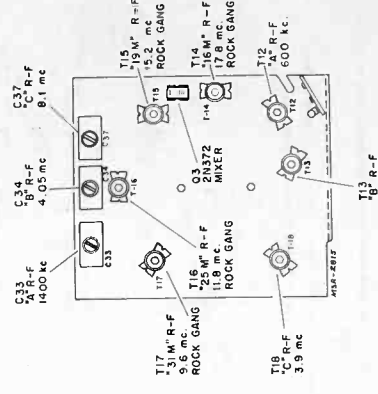
The superheterodyne circuit includes nine transistors. A tuned radio-frequency stage precedes the separate mixer and oscillator stages. Two stages of IF amplification are used, including two double-tuned stages. The detector and AGC stage is followed by a driver stage and a Class "B" push-pull output stage.

The RF tuning is done by means of a six-section variable capacitor. Three large sections for the "A", "B" and "C" bands with series tracking capacitors; also three small 3-plate sections for electrical band spread on the four spread-bands. The tuner, including the range switch, coil trimmers, RF mixer and oscillator transistors, is mounted on a printed circuit board. The coil and trimmer adjustments from the knob end of the band switch.

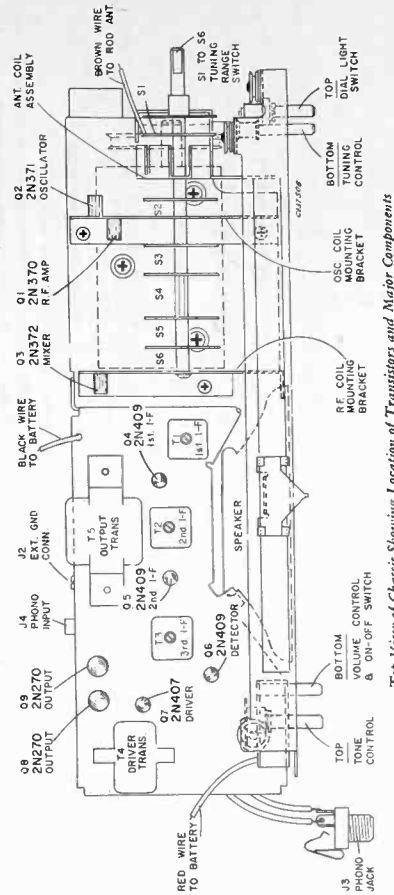
This receiver features a continuous low-cut/high-cut tone control, momentary dial lighting and compensated volume control along with vernier tuning. These comprise the four front panel knob controls. The band change knob is located at the right-hand end of the cabinet. A large extended slide-rule dial contains the calibration for all bands. A tone control knob is located at the left-hand end of the back panel. A special switching type phono jack is located at the back of the chassis for connecting either high-impedance or low-impedance



Tuner Adjustment Locations—Oscillator



Tuner Adjustment Locations—R-F

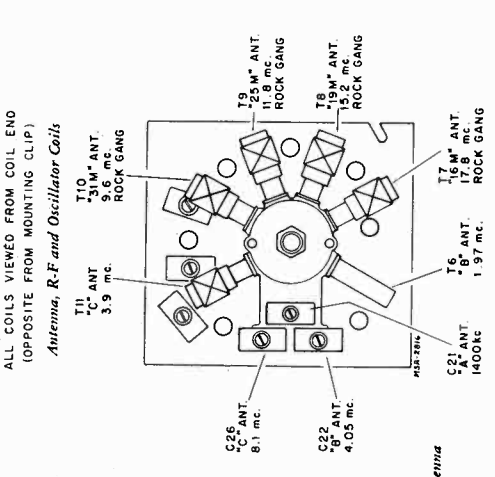
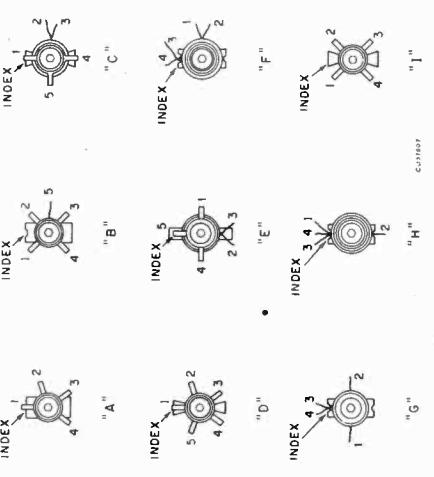


Top View of Chassis Showing Location of Transistors and Major Components

1-MBT-6

COIL IDENTIFICATION

COIL	FIG. NO.	MTG. CLIP COLOR	COIL COLOR
T1	"A"	Ant.	Red
T10	"C"	Ant.	Red
T11	"G"	Ant.	Red
T12	"H"	Ant.	Red
T13	"I"	Ant.	Red
T14	"J"	Ant.	Red
T15	"K"	Ant.	Red
T16	"L"	Ant.	Red
T17	"M"	Ant.	Red
T18	"N"	Ant.	Red
T19	"O"	Ant.	Red
T20	"P"	Ant.	Red
T21	"Q"	Ant.	Red
T22	"R"	Ant.	Red
T23	"S"	Ant.	Red
T24	"T"	Ant.	Red
T25	"U"	Ant.	Red
T26	"V"	Ant.	Red
T27	"W"	Ant.	Red
T28	"X"	Ant.	Red
T29	"Y"	Ant.	Red
T30	"Z"	Ant.	Red
T31	"AA"	Ant.	Red
T32	"AB"	Ant.	Red
T33	"AC"	Ant.	Red
T34	"AD"	Ant.	Red
T35	"AE"	Ant.	Red
T36	"AF"	Ant.	Red
T37	"AG"	Ant.	Red
T38	"AH"	Ant.	Red
T39	"AI"	Ant.	Red
T40	"AJ"	Ant.	Red
T41	"AK"	Ant.	Red
T42	"AL"	Ant.	Red
T43	"AM"	Ant.	Red
T44	"AN"	Ant.	Red
T45	"AO"	Ant.	Red
T46	"AP"	Ant.	Red
T47	"AQ"	Ant.	Red
T48	"AR"	Ant.	Red
T49	"AS"	Ant.	Red
T50	"AT"	Ant.	Red
T51	"AU"	Ant.	Red
T52	"AV"	Ant.	Red
T53	"AW"	Ant.	Red
T54	"AX"	Ant.	Red
T55	"AY"	Ant.	Red
T56	"AZ"	Ant.	Red
T57	"BA"	Ant.	Red
T58	"BB"	Ant.	Red
T59	"BC"	Ant.	Red
T60	"BD"	Ant.	Red
T61	"BE"	Ant.	Red
T62	"BF"	Ant.	Red
T63	"BG"	Ant.	Red
T64	"BH"	Ant.	Red
T65	"BI"	Ant.	Red
T66	"BJ"	Ant.	Red
T67	"BK"	Ant.	Red
T68	"BL"	Ant.	Red
T69	"BM"	Ant.	Red
T70	"BN"	Ant.	Red
T71	"BO"	Ant.	Red
T72	"BP"	Ant.	Red
T73	"BQ"	Ant.	Red
T74	"BR"	Ant.	Red
T75	"BS"	Ant.	Red
T76	"BT"	Ant.	Red
T77	"BU"	Ant.	Red
T78	"BV"	Ant.	Red
T79	"BW"	Ant.	Red
T80	"BX"	Ant.	Red
T81	"BY"	Ant.	Red
T82	"BZ"	Ant.	Red
T83	"CA"	Ant.	Red
T84	"CB"	Ant.	Red
T85	"CC"	Ant.	Red
T86	"CD"	Ant.	Red
T87	"CE"	Ant.	Red
T88	"CF"	Ant.	Red
T89	"CG"	Ant.	Red
T90	"CH"	Ant.	Red
T91	"CI"	Ant.	Red
T92	"CJ"	Ant.	Red
T93	"CK"	Ant.	Red
T94	"CL"	Ant.	Red
T95	"CM"	Ant.	Red
T96	"CN"	Ant.	Red
T97	"CO"	Ant.	Red
T98	"CP"	Ant.	Red
T99	"CQ"	Ant.	Red
T100	"CR"	Ant.	Red
T101	"CS"	Ant.	Red
T102	"CT"	Ant.	Red
T103	"CU"	Ant.	Red
T104	"CV"	Ant.	Red
T105	"CW"	Ant.	Red
T106	"CX"	Ant.	Red
T107	"CY"	Ant.	Red
T108	"CZ"	Ant.	Red
T109	"CA"	Ant.	Red
T110	"CB"	Ant.	Red
T111	"CC"	Ant.	Red
T112	"CD"	Ant.	Red
T113	"CE"	Ant.	Red
T114	"CF"	Ant.	Red
T115	"CG"	Ant.	Red
T116	"CH"	Ant.	Red
T117	"CI"	Ant.	Red
T118	"CJ"	Ant.	Red
T119	"CK"	Ant.	Red
T120	"CL"	Ant.	Red
T121	"CM"	Ant.	Red
T122	"CN"	Ant.	Red
T123	"CO"	Ant.	Red
T124	"CP"	Ant.	Red
T125	"CQ"	Ant.	Red
T126	"CR"	Ant.	Red
T127	"CS"	Ant.	Red
T128	"CT"	Ant.	Red
T129	"CU"	Ant.	Red
T130	"CV"	Ant.	Red
T131	"CW"	Ant.	Red
T132	"CX"	Ant.	Red
T133	"CY"	Ant.	Red
T134	"CZ"	Ant.	Red
T135	"CA"	Ant.	Red
T136	"CB"	Ant.	Red
T137	"CC"	Ant.	Red
T138	"CD"	Ant.	Red
T139	"CE"	Ant.	Red
T140	"CF"	Ant.	Red
T141	"CG"	Ant.	Red
T142	"CH"	Ant.	Red
T143	"CI"	Ant.	Red
T144	"CJ"	Ant.	Red
T145	"CK"	Ant.	Red
T146	"CL"	Ant.	Red
T147	"CM"	Ant.	Red
T148	"CN"	Ant.	Red
T149	"CO"	Ant.	Red
T150	"CP"	Ant.	Red
T151	"CQ"	Ant.	Red
T152	"CR"	Ant.	Red
T153	"CS"	Ant.	Red
T154	"CT"	Ant.	Red
T155	"CU"	Ant.	Red
T156	"CV"	Ant.	Red
T157	"CW"	Ant.	Red
T158	"CX"	Ant.	Red
T159	"CY"	Ant.	Red
T160	"CZ"	Ant.	Red
T161	"CA"	Ant.	Red
T162	"CB"	Ant.	Red
T163	"CC"	Ant.	Red
T164	"CD"	Ant.	Red
T165	"CE"	Ant.	Red
T166	"CF"	Ant.	Red
T167	"CG"	Ant.	Red
T168	"CH"	Ant.	Red
T169	"CI"	Ant.	Red
T170	"CJ"	Ant.	Red
T171	"CK"	Ant.	Red
T172	"CL"	Ant.	Red
T173	"CM"	Ant.	Red
T174	"CN"	Ant.	Red
T175	"CO"	Ant.	Red
T176	"CP"	Ant.	Red
T177	"CQ"	Ant.	Red
T178	"CR"	Ant.	Red
T179	"CS"	Ant.	Red
T180	"CT"	Ant.	Red
T181	"CU"	Ant.	Red
T182	"CV"	Ant.	Red
T183	"CW"	Ant.	Red
T184	"CX"	Ant.	Red
T185	"CY"	Ant.	Red
T186	"CZ"	Ant.	Red
T187	"CA"	Ant.	Red
T188	"CB"	Ant.	Red
T189	"CC"	Ant.	Red
T190	"CD"	Ant.	Red
T191	"CE"	Ant.	Red
T192	"CF"	Ant.	Red
T193	"CG"	Ant.	Red
T194	"CH"	Ant.	Red
T195	"CI"	Ant.	Red
T196	"CJ"	Ant.	Red
T197	"CK"	Ant.	Red
T198	"CL"	Ant.	Red
T199	"CM"	Ant.	Red
T200	"CN"	Ant.	Red



ALIGNMENT PROCEDURE

Test Oscillator—For all alignment operations, connect the low side of the test oscillator to the chassis and keep the oscillator output as low as possible to avoid AVC action.

STEP	CONNECT HIGH SIDE OF SIG. GEN. TO	SIGNAL GEN. OUTPUT	DIAL POINTER SETTING	ADJUST FOR MAXIMUM OUTPUT
1.	Base of Q3 (miser) thru 0.1 mf	485 KC	"A" band quiet point near 1600 KC	1/8 and bottom core of T1 and T3 angle core of T2
2.		Repeat Step 1 as required		
3.	"B" band gang fully open	4.05 mc	"B" band gang fully open	C 45 (osc.) C 34 (RF) C 22 (ant.)
4.	"B" band gang closed	1.97 mc	"B" band gang closed	T 20 (osc.) T 16 (ant.)
5.		Repeat Steps 3 and 4 as required		
6.	"C" band gang fully open	8.1 mc	"C" band gang fully open	C 49 (osc.) C 36 (RF) C 26 (ant.)
7.	"C" band gang closed	3.9 mc	"C" band gang closed	T 25 (osc.) T 18 (RF) T 11 (ant.)
8.		Repeat Steps 6 and 7 as required		
9.	"31 M" band gang closed	9.45 mc	"31 M" band gang closed	T 24 (osc.)
10.	Base ant. lead (connected to band switch S13) thru dummy lead consisting in series with 25 ohms	9.6 mc	"31 M" band 9.6 mc signal	T 17 (RF) T 10 (ant.)
11.		Repeat Steps 9 and 10 as required		
12.	"25 M" band gang closed	11.55 mc	"25 M" band gang closed	T 23 (osc.)
13.	"25 M" band 11.8 mc signal	11.8 mc	"25 M" band 11.8 mc signal	T 16 (RF) T 9 (ant.)
14.		Repeat Steps 12 and 13 as required		
15.	"19 M" band gang closed	14.9 mc	"19 M" band gang closed	T 22 (osc.)
16.	"19 M" band 15.2 mc signal	15.2 mc	"19 M" band 15.2 mc signal	T 15 (RF) T 8 (ant.)
17.		Repeat Steps 15 and 16 as required		
18.	"16 M" band gang closed	17.5 mc	"16 M" band gang closed	T 21 (osc.)
19.	"16 M" band 17.8 mc signal	17.8 mc	"16 M" band 17.8 mc signal	T 14 (RF) T 7 (ant.)
20.		Repeat Steps 18 and 19 as required		
21.	Position chassis assembly in back of and parallel to cabinet assembly permitting access to tuner coils and trimmers. Connect green end yellow loop lead direct to hinge terminals.	1620 KC	"A" band fully open	C 44 (osc.)
22.		1400 KC	"A" band 1400 KC signal	C 33 (RF) C 21 (ant.)
23.		600 KC	"A" band 600 KC signal	While rocking gang, T 12 (RF)
24.		Repeat Steps 22, 23 and 24 as required		
25.		Oscillator tracks 485 KC above signal on all bands.		

Tuner Adjustment Locations—Antenna

1-MBT-6

CONTROLS

The "TUNING," "TONE," and "VOL. ON-OFF" controls are located at the front of the cabinet; the "RANGE" control is located at the right end of the cabinet; they function in the customary manner. The "DIAL LIGHT" control at the front of the cabinet has a spring return and the dial lights are energized only when the knob is held in the clockwise position. The "PHONES" jack at the bottom left of the front panel enables headphones to be used. The speaker is disconnected when the headphones plug is inserted in the "PHONES" jack. The "PHONO INPUT" jack at the back of the chassis enables a record player to be used. Radio signals are disconnected when the phono input cable is plugged into the "PHONO INPUT" jack. The ROD ANTENNA at right side of case must be raised to its full height when short-wave reception is desired.

BAND SWITCH REPLACEMENT

Band switch replacement in any multi-band radio receiver is seldom required. When it is necessary, considerable time and expense is required. In order to reduce the time and expense of such replacement, individual switch sections are made available for separate replacement. When using such individual switch sections it is not necessary to remove coil leads to any switch section other than the one requiring replacement. The procedure for replacing an individual switch section is as follows:

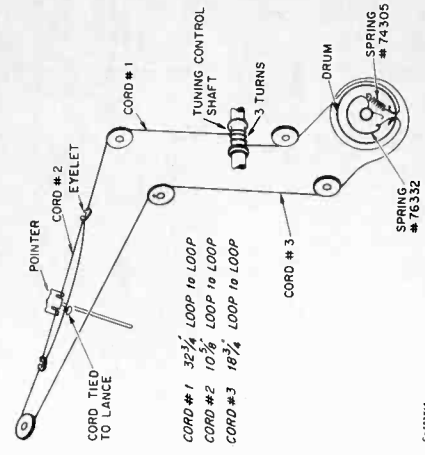
1. Unsolder all leads and components which are interconnections between the switch/coil assembly and the main chassis assembly.
2. Remove the four self-lapping screws which hold the switch assembly to the main chassis base.
3. Remove the two nuts and washers which hold the switch assembly to the front chassis wall.
4. Lift switch assembly off chassis base.
5. Remove the three leads interconnecting switch section #5 and oscillator coil assembly.
6. Disconnect all leads from the switch section which is to be replaced.
7. Threaded hex spacers separate switch sections #4 and #5. Loosening the two front screws or two rear screws while holding the hex spacers, leaves one group of switch wafers and coils as a solid assembly while the remaining group of switch wafers and coils can be removed as a unit while still assembled on the through bolts.
8. Using two 0.112 inch (#4) rods, push the through-bolts toward the front or rear of the switch to such point that the desired switch section can be removed. The two rods are used to hold all other switch components in their relative positions.
9. Remove the defective switch section and insert the replacement switch section. Make sure that the replacement switch section is placed in the correct position both front-to-rear and top-to-bottom.
10. Check the position of the switch rotor—it must not be in the 180° reversed position.
11. Reassemble in reverse order.

ANTENNAS

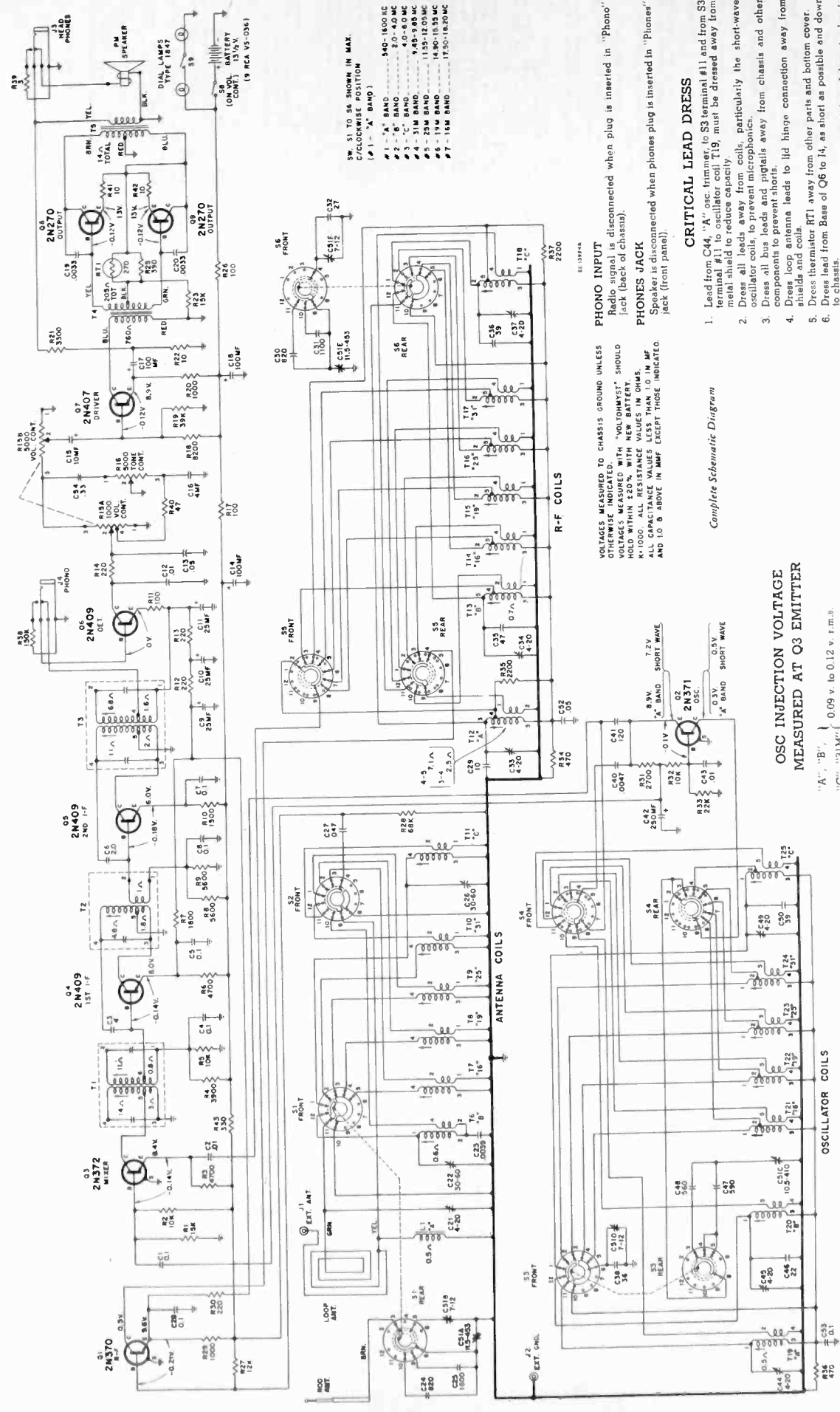
Rod Antenna  
Used on all bands except Sid. Broadcast.  
Loop Antenna  
Used only on Sid. Broadcast band  
Ext. Ant.—Gnd.  
Effective only on Sid. Broadcast band. "Ant" connection on loop. "Gnd" connection on back of chassis.

CHASSIS REMOVAL

1. Remove flat plastic coil shield (pull off).
2. Unsolder green and yellow wires from terminals at case lid hinges.
3. Unsolder brown wire from terminal on rod antenna.
4. Remove battery case and unsolder red wire from case and black wire from chassis ground.
5. Remove phones jack from front escutcheon (held in place by knurled nut).
6. Pull off five control knobs.
7. Remove four screws holding chassis to bottom of cabinet.
8. Remove four screws holding chassis to cabinet front.



Dial Drive Cord Assembly



SW. S1 TO S6 SHOWN IN MAX. CLOSURE POSITION (P1 - "A" BAND)

#1 - "A" BAND	540-1600 KC
#2 - "B" BAND	1000-1500 KC
#3 - "C" BAND	1500-2000 KC
#4 - "D" BAND	2000-2500 KC
#5 - "E" BAND	2500-3000 KC
#6 - "F" BAND	3000-3500 KC
#7 - "G" BAND	3500-4000 KC

**PHONO INPUT**

Radio signal is disconnected when plug is inserted in "Phono" jack (signal of chassis).

**PHONES JACK**

Speaker is disconnected when phones plug is inserted in "Phones" jack (front panel).

**CRITICAL LEAD DRESS**

1. Lead from C44, "A" osc. trimmer, to S3 terminal #11 and from S3 terminal #11 to oscillator coil T19, must be dressed away from metal shield to reduce capacity.
2. Dress all leads away from coils, particularly the short-wave oscillator coils, to prevent microphonics.
3. Dress all bus leads and digitals away from chassis and other components to prevent shorts.
4. Dress loop antenna leads to lid hinge connection away from shields and coils.
5. Dress thermistor RT1 away from other parts and bottom cover.
6. Dress lead from Base of Q6 to H, as short as possible and down to chassis.
7. Dress lead from I4 to T3 as short as possible and down to chassis.
8. Dress dial lamp leads away from coils and dial pointer.
9. Twist tone control ground lead around lead from C54 which connects to adjacent terminal (#1) of tone control.

Complete Schematic Diagram

**VOLTAGES MEASURED TO CHASSIS GROUND UNLESS OTHERWISE INDICATED.**

"A" BAND, "VOLTMETER" SHOULD HOLD WITHIN ±20% WITH NEW BATTERY.  
 \*1000: ALL RESISTANCE VALUES IN OHMS.  
 ALL CAPACITANCE VALUES LESS THAN 1.0 IN MF AND 1.0 & ABOVE IN MF EXCEPT THOSE INDICATED.

**OSC INJECTION VOLTAGE MEASURED AT Q3 EMITTER**

- "A", "B", } 0.09 v. to 0.12 v. r.m.s.
- "C", "31M" } 0.08 v. to 0.11 v. r.m.s.
- "25M" } 0.10 v. to 0.13 v. r.m.s.
- "19M" } 0.04 v. to 0.11 v. r.m.s.
- "16M" }



REPLACEMENT PARTS

Symbol No.	Stock No.	DESCRIPTION
		<b>CHASSIS ASSEMBLY RC-1184</b>
		<b>CAPACITORS</b>
C1	79251	Fixed, paper, 0.1 mf, ±20%, 200 v.
C2	101000	Fixed, paper, 0.01 mf, ±10%, 200 v.
C3	100926	Fixed, ceramic, 4 mf, ±1.0 mmf, 500 v., Coef.—750
C4	79251	Fixed, paper, 0.1 mf, ±20%, 200 v.
C5	100925	Fixed, ceramic, 2 mf, ±1.0 mmf, 500 v., Coef.—750
C6	79251	Fixed, paper, 0.1 mf, ±20%, 200 v.
C7	106054	Electrolytic, 25 mf, —10 to ±250%, 15 v.
C8	106114	Fixed, ceramic, 0.01 mf, ±20%, 100 v.
C9	103380	Fixed, ceramic, 0.05 mf, ±20%, 50 v.
C10	106055	Electrolytic, 100 mf, —10 to ±250%, 15 v.
C11	106114	Electrolytic, 10 mf, 10 v.
C12	106353	Electrolytic, 4 mf, 10 v.
C13	106353	Electrolytic, 100 mf, —10 to ±250%, 15 v.
C14	106055	Electrolytic, 10 mf, 10 v.
C15	106353	Electrolytic, 4 mf, 10 v.
C16	106353	Electrolytic, 100 mf, —10 to ±250%, 15 v.
C17	106353	Electrolytic, 4 mf, 10 v.
C18	106353	Electrolytic, 100 mf, —10 to ±250%, 15 v.
C19	102425-A	15 v. paper, 0.0033 mf, ±10%
C20	78131	Adjustable, mica, 4.20 mmf, 500 v.
C21	106009	Adjustable, mica, 30.60 mmf, 500 v.
C22	106053	Fixed, paper, 0.0039 mf, ±10%, 200 v.
C23	78143	Fixed, mica, 820 mmf, ±5%, 300 v.
C24	106056	Fixed, mica, 1600 mmf, ±5%, 500 v.
C25	106009	Adjustable, mica, 30.60 mmf, 500 v.
C26	104133	Fixed, paper, 0.047 mf, ±20%, 200 v.
C27	79251	Fixed, paper, 0.1 mf, ±20%, 200 v.
C28	33098	Fixed, ceramic, 10 mmf, ±1.0 mmf, 500 v., Coef.—750
C29	78143	Fixed, mica, 820 mmf, ±5%, 300 v.
C30	78143	Fixed, mica, 1600 mmf, ±5%, 500 v.
C31	78144	Fixed, mica, 1100 mmf, ±5%, 500 v.
C32	72570	Fixed, mica, 27 mmf, ±10%, 500 v., Coef.—750
C33	78131	Adjustable, mica, 4.20 mmf, 500 v.
C34	39042	Fixed, ceramic, 47 mmf, ±10%, 500 v., Coef.—750
C35	73664	Fixed, ceramic, 39 mmf, ±10%, 500 v., Coef.—750
C36	78131	Adjustable, mica, 4.20 mmf, 500 v.
C37	106052	Fixed, ceramic, 36 mmf, ±5%, 500 v., Coef.—750
C38	101721	Fixed, paper, 0.0047 mf, ±10%, 200 v.
C39	71614	Fixed, ceramic, 120 mmf, ±10%, 500 v., Coef.—750
C40	106552	Electrolytic, 250 mf, 15 v.
C41	101000	Fixed, paper, 0.01 mf, ±10%, 200 v.
C42	78130	Adjustable, mica, 4.20 mmf, 500 v.
C43	33101	Fixed, ceramic, 22 mmf, ±10%, 500 v., Coef.—750
C44	74929	Fixed, mica, 950 mmf, ±2%, 500 v., Coef.—100
C45	39646	Fixed, mica, 560 mmf, ±5%, 300 v., Coef.—100
C46	78130	Adjustable, mica, 4.20 mmf, 500 v.
C47	73664	Fixed, ceramic, 39 mmf, ±10%, 500 v., Coef.—750
C48	106030	Variable tuning capacitor
C49	103380	Fixed, ceramic, 0.05 mf, ±20%, 50 v.
C50	79251	Fixed, paper, 0.1 mf, ±20%, 200 v.
C51	102215-A	Fixed, paper, 0.33 mf, ±10%, 200 v.
C52	106057	See "Miscellaneous"
C53	106057	Terminal—Ground terminal
C54	106036	Jack—Headphone jack
C55	106036	Connector—Female phono input connector
C56	106031	Coil—"A" Band antenna coil
C57	106031	Coil—"A" Band antenna coil
C58	502315	RESISTORS
C59	502310	Fixed, composition, 15,000 ohms, ±10%, 1/2 w.
C60	502310	Fixed, composition, 10,000 ohms, ±10%, 1/2 w.

REPLACEMENT PARTS

Symbol No.	Stock No.	DESCRIPTION
S3	106117	Switch—Switch wafers "only"—Section #3 of band selector switch
S4	106118	Switch—Switch wafers "only"—Section #4 of band selector switch
S5	106119	Switch—Switch wafers "only"—Section #5 of band selector switch
S6	106120	Switch—Switch wafers "only"—Section #6 of band selector switch
S8	106199	Part of R15A, R15B
S9	106013	Switch—Rotary S.P.S.T. light switch with spring return
T1	106017	TRANSFORMERS
T2	106018	1st I.F. transformer
T3	106019	2nd I.F. transformer
T4	106021	3rd I.F. transformer
T5	106022	Driver transformer
T6	106001	Output transformer
T7	106001	"B" Band antenna transformer
T8	106005	"19" Meter Band antenna transformer
T9	106005	"25" Meter Band antenna transformer
T10	106003	"C" Meter Band antenna transformer
T11	106002	"A" Band antenna transformer
T12	106002	"B" Band R.F. transformer
T13	105994	"16" Meter Band R.F. transformer
T14	106000	"19" Meter Band R.F. transformer
T15	105999	"25" Meter Band R.F. transformer
T16	105998	"31" Meter Band R.F. transformer
T17	105997	"C" Meter Band R.F. transformer
T18	105996	"A" Band oscillator transformer
T19	105987	"B" Band oscillator transformer
T20	105988	"16" Meter Band oscillator transformer
T21	105993	"19" Meter Band oscillator transformer
T22	105992	"25" Meter Band oscillator transformer
T23	105991	"31" Meter Band oscillator transformer
T24	105989	"C" Band oscillator transformer
T25	102026	Bushing—Nylon bushing for mounting pointer (2 required)
T26	106007	Bushing—Threaded brass bushing for tuning control shaft (3 required)
T27	73935	Clip—Mounting clip for I.F. transformers
T28	72953	Cord—Pointer drive cord (250' spool) see illustration for lengths required.
T29	106121	Detent—Band selector switch detent plate and shaft assembly
T30	78097	Eyelet—Metal eyelet for pointer drive cord (2 required)
T31	74378	Gasket—Soft sponge rubber gasket for mounting speaker
T32	71851	Grommet—Rubber grommet for mounting speaker (4 required)
T33	16058	Insulating rubber grommet for mounting tuning capacitor (3 required)
T34	106008	Pointer—Tuning control dial pointer assembly
T35	72602	Pulley—1 1/2" O.D. aluminum pulley for pointer drive cord (2 required)
T36	102043	Pulley—5/8" O.D. aluminum pulley for pointer drive cord (3 required)
T37	106034	Shaft—Tuning control shaft assembly
T38	76332	Spring—Formed wire tension spring for drive cord
T39	74305	Spring—Coiled wire tension spring for drive cord
T40	100643	Socket—Ball lamp socket with bracket
T41	100642	Socket—Ball lamp socket with mounting bracket and one lead
T42	106039	Socket—Transistor socket with retainer for O1, O2 and O3
T43	101647	Socket—Transistor socket with retaining ring for O4, O5, O6, O7, O8, O9
T44	77586	Washer—"C" type retaining washer for tuning control shaft assembly

APPLY TO YOUR RCA DISTRIBUTOR FOR PRICES OF REPLACEMENT PARTS

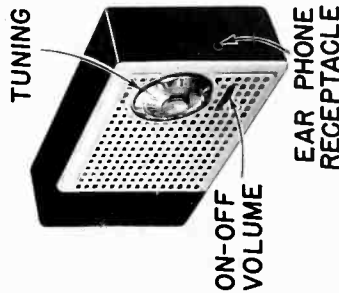
REPLACEMENT PARTS

Symbol No.	Stock No.	DESCRIPTION
11	106398	<b>SPEAKER ASSEMBLY</b> Speaker—5 1/4" P.M. speaker complete with cone
		<b>MISCELLANEOUS</b>
	106011	Terminal—"Ext. Ant." terminal for lid and loop assembly
	78189	Antenna—Telescopic antenna less cap
	106033	Bearing—Mounting bearing for pointer and arm hinge assembly (R.H. or L.H.)
	X4335	Bracket—Angle bracket retainer for cabinet back (2 required)
		Cabinet—Cabinet sub-assembly including back cover assembly, carrying handle & feet LESS lid assembly, escutcheon, dial, grille, antenna, cap, mounting latch, motif and misc. phenolic end cap for telescopic antenna
	106037	Case—Battery case bottom assembly, (wired) with spiral contact springs, antique white
	105973	Case—Battery case top, antique white, phenolic
	106016	Chart—World map and time chart
	106048	Dial—Tuning control dial
	106039	Escutcheon—Cabinet front escutcheon less grille
	106012	Foot—Cabinet foot (4 required)—natural polyethylene only stocked for replacement
	106028	Grille—Perforated aluminum grille screen for cabinet front
	106040	Handle—Carrying handle and link assembly with brass end caps, top and bottom mounting plates
	105974	Hinge—Left hand pivot and arm hinge assembly complete with spiral spring and mounting bearing for cabinet lid
	105972	Hinge—Right hand pivot and arm hinge assembly complete with spiral spring and mounting bearing for cabinet lid
	106041	Hinge—Chisel type hinge for cabinet lid back cover assembly (2 required)
	106023	Knob—Band selector control knob with spring
	106026	Knob—Light switch control knob, with spring
	106181	Knob—Tone control knob with spring
	106025	Knob—Volume control knob, with spring
	106462	Knob—Volume control knob, with spring
	106038	Latch—Magnetic latch assembly consisting of magnet, center shoulder stud, contact plates and phenolic support plate
	106020	Lid—Cabinet lid and loop antenna assembly complete with hinges, pull, "Ext." terminal and map
	106014	Motif—"All Transistor" motif for cabinet grille
	72765	Nut—Push-on retaining nut for grille & dial (8 required)
	74337	Nut—Push-on retaining nut for motif dial (3 required)
	106032	Pull—Aluminum lid pull with steel insert
	101668	Retainer—Retaining clip for plastic coil shield (3 req'd)
	102582	Spring—Retaining spring for band selector control knob
	101069	Spring—Retaining spring for tuning light switch, volume and tone control
	106031	Spring—Spiral contact spring for battery case assembly
	106035	Washer—Nylon insulating washer for mounting cabinet lid assembly to cabinet (2 required)

# RAYTHEON

## TRANSISTORIZED PORTABLE RADIO

4RT1 CHASSIS



MODELS T-100-1, T-100-2, T-100-3, T-100-4 and T-100-5

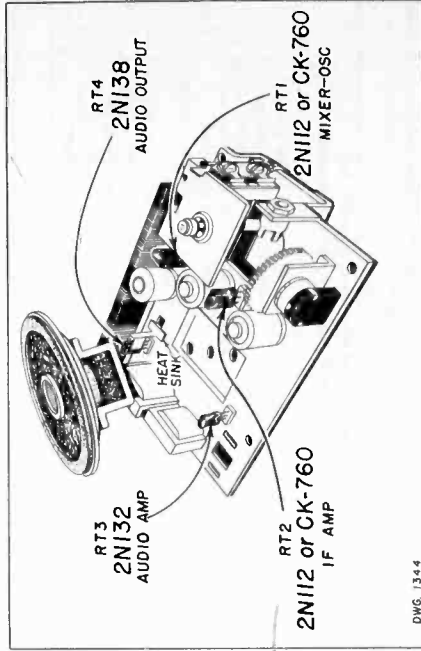
### SERVICE DATA

#### SPECIFICATIONS

Power Supply . . . . . 9 volts D.C.  
 Frequency Range . . . . . 540 to 1600 KC  
 Intermediate Frequency . . . . . 455 KC  
 Selectivity . . . . . At 1000 KC, 70 KC at 1000 X signal  
 Sensitivity (2 mw ref) . . . . . 800 u. v. per meter  
 Power Output . . . . . 20 m. w.  
 Speaker . . . . . 2 1/4" PM, V.C. impedance-15 ohms  
 Cabinet . . . . . 6 1/4" width, 1 1/4" depth, 3-3/8" height

#### TRANSISTOR COMPLEMENT

RT1	CK-760 or 2N112	Oscillator-Mixer
RT2	CK-760 or 2N112	1st. IF Amplifier
RT3	2N132	Audio Amplifier
RT4	2N138	Audio Output
	CK-706A	Crystal Detector



DWG. 1344

#### TRANSISTOR LOCATION

#### TRANSISTOR SERVICING

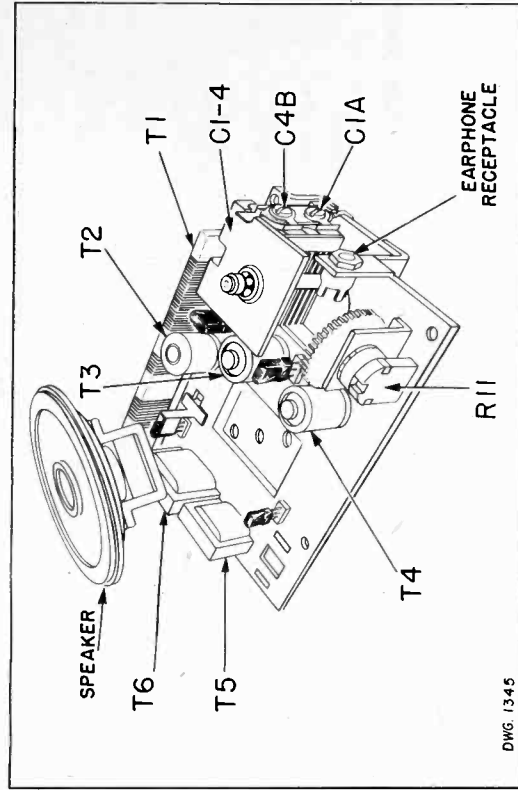
If a transistor is suspected of being defective, substitution will be the only reliable check. Checking resistance readings between the transistor elements with an ohmmeter will indicate only a shorted or open transistor. Under certain circumstances, damage to the transistor may result, therefore, this method is not recommended. When inserting a transistor in its socket, make sure the transistor leads line up with the socket holes. The schematic diagram illustrates that the audio transistors, type 2N132 and 2N138, have equal spacing between the transistor leads, therefore the red dot on the audio transistor must line up with the paint dot on the chassis. Do not rearrange placement of transistors; under certain circumstances, especially in the RF or IF circuits, slight realignment may be necessary after a transistor substitution is made. If a component is replaced which must be soldered to the transistor socket, remove the transistor from its socket before soldering as excessive heat may damage the transistor. When attempting any soldering, a low wattage small diameter tip iron is suggested. Heat may also damage other components, therefore, dissipate the heat by grasping the component lead with a long nose pliers. When checking the receiver with an ohmmeter remove the circuit transistor for accurate readings.

**ALIGNMENT PROCEDURE**

- NOTES:**
1. Remove chassis from case.
  2. Connect 9 volt battery.
  3. Use output meter with 15 ohms impedance.
  4. Turn volume control to maximum.
  5. Signal generator output at 100 microvolts, 30% modulation at 400 cycles.

CIRCUIT	SIGNAL GENERATOR		GROUND SIDE	OUTPUT METER	GANGED CAPACITY	ADJUST FOR MAXIMUM OUTPUT ON METER
	FREQUENCY	COUPLING CAPACITY				
i.F.	455KC	.5MF	To Base of RT1	Connect in place of speaker	-----	T3, T4
Repeat above step two or three times for best results, keeping generator output in all cases as low as possible to prevent overloading of audio.						
Osc.	1620KC	.5MF	To Chassis	Connect in place of speaker	Open Gang (Fully clockwise)	C4B
Caution: Too high an output from signal generator may cause setting of trimmer on a spurious response.						
Osc.	535KC	.5MF	To Base of RT1	Connect in place of speaker	Closed Gang (Fully counter-clockwise)	T2
Osc.	1620KC	.5MF	To Base of RT1	Connect in place of speaker	Open Gang (Fully clockwise)	C4B
Ant.	1400KC	Connect 3 turn loop to generator and place near T1.		Connect in place of speaker	Ganged Condenser should be rocked	C1A

Check for alignment and dial calibration at 1000KC and 600KC.



DWG. 1345

**REMOVING CHASSIS FROM CASE**

1. Remove battery.
2. Remove tuning knob stud by turning counter-clockwise and remove tuning knob.
3. Remove case cover mounting screw located behind tuning knob and remove case cover.
4. Remove three chassis mounting screws.
5. Carefully remove chassis from case allowing battery cable to slip through battery compartment hole.

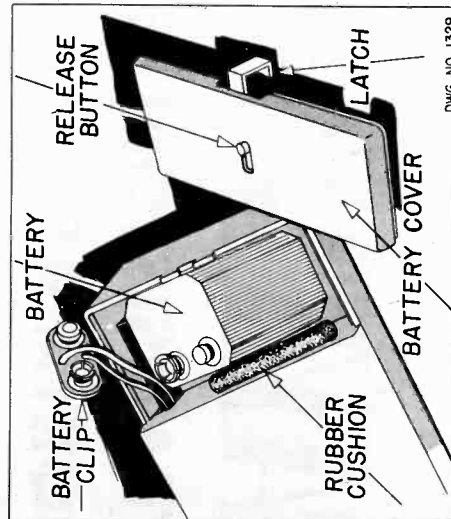
**BATTERY REPLACEMENT**

Since the receiver is small and compact, not every 9 volt battery will fit in the space provided. Listed below are three common manufactured types to be used for replacement.

- |          |         |
|----------|---------|
| BURGESS  | NO-2N6  |
| EVEREADY | NO-246  |
| OLIN     | NO-1707 |

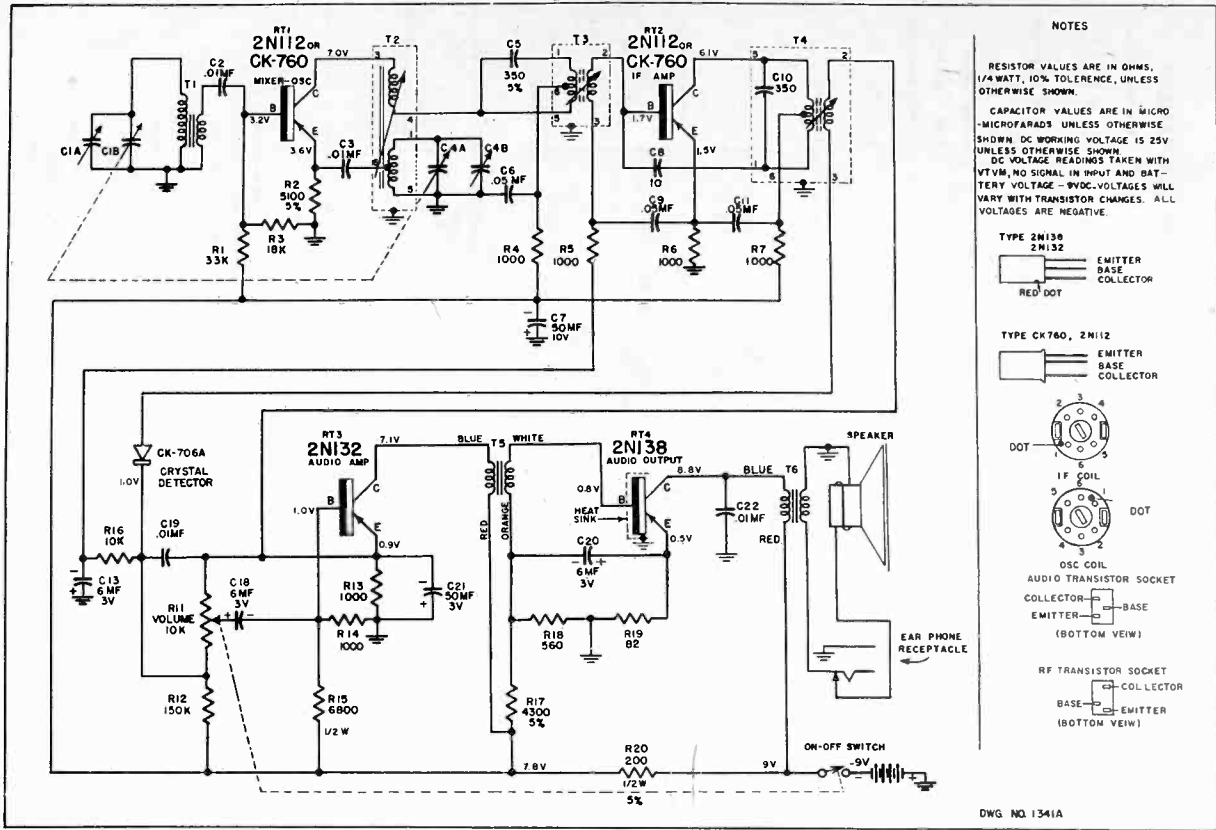
Approximately 100 hours performance can be experienced with the above batteries before replacement is required. Battery replacement should be performed when the sound output is noticed to be muffled or distorted with a decrease in total output or if a voltage measurement shows less than 6 volts. The battery voltage should be measured with the receiver turned on after at least 5 minutes of operation.

When battery replacement is necessary, remove battery cover by pushing release button upward, grasp latch and pull up and away from case. Remove old battery and un-snap battery cable. Snap battery cable on replacement battery and insert into case. Be sure rubber cushion is between battery and side wall of case to prevent battery movement. Insert battery cover in place and push latch down.



DWG. NO. 1329

BATTERY LOCATION



**NOTES**

RESISTOR VALUES ARE IN OHMS, 1/4 WATT, 10% TOLERANCE, UNLESS OTHERWISE SHOWN.

CAPACITOR VALUES ARE IN MICRO-MICROFARADS UNLESS OTHERWISE SHOWN. DC WORKING VOLTAGE IS 25V UNLESS OTHERWISE SHOWN.

DC VOLTAGE READINGS TAKEN WITH VTVM, NO SIGNAL IN INPUT AND BATTERY VOLTAGE - 9VDC. VOLTAGES WILL VARY WITH TRANSISTOR CHANGES. ALL VOLTAGES ARE NEGATIVE.

**TYPE 2N138, 2N132**  
EMITTER  
BASE  
COLLECTOR  
RED DOT

**TYPE CK760, 2N112**  
EMITTER  
BASE  
COLLECTOR

OSC COIL  
AUDIO TRANSISTOR SOCKET  
COLLECTOR - BASE  
EMITTER (BOTTOM VIEW)

RF TRANSISTOR SOCKET  
BASE - COLLECTOR  
EMITTER (BOTTOM VIEW)

SCHEMATIC DIAGRAM

REPLACEMENT PARTS LIST

REF. No.	PART No.	DESCRIPTION	REF. No.	PART No.	DESCRIPTION
<b>RESISTORS</b>			<b>TRANSFORMERS</b>		
R1	9B5-80	33K ohm, 1/4 watt, 10%	T1	13E-26452	Rod Antenna
R2	9B5-176	5100 ohm, 1/4 watt, 5%	T2	13D-26379	Oscillator coil
R3	9B5-77	18K ohm, 1/4 watt, 10%	T3	13A-26380	1st. IF Transformer
R4-5-6-7	9B5-62	1000 ohm, 1/4 watt, 10%	T4	13B-26382	2nd IF Transformer
R11	10A-26383	On-off Volume control-10K ohm	T5	12M-26467	Input Transformer
R12	9B5-88	150K ohm, 1/4 watt, 10%	T6	12C-26539	Output Transformer
R13-14	9B5-62	1000 ohm, 1/4 watt, 10%	<b>MISCELLANEOUS</b>		
R15	9B5-179	6800 ohm, 1/4 watt, 5%	44A-26374	Earphone receptacle	
R16	9B5-74	10K ohm, 1/4 watt, 10%	2D-26377	Volume control bracket	
R17	9B5-174	4300 ohm, 1/4 watt, 10%	32F2-5445	Volume knob screw	
R18	9B5-59	560 ohm, 1/4 watt, 5%	18A-26389	2 3/4" PM Speaker	
R19	9B1-99	82 ohm, 1/2 watt, 5%	14A-26469	Battery Cable	
R20	9B1-142	200 ohm, 1/2 watt, 5%	2M-26376	Antenna spring clip	
<b>CAPACITORS</b>			15B-24912	Transistor socket-large	
C14AB	8A-26384	Tuning condenser	15B-26420	Transistor socket-small	
C2-3	8G-26457	.01 mfd, 25 volt, ceramic	2M-26548	Heat sink clip	
C5	8N1-274	350 mmf, 500 volt, 5% mica	<b>CABINET PARTS</b>		
C6	8G-26459	.05 mfd, 25 volt, ceramic	5C-26542-A206	Case (T-100-1 & 2)-Yellow	
C7	8C-26454	50 mfd, 10 volt, lytic	5C-26542-A207	Case (T-100-3 & 4)-Red	
C8	8L-26471	10 mmf, 5%	5C-26542-A209	Case (T-100-5)-Blue grey	
C9	8G-26459	.05 mfd, 25 volt, ceramic	23C-26475	Raytheon crest	
C10		350 mmf (Incl. in T4)	2C-26505	Handle plate	
C11	8G-26459	.05 mfd, 25 volt, ceramic	62M-26504	Retainer pin	
C18	8C-26455	6 mfd, 3 volt, lytic	200-26448	Case cover (T-100-1 & 3)-Black	
C19	8C-26455	6 mfd, 3 volt, lytic	200-26448-1	Case cover (T-100-2 & 4 & 5)-Ivory	
C20	8C-26455	.01 mfd, 25 volt, ceramic	200-26449	Battery cover assy (T-100-1 & 2)-Yellow	
C21	8C-26453	6 mfd, 3 volt, lytic	200-26449-1	Battery cover assy (T-100-3 & 4)-Red	
C22	8G-26457	50 mfd, 3 volt, lytic	200-26449-2	Battery cover assy (T-100-5)-Blue grey	
		.01 mfd, 25 volt, ceramic	200-26408	Tuning knob	
			3M-26400	Tuning knob stud	
			5B-26356-A206	On-off volume knob (T-100-1 & 2)-Yellow	
			5B-26356-A207	On-off volume knob (T-100-3 & 4)-Red	
			5B-26356-A209	On-off volume knob (T-100-5)-Blue grey	
			22C-26460	9 Volt battery	
			25M-26538	Rubber cushion	

**SERVICE DATA**

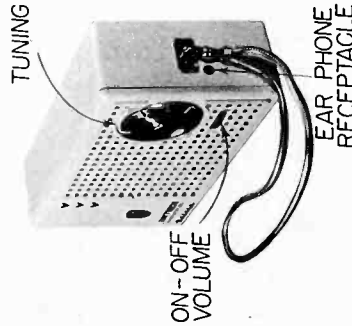
**SPECIFICATIONS**

Power Supply . . . . . 9 volts D.C.  
 Frequency Range . . . . . 540 to 1600 KC  
 Intermediate Frequency . . . . . 455 KC  
 Selectivity . . . . . At 1000 KC, 52 KC at 1000 X signal  
 Sensitivity . . . . . 200 u. v. per meter  
 Power Output . . . . . 50 m. w.  
 Speaker . . . . . 2 3/4" PM, V.C. impedance-15 ohms  
 Cabinet . . . . . 6 1/4" width, 1 3/4" depth, 3-3/8" height

TRANSISTOR COMPLEMENT	
RT1	CK-760 or 2N112
RT2	CK-760 or 2N112
RT3	CK-760 or 2N112
RT4	2N132
RT5	2N138
RT6	2N138
	CK-706A
	Crystal Detector

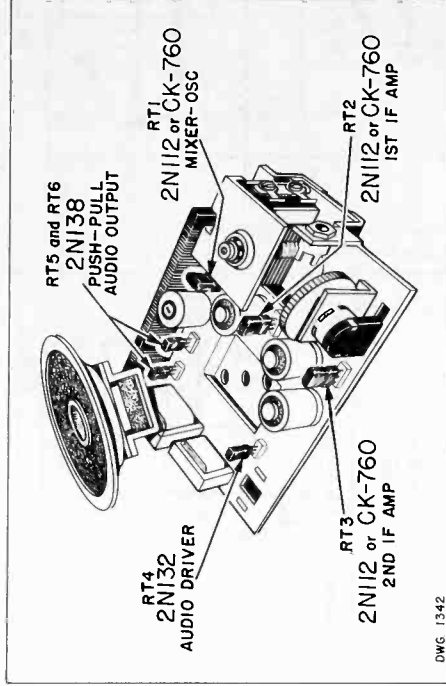
# RAYTHEON

**6RT1 CHASSIS**



MODELS T-150-1, T-150-2, T-150-3, T-150-4 and T-150-5

## TRANSISTORIZED PORTABLE RADIO



DWG. 1342

**TRANSISTOR LOCATION**

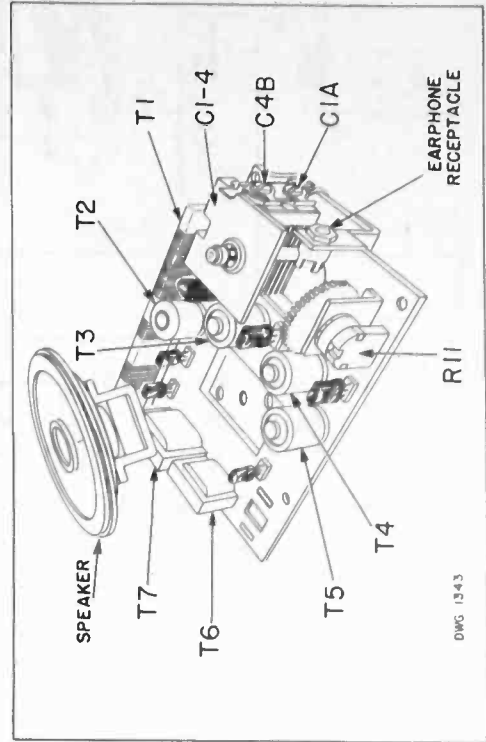
**TRANSISTOR SERVICING**

If a transistor is suspected of being defective, substitution will be the only reliable check. Checking resistance readings between the transistor elements with an ohmmeter will indicate only a shorted or open transistor. Under certain circumstances, damage to the transistor may result, therefore, this method is not recommended. When inserting a transistor in its socket, make sure the transistor leads line up with the socket holes. The schematic diagram illustrates that the audio transistors, type 2N132 and 2N138, have equal spacing between the transistor leads, therefore the red dot on the audio transistor must line up with the paint dot on the chassis. Do not rearrange placement of transistors; under certain circumstances, especially in the RF or IF circuits, slight realignment may be necessary after a transistor substitution is made. If a component is replaced which must be soldered to the transistor socket, remove the transistor from its socket before soldering as excessive heat may damage the transistor. When attempting any soldering, a low wattage small diameter tip iron is suggested. Heat may also damage other components, therefore, dissipate the heat by grasping the component lead with a long nose pliers. When checking the receiver with an ohmmeter remove the circuit transistor for accurate readings.

**ALIGNMENT PROCEDURE**

- NOTES:** 1. Remove chassis from case.  
 2. Connect 9 volt battery.  
 3. Use output meter with 15 ohms impedance.  
 4. Turn volume control to maximum.  
 5. Signal generator output at 100 microvolts, 30% modulation at 400 cycles.

CIRCUIT	SIGNAL GENERATOR		OUTPUT METER	GANGED CAPACITY	ADJUST FOR OUTPUT ON METER
	FREQUENCY	COUPLING CAPACITY			
I.F.	455KC	.5MF	To Base of RT1	To Chassis	T3, T4 and T5
Repeat above step two or three times for best results, keeping generator output in all cases as low as possible to prevent overloading of audio.					
Osc.	1620KC	.5MF	To Base of RT1	To Chassis	C4B
Caution: Too high an output from signal generator may cause setting of trimmer on a spurious response.					
Osc.	535KC	.5MF	To Base of RT1	To Chassis	T2
Osc.	1620KC	.5MF	To Base of RT1	To Chassis	C4B
Ant.	1400KC	Connect 3 turn loop to generator and place near T1.		Ganged Condenser should be rocked	C1A
Check for alignment and dial calibration at 1000KC and 600KC.					



DWG 1343

**REMOVING CHASSIS FROM CASE**

1. Remove battery.
2. Remove tuning knob stud by turning counterclockwise and remove tuning knob.
3. Remove case cover mounting screw located behind tuning knob and remove case cover.
4. Remove three chassis mounting screws.
5. Carefully remove chassis from case allowing battery cable to slip through battery compartment hole.

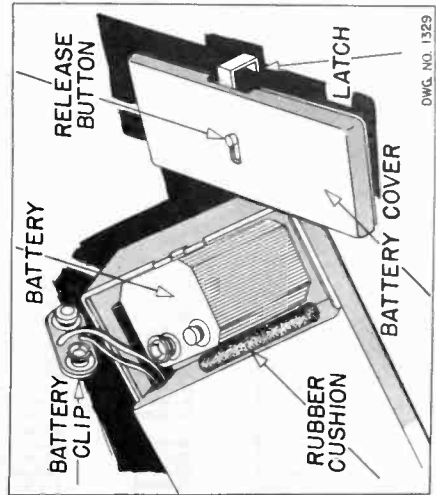
**BATTERY REPLACEMENT**

Since the receiver is small and compact, not every 9 volt battery will fit in the space provided. Listed below are three common manufactured types to be used for replacement.

- BURGESS NO-2N6
- EVEREADY NO-246
- OLIN NO-1707

Approximately 150 hours performance can be experienced with the above batteries before replacement is required. Battery replacement should be performed when the sound output is noticed to be muffled or distorted with a decrease in total output or if a voltage measurement shows less than 6 volts. The battery voltage should be measured with the receiver turned on after at least 5 minutes of operation.

When battery replacement is necessary, remove battery cover by pushing release button upward, grasp latch and pull up and away from case. Remove old battery and un-snap battery cable. Snap battery cable on replacement battery and insert into case. Be sure rubber cushion is between battery and side wall of case to prevent battery movement. Insert battery cover in place and push latch down.



DWG. NO. 1329

**BATTERY LOCATION**

**CIRCUIT CHANGES**

CODE	REASON	CHANGE
No Code	Reduce Treble	3rd IF Transformer (T5) changed from 13B-26382 to 13B-26600 C19 changed from .02 mfd; 25 volt to .05 mfd; 25 volt.
No Code	Increase Sensitivity	Tuning condenser (C1AB-4AB) changed from 8A-26384 to 8A-26659.
No Code	Provide Better Frequency Response	Speaker Part No. changed from 18A-26389 to 18A-26777.
Yellow splash on Tuning Condenser	To Facilitate Production	R5 - 1000 ohm, 1/4 watt, 10%, deleted. R8 - 1000 ohm, 1/4 watt, 10%, deleted. C-9 - .05 mfd; 25 volt, deleted. C20 - 1500 mmf; 25 volt, deleted. C6 changed from .05 mfd; 25 volt to .02 mfd; 25 volt. C11 changed from .05 mfd; 25 volt to .02 mfd; 25 volt. C18 changed from 50 mfd; 3 volt to 6 mfd; 3 volt C22 changed from .02 mfd; 25 volt to .01 mfd; 25 volt. R14 changed from 1500 ohm, 1/4 watt, 10% to 5100 ohm, 1/4 watt, 5% R15 changed from 6800 ohm, 1/4 watt, 10% to 27K ohm, 1/4 watt, 10%. R20 changed from 100 ohm, 1/4 watt, 10% to 470 ohm, 1/4 watt, 10%. R5 - 5100 ohm, 1/4 watt, 5% added. R8 - 27K ohm, 1/4 watt, 10% added. C9 - 1000 mmf, ceramic added.

**PARTS LIST**

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
R5	985-176	Resistors	C9	8G-26978	1000 mmf, 500 volt, disk
R8	985-79	5100 ohm, 1/4 watt, 5%	C11	8G-26456	.02 mfd, 25 volt, ceramic
R14	985-176	27K ohm, 1/4 watt, 10%	C18	8C-26455	6 mfd, 3 volt, lyric
R15	985-79	5100 ohm, 1/4 watt, 5%	C19	8G-26459	.05 mfd, 25 volt, ceramic
R17	985-69	27K ohm, 1/4 watt, 10%	C20	Deleted	Deleted
R17	985-69	3900 ohm, 1/4 watt, 10%	C22	8G-26879	.01 mfd, 25 volt, ceramic
R20	981-58	470 ohm, 1/2 watt, 10%	T5	13B-26600	3rd IF transformer
C1AB-4AB	8A-26659	Tuning condenser	<b>Transformers</b>		
C6	8G-26456	.02 mfd, 25 volt, ceramic	<b>Miscellaneous</b>		
				18A-26777	2 3/4" PM speaker

**TRANSISTOR SERVICING**

The following information is presented as a guide to servicing transistor radios:

transistors in the circuit. It is advisable to remove all transistors from their sockets before making ohmmeter checks.

**VOLTAGE READINGS**

Because of the low battery potential, it is suggested that a VTVM be used to measure all circuit voltages. Voltage readings will vary with the strength of the signal being received, the battery voltage, and the type voltmeter being used. The voltage readings indicated on the schematic diagram were measured with a VTVM, no signal input, and with a battery voltage of 9 volts. Voltage readings will also vary with a change of transistors. The transistors conductivity varies to one transistor to another, therefore, voltage readings will differ. All voltage readings will be negative with respect to chassis due to the PNP type transistor employed.

**SOLDERING**

Caution must be observed when using a soldering iron as excessive heat may easily damage a transistor. The transistors must be removed from their sockets before soldering at the socket pins. Heat may also damage other components such as 1/4 watt resistors. Therefore, dissipate the heat to the component by grasping the component lead with a pair of long nose pliers. A low wattage small diameter tip iron is suggested.

**TRANSISTORS**

If a transistor is suspected of being defective, substitution will be the only reliable check. Checking resistance readings of a transistor with an ohmmeter will indicate only a shorted or open transistor. When inserting a transistor in its socket, make sure the transistor's leads line up with the socket holes. Illustrations on the schematic diagram show the spacing between transistor's leads and the transistor sockets. Audio transistors have a red dot on the body of the transistor adjacent to the collector lead for identifying purposes. The red dot must line up with a paint dot on the chassis when the transistor is inserted into the socket. If a transistor substitution is made in the RF or IF circuit, realignment may be necessary. This is due to the difference in operating characteristics from one transistor to another.

**COMPONENT REPLACEMENT**

An important consideration is component replacement. Mixture as well as close tolerance components are used throughout the radio, therefore, all components must be replaced with exact duplicate parts.

**TROUBLE SHOOTING**

Trouble in a transistor radio can easily be isolated by using a signal generator and listening to the speaker. Circuit tracing from the base of the output stage back through the receiver to the antenna, should quickly reveal which stage is not functioning properly. When injecting the signal, use a 50 mfd lyric, negative to base, in the audio circuit; a .5 mfd capacitor in the IF or RF stages and inductive coupling to the antenna.

Caution must be observed not to accidentally short the collector circuit to the chassis, as damage to the transistor may result. Also, the practice of deliberately shorting a circuit to chassis to determine if voltage is present or to listen for click in the speaker, must be avoided for the same reason.

**OHMMETER READINGS**

When using an ohmmeter to check continuity and resistance readings, caution must be observed. It is important to know the internal battery voltage of the ohmmeter as damage could result due to excessive voltage being applied to the circuit by the ohmmeter. It is also important to know the battery polarity of the meter leads. Incorrectly placing the ohmmeter leads across a lyric capacitor with a low working voltage may damage the capacitor due to excessive reverse current. If the meter battery voltage is greater than 12 volts, the high frequency transistor rating will be exceeded and may be damaged. A diode action will be experienced when attempting to check the resistance readings with the

# RAYTHEON

## 7RT1 CHASSIS



MODELS 8TP1, 8TP2, 8TP3 AND 8TP4

# TRANSISTORIZED PORTABLE RADIO

## REPLACEMENT PARTS LIST

REF. No.	PART No.	DESCRIPTION	REF. No.	PART No.	DESCRIPTION
R1	981-153	560 ohm, 1/2 watt, 5%			Transformers & Coils (Continued)
R2	981-215	220K ohm, 1/2 watt, 5%	T4	12C-25652	Input Audio Transformer
R3	981-159	1000 ohm, 1/2 watt, 5%	T5	12C-25653	Interstage Audio Transformer
R4	981-175	4700 ohm, 1/2 watt, 5%	T6	12C-25654	Driver Audio Transformer
R5	981-167	1500 ohm, 1/2 watt, 5%	T7	12C-24928	Audio Output Transformer
R6	981-159	1000 ohm, 1/2 watt, 5%	L1	13M-24951	Intermediate IF Coil
R7	981-173	3900 ohm, 1/2 watt, 5%	L2	13B-24950	Output IF Coil
R8	981-50	100 ohm, 1/2 watt, 10%			MISCELLANEOUS
R9	981-145	270 ohm, 1/2 watt, 5%		200-25690	Control mtg. plate ass'y. (Inc. 3 items below)
R10	981-149	300 ohm, 1/2 watt, 5%		2C-24895	Control mounting plate
R11	981-171	1000 ohm, 1/2 watt, 5%		38A-24891	Antenna rod saddle
R12	981-172	1000 ohm, 1/2 watt, 5%		12C-25652	Input audio transformer
R13	981-159	1000 ohm, 1/2 watt, 5%		200-24946	Battery cap contact & bracket ass'y.
R14	981-199	47K ohm, 1/2 watt, 5%		15B-24912	Transistor socket 3-pin
R15	981-151	470 ohm, 1/2 watt, 5%		2M-24947	Socket mounting clip
R16	981-174	4300 ohm, 1/2 watt, 5%		18A-25271	3 1/2" PM Speaker
R17	981-174	22K ohm, 1/2 watt, 5%		43D-19967	Bracket
R18	981-191	22K ohm, 1/2 watt, 5%		2D-25313	L2 mounting clip
R19	10A-24886	Volume control and switch		200-24948	Battery base insulator and contact assembly
R20	981-171	3300 ohm, 1/2 watt, 5%		200-25689	Transistor mounting plate ass'y.
R21	981-156	750 ohm, 1/2 watt, 5%		8M-25351	Transistor mounting plate
R22	981-155	680 ohm, 1/2 watt, 5%		8M-25359	Transistor
R23	981-215	220K ohm, 1/2 watt, 5%		CK-751	Transistor
R24	981-155	680 ohm, 1/2 watt, 5%		CK-759	Transistor
R25	981-171	3300 ohm, 1/2 watt, 5%		CK-760	Transistor
R26	981-169	2700 ohm, 1/2 watt, 5%			CAPACITORS
R27	981-135	100 ohm, 1/2 watt, 5%			Variable capacitor
R28	981-50	100 ohm, 1/2 watt, 10%			.01 mfd, 200 volt, paper
C1A-B	8A-24879	Variable capacitor			300 mfd, 500 volt, mica
C1	8D-21820	01 mfd, 200 volt, paper			068 mfd, 200 volt, paper
C2	8F15-239	300 mfd, 500 volt, mica			.047 mfd, 200 volt, paper
C3	8D-24904	068 mfd, 200 volt, paper			1500 mfd, ceramic
C4	8D-21823	.047 mfd, 200 volt, paper			.1 mfd, 200 volt, paper
C5-6	8G-24994	1500 mfd, ceramic			.0047 mfd, 200 volt, paper
C7	8M-25399	.1 mfd, 200 volt, paper			.047 mfd, 200 volt, paper
C8	8D-21823	7 mfd, ceramic			.068 mfd, 200 volt, paper
C9	8M-25399	.068 mfd, 200 volt, paper			390 mfd, 500 volt, mica
C10	8D-21819	390 mfd, 500 volt, mica			22 mfd, ceramic
C11	8G-24973	22 mfd, ceramic			390 mfd, 500 volt, mica
C12	8D-24904	390 mfd, 500 volt, mica			470 mfd, ceramic
C13	8F15-239	470 mfd, ceramic			2 mfd, 6 volt, lyric
C14	8G-13909	2 mfd, 6 volt, lyric			.1 mfd, 200 volt, lyric
C15	8F15-239	.1 mfd, 200 volt, lyric			2 mfd, 6 volt, lyric
C16	8C-11732	2 mfd, 6 volt, lyric			50 mfd, 6 volt, lyric
C17	8C-25013	50 mfd, 6 volt, lyric			.022 mfd, 200 volt, paper
C18	8M-25399	.022 mfd, 200 volt, paper			50 mfd, 6 volt, paper
C19	8C-24903	50 mfd, 6 volt, paper			
C20	8C-25445	50 mfd, 6 volt, paper			TRANSFORMERS AND COILS
C21	8C-24903	50 mfd, 6 volt, paper			13E-25614
C22-23	8D-21822	50 mfd, 6 volt, paper			Oscillator coil
C24	8K-23086	50 mfd, 6 volt, paper			13D-25683
C25	8C-24903	50 mfd, 6 volt, paper			13A-24949
C26					Input IF Transformer
T1					
T2					
T3					

CHASSIS (RT1)

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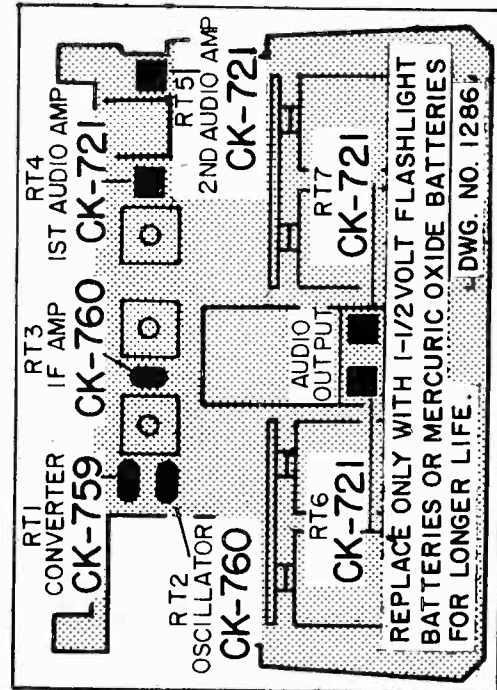
**SERVICE DATA**

**SPECIFICATIONS**

Power Supply	..... 6 volts D.C.
Frequency Range	..... 540 to 1600 KC
Intermediate Frequency	..... 455 KC
Selectivity	..... At 1000 KC, 52. KC at 1000 x signal
Sensitivity	..... .200 u. v. per meter
Power Output	..... 100 m. w.
Speaker	..... 3½" PM, v.c. impedance 15 ohms
Cabinet	..... 9½" width, 2¼" depth, 7" height

**TRANSISTOR COMPLEMENT**

Converter	CK-759
Oscillator	CK-760
IF Amplifier	CK-760
1st Audio Amp.	CK-721
2nd Audio Amp.	CK-721
Audio Output	CK-721
Audio Output	CK-721



TRANSISTOR LOCATION

**TRANSISTOR REPLACEMENT**

If a transistor is suspected of being defective, substitution will be the only reliable check. Note that sockets are provided for the converter and oscillator transistors while the remaining transistors are soldered in place. If a component is replaced which must be soldered to one of the two transistor sockets, remove the transistor from its socket before soldering. Excessive heat may damage the transistor. Also, when using a soldering iron at a terminal to which a transistor lead is soldered, dissipate the heat by grasping the transistor lead with a long nose pliers. Do not rearrange placement of transistors; under certain circumstances, especially in the RF stages, slight realignment may be required when a transistor substitution is made. When checking the receiver with an ohmmeter, either remove the circuits transistor from its socket or unsolder the transistor base lead for accurate readings.

**BATTERY REPLACEMENT**

Since the receiver is small and compact four batteries supply all the required power. When replacement is necessary, replace with type "D", 1½ volt, flashlight batteries, the same as used in any ordinary flashlight or for longer battery life, the mercuric oxide type batteries can be used. Remove back cover and replace all four old batteries by pulling straight out and insert new batteries with positive terminal (+) up as indicated in the accompanying diagram.

Approximately 500 hours performance can be expected with ordinary flashlight batteries corresponding to approximately 2500 hours on mercuric oxide batteries. Battery replacements should be performed when the sound output is noticed to be muffled or distorted with a decrease in total output. It is suggested that all four batteries be replaced at the same time.

**ALIGNMENT PROCEDURE**

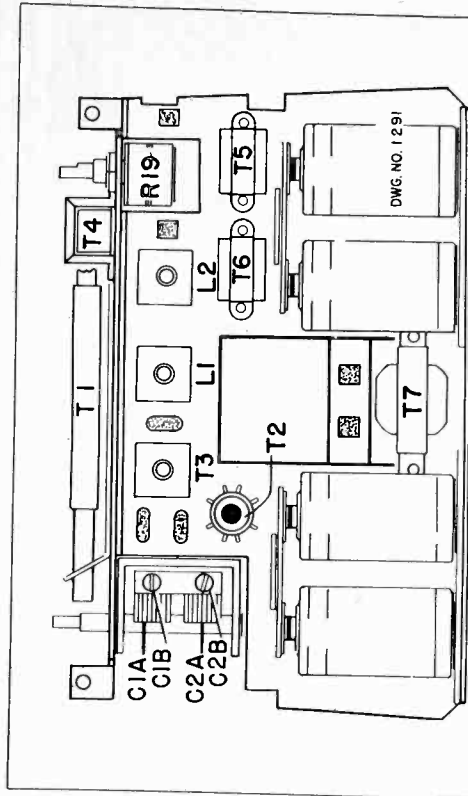
- NOTES:**
1. Turn Volume Control off. (Full counter-clockwise)
  2. Use output meter with 15 ohms impedance
  3. Insert four size "D" cells in proper positions. (Positive side towards top of chassis)
  4. Turn Volume Control on. (Full clockwise position)
  5. Signal generator output at 100 microvolts, 30% modulation at 400 cycles.
  6. Both knobs must be in place.

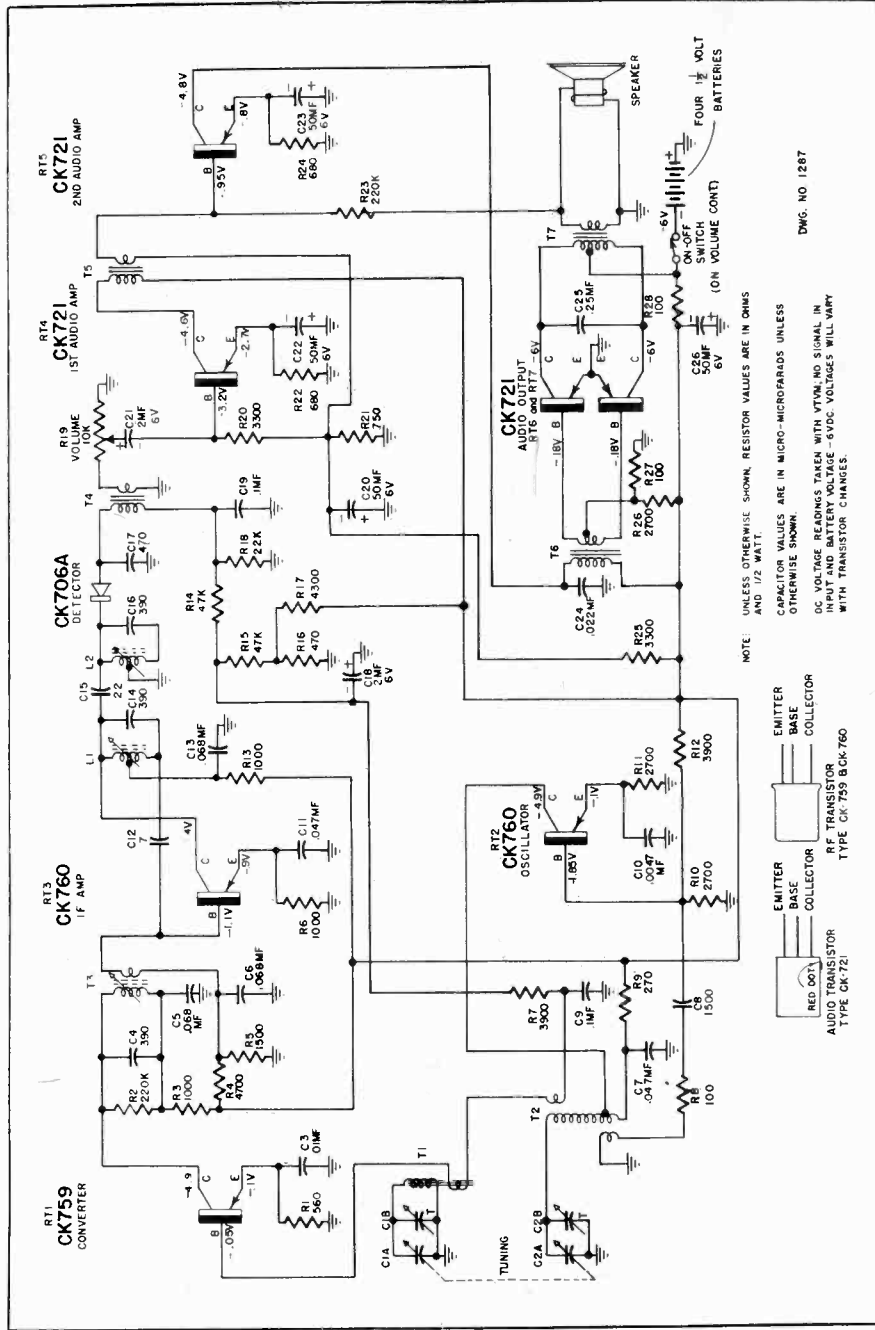
SIGNAL GENERATOR			ADJUST FOR MAXIMUM OUTPUT IN METER
FREQUENCY	COUPLING CAPACITY TO RADIO	GROUND SIDE	GANGED CAPACITY
I.F.	.5MF	To Base of RT1	.....
Osc.	.5MF	To Chassis	Open Gang (Fully clockwise)
Ant.	1400KC.	Connect 3 turn loop to generator and place near T1.	Ganged Condenser should be rocked.

Repeat above step two or three times for best results, keeping generator output in all cases as low as possible to prevent overloading of audio.

Caution: Too high an input from signal generator may cause setting of trimmer on a spurious response.

Check for alignment and dial calibration at 1000 KC and 600KC.





SCHEMATIC DIAGRAM







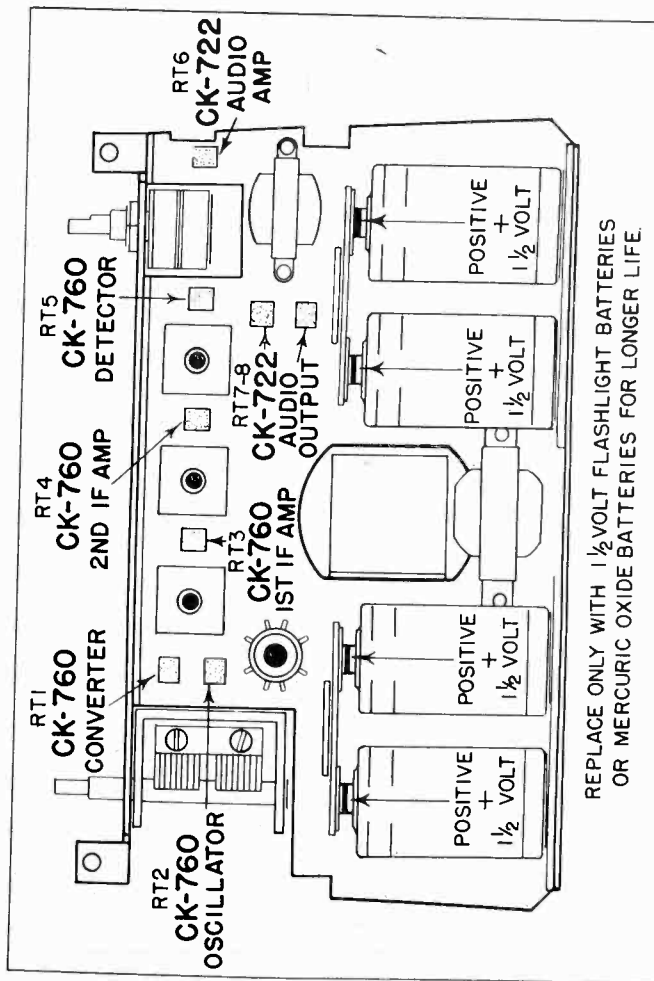
# SERVICE DATA

## SPECIFICATIONS

Power Supply	..... 6 volts D.C.
Frequency Range	..... 540 to 1600 KC
Intermediate Freq.	..... 455 KC
Selectivity	..... At 1000 KC, 52 KC at 1000 x signal
Sensitivity	..... 200 u.c. per meter
Power Output	..... 100 m.w.
Speaker	..... 3 1/2" PM, v.c. impedance 650 to 15 ohms
Cabinet	..... 9 1/2" width, 2 3/4" depth, 7" height

## TRANSISTOR COMPLEMENT

RT1	CK-760	Converter
RT2	CK-760	Oscillator
RT3	CK-760	1st IF Amp.
RT4	CK-760	2nd IF Amp.
RT5	CK-760	Detector
RT6	CK-722	Audio Amp.
RT7	CK-722	Audio Output
RT8	CK-722	Audio Output



REPLACE ONLY WITH 1 1/2 VOLT FLASHLIGHT BATTERIES OR MERCURIUM OXIDE BATTERIES FOR LONGER LIFE.

DWG. NO. 1224

## TRANSISTOR LOCATION

## TRANSISTOR REPLACEMENT

If a Transistor is suspected of being defective, substitution will be the only reliable check. When inserting a Transistor in its socket, the Red Dot on the Transistor must line up with the dimple on the socket. Do not rearrange placement of Transistors, under certain circumstances, especially in the RF section, slight realignment may be required when a Transistor substitution is made. If a component is replaced which must be soldered to the transistor socket, remove the Transistor from its socket before soldering. Excessive heat may damage the Transistor. When checking receiver with an ohmmeter remove all transistors for accurate readings.

## BATTERY REPLACEMENT

Since the receiver is small and compact, four batteries supply all the required power. When replacement is necessary, replace with type "D", 1 1/2 volt, flashlight batteries, the same as used in any ordinary flashlight or for longer battery life, the mercuric oxide type batteries can be used. Remove back cover and replace all four old batteries by pulling straight out and insert new batteries with positive terminal (+) up as indicated in the accompanying diagram.

Approximately 500 hours performance can be expected with ordinary flashlight batteries corresponding to approximately 2500 hours on mercuric oxide batteries. Battery replacements should be performed when the sound output is noticed to be muffled or distorted with a decrease in total output.

It is suggested that all four batteries be replaced at the same time.

## ALIGNMENT PROCEDURE

1. Turn Volume Control off. (Full counter-clockwise)
2. Use output meter with 15 ohms impedance
3. Insert four size "D" cells in proper positions. (Positive side towards top of chassis)
4. Turn Volume Control on. (Full clockwise position)
5. Signal generator output at 100 microvolts, 30% modulation at 400 cycles.
6. Both knobs must be in place.

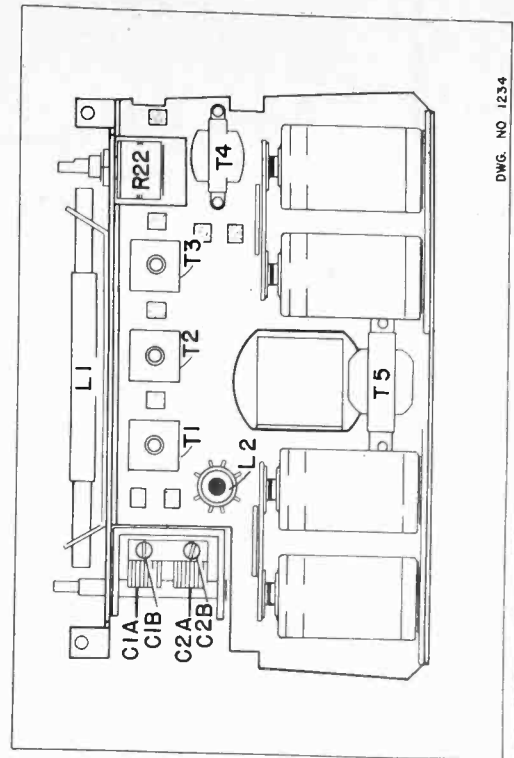
I.F.	SIGNAL GENERATOR		GROUND SIDE	OUTPUT METER	GANGED CAPACITY	ADJUST FOR MAXIMUM OUTPUT IN METER.
	FREQUENCY	COUPLING CAPACITY				
	455KC	.5MF.	To Base of RT1	Connected in place of speaker		Top cores of T3, T2 & T1
Osc.	1620KC	.5MF.	To base of RT1	Connected in place of speaker	Open Gang (Fully clockwise)	Adjust C 28
Ant.	1400KC.			Connected in place of speaker	Ganged Condenser should be rocked.	Adjust C 18

Repeat above step two or three times for best results, keeping generator output in all cases as low as possible as to prevent overloading of audio.

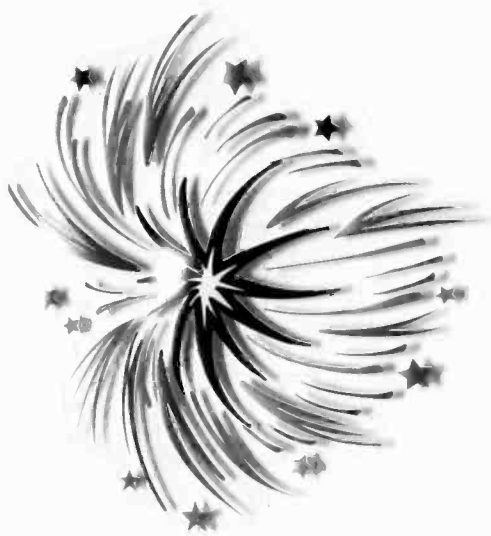
Caution: Too high an input from signal generator may cause setting of trimmer on a spurious response.

Connect 3 turn loop to generator and place near loop on receiver.

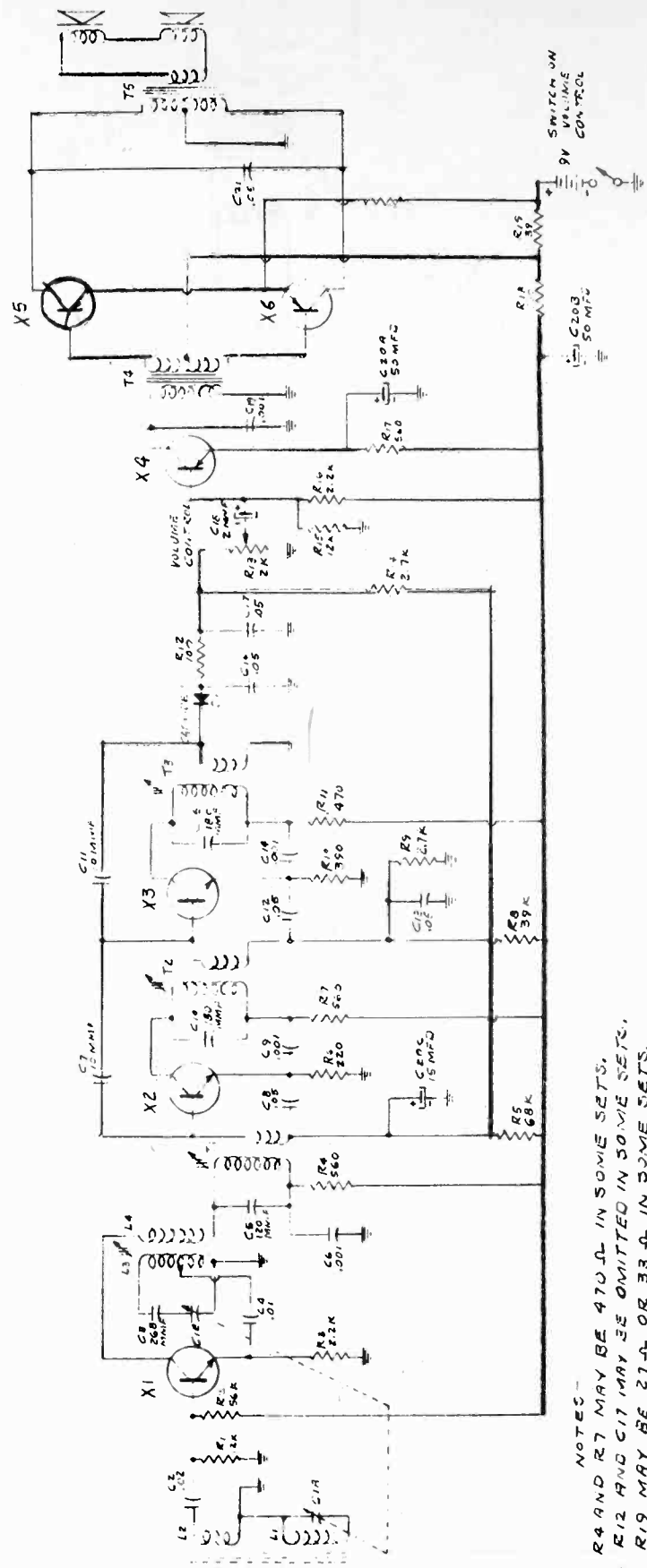
Check for alignment and dial calibration at 1000 KC and 600KC.



DWG. NO. 1234



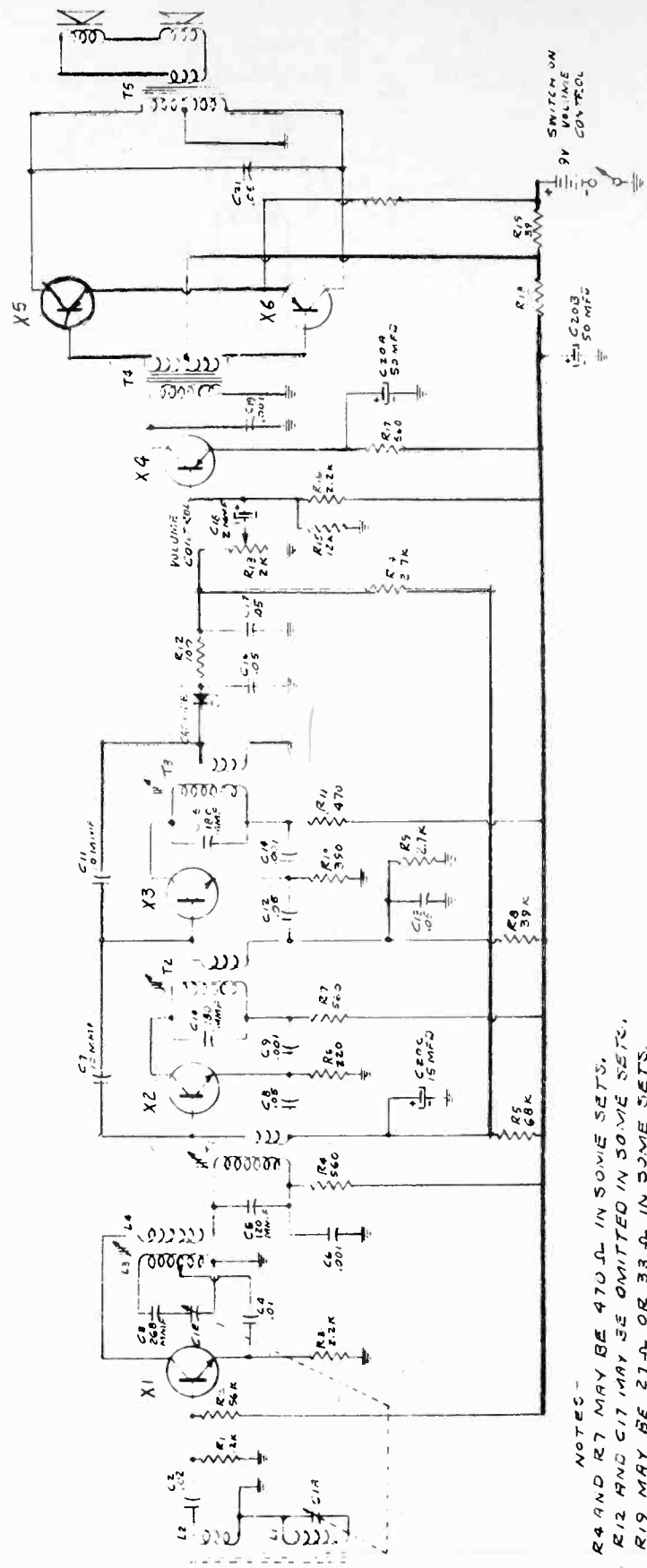
300-634 REV.  
SCHEMATIC



- NOTES-
1. R4 AND R7 MAY BE 470Ω IN SOME SETS.
  2. R12 AND C17 MAY BE OMITTED IN SOME SETS.
  3. R19 MAY BE 27Ω OR 33Ω IN SOME SETS.

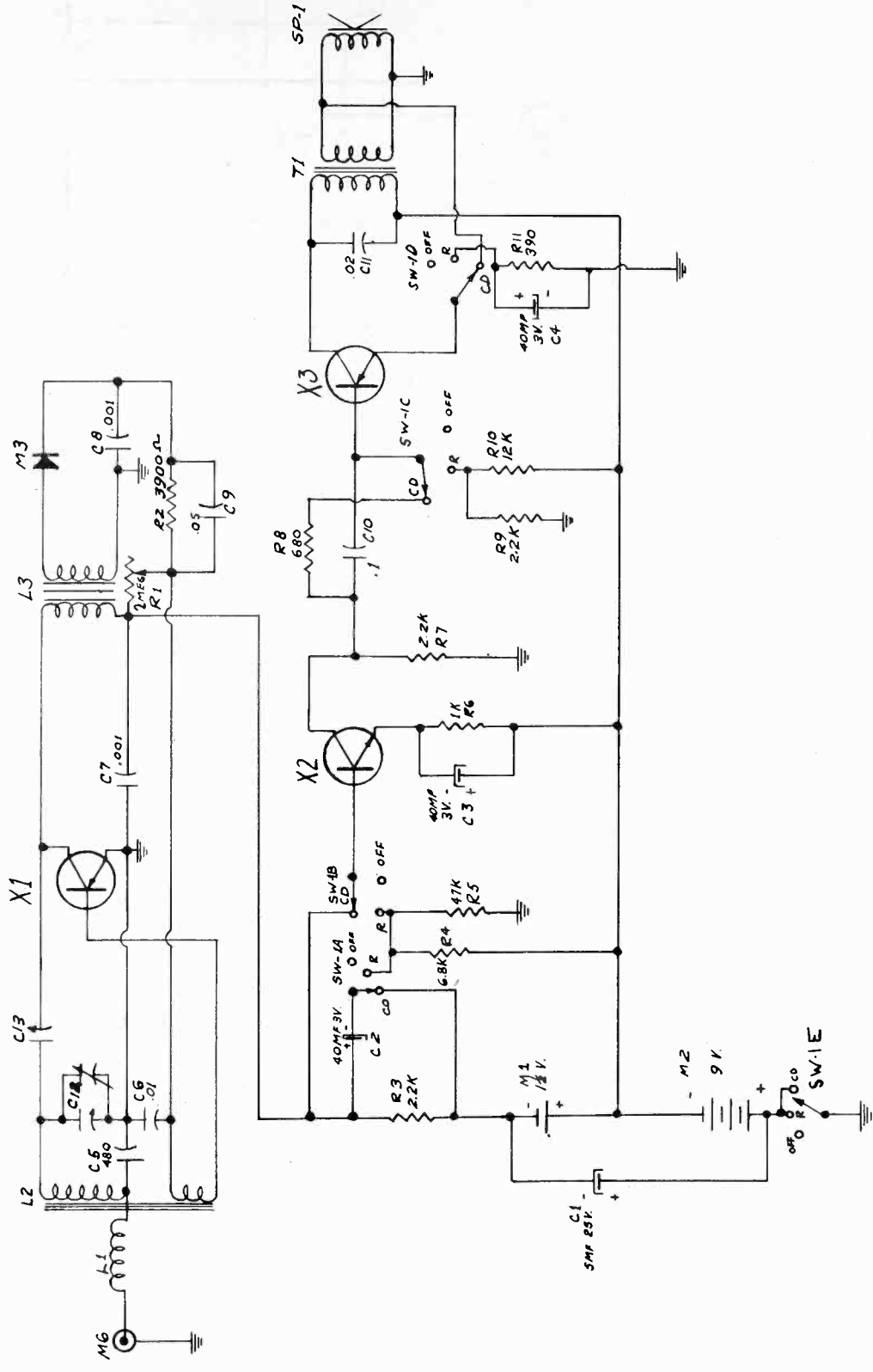


300-634 REV.  
SCHEMATIC

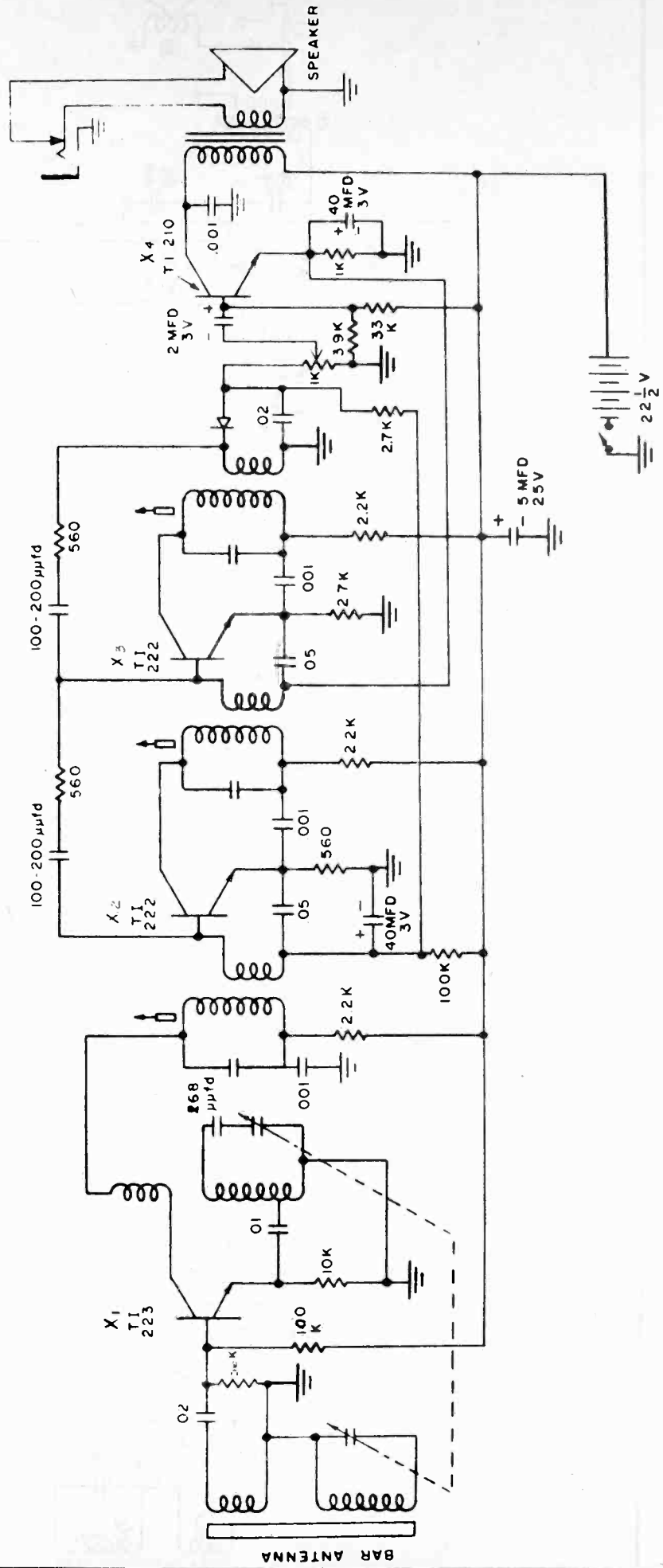


- NOTES -
1. R4 AND R7 MAY BE 470Ω IN SOME SETS.
  2. R12 AND C17 MAY BE OMITTED IN SOME SETS.
  3. R19 MAY BE 27Ω OR 33Ω IN SOME SETS.

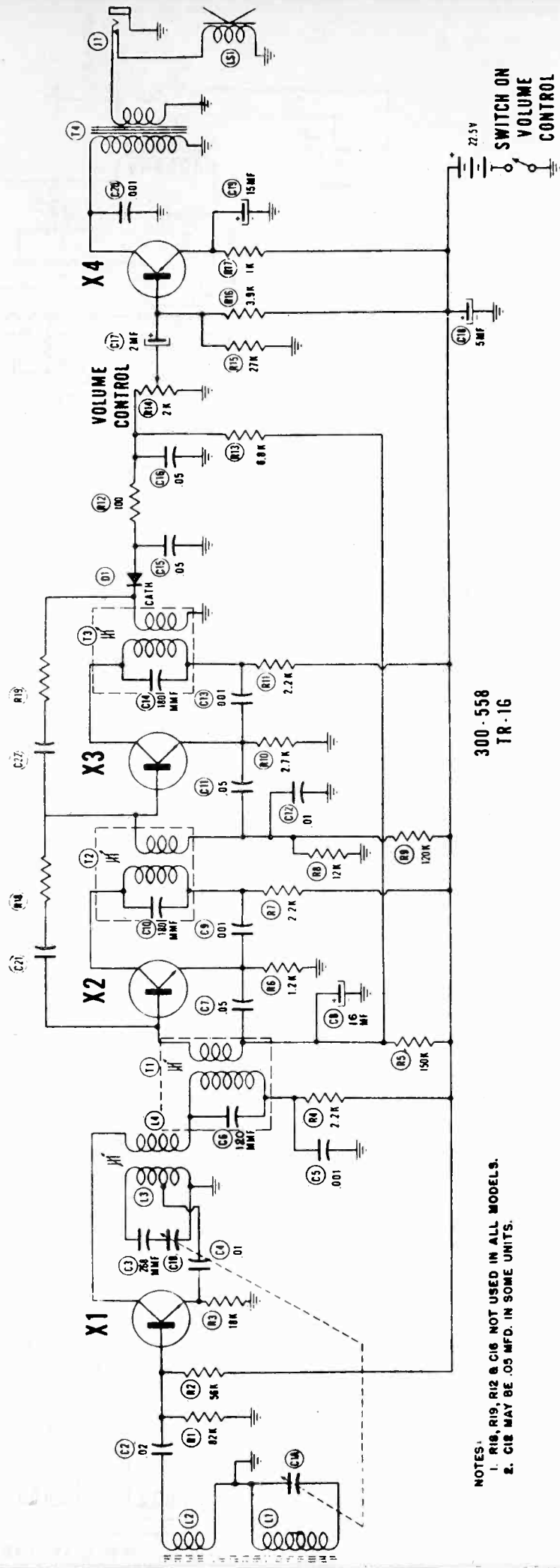
300-665 REV. V  
SCHEMATIC



500-437

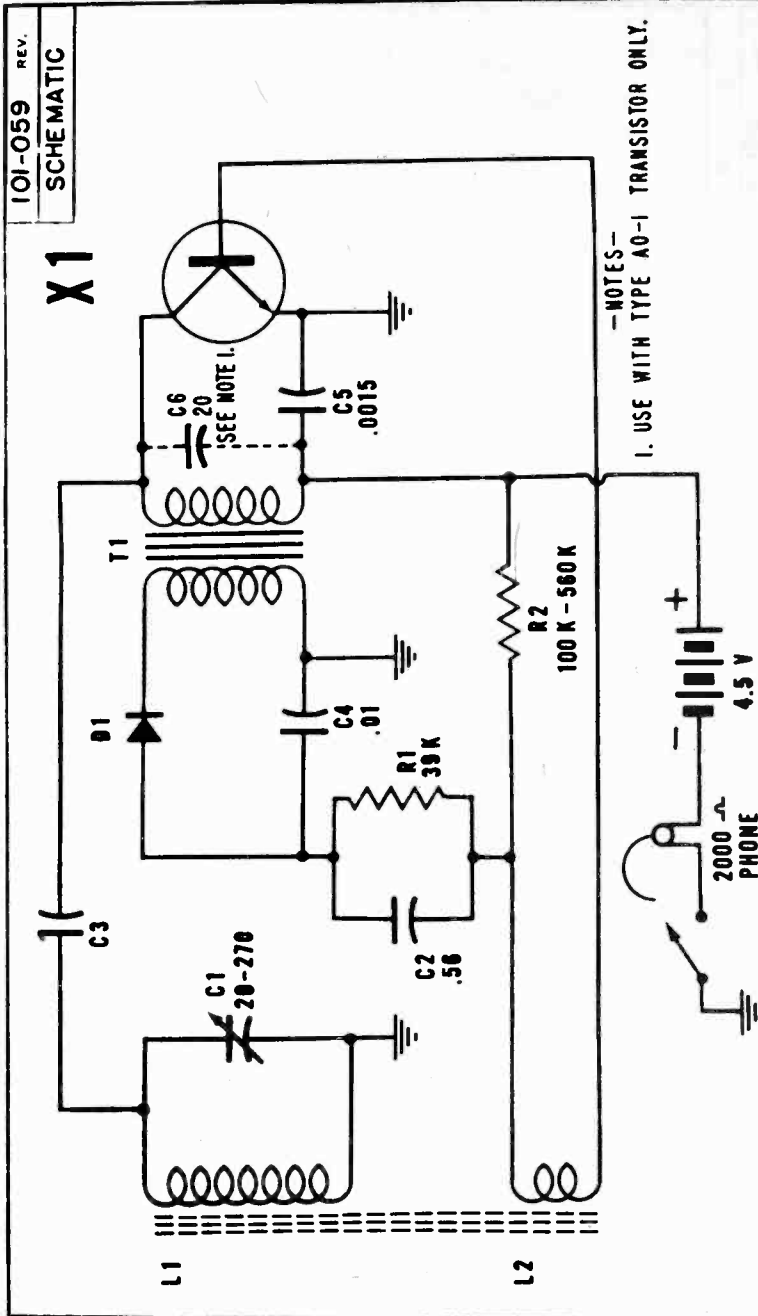


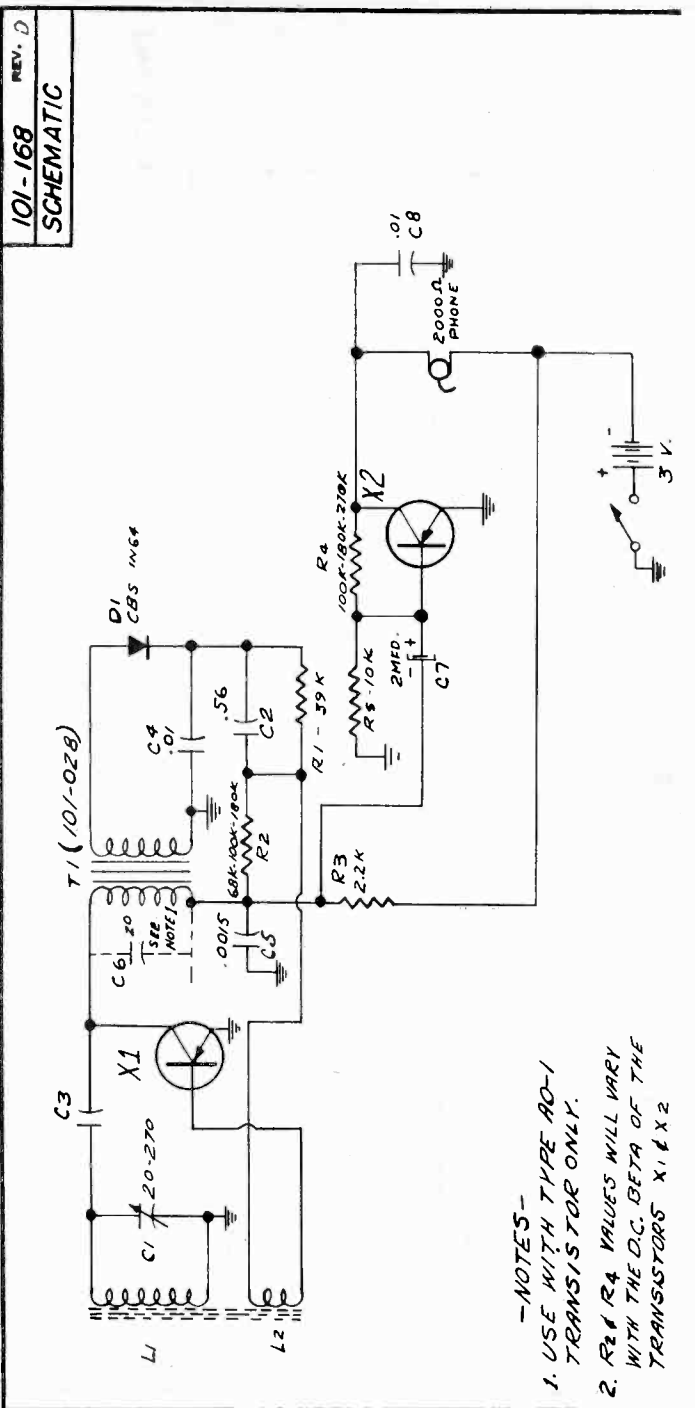
300-558 REV.  
SCHEMATIC



- NOTES:
- 1. R18, R19, R12 & C18 NOT USED IN ALL MODELS.
  - 2. C18 MAY BE .05 MFD. IN SOME UNITS.

300-558  
TR-1G





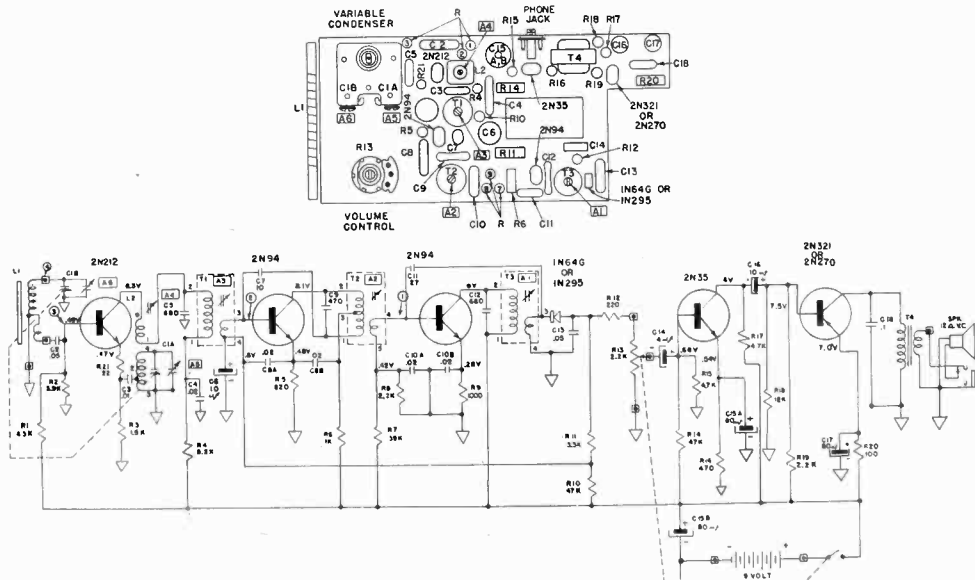
**MODEL NUMBERS**

8204
8206
8208

**PARTS LIST**  
for  
*Silvertone*  
**RADIO**

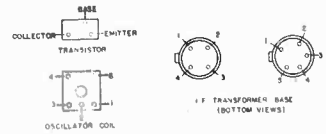
**PARTS LIST FOR SILVERTONE RADIO CHASSIS 132.42501**

SCHEMATIC LOCATION	PART NO.	DESCRIPTION	SCHEMATIC LOCATION	PART NO.	DESCRIPTION
<b>CAPACITORS</b>					
C1A, B	44730	Variable	R18	22381-123	12K., 1/2W., 10%
C2, 13	43674-9	.05 mfd., Disc.	R20	44052-101	100 ohm, 1/2W., 5%
C3	43674-11	.01 mfd., Disc.	R21	22381-220	22 ohm, 1/2W., 10%
C4	43674-13	.02 mfd., Disc.	<b>COILS &amp; TRANSFORMERS</b>		
C5, 12	44398-681	680 mmfd., Mica	L1	44511-2	Antenna Rod
C6, 16	44279-6	10 mfd., 10V., Elect.	L2	44383-5	Coil, Oscillator
C7	43957-12	10 mmfd., Disc.	T1	44855-1	Transformer, I.F., 1st
C8, 10	43956	.02 mfd., Dual Disc	T2	44855-2	Transformer, I.F., 2nd
C9	44398-471	470 mmfd., Mica	T3	44855-3	Transformer, I.F., 3rd
C11	43957-9	27 mmfd., Disc.	T4	44858	Transformer, Output
C14	44396-1	4 mfd., 10V., Elect.	<b>MISCELLANEOUS</b>		
C15A, B	44397-2	80-80 mfd./10V., Elect.	44875-59	Cabinet Assembly, Gray - 8204	
C17	44279-7	80 mfd./10V., Elect.	44875-83	Cabinet Assembly, Coral - 8206	
C18	44684-6	.1 mfd., Disc.	44875-29	Cabinet Assembly, Black - 8208	
<b>RESISTORS</b>					
R1	22382-433	43K., 1/2W., 5%	44728-59	Knob, Volume & On-Off, Gray - 8204	
R2	22382-392	3900 ohm, 1/2W., 5%	44728-83	Knob, Volume & On-Off, Coral - 8206	
R3	22381-152	1500 ohm, 1/2W., 10%	44728-29	Knob, Volume & On-Off, Black - 8208	
R4	22381-822	8200 ohm, 1/2W., 10%	44915	Knob, Tuning	
R5	22382-821	820 ohm, 1/2W., 5%	44917	Handle	
R6	43689-102	1000 ohm, 1/2W., 10%	44280	Speaker, 2 3/4" P.M., 12 ohm	
R7	22381-393	39K., 1/2W., 10%	44548	Earphone Jack	
R8, 19	22381-222	2200 ohm, 1/2W., 10%	45000-2	Control, Volume & Switch, 2200 ohm	
R9	22381-102	1000 ohm, 1/2W., 10%	45084-1	Battery Snap Assembly - Male	
R10	22382-473	47K., 1/2W., 5%	44992-1	Battery Snap Assembly - Female	
R11	44052-332	3300 ohm, 1/2W., 5%	44877-2	Instruction Leaflet	
R12	20061-221	220 ohm, 1/2W., 20%			
R14	43689-473	47K., 1/2W., 10%			
R15, 17	22381-472	4700 ohm, 1/2W., 10%			
R16	22381-471	470 ohm, 1/2W., 10%			



SIGNAL TEST POINT	TEST FREQUENCY	SERIES CAPACITOR TO GENERATOR (0.5 V ACROSS V <sub>CE</sub> )	INPUT FOR MFT OUTPUT (0.5 V ACROSS V <sub>CE</sub> )
ⓐ	488 KC	.05 μf	8000 μv
ⓑ	488 KC	.05 μf	70 μv
ⓒ	488 KC	.05 μf	4 μv
ⓓ	1000 KC	STANDARD LOOP	300 μv

RESISTANCE VALUES ARE IN OHMS, K = 1000  
CAPACITANCE VALUES LESS THAN 10 ARE IN MICROFARADS (μf), AND VALUES GREATER THAN 10 ARE IN MEGAFARADS (Mf) EXCEPT WHERE NOTED  
VOLTAGE READINGS TO COMMON GROUND ARE MEASURED WITH VACUUM TUBE VOLTMETER UNDER NO SIGNAL CONDITIONS WITH TUNING CAPACITOR CLOSED AND VOLUME CONTROL AT MAXIMUM COUNTERCLOCKWISE ROTATION  
ⓧ - COMMON GROUND SYMBOL  
ⓔ - EXTERNAL CONNECTION TO PRINTED CIRCUIT



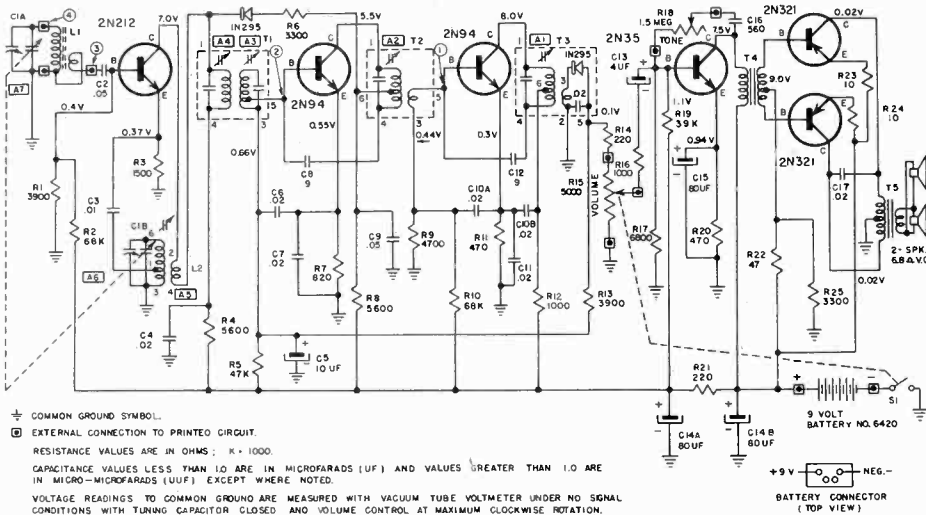
Chassis No. 132.43100

MODEL NUMBERS

8 2 2 8

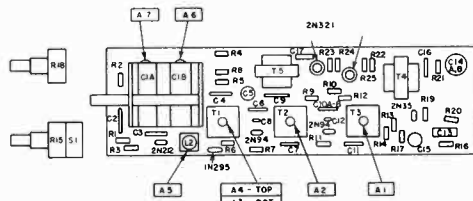
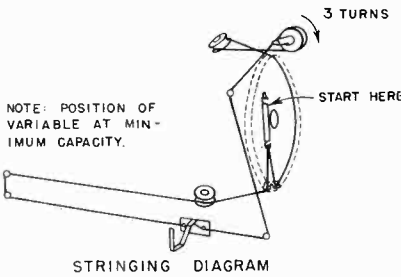
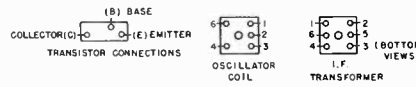
8 2 2 9

PARTS LIST for *Silvertone* RADIO



⊕ COMMON GROUND SYMBOL.  
 □ EXTERNAL CONNECTION TO PRINTED CIRCUIT.  
 RESISTANCE VALUES ARE IN OHMS; K = 1000.  
 CAPACITANCE VALUES LESS THAN 1.0 ARE IN MICROFARADS (UF) AND VALUES GREATER THAN 1.0 ARE IN MICRO-MICROFARADS (UUF) EXCEPT WHERE NOTED.  
 VOLTAGE READINGS TO COMMON GROUND ARE MEASURED WITH VACUUM TUBE VOLTMETER UNDER NO SIGNAL CONDITIONS WITH TUNING CAPACITOR CLOSED AND VOLUME CONTROL AT MAXIMUM CLOCKWISE ROTATION.

SIGNAL TEST POINT	TEST FREQUENCY	SERIES CAPACITOR TO GENERATOR	INPUT FOR 0.5 WATT OUTPUT (0.4 V ACROSS VC)
1	455 KC	05 UF	2000 UV
2	455 KC	05 UF	65 UV
3	455 KC	05 UF	5 UV
4	1000 KC	STANDARD LOOP	150 UV / M



PARTS LIST FOR SILVERTONE RADIO CHASSIS 132.43100

SCHEMATIC LOCATION	PART NO.	DESCRIPTION	SCHEMATIC LOCATION	PART NO.	DESCRIPTION
<b>CAPACITORS</b>					
C1A, B	45039	Variable	T1	44674	Transformer, I.F. Input
C2, 9	43674-9	.05 µf., Disc.	T2	44675	Transformer, I.F. Interstage
C3	43674-11	.01 µf., Disc.	T3	44676	Transformer, I.F. Output
C4, 6, 7, 11, 17	43674-13	.02 µf., Disc.	T4	44672	Transformer, Input
C5	44279-6	10 µf., 10V., Elect.	T5	44671	Transformer, Output, 3.2 ohm sec.
C6, 12	43952-3	1 µf., Disc.	<b>MISCELLANEOUS</b>		
C10A, B	43956	.02 µf., Dual Disc.	44998-48	*Cabinet Assembly, Brown - 8228	
C13	44396-1	8 µf., 10V., Elect.	44998-17	*Cabinet Assembly, Ivory - 8229	
C14, A, B	44397-2	80 µf., 10V., Elect.	44903-48	Knob, Off-Volume, Brown - 8228	
C15	44279-7	80 µf., 10V., Elect.	44903-17	Knob, Off-Volume, Ivory - 8229	
C16	41674-12	.00056 µf., Disc.	44904-48	Knob, Tone, Brown - 8228	
<b>RESISTORS</b>					
R1, 13	45052-362	3900 ohm, 1/2W., 5%	44905-48	Knob, Tuning, Brown - 8228	
R2, 10	44054-683	88K., 1/2W., 5%	44905-17	Knob, Tuning, Ivory - 8229	
R3	43688-152	1500 ohm, 1/2W., 10%	45005-1	Dial Crystals	
R4, 8	44052-562	5600 ohm, 1/2W., 5%	45002	Instruction Sheet	
R5	44052-473	47K., 1/2W., 5%	45117-1	Gridle	
R6, 25	43168-332	3300 ohm, 1/2W., 10%	45088	Speaker, 4" P.M., 6.4 ohm v.c.	
R7	44052-821	820 ohm, 1/2W., 5%	43959	1N295 Diode Detector	
R8	43688-472	4700 ohm, 1/2W., 10%	44607	Gridle Bar	
R11, 20	43688-471	470 ohm, 1/2W., 10%	45121-1	Pulley	
R12, 16	43688-102	1000 ohm, 1/2W., 10%	45074	Potentiometer	
R14, 21	43687-221	220 ohm, 1/2W., 10%	43072	Handle Mtg. Link	
R16	43688-393	39K., 1/2W., 10%	44500-1	Control, Volume & Switch (5000 ohms)	
R22	43688-470	47 ohm, 1/2W., 10%	44500-2	Control, Tone (1.3 meg)	
R23, 14	43688-100	10 ohm, 1/2W., 10%	45102-1	Battery Connector Assembly	
R24	43688-662	6600 ohm, 1/2W., 10%	45080-48	Handle, Brown - 8228	
<b>COILS &amp; TRANSFORMERS</b>					
L1	45118-7	Antenna Rod & Rear Cover - 8229	45080-17	Handle, Ivory - 8229	
L2	45118-8	Antenna Rod & Rear Cover - 8228	45101-48	Handle Mtg., Brown - 8228	
L3	43813-4	Coil, Oscillator	45101-17	Handle Mtg., Ivory - 8229	

\* Cabinet Assembly includes Handle and Handle Mounting.



Chassis No. 132.43600

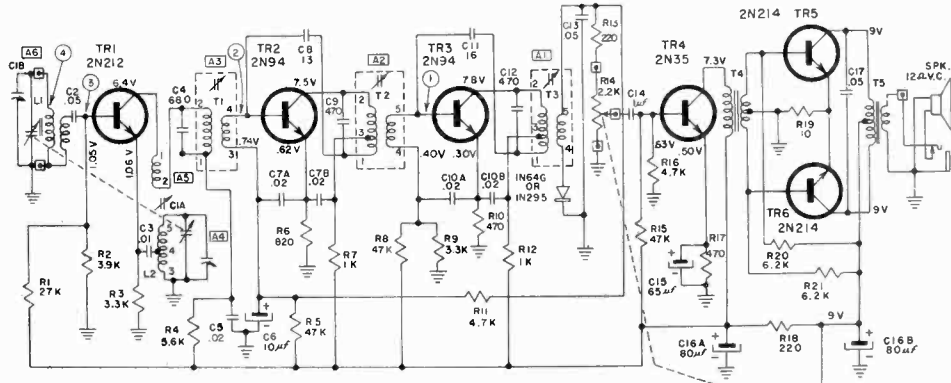
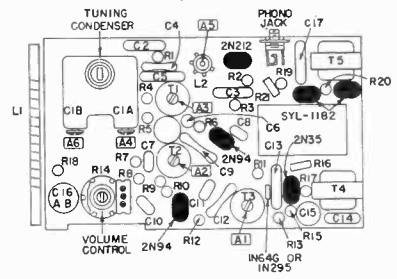
**MODEL NUMBERS**

- 9204
- 9205
- 9206

# PARTS LIST for *Silvertone* RADIO

## PARTS LIST FOR SILVERTONE RADIO CHASSIS 132.43600

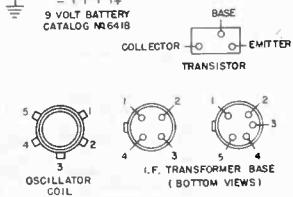
SCHEMATIC LOCATION	PART NO.	DESCRIPTION	SCHEMATIC LOCATION	PART NO.	DESCRIPTION
<b>CAPACITORS</b>			<b>MISCELLANEOUS</b>		
C1A, B	45483	Variable	*45551-59		Cabinet Assembly, Gray, 9204
C2, 13, 17	44684-13	.05 µf., Disc.	*45551-83		Cabinet Assembly, Coral, 9205
C3	43674-11	.01 µf., Disc.	*45551-29		Cabinet Assembly, Ebony, 9206
C4	44398-681	680 µf., Mica	46422-59		Knob, Volume & On-Off, Gray, 9204
C5	43674-13	.02 µf., Disc.	46422-83		Knob, Volume & On-Off, Coral, 9205
C6	44396-4	10 µf., 10V., Elect.	46422-29		Knob, Volume & On-Off, Ebony, 9206
C7, 10	44684-4	.02 µf., Dual Disc.	45571-59		Knob, Tuning, Gray - 9204
C8	43957-14	13 µf., Disc.	45571-83		Knob, Tuning, Coral - 9205
C9, 12	44398-471	470 µf., Mica	45571-29		Knob, Tuning, Ebony - 9206
C11	43957-7	16 µf., Disc.	45572		Handle
C14	44684-9	1 µf., Disc.	20578-041		Screw - Knob to Variable
C15	44396-3	65 µf., 10V., Elect.	44948		Screw - Cabinet Back to Cabinet Front
C16A, B	44397-2	80/80 µf., 10V., Elect.	44280-1	SPK	Speaker, 2 3/4" P.M., 12 ohm
<b>RESISTORS</b>			43959		Diode - 1N64G
R1	22381-273	27K., 1/2W., 10%	44548		Earphone Jack
R2	22381-392	3900 ohm, 1/2W., 10%	44992-2		Battery Snap, Female
R3, 9	22381-332	3300 ohm, 1/2W., 10%	45526-5		Battery Snap, Male
R4	22381-562	5600 ohm, 1/2W., 10%	45558		Instruction Leaflet
R5, 8, 15	22381-473	47K., 1/2W., 10%	*Cabinet Assembly includes escutcheon, bracket and grille.		
R6	22381-821	820 ohm, 1/2W., 10%			
R7, 12	22381-102	1000 ohm, 1/2W., 10%			
R10, 17	22381-471	470 ohm, 1/2W., 10%			
R11	22381-472	4700 ohm, 1/2W., 10%			
R13, 18	20061-221	220 ohm, 1/2W., 20%			
R14	45000-4	Control, Volume & Switch, 2200 ohm			
R16	43689-472	4700 ohm, 1/2W., 10%			
R19	22381-100	10 ohm, 1/2W., 10%			
R20	22382-622	6200 ohm, 1/2W., 5%			
R21	44052-622	6200 ohm, 1/2W., 5%			
<b>COILS &amp; TRANSFORMERS</b>					
L1	44511-4	Antenna Rod			
L2	45783-2	Coil, Oscillator			
T1	44855-1	Transformer, I.F., 1st			
T2	44855-2	Transformer, I.F., 2nd			
T3	44855-8	Transformer, I.F., 3rd			
T4	45604-1	Transformer, Input			
T5	44848-3	Transformer, Output			



SCHEMATIC DIAGRAM FOR CHASSIS 132.43600

SIGNAL TEST POINT	TEST FREQUENCY	SERIES CAPACITOR TO GENERATOR	INPUT FOR .005 WATT OUTPUT (245 V ACROSS VC)
1	455 KC	0.5 µf	1500 µv
2	455 KC	0.5 µf	50 µv
3	455 KC	0.5 µf	8 µv
4	1000 KC	STANDARD LOOP	250 µv/m

RESISTANCE VALUES ARE IN OHMS; K=1000.  
CAPACITANCE VALUES LESS THAN 1.0 ARE IN MICROPARADS (µP), AND VALUES GREATER THAN 1.0 ARE IN MICRO-MICROPARADS (µµP) EXCEPT WHERE NOTED.  
VOLTAGE READINGS TO COMMON GROUND ARE MEASURED WITH VACUUM TUBE VOLTMETER UNDER NO SIGNAL CONDITIONS WITH TUNING CAPACITOR CLOSED AND VOLUME CONTROL AT MAXIMUM CLOCKWISE ROTATION.  
⊕ - COMMON GROUND SYMBOL.  
⊞ - EXTERNAL CONNECTION TO PRINTED CIRCUIT.



CHASSIS 132.43600

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**MODEL NUMBERS**

9202

9203

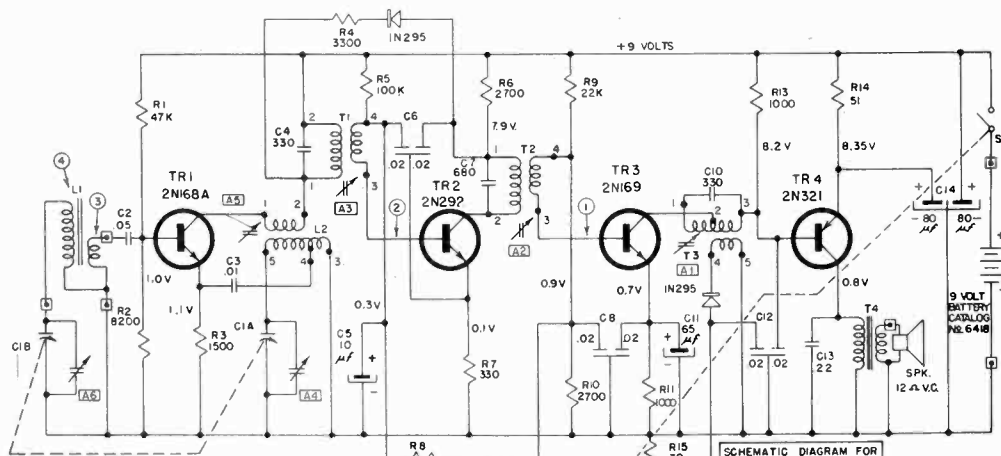
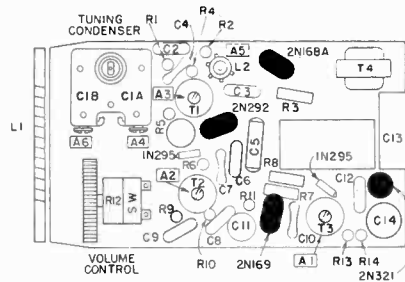
**PARTS LIST**  
for  
*Silvertone*  
**RADIO**

**PARTS LIST FOR SILVERTONE RADIO CHASSIS 132.45100**

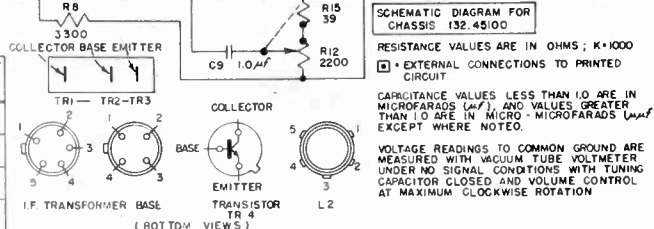
SCHEMATIC LOCATION	PART NO.	DESCRIPTION
<b>CAPACITORS</b>		
C1A, B	45483	Variable
C2	43674-9	.05 mfd., Disc.
C3	43674-11	.01 mfd., Disc.
C4, 10	44398-331	330 mmfd., Disc.
C5	44396-4	10 mfd., 10V., Elect.
C6, 8, 12	44684-4	.02 mfd., Dual Disc.
C7	44398-681	680 mmfd., Mica
C9	44684-9	1.0 mfd., 3V., Disc.
C11	44396-3	65 mfd., 10V., Elect.
C13	45775-1	.22 mfd., Mylar Tubular
C14A, B	44397-2	80-80 mfd., 10V., Elect.
<b>RESISTORS</b>		
R1	22381-473	47K., 1/2W., 10%
R2	22381-822	8200 ohm, 1/2W., 10%
R3	43689-152	1500 ohm, 1/2W., 10%
R4	22381-332	3300 ohm, 1/2W., 10%
R5	22381-104	100K., 1/2W., 10%
R6	22381-272	2700 ohm, 1/2W., 10%
R7	43689-331	330 ohm, 1/2W., 10%
R8	43689-332	3300 ohm, 1/2W., 10%
R9	22382-223	22K., 1/2W., 5%
R10	22382-272	2700 ohm, 1/2W., 5%
R11, 13	22382-102	1000 ohm, 1/2W., 5%
R12	45000-3	2200 ohm, Volume Control & Switch
R14	22382-510	51 ohm, 1/2W., 5%
R15	22381-390	39 ohm, 1/2W., 10%
<b>COILS &amp; TRANSFORMERS</b>		
L1	44511-3	Antenna Rod
L2	45783-1	Coil, Oscillator
T1	44855-5	Transformer, I.F., 1st
T2	44855-6	Transformer, I.F., 2nd
T3	44855-7	Transformer, I.F., 3rd
T4	44858-4	Transformer, Output

SCHEMATIC LOCATION	PART NO.	DESCRIPTION
<b>MISCELLANEOUS</b>		
	*45404-59	Cabinet Assembly, Gray (9202)
	45404-83	Cabinet Assembly, Coral (9203)
	45405-59	Knob, Volume & On-Off, Gray (9202)
	45405-83	Knob, Volume & On-Off, Coral (9203)
	45519-59	Knob, Tuning, Gray (9202)
	45519-83	Knob, Tuning, Coral (9203)
	45520	Insert, Tuning Knob
SPK	44280-1	Speaker, 2 3/4", 12 ohm
	44918	Screw - Tuning Knob to Variable
	45522	Screw - Cabinet Front to Cabinet Back
	43959	Diode - 1N64G
	45526-1	Battery Snap Assembly, Male
	44992-2	Battery Snap Assembly, Female
	45407	Instruction Leaflet

\*Cabinet assembly includes cabinet front, cabinet back and insert.



SIGNAL TEST POINT	TEST FREQUENCY	SERIES CAPACITY TO GENERATOR	INPUT FOR 5MW OUTPUT (2.45V ACROSS 12.2A)
1	455 KC	0.5µf	2500µV
2	455 KC	0.5µf	100µV
3	455 KC	0.5µf	3µV
4	1000 KC	STANDARD LOOP	350µV/PM



SCHEMATIC DIAGRAM FOR CHASSIS 132.45100  
RESISTANCE VALUES ARE IN OHMS; K=1000  
□ EXTERNAL CONNECTIONS TO PRINTED CIRCUIT  
CAPACITANCE VALUES LESS THAN 10 ARE IN MICROFARADS (µf) AND VALUES GREATER THAN 10 ARE IN MICRO-MICROFARADS (µµf) EXCEPT WHERE NOTED.  
VOLTAGE READINGS TO COMMON GROUND ARE MEASURED WITH VACUUM TUBE VOLTMETER UNDER NO SIGNAL CONDITIONS WITH TUNING CAPACITOR CLOSED AND VOLUME CONTROL AT MAXIMUM CLOCKWISE ROTATION

Chassis No. 132.45700

**MODEL NUMBERS**

- 9014
- 9015
- 9016

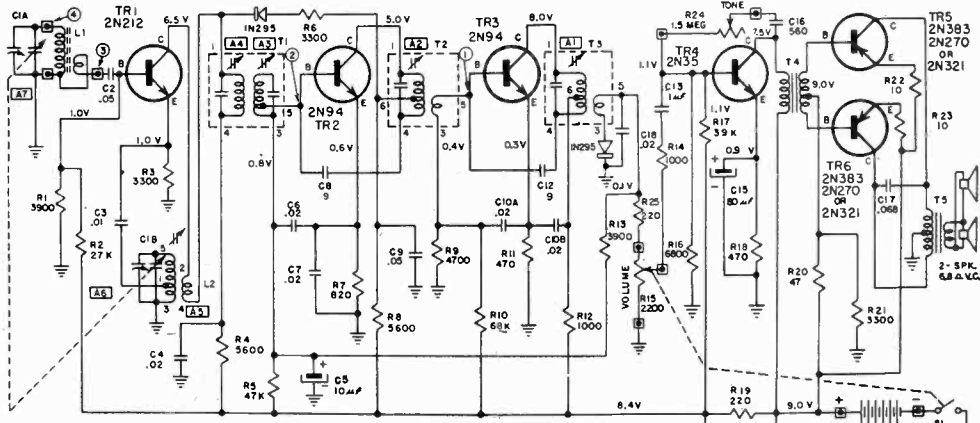
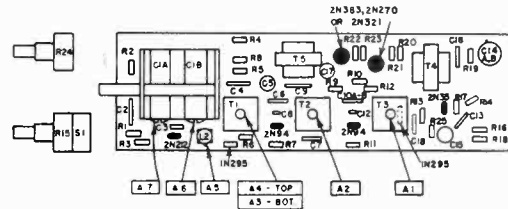
**PARTS LIST for**  
*Silvertone*  
**RADIO**

**PARTS LIST FOR SILVERTONE RADIO CHASSIS 132.45700**

SCHEMATIC LOCATION	PART NO.	DESCRIPTION	SCHEMATIC LOCATION	PART NO.	DESCRIPTION
<b>CAPACITORS</b>					
C1A, B	45039-2	Variable			
C2, 9	43674-9	.05 mf., Disc			
C3	44684-14	.01 mf., Disc			
C4, 6, 7, 18	43674-13	.02 mf., Disc			
C5	44396-4	10 mf., 10V., Elect.			
C8, 12	43953-3	9 mmf., Disc			
C10A, B	44684-4	.02 mf., Dual Disc			
C13	44684-9	1 mf., 3V., Disc			
C14A, B	44397-3	80-80 mf./10V., Elect.			
C15	44396-5	80 mf., 10V., Elect.			
C16	43674-12	560 mmf., Disc			
C17	43955-6	.068 mf., Tubular			
<b>RESISTORS</b>					
R1, 13	44052-392	3900 ohm, 1/2W., 5%			
R2	44052-273	27K., 1/2W., 5%			
R3, 6, 21	43689-332	3300 ohm, 1/2W., 10%			
R4, 8	44052-562	5600 ohm, 1/2W., 5%			
R5	44052-473	47K., 1/2W., 5%			
R7	44052-821	820 ohm, 1/2W., 5%			
R9	43689-472	4700 ohm, 1/2W., 10%			
R10	43689-683	68K., 1/2W., 10%			
R11, 18	43689-471	470 ohm, 1/2W., 10%			
R12, 14	43689-102	1000 ohm, 1/2W., 10%			
R15	44500-8	Control, Volume & Switch 2200 ohm			
R16	43689-682	6800 ohm, 1/2W., 10%			
R17	43689-393	39K., 1/2W., 10%			
R19	43689-221	220 ohm, 1/2W., 20%			
R20	43689-470	47 ohm, 1/2W., 10%			
R22, 23	43689-100	10 ohm, 1/2W., 10%			
R24	44500-9	Control, Tone, 1.5 meg.			
R25	20061-221	220 ohm, 1/2W., 20%			
<b>COILS &amp; TRANSFORMERS</b>					
L1	45534-10	Antenna Rod			
L2	45783-3	Coil, Oscillator			
T1	44674	Transformer, 1st. I.F.			
T2	44675	Transformer, 2nd. I.F.			
T3	41900-1	Transformer, 3rd. I.F.			
T4	44672	Transformer, Input			
T5	44671-1	Transformer, Output			

SCHEMATIC LOCATION	PART NO.	DESCRIPTION
<b>MISCELLANEOUS</b>		
	*45858-67	Cabinet Front Assembly, Ivory
	45765-48 2	Cabinet Back, Brown, 9014
	45765-17 2	Cabinet Back, Ivory, 9015
	45755-45 2	Cabinet Back, Ming Blue, 9016
	46025-48	Battery Cover, Brown, 9014
	46028-17	Battery Cover, Ivory, 9015
	46028-45	Battery Cover, Ming Blue, 9016
	45715	Nameplate
	**45909-1	Grille Assembly, 9014 & 9016
	**45909-2	Grille Assembly, 9015
	45916	Speaker, 4" P.M., 6.4 ohm v.c.
	45904-3	Battery Carriage
	45929-67	Knob, Volume & On-Off, White
	45928-67	Knob, Tone, White
	45927-67	Knob, Tuning, White
	45915-1	Pulley
	45850-1	Pointer
	45811-5	Battery Clip - Female
	45811-6	Battery Clip - Male
	43959	Diode 2N195
	45910-1	Chassis Base
	45741	Instruction Leaflet

\*Cabinet Front Assembly includes front, dial crystal and insert.  
\*\* Grille Assembly includes grille plate and grille cloth.



⊕ COMMON GROUND SYMBOL

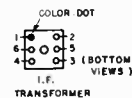
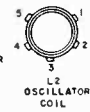
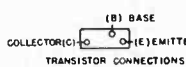
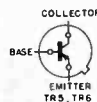
Ⓢ EXTERNAL CONNECTION TO PRINTED CIRCUIT.

RESISTANCE VALUES ARE IN OHMS; K = 1000.

CAPACITANCE VALUES LESS THAN 1.0 ARE IN MICROFARADS (μF) AND VALUES GREATER THAN 1.0 ARE IN MICRO-MICROFARADS (μμF) EXCEPT WHERE NOTED.

VOLTAGE READINGS TO COMMON GROUND ARE MEASURED WITH VACUUM TUBE VOLTMETER UNDER NO SIGNAL CONDITIONS WITH TUNING CAPACITOR CLOSED AND VOLUME CONTROL AT MAXIMUM CLOCKWISE ROTATION.

SIGNAL TEST POINT	TEST FREQUENCY	SERIES CAPACITOR TO GENERATOR	INPUT FOR .05 WATT OUTPUT (0.4 V ACROSS 32Ω)
①	455 KC	.05 μF	2000 μV
②	455 KC	.05 μF	65 μV
③	455 KC	.05 μF	5 μV
④	1000 KC	STANDARD LOOP	200 μV/V



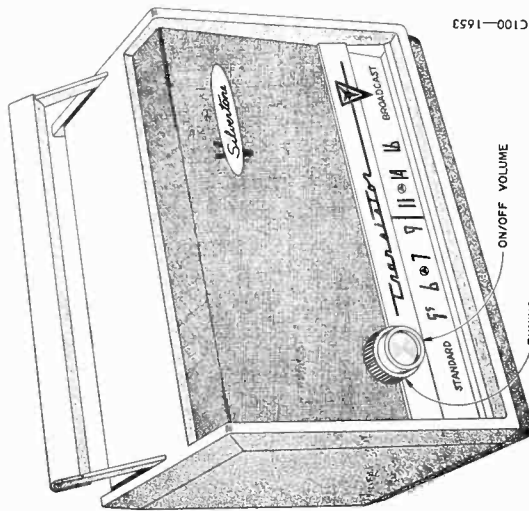
# TRANSISTOR PORTABLE RADIO

Silvertone brings you its newest and smartest portable. Your "Transistor" portable radio, incorporating completely new, Transistor circuit design, exemplifies the fine quality and workmanship which is the Silvertone byword. Designed in keeping with Silvertone's policy of bringing you the very latest in electronic achievement, the "Transistor" portable contains circuitry so much more efficient than a standard tube circuit that it allows truly economical operation.

Developed exclusively for battery operation, the radio has built into it the Silvertone "RADIONET" Ferrite Rod antenna system providing excellent reception without the use of an outside antenna. Automatic Volume Control, a special feature, varies the sensitivity of the set with respect to the strength of the signal being received. This tends to keep the volume level you select constant, reducing fading or blasting.

Your compact "Transistor" portable is housed in a leatherette covered wooden cabinet, durable yet stylish. The large, clearly marked dial scale of the set is designed for easy identification of station frequencies.

The dial contains markings for the special radio frequencies assigned to the Civilian Defense Corps under the "CONELRAD" plan. These frequencies are 640 Kc. and 1240 Kc. and are identified on the dial by small triangles. In the event of a national emergency all broadcast stations will go off the air and the Civilian Defense Corps will use these two frequencies to broadcast news to the Civilian population. At any time for an unexplained reason, or should there be an announcement of an impending emergency, the radio should be tuned to one of the marked "CONELRAD" stations to receive instructions from the "CONELRAD" plan. Try both CD stations and then tune to the station giving the best reception. Your radio is compactly designed, yet permits easy access to the battery compartment for installation and removal of the battery unit. The battery used is a nine (9) volt battery, Catalog No. 6420 or equivalent.



Should the station to which you are listening go off the air or an announcement of an impending emergency, the radio should receive instructions from the Civilian Defense Corps. If you are tuning for instructions under the "CONELRAD" plan, try both CD stations and then tune to the station giving the best reception. Your radio is compactly designed, yet permits easy access to the battery compartment for installation and removal of the battery unit. The battery used is a nine (9) volt battery, Catalog No. 6420 or equivalent.

Your portable radio is designed around one of the most remarkable electronic developments of recent years—the "transistor". Conceived and developed to replace the standard vacuum tube, the Transistor is a nonvacuum solid unit as tiny as a peanut. It is more rugged and less complex than a tube, thus provides longer life and service. Requiring little power to operate, the Transistor not only replaces bulky tubes, but outperforms them—giving you economical and trouble-free operation.

Silvertone has taken the Transistor and has designed new circuitry around it to produce a highly sensitive receiver, yet one which will last longer and cost less to operate. Thanks to Silvertone and the Transistor, more entertainment and listening pleasure can now be yours.

## INSTALLATION

The receiver is shipped without the battery. To install the battery first open the back cover, hinged to the bottom of the cabinet and held closed by spring clips midway up the cover. Grasp the cover and pull away from the case. Insert the two (2) pin battery card plug into the socket on top of the battery and arrange the ribbon stapled in the bottom of the cabinet so that one half comes over the top of the battery and the other half under the battery. Slide the battery—with socket and plug on top and to the left, as viewed from the rear of the set—into the space provided in the lower half of the cabinet. Knot the two ends of the ribbon securely as shown in Fig. 2. The battery plug and socket are so designed that the plug cannot be inserted except in the proper position.

## CONTROLS

**ON/OFF-VOLUME:** There are two control knobs, mounted concentrically on the left of the radio front. (See Fig. 1.) The smaller (front knob) is the On/Off Switch and Volume Control. When the knob is turned to the extreme left (counter-clockwise) the radio is off. To turn the radio on, rotate the knob to the right (clockwise) from this position until the switch is engaged. Since this receiver is battery operated, the radio will begin operating immediately.

Volume is increased by further turning the knob to the right, and is decreased by turning the knob to the left. Always increase the volume when tuning for a station and decrease it after the station has been picked up.

**STATION SELECTOR:** The larger (rear) knob of the two is the station selector. Stations are marked—in kilocycles minus the last two zeros—on the dial scale at the bottom of the radio front. A pointer, driven by rotation of the Station Selector Knob indicates the station to which the radio is tuned.

Using the pointer as a guide, turn the selector knob to the desired station and adjust it to the point giving the most natural tone. When the station has been tuned in properly, the Volume Control should be set to give the most pleasing volume level. Always use the Volume Control to reduce the volume, never attempt to reduce the volume by tuning off the station.

## MAINTENANCE

**BATTERY:** The life of any battery is limited; be sure that the radio is turned off when not in use. If the radio is not to be used for several weeks, the battery should be removed and stored in a cool place.

The transistors used in this portable radio are designed to give you low battery operation cost. However, to insure proper operation of the radio, it is recommended that you have the battery checked every six (6) months or whenever the radio sounds weak. The radio can be taken to any SEARS, ROEBUCK and CO. or SIMPSON'S-SEARS LIMITED Retail Store for service.

Always remove the battery from the radio when it has worn out. Possible corrosion and leakage from a dead battery may cause damage to the set.

## IF THE RECEIVER FAILS TO OPERATE PROPERLY

Re-read the instructions carefully to see if the radio has been properly installed. Be sure that the battery plug has not been disconnected from the battery. Make sure that the battery is operating properly.

Have the battery voltage checked at your local SEARS, ROEBUCK and CO. or SIMPSON'S-SEARS LIMITED Retail Store. Check to see if the transistors are pushed all the way down in the sockets.

If the radio still does not operate properly and you purchased it from a SEARS, ROEBUCK and CO. or SIMPSON'S-SEARS LIMITED Retail Store, bring the radio in to the Customer Service Department. They are fully equipped to handle your service requirements.

If you purchased your radio from SEARS, ROEBUCK and Co. or SIMPSON'S-SEARS LIMITED by Mail Order, write to the branch from which you ordered the radio, explaining the difficulty you are having. We will then advise what further action to take. If the radio is returned by mail for any reason, be sure to remove the battery before mailing. This will prevent possible damage to radio or battery in transit.

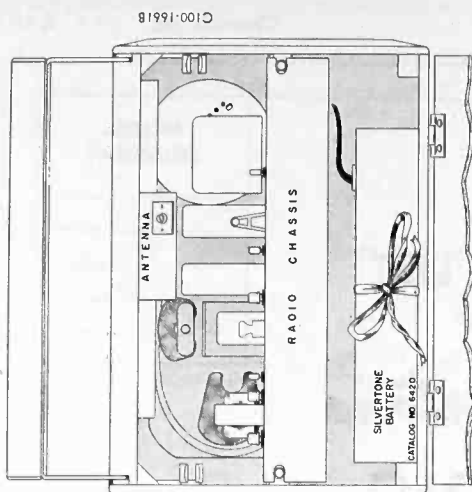


Fig. 2. Rear View of Chassis

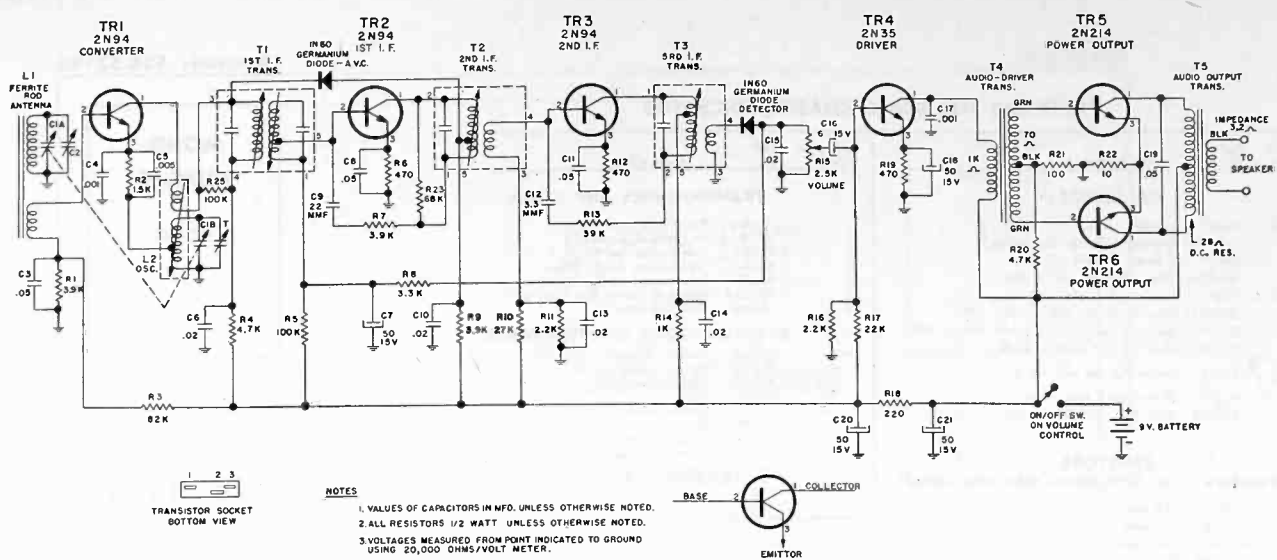


Fig. 3. Schematic Diagram of Silvertone Chassis 528.48701

**CHASSIS PARTS LIST**

SCHEMATIC LOCATION	PART No.	DESCRIPTION
<b>CAPACITORS</b>		
C1A & B	19-48-2	Variable Tuning
C2	19-143-0	Trimmer, Antenna (Part of L1)
C3, C8, C11, C19	16-50323	Tubular, .05 mfd., 200 v.
C4	15-10216	Disc, .001 mfd., GP
C5	15-50216	Disc, .005 mfd., GP
C6, C10, C13, C14	15-20317	Disc, .02 mfd., GMV
C7, C18, C20, C21	18-28-5	Electrolytic, 50 mfd., 15 v. v.
C9	15-22011	Disc, 22 mmfd., 500 v., 10%, GP
C12	20-45-0	Gimmick, 3.3 mmfd., 500 v., GA
C15	20-35-0	Disc, .02 mfd.
C16	18-27-5	Electrolytic, 6 mfd., 15 v. v.
C17	16-10253	Tubular, .001 mfd., 600 v.
<b>RESISTORS</b>		
[All Resistors, 1/2 w., 10%]		
R1, R7, R9	60-39201	3.9K ohm
R2	60-15201	1.5K ohm
R3	60-82301	82K ohm
R4, R20	60-47201	4.7K ohm
R5	60-10401	100K ohm
R6, R12, R19	60-47101	470 ohm
R8	60-33201	3.3K ohm

SCHEMATIC LOCATION	PART No.	DESCRIPTION
R10	60-27301	27K ohm
R11, R16	60-22201	2.2K ohm
R13	60-39301	39K ohm
R14	60-10201	1K ohm
R15	24-255	2.5K ohm, Volume-On/Off Switch
R17	60-22301	22K ohm
R18	60-22101	220 ohm
R21	60-10101	100 ohm
R22	60-10001	10 ohm
R23	60-68301	68K ohm
R25	60-10401	100K ohm
<b>TRANSFORMERS AND COILS</b>		
T1	10-59-2	Transformer, 1st I.F.
T2, T3	10-53-2	Transformer, 2nd and 3rd I.F.
T4	80-406	Transformer, Audio Driver
T5	80-405	Transformer, Audio Output
L1	82-110	Antenna, Ferrite Rod (inc. C2)
L2	10-21-4	Coil, Osc.
<b>MISCELLANEOUS CHASSIS PARTS</b>		
	84-2815	Issem., Battery Cable, Complete
	72-114	Bushing, Dial Cord
	11-995	Bracket, Antenna Mtg.

SCHEMATIC LOCATION	PART No.	DESCRIPTION
	83-421	Clip, I.F. Mtg. (4)
	67-618	Dial Background
	51-109	Diff Card (36")
	47-108	Grommet (3)
	28-153	Pad, Sponge Rubber
	45-178	Plug, Battery
	58-128	Pointer, Slide
	39-265	Pulley, Idler (2)
	68-158	Socket, Transistor (6)
	77-157	Spacer (3)
	79-480	Speaker, 4" x 6" PM, 3.2 ohm
	70-135	Spring, Tension
	70-201	Spring, Tuning Shaft Retaining
<b>CABINET PARTS LIST MODEL 7228</b>		
	42-871	Cabinet Portable, Leatherette, Mah.
	49-67	Hinge, Handle
	62-35	Foot, Bumper (4)
	67-615	Dial Scale
	73-748	Logo, "Silvertone"
	36-154	Grille, Cabinet
	52-726	Knob, Tuning
	52-725	Knob, Volume-On/Off

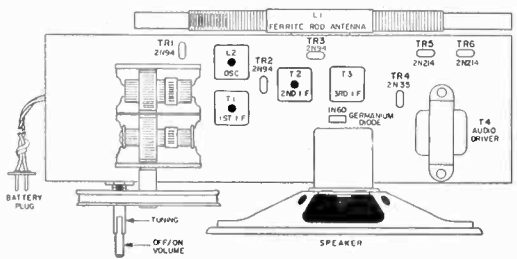


Fig. 4. Top View of Chassis

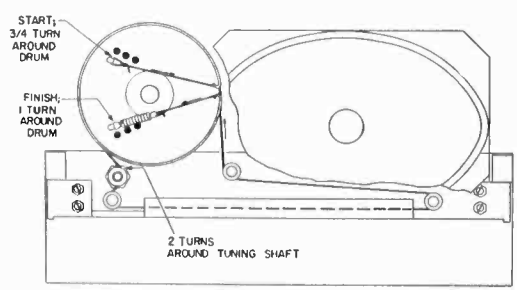


Fig. 5. Dial Stringing Diagram

**ALIGNMENT PROCEDURE**

**PRELIMINARY:**

NOTE: When servicing this receiver, use battery, Catalog No. 6420 or equivalent only, otherwise damage to the transistors may result.

- Output meter reading to indicate 0.05 watt across voice coil.....0.4 volt
- Generator ground lead connection.....Common ground
- Generator modulation.....30%, 400 cycles
- Position of volume control.....Fully on

POSITION OF TUNER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMER ADJUSTMENT	TRIMMER FUNCTION
Open	455 Kc	0.1 mfd.	Base of Converter (Pin 2 TR2)	T3	3rd I.F.
Open	455 Kc	0.1 mfd.	Base of Converter (Pin 2 TR2)	T2	2nd I.F.
Open	455 Kc	0.1 mfd.	Base of Converter (Pin 2 TR2)	T1	1st I.F.
Open	1630 Kc		Base of Converter (Pin 2 TR2)	C1B Trimmer	Oscillator
1400 Kc	1400 Kc	Hazeltine test loop		C2 (Ant. Trimmer)	R.F.*

\*Rock In.

**ALIGNMENT NOTES:**

- The alignment must be done in the order given above.
- While making the above adjustments, keep the volume control set for maximum output and the signal generator output attenuated to avoid AVC action.

**PARTS LIST FOR RADIO CHASSIS 528.53140**

Schematic Location	Part No.	Description
<b>CAPACITORS</b>		
C1 A & B	19-62-2	Variable Tuning
C2	19-187-0	Trimmer Antenna (Part of L1)
C3	20-57-1	Tubular, .05 mfd., 12 v.
C4	15-50216	Disc, .005 mfd., 500 v., GP
C5, C7, C16	20-56-1	Tubular, .047 mfd., 200 v.
C6	15-390111	Disc, 39 mmfd., 500 v., 10%, NPO
C8	15-339111	Disc, 3.3 mmfd., ± 1 mmfd., 500 v., NPO
C9	15-20317	Disc, .02 mfd., 500 v., GMV
C10, C12, C14, C15	18-61-5	Electrolytic, 50 mfd., 15 v.
C11	18-60-5	Electrolytic, 6 mfd., 15 v.
C13	15-10216	Disc, .001 mfd., 500 v., GP

**RESISTORS**  
(All Resistors 1/2 w., 10% unless otherwise noted)

R1	60-56201	5.6K ohm
R2	60-15201	1.5K ohm
R3	60-10401	100K ohm
R4, R9	60-10201	1K ohm
R5, R8, R15	60-47101	470 ohm
R6	60-68301	68K ohm
R7, R13	60-22301	22K ohm
R10	60-33201	3.3K ohm
R11	24-282-0	2.5K ohm, VOLUME-OFF/ON Switch
R12	60-22201	2.2K ohm
R14	60-22101	220 ohm
R16	60-47901	4.7K ohm
R17	60-10101	100 ohm
R18	60-10001	10 ohm

Schematic Location	Part No.	Description
<b>TRANSFORMERS AND COILS</b>		
T1	10-78-2	Transformer, 1st I.F.
T2	10-79-2	Transformer, 2nd I.F.
T3	10-80-2	Transformer, 3rd I.F.
T4	80-23-1	Transformer, Audio Driver
T5	80-22-1	Transformer, Audio Output
L1	82-130-1	Antenna, Ferrite Rod (Inc. C2)
L2	10-36-4	Coil, Oscillator

Schematic Location	Part No.	Description
<b>MISCELLANEOUS CHASSIS PARTS</b>		
PAC 1	13-14-5	Resistor Capacitor Network
	45-15-3	Socket, Transistor (6)
	38-1798	Owners Manual
	22-417-2	Clip
	22-93-3	Clamp, Wire
	11-1056	Bracket, Antenna Mounting
	83-1192	Diode, Crystal
	38-1798	Owners Manual

**CABINET PARTS LIST**

Part No.	Description
42-18-1	Cabinet
49-155	Handle, Cabinet
22-112-0	Cover, Cabinet
52-825-0	Knob, ANTENNA
52-818-0	Knob, TUNING
52-811-0	Knob, OFF/ON-VOLUME
45-31-5	Connector, "B" Battery
45-12-5	Spring, Speaker Contact (2)
40-33-2	Logo, "Silvertone"
40-4-1	Grill, Cabinet
33-270-4	Speaker, 3 1/2" PM, 3.2 ohm
22-127-0	Retainer, Battery (2)
22-123-0	Latch, Cover Retaining (2)
22-47-1	Spring Clip

**MODEL NUMBER**  
**8220**

**PARTS LIST for**  
*Silvertone*  
REG. U. S. PAT. OFF.  
**TRANSISTOR PORTABLE RADIO**

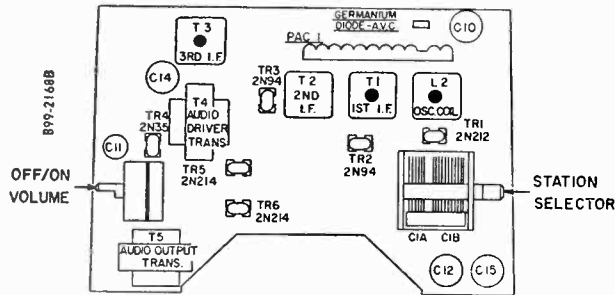


Fig. 1. Top View of Chassis

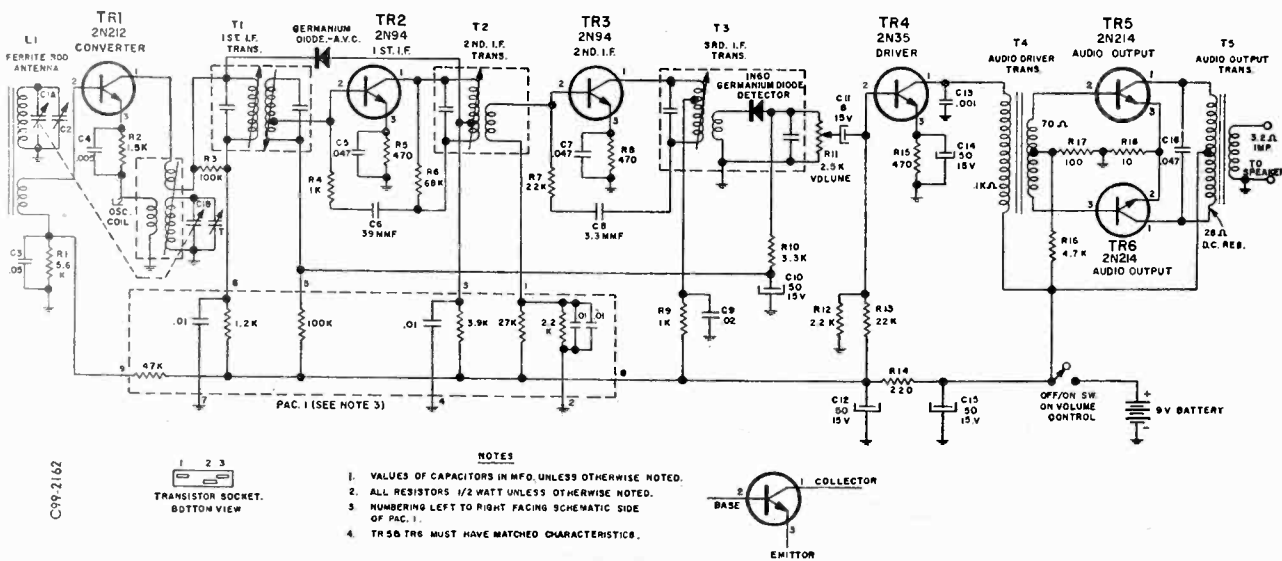


Fig. 2. Schematic Diagram of Radio Chassis 528.53140

Due to variations in transistor characteristics, the following resistors may have been added:

1. A 6.8K ohm, 1/2 watt, 10% resistor (Part No. 60-68201) in parallel with R1.
2. A 100K ohm, 1/2 watt, 10% resistor (Part No. 60-10401) in parallel with R3.

If replacement becomes necessary replace with exact duplicate.

528 53400

CHASSIS 528 53400

MODEL NUMBER

9222

# PARTS LIST for *Silvertone*

## TRANSISTOR PORTABLE RADIO

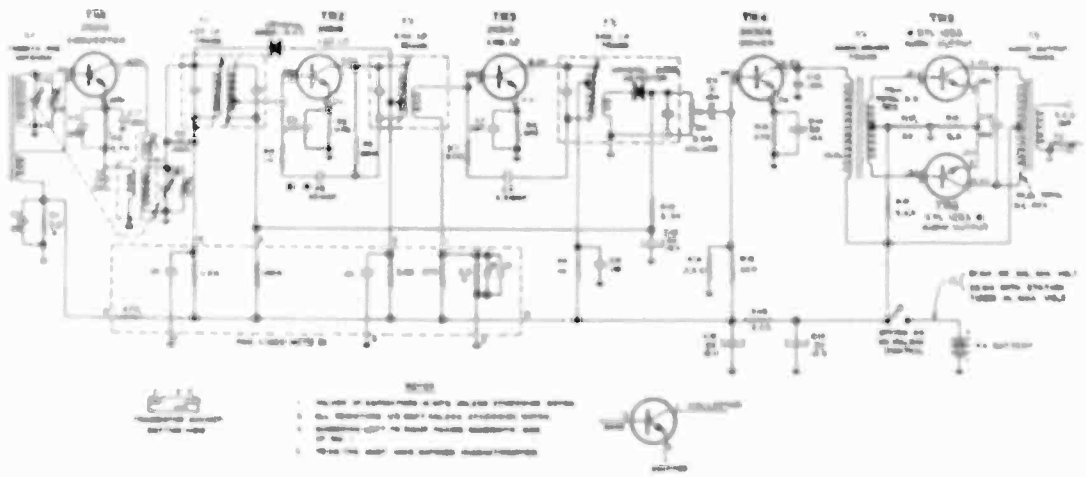


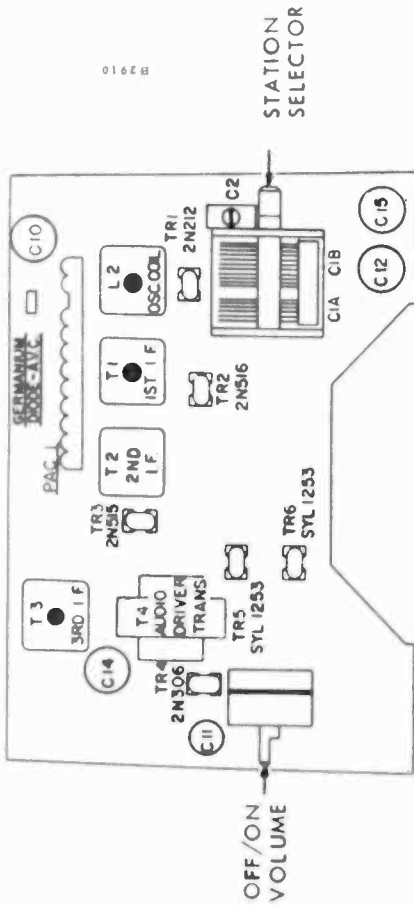
FIG. 2 SCHEMATIC DIAGRAM FOR SILVERTONE CHASSIS 528-53400

\* Some models have been produced using two Output Transistors, type 2N214 in place of type 1253. When replacing Output Transistors, replace with two type 1253 transistors, or two type 2N214 transistors. DO NOT USE ONE TRANSISTOR OF EACH TYPE.

\*\* On some models, the value of C6 is 25 micro.

SILVERTONE RADIO RECEIVER CHASSIS NUMBER 528-53400

SILVERTONE RADIO RECEIVER CHASSIS NUMBER 528.53400



CHASSIS PARTS LIST

Schematic No.	Parts No.	Description
C1 A&B	19-76-2	Variable Tuning (Inc. C2)
C2	19-187-3	Trimmer, Antenna (Part of C1)
C3	20-37-1	Tubular, .05 mfd., 12 v.
C4	15-50216	Disc, .005 mfd., 500 v., GP
C5, C7, C16	20-56-1	Tubular, .047 mfd., 200 v.
C6	15-390114	Disc, 39 mmfd., 10%, 500 v., N750
C8	15-239141	Disc, 3.3 mmfd., .1 mfd., 500 v., NPO
C9, C12	15-20317	Disc, .02 mfd., 500 v.
C10, C15	18-61-5	Electrolytic, 50 mfd., 15 v.
C11	18-60-5	Electrolytic, 6 mfd., 15 v.
C13, C17	18-10216	Disc, .001 mfd., 500 v., GP
R1, R16	(All resistors 1/2 W., 10% unless otherwise noted)	
R2	60-56201	5.6K ohm
R3	60-27201	2.7K ohm
R4, R9	60-10401	100K ohm
R5, R8, R15	60-10261	1K ohm
R6	60-47191	470 ohm
R7, R13	60-68201	68K ohm
R10	60-22301	22K ohm
R11	60-33201	3.3K ohm
R12	24-331-0	2.5K ohm, Volume-Off/On Switch
R14	60-22201	2.2K ohm
R17	60-22101	220 ohm
R18	60-82001	82 ohm
	60-56991	5.6 ohm
T1	10-78-2	TRANSFORMERS AND COILS
T2	10-79-2	Transformer, 1st I. F.
T3	10-80-2	Transformer, 2nd I. F.
T4	80-93-1	Transformer, 3rd I. F.
T5	80-70-1	Transformer, Audio Driver
L1	82-147-0	Transformer, Audio Output (Mounted on Speaker)
L2	10-48-4	Antenna, Ferrite Rod
		Coil, Oscillator
		MISCELLANEOUS CHASSIS PARTS
	83-1192	Diode, Germanium
	45-15-3	Socket, Transistor (6)
	45-16-0	Plug, Battery Connector
	11-1402	Bracket, Antenna Mounting

SILVERTONE RADIO RECEIVER CHASSIS NUMBER 528.53400

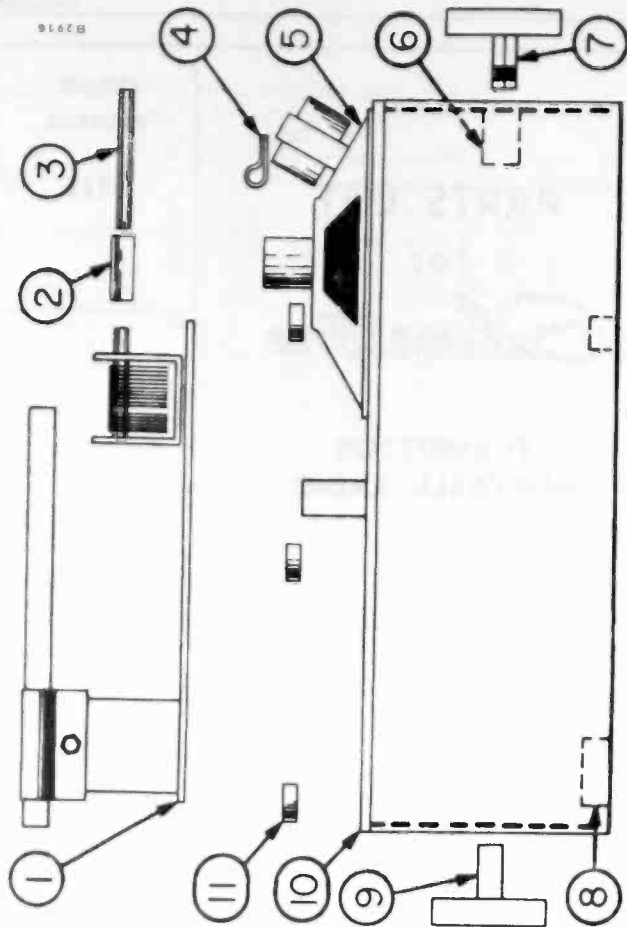


FIG. 1. EXPLODED VIEW OF CABINET PARTS

CABINET PARTS LIST

Key No.	Part No.	Description
1.	39-25-0	Chassis, Radio
2.	39-153-3	Coupling, Tuning Shaft
3.	22-102-3	Shaft, Tuning
4.	33-377-4	Retainer, Cable Clamp
5.	11-1380	Speaker (Inc. T5)
6.	52-1117-0	Bracket, Shaft Support
7.	28-175-1	Knob, Tuning
8.	52-1118-0	Pod, Rubber (4)
9.	72-64-1	Knob, Off/On-Volume
10.	77-29-0	Cabinet, Leather
11.		Spacer, Chassis (3)

\* Not supplied as a Repair Part. See page 3 for complete breakdown of parts.



# Sentinel

## RADIO CHASSIS - CR-729

### GENERAL

The CR-729 radio chassis is a six transistor superheterodyne type designed for use in battery operated pocket sized portable instruments. A receptacle is provided at the side of the chassis to accommodate a low impedance earphone. Insertion of the earphone will automatically disconnect the speaker. The chassis is powered by a single 4 volt battery having a useful life of approximately 200 hours. The circuit of this chassis consists of conventional wiring.

ilar transformer T-3 couples the output (collector) of the first i-f stage to the input (base) of the second i-f stage. The second i-f stage drives a 1N295 crystal diode detector by means of bifilar transformer T-4 which is single tuned by a powdered iron core.

The first and second i-f transformers operate in a manner similar to triode r-f amplifiers and therefore require neutralization to prevent possible self oscillation. Neutralization is accomplished by feeding a portion of properly phased output signal back to the input. Capacitor C-6 in series with R-6 furnishes the feedback for the first stage, capacitor C-10 in series with R-10 furnishes the required feedback for the second stage. Since inter-electrode capacitances and gain factors vary between transistor types, it is essential that the i-f transistors be replaced with exact replacements. If this is not done, circuit oscillation or a loss of gain might be incurred.

A negative AVC voltage is fed back from the diode detector to the base connection of the first i-f stage to control its gain with changes in signal level. The total negative AVC voltage appears across the Volume control R-12. This negative voltage is used to buck the positive voltage developed across the 1st i-f base resistor R-3 which is returned to a positive bias. The AVC voltage thus reduces the amount of positive bias to the base connection of the 1st i-f stage and reduces the gain of the stage as required.

The audio voltage selected by the Volume control is coupled to the base connection of the audio driver stage V4 by a 10 mfd.

electrolytic capacitor C-13. This high value of coupling is made necessary by the relatively low input impedance of the driver stage. Since C-13 is an electrolytic particular attention should be given to its polarity should replacement become necessary.

The output of the driver stage is coupled to the push-pull output stage by means of driver transformer T-5 having a center tapped secondary. The output stage is a pair of push-pull transistors, V5 and V6 operated in class B. When operated in this manner, the output transistors are biased to cut-off and their inputs driven 180 degrees out of phase. When one transistor is driven in a positive direction, the other is driven negative such that only one of the output transistors conducts at a time and when no audio signal is applied, neither transistor conducts. This provides for good battery economy. However, it should be noted that total current in the output stage increases with audio signal level so that total battery life will be conserved if the Volume control is maintained at lowest useable setting.

Push-pull output transformer T-6 matches the output transistors to a 15 ohm speaker voice coil.

This instrument is equipped with an earphone jack located on the left side of the chassis. A low impedance earphone set, Part No. 500043-1, is available for use with this instrument. The instrument speaker is automatically disconnected when the earphone plug is inserted in the jack.

### SERVICE INFORMATION

3. DO NOT SHORT ACROSS THE TERMINALS OF A TRANSISTOR WHILE THE RECEIVER IS OPERATING. Such practice may cause permanent damage to a transistor.

4. When soldering to a transistor socket first remove the transistor since EXCESSIVE HEAT FROM THE SOLDERING IRON CAN DESTROY THE TRANSISTOR.

5. Use a low wattage soldering iron with a small tip when removing or replacing components in the chassis. THE SMALL HEAT COULD CAUSE DAMAGE TO THE TRANSISTOR CIRCUIT COMPONENTS AND WIRING.

### SAFETY PRECAUTIONS

The following precautions should be exercised when servicing transistor radios:

1. Always replace with original type transistors.

2. Resistance measurements of chassis circuits should be made with the transistors removed from their sockets since the terminal voltage across the ohmmeter leads can cause conduction within the transistors causing erroneous readings. Also, EXCESSIVE OHMMETER TERMINAL VOLTAGES ACROSS A TRANSISTOR CAN CAUSE PERMANENT DAMAGE TO THE TRANSISTOR.

Original production chassis bear the suffix letters "AA" following the chassis model number stamped on the chassis. A circuit change is indicated by first suffix letter; for example, CR-729BA.

A mechanical change is denoted by the 2nd suffix letter; for example, CR-729AB. Supplements to Service Bulletins will be issued identifying these changes as they occur in production.

### SPECIFICATIONS

Power supply	4 volt mercury-type battery
Power output	50 milliwatts (90 milliwatts max.)
Tuning frequency range	535-1620 KC
Intermediate frequency	455 KC
Transistors:	
Converter	CR-729AA . . . . . 2N172
CR-729BA . . . . . 2N172	
CR-729CA . . . . . 2N253	
1st I-F Amplifier	CR-729AA . . . . . 2N146 or 2N145
CR-729BA . . . . . R02 or R03	
CR-729CA . . . . . 2N252	
2nd I-F Amplifier	CR-729AA . . . . . 2N146 or 2N147
CR-729BA . . . . . R04 or R03	
CR-729CA . . . . . 2N254	
Detector (Crystal Diode)	1N295
Audio Driver	TI 310
Audio Output	
CR-729AA . . . . . (2) TI 352	
CR-729BA . . . . . (2) 2N185	
CR-729CA . . . . . (2) 2N185	

### CIRCUIT DESCRIPTION

The CR-729 chassis employs six transistors and a crystal diode which replace the electronic tubes normally used in conventional battery operated AM radios. Some of the advantages of transistors are small size, ability to withstand physical shock and vibration without damage, instant operation without warm-up time, no need for bulky filament batteries and since operating potentials are low, the plate battery providing long battery life while still retaining long battery life. The transistors used in the CR-729 are of the plug-in type which provides for easy replacement and freedom from possible damage by heat that is often incurred when soldering the terminals directly into the circuits.

The antenna is a ferrite rod type inductively coupled to the base terminal of the 2N172 converter stage by means of a low impedance secondary winding. The antenna is tuned by section C-3X of the antenna tuning capacitor.

Collector to emitter feedback is accomplished by means of oscillator coil T-1

which consists of two windings and provides for the oscillator function of the 2N172 converter stage. The top winding of the oscillator coil (terminals 1-2) is the feedback winding. The bottom winding (terminals 3-5) is tuned by section C-3B of the tuning gang to establish the frequency of oscillation. Oscillator emitter current establishes oscillator bias by means of emitter coupling capacitor C-2 and emitter return resistor R-2. The function of the converter stage is threefold in that it acts as an amplifier for the antenna signal, an oscillator and a superheterodyne mixer which converts the antenna signal to an i-f frequency of 455 KC.

The i-f signal is taken from the converter collector terminal and coupled to the base terminal of the 1st i-f stage by means of 1st i-f transformer T-2. The primary of T-2 is slug tuned; the untuned secondary is a low impedance link which couples the high impedance primary to the relatively low impedance base to emitter circuit of the 1st i-f transistor. A sim-

ALIGNMENT

The output indicator may be an output meter across the speaker voice coil if test signal is modulated. Use a non-metallic screw driver for adjustments.

SIGNAL GENERATOR INPUT	SIGNAL GENERATOR FREQUENCY	TUNING CAPACITOR SETTING	ADJUSTMENTS	NOTES
High side to B (base) of V-1 thru 0.5 mfd. capacitor. Low side to chassis	455 KC.	Any point where no interfering signal is received	T-4, T-3 and T-2 i-f trimmers	Adjust for max. output
Radiating loop*	Exactly 1620 KC.	Exactly 1620 KC.	1620 KC. oscillator trimmer	Same
Same	Exactly 535 KC.	Exactly 535 KC.	535 KC. oscillator trimmer	Same
Same	Approx. 1400 KC.	Approx. 1400 KC.	1400 KC. antenna trimmer	Same

available from the rear of the chassis once the cabinet back and the small chassis shield plate are removed. The voltages shown in the table were measured with a vacuum tube voltmeter, however, a 20,000 ohm/volt meter may also be used with satisfactory results.

Standard servicing techniques may be used in servicing this chassis provided the precautions listed above are properly observed.

CHASSIS REMOVAL

1. Unscrew brass button at center of tuning dial. Remove dial.
2. Remove the two chassis mounting screws under tuning dial.
3. Remove cabinet back by applying pressure at thumb slot in top of cabinet and gently moving the two sections apart. A slight upward lift on the back section will aid the removal.
4. Remove battery and chassis mounting screw located at center of battery container. Chassis may now be removed from case.

BATTERY REPLACEMENT

An old or exhausted battery may damage the chassis if not removed from the instrument at the end of its useful life. If the radio is to stand unused for a long period, the battery should be removed to prevent possible damage to the instrument.

When installing, place the battery pull-out tape across battery container and install the 4 volt mercury battery into the container with the positive (+) terminal up. If the receiver does not operate try reversing the battery in the container.

Replace worn out battery with one of the following types or equivalent:

- Magnavox No. 530043-1
- Hallory No. TR233R
- General No. 696
- Eveready No. 233

SERVICING SUGGESTIONS

When a battery reaches the end of its useful life its internal resistance rises rapidly. For this reason, the terminal voltage of a battery should always be checked under load with receiver operating. If the battery voltage under load measures lower than 2.7 volts the battery should be replaced.

Weakness, distortion or no output may be caused by a damaged transistor. If it is believed that a transistor is defective, replacement with a new transistor, known to be good is the surest servicing check. Do not check transistors with an ohmmeter as damage to the transistor may result. An ohmmeter check measures the ability of a transistor to conduct current in one direction, and to resist current flow in the opposite direction. The resistance is low in the conduction direction in relation to the resistance in the non-conducting direction. Such a check is at best a crude one and is not recommended since the front to back resistance ratios differ widely among transistor types.

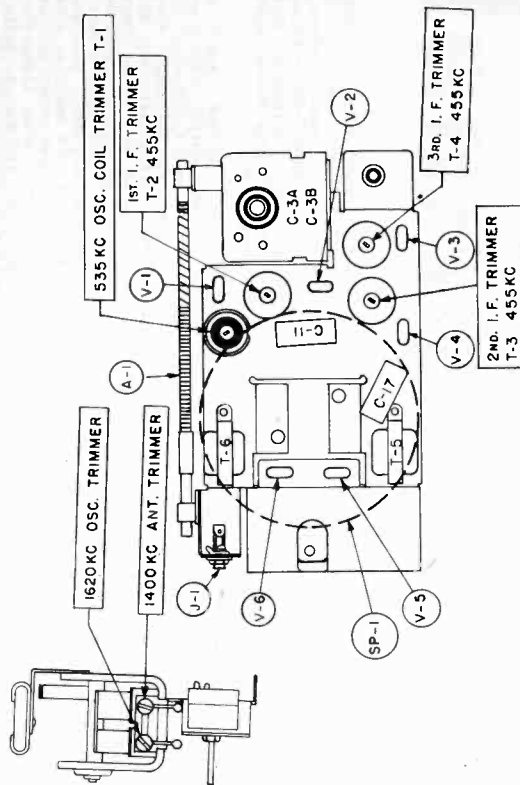
Several miniature electrolytic capacitors are used in this chassis. Should any one of these open, the receiver will exhibit oscillation, a loss of gain or both. The simplest means of checking for this condition is to bridge the suspected capacitor with another electrolytic while the receiver is turned on. This will indicate whether or not the suspected capacitor is defective. Be sure to observe capacitor polarity when making this check.

The total current drain from the battery when the receiver is operating with the Volume control set to zero is approximately 7.0 milliamperes, with a good battery. This current can be measured by placing the power switch in the off position and placing the milliammeter leads across the switch terminals. The total current will rise as the audio output is increased. At maximum volume the total current drain will increase to over 25 milliamperes. From this it can be seen that battery life can be extended by maintaining conservative settings of the Volume control.

The voltage readings of an average receiver are shown on the voltage chart beneath the schematic. These voltages are

Radiating loop may consist of a 5 turn coil approximately 2 inches in diameter connected across terminals of signal generator leads and loosely coupled to receiver loop antenna.

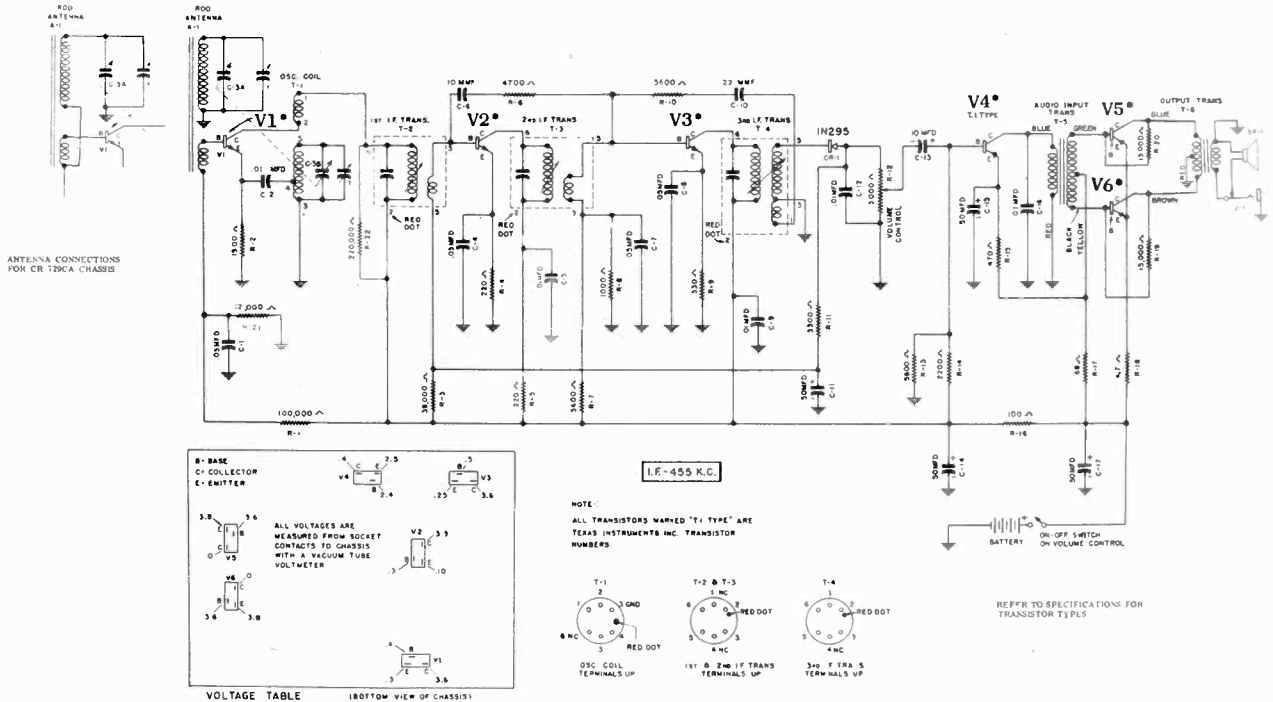
CHASSIS LAYOUT



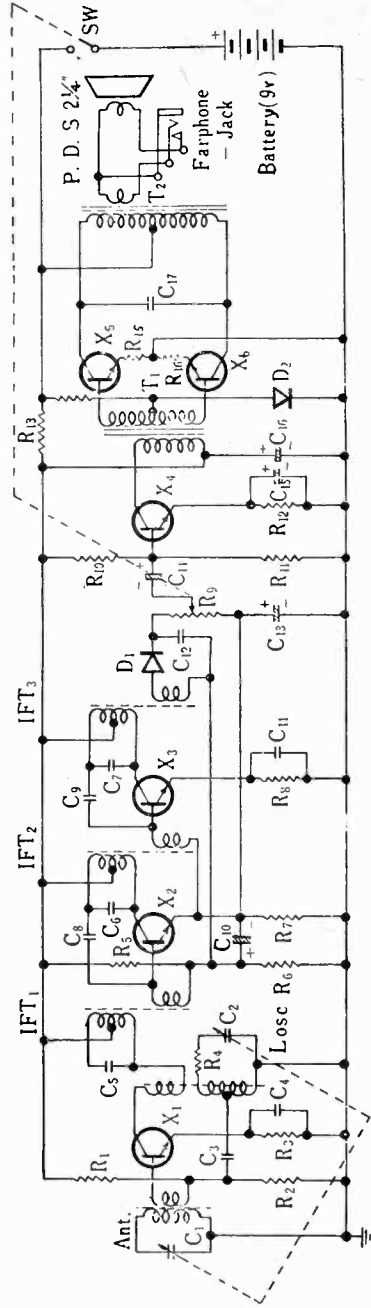
PARTS LIST

CHASSIS CR-729

SYMBOL	DESCRIPTION	PART NO.	LIST	SYMBOL	DESCRIPTION	PART NO.	LIST
<b>COILS &amp; TRANSFORMERS</b>							
A1	Rod Antenna	461512-1	1.90	R7	5600	230702-129	2.00
A1	Rod Antenna (CR-729CA)	461512-2	2.00	R8	1000	230702-122	2.00
T1	Oscillator Coil	361225-1	1.75	R9	330	230702-116	2.00
	Oscillator Coil (CR-729CA)	360700-1	1.50	R10	5600	230702-129	2.00
T2	1st I-F Transformer	320814-1	3.00	R11	3300	230702-126	2.00
T3	2nd I-F Transformer	320814-1	3.00	R12	Volume Control w/switch	220662-1	2.00
T4	3rd I-F Transformer	320815-1	3.00	R13	5600	230702-129	2.00
T5	Audio Input Transformer	320813-1	4.25	R14	2200	230702-124	2.00
T6	Audio Output Transformer	320816-1	3.75	R15	470	230702-118	2.00
<b>CAPACITORS</b>							
C1	Mylar, .01 mfd. (CR-729CA)	250753-2	.15	R16	100	230702-110	2.00
	Mylar, .05 mfd.	250753-1	.25	R17	100 (CR-729AA)	230702-110	2.00
C2	Ceramic, .01 mfd.	250756-1	.30		68	230702-108	2.00
	Mylar, .005 mfd. (CR-729CA)	250753-3	.15		4.7, 1/2W ±5%, Wire Wound	230109-3	2.00
C3	Tuning Capacitor	240606-1	3.00	R19	15K	230702-133	2.00
C4	Mylar, .05 mfd.	250753-1	.25	R20	15K	230702-133	2.00
C5	Ceramic, .01 mfd.	250756-1	.30	R21	12K	230702-277	2.00
C6	Ceramic, 16 mmf. (CR-729AA)	250175-46	.20	R22	220K	230702-146	2.00
	Ceramic, 10 mmf.	250175-45	.20	<b>MISCELLANEOUS</b>			
C7	Mylar, .05 mfd.	250753-1	.25		Battery container assy.	636386-2	.40
C8	Mylar, .05 mfd.	250753-1	.25		Transistor socket	181563-1	.05
C9	Ceramic, .01 mfd.	250753-1	.25		Transistor socket retainer	181563-2	.05
C10	Ceramic, 22 mmf. (CR-729AA)	250175-44	.20		Earphone jack	181564-1	.65
	Electrolytic, 50 mfd., 10V	270559-5	1.10	SP1	2 3/4" PM speaker	590352-1	5.00
C11	Ceramic, .01 mfd.	250756-1	.30	CR1	Germanium IN295 diode	530553-1	1.50
C12	Electrolytic, 10 mfd., 10V	270559-3	1.10		Chassis shield	442290-2	.25
C13	Electrolytic, 50 mfd., 10V	270559-5	1.10		Battery	530043-1	2.75
C14	Electrolytic, 50 mfd., 10V	270559-5	1.10	<b>CABINET PARTS</b>			
C15	Ceramic, .01 mfd.	250756-1	.30		Cabinet Front Assy., Red	884272-10	2.50
C16	Electrolytic, 50 mfd., 10V	270559-5	1.10		Cabinet Front Assy., Ivory	884272-11	2.50
C17	Electrolytic, 50 mfd., 10V	270559-5	1.10		Cabinet Front Assy., Black	884272-12	2.50
<b>RESISTORS</b>							
All Resistors are 1/3W unless specified otherwise							
R1	3300 (CR-729CA)	230702-126	2.00		Cabinet Front Assy., Turquoise	884272-13	2.50
	100K	230702-143	2.00		Cabinet Front Assy., Coral	884272-14	2.50
R2	1500	230702-123	2.00		Back, Red	442295-1	.60
	2700 (CR-729CA)	230702-125	2.00		Back, Ivory	442295-2	.60
R3	39K	230702-130	2.00		Back, Black	442295-3	.60
R4	220	230702-114	2.00		Back, Turquoise	442295-6	.60
R5	220	230702-114	2.00		Back, Coral	442295-7	.60
R6	4700	230702-128	2.00		Nameplate	150448-1	.50
					Grille	636396-7	.80
					Volume-On-Off knob	140773-2	.45
					Tuning dial	140772-2	1.00
					Brass button for tuning dial	106268-2	.15



回路图



R <sub>1</sub>	56kΩ	20% 1/4W	R <sub>12</sub>	1.5kΩ	20% 1/4W	C <sub>4</sub>	0.02μF	Disk Ceramic	C <sub>15</sub>	30μF 6V	Electrolic	X <sub>1</sub>	Conv.
R <sub>2</sub>	10kΩ	"	R <sub>13</sub>	220Ω	"	C <sub>5</sub>	200pF	Silvered Mica	C <sub>16</sub>	12μF 15V	Electrolic	X <sub>2</sub>	IF <sub>1</sub>
R <sub>3</sub>	1.5kΩ	"	R <sub>14</sub>	42kΩ	"	C <sub>6</sub>	200pF	Silvered Mica	C <sub>17</sub>	0.04μF	Disk Ceramic	X <sub>3</sub>	IF <sub>2</sub>
R <sub>4</sub>	10Ω	"	R <sub>15</sub>	42Ω	10% 1/4W	C <sub>7</sub>	200pF	Silvered Mica				X <sub>4</sub>	Driver
R <sub>5</sub>	56kΩ	"	R <sub>16</sub>	42Ω	"	C <sub>8</sub>	2pF	Silvered Mica				X <sub>5</sub>	Power Amp.
R <sub>6</sub>	27kΩ	"				C <sub>9</sub>	2pF	Silvered Mica				X <sub>6</sub>	
R <sub>7</sub>	3.3kΩ	"				C <sub>10</sub>	3μF 6V	Electrolic	Ant	LA-461-GE		T <sub>1</sub>	Input Trans.
R <sub>8</sub>	1.5kΩ	"				C <sub>11</sub>	0.02μF	Disk Ceramic	Loss	103-7M		T <sub>2</sub>	Output Trans.
R <sub>9</sub>	5kΩ	V.R	C <sub>1</sub>	V.C.	Ant.	C <sub>12</sub>	0.01μF	"	IFT <sub>1</sub>	A	455kc	D <sub>1</sub>	Detector
R <sub>10</sub>	27kΩ	20% 1/4W	C <sub>2</sub>		Osc.	Osc.	C <sub>13</sub>	30μF 6V	Electrolic	IFT <sub>2</sub>	B	"	D <sub>2</sub>
R <sub>11</sub>	7.5kΩ	"	C <sub>3</sub>	0.02μF	Disk Ceramic	C <sub>14</sub>	3μF 6V	"	IFT <sub>3</sub>	C	"		



CR-729

RADIO CHASSIS

GENERAL

The CR-729 radio chassis is a six transistor superheterodyne type designed for use in battery operated pocket sized portable instruments. A receptacle is provided at the side of the chassis to accommodate a low impedance earphone. Insertion of the earphone will automatically disconnect the speaker. The chassis is powered by a single 4 volt battery having a useful life of approximately 200 hours. The circuit of this chassis consists of conventional wiring.

Original production chassis bear the suffix letters "AA" following the chassis model number stamped on the chassis. A circuit change is indicated by the first suffix letter; for example, CR-729BA.

A mechanical change is denoted by the 2nd suffix letter, for example, CR-729AB. Supplements to Service Bulletins will be issued identifying these changes as they occur in production.

SPECIFICATIONS

Power supply . . . . . 4 volt mercury-type battery  
 Power output . . . . . 50 milliwatts (90 milliwatts max.)  
 Tuning frequency range . . . . . 535-1620 KC  
 Intermediate frequency . . . . . 455 KC

Transistors:

Converter . . . . . 2N172  
 CR-729AA . . . . . 2N172  
 CR-729BA . . . . . 2N172  
 CR-729CA . . . . . 2N253

1st I-F Amplifier  
 CR-729AA . . . . . 2N146 or 2N145  
 CR-729BA . . . . . R02 or R03  
 CR-729CA . . . . . 2N253

2nd I-F Amplifier  
 CR-729AA . . . . . 2N146 or 2N147  
 CR-729BA . . . . . R04 or P-3  
 CR-729CA . . . . . 2N254

Detector (Crystal Diode) . . . . . 1N295  
 Audio Driver . . . . . TI 310

Audio Output  
 CR-729AA . . . . . (2) TI 352  
 CR-729BA . . . . . (2) 2N185  
 CR-729CA . . . . . (2) 2N105

CIRCUIT DESCRIPTION

The CR-729 chassis employs six transistors and a crystal diode which replace the electron tubes normally used in conventional battery operated AM radios. Some of the advantages of transistors are small size, ability to withstand physical shock and vibration without damage, instant operation without warm-up time, no need for bulky filament batteries and since operating potentials are low, the plate battery can be made small in size while still providing long battery life. The transistors used in the CR-729 are of the plug-in type which provides for easy replacement and freedom from possible damage by heat that is often incurred when soldering the terminals directly into the circuits.

The antenna is a ferrite rod type inductively coupled to the base terminal of the 2N172 converter stage by means of a low impedance secondary winding. The antenna is tuned by section C-3A of the 2 gang tuning capacitor.  
 Collector to emitter feedback is accomplished by means of oscillator coil T-1

which consists of two windings and provides for the oscillator function of the 2N172 converter stage. The top winding of the oscillator coil (terminals 1-2) is the feedback winding. The bottom winding (terminals 3-5) is tuned by section C-3B of the tuning gang to establish the frequency of oscillation. Oscillator current establishment. Oscillator bias by means of emitter coupling capacitor C-2 and emitter return resistor R-2. The function of the converter stage is threefold in that it acts as an amplifier for the antenna signal, an oscillator and a superheterodyne mixer which converts the antenna signal to an i-f frequency of 455 KC.

The i-f signal is taken from the converter collector terminal and coupled to the base terminal of the 1st i-f stage by means of 1st i-f transformer T-2. The primary of T-2 is slug tuned; the untuned secondary is a low impedance link which couples the high impedance primary to the relatively low impedance base to emitter circuit of the 1st i-f transistor. A sim-

alar transformer T-3 couples the output (collector) of the first i-f stage to the input (base) of the second i-f stage. The second i-f stage drives a 1N295 crystal diode detector by means of bifilar transformer T-4 which is single tuned by a powdered iron core.

The first and second i-f transistors operate in a manner similar to triode r-f amplifiers and therefore require neutralization to prevent possible self oscillation. Neutralization is accomplished by feeding a portion of properly phased output signal back to the input. Capacitor C-6 in series with R-6 furnishes the feedback for the first stage; capacitor C-10 in series with R-10 furnishes the required feedback for the second stage. Since factors vary between transistor types, inter-electrode capacitances and gain it is essential that the i-f transistors be replaced with exact replacements. If this is not done, circuit oscillation or a loss of gain might be incurred.

A negative AVC voltage is fed back from the diode detector to the base connection of the first i-f stage to control its gain with changes in signal level. The total negative AVC voltage appears across the Volume control R-12. This negative voltage is used to buck the positive voltage developed across the 1st i-f base resistor R-3 which is returned to a positive bias. The AVC voltage thus reduces the amount of positive bias to the base connection of the 1st i-f stage and reduces the gain of the stage as required.

The audio voltage selected by the Volume control is coupled to the base connection of the audio driver stage V4 by a 10 mfd.

SAFETY PRECAUTIONS

The following precautions should be exercised when servicing transistor radios:

1. Always replace with original type transistors.
2. Resistance measurements of chassis circuits should be made with the transistors removed from their sockets since the terminal voltage across the ohmmeter leads can cause conduction within the transistors causing erroneous readings. Also, EXCESSIVE OHMMETER TERMINAL VOLTAGES ACROSS A TRANSISTOR CAN CAUSE PERMANENT DAMAGE TO THE TRANSISTOR.

SERVICE INFORMATION

3. DO NOT SHORT ACROSS THE TERMINALS OF A TRANSISTOR WHILE THE RECEIVER IS OPERATING. Such practice may cause permanent damage to a transistor.

4. When soldering to a transistor socket first remove the transistor since EXCESSIVE HEAT FROM THE SOLDERING IRON CAN DESTROY THE TRANSISTOR.

5. Use a low wattage soldering iron with a small tip when removing or replacing components in order to avoid EXCESSIVE HEAT WHICH COULD CAUSE DAMAGE TO THE SMALL CIRCUIT COMPONENTS AND WIRING.

electrolytic capacitor C-13. This high value of coupling is made necessary by the relatively low input impedance of the driver stage. Since C-13 is an electrolytic particular attention should be given to its polarity should replacement become necessary.

The output of the driver stage is coupled to the push-pull output stage by means of driver transformer T-5 having a center tapped secondary. The output stage is a pair of push-pull transistors, V5 and V6 operated in Class B. When operated in this manner, the output transistors are biased to cut-off and their inputs driven 180 degrees out of phase. When one transistor is driven in a positive direction, the other is driven negative such that only one of the output transistors conducts at a time and when no audio signal is applied, neither transistor conducts. This provides for good battery economy. However, it should be noted that total current in the output stage increases with audio signal level so that total battery life will be conserved if the Volume control is maintained at lowest useable setting.

Push-pull output transformer T-6 matches the output transistors to a 15 ohm speaker voice coil.

This instrument is equipped with an earphone jack located on the left side of the chassis. Model 560043-1 is available for use with this instrument. The instrument speaker is automatically disconnected when the earphone plug is inserted in the jack.

**ALIGNMENT**

The output indicator may be an output meter across the speaker voice coil if test signal is modulated. Use a non-metallic screw driver for adjustments.

SIGNAL GENERATOR INPUT	SIGNAL GENERATOR FREQUENCY	TUNING CAPACITOR SETTING	ADJUSTMENTS	NOTES
High side to B (base) of V-1 thru 0.5 mfd. capacitor. Low side to chassis	455 KC.	Any point where no interfering signal is received	T-4, T-3 and T-2 i-f trimmers	Adjust for max. output
Radiating loop*	Exactly 1620 KC.	Exactly 1620 KC.	1620 KC oscillator trimmer	Same
Same	Exactly 535 KC.	Exactly 535 KC.	535 KC. oscillator trimmer	Same
Same	Approx. 1400 KC.	Approx. 1400 KC.	1400 KC. antenna trimmer	Same

available from the rear of the chassis once the cabinet back and the small chassis shield plate are removed. The voltages shown in the table were measured with a vacuum tube voltmeter, however, a 20,000 ohm/volt meter may also be used with satisfactory results.

Standard servicing techniques may be used in servicing this chassis provided the precautions listed above are properly observed.

**CHASSIS REMOVAL**

1. Unscrew brass button at center of tuning dial. Remove dial.
2. Remove the two chassis mounting screws under tuning dial.
3. Remove cabinet back by applying pressure at thumb slot in top of cabinet and gently moving the two sections apart. A slight upward lift on the back section will aid the removal.
4. Remove battery and chassis mounting screw located at center of battery container. Chassis may now be removed from case.

**BATTERY REPLACEMENT**

An old or exhausted battery may damage the chassis if not removed from the instrument at the end of its useful life. If the radio is to stand unused for a long period, the battery should be removed to prevent possible damage to the instrument.

When installing, place the battery pull-out tape across battery container and install the 4 volt mercury battery into the container with the positive (+) terminal up. If the receiver does not operate try reversing the battery in the container.

Replace worn out battery with one of the following types or equivalent:

- Magnavox No. 530043-1
- Hallory No. TR233R
- General No. 696
- Eveready No. 233

**SERVICING SUGGESTIONS**

When a battery reaches the end of its useful life its internal resistance rises rapidly. For this reason, the terminal voltage of a battery should always be checked under load with receiver operating. If the battery voltage under load measures lower than 2.7 volts the battery should be replaced.

Weakness, distortion or no output may be caused by a damaged transistor. If it is believed that a transistor is defective, replacement with a new transistor, known to be good is the surest servicing check. Do not check transistors with an ohmmeter as damage to the transistor may result. An ohmmeter check measures the ability of a transistor to conduct current in one direction, and to resist current flow in the opposite direction. The resistance is low in the conduction direction, in relation to the resistance in the non-conducting direction. Such a check is at best a crude one and is not recommended since the front to back resistance ratios differ widely among transistor types.

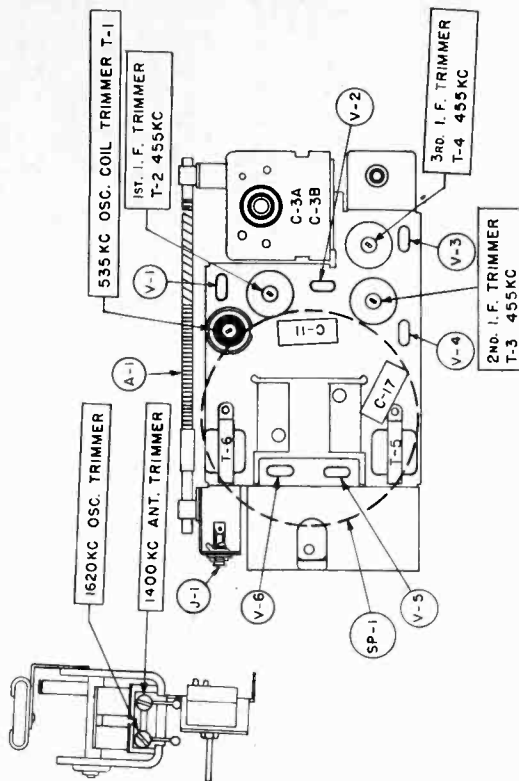
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The total current drain from the battery when the receiver is operating with the Volume control set to zero is approximately 7.0 milliamperes, with a good battery. This current can be measured by placing the power switch in the off position and placing the milliammeter leads across the switch terminals. The total current will rise as the audio output is increased. At maximum volume the total current drain will increase to over 25 milliamperes. From this it can be seen that battery life can be extended by maintaining conservative settings of the Volume control.

The voltage readings of an average receiver are shown on the voltage chart beneath the schematic. These voltages are

\* Radiating loop may consist of a 5 turn coil approximately 2 inches in diameter connected across terminals of signal generator leads and loosely coupled to receiver loop antenna.

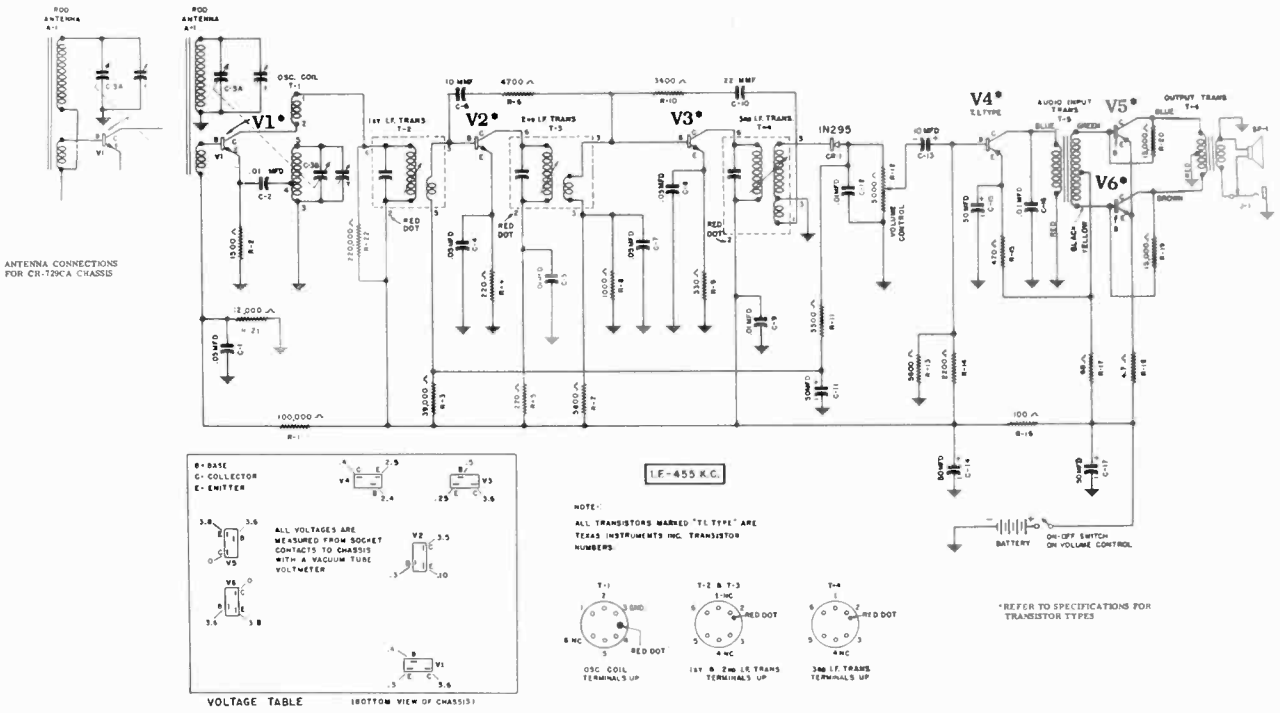
**CHASSIS LAYOUT**



PARTS LIST

CHASSIS CR-729

SYMBOL	DESCRIPTION	PART NO.	LIST	SYMBOL	DESCRIPTION	PART NO.	LIST
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A1	Rod Antenna (CR-729CA)	461512-2	2.00	R8	1000	230702-122	2.00
T1	Oscillator Coil	361225-1	1.75	R9	330	230702-116	2.00
T2	1st I-F Transformer	320014-1	3.00	R10	5600	230702-129	2.00
T3	2nd I-F Transformer	320014-1	3.00	R11	3300	230702-126	2.00
T4	3rd I-F Transformer	320015-1	3.00	R12	Volume Control w/switch	230663-1	2.00
T5	Audio Input Transformer	320013-1	4.25	R13	5600	230702-129	2.00
T6	Audio Output Transformer	320016-1	3.75	R14	2200	230702-124	2.00
<b>CAPACITORS</b>							
C1	Mylar, .01 mfd. (CR-729CA)	250753-2	.15	R15	470	230702-118	2.00
	Mylar, .05 mfd.	250753-1	.25	R16	100	230702-110	2.00
C2	Ceramic, .01 mfd.	250756-1	.30	R17	100 (CR-729AA)	230702-110	2.00
C3	Mylar, .005 mfd. (CR-729CA)	250753-3	.15	R18	60	230702-108	2.00
C4	Mylar, .05 mfd.	250756-1	.30	R19	4.7, 5% Wire Wound	230109-3	2.00
C5	Ceramic, .01 mfd.	250756-1	.30	R20	15K	230702-133	2.00
C6	Ceramic, 16 mmf. (CR-729AA)	250175-46	.20	R21	15K	230702-133	2.00
C7	Ceramic, 10 mmf.	250175-45	.20	R22	12K	230702-277	2.00
C8	Mylar, .05 mfd.	250753-1	.25		220K	230702-146	2.00
C9	Mylar, .05 mfd.	250753-1	.25	<b>MISCELLANEOUS</b>			
C10	Ceramic, 18 mmf. (CR-729AA)	250175-44	.20	Battery container assy. . . . . 636386-2 .40			
C11	Ceramic, 22 mmf.	250175-44	.20	Transistor socket . . . . . 181563-1 .05			
C12	Electrolytic, 50 mfd., 10V	270559-5	1.10	Transistor socket retainer . . . . . 181563-2 .08			
C13	Ceramic, .01 mfd.	250756-1	.30	Earphone jack . . . . . 181564-1 .65			
C14	Electrolytic, 10 mfd., 10V	270559-3	1.10	2 3/4" PM speaker . . . . . 580352-1 6.00			
C15	Electrolytic, 50 mfd., 10V	270559-5	1.10	Germanium 1N295 diode . . . . . 530653-1 1.50			
C16	Ceramic, .01 mfd.	250756-1	.30	Chassis shield . . . . . 142290-2 .25			
C17	Electrolytic, 50 mfd., 10V	270559-5	1.10	Battery . . . . . 530043-1 2.75			
<b>RESISTORS</b>							
All Resistors are 1/3W unless specified otherwise							
R1	3300 (CR-729CA)	230702-126	2.00	<b>CABINET PARTS</b>			
R2	100K	230702-143	2.00	Cabinet Front Assy, Red . . . . . 884272-15 2.50			
R3	1500	230702-123	2.00	Cabinet Front Assy, Ivory . . . . . 884272-16 2.50			
R4	2700 (CR-729CA)	230702-125	2.00	Cabinet Front Assy, Black . . . . . 884272-17 2.50			
R5	39K	230702-136	2.00	Cabinet Front Assy, Turquoise . . . . . 884272-18 2.50			
R6	220	230702-114	2.00	Back, Red . . . . . 442295-1 .60			
	4700	230702-128	2.00	Back, Ivory . . . . . 442295-2 .60			
				Back, Black . . . . . 442295-3 .60			
				Back, Turquoise . . . . . 442295-6 .60			
				Nameplate . . . . . 150447-1 .50			
				Grille . . . . . 636396-7 .80			
				Volume-On-Off knob . . . . . 140773-2 .45			
				Tuning dial . . . . . 140772-2 1.00			
				Brass button for tuning dial . . . . . 106268-2 .15			

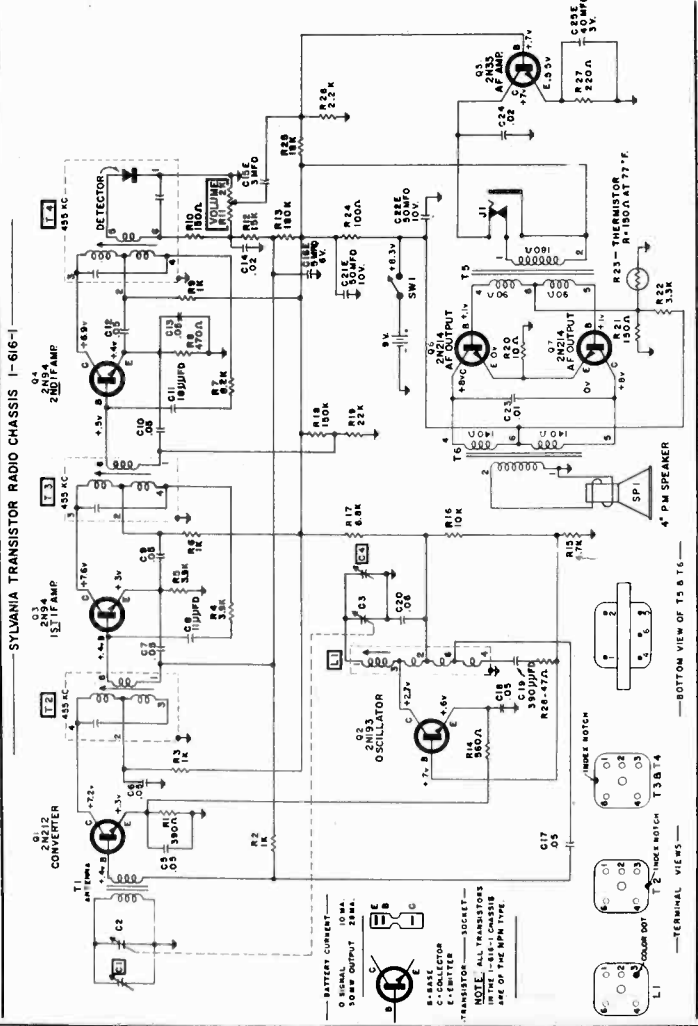
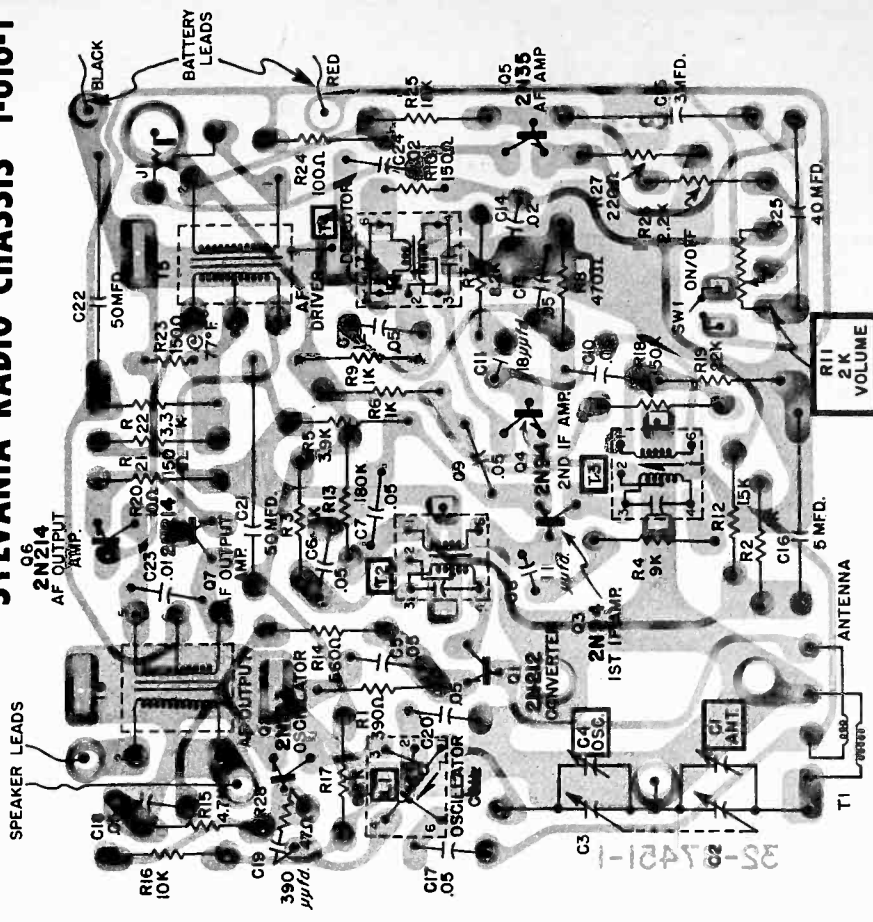


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# SYLVANIA RADIO CHASSIS 1-616-1



### SCHEMATIC NOTES

- VOLTAGES TAKEN WITH SYLVANIA POLYMER (VTVM).
- BATTERY VOLTAGE WITH RECEIVER OPERATING 8.3V.
- VOLTAGE VALUES SHOWN ARE AVERAGE READINGS.
- VARIATIONS MAY BE NOTED DUE TO NORMAL PRODUCTION TOLERANCES.
- T2, T3, T4 ARE BIFILAR. T5, T6, PRIMARIES ONLY ARE BIFILAR.

### SPEAKER REMOVAL

- Read instructions carefully before removing speaker.
- With top cover up, remove (4) brass screws from speaker grill (located inside cover). Take out speaker grill terminals.
  - Then remove (4) screws holding speaker to cover and lift out speaker. UNSOLDER SPEAKER LEADS AT SPEAKER TERMINALS.

### CHASSIS BOARD REMOVAL

Read instructions carefully before removing chassis.

- Remove (2) screws from chassis cover and remove cover.
- Remove (1) screw and mounting clip holding rear edge of chassis and (1) screw located near "T2" 1st IF transformer.
- Unsolder red and black battery leads on right side of chassis board and speaker leads at left side of chassis.

Remove (Q2) "Oscillator Transistor" before unsoldering speaker leads.

NOTE: Exercise caution when unsoldering leads to prevent possible damage to chassis board and components.

4. Slide chassis board toward back of case freeing it from front retaining lugs and remove chassis.

NOTE: When removing chassis board, it may be necessary to spread chassis cover brackets.

# SYLVANIA RADIO CHASSIS 1-616-1

## REPLACEMENT PARTS LIST

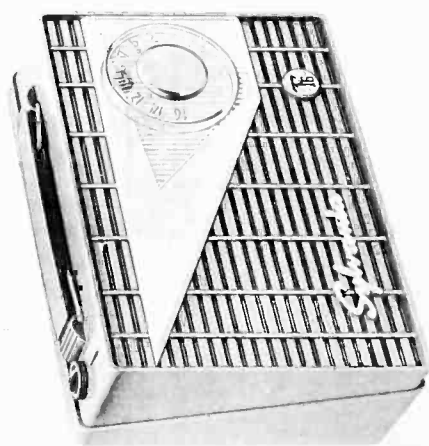
SCHMATIC LOCATION	SERVICE PART NO.	DESCRIPTION	SCHMATIC LOCATION	SERVICE PART NO.	DESCRIPTION
R1	181-0391	390 Ohm - 1/4W.	L1	113-0038	Coils - Transformers
R2	181-0102	1,000 Ohm - 1/4W.	T1	581-0011	Coil - Oscillator
R3	181-0102	1,000 Ohm - 1/4W.	T2	121-0029	Antenna - Iron Core
R4	181-0392	3,900 Ohm - 1/4W.	T3	122-0029	1st IF Transformer
R5	181-0392	3,900 Ohm - 1/4W.	T4	123-0030	2nd IF Transformer
R6	181-0102	1,000 Ohm - 1/4W.	T5	143-0056	3rd IF Transformer
R7	181-0822	8,200 Ohm - 1/4W.	T6	143-0057	Driver Transformer
R8	181-0471	470 Ohm - 1/4W.			Output Transformer
R9	181-0102	1,000 Ohm - 1/4W.			
R10	189-0075	150 Ohm - 1/10 W.			
R11	181-0153	"Miscellaneous Electrical Parts"			
R12	181-0184	15,000 Ohm - 1/4W.			
R13	181-0184	180,000 Ohm - 1/4W.			
R14	181-0561	560 Ohm - 1/4W.	J1	419-0026	Socket - Phone
R15	181-0472	4,700 Ohm - 1/4W.		412-0049	Socket - Transistor
R16	181-0103	10,000 Ohm - 1/4W.			
R17	181-0682	6,800 Ohm - 1/4W.			
R18	181-0154	150,000 Ohm - 1/4W.			
R19	181-0223	22,000 Ohm - 1/4W.			
R20	181-0100	10 Ohm - 1/4W.			
R21	181-0151	150 Ohm - 1/4W.			
R22	181-0332	3,300 Ohm - 1/4W.			
R23	189-0076	Thermistor - Rr 150 Ohm @ 77° F			
R24	181-0101	100 Ohm - 1/4W.			
R25	181-0183	18,000 Ohm - 1/4W.			
R26	181-0222	2,200 Ohm - 1/4W.			
R27	181-0221	220 Ohm - 1/4W.			
R28	181-0470	47 Ohm - 1/4W.			
C1, C4	170-0025	Variable Tuning Capacitor			
C2, C3	170-0025	Antenna Trimmer; Oscillator Trimmer			
C5	169-0054	.05 Mfd - 50V. - Ceramic			
C6	169-0054	.05 Mfd - 50V. - Ceramic			
C7	166-0011	11 Mmfd 10% - Ceramic	R1-1	181-0392	3900 Ohm - 1/4W.
C8	169-0054	.05 Mfd - 50V. - Ceramic	R12-1	181-0273	27K Ohm - 1/4W.
C9	169-0054	.05 Mfd - 50V. - Ceramic	R14-1	181-0102	1K Ohm - 1/4W.
C10	168-0022	18 Mmfd 10% - Ceramic	R17-1	181-0222	2200 Ohm - 1/4W.
C11	169-0054	.05 Mfd - 50V. - Ceramic	R22-1	181-04725	4300 Ohm - 1/4W. - 5%
C12	169-0054	.05 Mfd - 50V. - Ceramic			
C13	169-0054	.05 Mfd - 50V. - Ceramic			
C14	161-1037	3 Mfd - 6V. - Electrolytic			
C15	169-0054	.05 Mfd - 50V. - Ceramic			
C16	169-0054	.05 Mfd - 50V. - Ceramic			
C17	163-0301	300 Mmfd - 300V. Mica			
C18	169-0054	.05 Mfd - 50V. - Ceramic			
C19	169-0054	.05 Mfd - 50V. - Ceramic			
C20	161-1039	50 Mfd - 10V. - Electrolytic			
C21	168-0020	.01 Mfd - 50V. - Ceramic			
C22	161-1039	50 Mfd - 10V. - Electrolytic			
C23	169-0055	.02 Mfd - 50V. - Ceramic			
C24	161-1036	40 Mfd - 3V. - Electrolytic			
C25					

ALIGNMENT SETUP NOTES	TEST EQUIPMENT HOOKUP	ADJUST
1. Set variable tuning capacitor plates fully open (minimum capacity).	SIGNAL GENERATOR - radiate signal to receiver through a loop consisting of several turns of wire in series with a 150 Ohm resistor. Set generator frequency at 455 KC.	Adjust in order shown for MAXIMUM output: T4, T3, T2. Repeat for optimum performance.
2. Set dial to approximately 1650 KC.	SIGNAL GENERATOR - radiate to receiver as in step 1. Set generator frequency at 1650 KC.	C4 (oscillator trimmer) for maximum volume.
3. Set dial to a frequency between 1400 KC and 1500 KC.	SIGNAL GENERATOR - radiate to receiver as in step 1. Set generator to a frequency corresponding to receiver dial (until signal is heard through receiver speaker).	C1 (antenna trimmer) for MAXIMUM volume.
4. Set dial to 600 KC.	SIGNAL GENERATOR - radiate to receiver as in step 1. Set generator to 600 KC and tune for maximum volume.	L1 (oscillator coil) for MAXIMUM volume while simultaneously rocking tuning capacitor through the 600 KC position.

REPLACEMENT PARTS LIST

SCHEMATIC LOCATION	SERVICE PART NO.	DESCRIPTION	SCHEMATIC LOCATION	SERVICE PART NO.	DESCRIPTION
<b>RESISTORS</b>			<b>CAPACITORS</b>		
R1	181-0472	4,700 OHM - 10% - 1/4W.	C17	161-1043	50 MFD. - 3V. - ELECTROLYTIC
R2	181-0182	1,800 OHM - 10% - 1/4W.	C18	169-0054	.05 MFD. - 50V. - CERAMIC
R3	181-0153	15,000 OHM - 10% - 1/4W.	C19	169-0065	.005 MFD. - 50V. - CERAMIC
R4	181-0101	100 OHM - 10% - 1/4W.	<b>COILS &amp; TRANSFORMERS</b>		
R5	181-0272	2,700 OHM - 10% - 1/4W.	L1	113-0039	COIL - OSCILLATOR
R6	181-0104	100,000 OHM - 10% - 1/4W.	T1	581-0012	ANTENNA - FERRITE ROD
R7	181-0222	2,200 OHM - 10% - 1/4W.	T2	121-0103	1ST IF TRANSFORMER
R8	181-0472	4,700 OHM - 10% - 1/4W.	T3	121-0103	2ND IF TRANSFORMER
R9	181-0821	820 OHM - 10% - 1/4W.	T4	122-0031	3RD IF TRANSFORMER
R10	181-0822	8,200 OHM - 10% - 1/4W.	T5	143-0063	AF DRIVER TRANSFORMER
R11	181-0182	1,800 OHM - 10% - 1/4W.	T6	143-0062	AF OUTPUT TRANSFORMER
R12	152-0042	2,500 OHM - VARIABLE	<b>CAPACITORS</b>		
SW1	PART OF R13	ON/OFF SWITCH	<b>CABINET PARTS</b>		
R13	181-0821	820 OHM - 20% - 1/4W.	<b>MODELS</b>		
R14	181-0101	100 OHM - 10% - 1/4W.	3202GR	3204TU	3204YE
R15	181-0101	100 OHM - 10% - 1/4W.	CASE - FRONT 822-0019 822-0021 822-0023		
R16	181-0470	47 OHM - 10% - 1/4W.	CASE - REAR 822-0020 822-0022 822-0024		
R17	181-0562	5,600 OHM - 10% - 1/4W.	CLIP - "A" BATTERY 487-0091 487-0091 487-0091		
C1, C4			CLIP - HANDLE RETAINING 487-0088 487-0088 487-0088		
C2, C3			COVER - BATTERY HOLDER 803-0017 803-0017 803-0017		
C5			COVER & LEADS ASSY. (BATTERY HOLDER) 803-0018 803-0018 803-0018		
C6			HANDLE 818-0128 818-0129 818-0130		
C7			KNOB - VOLUME 740-0171 740-0172 740-0173		
C8			KNOB - TUNING 741-0041 741-0041 741-0041		
C9			SPEAKER W/TRANS. 539-0425 539-0425 539-0425		
C10			SW - BATTERY JUMPER 496-0150 496-0150 496-0150		
C11			TUBE - BATTERY HOLDER 803-0016 803-0016 803-0016		
C12					
C13					
C14					
C15					
C16					
"A"					
"B"					

**COMPLETE SERVICE INFORMATION**  
*for*  
**RADIO CHASSIS 1-617-1**  
 NOVEMBER 1957  
 SERVICE LITERATURE  
**SYLVANIA**  
 RADIO & TELEVISION  
 Sylvania Electric Products Inc., Radio & Television Div., Service Dept., Batavia, N. Y.



MODEL 3204  
(MODEL 3203 SIMILAR)

**SPECIFICATIONS**  
 FREQUENCY RANGE.....540 KC to 1650 KC  
 IF FREQUENCY.....455 KC  
 SPEAKER.....4" PM  
 POWER SUPPLY.....9V. & 1.5V.  
 (7-1.5V. Size "C" Batteries)

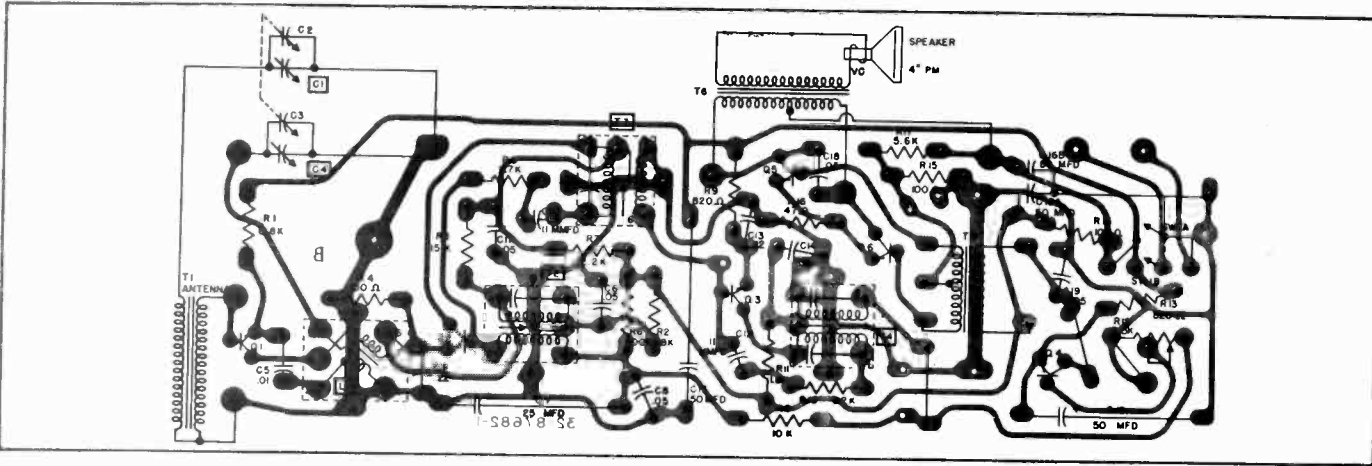
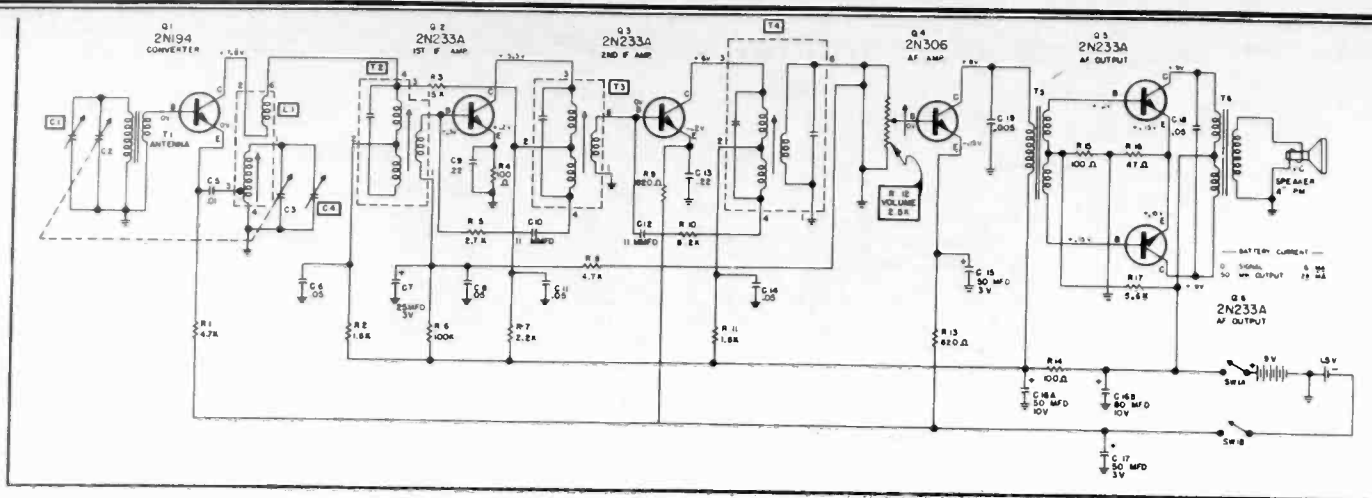
**TRANSISTOR COMPLEMENT**  
 Converter.....2N194  
 1st IF Amplifier.....2N233A  
 2nd IF Amplifier.....2N233A  
 AF Amplifier.....2N306  
 AF Output Amplifier.....2N306  
 AF Output Amplifier.....2N306



**BATTERY INSTALLATION**  
 Replace with size "C" 1 1/2 volt flashlight batteries only. Proper polarity must be observed to prevent damage to receiver. On carbon batteries the button is positive. To prevent damage, always remove discharged batteries.  
 To open case, depress top of front cover near both ends of handle while pulling top of rear cover backward.  
 1. Install a single battery in compartment at lower left corner below chassis. Positive "+" terminal of battery must face toward "+" on case.  
 2. Install batteries (6) in battery holder as illustrated. Release cover by depressing spring clips.  
 3. Replace back cover by locating tongues in corresponding grooves at bottom of case and gently press top of cover until it snaps in place.

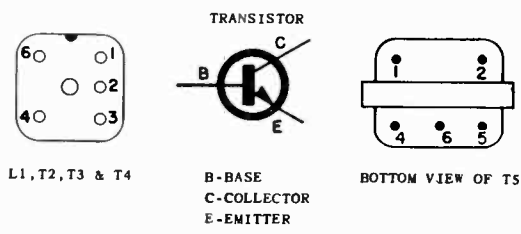
**BATTERY REMOVAL**  
 1. Open case by depressing top of front cover near handle ends while pulling top of rear cover backward.  
 2. Remove knobs (2) and remove screw (1) behind tuning knob.  
 3. Remove screws (2) securing chassis board to mounting brackets. (NOTE: One screw is insulating from chassis by a fiber washer. Replace this washer when installing chassis board.)  
 The chassis may now be lifted from case for alignment and maintenance.

CHASSIS 1-617-1



**NOTES:**

1. Voltages taken with Sylvania Polymeter (VTVM).
2. Battery voltage with receiver operating 9V.
3. Voltage values shown are average readings.
4. Variations may be noted due to normal production tolerances.



ALIGNMENT PROCEDURE

PRELIMINARY INSTRUCTIONS

1. Remove chassis from case as outlined under Chassis Board Removal.
2. Allow signal generator several minutes warm-up time.
3. Set signal generator for an amplitude modulated RF output signal.
4. Maintain signal generator output at lowest usable level.
5. Use an audible check or an output meter.
6. Adjust Volume Control to full volume.

STEP	ALIGNMENT SETUP NOTES	TEST EQUIPMENT HOOKUP	ADJUST
1.	Set variable tuning capacitor plates fully open (minimum capacity).	SIGNAL GENERATOR - radiate signal to receiver through loop consisting of several turns of wire in series with a 150 Ohm resistor. Set generator frequency at 455 KC.	Adjust in order shown for MAXIMUM Output: T4, T3, T2.  Repeat for optimum performance.
2.	Set dial to 600 KC.	SIGNAL GENERATOR - radiated to receiver as in step 1. Set generator to 600 KC and tune for maximum volume.	L1 (oscillator coil) for MAXIMUM volume while simultaneously rocking tuning capacitor through the 600 KC position.
3.	Set dial to approximately 1650 KC.	SIGNAL GENERATOR - radiated to receiver as in step 1. Set generator frequency at 1650 KC.	C4 (oscillator trimmer) for maximum volume.
4.	Set dial to a frequency between 1400 KC and 1500 KC.	SIGNAL GENERATOR - radiated to receiver as in step 1. Set generator to a frequency corresponding to receiver dial (until signal is heard through receiver speaker.)	C1 (antenna trimmer) for MAXIMUM volume.

**COMPLETE SERVICE INFORMATION**

**RADIO CHASSIS 1-620-1**

for

**CHASSIS:** 1-620-1  
**MODELS:** 3305

NOVEMBER 1957



Sylvania Electric Products Inc., Radio & Television Div., Service Dept., Batavia, N. Y.



MODEL 3305

**REPLACEMENT PARTS LIST**

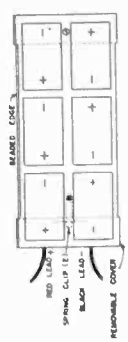
SCHMATIC LOCATION	SERVICE PART NO.	DESCRIPTION	SCHMATIC LOCATION	SERVICE PART NO.	DESCRIPTION
<b>RESISTORS</b>					
R1	181-0682	6,800 OHM - 10% - 1/4W.	C17	161-2020	TRD SECTION ELECTROLYTIC:
R2	181-0182	1,800 OHM - 10% - 1/4W.	"A"		50 MFD. - 10V.
R3	181-0101	100 OHM - 10% - 1/4W.	"B"		80 MFD. - 10V.
R4	181-0682	6,800 OHM - 10% - 1/4W.	C18	161-1043	50 MFD. - 3V. - ELECTROLYTIC
R5	181-0104	100,000 OHM - 10% - 1/4W.	C19	169-0054	.05 MFD. - 50V. CERAMIC
R6	181-0222	2,200 OHM - 10% - 1/4W.	C20	169-0064	.01 MFD. - 50V. CERAMIC
R7	181-0392	3,900 OHM - 10% - 1/4W.	<b>CAPACITORS</b>		
R8	181-0471	470 OHM - 10% - 1/4W.	<b>COILS &amp; TRANSFORMERS</b>		
R9	181-0821	820 OHM - 10% - 1/4W.	L1	113-0039	COIL - OSCILLATOR
R10	181-0682	6,800 OHM - 10% - 1/4W.	T1	581-0012	ANTENNA - FERRITE ROD
R11	181-0182	1,800 OHM - 10% - 1/4W.	T2	121-0103	1ST IF TRANSFORMER
R12	181-0151	150 OHM - 20% - 1/4W.	T3	121-0103	2ND IF TRANSFORMER
R13	152-0042	2,500 OHM - VARIABLE	T4	122-0031	3RD IF TRANSFORMER
SW1	PART OF R13	ON/OFF SWITCH	T5	143-0063	AF DRIVER TRANSFORMER
R14	181-0821	820 OHM - 20% - 1/4W.	T6	143-0062	AF OUTPUT TRANSFORMER
R15	181-0101	100 OHM - 10% - 1/4W.	<b>CABINET PARTS</b>		
R16	181-0151	150 OHM - 10% - 1/4W.	<b>MODELS</b>		
R17	169-0076	THERMISTOR, 150 OHM @77° F.	<b>3305TA</b> <b>3305BL</b>		
R18	181-0100	10 OHM - 10% - 1/4W.	CASE - FRONT	822-0025	822-0027
R19	181-0392	3,900 OHM - 10% - 1/4W.	CASE - REAR	822-0026	822-0026
<b>CAPACITORS</b>					
C1, C4	170-0026	VARIABLE TUNING CAPACITOR	CLIP - "A" BATTERY	487-0091	487-0091
C2, C3		ANTENNA TRIMMER, OSC. TRIMMER	CLIP - HANDLE RETAINING	487-0088	487-0088
C5	169-0020	ANTENNA GANG, OSC. GANG	COVER - BATTERY HOLDER	803-0017	803-0017
C6	169-0054	.01 MFD. - 500V. - CERAMIC	COVER & LEADS ASSY. (BATTERY HOLDER)	803-0018	803-0018
C7	161-1045	.05 MFD. - 50V. - CERAMIC	HANDLE	818-0131	818-0132
C8	169-0054	.05 MFD. - 50V. - CERAMIC	KNOB - VOLUME	740-0177	740-0178
C9	169-0067	.22 MFD. - 3V. - CERAMIC	KNOB - TUNING	741-0041	741-0041
C10	166-0011	11 MFD. - 50V. - CERAMIC	SPEAKER W/TRANS.	539-4603	539-4603
C11	169-0054	.05 MFD. - 50V. - CERAMIC	SPRING - BATTERY JUMPER	496-0150	496-0150
C12	166-0011	11 MFD. - 50V. - CERAMIC	TUBE - BATTERY HOLDER	803-0016	803-0016
C13	169-0067	.22 MFD. - 3V. - CERAMIC			
C14	169-0054	.05 MFD. - 50V. - CERAMIC			
C15	169-0055	.02 MFD. - CERAMIC			
C16	161-1043	50 MFD. - 3V. - ELECTROLYTIC			

**SPECIFICATIONS**

FREQUENCY RANGE.....540 KC to 1650 KC  
 IF FREQUENCY.....455 KC  
 SPEAKER.....4" x 6" PM  
 POWER SUPPLY.....9V. & 1.5V.  
 (7-1.5V. Size "C" Batteries)

**TRANSISTOR COMPLEMENT**

- Converter.....2N212
- 1st IF Amplifier.....2N94
- 2nd IF Amplifier.....2N94
- AF Amplifier.....2N35
- AF Output Amplifier.....2N214
- AF Output Amplifier.....2N214



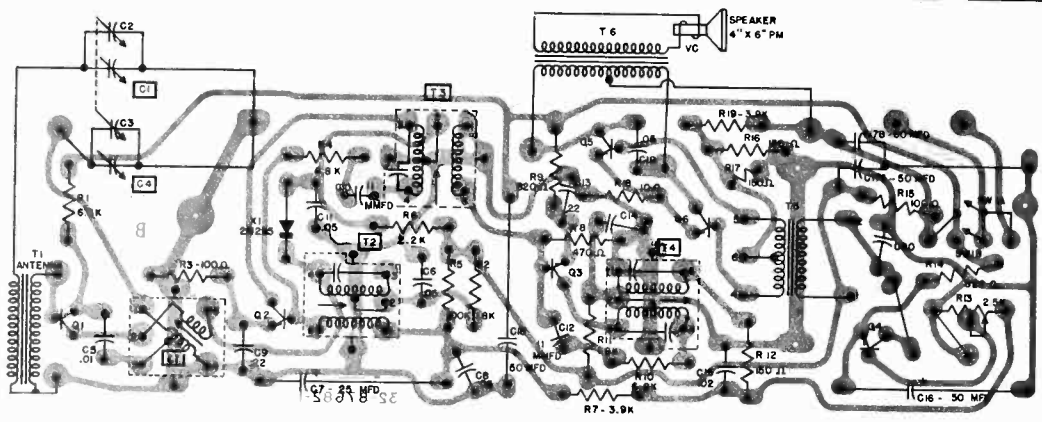
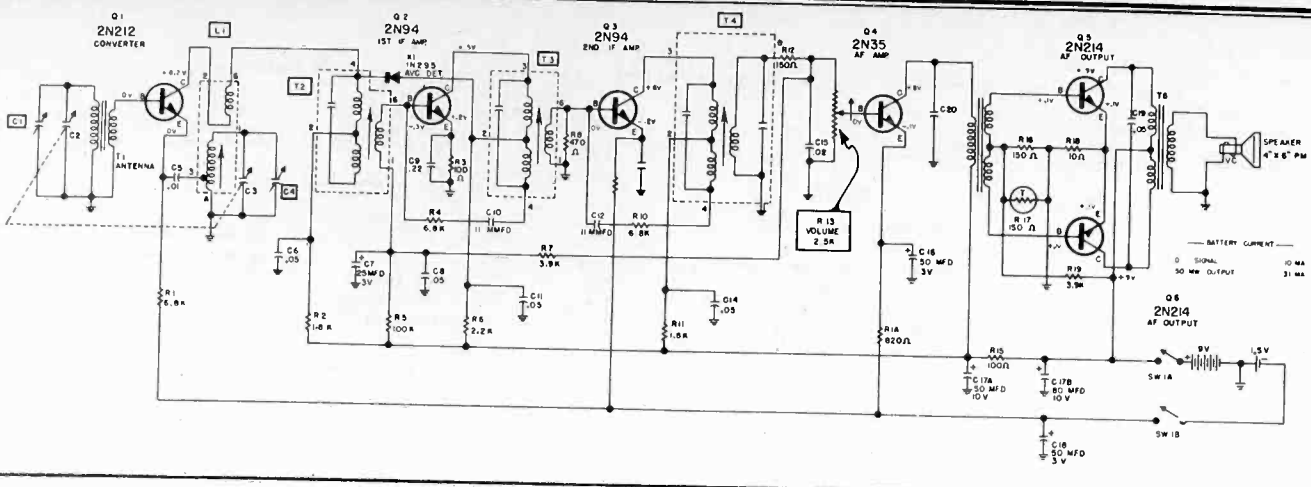
**BATTERY INSTALLATION**

Replace with size "C" 1 1/2 volt flashlight batteries only. Proper polarity must be observed to prevent damage to receiver. On carbon batteries, the button is positive. To prevent damage, always remove discharged batteries.

1. To open case, depress top of front cover near both ends of handle while pulling top of rear cover backward.
2. Install a single battery in compartment at lower left corner below chassis. Positive terminal of battery must face toward "+" on case.
3. Install batteries (6) in battery holder as illustrated. Release cover by depressing spring clips.
4. Replace back cover by locating tongues in corresponding grooves at bottom of case and gently press top of cover until it snaps in place.

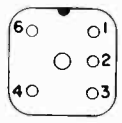
**CHASSIS BOARD REMOVAL**

1. Open case by depressing top of front cover near handle ends while pulling top of rear cover backward.
  2. Remove knobs (2) and remove screw (1) behind tuning knob.
  3. Remove screws (2) securing chassis board to mounting brackets. (NOTE: One screw is insulated from chassis by a fiber washer. Replace this washer when installing chassis board.)
- The chassis may now be lifted from case for alignment and maintenance.



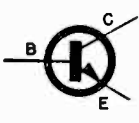
NOTES:

1. Voltages taken with Sylvania Polymeter (VTVM).
2. Battery voltage with receiver operating 9V.
3. Voltage values shown are average readings.
4. Variations may be noted due to normal production tolerances.

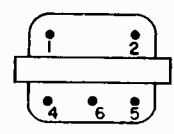


L1, T2, T3 & T4

TRANSISTOR



B-BASE  
C-COLLECTOR  
E-EMITTER



BOTTOM VIEW OF T5

ALIGNMENT PROCEDURE

PRELIMINARY INSTRUCTIONS

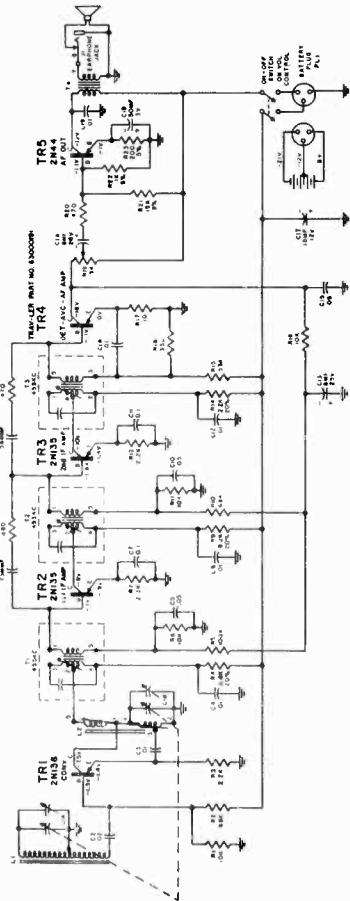
1. Remove chassis from case as outlined under Chassis Board Removal.
2. Allow signal generator several minutes warm-up time.
3. Set signal generator for an amplitude modulated RF output signal.
4. Maintain signal generator output at lowest usable level.
5. Use an audible check or an output meter.
6. Adjust Volume Control to full volume.

STEP	ALIGNMENT SETUP NOTES	TEST EQUIPMENT HOOKUP	ADJUST
1.	Set variable tuning capacitor plates fully open (minimum capacity).	SIGNAL GENERATOR - radiate signal to receiver through a loop consisting of several turns of wire in series with a 150 Ohm resistor. Set generator frequency at 455 KC.	Adjust in order shown for MAXIMUM Output: T4, T3, T2.  Repeat for optimum performance.
2.	Set dial to 600 KC.	SIGNAL GENERATOR - radiated to receiver as in step 1. Set generator to 600 KC and tune for maximum volume.	L1 (oscillator coil) for MAXIMUM volume while simultaneously rocking tuning capacitor through the 600 KC position.
3.	Set dial to approximately 1650 KC.	SIGNAL GENERATOR - Radiated to receiver as in step 1. Set generator frequency at 1650 KC.	C4 (oscillator trimmer) for maximum volume.
4.	Set dial to a frequency between 1400 KC and 1500 KC.	SIGNAL GENERATOR - radiated to receiver as in step 1. Set generator to a frequency corresponding to receiver dial (until signal is heard through receiver speaker.)	C1 (antenna trimmer) for MAXIMUM volume.

**TRAVLER ALL-TRANSISTOR POWER-MITE PORTABLE**

MODELS - 250 & 251

SD-229



**ALIGNMENT AND SERVICE DATA**

MODEL TR-250 AND TR 251  
MODEL TR-250A AND TR-251A

**Remove The Chassis From The Cabinet For Alignment**

A signal generator having the following frequencies 455KC, 535KC, 1400KC, 1630KC, is required. An output meter should also be connected across the speaker. One meter lead is connected to the terminal on the printed board next to the output transformer where the speaker lead is soldered. The other lead of the meter is connected to a mounting lug on the I.F. transformers.

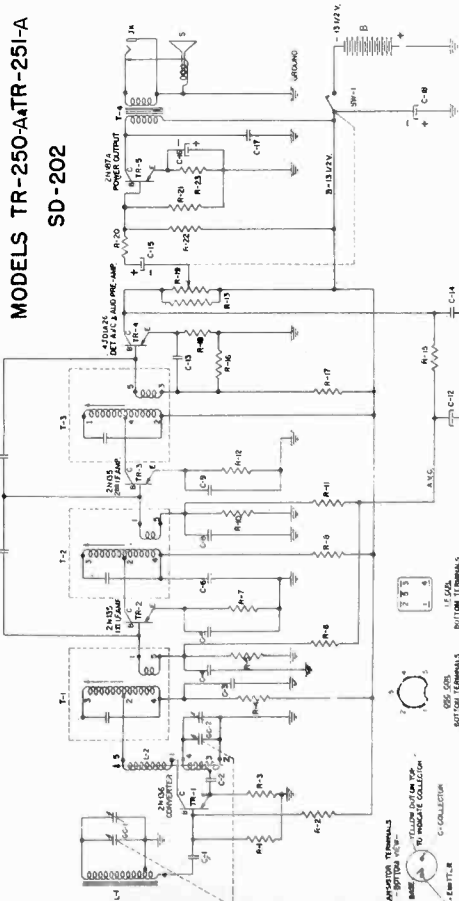
STEP NO. 2: With the generator leads still connected as in I.F. alignment, set the generator to 1630KC. Make sure the gang condenser is at complete minimum capacity (completely open) and adjust the OSC. trimmer (front section) to the 1630KC signal. Rotate the gang condenser to complete maximum capacity (completely meshed). Set the generator to 535KC and adjust the OSC. coil slug (through the hole in the printed board next to the 1st I.F. can) to the 535KC signal. It is well to recheck the 1630KC signal, then the 535KC signal to be sure that adjustment of the OSC. trimmer or OSC. slug has not affected the settings.

The volume control must be turned to maximum during all adjustments. The signal generator output must be kept at an absolute minimum to prevent overloading and giving false readings.

1st STEP: Connect the hot lead of the generator through a .1 MFD condenser to the ANT. section (rear section) of the gang condenser. The ground lead of the generator must be connected to chassis ground (a mounting lug for the I.F. cans).

Set the generator to 455KC and adjust the I.F. tuning slugs through the holes in the printed board directly below the I.F. CANS (three in number). Use only enough signal from the generator to give a slight indication on the output meter. The gang condenser should be turned to complete minimum capacity during the I.F. alignment.

**MODELS TR-250-A & TR-251-A  
SD-202**



TRANSISTOR TERMINALS  
B-BASE  
C-COLLECTOR  
E-EMITTER

PART NO.	SYMBOL	DESCRIPTION	QTY	REVISION
CC-249	C-1	50MFD 25V	1	
CC-250	C-2	10MFD 50V	1	
CC-251	C-3	10MFD 50V	1	
CC-252	C-4	10MFD 50V	1	
CC-253	C-5	10MFD 50V	1	
CC-254	C-6	10MFD 50V	1	
CC-255	C-7	10MFD 50V	1	
CC-256	C-8	10MFD 50V	1	
CC-257	C-9	10MFD 50V	1	
CC-258	C-10	10MFD 50V	1	
CC-259	C-11	10MFD 50V	1	
CC-260	C-12	10MFD 50V	1	
CC-261	C-13	10MFD 50V	1	
CC-262	C-14	10MFD 50V	1	
CC-263	R-1	10K	1	
CC-264	R-2	10K	1	
CC-265	R-3	10K	1	
CC-266	R-4	10K	1	
CC-267	R-5	10K	1	
CC-268	R-6	10K	1	
CC-269	R-7	10K	1	
CC-270	R-8	10K	1	
CC-271	R-9	10K	1	
CC-272	R-10	10K	1	
CC-273	R-11	10K	1	
CC-274	R-12	10K	1	
CC-275	R-13	10K	1	
CC-276	R-14	10K	1	
CC-277	R-15	10K	1	
CC-278	R-16	10K	1	
CC-279	R-17	10K	1	
CC-280	R-18	10K	1	
CC-281	R-19	10K	1	
CC-282	R-20	10K	1	
CC-283	R-21	10K	1	
CC-284	R-22	10K	1	
CC-285	R-23	10K	1	
CC-286	R-24	10K	1	
CC-287	R-25	10K	1	
CC-288	R-26	10K	1	
CC-289	R-27	10K	1	
CC-290	R-28	10K	1	
CC-291	R-29	10K	1	
CC-292	R-30	10K	1	
CC-293	R-31	10K	1	
CC-294	R-32	10K	1	
CC-295	R-33	10K	1	
CC-296	R-34	10K	1	
CC-297	R-35	10K	1	
CC-298	R-36	10K	1	
CC-299	R-37	10K	1	
CC-300	R-38	10K	1	
CC-301	R-39	10K	1	
CC-302	R-40	10K	1	
CC-303	R-41	10K	1	
CC-304	R-42	10K	1	
CC-305	R-43	10K	1	
CC-306	R-44	10K	1	
CC-307	R-45	10K	1	
CC-308	R-46	10K	1	
CC-309	R-47	10K	1	
CC-310	R-48	10K	1	
CC-311	R-49	10K	1	
CC-312	R-50	10K	1	
CC-313	R-51	10K	1	
CC-314	R-52	10K	1	
CC-315	R-53	10K	1	
CC-316	R-54	10K	1	
CC-317	R-55	10K	1	
CC-318	R-56	10K	1	
CC-319	R-57	10K	1	
CC-320	R-58	10K	1	
CC-321	R-59	10K	1	
CC-322	R-60	10K	1	
CC-323	R-61	10K	1	
CC-324	R-62	10K	1	
CC-325	R-63	10K	1	
CC-326	R-64	10K	1	
CC-327	R-65	10K	1	
CC-328	R-66	10K	1	
CC-329	R-67	10K	1	
CC-330	R-68	10K	1	
CC-331	R-69	10K	1	
CC-332	R-70	10K	1	
CC-333	R-71	10K	1	
CC-334	R-72	10K	1	
CC-335	R-73	10K	1	
CC-336	R-74	10K	1	
CC-337	R-75	10K	1	
CC-338	R-76	10K	1	
CC-339	R-77	10K	1	
CC-340	R-78	10K	1	
CC-341	R-79	10K	1	
CC-342	R-80	10K	1	
CC-343	R-81	10K	1	
CC-344	R-82	10K	1	
CC-345	R-83	10K	1	
CC-346	R-84	10K	1	
CC-347	R-85	10K	1	
CC-348	R-86	10K	1	
CC-349	R-87	10K	1	
CC-350	R-88	10K	1	
CC-351	R-89	10K	1	
CC-352	R-90	10K	1	
CC-353	R-91	10K	1	
CC-354	R-92	10K	1	
CC-355	R-93	10K	1	
CC-356	R-94	10K	1	
CC-357	R-95	10K	1	
CC-358	R-96	10K	1	
CC-359	R-97	10K	1	
CC-360	R-98	10K	1	
CC-361	R-99	10K	1	
CC-362	R-100	10K	1	
CC-363	R-101	10K	1	
CC-364	R-102	10K	1	
CC-365	R-103	10K	1	
CC-366	R-104	10K	1	
CC-367	R-105	10K	1	
CC-368	R-106	10K	1	
CC-369	R-107	10K	1	
CC-370	R-108	10K	1	
CC-371	R-109	10K	1	
CC-372	R-110	10K	1	
CC-373	R-111	10K	1	
CC-374	R-112	10K	1	
CC-375	R-113	10K	1	
CC-376	R-114	10K	1	
CC-377	R-115	10K	1	
CC-378	R-116	10K	1	
CC-379	R-117	10K	1	
CC-380	R-118	10K	1	
CC-381	R-119	10K	1	
CC-382	R-120	10K	1	
CC-383	R-121	10K	1	
CC-384	R-122	10K	1	
CC-385	R-123	10K	1	
CC-386	R-124	10K	1	
CC-387	R-125	10K	1	
CC-388	R-126	10K	1	
CC-389	R-127	10K	1	
CC-390	R-128	10K	1	
CC-391	R-129	10K	1	
CC-392	R-130	10K	1	
CC-393	R-131	10K	1	
CC-394	R-132	10K	1	
CC-395	R-133	10K	1	
CC-396	R-134	10K	1	
CC-397	R-135	10K	1	
CC-398	R-136	10K	1	
CC-399	R-137	10K	1	
CC-400	R-138	10K	1	
CC-401	R-139	10K	1	
CC-402	R-140	10K	1	
CC-403	R-141	10K	1	
CC-404	R-142	10K	1	
CC-405	R-143	10K	1	
CC-406	R-144	10K	1	
CC-407	R-145	10K	1	
CC-408	R-146	10K	1	
CC-409	R-147	10K	1	
CC-410	R-148	10K	1	
CC-411	R-149	10K	1	
CC-412	R-150	10K	1	
CC-413	R-151	10K	1	
CC-414	R-152	10K	1	
CC-415	R-153	10K	1	
CC-416	R-154	10K	1	
CC-417	R-155	10K	1	
CC-418	R-156	10K	1	
CC-419	R-157	10K	1	
CC-420	R-158	10K	1	
CC-421	R-159	10K	1	
CC-422	R-160	10K	1	
CC-423	R-161	10K	1	
CC-424	R-162	10K	1	
CC-425	R-163	10K	1	
CC-426	R-164	10K	1	
CC-427	R-165	10K	1	
CC-428	R-166	10K	1	
CC-429	R-167	10K	1	
CC-430	R-168	10K	1	
CC-431	R-169	10K	1	
CC-432	R-170	10K	1	
CC-433	R-171	10K	1	
CC-434	R-172	10K	1	
CC-435	R-173	10K	1	
CC-436	R-174	10K	1	
CC-437	R-175	10K	1	
CC-438	R-176	10K	1	
CC-439	R-177	10K	1	
CC-440	R-178	10K	1	
CC-441	R-179	10K	1	
CC-442	R-180	10K	1	
CC-443	R-181	10K	1	
CC-444	R-182	10K	1	
CC-445	R-183	10K	1	
CC-446	R-184	10K	1	
CC-447	R-185	10K	1	
CC-448	R-186	10K	1	
CC-449	R-187	10K	1	
CC-450	R-188	10K	1	
CC-451	R-189	10K	1	
CC-452	R-190	10K	1	
CC-453	R-191	10K	1	
CC-454	R-192	10K	1	
CC-455	R-193	10K	1	
CC-456	R-194	10K	1	
CC-457	R-195	10K	1	
CC-458	R-196	10K	1	
CC-459	R-197	10K	1	
CC-460	R-198	10K	1	
CC-461	R-199	10K	1	
CC-462	R-200	10K	1	
CC-463	R-201	10K	1	
CC-464	R-202	10K	1	
CC-465	R-203	10K	1	
CC-466	R-204	10K	1	
CC-467	R-205	10K	1	
CC-468	R-206	10K	1	
CC-469	R-207	10K	1	
CC-470	R-208	10K	1	
CC-471	R-209	10K	1	
CC-472	R-210	10K	1	
CC-473	R-211	10K	1	
CC-474	R-212	10K	1	
CC-475				

### MODEL NO. D3614A

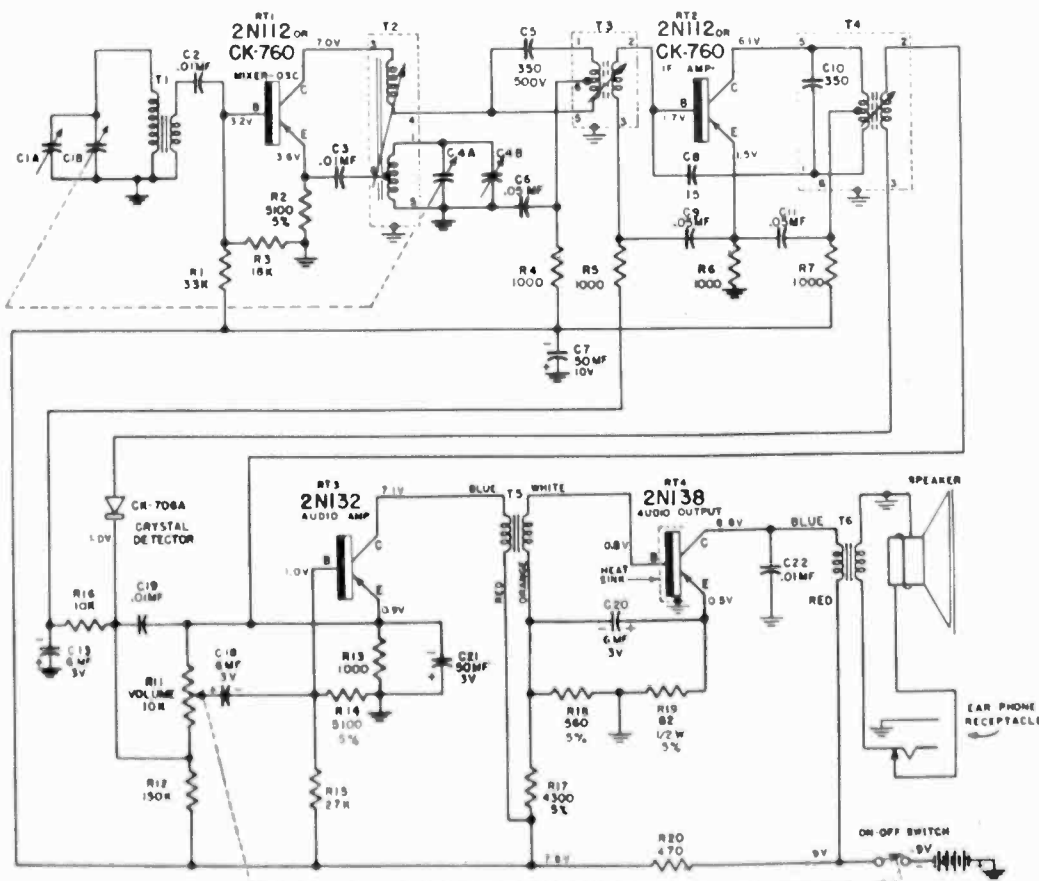
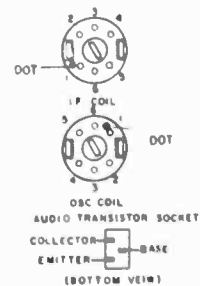
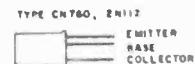
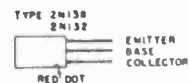
Listed below are the production changes pertaining to Model No. D3614A, 4RT1 chassis. The resistors R14, 15, 20 and capacitors C8 changes were incorporated to increase the sensitivity and are as follows:

Ref. No.	Part No.	Description
R14	9B5-176	5100 ohm, 1/4 watt, 5%
R15	9B5-79	27K ohm, 1/4 watt, 10%
R19	9B1-49	82 ohm, 1/2 watt, 5%
R20	9B5-58	470 ohm, 1/4 watt, 10%
C1AB-4AB	8A-26659	Tuning condenser
C8	8G-26706	15 mm $\frac{1}{2}$ , 5%, N-150
	38A-26593	Insulator
	4B-26782	On-off Volume knob
	6M-26781	Indicator

### MODEL NO. D3614A

NOTES

RESISTOR VALUES ARE IN OHMS, 1/4 WATT, 10% TOLERANCE, UNLESS OTHERWISE SHOWN  
 CAPACITOR VALUES ARE IN MICRO-MICROFARADS UNLESS OTHERWISE SHOWN DC WORKING VOLTAGE IS 25V UNLESS OTHERWISE SHOWN  
 DC VOLTAGE READINGS TAKEN WITH VTVM, NO SIGNAL IN INPUT AND BATTERY VOLTAGE - 9VDC. VOLTAGES WILL VARY WITH TRANSISTOR CHANGES ALL VOLTAGES ARE NEGATIVE



DWG NO 1341B



MODEL D3615A

**MODEL NO. D3615A**

7RT1B

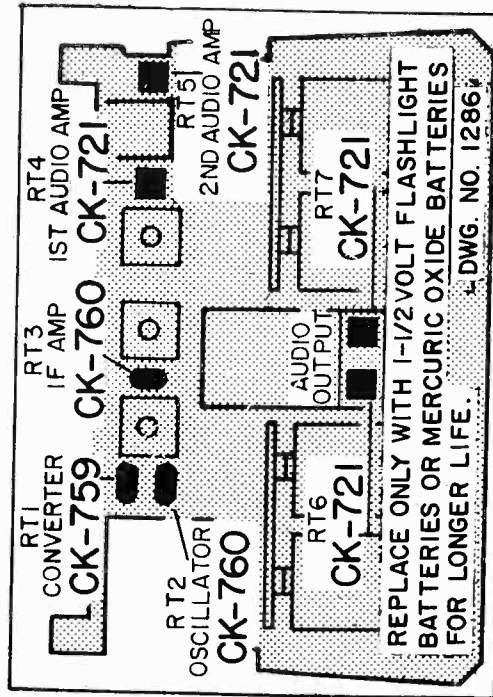
**SERVICE DATA**

**SPECIFICATIONS**

Power Supply	6 volts D.C.
Frequency Range	540 to 1600 KC
Intermediate Frequency	455 KC
Selectivity	At 1000 KC, 52. KC at 1000 x signal
Sensitivity	.200 u. v. per meter
Power Output	100 m. w.
Speaker	3½" PM, v. c. impedance 15 ohms
Cabinet	9½" width, 2¼" depth, 7" height

**TRANSISTOR COMPLEMENT**

RT1	CK-759	Converter
RT2	CK-760	Oscillator
RT3	CK-760	IF Amplifier
RT4	CK-721	1st Audio Amp.
RT5	CK-721	2nd Audio Amp.
RT6	CK-721	Audio Output
RT7	CK-721	Audio Output

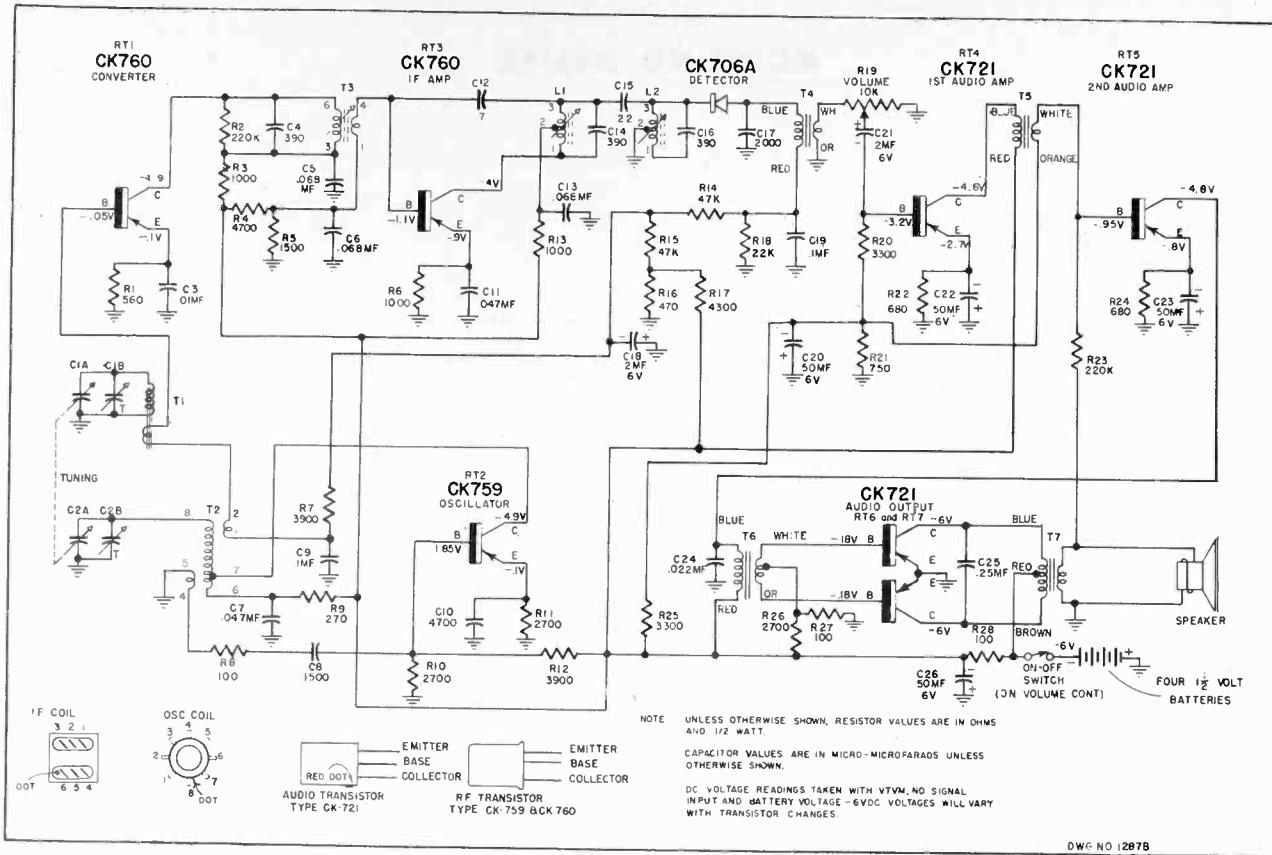


**TRANSISTOR LOCATION**

**TRANSISTOR REPLACEMENT**

If a transistor is suspected of being defective, substitution will be the only reliable check. Note that sockets are provided for the converter and oscillator transistors while the remaining transistors are soldered in place. If a component is replaced which must be soldered to one of the two transistor sockets, remove the transistor from its socket before soldering. Excessive heat may damage the transistor. Also, when using a soldering iron at a terminal to which a transistor lead is soldered, dissipate the heat by grasping the transistor lead with a long nose pliers. Do not rearrange placement of transistors; under certain circumstances, especially in the RF stages, slight realignment may be required when a transistor substitution is made. When checking the receiver with an ohmmeter, either remove the transistor from its socket or unsolder the transistor base lead for accurate readings.

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DWG NO 1287B

# MODEL NO. D3615A BATTERY REPLACEMENT

Since the receiver is small and compact, four batteries supply all the required power. When replacement is necessary, replace with type "D", 1 1/2 volt, flashlight batteries, the same as used in any ordinary flashlight or for longer battery life, the mercuric oxide type batteries can be used. Remove back cover and replace all four old batteries by pulling straight out and insert new batteries with positive terminal (+) up as indicated in the accompanying diagram.

Approximately 500 hours performance can be expected with ordinary flashlight batteries corresponding to approximately 2300 hours on mercuric oxide batteries. Battery replacements should be performed when the sound output is noticed to be muffled or distorted with a decrease in total output.

It is suggested that all four batteries be replaced at the same time.

## ALIGNMENT PROCEDURE

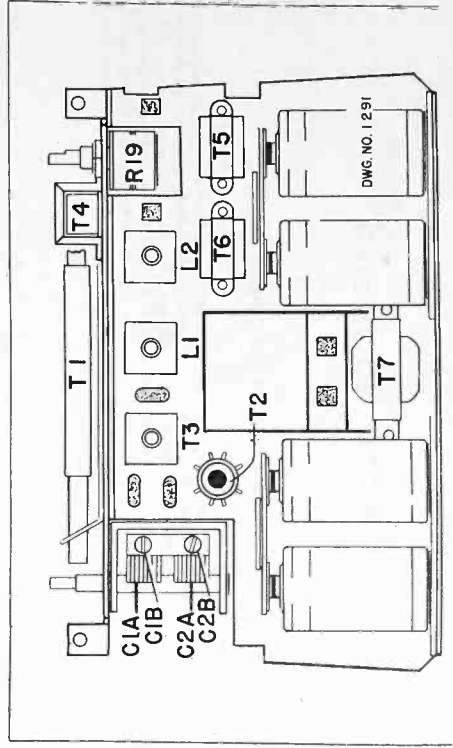
1. Turn Volume Control off. (Full counter-clockwise)
2. Use output meter with 15 ohms impedance
3. Insert four size "D" cells in proper positions. (Positive side towards top of chassis)
4. Turn Volume Control on. (Full clockwise position)
5. Signal generator output at 100 microvolts, 30% modulation at 400 cycles.
6. Both knobs must be in place.

I.F.	SIGNAL GENERATOR		OUTPUT METER	GANGED CAPACITY	ADJUST FOR MAXIMUM OUTPUT IN METER.
	FREQUENCY	COUPLING CAPACITY			
455KC	.5MF	To Base of RT1	Connected in place of speaker	.....	Top cores of T3, L1 & L2
Osc.	.5MF	To base of RT1	Connected in place of speaker	Open Gang (Fully clockwise)	Adjust C 28
Ant.	1400KC.	To generator and place near T1.	Connected in place of speaker	Ganged Condenser should be rocked.	Adjust C 18

Repeat above step two or three times for best results, keeping generator output in all cases as low as possible to prevent overloading of audio.

**Caution:** Too high an input from signal generator may cause setting of trimmer on a spurious response.

Check for alignment and dial calibration at 1000 KC and 600KC.



MODEL D3615A

# MODEL NO. D3615A REPLACEMENT PARTS LIST

## TRANSFORMERS AND COILS

## 7RT1B

Ref. No.	Part No.	Description	Price
R1	9B1-153	560 ohm, 1/2 watt, 5%	.17
R2	9B1-215	220K ohm, 1/2 watt, 5%	.17
R3	9B1-159	1000 ohm, 1/2 watt, 5%	.17
R4	9B1-175	4700 ohm, 1/2 watt, 5%	.17
R5	9B1-163	1500 ohm, 1/2 watt, 5%	.17
R6	9B1-159	1000 ohm, 1/2 watt, 5%	.17
R7	9B1-173	3900 ohm, 1/2 watt, 5%	.17
R8	9B1-135	100 ohm, 1/2 watt, 5%	.17
R9	9B1-145	270 ohm, 1/2 watt, 5%	.17
R10-11	9B1-169	2700 ohm, 1/2 watt, 5%	.17
R12	9B1-173	3900 ohm, 1/2 watt, 5%	.17
R13	9B1-159	1000 ohm, 1/2 watt, 5%	.17
R14-15	9B1-151	47K ohm, 1/2 watt, 5%	.17
R16	9B1-174	4300 ohm, 1/2 watt, 5%	.17
R17	9B1-171	22K ohm, 1/2 watt, 5%	.17
R18	10A-25723	3200 ohm, 1/2 watt, 5%	.17
R19	9B1-171	22K ohm, 1/2 watt, 5%	.17
R20	9B1-156	750 ohm, 1/2 watt, 5%	.17
R21	9B1-155	680 ohm, 1/2 watt, 5%	.17
R22	9B1-155	220K ohm, 1/2 watt, 5%	.17
R23	9B1-155	680 ohm, 1/2 watt, 5%	.17
R24	9B1-171	3300 ohm, 1/2 watt, 5%	.17
R25	9B1-171	2700 ohm, 1/2 watt, 5%	.17
R26	9B1-169	100 ohm, 1/2 watt, 5%	.17
R27	9B1-135	100 ohm, 1/2 watt, 5%	.17
R28	9B1-50*	100 ohm, 1/2 watt, 10%	.10

## CAPACITORS

C1A-B	8A-24879	Variable capacitor	2.58
C2	8C-28970	0 mfd, ceramic	.15
C3	8C-28970	0 mfd, ceramic	.15
C4	8D-2329	100 mfd, 50 volt, mica	.18
C5-6	8D-24904	100 mfd, 200 volt, Paper	.23
C7	8D-21823	0.07 mfd, 200 volt, Paper	.23
C8	8C-24994	1500 mfd, ceramic	.97
C9	8W-25599	.1 mfd, 200 volt, paper	.13
C10	8C-25809	4700 mfd, ceramic	.25
C11	8D-21823	.07 mfd, 200 volt, paper	.24
C12	8C-24973	7 Mfd, ceramic	.18
C13	8D-24904	.068 mfd, 200 volt, mica	.16
C14	8A2-239	390 mfd, 500 volt, mica	.81
C15	8C-13909	22 mfd, ceramic	.28
C16	8A2-239	390 mfd, 500 volt, mica	.81
C17	8C-19222	2000 mfd, ceramic	.28
C18	8C-25013	2 mfd, 6 volt lytic	.81
C19	8W-26001	.1 mfd, 200 volt, paper	.17
C20	8C-25003	50 mfd, 6 volt, lytic	.91
C21	8C-24903	50 mfd, 6 volt, lytic	.91
C22-23	8C-24903	.072 mfd, 200 volt, paper	.32
C24	8D-21822	.22 mfd, 200 volt, paper	.81
C25	8K-23086	50 mfd, 6 volt paper	.81
C26	8C-24903	50 mfd, 6 volt paper	.81

## CABINET PARTS

24D-26206-A174	Case (D-2615A)	
23K-26150	Grille	
23J-26203	Speaker baffle	.14
3M-25028	Indicator	.20
3M-24968	Handle pivot stud	
23A-26218-A174	Handle	.87
4B-24920	Tuning disc	1.14
200-24932	Tuning knob assembly	
4B-24917	(Inc. 3 items below)	
5B-2170-1	Tuning knob	.79
3M-25494	Knob coupling	.12
43D-24933	Spring pin	.04
4B-24918	Volume knob	.87
23C-26217	Name plate (Truetone)	

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MODEL D3615A

**MODEL NO. D3615A**

7RT1B

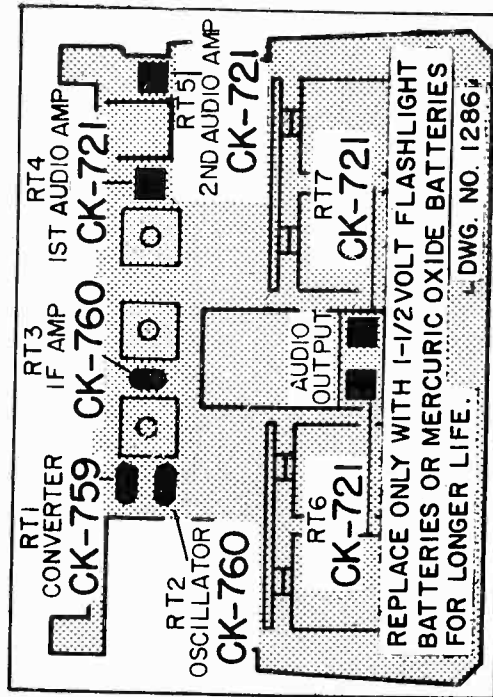
**SERVICE DATA**

**SPECIFICATIONS**

Power Supply . . . . . 6 volts D.C.  
 Frequency Range . . . . . 540 to 1600 KC  
 Intermediate Frequency . . . . . 455 KC  
 Selectivity . . . . . At 1000 KC, 52. KC at 1000 x signal  
 Sensitivity . . . . . .200 u. v. per meter  
 Power Output . . . . . 100 m. w.  
 Speaker . . . . . 3½" PM, v. c. impedance 15 ohms  
 Cabinet . . . . . 9½" width, 2¼" depth, 7" height

**TRANSISTOR COMPLEMENT**

RT1	CK-759	Converter
RT2	CK-760	Oscillator
RT3	CK-760	IF Amplifier
RT4	CK-721	1st Audio Amp.
RT5	CK-721	2nd Audio Amp.
RT6	CK-721	Audio Output
RT7	CK-721	Audio Output

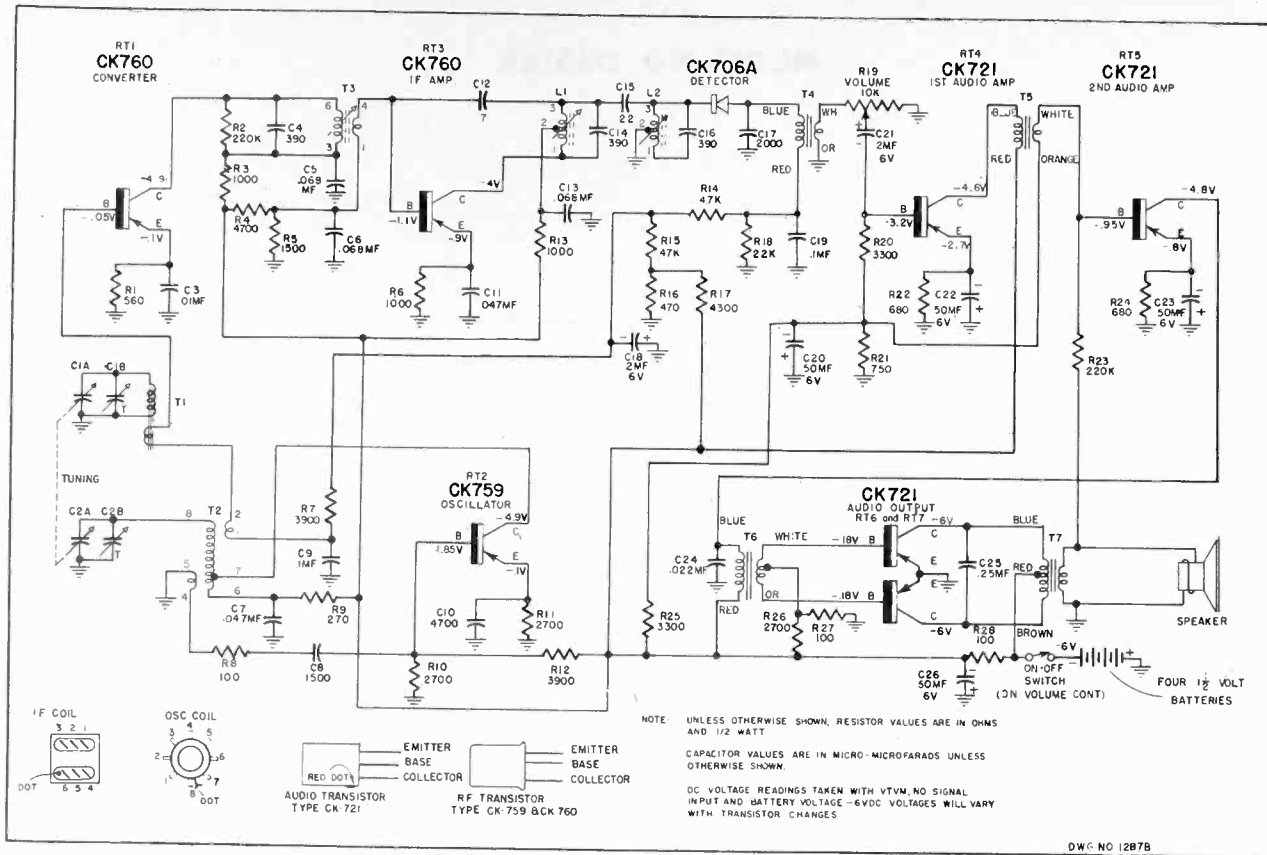


**TRANSISTOR LOCATION**

**TRANSISTOR REPLACEMENT**

If a transistor is suspected of being defective, substitution will be the only reliable check. Note that sockets are provided for the converter and oscillator transistors while the remaining transistors are soldered in place. If a component is replaced which must be soldered to one of the two transistor sockets, remove the transistor from its socket before soldering. Excessive heat may damage the transistor. Also, when using a soldering iron at a terminal to which a transistor lead is soldered, dissipate the heat by grasping the transistor lead with a long nose pliers. Do not rearrange placement of transistors; under certain circumstances, especially in the RF stages, slight realignment may be required when a transistor substitution is made. When checking the receiver with an ohmmeter, either remove the circuits transistor from its socket or unsolder the transistor base lead for accurate readings.

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DWG NO 1287B

# MODEL NO. D3615A BATTERY REPLACEMENT

Since the receiver is small and compact, four batteries supply all the required power. When replacement is necessary, replace with type "D", 1 1/2 volt, flashlight batteries, the same as used in any ordinary flashlight or for longer battery life, the mercuric oxide type batteries can be used. Remove back cover and replace all four old batteries by pulling straight out and insert new batteries with positive terminal (+) up as indicated in the accompanying diagram.

Approximately 500 hours performance can be expected with ordinary flashlight batteries corresponding to approximately 2500 hours on mercuric oxide batteries. Battery replacements should be performed when the sound output is noticed to be muffled or distorted with a decrease in total output.

It is suggested that all four batteries be replaced at the same time.

## ALIGNMENT PROCEDURE

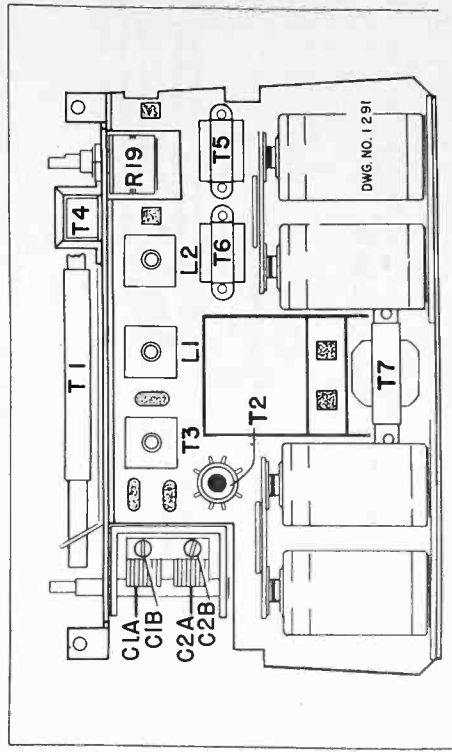
1. Turn Volume Control off. (Full counter-clockwise)
2. Use output meter with 1.5 ohms impedance
3. Insert four size "D" cells in proper positions. (Positive side towards top of chassis)
4. Turn Volume Control on. (Full clockwise position)
5. Signal generator output at 100 microvolts, 30% modulation at 400 cycles.
6. Both knobs must be in place.

I.F.	SIGNAL GENERATOR		OUTPUT METER	GANGED CAPACITY	ADJUST FOR MAXIMUM OUTPUT IN METER.
	FREQUENCY	COUPLING CAPACITY			
455KC	.5MF	To Base of RT1	Connected in place of speaker	*****	Top cores of T3, L1 & L2
Osc.	.5MF	To base of RT1	Connected in place of speaker	Open Gang (Fully clockwise)	Adjust C 2B
Ant.	1400KC.	Connect 3 turn loop to generator and place near T1.	Connected in place of speaker	Ganged Condenser should be rooked.	Adjust C 1B

Repeat above step two or three times for best results, keeping generator output in all cases as low as possible to prevent overloading of audio.

Caution: Too high an input from signal generator may cause setting of trimmer on a spurious response.

Check for alignment and dial calibration at 1000 KC and 600KC.



# MODEL NO. D3615A REPLACEMENT PARTS LIST

## TRANSFORMERS AND COILS

Ref. No.	Part No.	Description	Price
R1	13E-25614	Antenna coil	1.38
R2	13D-25683	Oscillator coil	1.24
R3	13A-25806	Input IF Transformer	2.14
R4	12C-25652	Interstage Audio transformer	
R5	12C-25653	Driver Audio transformer	
R6	12C-25654	Audio Output transformer	2.29
R7	12C-24928	IF Coil	1.94
R8	13B-25807		

## MISCELLANEOUS

Ref. No.	Part No.	Description	Price
R9	200-25690-1	Control mfg. plate assembly (Inc. 3 items below)	3.20
R10	2C-24895	Control mounting plate	.52
R11	3E-24801	Antenna rod saddle	.04
R12	12C-25652	Interstage Audio transformer	1.00
R13	200-24946	Battery cap contact & bracket assembly	.43
R14	15B-24912	Transistor socket 5-pin	.04
R15	2M-24947	Socket mounting clip	4.68
R16	18A-25371	3 1/2" PM Speaker	.32
R17	2D-25313	L2 mounting clip	.05
R18	43D-19767	IF Coil can clip	.04
R19	2N-25081	Battery base insulator & contact assembly	.70
R20	200-25689	Transistor mounting plate assembly	.45
R21	6M-25551	Transistor mounting plate	.04
R22	8M-25784	CK-706A crystal diode	4.00
R23	1K-759	Transistor	10.60
R24	CK-760	Transistor	6.60

## CAPACITORS

Ref. No.	Part No.	Description	Price
C1A-B	8A-24879	Variable capacitor	2.58
C2	8C-24810	0 mfd, ceramic	.15
C3	8D-2329	300 mfd, 200 volt, mica	.18
C4	8D-24904	.068 mfd, 200 volt, Paper	.23
C5-6	8D-21823	.047 mfd, 200 volt, Paper	.23
C7	8C-4994	1500 mfd, ceramic	.13
C8	8M-25599	.1 mfd, 200 volt, paper	.97
C9	8C-25809	4700 mfd, ceramic	.13
C10	8D-21823	.047 mfd, 200 volt, paper	.25
C11	8C-24873	7 MMF, ceramic	.24
C12	8D-24904	.068 mfd, 200 volt, paper	.18
C13	8D-24904	390 mfd, 500 volt, mica	.16
C14	8A2-239	22 mfd, ceramic	.16
C15	8C-13909	390 mfd, 500 volt, mica	.28
C16	8A2-239	2000 mfd, ceramic	.81
C17	8C-19322	2 mfd, 6 volt lytic	.28
C18	8C-25013	.1 mfd, 200 volt, paper	.81
C19	8M-26001	50 mfd, 6 volt, lytic	.17
C20	8C-25013	50 mfd, 6 volt, lytic	.17
C21	8C-24903	.072 mfd, 200 volt, paper	.32
C22	8C-21822	.22 mfd, 200 volt, paper	.32
C23	8K-20866	50 mfd, 6 volt paper	.81
C24	8C-24903		
C25	8K-20866		
C26	8C-24903		

## CABINET PARTS

Ref. No.	Part No.	Description	Price
C27	24D-26206-A174	Case (D-2615A)	
C28	23K-26150	Grille	.14
C29	23J-26203	Speaker baffle	.20
C30	3M-25028	Indicator	.87
C31	3M-24968	Handle pivot stud	1.14
C32	23A-26218-A174	Handle	1.14
C33	4B-24920	Tuning disc	.79
C34	200-24932	Tuning knob assembly (Inc. 3 items below)	.12
C35	4B-24917	Tuning knob	.04
C36	5M-24916-1	Knob coupling	.87
C37	2M-25449	Spring pin	.04
C38	43D-24933	Compression ring	.04
C39	4B-24918	Volume knob	.87
C40	23C-26217	Name plate (Tru-tone)	

MODEL D3614B

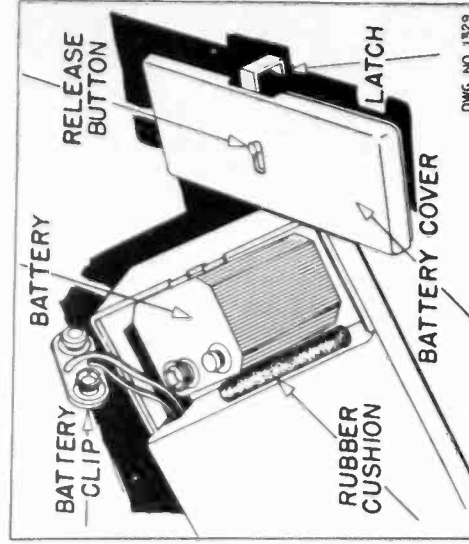
MODEL NO. D3614B

BATTERY REPLACEMENT

Since the receiver is small and compact, not every 9 volt battery will fit in the space provided. When replacement of the battery pack is necessary, replace with Truetone stock number 3B6-465 and follow the procedure below:

Remove battery cover by pushing release button upward, grasp latch and pull up and away from case. Remove old battery and un-snap battery clip. Snap battery clip on replacement battery and insert into case. Be sure rubber cushion is between battery and side wall of case to prevent battery movement. Insert battery cover in place and push latch down.

Remove battery cover by pushing release button



BATTERY LOCATION

Approximately 100 hours performance can be experienced with the above Battery before replacement is required. Battery replacement should be performed when the sound output is noticed to be muffled or distorted with a decrease in total output or if a voltage measurement shows less than 6 volts. The battery voltage should be measured with the receiver turned on after at least 5 minutes of operation.

REMOVING CHASSIS FROM CASE

1. Remove battery.
2. Remove tuning knob stud by turning counter-clockwise and remove tuning knob.
3. Remove case cover mounting screw located behind tuning knob and remove case cover.
4. Remove three chassis mounting screws.
5. Carefully remove chassis from case allowing battery cable to slip through battery compartment hole.



MODEL NO. D3614 B

DESCRIPTION

Your new Truetone Transistorized Personal Portable Radio incorporates the latest in electronic engineering developments—the TRANSISTOR. Four transistors replace bulky vacuum tubes and are only slightly larger than a kernel of corn. The Transistor is practically service free and requires only a fraction of the power for operation needed for vacuum tubes. For this reason, the small battery included with the radio supplies all the required power for the superheterodyne transistor circuitry. A sensitive built-in antenna and

acoustically matched speaker and case will give you more stations to choose from, better tone quality, and clearer reception of the entire broadcast band. As an added feature, an earphone and cable is available as an accessory item for use with the radio. When the earphone cable jack is inserted in the receptacle provided at the top of the case, the set's speaker will automatically be disconnected and provide earphone reception only.

OPERATION

This receiver operates on a 9 volt battery installed in the case and will receive all standard broadcast stations within operating range. Approximately 100 hours performance can be experienced with this battery before replacement is required.

ON-OFF SWITCH AND VOLUME CONTROL

The small knob recessed in the case is both the On-Off Switch and the Volume Control. When the control is rotated towards the top of the case, the set is off. Rotation in the opposite direction (toward bottom of case) will click the switch and turn the set on. The knob may then be used to regulate the volume.

TUNING KNOB

The large center knob is the tuning knob. When selecting a station turn the knob back and forth until the tone is clearest and loudest. Do not use the tuning knob to regulate volume; the volume control should be used for that purpose after the station selected has been tuned in properly.

ANTENNA

This radio is equipped with a built-in antenna which is sufficient for receiving local stations and powerful distant stations. Because the antenna is directional, it may be necessary to turn the radio in various directions to get the best reception from some distant stations.

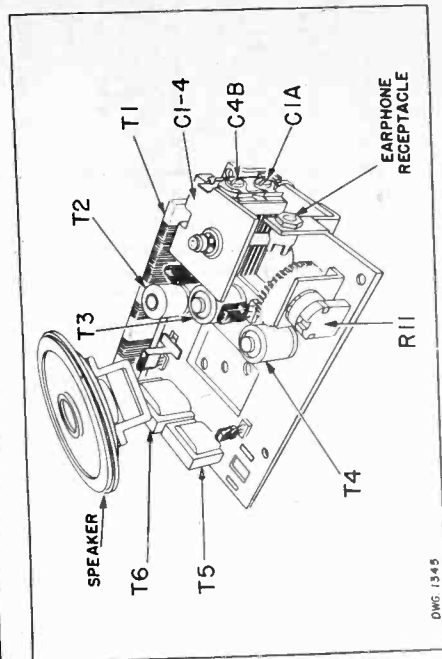
**MODEL NO. D3614B**

**ALIGNMENT PROCEDURE**

- NOTES:** 1. Remove chassis from case.  
 2. Connect 9 volt battery.  
 3. Use output meter with 15 ohms impedance.  
 4. Turn volume control to maximum.  
 5. Signal generator output at 100 microvolts, 30% modulation at 400 cycles.

CIRCUIT	SIGNAL GENERATOR			OUTPUT METER	GANGED CAPACITY	ADJUST FOR MAXIMUM OUTPUT ON METER
	FREQUENCY	COUPLING CAPACITY	CIRCUIT CONNECTION			
I.F.	455KC	.5MF	To Base of RT1	Connect in place of speaker	—	T3, T4
Repeat above step two or three times for best results, keeping generator output in all cases as low as possible to prevent overloading of audio.						
Osc.	1620KC	.5MF	To Base of RT1	Connect in place of speaker	Open Gang (Fully clockwise)	C4B
Caution: Too high an output from signal generator may cause setting of trimmer on a spurious response.						
Osc.	535KC	.5MF	To Base of RT1	Connect in place of speaker	Closed Gang (Fully counter-clockwise)	T2
Osc.	1620KC	.5MF	To Base of RT1	Connect in place of speaker	Open Gang (Fully clockwise)	C4B
Ant.	1400KC	Connect 3 turn loop to generator and place near T1.		Connect in place of speaker	Ganged Condenser should be rocked	C1A

Check for alignment and dial calibration at 1000KC and 600KC.



DWG. 13445

**MODEL NO. D3614B**

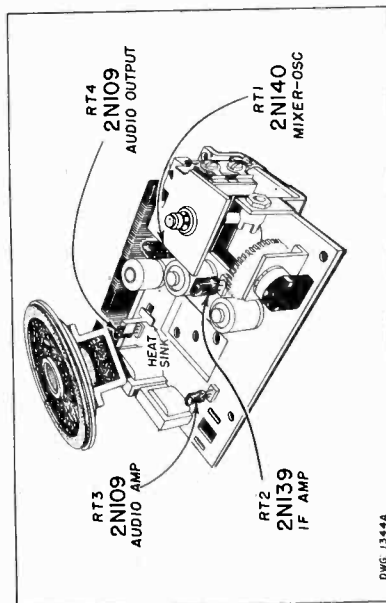
**SERVICE DATA**

**SPECIFICATIONS**

- Power Supply ..... 9 volts D.C.  
 Frequency Range ..... 540 to 1600 KC  
 Intermediate Frequency ..... 455 KC  
 Selectivity ..... At 1000 KC, 70 KC at 1000 X signal  
 Sensitivity ..... 800 u. v. per meter (2 mw ref)  
 Power Output ..... 20 m. w.  
 Speaker ..... 2 3/4" PM, V.C. Impedance - 15 ohms  
 Cabinet ..... 6 1/4" width, 1 3/4" depth, 3 3/8" height

**TRANSISTOR COMPLEMENT**

Sch. Ref. No.	RETMA Type	Function
RT1	2N140	Oscillator-Mixer
RT2	2N139	IF Amplifier
RT3	2N109	Audio Amplifier
RT4	2N109	Audio Output
	CK-706A	Crystal Detector



DWG. 1344A

Transistor Location

**TRANSISTOR SERVICING**

If a transistor is suspected of being defective, substitution will be the only reliable check. Checking resistance readings between the transistor elements with an ohmmeter will indicate only a shorted or open transistor. Under certain circumstances, damage to the transistor may result, therefore, this method is not recommended. When inserting a transistor in its socket, make sure the transistor leads line up with the socket holes. Do not rearrange placement of transistors, under certain circumstances, especially in the RF or IF circuits, slight re-

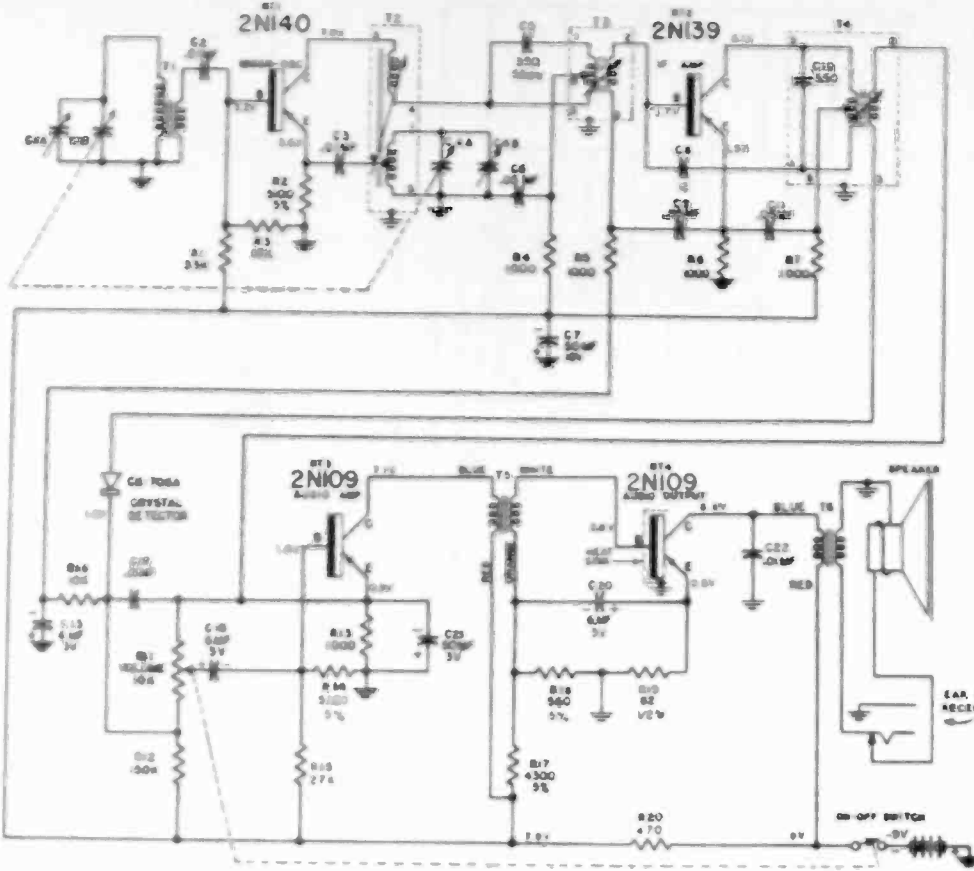
alignment may be necessary after a transistor substitution is made. If a component is replaced which must be soldered to the transistor socket, remove the transistor from its socket before soldering as excessive heat may damage the transistor. When attempting any soldering, a low wattage small diameter tip iron is suggested. Heat may also damage other components, therefore, dissipate the heat by grasping the component lead with a long nose pliers. When checking the receiver with an ohmmeter remove the circuit transistor for accurate readings.

MODEL D3614B

MODEL NO. D3614 B

REPLACEMENT PARTS LIST

Part No.	Description	List Price	Ref. No.	Part No.	Description
<b>RESISTORS</b>					
R1	22K ohm, 1/4 W, 10%		T3	13A-26380	1st IF Transformer
R2	22K10X12J		T4	13B-26382	2nd IF Transformer
R3	22K10X13E		T5	12M-26467	Input Transformer
R4, 6, 7	22K10X10ZK		T6	12C-26539	Output Transformer
R11	10A-26363	10K ohm	<b>MISCELLANEOUS</b>		
R12	22X10X134E	150K ohm, 1/4 W, 10%	44A-26374		Earphone receptacle
R13	22X10X10ZK	1000 ohm, 1/4 W, 10%	2D-26377		Volume control bracket
R14	22X10X12J	5100 ohm, 1/4 W, 5%	32F-2-5445		Volume knob screw
R15	22X10X373K	27K ohm, 1/4 W, 10%	18A-26777		2 3/4" PM Speaker
R16	22X10X103K	10K ohm, 1/4 W, 10%	14A-26469		Battery cable
R17	22X10X432J	4300 ohm, 1/4 W, 5%	2M-26376		Antenna spring clip
R18	22X10X561J	560 ohm, 1/4 W, 5%	15B-24912		Transistor socket, large
R19	22X10X30K	82 ohm, 1/2 W, 10%	43D-27661		Real sink clip
R20	22X10X671K	470 ohm, 1/2 W, 10%	<b>CABINET PARTS</b>		
<b>CAPACITORS</b>					
CIAR			116A071		Case - Pink
CIAB			2C-26505		Handle plate
C2, 3	Tuning Condenser	.01 mfd, 25 V, ceramic	62M-26504		Retainer pin
C5		350 mmf, 500 V, 5%, mica	116A070		Case cover - Grey
C6		.05 mfd, 25 V, ceramic	116A069		Battery cover assembly - Pink
C7		50 mfd, 10 V, lytic	200-26408		Tuning knob
C8		12 mmf, 5%	3M-26400		Tuning knob stud
C9		.05 mfd, 25 V, ceramic	5B-27470		On-off volume knob
C10		350 mmf (incl. in T4)	25M-26538		Rubber cushion
C11		.05 mfd, 25 V, ceramic	<b>ACCESSORY ITEM STOCK NO. 3D-W5300</b>		
C12		6 mfd, 3 V, lytic	44C-26544		Earphone & plug assembly (Inc. 3 items below)
C13		6 mfd, 3 V, lytic	44C-26547		Ear Loop
C14		.01 mfd, 25 V, ceramic	44C-26545		Earphone
C15		6 mfd, 3 V, lytic	44C-26546		Cord and plug
C16		50 mfd, 3 V, lytic	<b>TRANSFORMERS</b>		
C17		.01 mfd, 25 V, ceramic	T1	13E-26452	Red Antenna
C18			T2	13D-26379	Oscillator coil



NOTES

SELECTED VALUES ARE IN OHMS UNLESS NOTED TO THE CONTRARY. UNLESS OTHERWISE NOTED.

COMPONENT VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.

RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.

TRANSISTOR VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.

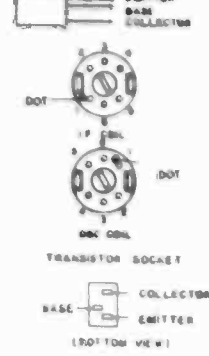
RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.

TRANSISTOR VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.

RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.

TRANSISTOR VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.

TYPE 2N109, 2N139 AND 2N140



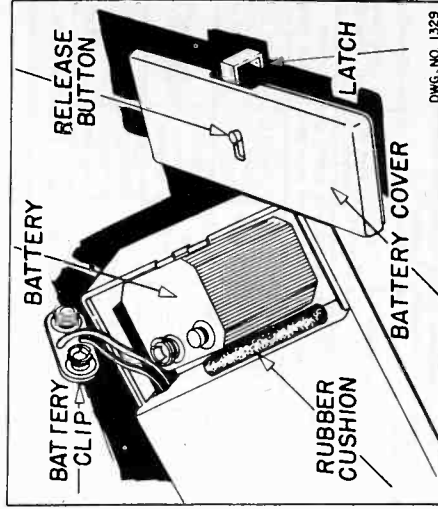
**MODEL NO. D3714A**

**BATTERY REPLACEMENT**

Since the receiver is small and compact, not every 9 volt battery will fit in the space provided. When replacement of the battery pack is necessary, replace with TrueTone stock number 3B6465 and follow the procedure below:

upward, grasp latch and pull up and away from case. Remove old battery and un-snap battery clip. Snap battery clip on replacement battery and insert into case. Be sure rubber cushion is between battery and side wall of case to prevent battery movement. Insert battery cover in place and push latch down.

Remove battery cover by pushing release button



DWG. NO. 1329

**BATTERY LOCATION**

Approximately 100 hours performance can be experienced with the above. Battery before replacement is required. Battery replacement should be performed when the sound output is noticed to be muffled or

disrupted with a decrease in total output or if a voltage measurement shows less than 6 volts. The battery voltage should be measured with the receiver turned on after at least 5 minutes of operation.

**REMOVING CHASSIS FROM CASE**

1. Remove battery.
2. Remove tuning knob stud by turning counter-clockwise and remove tuning knob.
3. Remove case cover mounting screw located behind tuning knob and remove case cover.
4. Remove three chassis mounting screws.
5. Carefully remove chassis from case allowing battery cable to slip through battery compartment hole.

**MODEL NO. D3714A**

Factory Model 4RT1

**DESCRIPTION**

Your new TrueTone Transistorized Personal Portable Radio incorporates the latest in electronic engineering developments--the TRANSISTOR. Four transistors replace bulky vacuum tubes and are only slightly larger than a kernel of corn. The Transistor is practically service free and requires only a fraction of the power for operation needed for vacuum tubes. For this reason, the small battery included with the radio supplies all the required power for the superheterodyne transistor circuitry. A sensitive built-in antenna and

acoustically matched speaker and case will give you more stations to choose from, better tone quality, and clearer reception of the entire broadcast band. As an added feature, an earphone and cable is available as an accessory item for use with the radio. When the earphone cable jack is inserted in the receptacle provided at the top of the case, the sets' speaker will automatically be disconnected and provide earphone reception only.

**OPERATION**

This receiver operates on a 9 volt battery installed in the case and will receive all standard broadcast stations within operating range. Approximately 100 hours performance can be experienced with this battery before replacement is required.

**ON-OFF SWITCH AND VOLUME CONTROL**

The small knob recessed in the case is both the On-Off Switch and the Volume Control. When the control is rotated towards the top of the case, the set is off. Rotation in the opposite direction (toward bottom of case) will click the switch and turn the set on. The knob may then be used to regulate the volume.

**TUNING KNOB**

The large center knob is the tuning knob. When selecting a station turn the knob back and forth until the tone is clearest and loudest. Do not use the tuning knob to regulate volume; the volume control should be used for that purpose after the station selected has been tuned in properly.

**ANTENNA**

This radio is equipped with a built-in antenna which is sufficient for receiving local stations and powerful distant stations. Because the antenna is directional, it may be necessary to turn the radio in various directions to get the best reception from some distant stations.



MODEL NO. D3714A

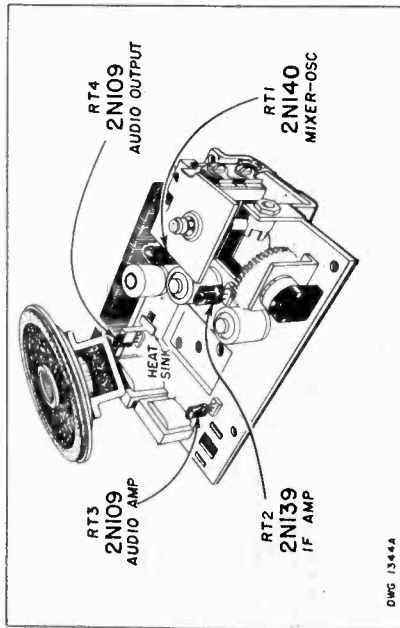
SERVICE DATA

SPECIFICATIONS

Power Supply	9 volts D.C.	Sch.		Function
Frequency Range	540 to 1600 KC	Ref. No.	RT1	Oscillator-Mixer
Intermediate Frequency	455 KC		RT2	IF Amplifier
Selectivity	At 1000 KC, 70 KC at 1000 X signal		RT3	Audio Amplifier
Sensitivity	800 u.v. per meter (2 mw ref)		RT4	Audio Output
Power Output	20 m.w.			Crystal Detector
Speaker	2 3/4" PM, V.C.			
Cabinet	Impedance - 15 ohms 6 1/4" width, 1 3/4" depth, 3 3/8" height			

TRANSISTOR COMPLEMENT

Sch. Ref. No.	RETMA Type	Function
RT1	2N140	Oscillator-Mixer
RT2	2N139	IF Amplifier
RT3	2N109	Audio Amplifier
RT4	2N109	Audio Output
	CK-706A	Crystal Detector



DWG 1344A

Transistor Location

TRANSISTOR SERVICING

If a transistor is suspected of being defective, substitution will be the only reliable check. Checking resistance readings between the transistor elements with an ohmmeter will indicate only a shorted or open transistor. Under certain circumstances, damage to the transistor may result, therefore, this method is not recommended. When inserting a transistor in its socket, make sure the transistor leads line up with the socket holes. Do not rearrange placement of transistors; under certain circumstances, especially in the RF or IF circuits, slight re-alignment may be necessary after a transistor substitution is made. If a component is replaced which must be soldered to the transistor socket, remove the transistor from its socket before soldering as excessive heat may damage the transistor. When attempting any soldering, a low wattage small diameter tip iron is suggested. Heat may also damage other components, therefore, dissipate the heat by grasping the component lead with a long nose pliers. When checking the receiver with an ohmmeter remove the circuit transistor for accurate readings.

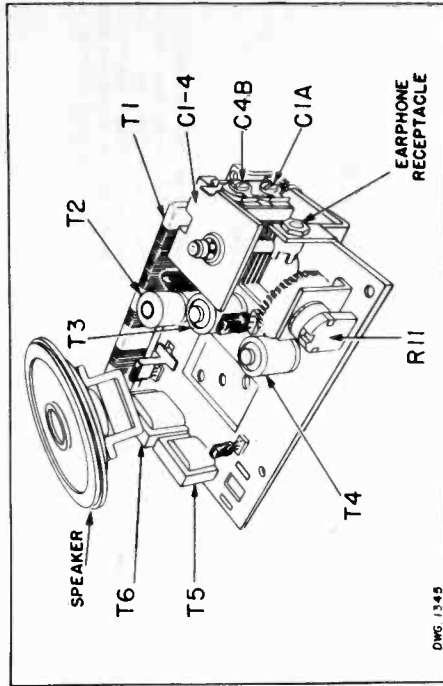
MODEL NO. D3714A

ALIGNMENT PROCEDURE

- NOTES: 1. Remove chassis from case.  
2. Connect 9 volt battery.  
3. Use output meter with 15 ohms impedance.  
4. Turn volume control to maximum.  
5. Signal generator output at 100 microvolts, 30% modulation at 400 cycles.

CIRCUIT	SIGNAL GENERATOR		OUTPUT METER	GANGED CAPACITY	ADJUST FOR MAXIMUM OUTPUT ON METER
	FREQUENCY	COUPLING CAPACITY			
I.F.	455KC	.5MF	To Base of RT1	To Chassis	T3, T4
Repeat above step two or three times for best results, keeping generator output in all cases as low as possible to prevent overloading of audio.					
Osc.	1620KC	.5MF	To Base of RT1	To Chassis	Open Gang (Fully clockwise) C4B
Caution: Too high an output from signal generator may cause setting of trimmer on a spurious response.					
Osc.	535KC	.5MF	To Base of RT1	To Chassis	Connect in place of speaker T2
Osc.	1620KC	.5MF	To Base of RT1	To Chassis	Connect in place of speaker T2
Ant.	1400KC		Connect 3 turn loop to generator and place near T1.		Connect in place of speaker T2

Check for alignment and dial calibration at 1000KC and 600KC.

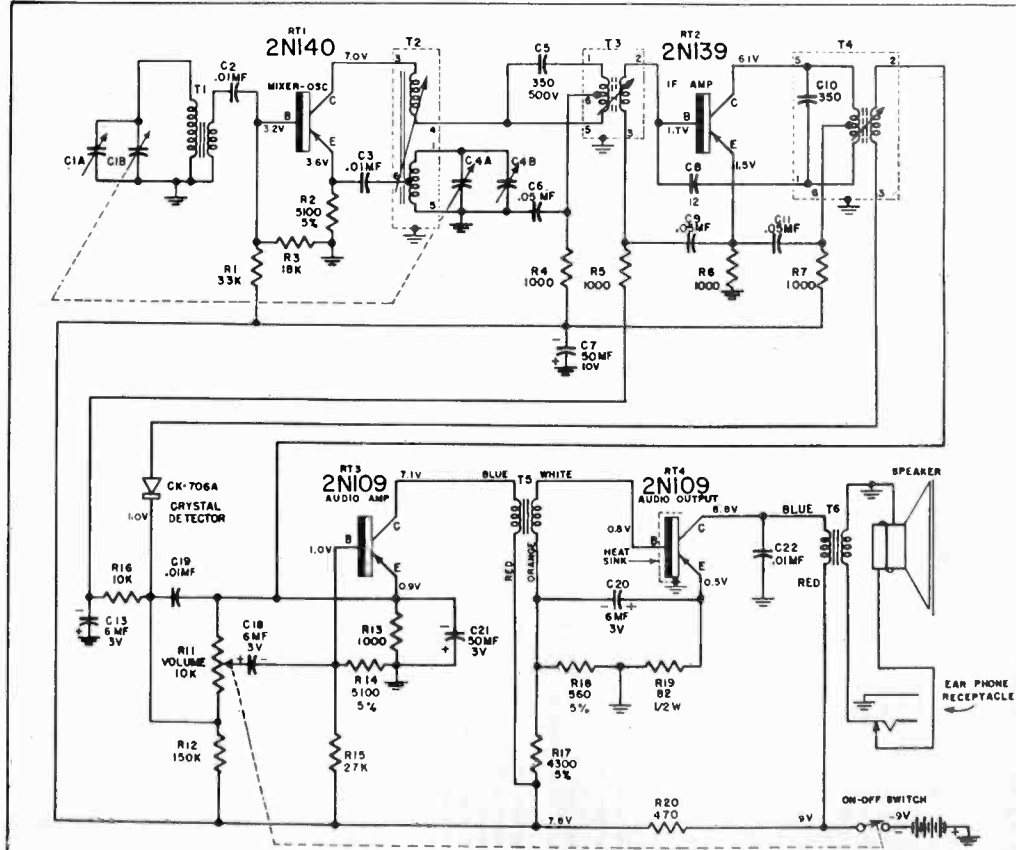


DWG 1345

# MODEL NO. D3714A

## REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	List Price	Ref. No.	Part No.	Description
<b>RESISTORS</b>						
R1	23X10X33K	33K ohm, 1/4 W, 10%		T3	13A-26380	1st IF Transformer
R2	23X10X512J	5100 ohm, 1/4 W, 5%		T4	13B-26382	2nd IF Transformer
R3	23X10X183K	18K ohm, 1/4 W, 10%		T5	12M-26467	Input Transformer
R4, 5, 6, 7	23X10X102K	1000 ohm, 1/4 W, 10%		T6	12C-26539	Output Transformer
R11	10A-26383	ON-off Volume control 10K ohm		<b>MISCELLANEOUS</b>		
R12	23X10X154K	150K ohm, 1/4 W, 10%		44A-26374	Earphone receptacle	
R13	23X10X102K	1000 ohm, 1/4 W, 10%		2D-26377	Volume control bracket	
R14	23X10X512J	5100 ohm, 1/4 W, 5%		32F2-5445	Volume knob screw	
R15	23X10X273K	27K ohm, 1/4 W, 10%		18A-26777	2 3/4" PM Speaker	
R16	23X10X103K	10K ohm, 1/4 W, 10%		14A-26469	Battery cable	
R17	23X10X432J	4300 ohm, 1/4 W, 5%		2M-26376	Antenna spring clip	
R18	23X10X561J	560 ohm, 1/4 W, 5%		15B-24912	Transistor socket, large	
R19	23X10X820K	82 ohm, 1/2 W, 10%		43D-27661	Heat sink clip	
R20	23X10X471K	470 ohm, 1/2 W, 10%		<b>CABINET PARTS</b>		
<b>CAPACITORS</b>						
C1A, B	8A-26659	Tuning Condenser		116EC78	Case-(Turquoise)	
C2, 3	8C-26457	.01 mfd, 25 V, ceramic		2C-26505	Handle plate	
C5	8N1-274	350 mmf, 500 V, 5%, mica		62M-26504	Retainer pin	
C6	8G-26459	.05 mfd, 25 V, ceramic		116A077	Case cover-(Grey-Green)	
C7	8C-26454	50 mfd, 10 V, lytic			Battery cover Assembly	
C8	8G-26766	12 mmf, 5%			-(Turquoise)	
C9	8G-26459	.05 mfd, 25 V, ceramic		15A1129	Tuning knob	
C10	8G-26459	.05 mfd, 25 V, ceramic		3M-26400	Tuning knob stud	
C11	8C-26455	6 mfd, 3 V, lytic		5B-27470	On-Off volume knob	
C13	8C-26455	6 mfd, 3 V, lytic		25M-26538	Rubber cushion	
C18	8C-26457	.01 mfd, 25 V, ceramic		23J-26387	Grille Cloth & Baffle Board	
C19	8G-26455	.01 mfd, 25 V, ceramic		23C-26543	W. A. Crest	
C20	8C-26455	6 mfd, 3 V, lytic		<b>ACCESSORY ITEM STOCK NO. 3D-W5300</b>		
C21	8C-26453	50 mfd, 3 V, lytic		44C-26544	Earphone & plug assembly (Inc. 3 items below)	
C22	8G-26879	.01 mfd, 25 V, ceramic		44C-26547	Ear Loop	
<b>TRANSFORMERS</b>						
T1	13E-26452	Rod Antenna		44C-26545	Earphone	
T2	13D-26379	Oscillator coil		44C-26546	Cord and plug	



**NOTES**

RESISTOR VALUES ARE IN OHMS. 1/4 WATT, 10% TOLERANCE, UNLESS OTHERWISE SHOWN.

CAPACITOR VALUES ARE IN MICRO-MICROFARADS. UNLESS OTHERWISE SHOWN. DC WORKING VOLTAGE IS 25V UNLESS OTHERWISE SHOWN.

DC VOLTAGE READINGS TAKEN WITH VTVM, NO SIGNAL IN INPUT AND BATTERY VOLTAGE - BVDC. VOLTAGES WILL VARY WITH TRANSISTOR CHANGES. ALL VOLTAGES ARE NEGATIVE.

TYPE 2N109, 2N139 AND 2N140

EMITTER  
BASE  
COLLECTOR

DOT

IF COIL

DOT

OSC COIL

TRANSISTOR SOCKET

COLLECTOR

BASE

EMITTER

(BOTTOM VIEW)

DWG NO. 1541C

MODEL D3714A

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**tru-tone**  
PORTABLE TRANSISTOR RADIO

# INSTALLATION, OPERATING and SERVICE INSTRUCTIONS

**MODEL NO. D3715A**

Factory Model TR-47

## DESCRIPTION

Your new Tru-tone Transistorized Personal Portable Radio incorporates the latest in electronic engineering developments—the TRANSISTOR. Four transistors replace bulky vacuum tubes and are only slightly larger than a kernel of corn. The Transistor is practically service free and requires only a fraction of the power for operation needed for vacuum tubes. For this reason, the small battery included with the radio supplies all the required power for the superheterodyne transistor circuitry.

A sensitive built-in antenna and acoustically matched speaker and case will give you more stations to choose from, better tone quality, and clearer reception of the entire broadcast band. As an added feature, an earphone and cable is available as an accessory item for use with the radio. When the earphone cable jack is inserted in the receptacle provided at the top of the case, the set's speaker will automatically be disconnected and provide earphone reception only.

## OPERATION

This receiver operates on a 9 volt battery installed in the case and will receive all standard broadcast stations within operating range. Approximately 100 hours performance can be experienced with this battery before replacement is required.

### ON-OFF SWITCH AND VOLUME CONTROL

The small knob is both the On-Off Switch and the Volume Control. When the control is rotated counter-clockwise, the set is off. Rotation in the opposite direction will click the switch and turn the set on. The knob may then be used to regulate the volume.

### TUNING KNOB

The large center knob is the tuning knob. When selecting a station turn the knob back and forth until the tone is clearest and loudest. Do not use the tuning knob to regulate volume; the volume control should be used for that purpose after the station selected has been tuned in properly.

### ANTENNA

This radio is equipped with a built-in antenna which is sufficient for receiving local stations and powerful distant stations. Because the antenna is directional, it may be necessary to turn the radio in various directions to get the best reception from some distant stations.

**MODEL NO. D3715A**

## BATTERY REPLACEMENT

Since the receiver is small and compact, not every 9 volt battery will fit in the space provided. When replacement of the battery pack is necessary, replace with Tru-tone stock number 3B6464 and follow the procedure below:

Remove battery cover by pushing release button up-

ward, grasp latch and pull up and away from case. Remove old battery and up-snap battery clip. Snap battery clip on replacement battery and insert into case. Be sure rubber cushion is between battery and side wall of case to prevent battery movement. Insert battery cover in place and push latch down.

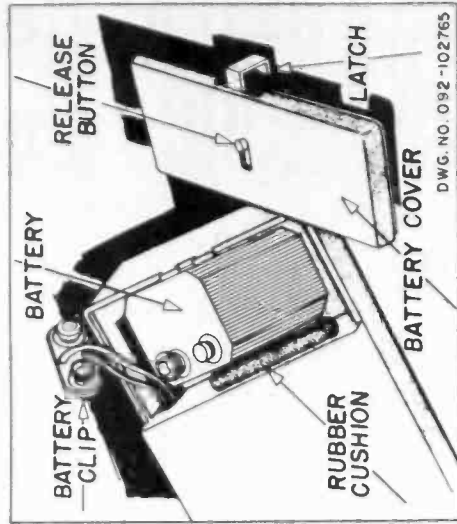


Fig. 1

## BATTERY LOCATION

Approximately 100 hours performance can be experienced with the above Battery before replacement is required. Battery replacement should be performed when the sound output is noticed to be muffled or distorted with a decrease in total output or if a voltage measurement shows less than 6 volts. The battery voltage should be measured with the receiver turned on after at least 5 minutes of operation.

## REMOVING CHASSIS FROM CASE

1. Remove battery.
2. Remove tuning knob stud by turning counter-clockwise and remove tuning knob.
3. Remove On-Off volume control knob.
4. Remove case cover mounting screw located behind tuning knob and remove case cover.
5. Remove three chassis mounting screws.
6. Carefully remove chassis from case allowing battery cable to slip through battery compartment hole.

# MODEL NO. D3715A

## ALIGNMENT PROCEDURE

- NOTES: 1. Remove chassis from case.  
 2. Connect 9 volt battery.  
 3. Use output meter with 5 ohms impedance.  
 4. Turn volume control to maximum.  
 5. Signal generator output at 100 microvolts, 30% modulation at 400 cycles.

SIGNAL GENERATOR				OUTPUT METER	GANGED CAPACITY	ADJUST FOR MAXIMUM OUTPUT ON METER
CIRCUIT	FREQUENCY	COUPLING CAPACITY	CIRCUIT CONNECTION			
I.F.	455KC	.5MFD	To Base of Q1 To Chassis	Connect in place of speaker	—	T3, T4
Repeat above step two or three times for best results, keeping generator output in all cases as low as possible to prevent overloading of audio.						
Osc.	1620KC	.5MFD	To Base of Q1 To Chassis	Connect in place of speaker	Open Gang (Fully Clockwise)	C12A
Caution: Too high an output from signal generator may cause setting of trimmer on a spurious response.						
Osc.	535KC	.5MFD	To Base of Q1 To Chassis	Connect in place of speaker	Closed Gang (Fully counter clockwise)	T2
Osc.	1620KC	.5MFD	To Base of Q1 To Chassis	Connect in place of speaker	Open Gang (Fully clockwise)	C12A
Ant.	1400KC		Connect 3 turn loop to generator and place near T1.	Connect in place of speaker	Ganged Condenser should be rocked	C1A

— CHECK FOR ALIGNMENT AND DIAL CALIBRATION AT 1000KC and 600KC.

# MODEL NO. D3715A

## SERVICE DATA

### SPECIFICATIONS

- Power Supply ..... 9 Volts D.C.
- Frequency Range ..... 540 to 1620 KC
- Intermediate Frequency ..... 455 KC
- Power Output ..... 50 M.W.
- Speaker ..... 2 3/4" PM, V.C. Impedance - 15 Ohms
- Cabinet ..... 6 1/4" Width, 1 3/4" Depth, 3 3/8" Height

### TRANSISTOR COMPLEMENT

Schematic Ref. No.	RETMA Type	Function
Q1	2N252	Oscillator-Mixer
Q2	2N308	IF Amplifier
Q3	2N238	Audio Amplifier
Q4	2N185	Audio Output

### TRANSISTOR SERVICING

If a transistor is suspected of being defective, substitution will be the only reliable check. Checking resistance readings between the transistor elements with an ohmmeter will indicate only a shorted or open transistor. Under certain circumstances, damage to the transistor may result, therefore, this method is not recommended.

When inserting a transistor in its socket, make sure the transistor leads line up with the socket holes. Do not rearrange placement of transistors; under certain circum-

stances, especially in the RF or IF circuits, slight re-alignment may be necessary after a transistor substitution is made, if a component is replaced which must be soldered to the transistor socket, remove the transistor from its socket before soldering as excessive heat may damage the transistor. When attempting any soldering, a low wattage small diameter tip iron is suggested. Heat may also damage other components, therefore, dissipate the heat by grasping the component lead with a long nose pliers. When checking the receiver with an ohmmeter remove the circuit transistor for accurate reading.

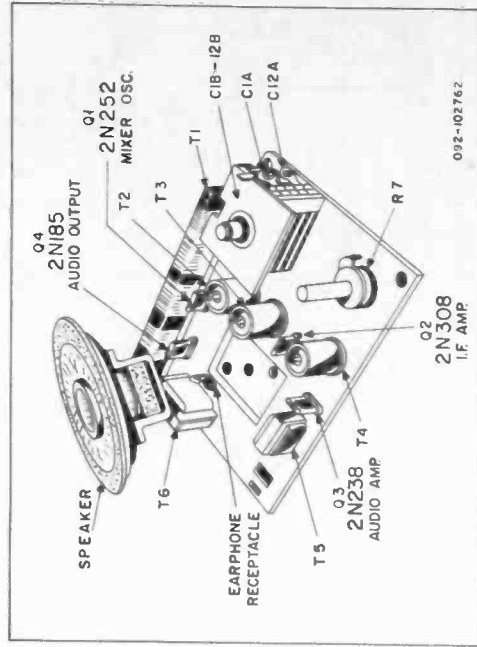
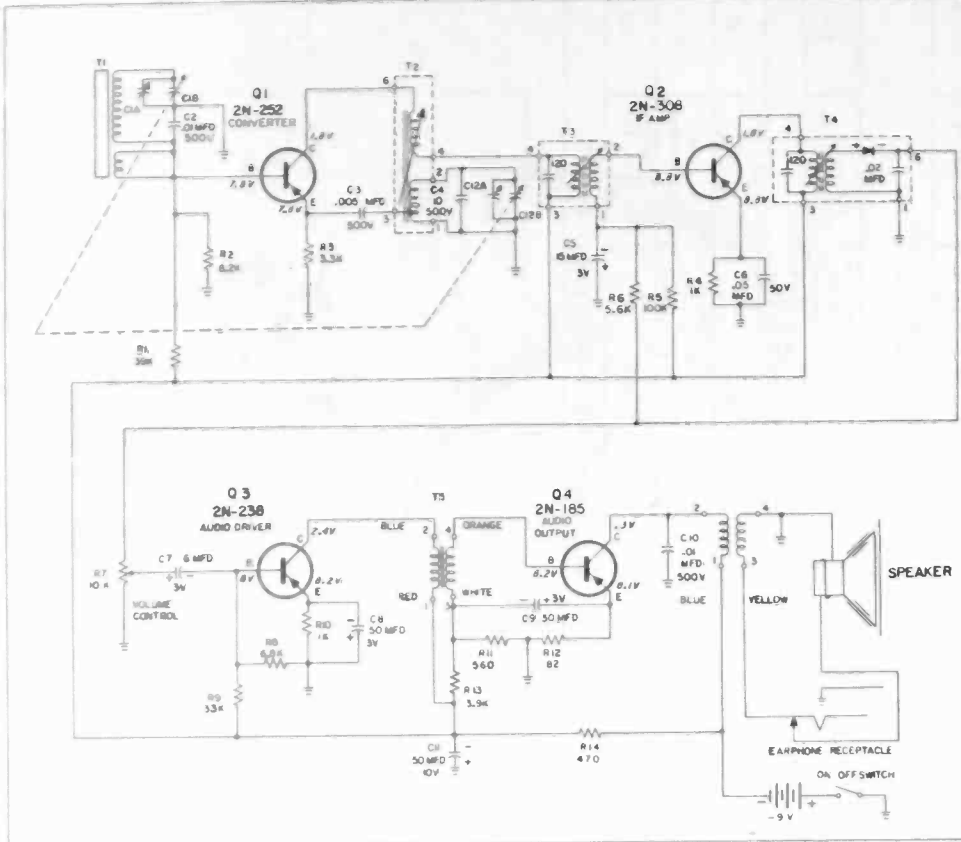


Fig. 2 Chassis Layout.

**MODEL NO. D3715A**

**REPLACEMENT PARTS LIST**

Ref. No.	Part No.	Description
<b>TRANSFORMERS AND COILS</b>		
T1	257-300007	Antenna Rod Ass'y.
T2	251-200007	Oscillator Coil
T3	250-200002	Transformer, I.F.
T4	250-200003	Transformer, Diode
T5	255-300009	Transformer, Audio Input
T6	255-300010	Transformer, Audio Output
<b>CAPACITORS</b>		
C1, AB, 12AB,	248-300001	Variable (Gang)
C2, 10	247-300016	.01 mfd 20% 500V., Cer. Disc.
C3	247-300018	.005 mfd. 20% 500V., Cer. Disc.
C4	491-106100-25	10 mufd 10% 500V., Cer. Tub.
C5	245-200011	15 mfd -100-20% 3V., Lytic
C6	247-300017	.05 mfd -80-20% 50V Cer. Disc.
C7	245-200009	6 mfd -100-20% 3V., Lytic
C8	245-200013	50 mfd. -100-20% 3V., Lytic
C9	245-200012	30 mfd. -100-20% 3V., Lytic
C11	245-200008	30 mfd. -100-20% 10V., Lytic
<b>RESISTORS</b>		
(All resistors 10% 1/2W Composition unless otherwise noted.)		
R1	451-252393	39,000 OHM
R2	451-252828	8,200 OHM
R3	451-252392	3,300 OHM
R4, 10	451-252102	1,000 OHM
R5	451-252104	100,000 OHM
R6	451-252562	5,600 OHM
R7	225-200011	Variable (On-Off, Vol.)
R8	451-252682	6,800 OHM
R9	451-252333	33,000 OHM
R11	451-252561	560 OHM
R12	451-252820	82 OHM
R13	451-252392	3,300 OHM
R14	451-252471	470 OHM
<b>MISCELLANEOUS</b>		
205-300007	Socket, Sub.-Min. (3 Prong)	
036-300085	Receptacle, Earphone	
285-100006	Speaker 2 3/4" P. M.	
287-200007	Battery Cable Ass'y.	
329-400001	Printed Circuit Board	
276-200018	Clip, Antenna Mounting	
<b>TRANSISTORS</b>		
Q1	312-300002	Converter (2N252)
Q2	312-300003	I. F. Amplifier (2N308)
Q3	312-300004	Audio Driver (2N238)
Q4	312-300005	Audio Output (2N185)
<b>CABINET PARTS</b>		
316-400002	Portable Case (Turquoise)	
215-300048	Knob, Indicator	
215-200049	Knob, (Vol. ON-OFF)	
241-940016	Battery Cover Heat Seal Ass'y	
316-300003	Case, Cover (White)	
216-100004	Sponge Rubber Filler (1" x 5/8 Dia.)	
216-100003	Sponge Rubber Filler (2" x 5/8 Dia.)	
116-100066	Battery Cover (Turquoise)	
241-940017	Clip & Stud Staking Ass'y.	



**NOTES**

RESISTOR VALUES ARE IN OHMS, 1/2 WATT  
10% TOLERANCE, UNLESS OTHERWISE SHOWN.

CAPACITOR VALUES ARE IN MICRO-MICROFARADS  
UNLESS OTHERWISE SHOWN.

DC VOLTAGE READINGS TAKEN WITH VTVM,  
NO SIGNAL IN INPUT AND BATTERY AT NOMINAL  
-9V DC. VOLTAGES WILL VARY WITH TRANSISTOR  
CHANGES. ALL VOLTAGES ARE NEGATIVE.

TYPE 2N-185, 2N-238, 2N-252, 2N-308

EMITTER  
BASE  
COLLECTOR

BASE  
EMITTER

TRANSISTOR SOCKET  
(BOTTOM VIEW)

DWG NO 089-400958

**MODEL NO. DC3715B**

**MODEL NO. DC3715B**

Factory Model TR-47

**DESCRIPTION**

Your new Truotone Transistorized Personal Portable Radio incorporates the latest in electronic engineering developments--the TRANSISTOR. Four transistors replace bulky vacuum tubes and are only slightly larger than a kernel of corn. The Transistor is practically service free and requires only a fraction of the power for operation needed for vacuum tubes. For this reason, the small battery included with the radio supplies all the required power for the superheterodyne transistor circuitry.

A sensitive built-in antenna and acoustically matched speaker and case will give you more stations to choose from, better tone quality, and clearer reception of the entire broadcast band. As an added feature, an earphone and cable is available as an accessory item for use with the radio. When the earphone cable jack is inserted in the receptacle provided at the top of the case, the sets' speaker will automatically be disconnected and provide earphone reception only.

**OPERATION**

This receiver operates on a 9 volt battery installed in the case and will receive all standard broadcast stations within operating range. Approximately 100 hours performance can be experienced with this battery before replacement is required.

**TUNING KNOB**

The large center knob is the tuning knob. When selecting a station turn the knob back and forth until the tone is clearest and loudest. Do not use the tuning knob to regulate volume; the volume control should be used for that purpose after the station selected has been tuned in properly.

**ANTENNA**

This radio is equipped with a built-in antenna which is sufficient for receiving local stations and powerful distant stations. Because the antenna is directional, it may be necessary to turn the radio in various directions to get the best reception from some distant stations.

**ON-OFF SWITCH AND VOLUME CONTROL**

The small knob is both the On-Off Switch and the Volume Control. When the control is rotated counterclockwise, the set is off. Rotation in the opposite direction will click the switch and turn the set on. The knob may then be used to regulate the volume.

**CHASSIS REMOVAL**

1. Remove Battery. (Refer to the manual for battery removal information.)
2. Remove tuning and on-off volume control knobs by pulling straight out from the case.
3. Remove the flat head screw located at the end of the case and remove the case cover.

4. Remove the chassis mounting screw located near the base of the on-off volume control.
5. Carefully remove the chassis from the case allowing the battery cable to slip through the battery compartment hole.

**BATTERY REPLACEMENT**

Since the receiver is small and compact, not every 9 volt battery will fit in the space provided. When replacement of the battery pack is necessary, replace with Truotone stock number 3B6664 and follow the procedure below: Remove battery cover by pushing release button upward, grasp latch and pull up and away from case. Remove old battery and un-snap battery clip. Snap battery clip on replacement battery and insert into case. Be sure rubber cushion is between battery and side wall of case to prevent battery movement. Insert battery cover in place and push latch down.

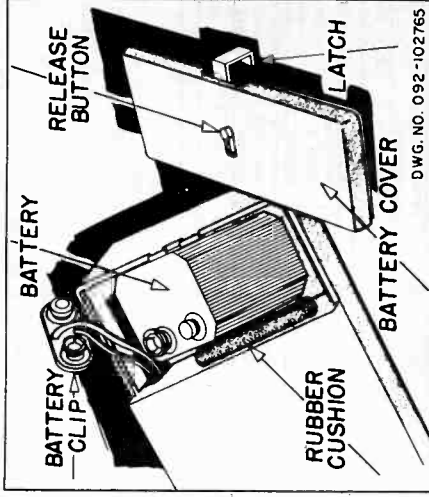


Figure 1

**BATTERY LOCATION**

Approximately 100 hours performance can be experienced with the above Battery before replacement is required. Battery replacement should be performed when the sound output is noticed to be muffled or distorted with a decrease in total output or if a voltage measurement shows less than 6 volts. The battery voltage should be measured with the receiver turned on after at least 5 minutes of operation.

in total output or if a voltage measurement shows less than 6 volts. The battery voltage should be measured with the receiver turned on after at least 5 minutes of operation.

**REMOVING CHASSIS FROM CASE**

1. Remove battery.
2. Remove tuning knob stud by turning counterclockwise and remove tuning knob.
3. Remove On-Off volume control knob.
4. Remove case cover mounting screw located behind tuning knob and remove case cover.
5. Remove three chassis mounting screws.
6. Carefully remove chassis from case allowing battery cable to slip through battery compartment hole.

# MODEL NO. DC3715B

## ALIGNMENT PROCEDURE

- NOTES:** 1. Remove chassis from case.  
 2. Connect 9 volt battery.  
 3. Use output meter with 5 ohms impedance.  
 4. Turn volume control to maximum.  
 5. Signal generator output at 100 micro-volts, 30% modulation at 400 cycles.

SIGNAL GENERATOR		CIRCUIT CONNECTION	GROUND SIDE	OUTPUT METER	GANGED CAPACITY	ADJUST FOR MAXIMUM OUTPUT ON METER
CIRCUIT	FREQUENCY					
I.F.	455KC	.5MFD	To Base of Q1 To Chassis	Connect in place of speaker	—	T3, T4
Repeat above step two or three times for best results, keeping generator output in all cases as low as possible to prevent overloading of audio.						
Osc.	1620KC	.5MFD	To Base of Q1 To Chassis	Connect in place of speaker	Open Gang (Fully Clockwise)	C12A
Caution: Too high an output from signal generator may cause setting of trimmer on a spurious response.						
Osc.	555KC	.5MFD	To Base of Q1 To Chassis	Connect in place of speaker	Closed Gang (Fully counter-clockwise)	T2
Osc.	1620KC	.5MFD	To Base of Q1 To Chassis	Connect in place of speaker	Open Gang (Fully clockwise)	C12A
Ant.	1400KC	Connect 3 turn loop to generator and place near T1.	Connect 3 turn loop to generator and place near T1.	Connect in place of speaker	Ganged Condenser should be rocked	C1A

CHECK FOR ALIGNMENT AND DIAL CALIBRATION AT 1000KC and 600KC.

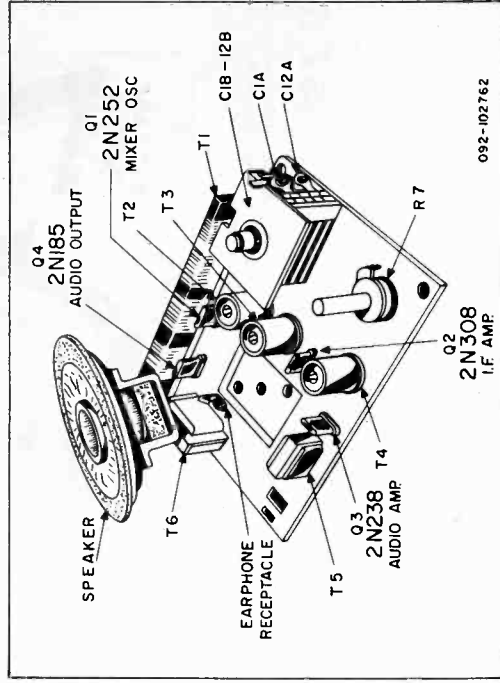


Figure 2 Chassis Layout

# MODEL NO. DC3715B

## SERVICE DATA

### SPECIFICATIONS

- Power Supply ..... 9 Volts D.C.
- Frequency Range ..... 540 to 1620 KC
- Intermediate Frequency ..... 455 KC
- Power Output ..... 50 M.W.
- Speaker ..... 2 3/4" PM, V.C. Impedance - 15 Ohms
- Cabinet ..... 6 1/4" Width, 1 3/4" Depth, 3 3/8" Height

## TRANSISTOR COMPLEMENT

Schematic Ref. No.	RETMA Type	Function
Q1	2N252	Oscillator-Mixer
Q2	2N308	IF Amplifier
Q3	2N238	Audio Amplifier
Q4	2N185	Audio Output

## TRANSISTOR SERVICING

If a transistor is suspected of being defective, substitution will be the only reliable check. Checking resistance readings between the transistor elements with an ohmmeter will indicate only a shorted or open transistor. Under certain circumstances, damage to the transistor may result, therefore, this method is not recommended.

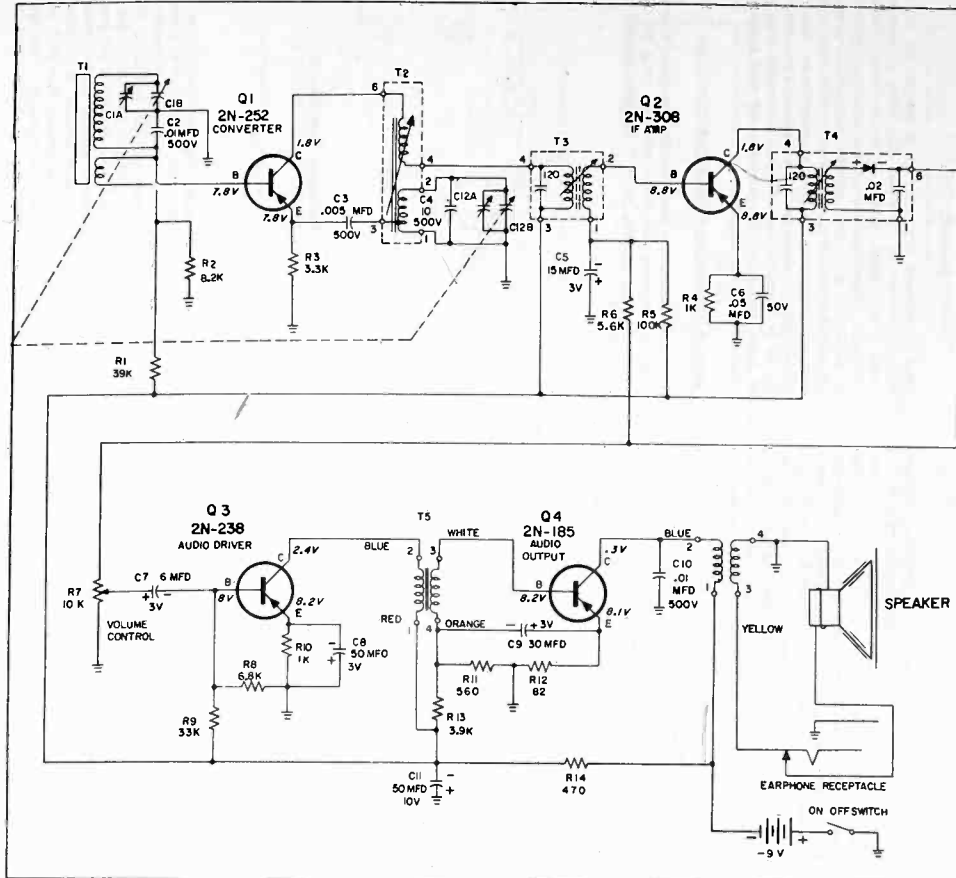
When inserting a transistor in its socket, make sure the transistor leads line up with the socket holes. Do not re-arrange placement of transistors; under certain circumstances, especially in the RF or IF circuits, slight re-

alignment may be necessary after a transistor substitution is made. If a component is replaced which must be soldered to the transistor socket, remove the transistor from its socket before soldering as excessive heat may damage the transistor. When attempting any soldering, a low wattage small diameter tip iron is suggested. Heat may also damage other components, therefore, dissipate the heat by grasping the component lead with a long nose pliers. When checking the receiver with an ohmmeter remove the circuit transistors for accurate readings.

**MODEL NO. DC3715B**

**REPLACEMENT PARTS LIST**

Ref. No.	Part No.	Description
<b>TRANSFORMERS AND COILS</b>		
T1	257-300002	Antenna Rod Ass'y.
T2	251-200007	Oscillator Coil
T3	250-200002	Transformer, I. F.
T4	250-200003	Transformer, Diode
T5	255-300009	Transformer, Audio Input
T6	255-300010	Transformer, Audio Output
<b>CAPACITORS</b>		
C1, B	248-300001	Variable (Gang)
C2, 10	247-300016	.01 mfd 20% 500V, Cer. Disc.
C3	247-300018	.005 mfd 20% 500V, Cer. Disc.
C4	491-106100-25	10 mmf 10% 500V Cer. Tub.
C5	245-200011	15 mfd $\pm$ 100-20% 3V., Lytic
C6	247-300017	.05 mfd $\pm$ 80-20% 50V, Cer. Disc.
C7	245-200009	6 mfd $\pm$ 100-20% 3V., Lytic
C8	245-200013	50 mfd $\pm$ 100-20% 3V., Lytic
C9	245-200012	30 mfd $\pm$ 100-20% 3V., Lytic
C11	245-200008	50 mfd $\pm$ 100-20% 10V., Lytic
<b>RESISTORS</b>		
(All resistors 10% $\pm$ 1/2W Composition unless otherwise noted.)		
R1	451-252393	39,000 OHM
R2	451-252822	8,200 OHM
R3	451-252332	3,300 OHM
R4, 10	451-252102	1,000 OHM
R5	451-252104	100,000 OHM
R6	451-252562	5,600 OHM
R7	225-200011	Variable (On-Off, Vol.)
R8	451-252682	6,800 OHM
R9	451-252333	33,000 OHM
R11	451-252561	560 OHM
R12	451-252820	82 OHM
R13	451-252392	3,900 OHM
R14	451-252471	470 OHM
<b>MISCELLANEOUS</b>		
206-300007	Socket, Sub., -Min. (3 Prong)	
036-200085	Receptacle, Earphone	
285-100006	Speaker 2 3/4" P. M.	
287-200007	Battery Cable Ass'y.	
329-400001	Printed Circuit Board	
276-200018	Clip, Antenna Mounting	
<b>TRANSISTORS</b>		
Q1	312-300002	Converter (2N252)
Q2	312-300003	I. F. Amplifier (2N308)
Q3	312-300004	Audio Driver (2N238)
Q4	312-300005	Audio Output (2N185)
<b>CABINET PARTS</b>		
316-400002	Portable Case (Turquoise)	
215-300048	Knob, Indicator	
215-200049	Knob, (Vol. ON-OFF)	
241-940016	Battery Cover Heat Seal Ass'y.	
316-300003	Case, Cover (White)	
216-100004	Sponge Rubber Filler (1" $\times$ 5/8 Dia.)	
216-100003	Sponge Rubber Filler (2" $\times$ 5/8 Dia.)	
116-100066	Battery Cover (Turquoise)	
241-940017	Clip & Stud Stalldng Ass'y.	



**NOTES**

RESISTOR VALUES ARE IN OHMS, 1/2 WATT 10% TOLERANCE, UNLESS OTHERWISE SHOWN.

CAPACITOR VALUES ARE IN MICRO-MICROFARADS UNLESS OTHERWISE SHOWN

DC VOLTAGE READINGS TAKEN WITH VTVM, NO SIGNAL IN INPUT AND BATTERY VOLTAGE -9V DC. VOLTAGES WILL VARY WITH TRANSISTOR CHANGES. ALL VOLTAGES ARE POSITIVE WITH RESPECT TO THE NEGATIVE TERMINAL OF BATTERY.

RED DOT  
IST IF COIL

BLUE DOT  
2ND IF COIL

GREEN DOT  
OSC. COIL

TYPE 2N-185, 2N-238, 2N-252, 2N-308

EMITTER  
BASE  
COLLECTOR

BASE  
COLLECTOR  
EMITTER

TRANSISTOR SOCKET  
(BOTTOM VIEW)

DWG. NO. 089-400935-B

**MODEL NO. DC3715B**



**Model No. D3716B**  
Factory Model No. TR57RC

**SPECIFICATIONS**

- ANTENNA..... BUILT-IN STICK LOOP
- FREQUENCY COVERAGE..... 540-1620 KC
- INTERMEDIATE FREQUENCY..... 455 KC
- POWER SUPPLY..... 6 VOLTS DC, 4, 1 1/2 VOLTAGE BATTERIES
- SPEAKER VOICE COIL IMPEDANCE..... 11 OHMS
- TRANSISTORS..... 5

**OPERATION**

The new Truetone battery operated Transistor portable radio is the latest development of Electronic engineering laboratories. It is precision engineered and uses 5 Transistors and one Germanium detector in a highly sensitive circuit which employs no tubes whatsoever. Only four ordinary flashlight batteries power this receiver. They are easy to procure and low in cost. The use of transistors assures much longer battery life than can be expected of previous type portables, effecting both economy of operation and far less frequent battery replacement. Sensitivity, power and tone quality are equal to any other portable of similar size. Due to the long battery life and economy of operation it is not necessary that any provision for AC-DC operation be made. Transistors, unlike radio tubes, have an indefinite life expectancy so that frequent testing or replacement is eliminated. It is recommended however, that if such replacement does become necessary, that you see your Truetone dealer. See Figure 6 for transistor locations.

**CAUTION:** Never remove transistors from their sockets while receiver is turned on.

**INSTALLING THE BATTERIES**

Your D-3716B radio uses four #2, 1-1/2 volt flashlight cells as shown in Fig. 1. To replace these, proceed as follows:

1. Open back of cabinet by pulling up on tabs at each corner where snap fasteners are located.
2. Remove the two long springs over each cardboard battery holder by unhooking one end from metal clip.
3. Remove the two cardboard battery holders and insert two flashlight cells in each holder. Be sure batteries are inserted in direction shown in Fig. 1. Inserting them incorrectly will make receiver inoperative and cause possible damage to parts.
4. Replace battery holders containing the batteries in the metal clips exactly as shown in Fig 1 and secure them in place by rehooking the metal springs referred to in step 1 above.
5. Close cabinet cover and snap the tab fasteners.

**CAUTION:** Batteries should be replaced when the tone becomes mushy or the receiver lacks power. It is recommended that all four batteries be replaced when new ones are needed. Be sure and replace batteries promptly when they become weak, or remove them entirely if receiver is not to be used for a long period of time.

The Truetone D-3716B is a new kind of portable radio receiver, in that it uses all transistors instead of vacuum tubes or a combination of tubes and transistors. At first glance, the circuitry may appear to be the same as for a conventional tube powered superheterodyne, and actually there is quite a bit of similarity. However, there is enough difference between the two, to warrant some consideration of the difference. While it is beyond the scope of this service manual to go into the theory of transistor behavior, some pertinent facts concerning their operation is necessary in order to service properly radio receivers using them.

The D-3716B uses junction type transistors which have proven more satisfactory than point-contact types for this type of service. There are two types of junction transistors, the p-n-p and the n-p-n. A transistor is composed of two types of germanium, n-type and p-type, the difference being the form of impurity injected into it. A p-n-p type transistor is constructed by alloying p-type impurities on opposing sides of a thin slab of n-type germanium. The n-p-n type transistor is constructed by alloying n-type impurities on opposing sides of thin slab of p-type germanium. Figure 2 below illustrates the

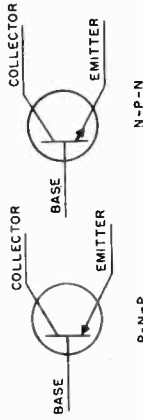


Fig. 2

graphical symbols for p-n-p and n-p-n transistors. The D-3716B uses p-n-p transistors. In transistor circuits, the base is analogous to the grid, the emitter to the cathode and the collector to the plate, of the conventional triode vacuum tube. Unlike the vacuum tube, the transistor is a current amplifying device and not a voltage amplifier. In general, the servicing of transistor radios is somewhat different from that used in vacuum tube circuits. In receivers using tubes, it is usually first assumed that one or more tubes are weak or defective, so the first logical step is to check the tubes. Transistors, on the other hand, show little if any deterioration with age and are considerably more reliable than tubes and it can usually be assumed that the difficulty lies elsewhere in the set. As yet, no accurate data is available on the actual useful life of a transistor in normal usage and not subjected to abuse.

Transistorized radio receivers require smaller servicing tools than are normally on hand. A small soldering iron (pencil type) having a rating of not more than 35 watts, tweezers, and a small wire brush for removing excess solder will be valuable aids in reconnecting damaged transformer leads and other miniature parts. Transistors should always be removed from their sockets when doing any soldering to the socket, making resistance

measurements or checking for leaky electrolytic capacitors. Since all the transistors in the D-3716B are placed in sockets, like tubes, there should be no occasion to do any soldering direct to the transistor, but as a precaution, always remove them when doing any soldering to the sockets or to any other components near to the transistors. When in doubt as to whether a transistor is defective, substituting another one is the simplest procedure.

**CAUTION:** Never attempt to check a transistor with an Ohmmeter.

Many ohmmeters are designed to permit 100 ma or more of current to flow, and this heavy current may cause a permanent change in the transistor characteristics. Commercial transistor checking equipment is available and every service shop should procure one since there will be more and more transistorized equipment appearing in the market in the near future. One important thing to remember when replacing a transistor in the RF or IF stages of the D-3716B is that usually when this is found necessary, the receivers will need alignment. (See alignment instructions.)

**SIMPLE TRANSISTOR TEST CIRCUIT**

Where no commercial transistor test equipment is available, the following test circuit will indicate if the transistor is good or bad, or if it has been damaged by a short circuit.

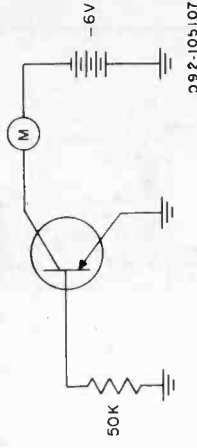


Fig. 3. Transistor Test Circuit

One of the most revealing characteristics is the collector current that flows when the emitter is grounded and no signal is applied to the base. This current is a function of the temperature and the resistivity of the germanium. Of more importance however, is the fact that the current increases considerably if the junction of the germanium is contaminated or if the transistor has been damaged by a short circuit. If the collector current of the transistor is greater than 0.75 MA at room temperature it should be replaced. This applies to transistors 112-300001 and 112-300002 used in the D-3716B.

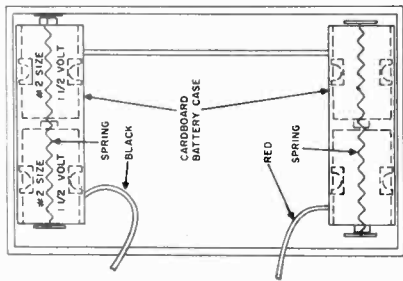


Fig. 1

**OPERATING INSTRUCTIONS**

The Truetone D-3716B Transistor Portable Radio employs a built-in compact highly sensitive stick loop antenna thus eliminating the necessity for any type of external antenna. To turn the receiver on, rotate the volume control knob, until a click is heard. It will become operative immediately, as no warm up period is required. Then adjust the tuning knob to the station you desire to listen to. This knob is calibrated in kilocycles with the last 0 omitted. Adding a 0 to the number on the knob will give the correct kilocycle reading. Now adjust the volume control knob to the desired volume.

**CAUTION:** Be sure and turn the volume control knob to the "off" position (until a click is heard) when you are through using the receiver in order to conserve battery. Since transistors have no filaments like tubes, and generate no heat, the click of the "on-off" switch is the only indication you will get that the receiver is turned off.

Never leave low or run down batteries in the receiver, as they may swell or leak and cause serious damage to set and cabinet.

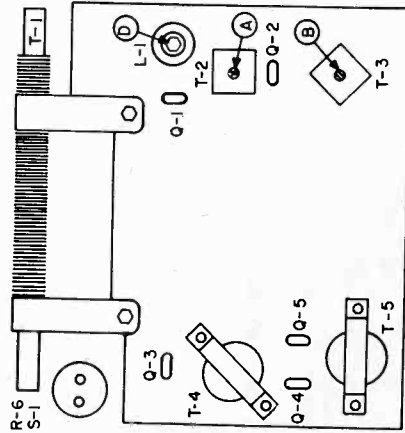
Do not expose receiver to temperatures in excess of 125° F.

Never use abrasive soaps or cleaning fluids on cabinet. Lukewarm water will clean the cabinet without damage (saddle soap may also be used).

**NOTE:** THE TUNING DIAL IS MARKED WITH THE CIVIL DEFENSE "CD" EMBLEM AT 640 AND 1240 KILOCYCLES. IN A NATIONAL EMERGENCY, TURN TO EITHER OF THESE MARKINGS FOR OFFICIAL CIVIL DEFENSE INFORMATION, NEWS OR INSTRUCTIONS.

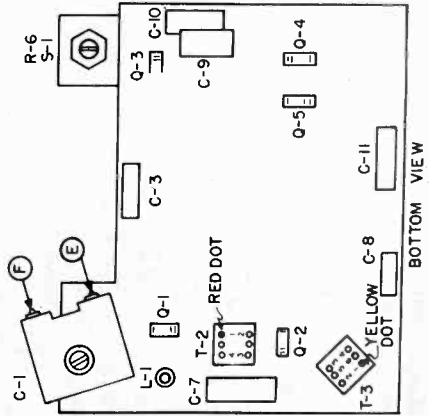
### Model No. D3716B SOME PRECAUTIONS TO OBSERVE

- When servicing radios using transistors, there are several things to be extremely careful of during test and repair.
1. Avoid accidental shorting of transistor elements to circuit ground as the transistor may be permanently damaged.
  2. Also remove the transistors from their sockets when making continuity tests. Failure to do this will not only give misleading continuity readings, but may also damage the transistors.
  3. For voltage measurements, use only a VTVM.
  4. When first checking a D-3716B that is inoperative, check battery voltage before looking any further. A new set of batteries should read 6 volts with the receiver turned on. Satisfactory performance can be obtained with battery voltage as low as 4 volts.
  5. Avoid reversing the battery polarity when replacing batteries, as this can damage the electrolytic capacitors.



TOP VIEW

092-202793



BOTTOM VIEW

### Model No. D3716B ALIGNMENT PROCEDURE

- # Connect Output Meter across the Voice Coil (Ap- proximately 11 Ohms).
- # Set Volume Control to Maximum.
- # Use Non-Magnetic Alignment Tool.
- # Refer to Figure 6 for the location of all adjustments.
- # To limit AVC action and prevent overloading use only enough generator output to give a useful indication.

#### IF ALIGNMENT

STEP	SIGNAL GENERATOR CONNECTIONS	GENERATOR FREQUENCY	RECEIVER DIAL SETTING	ADJUST	REMARKS
1	Across secondary of stick-loop ant. (terminal strip on top side of chassis.)	455 KC modulated.	Tuning gang open.	A & B i-f slugs.	Tune for maximum output.

#### RF ALIGNMENT

2	Loosely couple to stick-loop antenna.	1620 KC modulated.	Tuning gang open.	E Osc. trimmer.	Tune for maximum output.
3	Same as Step 2.	535 KC modulated.	Tuning gang closed.	D Osc. Coil slug.	Same as Step 2.
4	Same as Step 2.	1400 KC modulated.	1400 KC	F Ant. trimmer.	Same as Step 2.

#### TRANSISTOR SUBSTITUTION CHART

Hollcrafters Part	General Transistor	G.E.	Raytheon	RCA	Texas Inst.
112-300001	GT 766	2N136	CK766	2N140	—
112-300002	GT 760	2N135	2N112A, CK760A	2N139	—
112-300003*	GT 2N109	2N186	CK888	2N109	2N109, 352
112-300004	GT 81, 2N109	2N191	CK888	2N109	310

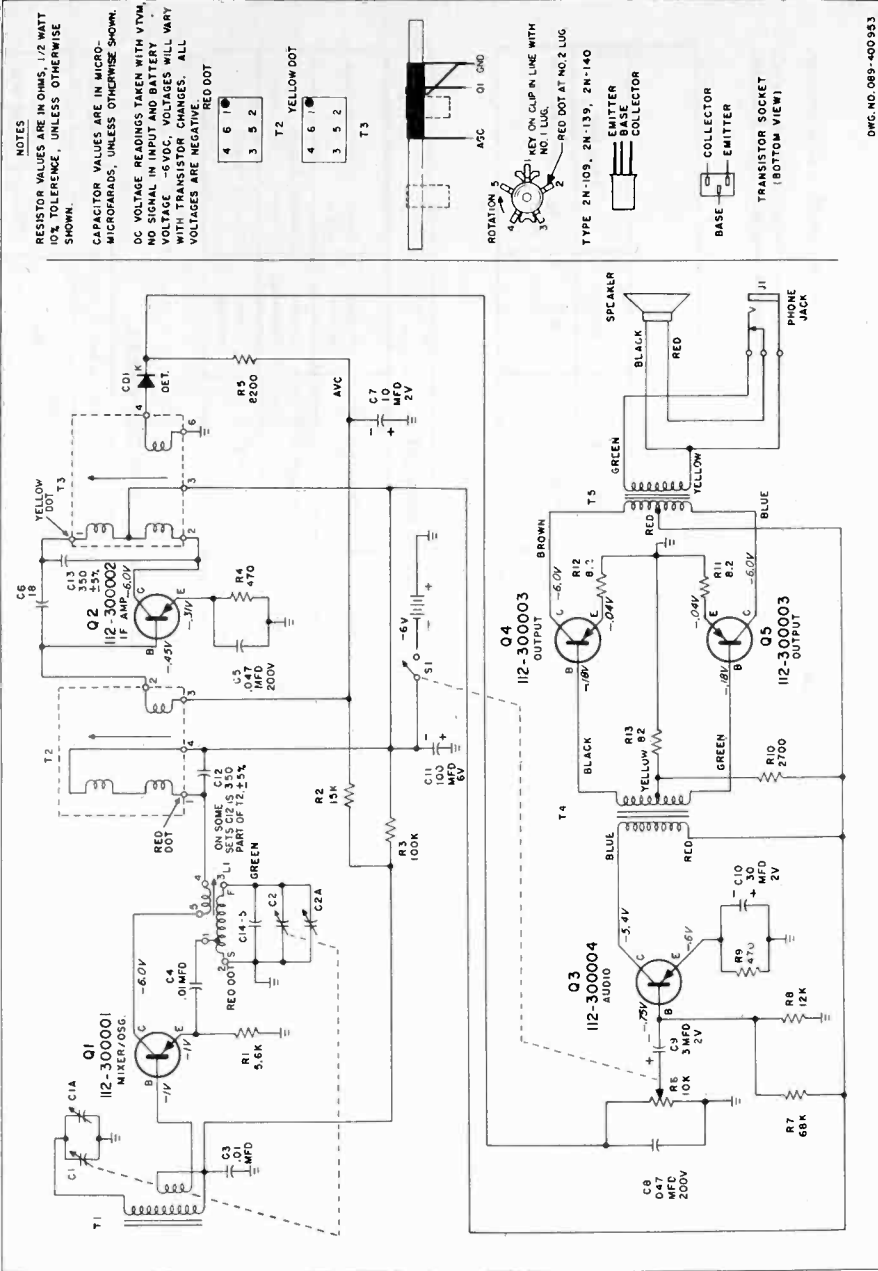
\*NOTE

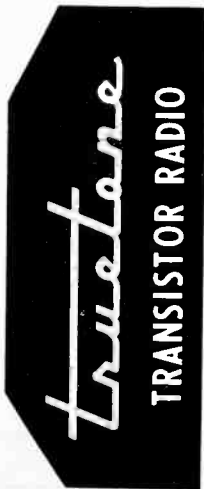
The audio output transistors were installed at the factory as a matched pair. If replacement of either unit becomes necessary it is recommended that a new matched pair be installed. Replacement of a single unit will probable restore operation but may result in increased distortion especially at high volume levels.

Model No. D3716B

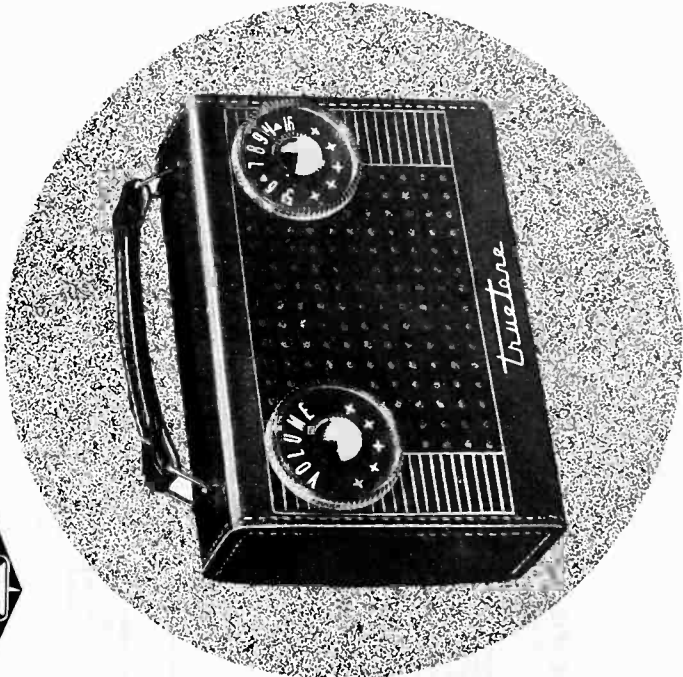
Model No. D3716B  
REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description
		<b>CAPACITORS</b>
C1, C2	248-300002	Variable
C1A, C2A	Part of 248-300002	
C3, C4	047-100354	.01 Mid. 20% @ 500V., Cer. Disc
C5, C8	477-022473	.047 Mfd. 20% @ 200V., Paper Tub.
C6	475-105180-15	18 mmf., 5%, NPO., Cer. Tub. Durez
C7	045-300438	10 Mfd @ 2V., Lytic
C9	045-300437	3 Mfd @ 2V., Lytic
C10	045-300436	30 Mfd @ 2V., Lytic
C11	045-200371	100 Mfd @ 6V., Lytic
C12, C13	247-100019	350 mmf., 5% @ 500V., Silver Mica Durez
C14	475-101050-25	5 mmf., ± 25 mmf., NPO., Cer. Tub. Durez
		*C12 is part of T2 on some sets.
		<b>RESISTORS</b>
R1	451-252562	5600 OHMS
R2	451-252153	15,000 OHM
R3	451-252104	100,000 OHM
R4, R9	451-252471	470 OHM
R5	451-252822	8200 OHM
R6	025-201405	Variable (Volume, On-Off)
R7	451-252683	68,000 OHM
R8	451-252123	12,000 OHM
R10	451-252272	2700 OHM
R11, R12	224-100008	16.4 OHM (Center Tap)
R13	451-252820	82 OHM
		<b>COILS AND TRANSFORMERS</b>
L1	251-200010	Coil, Oscillator
T1	257-300004	Antenna, Ferrite Stick
*T2	050-300703	Transformer, IF Osc/Mixer
*T3	050-300704	Transformer, IF Diode
T4	050-300324	Transformer, Audio Input
T5	055-300325	Transformer, Audio Output
		*Alternate Replacements:
T2	250-300008	Transformer, IF Osc/Mixer (Includes C12)
T3	250-300009	Transformer, IF Diode
		<b>TRANSISTORS</b>
Q1	112-300001	Converter (2N140)
Q2	112-300002	455 KC IF (2N139)
Q3	112-300004	Class - A Audio (2N109)
Q4, Q5	112-300003	Class - B Audio Output (2N109)
		<b>MISCELLANEOUS</b>
278-100027		Cabinet, Simulated Leather
076-101882		Clamp Plastic, Ant. Mtg.
076-100385		Clip, IF Can Mtg.
076-101722		Clip, Socket Mtg.
019-201933		Crystal Diode, 1N60
006-200689		Socket, Sub-Min., 3 Pin
008-203574		Form, Battery Holder
036-200085		Jack, Miniature (Sup. with Mtg. Hardware)
215-300060		Knob, Tuning
015-301019		Knob, Volume Control
006-200689		Socket, Sub-Min., 3 Pin
285-200008		Speaker, 4" x 4"
075-200506		Spring, Battery Holder





# TRANSISTOR RADIO INSTALLATION, OPERATING and SERVICE INSTRUCTIONS



MODEL NO. DC3884

WESTERN AUTO SUPPLY CO.

## MODEL NO. DC3884

This portable Receiver incorporates Transistors - the very latest scientific achievement in the field of Electronics. Like the vacuum tube, the Transistor amplifies weak radio signals. Unlike the vacuum tube, the Transistor does not have a filament, so the usual A Battery which required frequent replacement, is unnecessary. The second advantage of the Transistor is that it is an electric current flow device, which current can readily be furnished by 6 C size flashlight cells, so that the usual 67 1/2 volt multi cell and expensive B battery is eliminated.

For these reasons, this portable radio will serve you for several hundred hours before renewal of the 6 Wizard battery #3B6731 is necessary.

### GENERAL DESCRIPTION

This Receiver is designed to operate from its self contained battery supply. The Ferrite Rod Antenna is designed to produce satisfactory reception in low signal areas. In some locations turning the Receiver in various directions may improve the reception.

This Receiver is equipped with an earphone Jack to receive Truettone Earphone 3 DW3300, for listeners desiring to listen to programs in private. The Earphone Plug disconnects and silences the Speaker. The program sound level when using Earphone is controlled by the Volume Control.

The Earphone Jack is located at the back of the cabinet.

### CONTROLS

The left-hand knob is the on-off switch and volume control. To turn on radio, turn this knob clockwise. The radio plays immediately - no warm-up time is required. To turn radio off, turn this knob counter-clockwise until click is heard and the bar is over the word OFF.

The Tuning Control is the right-hand knob. The numerals under this knob show Kilocycles with the last two ciphers left off.

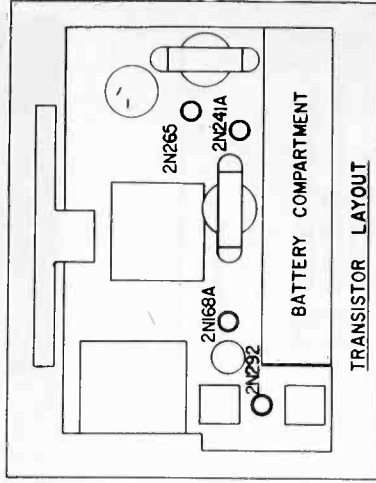
To tune in station desired, move this tuning knob back and forth to the position which produces the deepest rounded tones.

The tuning knob shows the "CD" Civil Defense Emblem at - Commercial Frequencies - 640 and 1240 Kilocycles. In a Civil Defense emergency, tune to either of these frequencies to receive defense news, instructions and information.

**To Install Batteries** : Unsnap the two bottom tabs at the back of the cabinet and open the cover. Take out the battery case and remove its cover. Place three no. 3B6731 Wizard Batteries (in the front section of the case) - as shown in the illustration below, so that the metal button end of the battery is to the left and engages the spring contact provided.

Place three no. 3B6731 Wizard Batteries (in the rear section of the case) - as shown in the illustration below, so that the metal button end of the battery is to the right and engages the right-hand spring contact provided.

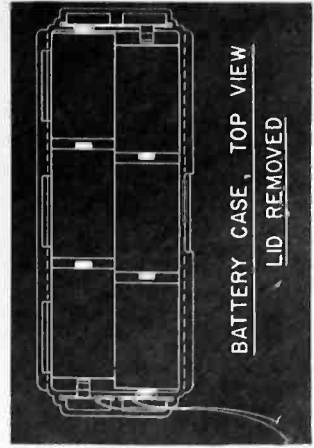
It is very important that the batteries be inserted correctly. The forward batteries must all have the metal button end facing to the left and all of the rear batteries must all have the metal button end facing to the right. Make sure that the center battery is correctly in place. If this is not done right, the radio will not operate at full power. If the batteries are not correctly inserted as to metal button end, the batteries will not be connected and the radio will not operate - remaining silent.



### WARNING

Old batteries become corroded and leaky. Before storing radio for a long period, remove batteries from cabinet to prevent damage. To clean the Texon case of this receiver, use only warm water and a soft cloth.

Note: We recommend that you use our Wizard Batteries. However, C Batteries of other manufacturers are also acceptable.



BATTERY CASE, TOP VIEW  
LID REMOVED

**MODEL NO. DC3884**

**TRANSISTOR COMPLEMENT**

- FUNCTION  
 G. E. TYPE  
 2N168A ..... Oscillator Mixer  
 2N2921F ..... Amplifier  
 IN295 ..... Germanium Diode  
 2N265 ..... Audio Amplifier  
 2N241A ..... Audio Output

**ELECTRICAL SPECIFICATIONS**

- POWER SUPPLY --- 9 volts --- 6 Wizard no. 3B6731  
 --- "C" Batteries  
 Frequency range.....555 to 1650 Kilocycles  
 Intermediate frequency.....455 K.C.  
 Tuning two gang capacitor.....3.2 ohm voice coil impedance  
 Speaker, 4 ph.....30 milliwatts maximum  
 Power output.....600 microvolts at 5 milliwatts  
 Sensitivity.....

**GENERAL SERVICING INFORMATION**

**CAUTION**

Never attempt to check a transistor with an Ohmmeter. Do not use heavy soldering iron; use small soldering iron, pencil type, having a rating of not more than 35 watts.

**ALIGNMENT PROCEDURE**

1. Connect 1 volt OUTPUT METER across the voice coil.
2. Set volume control to maximum.
3. Use plastic alignment tool to prevent detuning.
4. Keep input signal from Generator at minimum value to give indication on meter.
5. Use a level between .1 and .2 volts on A.C. meter.
6. Measurements taken at 5 milliwatt level or .13 volts.
7. Modulation for alignment - 1000 cycles - 30%.

**I.F. ALIGNMENT**

STEP	Signal/Generator Connections High end to loop stick secondary winding. Ground to chassis - use .1 mfd. dummy.	Generator Frequency 455 K.C. modulated	Receiver Dial Setting Receiver Gang Fully open	ADJUST FERRITE CORES T1 - T2	REMARKS ADJUST for MAXIMUM
1					

**R.F. ALIGNMENT**

2	Spray signal using loop of wire close to loop stick	1650 modulated	Receiver Gang Fully Open	O S C Trimmer C-4	TUNE for MAXIMUM
3	Same as step 2	540 K.C. modulated	Receiver Gang Fully closed	O S C Slug L-2	TUNE for MAXIMUM
4	Same as step 2	1400 K.C. modulated	1400 K.C.	Antenna Trimmer C-3	TUNE for MAXIMUM
5	Same as step 2	600 K.C. modulated	600 K.C.	Adjust L-2	Rock in gang for maximum output
6	Repeat steps 4 and 5 for maximum output.				

**MODEL NO. DC3884**

**REPLACEMENT PARTS LIST**

When ordering parts, specify part number, model number and series. DESCRIPTION

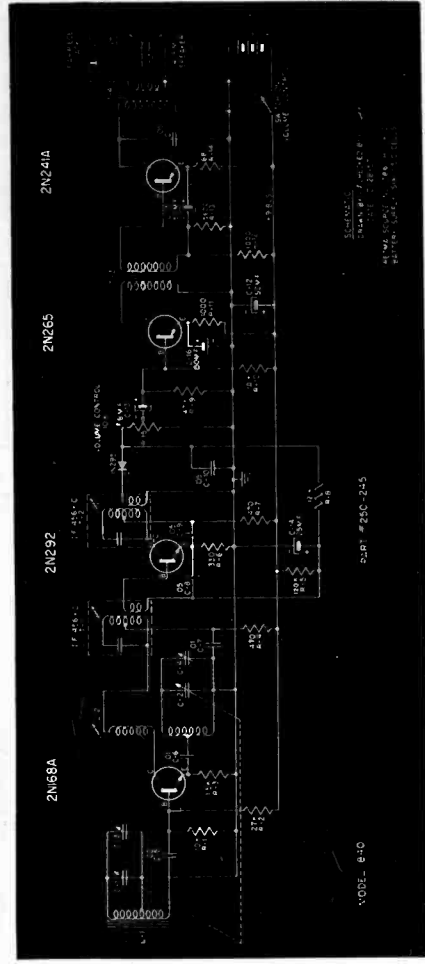
Ref. No.	Part No.	Approximate Selling Price	RESISTORS	No. Ref.	Part No.	Approximate Selling Price	CONDENSERS
R1	180-190	.10	10,000 ohms, 1/2 W, 10%	C-1-2-3-4	160-139	2-section Variable	Condenset
R2	180-193	.10	27,000 " "	C5	158-114	02 MFD Disc, 10WV	
R3	180-192	.10	1,500 " "	C6	158-113	01 MFD Disc, 10WV	
R4	180-186	.10	470 " "	C7	158-113	01 MFD Disc, 10WV	
R5	180-202	.10	120,000 " "	C8	158-111	05 MFD Disc, 10WV	
R6	180-197	.10	470 " "	C9	158-111	05 MFD Disc, 10WV	
R7	180-188	.10	470 " "	C10	158-111	05 MFD Disc, 10WV	
R8	180-121	.10	12,000 " "	C11	158-111	05 MFD Disc, 10WV	
R9	180-200	.10	47,000 " "	C12	150-134	50 MFD, 10V, Electrolytic	
R10	180-190	.10	10,000 " "	C13	150-131	8 MFD, 10V, Electrolytic	
R11	180-186	.10	1,000 " "	C14	150-133	25 MFD, 10V, Electrolytic	
R12	180-186	.10	1,000 " "	C15	150-130	5V, Electrolytic	
R13	180-203	.10	5,600 " "	C16	150-130	5V, Electrolytic	
R14	180-149	.10	Volume Control				
R15	120-134	1.30	- 10,000 ohms -				
210-145	Complete Cabinet - Sustain	10.46*					
220-132	Knob - Tuning/Volume with bar	.56					
175-129C	4" PM Speaker	3.90*		L1	132-134	Antenna Ferrite Rod	2.04*
170-134	Earpiece Jack	.68		L2	136-133	Oscillator Coil	1.26
195-197	Battery Case, bottom section, with contact springs	1.96		T1	130-130	IF Transformer	1.76
195-196	Battery Case - Top Section	.64		T2	130-130	IF Transformer	1.76
				T3	138-121	Intermediate Audio Transformer	1.80
				T4	138-127	Output Transformer	1.68

**CABINET and ACCESSORIES**

- 210-145 Complete Cabinet - Sustain
- 220-132 Knob - Tuning/Volume with bar
- 175-129C 4" PM Speaker
- 170-134 Earpiece Jack
- 195-197 Battery Case, bottom section, with contact springs
- 195-196 Battery Case - Top Section

\* Federal Excise Tax Included

Prices Shown Are Approximate and Subject to Change Without Notice.



**MODEL NO. DC3886**

This portable Receiver incorporates Transistors - the very latest scientific achievement in the field of Electronics. Like the vacuum tube, the Transistor amplifies weak radio signals. Unlike the vacuum tube, the Transistor does not have a filament, so the usual A Battery which required frequent replacement, is unnecessary. The second advantage of the Transistor is that it is an electric current flow device, which current can readily be furnished by 6 C size flashlight cells, so that the usual 67 1/2 volt multi cell and expensive B battery is eliminated.

For these reasons, this portable radio will serve you for several hundred hours before renewal of the 6 Wizard battery #3B6731 is necessary.

**GENERAL DESCRIPTION**

This Receiver is designed to operate from its self contained battery supply. The Ferrite Rod Antenna is designed to produce satisfactory reception in low signal areas. In some locations turning the Receiver in various directions may improve the reception.

This Receiver is equipped with an earphone Jack to receive Truetone Earphone 3 DW5300, for listeners desiring to listen to programs in private. The Earphone Plug disconnects and silences the Speaker. The program sound level when using Earphone is controlled by the Volume Control.

The Earphone Jack is located at the back of the cabinet.

**CONTROLS**

The left-hand knob is the on-off switch and volume control. To turn on radio, turn this knob clockwise. The radio plays immediately - no warm-up time is required. To turn radio off, turn this knob counter-clockwise until click is heard and the bar is over the word OFF.

THE TUNING CONTROL is the right-hand knob. The numerals under this knob show Kilocycles with the last two ciphers left off.

To tune in station desired, move this tuning knob back and forth to the position which produces the deepest rounded tones.

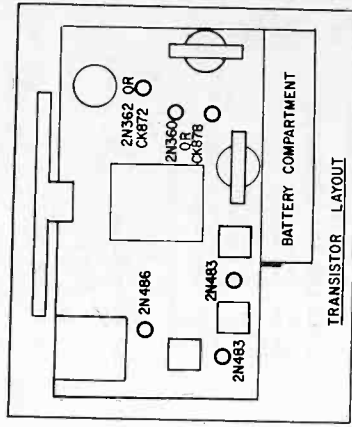
The tuning knob shows the "CD" Civil Defense Emblem at - Conestrad. Frequencies - 640 and 1240 Kilocycles. In a Civil Defense emergency, tune to either of these frequencies to receive defense news, instructions and information.

TO INSTALL BATTERIES: Unsnap the two bottom tabs at the back of the cabinet and open the cover. Take out the battery case and remove its cover. Place three no. 3B6731 Wizard Batteries (in the front section of the case) - as shown in the illustration below, so that the metal button end of the battery is to the left and engages the spring contact provided.

Place three no. 3B6731 Wizard Batteries (in the rear section of the case) - as shown in the illustration below, so that the metal button end of the battery is to the right and engages the right-hand spring contact provided.

It is very important that the batteries be inserted correctly. The forward batteries must all have the metal button end facing to the left and all of the rear batteries must all have the metal button end facing to the right. Make sure that the center battery is correctly in place. If this is not done right, the radio will not operate at full power.

If the batteries are not correctly inserted as to metal button end, the batteries will not be connected and the radio will not operate - remaining silent.



MODEL DC3886

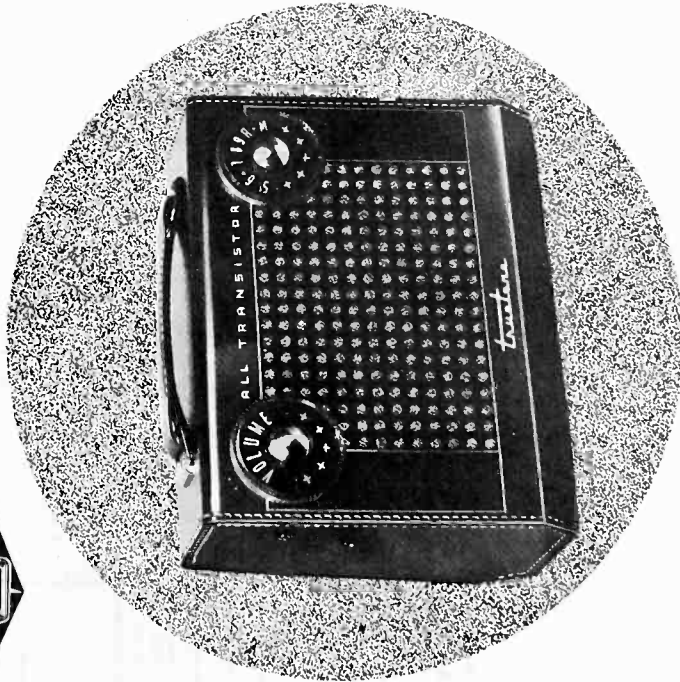
**WARNING**

Old batteries become corroded and leaky. Before storing radio for a long period, remove batteries from cabinet to prevent damage. To clean the Texon case of this receiver, use only warm water and a soft cloth.

Note: We recommend that you use our Wizard Batteries. However, C Batteries of other manufacturers are also acceptable.

*Truetone*  
TRANSISTOR RADIO

**INSTALLATION, OPERATING  
and SERVICE INSTRUCTIONS**



MODEL NO. DC3886

**WESTERN AUTO SUPPLY CO.**

**MODEL NO. DC3886**

**TRANSISTOR COMPLEMENT**

RAYTHEON TYPE	FUNCTION
2N485	Oscillator Mixer
2N487	IF Amplifier
IN295	(Germanium Diode)
2N483	A.G.C.
IN295	IF Amplifier
2N485	(Germanium Diode)
2N362 or CK872	Detector
2N360 or CK878*	Driver
2N360 or CK878*	Audio Output
	Push - Pull

\*Matched and paired

**ELECTRICAL SPECIFICATIONS**

POWER SUPPLY --- 9 volts --- 6 wizard no. 3B6731  
 "C" Cells

Frequency range.....535 to 1650 Kilocycles  
 Intermediate frequency.....455 K.C.  
 Tuning capacitor......250 millifarads  
 Speaker 6 1/2" P.M. ....3.2 ohm voice coil impedance  
 Power output.....10% distortion 500 milliwatts maximum  
 Sensitivity.....80 microvolts at 50 milliwatts

**GENERAL SERVICING INFORMATION**

**CAUTION:**

Never attempt to check a transistor with an Ohmmeter. Do not use heavy soldering iron; use small soldering iron, pencil type, having a rating of not more than 35 watts.

1. Connect 1 volt output meter across the voice coil terminals.
2. Set volume control to maximum.
3. Use plastic alignment tool to prevent detuning.
4. Keep input signal from generator at minimum value to give indication on meter.
5. Use a level of .4 volts or 50 milliwatts.
6. Modulation for alignment - 1000 cycles - 30%.

**IF ALIGNMENT**

STEP	Signal Generator Connections	Generator Frequency	Receiver Dial Setting	REMARKS
1	High end to Loop Stick secondary winding. Ground to chassis. Use .1 mid. dummy	455 K. C. modulated	Adjust IF. Ferrite Cores T-1, T-2 T-3	Adjust for Maximum

**RF ALIGNMENT**

STEP	Signal Generator Connections	Generator Frequency	Receiver Dial Setting	REMARKS
2	Spray Signal using loop of wire close to Loop stick	1650 K.C. modulated	Receiver Gang Fully open	TUNE for MAXIMUM
3	Same as step 2	540 modulated	Receiver Gang Fully closed	TUNE for MAXIMUM
4	Same as step 2	1400 K.C. modulated	1400 KC	TUNE for MAXIMUM
5	Same as step 2	600 KC modulated	Adjust L-2	Rock in Gang for maximum output

6 Repeat 4 and 5 for Maximum output

**MODEL NO. DC3886  
REPLACEMENT PARTS LIST**

When ordering parts, specify part number, model number and series.

Ref. No. Part No.	Approximate Selling Price	Approximate Selling Price
R1	180-194	6,800 ohms, 1/2 W, 10%
R2	180-195	3,900 ohms, 1/2 W, 10%
R3	180-132	18,000 ohms, 1/2 W, 10%
R4	180-196	1,500 ohms, 1/2 W, 10%
R5	180-196	1,500 ohms, 1/2 W, 10%
R6	180-188	4,700 ohms, 1/2 W, 10%
R7	180-188	3,300 ohms, 1/2 W, 10%
R8	180-193	27,000 ohms, 1/2 W, 10%
R9	180-121	12,000 ohms, 1/2 W, 10%
R10	180-186	1,000 ohms, 1/2 W, 10%
R11	180-197	220,000 ohms, 1/2 W, 10%
R12	120-134	-10,000 ohms - Volume Control
R13	180-198	8,200 ohms, 1/2 W, 10%
R14	180-199	680 ohms, 1/2 W, 10%
R15	180-200	47,000 ohms, 1/2 W, 10%
R16	180-198	8,200 ohms, 1/2 W, 10%
R17	180-145	120 ohms, 1/2 W, 10%
R18	180-201	4.7 ohms, 1/2 W, 10%
R19	180-188	470 ohms, 1/2 W, 10%
210-147	Complete Cabinet - Suntan (in carton)	\$13.90
220-152	Knob - tuning/volume, with bar (Clear Butyrate)	.56
175-136	6 1/2" P.M. Speaker	8.10*
170-134	Battery Case, bottom section with contact springs	.68
195-197	Battery Case - top section	1.96
195-196		.64

**CABINETS and ACCESSORIES**

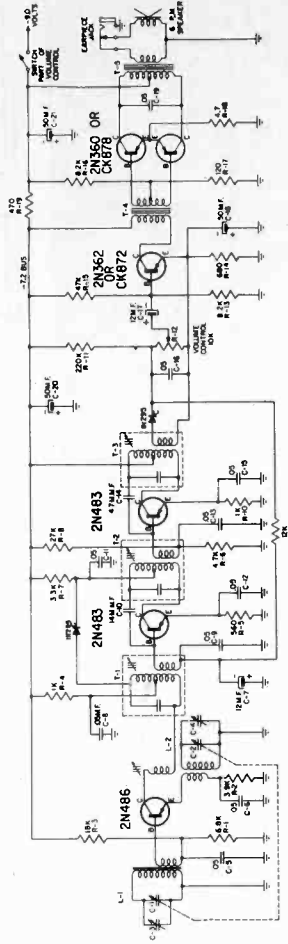
Complete Cabinet - Suntan (in carton) \$13.90  
 Knob - tuning/volume, with bar (Clear Butyrate) .56  
 6 1/2" P.M. Speaker 8.10\*  
 Battery Case, bottom section with contact springs .68  
 Battery Case - top section .64

**COILS AND TRANSFORMERS**

L1	132-138	Antenna Ferrite Rod	2.04*
L2	136-140	Oscillator Coil	1.26
T1	130-131	IF Transformer	1.66
T2	130-132	IF Transformer	1.66
T3	130-133	IF Transformer	1.66
T4	138-128	Interstage Audio Transformer	2.36
T5	138-129	Output Transformer	2.06

\*Federal Excise Tax Included

Prices Shown Are Approximate and Subject to Change Without Notice.



SCHEMATIC prepared by Western Auto  
 DATE: 10-20-57  
 PARTS SOURCE: W. T. M. H. S. C.  
 BATTERY SUPPLY: 1.5 V C CELLS

PART # 250-308

# Westinghouse

TELEVISION RADIO

## MODELS

H-587P7

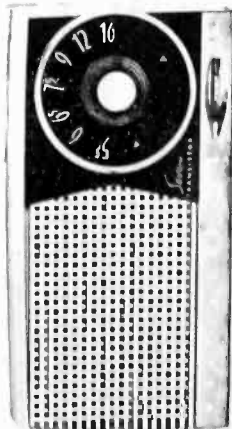
(Grey)

H-588P7

(Black)

H-589P7

(Red)



## CHASSIS ASSEMBLY V-2278-1

### SPECIFICATIONS

FREQUENCY RANGE	540 to 1600 KC.	POWER OUTPUT:	.140W
INTERMEDIATE FREQUENCY	455 KC.	Maximum	.075W
TRANSISTOR COMPLEMENT:		Undistorted	
1 - 2N172	Converter	LOUDSPEAKER:	2 1/2" P.P.M.
2 - 2N146	I.F. AMP.	POWER SUPPLY:	9 volts; Ray-o-Vac 1600, Eveready 226.
1 - 2N145 & 2N147	I.F. AMP.	AVERAGE CURRENT DRAIN	
1 - 880	Det. AGC	Earphone	6 ma.
1 - 910	Audio Driver	Speaker	12 ma.
2 - 2N185	Audio Output Pair		

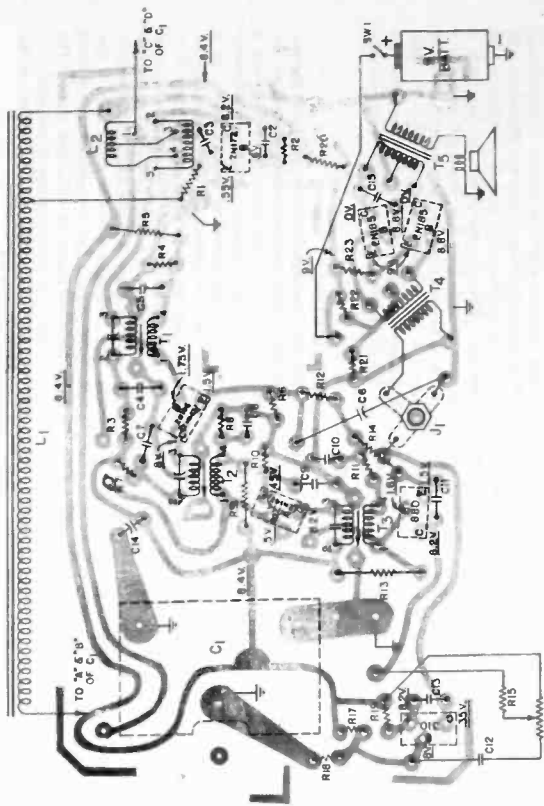


Figure 2 - Bottom View of Printed Board Showing Top Components Symbolically

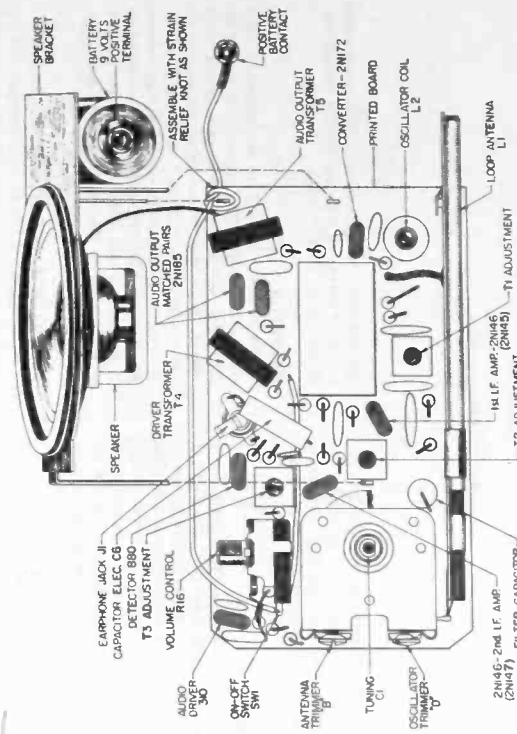


Figure 3 - Top View Parts Layout with Speaker Raised from Board



CIRCUIT DESCRIPTION

GENERAL

Transistor radio chassis V2278-1 includes seven junction type transistors. The converter, first and second I.F. amplifiers and the detector are NPN, whereas the audio driver and the audio output are PNP.

THE CONVERTER

The converter stage uses a 2N172 transistor as an autodyne type oscillator-mixer. The signal is picked up by a tuned, high "Q", ferrite-core coil and a low impedance winding couples the signal to the base through capacitor C2. Local oscillations are generated by a parallel resonant circuit connected to the emitter through C3. With the signal input and the local oscillator voltage both being applied to the converter transistor, the I.F. signal is developed and fed to I1.

The resistor, R1, in the emitter circuit provides d.c. stabilization against temperature changes and variations in characteristics among different replacement transistors. The emitter bias voltage developed across R1 is counterbalanced by a base bias voltage applied through R2. This places the emitter slightly negative with respect to the base. The proper bias for the collector is applied through R3, and is 8.3 volts. A .01 ufd. bypass capacitor (C4) keeps signal currents out of the d.c. power supply.

An inoperative local oscillator can be detected by a quick check across the emitter resistor (R1), where it will be seen that the emitter bias voltage has about doubled in value. Failure of the local oscillator can be caused by a damaged coil, (L2) an open ground end of the iron core loop antenna, etc.

I.F. AMPLIFIERS

The primary of each I.F. transformer is tuned with a fixed capacitor while the secondary is untuned. This is done to match the high collector impedance of the preceding stage to the low input impedance of the following stage. They operate at a frequency of 455 KC.

The transistors used as I.F. amplifiers are in the following combinations. Either two 2N146 transistors are used or a 2N145 in the first I.F. and a 2N147 in the second I.F. Combinations of one 2N146 and a 2N145 will cause an appreciable loss in gain, whereas using a 2N146 and a 2N147 may cause regeneration.

The base bias for the I.F. amplifiers is developed from the battery divider network R5, R4, R8 and R9. (See Figure 1) The voltages, with respect to ground, should be as shown in Figure 1. C5, C6, C8, C9, are in the circuit so that only the D.C. portion of the current passes through R4, R6,

I.F. ALIGNMENT REQUIREMENTS

1. Unsolder the three feet and voice coil connection and remove the speaker bracket from the printed board.
2. Form a 4 or 5 turn loop of wire and connect across the signal generator output cable.
3. Signal generator capable of covering frequencies of 455 KC and the entire broadcast band with provisions for modulation.
4. V.T.V.M. or output meter.
5. Keep the output of the signal generator low enough just to give an indication on the V.T.V.M. or output meter. If the peak is broad or double peak occurs when rocking the I.F. slug adjustment, the signal generator output is excessive.

Either further decoupling of the generator loop or decreasing the generator output is necessary.

6. Set the volume control and tuning capacitor to maximum.

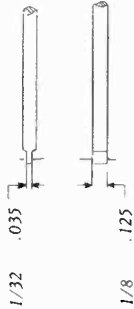
Loosely couple signal modulated from the generator to:	Generator frequency	Connect VTVM or output meter across the voice coil and adjust
Loop L1	455 KC	T3, T2 and T1 in order indicated for max. output
		Reduce generator output if necessary for T2 and T1 adjustments.

R.F. ALIGNMENT REQUIREMENTS

1. Speaker bracket must be soldered in place for R.F. alignment.
2. Steps 2, 3 and 4 also apply as in the I.F. alignment.
3. Keep the output of the signal generator low enough just to give an indication on the V.T.V.M. or output meter.
4. Set the volume control to maximum.

Loosely couple modulated signal, from the generator to:	Generator Frequency	C 1 Setting	Connect VTVM or output meter across voice coil and adjust for max. output.
Loop L 1	1625 KC	Min.	Oscillator Trim. "D"
" "	1400 KC	1400 KC	Antenna Trim. "B"

Caution: Be sure during R.F. alignment that the hand or any objects on the bench do not come in close contact with the antenna loop or detuning will occur and alignment will be incorrect.



\*It is recommended that a fiber aligning tool that snugly fits the slot in the ferrite core be used to prevent chipping of the slot.

Alignment Tool

R8, and R10, otherwise signal degeneration would occur. C7 serves as a decoupling and bypass condenser for the first I.F. stage.

DETECTOR

The detector employs an 880 transistor functioning as a class "B" amplifier to detect the I.F. signal and provide some gain for the audio signal. Base bias is developed through the divider network R6, R12, R11, and R13. The emitter bias is developed across the divider network R6, R12 and R14. The detector load is formed by resistors R15 and R16, with capacitor C11 bypassing some of the high frequency audio components and I.F. component.

AUTOMATIC GAIN CONTROL

As the signal at the antenna increases the signal between base and emitter of the detector transistor increases. This in turn will increase the detector current during conduction. Current flows from ground through R6, R12, R14 and then from emitter to collector in the detector. This increase of detector emitter current flowing through R6, changes the bias of the first I.F. emitter with respect to its base. The first I.F. amplifier emitter bias will thus be made more positive with a stronger signal, thus decreasing the gain of the stage. The opposite will happen with a weaker signal at the antenna. Capacitor C6 is the AGC filter capacitor and together with the resistance of the circuit sets up the proper time constant for good AGC action.

AUDIO SECTION

The audio voltage is developed across the volume control, R16, where the desired level is coupled to the base of the audio driver transistor, a type 310, through capacitor C12. The audio driver is a PNP type transistor and functions as a grounded emitter circuit. The base bias is gotten from the battery divider network R17 and R18. The emitter is biased slightly positive with respect to the base and is at a potential of the battery source voltage less the drop across resistor R19. The voltages are as shown in Figure 1. The collector voltage must be negative with respect to the base and reads .35 volts from ground. The small positive potential is due to the small d.c. voltage drop across the primary winding of the driver transformer T4.

Provisions are made in the receiver for private earphone reception through the use of an earphone which replaces the loudspeaker when a miniature plug is inserted through the hole in the back of the cabinet. This silences the speaker

### BOARD REMOVAL

1. Remove the screw located in center of the tuning knob. Turn the dial to the high frequency end and grip the tuning knob with one hand. Remove the screw by turning it in a counter clockwise direction. Do not cause any undue strain on the tuning capacitor.
2. Remove back of cabinet by loosening coin-slot screw on back. Remove the 1/4" self tapping screw located at tuning condenser end of the board.
3. Hold radio in the palm of the hand with the open back side up. Grip the board with the other hand and slide it down towards the tuning capacitor end of the cabinet, until the upper end of the speaker bracket is free of the plastic lip. Now raise this end of the board over lip and slide it out of the cabinet.
4. To insert the board into the cabinet use the reverse procedure, being careful to lock the speaker bracket under both recesses provided in the cabinet front.

### BATTERY INFORMATION

Models H-587P7, H-588P7 and H-589P7 use a new miniature 9 volt battery. Referring to Figure 5 and using it as a guide, the battery itself snaps into the speaker bracket assembly and is held in place by its negative terminal. A flexible positive contact is connected to the battery as shown. Recommended batteries available are the RAY-O-VAC No. 1600 or the EVEREADY No. 226. Depending upon the setting of the volume control and under intermittent useage the normal battery life will be approximately 75 hours. When the earphone is used, no signal is coupled to the push-pull output stage and thus the current drain is much lower, resulting in greatly increased battery life.

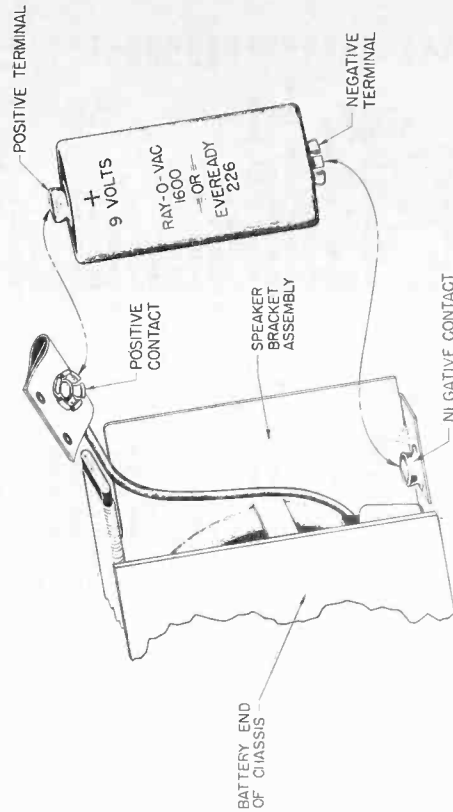


Figure 5 - BATTERY INSTALLATION

sistors should not be soldered or unsoldered in the circuit when voltage is applied to the circuit. The transistors themselves are very stable and have exceptionally long life. Too much heat applied, mechanical damage or application of improper voltages are the main causes of transistor failure. A fused transistor can be detected by its excessive current drain and the large voltage drop that appears across the resistor in the collector circuit.

When removing components from the printed board, including the transistors, care must be taken to avoid damaging the board. Replacement of the converter transistor may require realignment of the oscillator and the antenna loop. For complete information refer to the RF alignment procedure. Replacement of IF transistors usually will have no effect on the overall alignment. In some cases IF alignment may be affected. For proper IF alignment procedure refer to the section on IF alignment.

The 2N185 audio output transistors are matched pairs. Matched transistors clip the wave forms at equal levels above and below the zero reference point. See Figure 4. A simple check can be made by applying a modulated RF signal to the antenna loop, (for proper coupling of R.F. signals to the receiver refer to the RF alignment). Connect the vertical input of an oscilloscope across the voice coil. Set the generator frequency to any clear spot within the broadcast band and the R.F. output at a strong signal level. Observe the sine wave on the oscilloscope. As the volume control is increased clipping should occur at equal amplitudes, above and below the zero reference, if the 2N185 transistors are matched. The clipping occurs because the instantaneous potentials of the collector and the emitter of the 2N185 become equal at the peaks of the signal. Unequal clipping will cause an unbalance and distortion will be noticeably greater.

Figure 4 shows two waveforms. The left waveform is labeled 'MISMATCHED PAIR OF 2N185' and shows a distorted, clipped sine wave. The right waveform is labeled 'MATCHED PAIR OF 2N185' and shows a clean, symmetrical sine wave. The caption below the waveforms reads: 'Figure 4 - sine wave output of matched and unmatched pair of 2N185's.'



Figure 4 - sine wave output of matched and unmatched pair of 2N185's.

and allows the user to listen under conditions of high ambient noise, or situations in which operation of the speaker is undesirable.

The audio signal from the driver is transformer coupled to a matched pair of PNP transistors type 2N185, operating as push-pull, class "B", amplifiers. A positive base bias voltage is developed from the battery divider network R21 and R22. The voltages shown in Figure 1, for this stage are with no signal at the antenna. Thus the emitter current is nearly zero and the emitter voltage is nearly 9 volts.

The current drain of the push-pull stage will vary with listening level. Resistor R23 is connected to the emitters and is used as a self-biasing device for temperature stabilization. C13 and C15 serve to adjust the audio frequency response to the desired shape. The voice coil impedance of the speaker is 12 ohms.

### GENERAL INFORMATION

The Models H-587P7, H-588P7, and H-589P7 are newly designed all transistor pocket size portable radios which will operate from a single nine volt battery.

Transistors used in these receivers have been carefully tested during manufacture and should give much longer service than the conventional electron tube.

### SUGGESTED SERVICE HINTS

Before beginning service of these receivers it may be advantageous to have on hand smaller servicing tools, such as a small soldering iron (35 watts or less), tweezers and a small wire brush to clean away the excess solder.

For simple checks, such as voltages or resistances the back cover of the cabinet need only be removed by removing the screw located in the center of the back cover.

Figure 2 can be used in locating the pin orientation of the transistors and printed circuitry, and Figure 3 for locations of the components on top of the printed board.

The voltage measurements of an average receiver can be obtained from the schematic diagram, Figure 1 or printed circuit chart, Figure 2 and are measured with a VTVM. All voltage readings are taken with the tuning capacitor set for maximum capacity and the volume control at minimum. Battery voltage should be at nine volts. Total battery current drain should be monitored at all times during servicing and should be, in a normal functioning receiver, with the above stipulations, approximately 5.5 milliamperes.

If all other circuit components have been checked and a faulty transistor is suspected, replacement of the transistor is the surest check. It is not advisable to check the transistors with an ohmmeter as damage to them can result. Trans-





Westinghouse

MODEL  
602P7  
(Tan and Gold)

CHASSIS  
V-2295-1

A SERVICE DEPARTMENT PUBLICATION  
TELEVISION-RADIO DIVISION WESTINGHOUSE ELECTRIC CORP., METUCHEN, N.J.

**SPECIFICATIONS**

Frequency range ..... 540 to 1600 KC  
Intermediate Frequency ..... 455 KC  
Transistor Complement  
1 2N146 ..... Converter  
2 2N146 ..... IF Amp.  
or  
1 2N145 & 2N147 ..... IF Amp.  
1 1N87G ..... Diode Detector  
1 2N217 ..... 1st Audio Amp.  
1 2N217 ..... Audio Driver  
2 2N217 ..... Audio Output pair  
Power Output  
Undistorted ..... 150 watts  
Maximum ..... 300 watts  
Loudspeaker  
4" x 6" Oval PM  
Power Supply:  
(2) 9 Volt Batteries  
Eveready - 276      Burgess - D-6  
General - 88      Ray-O-Vac - 1603  
Average current Drain ..... 25 ma.

**BATTERY INFORMATION**

Model H-602P7 uses two nine volt batteries connected in parallel. Referring to Figure 1 and using it as a guide, the two batteries are held secure in either end of the cabinet by retaining springs. The battery cable, consisting of two sets of positive and negative contacts, is connected as shown. Recommended batteries available are listed in Figure 1.

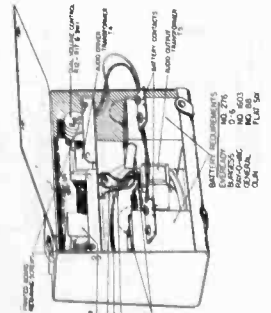


Figure 1 Battery Installation

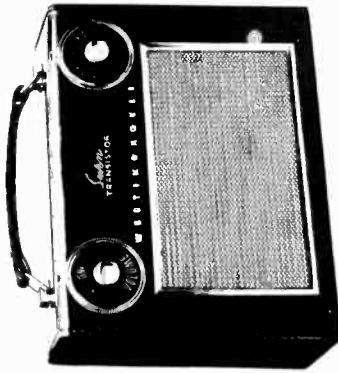


Figure 2 Schematic Diagram

NO.	TYPE	FUNCTION
2N172	NPN	CONVERTER
2N145	NPN	IF AMPLIFIER
2N146	NPN	IF AMPLIFIER
2N147	NPN	IF AMPLIFIER
1N87G	DIODE	DETECTOR
2N217	PNP	1ST AUDIO
2N217	PNP	AUDIO DRIVER
2N217	PNP	AUDIO OUTPUT
JUNCTION	TRANSISTORS	

- NOTES:
- DURING SERVICING TOTAL BATTERY CURRENT SHOULD BE METERED. WITH NO SIGNAL AND VOLUME CONTROL AT MINIMUM TOTAL BATTERY DRAIN APPROX. 9.5 MA.
  - VOLTAGE MEASUREMENTS ARE MADE WITH A V.T.V.M. FROM POINTS INDICATED TO GND WITH TUNING CAPACITOR AT MAXIMUM VOLUME AT MINIMUM BATTERY SOURCE AT 9 VOLTS.
  - ALTERNATE LF TRANSISTORS CAN BE USED. COMBINATIONS OF EITHER TWO 2N146 TRANSISTORS, OR A 2N145 1ST. IF. AND A 2N147 2ND. IF.
  - AUDIO OUTPUT TRANSISTORS 2N217 MUST BE MATCHED PAIRS.

**AUTOMATIC GAIN CONTROL**

AGC voltage is applied to the first IF Amplifier base only. This stage is biased in a forward direction. Base bias of about .7 volt, is developed by the divider network composed of R12, R11 and R4. Emitter bias developed by the first IF Amplifier is thus biased in a forward direction by approximately .2 volts.

As the signal at the antenna increases the signal current detected by the crystal, X1, increases. The signal voltage across the detector load, R12, increases. This resistor is common to the AGC divider network and the increased negative voltage developed across it bucks the flow of AGC current. Less current now flows through the AGC network and the positive bias developed for the first IF Amplifier is less. The forward bias for this stage is now less since the base is now less positive with respect to the emitter, effectively decreasing the gain of the stage.

The opposite will happen with a weaker signal at the antenna. Capacitor C10 is the AGC filter capacitor and together with the resistance of the AGC network sets up the proper time constant for good AGC action.

**GENERAL INFORMATION**

The model H602P7 is a newly designed all transistor portable radio which will operate from two nine volt batteries.

Transistors used in these receivers have been carefully tested during manufacture and should give much longer service than the conventional electron tube.

**SUGGESTED SERVICE HINTS**

Before beginning service of these receivers it may be advantageous to have on hand smaller servicing tools, such as a small wire brush to clean away the excess solder.

Figure 4 can be used in locating the pin orientation of the transistors and printed circuitry, and Figure 3 for the location of the components on top of the printed board.

The voltage measurements of an average receiver can be obtained from the schematic diagram, Figure 2 or printed circuit chart Figure 4, and are measured with a VTVM. All voltage readings are taken with tuning capacitor set for maximum capacity and the volume control at minimum. Battery voltage should be at nine volts.

Total battery current drain should be monitored at all times during servicing and should be, in a normal functioning receiver, with the above stipulations, approximately 9.5 milliamperes.

If all other circuit components have been checked and a faulty transistor is suspected, replacement of the transistor is the surest check. It is not advisable to check transistors with an ohmmeter as damage to them can result. Transistors should not be soldered or unsoldered in the circuit when voltage is applied to the circuit.

The transistors themselves are very stable and have exceptionally long life. Too much heat applied, mechanical damage or application of improper voltages are the main causes of transistor failure. A fused transistor can be detected by its excessive current drain and the large voltage drop that appears across the resistor in the collector circuit.

When removing components from the printed board, including transistors, care must be taken to avoid damaging the board.

Replacement of an IF transistor usually will have no effect on the overall alignment. In some cases IF alignment may be affected. For proper IF alignment procedure refer to the section on IF alignment.

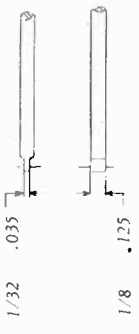
The 2N217 audio output transistors are a matched pair. These transistors are balanced and conduct equally, cancelling much distortion.

**I. F. ALIGNMENT REQUIREMENTS**

1. Form a 4 or 5 turn loop of wire and connect across the signal generator output cable.
2. Signal generator capable of covering frequencies of 455KC and the entire broadcast band with provisions for modulation.
3. VTVM or output meter.
4. Keep the output of the signal generator low enough just to give an indication on the VTVM or output meter. If the peak is broad or double peak occurs when rocking the IF slug adjustment, the signal generator output is excessive. Either further decoupling of the generator loop or decreasing the generator output is necessary.
5. Set the volume control and tuning capacitor to maximum.

Loosely couple signal modulated from the generator to:	Generator frequency	Connect VTVM or output meter across the voice coil and adjust
Loop L 1	455 KC	T3, T2 and T1 in order indicated for max. output
		Reduce generator output if necessary for T2 and T1 adjustments.

\*It is recommended that a fiber aligning tool that snugly fits the slot in the ferrite core be used to prevent chipping of the slot.



Alignment Tool

**RF ALIGNMENT REQUIREMENTS**

1. Steps 1, 2 and 3 also apply as in the IF alignment.
2. Keep the output of the signal generator low enough just to give an indication on the VTVM or output meter.
3. Set the volume control to maximum.

Loosely couple modulated signal, from the generator to:	Generator Frequency Setting	Connect VTVM or output meter across voice coil and adjust for max. output.
Loop L 1	1625 KC	Oscillator Trim. "D"
" "	1400 KC	Antenna Trim. "B"

Caution: Be sure during R.F. Alignment that the band or any objects on the bench do not come in close contact with the antenna loop or detuning will occur and alignment will be incorrect.

**CIRCUIT DESCRIPTION**

For a description of circuit operation refer to the "H587 Service Manual". The basic theory of operation of both receivers is the same with the following exceptions. This receiver using the V-2295-1 chassis employs a diode detector, tapped IF transformers for better impedance match, a new AGC system and a dual potentiometer volume control. The transistors used are junction type transistors. The converter, first and second IF amplifiers are NPN whereas the first audio, audio driver and the audio output are PNP.

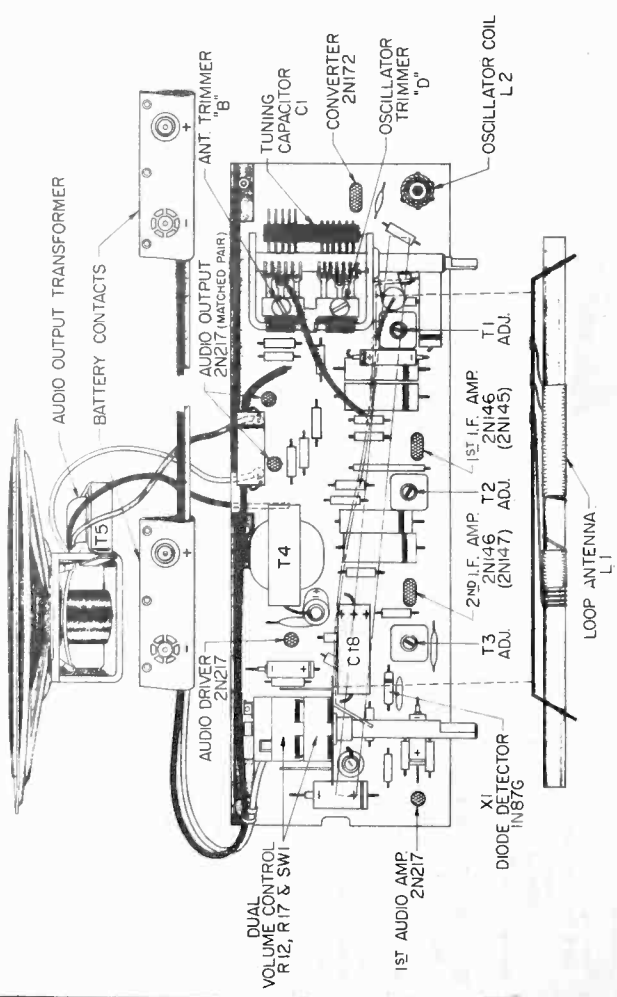


Figure 3 Top View Parts Layout

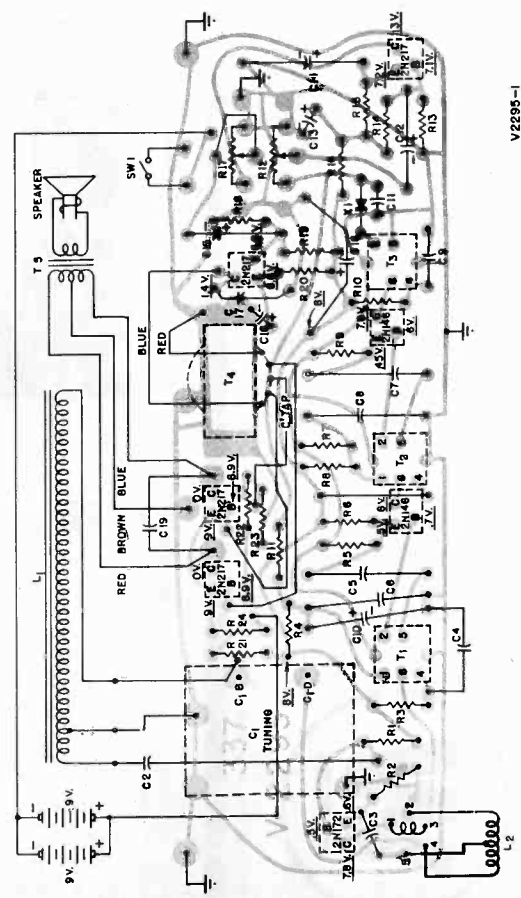


Figure 4 Bottom View of Printed Board Showing Top Components Symbolically

**MODEL H602P7**

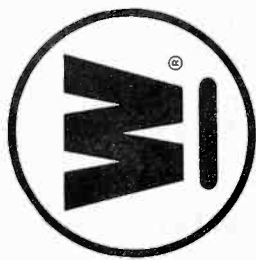
When ordering parts, specify part number, description and model number.

Part No.	Description	Equiv. Part No.	Ref. No.	Part No.	Ref. No.	Description	Function	List Price Each	Price List Each
4513V010M01	Cabinet, complete, includes estucheon, grille, handle and battery retaining spring			270V028M01	SW1	Switch Off-On part of dual assy, consisting of volume control R12 & R17	Power Off-On	12.00	2.50
4759V019M01	Cable assembly, battery			235V017M01	T1	Transformer IF	1st IF	.60	2.85
555V005M01	Escutcheon, grille			235V017M01	T2	Transformer IF	2nd IF	2.00	2.70
555V001M02	Grille, metal			430V028M01	T4	Transformer - Audio	Audio Driver	1.75	3.00
4V19022-1	Handle, includes "D" rings			570V012M01	T5	Speaker PM 4 X 6" oval (includes audio output transformer T5)	Audio output	.40	8.35*
4520V019M01	Knob, dial				X1	Diode - crystal IN87G	Detector	.45	1.10
4550V030M01	Knob, tuning			297V002M01	T172	Transistor, 2N172	1st IF Amp.	40	..
4550V013M13	Knob, Off-On-Volume			297V002M01	T145	Transistor, 2N145	2nd IF Amp.	40	..
4570V012M01	Speaker, P.M. 4 X 6" oval, includes transformer T5			297V002M03	T146	Transistor, 2N146	IF Amp.	40	..
4V19023-1	Spring assy. battery retaining with backing			297V007M02	T217	Transistor, 2N217	Audio Driver	8.35*	..
				297V003M02	T217	Transistor, 2N217	Audio output, matched pair	.50	..

**CHASSIS VZ295-1**

Ref. No.	Part No.	Description	Function	List Price Each	Price List Each
4C1	330V008M01	Capacitor, 2 gang Variable	Tuning	3.80	3.80
4C2	210V111M02	Capacitor, .05 mfd	Ant. coupling	.20	.20
4C3	215V300M12	Oscillator	Oscillator	.15	.15
4C4	210V111M02	Capacitor, Ceramic .01 mfd	(C) Bypass, (converter)	.20	.20
4C5	210V111M03	Capacitor, .05 mfd	Coupling (E) 1st IF	.20	.20
4C6	210V111M02	Capacitor, .05 mfd	(B) 1st IF	.20	.20
4C7	210V111M03	Capacitor, .1 mfd	Coupling (E) 2nd IF	.20	.20
4C8	210V111M02	Capacitor, .05 mfd	(B) 2nd IF	.20	.20
4C9	215V303M03	Capacitor, Ceramic .05 mfd	(C) 2nd IF	.35	.35
4C10	218V012M05	Capacitor, Elec. 25 mfd 6V	AGC	1.30	1.30
4C11	215V303M03	Capacitor, Ceramic .05 mfd	Detector bypass	.35	.35
4C12	218V012M06	Capacitor, Elec. 10 mfd 12V	Audio Coupling (B)	1.30	1.30
4C13	218V012M04	Capacitor, Elec. 100 mfd 12V	Filter	1.40	1.40
4C14	218V012M07	Capacitor, Elec. 40 mfd 12V	(E) bias 1st audio	..	..
4C15	218V012M06	Capacitor, Elec. 10 mfd 12V	Audio coupling (B)	1.30	1.30
4C16	218V012M04	Capacitor, .0022 mfd	(E) bias Audio driver	1.40	1.40
4C17	215V112A22	Capacitor, .0022 mfd	(C) Audio driver	1.50	1.50
4C18	218V012M04	Capacitor, Elec. 100 mfd 12V	Filter	1.40	1.40
4C19	210V111M03	Capacitor, .1 mfd	(C-C) Audio output	2.00	2.00
4L1	310V014M01	Loop - Antenna Iron Core	Antenna	2.00	2.00
4L2	230V024M01	Coil - Oscillator	Oscillator	.95	.95
R1	250V221A54	Resistor, 150,000 ohms 10% 1/2W	(B) Converter	.07	.07
R2	250V221A52	Resistor, 1,500 ohms 10% 1/2W	(E) Converter	.05	.05
R3	250V225A61	Resistor, 560 ohms 10% 1/2W	(C) Converter	.05	.05
R4	250V223A93	Resistor, 39,000 ohms 10% 1/2W	(B) 1st IF Amp.	.05	.05
R5	250V225A61	Resistor, 560 ohms 10% 1/2W	(E) 1st IF Amp.	.04	.04
R6	250V221A53	Resistor, 15,000 ohms 10% 1/2W	(E) 1st IF Amp.	.11	.11
R7	250V222A22	Resistor, 2,200 ohms 10% 1/2W	(B) 2nd IF Amp.	.05	.05
R8	250V222A23	Resistor, 22,000 ohms 10% 1/2W	(E) 2nd IF Amp.	.06	.06
R9	250V224A71	Resistor, 470 ohms 10% 1/2W	(E) 2nd IF Amp.	.05	.05
R10	250V222A21	Resistor, 220 ohms 10% 1/2W	(C) 2nd IF Amp.	.05	.05
R11	250V224A72	Resistor, 4,700 ohms 10% 1/2W	AGC	.05	.05
4R12	270V028M01	Control - Volume, Dual Assy., 1,500 ohms consists of R17 & SW1	Volume 1st Audio	2.50	2.50
R13	250V225A63	Resistor, 56,000 ohms 10% 1/2W	(B) 1st Audio	.10	.10
R14	250V224A72	Resistor, 4,700 ohms 10% 1/2W	(B) 1st Audio	.05	.05
R15	250V221A02	Resistor, 1,000 ohms 10% 1/2W	(B) 1st Audio	.05	.05
R16	250V224A71	Resistor, 470 ohms 10% 1/2W	(B) 1st Audio	.06	.06
4R17	270V028M01	Control volume, Dual assy.	Volume Audio Driver	2.50	2.50
R18	250V221A83	Resistor, 18,000 ohms 10% 1/2W	(B) Audio Driver	.04	.04
R19	250V223A92	Resistor, 3,900 ohms 10% 1/2W	(B) Audio Driver	.05	.05
R20	250V221A02	Resistor, 1,000 ohms 10% 1/2W	(E) Audio Driver	.05	.05
R21	250V232A21	Resistor, 220 ohms 20% 1/2W	Filter	.10	.10
4R22	250V223A90	Resistor, 39 ohms 10% 1/2W	(B) Audio output	.20	.20
R23	250V212A42	Resistor, 2,400 ohms 5% 1/2W	(B) Audio output	.10	.10
R24	250V221A00	Resistor, 10 ohms 10% 1/2W	(E) Audio output	.06	.06

\* New part number listed for the first time in Westinghouse Television or Radio service information.  
 \*\* Price includes Federal Excise Tax.  
 NOTE: All prices are subject to change without notice.



Westinghouse

RADIO

**MODELS**  
 H 610P5  
 (Charcoal Gray)  
 H 611P5  
 (Blue)  
 H 612P5  
 (Yellow)  
 Chassis  
 V-2278-2

A SERVICE DEPARTMENT PUBLICATION TELEVISION RADIO DIVISION  
 WESTINGHOUSE ELECTRIC CORP.  
 METUCHEN, N. J.

**SPECIFICATIONS**

Frequency range ..... 540 to 1600 KC  
 Intermediate Frequency ..... 455 KC  
 Transistor Complement  
 1 2N252 ..... Converter  
 1 2N253 ..... 1st IF Amp.  
 1 2N254 ..... 2nd IF Amp.  
 1 1N87G or 1N295 ..... Diode Detector  
 1 2N238 or 310 ..... Audio Driver  
 1 2N249 or 357 ..... Audio Output  
 Power Output  
 Undistorted ..... .035 watts  
 Maximum ..... .060 watts  
 Loudspeaker ..... 2 1/4" PM  
 Power Supply:  
 Eveready - 226 Ray-O-Vac - 1600  
 Average current Drain ..... 17 ma.

**BATTERY INFORMATION**

Models H-610P5, H-611P5 and H-612P5 use a new miniature 9 volt battery. Referring to Figure 1 and using it as a guide, the battery itself snaps into the speaker bracket assembly and is held in place by its negative terminal. A

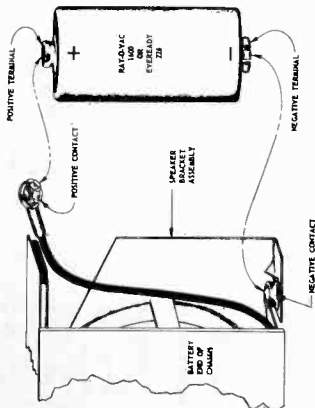
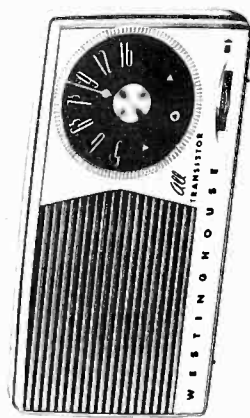


Figure 1 Battery Installation



flexible positive contact is connected to the battery as shown. Recommended batteries available are the RAY-O-VAC No. 1600 or the EVEREADY No. 226.

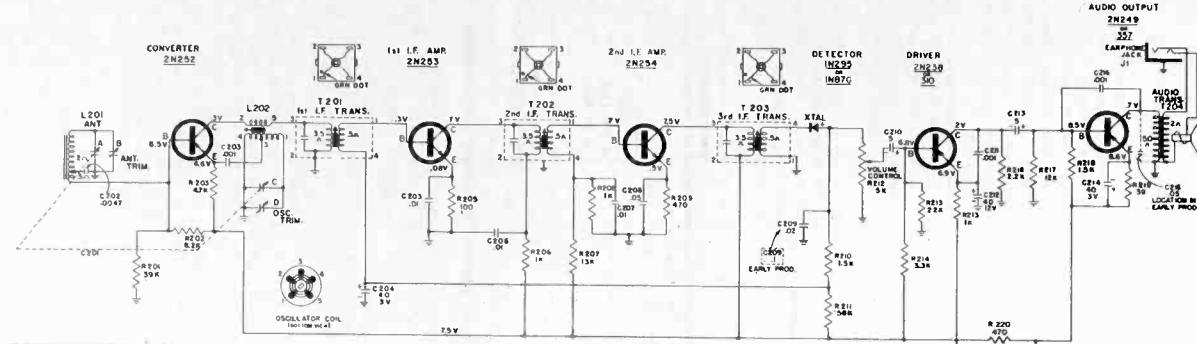
**BOARD REMOVAL**

1. Remove the screw located in center of the tuning knob. Turn the dial to the high frequency end and grip the tuning knob with one hand. Remove the screw by turning it in a counter clockwise direction. Do not cause any undue strain on the tuning capacitor.
2. Remove back of cabinet by loosening coin-slot screw on back. Remove the 1/4" self tapping screw located at tuning condenser end of board.
3. Hold radio in the palm of the hand with the open back side up. Grip the board with the other hand and slide it down towards the tuning capacitor end of the cabinet, until the upper end of the speaker bracket is free of the plastic lip. Now raise this end of the board over lip and slide it out of the cabinet.
4. To insert the board into the cabinet use the reverse procedure, being careful to lock the speaker bracket under both recesses provided in the cabinet front.

**CIRCUIT DESCRIPTION**

The circuitry of the V-2278-2 chassis is similar to that of previous Westinghouse transistor radios with the following exceptions. This receiver uses a PNP type transistor in the converter stage and class "A" audio output amplifier. A 2N252 PNP type transistor is used in the converter stage. An increase in conversion gain is realized by the use of this transistor. All the transistors used in this receiver are of the junction type. The 1st and 2nd IF Amplifiers employ NPN type transistors. The audio driver output amplifiers employ PNP type transistors.

**THE AUDIO OUTPUT AMPLIFIER** is a conventional



JUNCTION NO.	TRANSISTORS	FUNCTION
2N252	PNP	CONVERTER
2N253	NPN	1st AMPLIFIER
2N254	NPN	2nd AMPLIFIER
2N238	PNP	AUDIO DRIVER
2N249	PNP	AUDIO OUTPUT
1N87G	XTL	DIODE DETECTOR

CHASSIS NO. V2278-2

NOTE:  
 1. DURING SERVICING TOTAL BATTERY CURRENT SHOULD BE METERED. WITH NO SIGNAL AND VOLUME CONTROL AT MINIMUM TOTAL BATTERY DRAIN APPROX. 18 MA.  
 2. VOLTAGE MEASUREMENTS MADE WITH A V.T.V.M. FROM POINTS INDICATED TO GND. WITH TUNING CAPACITOR AT MAXIMUM, VOLUME CONTROL AT MINIMUM, BATTERY SOURCE AT 9 VOLTS.

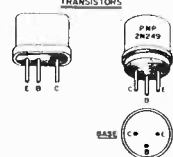


Figure 2 Schematic Diagram

**IF ALIGNMENT REQUIREMENTS**

1. Form a 4 or 5 turn loop of wire and connect across the signal generator output cable.
2. Signal generator capable of covering frequencies of 455 KC across the entire broadcast band with provisions for modulation.
3. VTVM or output meter.
4. Keep the output of the signal generator low enough just to give an indication on the VTVM or output meter. If the peak is broad or double peak occurs when rocking the IF slug adjustment, the signal generator output is excessive. Either further decoupling of the generator loop or decreasing the generator output is necessary.
5. Set the volume control and tuning capacitor to maximum.

Loosely couple signal generator to the generator to:	Generator Frequency	Connect VTVM or output meter across the voice coil and adjust.
Loop L 201	455 KC	T203, T202 and T201 in order indicated for max output
		Reduce generator output if necessary for T202 and T201 adjustments*

\*It is recommended that a fiber aligning tool that snugly fits the slot in the ferrite core be used to prevent chipping of the slot.

**RF ALIGNMENT REQUIREMENTS**

1. Steps 1, 2 and 3 also apply as in the IF alignment.
2. Keep the output of the signal generator low enough just to give an indication on the VTVM or output meter.
3. Set the volume control to maximum.

Loosely couple modulated signal, from generator to:	Generator Frequency	Connect VTVM or output meter across voice coil and adjust for max. output
Loop L 201	1625 KC	Min. Oscillator Trim. *D*
" "	1400 KC	1400 KC Antenna Trim. *B*

Caution: Be sure during RF Alignment that the hand or any objects on the bench do not come in close contact with the antenna loop or detuning will occur and alignment will be incorrect.

**SUGGESTED SERVICE HINTS**

Before beginning service of these receivers it may be advantageous to have on hand smaller servicing tools, such as a small soldering iron (35 watts or less), tweezers and a small wire brush to clean away the excess solder.

Figure 4 can be used in locating the pin orientation of the transistors and printed circuitry, and Figure 3 for the location of the components on top of the printed board.

The voltage measurements of an average receiver can be obtained from the schematic diagram, Figure 2 or printed circuit chart Figure 4, and are measured with a VTVM. All voltage readings are taken with tuning capacitor set for maximum capacity and the volume control at minimum. Battery voltage should be at nine volts.

Total battery current drain should be monitored at all times during servicing and should be, in a normal functioning receiver, with the above stipulations, approximately 17 milliamperes.

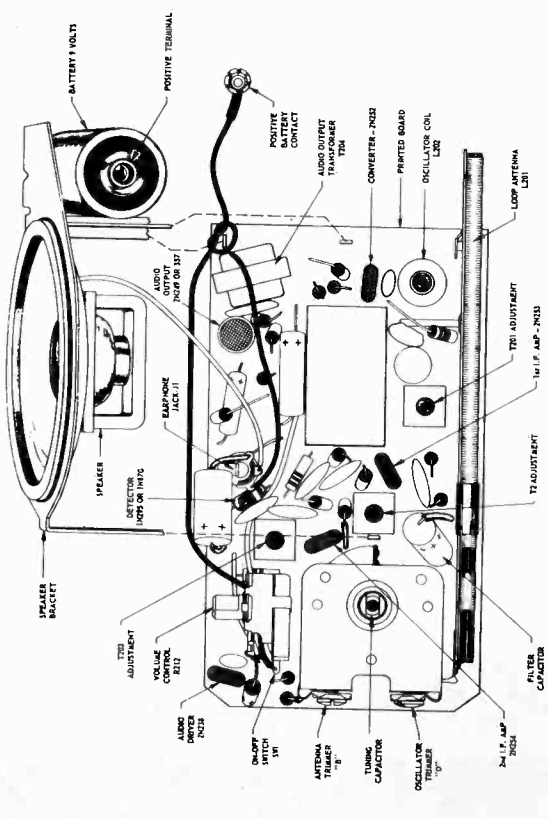
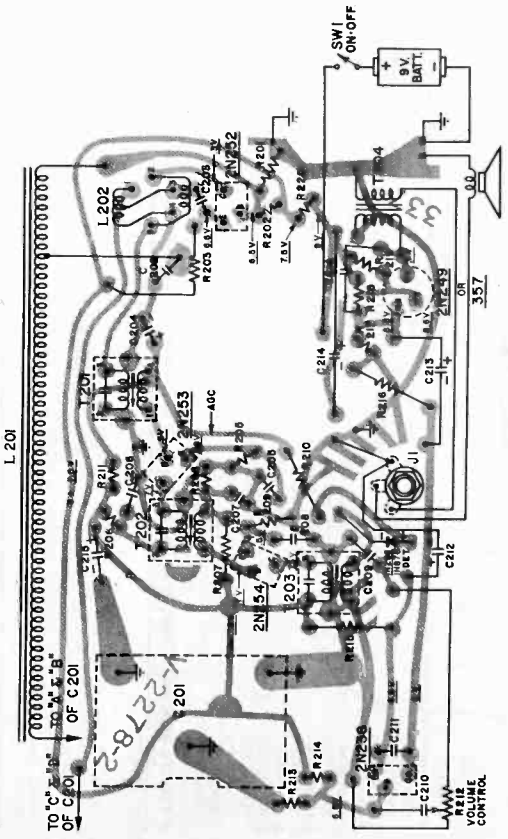


Figure 3 Top View Parts Layout



V2278-2

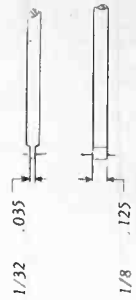
Figure 4 Bottom View of Printed Board Showing Top Components Symbolically

If all other circuit components have been checked and a faulty transistor is suspected, replacement of the transistor is the surest check. It is not advisable to check transistors with an ohmmeter as damage to them can result. Transistors should not be soldered or unsoldered in the circuit when voltage is applied to the circuit.

The transistors themselves are very stable and have exceptionally long life. Too much heat applied, mechanical damage or application of improper voltages are the main causes of transistor failure. A fused transistor can be detected by its excessive current drain and the large voltage drop that appears across the resistor in the collector circuit.

When removing components from the printed board, including transistors, care must be taken to avoid damaging the board.

Replacement of an IF transistor usually will have no effect on the overall alignment. In some cases IF alignment may be affected. For proper IF alignment procedure refer to the section on IF alignment.



Alignment Tool

**CIRCUIT DESCRIPTION (Continued from page 1)**

class "A" grounded emitter circuit. Base bias (8.5 volts) is developed by battery current flowing through the divider network composed of R217 and R218. Current flowing up through T204, from collector to emitter and through R219 to the battery cause .7 volts to appear on the collector and 8.6 volts to appear on the emitter. The current drain of this stage is approximately 15 ma.

An earphone jack is located in the secondary of the audio output transformer, T204. When the plug is inserted into the jack, the speaker circuit is effectively open-circuited and the earphone placed across the full secondary of T204. The earphone is a Westinghouse item and can be purchased only through a Westinghouse distributor.

**AUTOMATIC GAIN CONTROL** voltage is applied to the first IF Amplifier base only. This stage is biased in a forward direction. Base bias of about .3 volt, is developed by the divider network composed of R212, R210 and R211. The emitter potential is approximately .08 volts. The first IF Amplifier is thus biased in a forward direction by approximately .22 volts.

As the signal at the antenna increases, the signal current detected by the crystal (IN295 or IN87G) and the signal voltage across the detector load, R212, increases. This resistor is common to the AGC network and the increased negative voltage developed across it bucks the flow of bias current. Less current now flows through the AGC network and the positive bias developed for the first IF Amplifier is less. The forward bias for this stage is now less since the base is now less positive with respect to the emitter, effectively decreasing the gain of the stage. The opposite will happen with a weaker signal at the antenna.



When ordering parts, specify part number, description and model number.

MODEL PARTS

Part No.	Description	List Price Each
770V109M02	Bracket—Volume control mounting	.05
778V018M01	Bracket rivet assembly (includes battery negative terminal) less speaker	.30
513V006M04	Cabinet—H610P5 (Charcoal Gray)	1.95
513V006M05	Cabinet—H611P5 (Blue)	1.95
513V006M06	Cabinet—H612P5 (Yellow)	.20
754V007M01	Connector assembly (battery positive terminal)	..
513V012M01	Case, carrying †	..
753V003M01	Earpiece †	..
550V011M01	Escutcheon	1.00
550V017M01	Knob dial	.65
550V017M01	Knob—volume-on-off	.20
761V804M01	Screw—8/32", Cabinet Back Cover	.20
761V803M01	Screw—8/32", Cabinet Back Cover	.20
570V004M01	Speaker—2 1/2" P.M.	5.25*

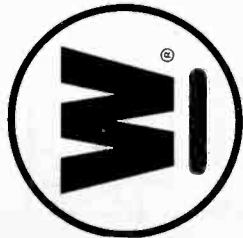
† This is a Westinghouse item and can be purchased only through a Westinghouse distributor. Do not order from Westco-Metuchen.

CHASSIS

Ref. No.	Part No.	Equivalent Part No.	Description	Function	List Price
C201	330V005M01		Capacitor, variable gang	Tuning	\$2.95
✓ C202	215V300M04		Capacitor, ceramic .0047 MFD	Antenna	.15
✓ C203	215V300M15		Capacitor, ceramic .001 MFD	Converter (E)	.15
✓ C204	218V012M10		Capacitor, elec. 40 MFD 3V	AGC filter	1.10
C205	215V300M12		Capacitor, ceramic .01 MFD	1st IF Amp. (E)	.15
C206	215V300M12		Capacitor, ceramic .01 MFD	bypass	.15
C207	215V300M12		Capacitor, ceramic .01 MFD	2nd IF Amp. (B)	.15
C208	215V303M03		Capacitor, ceramic .05 MFD	bypass	.35
□ C209	215V303M02		Capacitor, ceramic .1 MFD	bypass	..
✓ C210	218V012M09		Capacitor, elec. 5 MFD 12V	audio coupling	1.05
C211	215V300M15		Capacitor, ceramic .001 MFD	Detector (C)	.15
C212	218V012M01		Capacitor, elec. 40 MFD 12V	bypass	1.20
✓ C213	218V012M09		Capacitor, elec. 5 MFD 12V	Audio coupling	1.05
C214	218V012M02		Capacitor, elec. 40 MFD 3V	bypass	1.20
C215	218V012M01		Capacitor, elec. 40 MFD 12V	Filter	.15
C216	215V303M03		Capacitor, ceramic .001 MFD	Feedback	.35
□ L201	310V012M02		Loop, iron core	Antenna	2.15
✓ L202	230V026M01		Coil, oscillator	Oscillator	1.05
J1	794V008M01		Jack	Earphone	.65
R201	296V002M01		Crystal IN295 or IN87G	Detector	1.10
R202	250V223A95		Resistor, 39000 ohms	Converter bias (B)	.05
R203	250V228A22		Resistor, 8200 ohms	Converter bias (B)	.05
R204	250V224A72		Resistor, 4700 ohms	Bias converter (E)	.05
R205	250V221A01		Resistor, 100 ohms	1st IF Amp. bias (E)	.04
R206	250V231A02		Resistor, 1000 ohms	2nd IF Amp. bias (B)	.05
R207	250V221A53		Resistor, 15000 ohms	2nd IF Amp. bias (B)	.05
R208	250V221A02		Resistor, 1000 ohms	2nd IF Amp. bias (E)	.06
R209	250V224A71		Resistor, 470 ohms	AGC divider	.10
R210	250V221A52		Resistor, 1500 ohms	AGC divider	.10
R211	250V235A63		Resistor, 56000 ohms	Volume	1.35
R212	270V024M01		Control, 5000 ohms	Bias, audio driver (B)	.06
R213	250V222A23		Resistor, 22000 ohms	Bias, audio driver (B)	.05
R214	250V223A32		Resistor, 3300 ohms	Bias, audio driver (E)	.05
R215	250V221A02		Resistor, 1000 ohms	Load (C)	.05
R216	250V222A22		Resistor, 2200 ohms	Bias—Audio Output (B)	.05
R217	250V221A23		Resistor, 12000 ohms	Bias—Audio Output (B)	.05
R218	250V221A52		Resistor, 1500 ohms	Bias—Audio Output (E)	.10
R219	250V223A90		Resistor, 39 ohms	B	.06
R220	250V224A71		Resistor, 470 ohms	B	.06

SW1	270V024M01	Switch—off-on	B	✓ on-off
T201	235V014M01	Transformer, IF 455 KC	1st IF	
T202	235V014M01	Transformer, IF 455 KC	2nd IF	
T203	235V014M02	Transformer, IF 455 KC	3rd IF	
✓ T204	430V034M01	Transformer, audio	Audio Output	
✓	297V008M01	Transistor 2N252	Converter	
✓	297V002M04	Transistor 2N254	1st IF Amp.	
✓	297V002M05	Transistor 2N254	2nd IF Amp.	
✓	297V004M01	Transistor 2N238 or 310	Audio driver	
✓	297V009M01	Transistor 2N249 or 357	Audio Output	

✓ New part number listed for the first time in Westinghouse Television or Radio service information.  
 \* Price includes Federal Excise Tax.  
 \*\* Price furnished on request.  
 □ Used in early production.  
 NOTE: All prices are subject to change without notice.



Westinghouse

radio



MODELS

H-617P7 (Gray)

H-618P7 (Black)

H-619P7 (Red)

Chassis V-2278-3

SERVICE DEPARTMENT TELEVISION-RADIO DIVISION  
WESTINGHOUSE ELECTRIC CORP. METUCHEN, N.J.

**SPECIFICATIONS**

Frequency range.....	540 to 1600 KC
Intermediate Frequency.....	455 KC
Transistor Complement.....	Converter 1 2N252 1 2N253 1 2N254 1 880 Transistor Detector Audio Driver 2 2N185 (matched pair)
Power Output.....	.075 watts
Undistorted.....	Maximum.....140 watts
Loadspeaker.....	2 1/2" PM
Power Supply: 9 volts.....	Eveready-226 Ray-O-Vac-1600 Burgess-P6
Average Current Drain.....	12 ma.

**BATTERY INFORMATION**

Models H-617P7, H-618P7, and H-619P7 use a miniature 9 volt battery. Referring to Figure 1 and using it as a guide, the battery itself snaps into the speaker bracket assembly and is held in place by its negative terminal. A flexible positive contact is connected to the battery as shown. Recommended batteries available are the RAY-O-VAC No. 1600, EVEREADY No. 226 or the BURGESS P6.

**BOARD REMOVAL**

1. Remove the screw located in center of the tuning knob. Turn the dial to the high frequency end and grip the tuning knob with one hand. Remove the screw by turning it in a counter clockwise direction. Do not cause any undue strain on the tuning capacitor.
2. Remove back of cabinet by loosening coin-slot screw on back. Remove the 1/4" self tapping screw located at tuning condenser end of board.

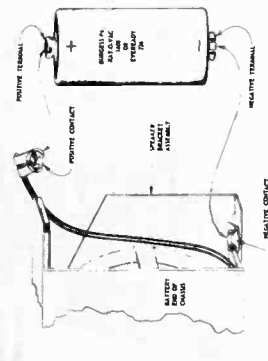
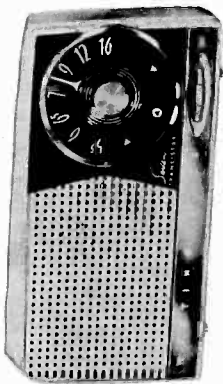


FIGURE 1 BATTERY INSTALLATION



3. Hold radio in the palm of the hand with the open back side up. Grip the board with the other hand and slide it down towards the tuning capacitor end of the cabinet, until the upper end of the speaker bracket is free of the plastic lip. Now raise this end of the bracket over lip and slide it out of the cabinet.
4. To insert the board into the cabinet use the reverse procedure, being careful to lock the speaker bracket under both recesses provided in the cabinet front.

**SERVICE INFORMATION**

The circuitry of the V-2278-3 chassis is similar to that of the V-2278-1 chassis with the exceptions that the converter stage is of a new design employing a PNP type transistor, and direct coupling is used between detector and audio driver, and the earphone jack is now in the secondary of the audio output transformer. An increase in conversion gain is realized by using a 2N252 PNP type transistor in the converter stage. All of the 2N252 PNP type transistors in the converter employ NPN type transistors, while PNP type transistors are used in all other stages.

For the basic theory of circuit operation of the IF amplifiers, detector, AGC and audio section and servicing hints refer to the "H-587P7, H-588P7, and H-589P7 Service Manual" (chassis V-2278-1). However a description of the operation of the Converter stage follows below.

**CONVERTER CIRCUIT DESCRIPTION**

The converter stage uses a 2N252 type transistor in an autodyne type oscillator-mixer circuit. The RF signal is picked up by a tuned, high "Q" ferrite-core antenna coil and a low impedance winding is used to couple the signal to the base of the transistor. Local oscillations are generated by a feedback winding in the collector circuit inducing energy into the emitter parallel resonant circuit. Mixing of the RF and local oscillator signal take place within the transistor and the resultant difference signal (455 kc) appears across the 1st IF transformer T301.

The circuit has been developed by current flow through resistor R301 which has a biasing effect on the base of the transistor. The base bias being 6.6 volts and the emitter bias being 6.8 volts makes the emitter slightly positive with respect to the base. The collector potential is zero (actually a few millivolts can be measured).

**IF ALIGNMENT REQUIREMENTS**

1. Form a 4 or 5 turn loop of wire and connect across the signal generator output cable.
2. Signal generator capable of covering frequencies of 455 KC and the entire broadcast band with provisions for modulation.
3. VTVM or output meter.
4. Keep the output of the signal generator low enough just to give an indication on the VTVM or output meter. If the peak is broad or double peak occurs when rocking the IF slug adjustment, the signal generator output is excessive. Either further decoupling of the generator loop or decreasing the generator output is necessary.
5. Set the volume control and tuning capacitor to maximum.

Loosely couple signal modulated from the generator to:	Generator Frequency	Connect VTVM or output meter across the voice coil and adjust:
Loop L301	455 KC	T303, T302 and T301 in order indicated for max. output  (Reduce generator output if necessary for T302 and T301 adjustments.)*

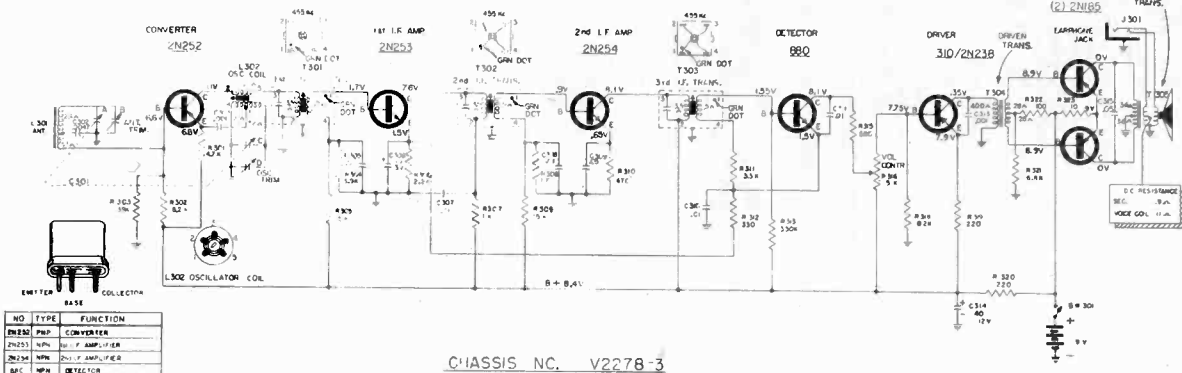
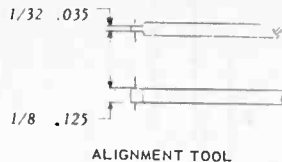
**RF ALIGNMENT REQUIREMENTS**

1. Steps 1, 2 and 3 also apply as in the IF alignment.
2. Keep the output of the signal generator low enough just to give an indication on the VTVM or output meter.
3. Set the volume control to maximum.

Loosely couple modulated signal, from generator to:	Generator Frequency	C301 Setting	Connect VTVM or output meter across voice coil and adjust for max. output
Loop L301	1625 KC	Min.	Oscillator Trim "D"
" "	1400 KC	1400 KC	Antenna Trim "B"

Caution: Be sure during RF Alignment that the hand or any objects on the bench do not come in close contact with the antenna loop or detuning will occur and alignment will be incorrect.

\*It is recommended that a fiber aligning tool that snugly fits the slot in the ferrite core be used to prevent chipping of the slot.



NO	TYPE	FUNCTION
2N252	PNP	CONVERTER
2N253	NPN	1st IF AMPLIFIER
2N254	NPN	2nd IF AMPLIFIER
880	NPN	DETECTOR
2N185	PNP	AUDIO DRIVER
2N185	PNP	AUDIO OUTPUT

NOTE:  
1. DURING SERVICING, TOTAL SECONDARY CURRENT SHOULD BE LIMITED TO 150 MA. WITH NO SIGNAL AND VOLUME CONTROL AT MINIMUM. TOTAL BATTERY CURRENT SHOULD BE APPROX. 12 MA.  
2. VOLUME MEASUREMENTS MADE WITH A 100 OHM 1000 OHM RESISTOR IN SERIES WITH TND, WITH TUNING CAPACITOR AT MAXIMUM, VOLUME CONTROL AT MINIMUM, ANTENNA SOURCE AT 9 VOLTS.  
3. AUDIO OUTPUT TRANSISTORS 2N185 MUST BE MATCHED PAIRS.  
4. ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SHOWN.

CHASSIS NO. V2278-3

FIGURE 2 SCHEMATIC DIAGRAM

MODEL PARTS LIST

When ordering parts, specify part number, description and model number

Part No.	Description	List Price
770V109M02	Bracket - Volume control mounting	\$ .05
778V018M01	Bracket rivet assembly (includes battery negative terminal) less speaker	.30
513V006M01	Cabinet - H617P7 (Gray)	2.20
513V006M02	Cabinet - H618P7 (Black)	2.20
513V006M03	Cabinet - H619P7 (Red)	2.20
754V007M01	Connector assembly (battery positive terminal)	1.20
V-19021-1	Cover, back - H617P7 (Gray)	1.50
V-19021-2	Cover, back - H618P7 (Black)	1.50
V-19021-3	Cover, back - H619P7 (Red)	1.50
530V006M01	Escutcheon	1.10
530V016M01	Knob - volume-on-off	.20
50V017M01	Knob - dial knob	.20
761V804M01	Screw - B/32", Cabinet Back Cover	.20
761V803M01	Speaker - 2 1/4" PM	5.25*
570V004M01		

CHASSIS PARTS LIST

Ref. No.	Part No.	Equip. Part No.	Description	Function	List Price
C301	330V005M01		Capacitor - 2 gang variable	Tuning	\$ 2.95
C302	215V300M04		Capacitor .0047 mfd	Ant. DC blocking	.15
C303	215V300M15		Capacitor .001 mfd Ceramic	Osc. Coupling	.15
C304	215V300M12		Capacitor .01 mfd Ceramic	Base bias 1st IF	.15
C306	218V012M02		Capacitor - Elec. 40 mfd, 3v	(E) Bias 1st IF	1.20
C307	215V300M12		Capacitor .01 mfd Ceramic	(C) Bypass 1st IF	.15
C308	215V303M03		Capacitor .01 mfd Ceramic	(B) bias 2nd IF	.35
C309	215V303M03		Capacitor .05 mfd Ceramic	(E) bias 2nd IF	.35
C310	215V300M12		Capacitor .01 mfd Ceramic	AGC filter	.15
C311	215V300M11		Capacitor .01 mfd Ceramic	Detector bypass	.20
C312	215V300M15		Capacitor .001 mfd Ceramic	(C) Audio Driver	.15
C314	218V012M01		Capacitor 40 mfd Elec. 12v	Filter	1.20
C315	215V303M03		Capacitor .05 mfd Ceramic	Earpiece	.35
J301	754V008M01		Jack	(C) Audio Output	.65
L301	310V012M03		Loop Inductor	Antenna	2.15
L302	240V026M01		Coil, Oscillator	Oscillator	1.05
R301	250V224A72		Resistor 4,700 ohms	(E) Converter	.05
R302	250V228A22		Resistor 8,200 ohms	(B) bias Converter	.05
R303	250V228A95		Resistor 39,000 ohms	(B) bias Converter	.05
R304	250V223A92		Resistor 3,900 ohms	(B) bias 1st IF	.04
R305	250V221A53		Resistor 15,000 ohms	(B) bias divider 1st IF	.11
R306	250V222A22		Resistor 2,200 ohms	(C) decoupling 1st IF	.05
R307	250V231A02		Resistor 1,000 ohms	(B) bias 1st IF	.05
R308	250V221A02		Resistor 15,000 ohms	(B) bias 2nd IF	.11
R309	250V221A53		Resistor 470 ohms	(E) bias divider 2nd IF	.06
R310	250V224A71		Resistor 3,300 ohms	(B) bias divider detector & AGC	.05
R311	250V223A31		Resistor 330 ohms	AGC time constant	.05
R312	250V223A34		Resistor 330,000 ohms	(B) bias divider detector	.11
R313	250V226A81		Resistor 680 ohms	(C) Detector	1.35
R314	270V024M01		Control - Volume (includes off-on switch SW301)	Volume	1.35
R315	250V228A23		Resistor 82,000 ohms	(B) bias divider detector	.05
R316	250V222A21		Resistor 220 ohms	(E) bias detector	.05
R317	250V222A21		Resistor 220 ohms	Filter	.05
R318	250V226A82		Resistor 6,800 ohms	(B) bias divider Audio output	.05
R319	250V221A01		Resistor 100 ohms	Cross-over network Audio output	.05
R320	250V221A01		Resistor 10 ohms	Current limiting Audio output	.06
R321	250V221A00		Switch, off-on (includes volume control R316)		1.35
R322	270V024M01		Transformer IF	1st IF	2.60
R323	250V014M01		Transformer IF	2nd IF	2.60
T301	235V014M01		Transformer IF	Detector	2.65
T302	235V014M02		Transformer IF	Audio Driver	2.65
T303	430V024M02		Transformer	Audio Output	2.50
T304	430V025M02		Transformer	Converter	6.50
T305	297V008M01		Transformer 2N252	1st IF AMP	5.95
T306	297V002M04		Transformer 2N253	2nd IF AMP	5.95
T307	297V002M05		Transformer 2N254	Detector	6.50
T308	297V005M01		Transformer 880	Audio Driver	6.50
T309	297V004M01		Transformer 310/2N238	Audio Output	11.90
T310	297V003M01		Transformer (2) 2N185 Matched pair		11.90

\* New part listed for the first time in Westinghouse television or radio information. Price includes Federal Excise Tax. NOTE: All prices are subject to change without notice.

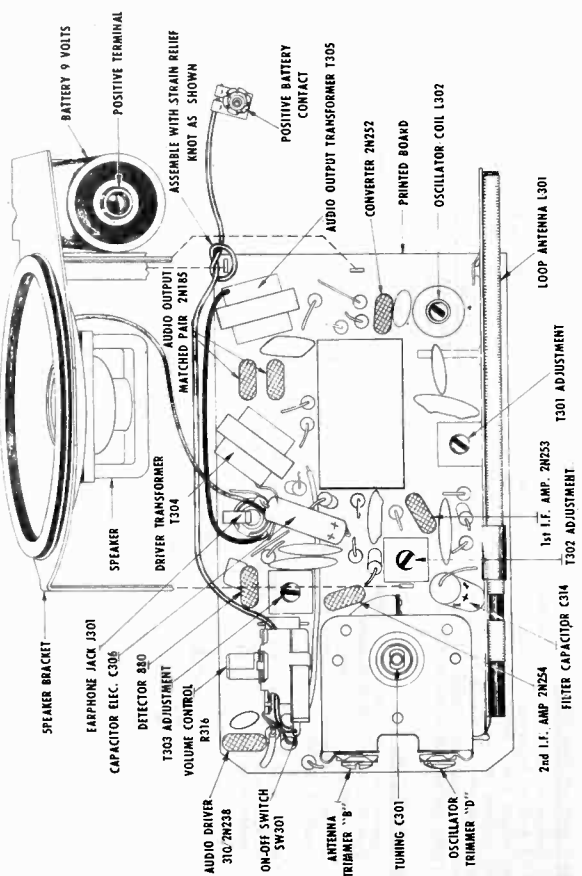


FIGURE 3 TOP VIEW PARTS LAYOUT

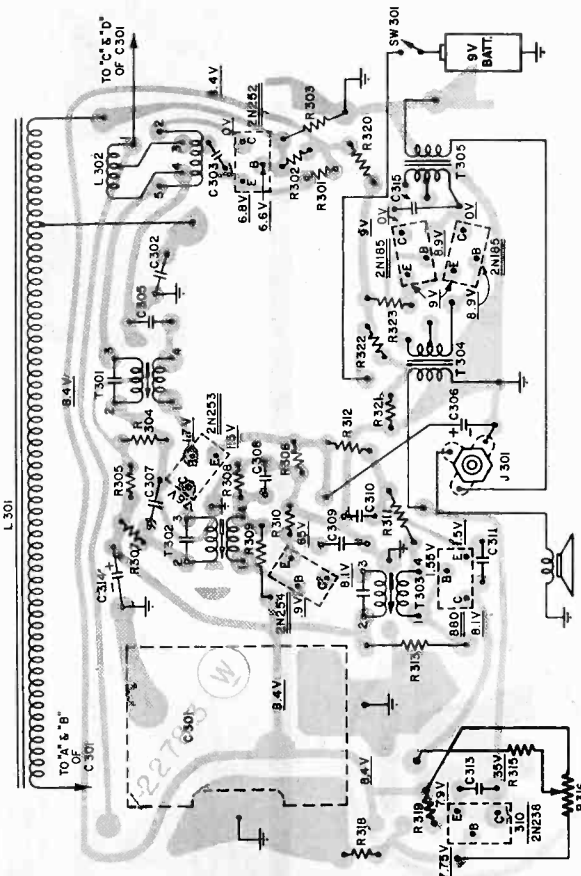


FIGURE 4 BOTTOM VIEW OF PRINTED BOARD SHOWING TOP COMPONENTS SYMBOLICALLY

**IF ALIGNMENT REQUIREMENTS**

1. Form a 4 or 5 turn loop of wire and connect across the signal generator output cable.
2. Signal generator capable of covering frequencies of 455 KC and the entire broadcast band with provisions for modulation.
3. VTVM or output meter.
4. Keep the output of the signal generator low enough just to give an indication on the VTVM or output meter. If the peak is broad or double peak occurs when rocking the IF slug adjustment, the signal generator output is excessive. Either further decoupling of the generator loop or decreasing the generator output is necessary.
5. Set the volume control and tuning capacitor to maximum.

Loosely couple signal modulated from the generator to:	Generator Frequency	Connect VTVM or output meter across the voice coil and adjust:
Loop L1	455 KC	T3, T2, and T1 in order indicated for max. output (Reduce generator output if necessary for T2 and T1 adjustments.)

**RF ALIGNMENT REQUIREMENTS**

1. Steps 1, 2 and 3 also apply as in the IF alignment.
2. Keep the output of the signal generator low enough just to give an indication on the VTVM or output meter.
3. Set the volume control to maximum.

Loosely couple modulated signal, from generator to:	Generator Frequency	C1 Setting	Connect VTVM or output meter across voice coil and adjust for max. output
Loop L1	1625 KC	Min.	Oscillator Trim "D"
" "	1400 KC	1400 KC	Antenna Trim "B"

**Caution:** Be sure during RF Alignment that the hand or any objects on the bench do not come in close contact with the antenna loop or detuning will occur and alignment will be incorrect.

\*It is recommended that a fiber aligning tool that snugly fits the slot in the ferrite core be used to prevent chipping of the slot.

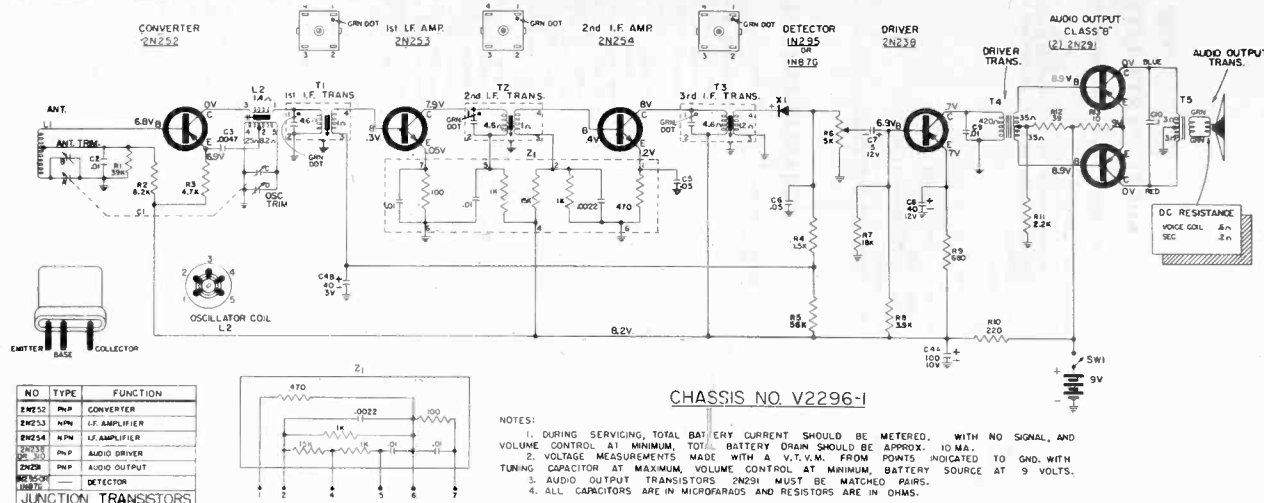
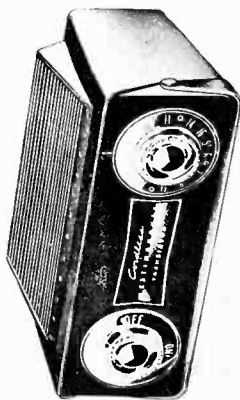


FIGURE 2 SCHEMATIC DIAGRAM

**MODELS**  
**H621P6**  
 (Charcoal)  
**H622P6**  
 (Yellow & White)

**Chassis V-2296-1**



**BOARD REMOVAL**

1. Remove the two control knobs.
2. Remove the three self tapping screws which secure the printed board to the interior of the cabinet.
3. Disconnect the two pronged plug from either the receptacle in the top cover or from the battery pack.
4. The radio chassis may now be removed from the cabinet for servicing without unsoldering the speaker leads.
5. When inserting the radio chassis into the cabinet use the reverse procedure, being careful to insert the reinforced side of the printed board into the grooves on the inside front of the cabinet and then secure with self-tapping screws.

**SERVICE INFORMATION**

**Circuit Description**

The V-2296-1 radio chassis has six stages - converter, two IF amplifiers, detector, audio driver and push-pull audio output stage. Four PNP transistors and two NPN transistors (IF amplifiers) are employed.

The converter stage uses a 2N252 type transistor in an autodyne type oscillator-mixer circuit. The RF signal is picked up by a tuned, high Q ferrite-core antenna and a low impedance winding is used to couple the signal to the base of the transistor. Local oscillations are generated by a feedback winding in the collector circuit inducing energy into the emitter parallel resonant circuit. Mixing of the RF and local oscillator signal takes place within the transistor and the resultant difference signal (455kc) appears across the 1st IF transformer T1.

Two stages of IF amplification amplify the 455kc signal. The primary of each IF transformer is tuned with a fixed capacitor while the secondary is not. This is done to match the high collector impedance of the preceding stage to the low input impedance of the following stage. The gain of the 1st IF amplifier is controlled by an Automatic Gain Control circuit. This stage is biased in a forward direction.

**Westinghouse**



**RADIO**  
 Westinghouse  
**Push-Button**  
 SERVICE

SERVICE DEPARTMENT, TELEVISION-RADIO DIVISION  
 WESTINGHOUSE ELECTRIC CORP., METUCHEN, N.J.

**SPECIFICATIONS**

- Frequency Range ..... 540 to 1600 KC
- Intermediate Frequency ..... 455 KC
- Transistor Complement
- 1. 2N252 ..... Converter
- 1. 2N253 ..... 1st. IF Amp.
- 1. 2N254 ..... 2nd. IF Amp.
- 1. 1N295 ..... Detector
- 1. 2N238 ..... Audio Driver
- 2. 2N231 (matched pair) ..... Audio Output
- Loadspeaker ..... 0.50 watts
- Power Supply: 9 volts
- 6-1/2 volt "D" size flashlight batteries
- or
- 11-9 volt battery pack Eveready No. 2761
- Battery Life (intermittent use) ..... up to 800 hours
- Average Current Drain ..... (no signal) 7 ma.

**BATTERY INFORMATION**

Models H621P6 and H622P6 use either six 1 1/2 volt "D" size flashlight type batteries or one 9 volt battery pack. As shown in figure 1 the six "D" size batteries are snapped into the battery holders with the positive terminals facing the front of the radio. The two pronged plug from the radio chassis is inserted into the receptacle in the top cover. When one 9 volt battery pack is used the two pronged plug from the receptacle in the top cover is inserted into the battery.

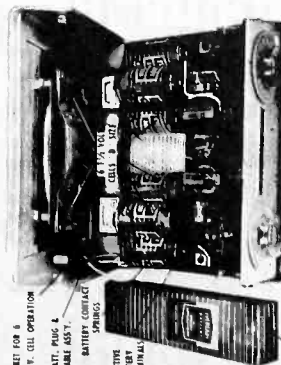


FIGURE 1 BATTERY INSTALLATION

MODEL PARTS LIST

When ordering parts, specify part number, description and model number.

Part No.	Description
+ 513V013M01	Cabinet (includes hinge and catch springs and battery contacts) H621P6 - Charcoal
+ 513V013M02	Cabinet (includes hinge and catch springs and battery contacts) H622P6 - Yellow & White
770V030M01	Catch, cabinet
+ 555V014M01	Escucheon
+ 558V062M01	Handle
+ 550V014M07	Knob, dial
+ 550V014M05	Knob, off-on-volume
+ 768V015M11	Nut, Speed (handle stud)
Y-11940-1	Spring, hinge
+ 570V021M01	Speaker, 4" X6" Inverted PM
+ 538V064M01	Stud, handle
+ 763V000M61	Washer, Spring (handle stud)

CHASSIS PARTS LIST

Ref. No.	Part No.	Equiv. Part No.	Description	Function
+ C1	330V009M01		Capacitor, variable, 2 gang	tuning
C2	215V101A03		Capacitor, .01 mfd, ceramic	filter converter (B)
C3	215V300M04		Capacitor, .0047 mfd, ceramic	osc. coupling
+ C4A	218V026M01		Capacitor, 100 mfd, 10V, dual	Supply filter
+ C4B			Capacitor, 40 mfd, 3V, elec.	AGC filter
C5	215V303M03		Capacitor, .05 mfd, ceramic	2nd IF Amp. (E)
C6	215V303M03		Capacitor, .05 mfd, ceramic	IF bypass det.
C7	218V012M09		Capacitor, 5 mfd, 12V, elec.	audio coupling
C8	218V012M07		Capacitor, 40 mfd, 12V, elec.	filter audio driver (E)
C9	215V300M04		Capacitor, .0047 mfd, ceramic	audio bypass
+ C10	210V111M03		Capacitor, .0047 mfd, ceramic	bypass
+ I1	751V522M01		Socket, "D", cell operation	battery
+ L1	310V015M01		Loop, iron core	antenna
+ L2	230V029M01		Coil	oscillator
+ PL1	759V022M01		Plug & Cable Assy.	battery
R1	250V223A93	RC20AE393K	Resistor, 39K ohms, 0.5W, 10%	converter bias (B)
R2	250V228A22	RC20AE822K	Resistor, 8.2K ohms, 0.5W, 10%	converter bias (B)
R3	250V224A72	RC20AE472K	Resistor, 4.7K ohms, 0.5W, 10%	converter bias (E)
R4	250V221A52	RC20AE152K	Resistor, 1.5K ohms, 0.5W, 10%	AGC filter
R5	250V225A63	RC20AE563K	Resistor, 56K ohms, 0.5W, 10%	AGC network
+ R6	270V027M04		Control, 5K ohms (includes SW1)	volume
R7	250V221A83	RC20AE183K	Resistor, 18K ohms, 0.5W, 10%	Audio driver bias (B)
R8	250V223A92	RC20AE392K	Resistor, 3.9K ohms, 0.5W, 10%	Audio driver bias (B)
R9	250V226A81	RC20AE681K	Resistor, 680 ohms, 0.5W, 10%	Audio driver (E)
R10	250V222A31	RC20AE21K	Resistor, 220 ohms, 0.5W, 10%	Supply filter
R11	250V222A22	RC20AE222K	Resistor, 2.2K ohms, 0.5W, 10%	Audio output bias (B)
R12	250V225A90	RC20AE590K	Resistor, 59 ohms, 0.5W, 10%	Audio output bias (B)
R13	250V221A00	RC20AE100K	Resistor, 10 ohms, 0.5W, 10%	Current limiting
+ SW1	270V027M04		Switch (includes R6)	off-on power
+ T1	235V019M01		Transformer, IF	1st IF Amp.
+ T2	235V019M01		Transformer, IF	2nd IF Amp.
+ T3	430V019M02		Transformer, IF	Detector
+ T4	430V035M01		Transformer, Audio	Audio driver
+ T5	430V036M01		Transformer, Audio	Audio output
+ X1	296V002M01		Diode, Crystal - 1N87G or 1N295	Detector
+ Z1	219V005M01		Packaged circuit	IF amplifier
	297V008M01		Transistor, 2N252	Converter
	297V002M04		Transistor, 2N253	1st IF amp
	297V002M05		Transistor, 2N254	2nd IF amp
	297V004M01		Transistor, 2N238	Audio driver
	297V010M01		Transistor, 2N291 (matched pair)	Audio output

= Paris equal and interchangeable - order by number listed in "Paris No." column.  
 † New part number listed for the first time in Westinghouse television or radio service information.

The detected signal appearing across resistor R6 is amplified by the audio driver stage and transformer coupled to the audio output stage.  
 The driver transformer (T4) couples out-of-phase voltages to the base of each audio output transistor. The transistors are operated class "B" and conduct on alternate half cycles providing greater audio output, less distortion and smaller average current drain. Resistor R13, in the emitter circuits, is used to limit the current under higher than normal temperatures. An additional precaution to guard against excessive heat and possible thermal runaway during operation is the use of heat sinks clamped around the bodies of the audio output transistor to dissipate heat.

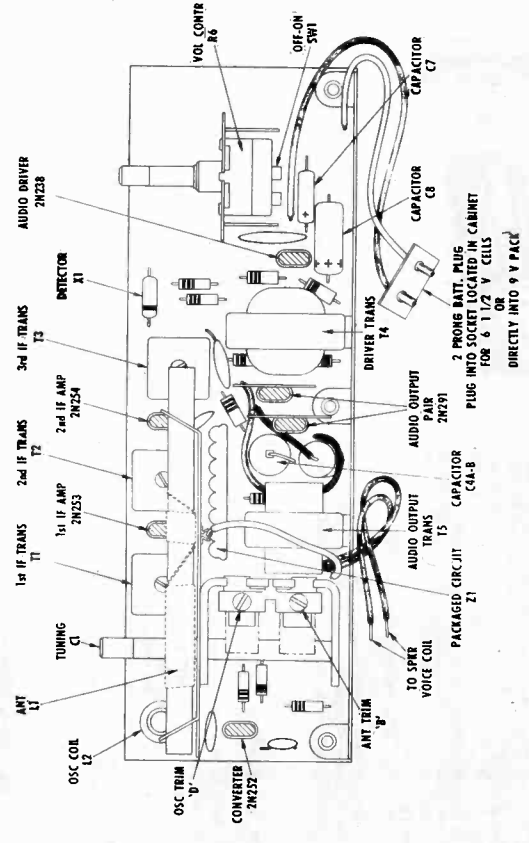


FIGURE 3 TOP VIEW PARTS LAYOUT

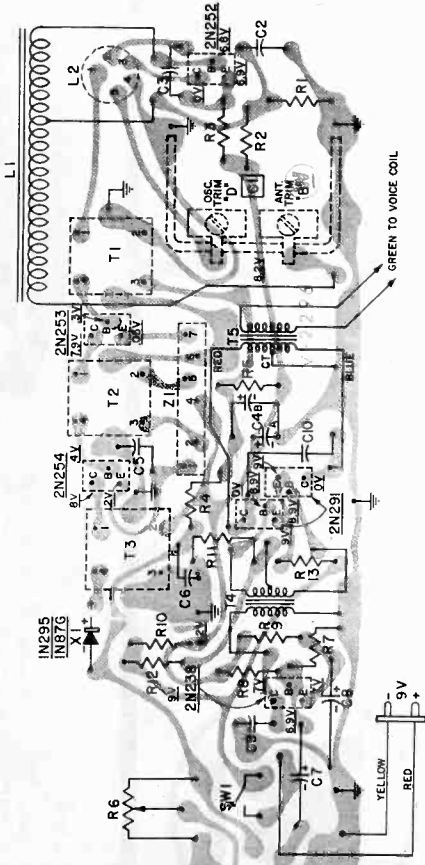


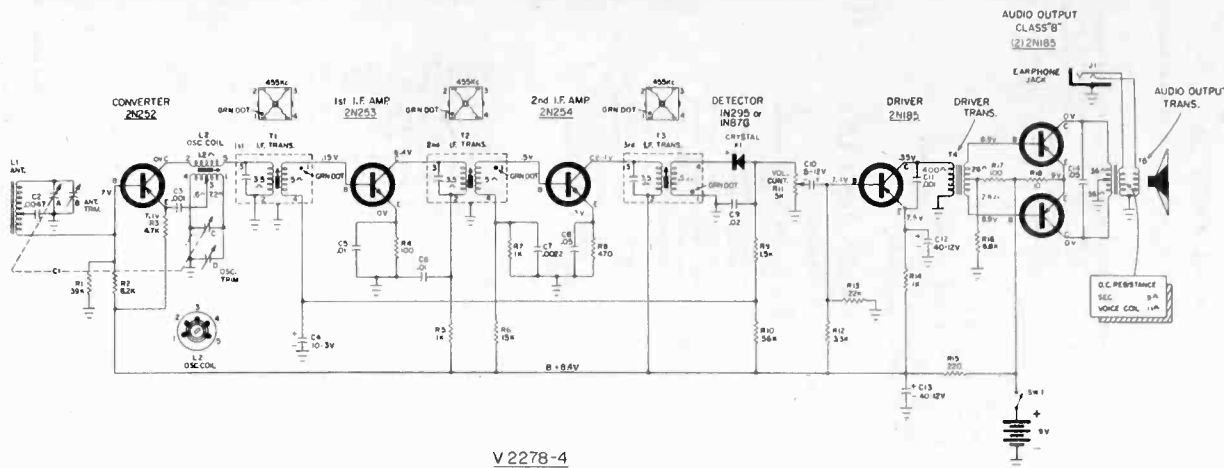
FIGURE 4 BOTTOM VIEW OF PRINTED BOARD SHOWING TOP COMPONENTS SYMBOLICALLY

**ALIGNMENT REQUIREMENTS**

**Signal Generator** — Use generator providing modulated 455KC and AM broadcast frequencies. Connect a 4 or 5 turn loop of wire across output cable. Keep output of generator low enough to just give an indication on VTVM or output meter. Keep volume control at maximum to avoid AVC action.  
**Indicator** — Connect VTVM or output meter across voice coil.  
**Receiver** — Set volume control to maximum. Be sure during RF alignment that the hand or any objects on the bench do not come in close contact with the antenna loop or detuning will occur and alignment will be incorrect.  
**Alignment Tool** — Use a fiber aligning tool that snugly fits the slot in the ferrite core to prevent chipping of the slot.

**ALIGNMENT PROCEDURE**

Loosely couple modulated signal to:	Generator frequency	C1 setting	Adjust for maximum:
Loop L1	455KC	maximum	T3, T2 and T1 in order. Reduce generator output if necessary for T2 and T1 adjustments
Loop L1	1625KC	minimum	Oscillator trimmer "D"
Loop L1	1400KC	1400KC	RF trimmer "B"
Loop L1	600KC	600KC	Oscillator coil, L2, if necessary



**NOTES**

- DURING SERVICING, TOTAL CURRENT SHOULD BE MEASURED. WITH NO SIGNAL, AND VOLUME CONTROL AT MINIMUM, TOTAL BATTERY SHOULD BE APPROX. 6 MA.
- VOLTAGE MEASUREMENTS MADE WITH A V.T.V.M. FROM POINTS INDICATED TO GND. WITH TUNING CAPACITOR AT MAXIMUM, VOLUME CONTROL AT MINIMUM, BATTERY SOURCE AT 9 VOLTS.
- AUDIO OUTPUT TRANSISTORS 2N185 MUST BE MATCHED PAIRS.
- ALL CAPACITORS ARE IN MICROFARADS AND RESISTORS ARE IN OHMS.

JUNCTION TRANSISTOR		
NO.	TYPE	FUNCTION
2N252	PNP	CONVERTER
2N253	NPN	1st I.F. AMPLIFIER
2N254	NPN	2nd I.F. AMPLIFIER
2N185	PNP	AUDIO DRIVER
2N185	PNP	AUDIO OUTPUT

FIGURE 2 SCHEMATIC DIAGRAM

**MODELS**  
**H-651P6** (charcoal)  
**H-652P6** (turquoise)  
**H-653P6** (off white)

Chassis V-2278-4

**Westinghouse**

radio



SERVICE DEPARTMENT • TELEVISION-RADIO DIVISION  
 WESTINGHOUSE ELECTRIC CORP., METUCHEN, N. J.

**SPECIFICATIONS**

- Frequency range . . . . . 540 to 1600 KC
- Intermediate Frequency . . . . . 455 KC
- Transistor Complement
- 1 2N252 . . . . . Converter
- 1 2N253 . . . . . 1st IF Amp.
- 1 2N254 . . . . . 2nd IF Amp.
- 1 IN259 or IN87G . . . . . Diode Detector
- 1 2N185 . . . . . Audio Driver
- 2 2N185 (matched pair) . . . . . Audio Output
- Power Output
- Undistorted . . . . . 0.075 watts
- Maximum . . . . . 1.50 watts
- Loudspeaker . . . . . 2 1/2" PM
- Power Supply: 9 volts, Eveready — 226 Ray-O-Vac — 1600 Burgess — P6 or P6M
- No Signal Current Drain . . . . . 6.5 ma.

**BOARD REMOVAL**

- Remove the screw located in center of the tuning knob. Turn the dial to the low frequency end and grip the tuning knob with one hand. Remove the screw by turning it in a counter clockwise direction. Do not cause any undue strain on the tuning capacitor.
- Remove back of cabinet by loosening coin-slot screw on back. Remove the 1/4" self tapping screw located at tuning condenser end of board.

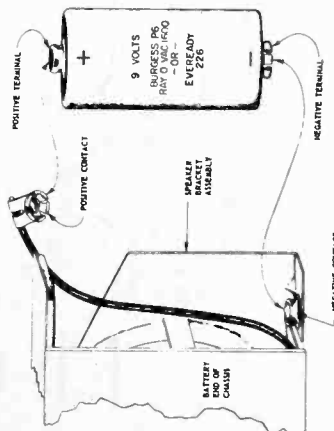


FIGURE 1 BATTERY INSTALLATION

- Hold radio in the palm of the hand with the open back side up. Grip the board with the other hand and slide it down towards the tuning capacitor end of the cabinet, until the upper end of the speaker bracket is free of the plastic lip. Now raise this end of the bracket over lip and slide it out of the cabinet.
- To insert the board into the cabinet use the reverse procedure, being careful to lock the speaker bracket under both recesses provided in the cabinet front.

**SERVICE INFORMATION**

The circuitry of the V-2278-4 chassis is similar to that of the V-2278-5 chassis. The only exception is that audio detection is accomplished here by a germanium crystal diode (IN259 or IN87G).  
 For an explanation of operation of the IF amplifier and audio amplifier stages refer to the "H587P7, H588P7 and H589P7 Service Manual". Information on the operation of the converter stage is given in the "H617P7, H618P7 and H619P7 Service Manual". AGC operation information is available in the "H610P5, H611P5 and H612P5 Service Manual."



Westinghouse

MODELS

**H-655PS**  
(White & Charcoal)

**H-656PS**  
(White & Red)

Chassis V-2393-1



radio



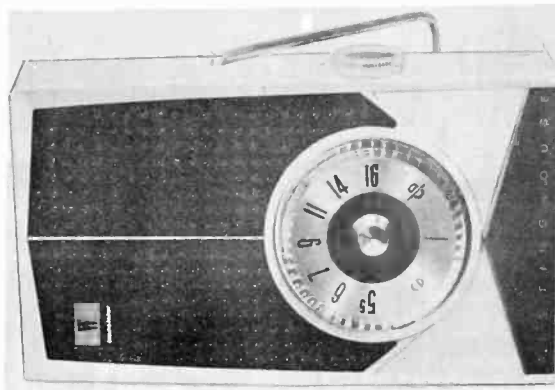
SERVICE DEPARTMENT • TELEVISION-RADIO DIVISION  
WESTINGHOUSE ELECTRIC CORP., METUCHEN, N. J.

**SPECIFICATIONS**

Frequency Range	540 to 1600 KC
Intermediate Frequency	455 KC
Transistog. Complement	.....
1 - 297V011H01	..... Converter
1 - 297V012H01	..... 1st IF Amp.
1 - 297V012H01	..... 2nd IF & 1st Audio Amp.
1 - IN87G or IN295	..... Diode Detector
2 - 297V003H03	..... Audio Output
Power Output	.....
Undistorted	0.072 Watts
Maximum	0.120 Watts
Loudspeaker	..... 3 1/4" PM
Power Supply	.....
Flashlight batteries	Mercury batteries
Eveready 915 or 1015	Nalloy ZM-9
Ray-O-Vac 7LP or 7R	Eveready E9
Burgess Z	.....
Nalloy M15	.....
No Signal Current Drain	..... 7.5 ma

**BATTERY INFORMATION**

This receiver can use either four 1 1/2 volt flash-light or mercury type batteries. The Mercury batteries give much longer battery life and are placed in the holder with buttons in opposite direction to those of flash-light type batteries. It is important that batteries are in holder correctly before turning radio on. Refer to figures 3 and 4 and label on battery holder for correct battery installation.



**CHASSIS REMOVAL**

1. Remove the tuning knob as follows. Insert a loop of string (see figure 1) under the tuning knob and pull the knob up and out of the cabinet front.
2. Remove the carrying handle. Grasp the handle on both sides and carefully spread it apart until it clears the holes in the cabinet sides.
3. Remove the back of the cabinet by loosening the two coin-slot screws on the back.
4. Remove the two 1" long hex head screws securing the chassis to the cabinet front.
5. Remove the printed circuit chassis, battery case, speaker spacers, rubber grommer and speaker.
6. To insert the printed circuit chassis back into the cabinet use the reverse procedure. *The tuning knob and cabinet back screws must be the same or identical to the original dimensions to prevent possible damage to the tuning gang.*

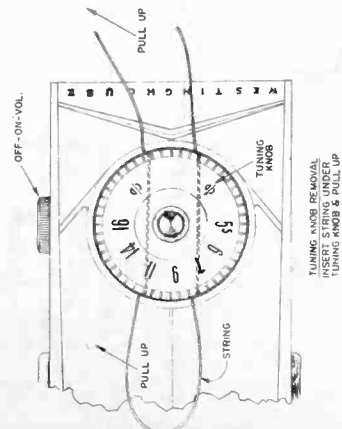


FIGURE 1 - TUNING KNOB REMOVAL

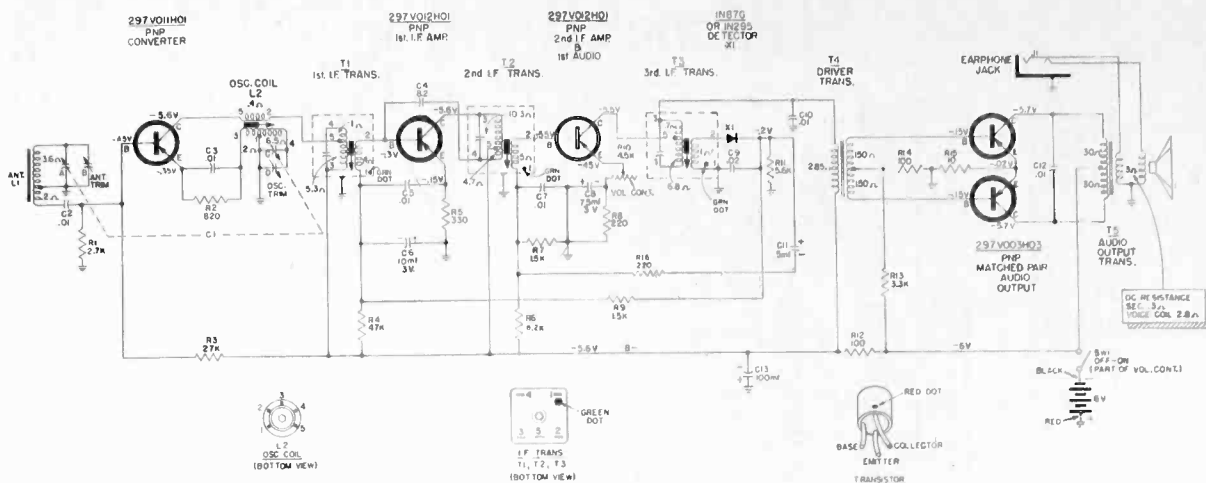


FIGURE 2 - SCHEMATIC DIAGRAM



**ALIGNMENT REQUIREMENTS**

**SIGNAL GENERATOR** — Use a generator providing modulated 455KC and AM broadcast frequencies. Connect a 4 or 5 turn loop of wire across output cable. Place the loop near the ferrite core antenna of the receiver. To increase or decrease the amount of signal coupled to the receiver move the loop closer or further from the antenna. Keep the output of the generator low enough to just give an indication on the VTVM or output meter to avoid AVC action. Keep the volume control set at maximum.

**INDICATOR** — Connect a VTVM or output meter across the voice coil at points shown in figure 4.

**RECEIVER** — Set the volume control to maximum. During steps 1 and 2 the chassis must be out of the cabinet. During steps 3, 4 and 5 the chassis must be in the cabinet. Also during the last three steps be sure that the hand or any objects on the bench do not come in close contact with the antenna loop or detuning will occur and alignment will be incorrect.

**ALIGNMENT TOOL** — Use a fiber aligning tool that snugly fits the slot in the ferrite cores of the IF transformers to prevent chipping of the slot.

**ALIGNMENT PROCEDURE CHART**

Step	Loosely couple modulated signal to:	Generator Frequency	C1 Setting	adjust for maximum:
1.	Loop L1	455KC	maximum	T3, T2 and T1 in order. Reduce generator output if necessary for T2 and T1 adjustments.
2.	Loop L1	1625KC	minimum	RF trimmer "B"
3.	Loop L1	1400 KC	1400KC	Oscillator trimmer "B"
4.	Loop L1	600KC	600KC	Oscillator coil, L2, if necessary.
5.	Repeat steps 2, 3 & 4			

**RECEIVER CIRCUITRY INFORMATION**

This receiver has several circuit differences as compared to previous Westinghouse transistor radios. This receiver features the newly developed reflexed IF-Audio amplifier for increased receiver sensitivity and a slightly different AGC circuit. Since all of the transistors are of the PNP type, the battery positive terminal is connected to chassis ground. This point should be kept in mind when servicing the receiver and replacing components.

**The Reflexed IF-Audio Amplifier**

The third stage in this receiver is a reflexed IF-Audio amplifier. In other words one transistor is being used to amplify both IF and Audio frequencies.

For IF signals this stage operates as a standard transformer coupled IF amplifier. The IF signal appearing in the secondary of T3 is detected by the crystal diode (X1) as follows. When the IF signal in the secondary of T3 is positive with respect to ground, X1 conducts charging capacitor C9. When the IF signal becomes negative the diode does not conduct and capacitor C9 discharges through resistor R11. Thus the voltage appearing across R11 is the rectified IF signal (audio component). The amplitude of this voltage will depend upon the strength of the received signal and the setting of the volume control. This voltage is coupled back to the base of the 2nd IF amplifier through C11, R16 and the secondary of T2.

It can now be seen that both IF and audio signals are simultaneously appearing on the base of the transistor.

Both signals are simultaneously being amplified. Control R10 in the emitter circuit hence controls the gain of both the IF and audio signals.

No interaction occurs between the two signals primarily because they use separate input and output loads. For example separate output transformers, one for audio and the other for IF frequencies, are connected in series. Because the audio transformer is designed to operate at audio frequencies and the IF transformer at 455KC, the audio transformer has many more turns and a higher inductance than the IF transformer. As a result the small IF transformer presents little impedance to the audio signal and the audio acts as though the IF transformer is shorted out.

On the other hand for the IF signal, the audio transformer is bypassed by capacitor C10 which presents virtually no impedance to the IF signal. The transformers therefore do not affect each other and may be connected together.

**AGC Circuit**

AGC voltage is applied to the base of the 1st IF amplifier to control the receiver gain and compensate for changes in signal strength.

With no signal being received the 1st IF amplifier is biased in a forward direction by approximately .15 volts. The base voltage is  $-3$  volts and is derived from the

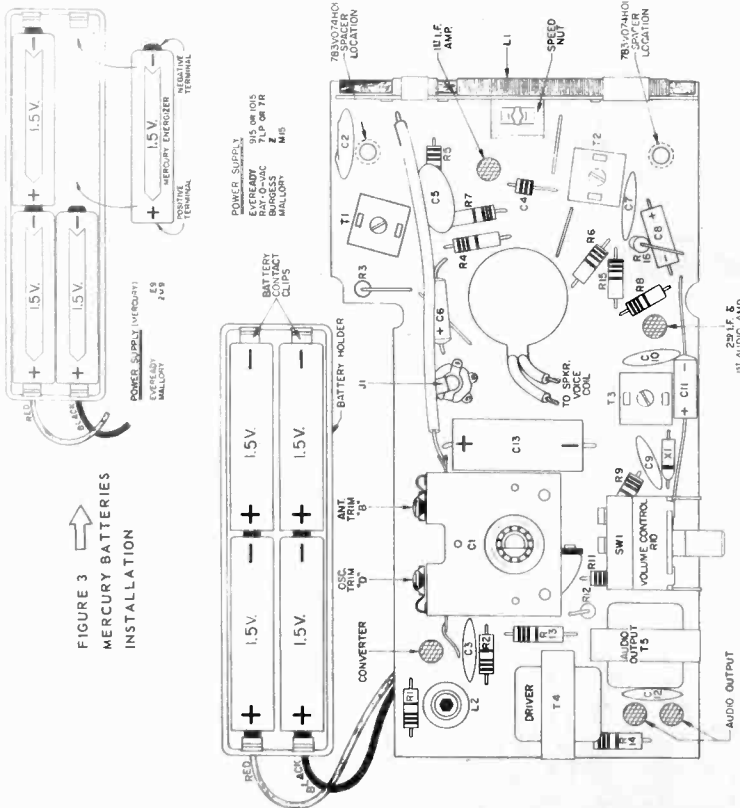


FIGURE 4 - TOP VIEW OF PRINTED CIRCUIT CHASSIS

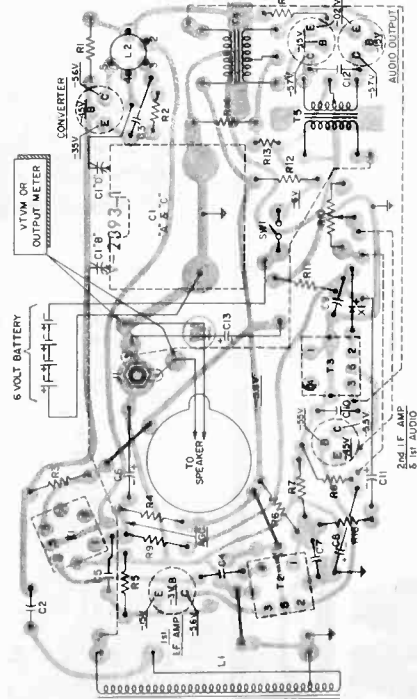


FIGURE 5 - BOTTOM VIEW OF PRINTED CIRCUIT CHASSIS SHOWING COMPONENTS SYMBOLICALLY

resistor divider network (R12, R4, R9 and R11) across the battery. Resistor R11 is also the detector load resistor. The current through R11 when a signal is being received is opposite to that supplied by the divider network. The voltages developed across R11 buck each other decreasing the current through the divider network R12, R4, R9 and R11 hence reducing the negative bias on the base of the 1st IF amplifier. The reduction in base voltage causes the transistor to be biased in a less negative direction, decreasing its gain.

Thus the greater the signal strength the greater the bucking voltage across R11, the less the current through the divider network, the less the negative voltage on the base of the first IF amplifier transistor, the less the forward bias and the less the gain. If the signal strength should decrease the opposite will happen.

transistor to be biased in a less negative direction, decreasing its gain.

Thus the greater the signal strength the greater the bucking voltage across R11, the less the current through the divider network, the less the negative voltage on the base of the first IF amplifier transistor, the less the forward bias and the less the gain. If the signal strength should decrease the opposite will happen.

**MODEL PARTS LIST**

When ordering parts, specify part number, description and model number.

Part No.	Description
4 513V026H01	Cabinets, H655P5, White & Charcoal (Includes Grille)
4 513V026H02	Cabinets, H656P5, White & Red (Includes Grille)
4 770V516H01	Clip, battery contact
4 555V026H01	Escucheon, H655P5
4 555V026H02	Escucheon, H656P5
4 558V151H01	Holder, batteries
4 781V186H01	Insignia, "W"
4 558V150H01	Knob, tuning
4 550V080H01	Knob, on-off-volume
4 558V152H02	Ring, tuning knob
4 761V182H01	Screw, securing back cover
4 570V044H01	Speaker, 3/4" P.M.



**CHASSIS PARTS LIST**

Ref. No.	Part No.	Equip. Part No.	Description	Function
4 C1	330V020H01	R2CC63Z5Z103P	Capacitor, variable	tuning
C2	215V111A03	R2CC65Z5Z103P	Capacitor, .01 ufd, ceramic	ant. coupling
C3	215V111A03	R2CC65Z5Z103P	Capacitor, .01 ufd, ceramic	osc. coupling
4 C4	217V018A29	R2CC63Z5Z103P	Capacitor, 8.2 ufd, fixed composition	neutralization
C5	215V111A03	R2CC65Z5Z103P	Capacitor, .01 ufd, ceramic	(E) 1st IF Amp.
4 C6	218V012H16	R2CC63Z5Z103P	Capacitor, 10 ufd, 3V., electrolytic	(B) 1st IF Amp.
C7	215V111A03	R2CC65Z5Z103P	Capacitor, .01 ufd, ceramic	(B) 2nd IF & 1st Audio
4 C8	218V012H17		Capacitor, 75 ufd, 3V., electrolytic	(E) 2nd IF & 1st Audio
C9	215V203H04		Capacitor, .02 ufd, ceramic	Detector
C10	215V111A03		Capacitor, .01 ufd, ceramic	IF Bypass
4 C11	218V012H14	R2CC63Z5Z103P	Capacitor, 5 ufd, 7V., electrolytic	Audio Coupling
C12	215V111A03		Capacitor, .01 ufd, ceramic	Audio Output
C13	218V012H15		Capacitor, 100 ufd, 7V., electrolytic	Supply Filter
4 L1	310V029H01		Jack	Earphone
4 L2	230V057H01		Loop, iron-core	Antenna
R1	250V222A72		Resistor, 2.7K ohms, 0.5W.	Oscillator
R2	250V222A72		Resistor, 820 ohms, 0.5W.	(B) Converter
R3	250V222A73		Resistor, 27K ohms, 0.5W.	(E) Converter
R4	250V222A73		Resistor, 47K ohms, 0.5W.	(B) 1st IF Amp.
R5	250V222A73		Resistor, 330 ohms, 0.5W.	(E) 1st IF Amp.
R6	250V222A72		Resistor, 8.2K ohms, 0.5W.	(B) 2nd IF & 1st Audio
R7	250V222A52		Resistor, 1.5K ohms, 0.5W.	(B) 2nd IF & 1st Audio
R8	250V222A21		Resistor, 220 ohms, 0.5W.	(E) 2nd IF & 1st Audio
R9	250V222A52		Resistor, 1.5K ohms, 0.5W.	(B) 2nd IF & 1st Audio

**CHASSIS PARTS LIST (Cont.)**

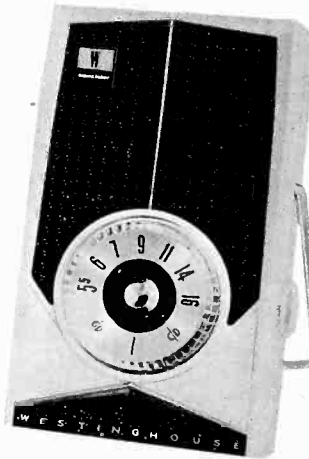
Ref. No.	Part No.	Equip. Part No.	Description	Function
4 R10	270V050H02		Control, 4.5K ohms (includes SW1)	Volume
R11	250V222A62	RC20AE562K	Resistor, 5.6K ohms, 0.5W.	Detector Load
R12	250V223A01	RC20AE101M	Resistor, 100 ohms, 0.5W.	Supply Filter
R13	250V223A32	RC20AE332K	Resistor, 3.3K ohms, 0.5W.	(B) bias audio output
R14	250V228A20	RC20AE101K	Resistor, 100 ohms, 0.5W.	(E) bias audio output
R15	250V221A00	RC20AE100K	Resistor, 10 ohms, 0.5W.	(E) bias audio output
R16	250V222A21	RC20AE221K	Resistor, 220 ohms, 0.5W.	Audio return
4 SW1	270V050H02		Switch (part of R10)	Off-On
4 T1	235V041H01		Transformer	1st IF
4 T2	235V041H02		Transformer	2nd IF
4 T3	235V041H03		Transformer	3rd IF
4 T4	430V054H01		Transformer	Audio Driver
4 T5	430V055H01		Transformer	Audio Output
4 X1	296V002H01		Crystal, 1N78G or 1N295	Diode Detector
4	297V003H03		Transistors, matched pair (2N408 or 2N217*)	Audio Output
4	297V011H01		Transistor (2N412 or 2N219*)	Converter
4	297V012H01		Transistor (2N410 or 2N218*)	1st & 2nd IF Amps.

\* New part number listed for the first time in Westinghouse television or radio service information.  
 \* These transistors may be substituted for transistors marked with Westinghouse part numbers.

 <p>SERVICE DEPARTMENT          RADIO-TELEVISION DIVISION          WESTINGHOUSE ELECTRIC CORP.          METUCHEN, N. J.</p>	<p>Westinghouse</p> <p><b>RADIO</b></p> 	<p><b>MODEL</b>  <b>H-657P5</b></p> <p>White - Turquoise</p>
		<p><b>CHASSIS</b>  <b>V-2393-1</b></p>

**CHASSIS SERVICE INFORMATION**

For complete service information on the model H-657P5 radio refer to the H-655P5 and H-656P5 service manual (RM 4337) and any supplementary information thereto.



**ADDITIONS TO PARTS LIST**

New Part	Ref. No.	Part No.	Equiv. Part No.	Description	List Price
†		513V026H03		Cabinet, H-657P5, White / Turquoise (includes grille)	2.95
†		555V026H03		Escutcheon	.65



# MODEL "ROYAL 300" ALL TRANSISTOR PORTABLE RADIO

Chassis 7AT42 & 7AT42Z1

### GENERAL

These transistor portable chassis are conventional superheterodyne receivers using an individual mixer and oscillator to produce the 455 Kc intermediate frequency. The first and second intermediate frequency amplifiers are conventional. It is necessary to use neutralization in the first IF amplifier. The detector and AVC voltage source. This is then followed by a driver stage and a class "B" push-pull output stage. As you can see from the chart, the chassis use matched transistor pairs in the final output stage and therefore should one transistor fail, both transistors must be replaced simultaneously as chances are they will not perform properly unless so matched.

Power Supply — Carbon Penlite Batteries 6 volts D.C. approx. life 100 hrs.  
Mercury Batteries . . . 5.36 volts D.C. approx. life 400 hrs.

Frequency Range . . . . . 540 to 1600 KC  
Intermediate Frequency . . . . . 455 KC  
Sensitivity . . . . . Approximately 500 microvolts/meter for 50 milliwatts output  
Power Output Undistorted . . . . . 100 milliwatts  
Power Output Maximum . . . . . 180 milliwatts  
Speaker . . . . . 2 1/2 inch P.M.  
Alnico V Voice Coil Impedance 15 ohms • 1000 cycles  
Accessory Earphone. 39-22 impedance 15 ohms • 1000 cycles

### CHASSIS IDENTIFICATION

The "Royal 300" seven transistor portable has been produced with two basic chassis. This expedient was necessary to produce the radio in two price ranges. The chassis are stamped on them as well as a color identifying code on the battery compartment just above the battery installation instruction label.

The 7AT42 chassis uses transistors manufactured by Sylvania. The 7AT42Z1 chassis uses transistors manufactured by Texas Instrument. In addition to this, both chassis have individual transistor layout labels. The color of the printing on these labels identifies the transistor type. The color dot on the chassis. The accompanying chart gives all the necessary information on

chassis number, color dot, transistor layout labels, transistor numbers, Zenith part number, RETMA part number (where available), transistor supplier, etc.

### PRINTED CIRCUIT SERVICING:

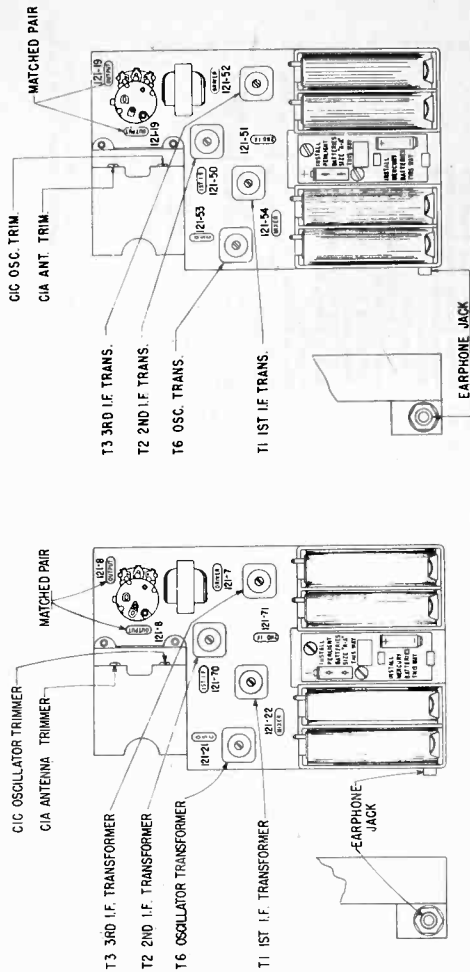
Servicing "printed" circuit sets is, in general, much the same as servicing many other electronic assemblies. Accurate and accurate measurements are essential for this type of work. The following items are especially useful:

1. Good pair of long-nose pliers.
  2. Sharp wire cutters.
  3. Small stiff blue brush (for solder removal).
  4. Pencil type soldering iron with a small tip (25 watts or less).
- WARNING: Excessive heat may damage the "printed" circuit during component replacement if a soldering pencil, iron or gun of higher wattage rating is used.**
5. Tin leads on component before soldering.
  6. Use only EUTECTIC solder 63% tin 37% lead. This solder has an extremely low melting point.
  7. Metal pick (soldering aid).

### COMPONENT REPLACEMENT:

Resistors, capacitors and inductors should be replaced by clipping out the defective part and neatly soldering in the new component. It is important to use the correct value and tolerance. When replacing components such as the tuning lugs with a pencil type soldering iron and move them away from the soldered connection with a long nose pliers or metal pick. Continue heating the lugs and brush away the molten solder with a small stiff glue brush. Remove the defective unit by lifting it off the chassis. Before inserting the new unit, be certain that the lug holes are open and free from solder. Force a lug against a solder filled lug hole may break the bond between the chassis base and the "printed" wiring. It is, therefore, necessary to exercise care when replacing tuning lugs.

An open or damaged section of "printed" circuit wiring can be replaced by soldering a short jumper wire across the points to be connected.



TRANSISTOR & TRIMMER LAYOUT FOR 7AT42

TRANSISTOR & TRIMMER LAYOUT FOR 7AT42Z1

## Alignment Procedure

Operation	Input Signal Frequency	Connect Inner Conductor From Oscillator To	Connect Outer Shield Conductor From Oscillator To	Set Dial At	Trimmers	Purpose
1	455 KC	ONE TURN	Chassis	600 KC	Adj. T1, T2, T3 for maximum output.	For L.F. Alignment
2	1620 KC	LOOSELY COUPLED TO	—	Gang wide open.	C1C	Set Oscillator to dial scale.
3	535 KC	TO	—	Gang Closed	Adjust slug in T6	Set Oscillator to dial scale.
4	REPEAT STEPS 2 & 3	—	—	—	—	—
5	1260 KC	WAVEMAGNET	—	1260 KC	C1A	Align loop ant.

Chassis	Chassis Color/Dot	Transistor Layout Color	Part No.	Mixer	Osc.	1st I.F.	2nd I.F.	Crystal Diode	Driver	Output	Supplier
7AT42	Green	Green 102-3498	Zenith RETMA 2N194	Zenith 2N122 NPN	Zenith 2N121 NPN	121-70 NPN	121-71 NPN	103-19 1N87G	121-7 2N352NPN	121-8 Matched Pair NPN	Sylvania
7AT42Z1	Red	Red 102-3474	Zenith Type	Zenith 121-54 PNP	Zenith 121-53 PNP	121-50 NPN	121-51 NPN	103-19 1N97G	121-52 PNP	121-19 Matched Pair PNP	Texas Instrument

THE FOLLOWING ARE PARTS USED ON CHASSIS 7AT42Z1 ONLY

PART NO.	DESCRIPTION	PRICE
22-3010	.01 Mid. Ceramic Disc - 25V (2 used)	.45
63-1785	1000 Ohm 1/2 W Ins. 10%	.17
63-1783	1500 Ohm 1/2 W Ins. 20%	.17
63-1803	2700 Ohm 1/2 W Ins. 10%	.17
63-1806	3300 Ohm 1/2 W Ins. 10%	.17
63-1834	15 K Ohm 1/2 W Ins. 10%	.17
63-1856	47 K Ohm 1/2 W Ins. 20%	.17
95-1514	1st I. F. Transformer	3.50
95-1515	2nd I. F. Transformer	3.50
95-1576	3rd I. F. Transformer	3.50
121-19	Transistor (Output - matched pair)	.10
121-50	Transistor (1st I. F.)	.17
121-51	Transistor (2nd I. F.)	.17
121-52	Transistor (Driver)	.17
121-53	Transistor (Oscillator)	.17
121-54	Transistor (Mixer)	.17

CABINET PARTS.

PART NO.	DESCRIPTION	PRICE
2-8	1 1/2V Battery (use 4)	2.00
12-2378	Theft Prevention Bolt Down	2.00
14-2322	Plastic Cabinet - Rear - Royal 300Y	2.00
14-2323	Plastic Cabinet - Rear - Royal 300R	2.00
14-2324	Plastic Cabinet - Rear - Royal 300F	2.00
16-1407	Packing Carton	.60
24-876	Battery Cover - Royal 300Y	.60
24-877	Battery Cover - Royal 300R	.60
24-878	Battery Cover - Royal 300F	1.00
36-189	Cabinet Handle	.25
46-1880	Tuning Control Knob - Royal 300Y	.25
46-1881	Tuning Control Knob - Royal 300R	.25
46-1882	Tuning Control Knob - Royal 300F	.25
46-1885	Volume Control Knob - Royal 300Y	.25
46-1886	Volume Control Knob - Royal 300R	.25
46-1887	Volume Control Knob - Royal 300F	.25
57-2444	Escutcheon	.85
71-112	4-40 X 5/16 Phillips, Flat Hd. Mach. Screw - Gold (Mts. 97-447)	.30
71-117	2-56 X 3/16 Flat Hd. Mach. Screw - Brass (Model 300Y)	.01
71-119	2-56 X 3/16 Flat Hd. Mach. Screw - Brass (Models 300F & R)	.01
83-2489	Rubber Strip	.02
97-447	Chassis Mounting Stud	.30
112-773	6-20 X 3/8 Phillips, Pan Hd. Self-lap Screw (2 Mt. chassis)	.03
112-1007	8-32 X 3/16 Mach. Screw (used on 14-2322-24)	.02
198-204	Knob Clamping Ring (1 used on ea. knob)	.35
202-245	Dial Crystal	.15
202-1333	Instruction Book	2.00
S-42510	Front Plastic Cabinet - Royal 300Y	2.00
S-43265	Front Plastic Cabinet - Royal 300R	2.00
S-43267	Front Plastic Cabinet - Royal 300F	2.00

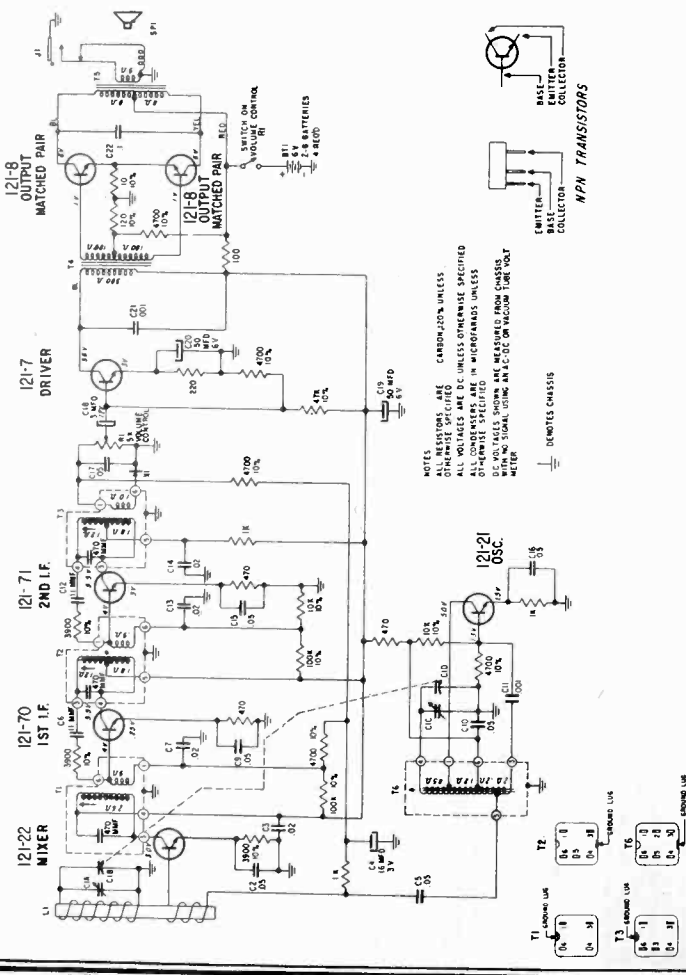
All prices shown are suggested retail prices which include Federal Manufacturers' Excise Tax where applicable and are subject to change without notice.

THE FOLLOWING ARE PARTS USED ON BOTH 7AT42 & 7AT42Z1 CHASSIS

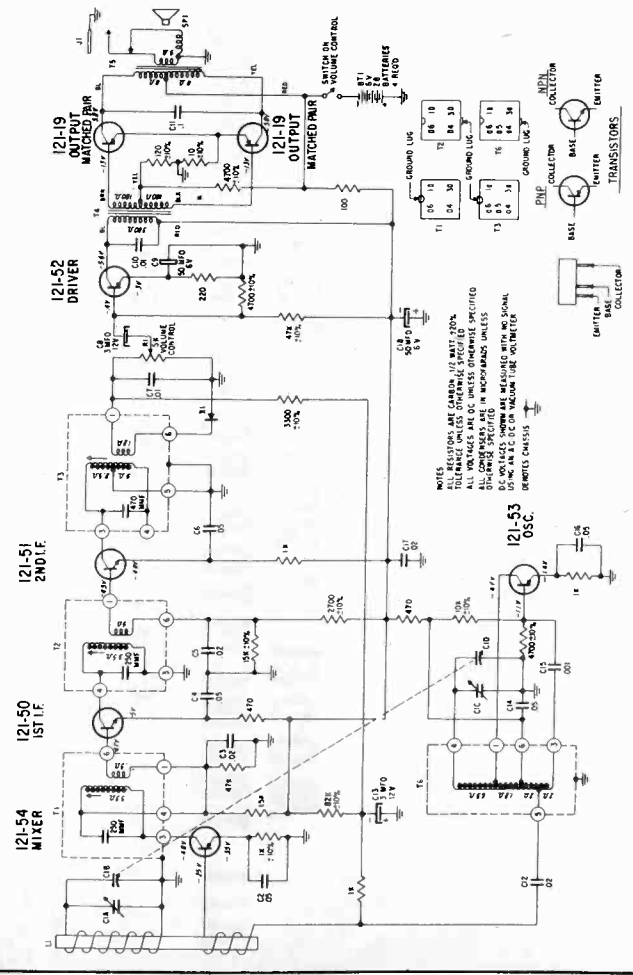
PART NO.	DESCRIPTION	PRICE
12-2364	Variable Capacitor Mfg. Bracket	1.0
22-2726	.05 Mid. Electrolytic 6V (2 used)	1.50
22-2728	.05 Mid. Ceramic Disc 25V (7 used)	.23
22-2729	.01 Mid. Ceramic Disc 30V (2 used)	1.5
22-2884	3 Mid. Electrolytic 12V	.25
22-2885	.02 Mid. Ceramic Disc 25V (4 used)	.35
22-2898	1 Mid. Mylar - 50V	3.50
22-3012	2 Section Variable Capacitor	.90
44-32	Miniature Jack	6.10
49-788	23/4" PM Speaker	6.10
54-74	2-56 X 3/16 Hex Nut (1 used on ea. 112-1043)	.03
54-417	1/4-32 X 3/8 Hex Nut Brass (1 Mts. ea. 44-32 & 63-4034)	.03
57-2214	Battery Instruction Plate	.10
63-1701	10 Ohm 1/2 W Ins. 10%	.17
63-1744	100 Ohm 1/2 W Ins. 20%	.17
63-1747	120 Ohm 1/2 W Ins. 20%	.17
63-1758	220 Ohm 1/2 W Ins. 20%	.17
63-1772	470 Ohm 1/2 W Ins. 20%	.17
63-1786	1000 Ohm 1/2 W Ins. 20% (3 used)	.17
63-1813	4700 Ohm 1/2 W Ins. 10% (5 used)	.17
63-1827	10 K Ohm 1/2 W Ins. 10% (2 used)	.17
63-1855	47 K Ohm 1/2 W Ins. 10%	.17
79-1087	Volume Control & Switch	2.05
80-1076	Three Contact Socket (7 used)	.30
83-2489	Rubber Strip	.02
83-2515	Batt. Contact Spring (2 used)	.70
93-1270	Polyethylene Strip (Battery Pull Out) on ea. 112-1048)	.05
95-1513	Oscillator Transformer	.01
95-1518	Driver Transformer	2.00
95-1519	Audio Output Transformer	5.00
103-19	Crystal Diode	3.50
112-1016	8-32 X 1/4 Bind. Hd. Mach. Screw (2 used on 49-788)	.75
112-1044	S-56 X 1/4 Bind. Mach. Screw (1 Mts. ea. 80-1076)	.02
113-6	4-40 X 3/16 Rd. Hd. Mach. Screw (used on 40-1023)	.02
113-69	8-40 X 5/32 Hex. Hd. Mach. Screw (2 used on 22-3012)	.02
S-40123	Antenna Assembly	.03
S-40226	Housing, Bracket & Spring Assembly	1.50

THE FOLLOWING ARE PARTS USED ON CHASSIS 7AT42 ONLY

PART NO.	DESCRIPTION	PRICE
22-2817	11 Mmf. Ceramic Disc. 500V (2 used)	.95
22-2871	16 Mfd. Electrolytic 3V	1.50
63-1810	3900 Ohm 1/2 W Ins. 10% (3 used)	.17
63-1869	100 K Ohm 1/2 W Ins. 10% (2 used)	.17
95-1510	1st I. F. Transformer	3.50
95-1511	2nd I. F. Transformer	3.50
95-1512	3rd I. F. Transformer	3.50
121-7	Transistor (Driver)	2.25
121-8	Transistor (Output) matched pair	4.95
121-21	Transistor (Oscillator)	2.85
121-22	Transistor (Mixer)	2.85
121-70	Transistor (1st I. F.)	3.05
121-71	Transistor (2nd I. F.)	3.05



SCHEMATIC DIAGRAM FOR 7AT42



SCHEMATIC DIAGRAM FOR 7AT42Z1

ZENITH RADIO CORP. 6001 Dickens Ave. Chicago 39, Ill.



# MODEL "ROYAL 450" ALL TRANSISTOR PORTABLE RADIO

## CHASSIS 7AT45Z1

### GENERAL

This transistor portable chassis is a conventional super-heterodyne receiver. It has an individual mixer and oscillator to produce the 455 Kc intermediate frequency. The first and second intermediate frequency amplifiers are conventional. A 1N87G is used as the diode detector and AVC voltage source. This is then followed by a driver stage and a class "B" push-pull output stage. As you can see from the chart, the chassis uses a pair of matched transistors in the final output stage and therefore should one transistor fail, both transistors must be replaced simultaneously as chances are they will not perform properly unless so matched.

Power Supply.....Six Zenith type Z-8 or Z-9 1 1/2 volt batteries or six 1 1/2 volt penlite batteries  
 Frequency Range.....540 to 1600 KC  
 Intermediate Frequency.....455 KC  
 Sensitivity.....Approximately 250 microvolts/meter for 50 milliwatts output  
 Power Output Undistorted.....250 milliwatts  
 Power Output Maximum.....450 milliwatts  
 Speaker.....3 inch P.M.  
 Alnico V Voice Coil Impedance 3.2 ohms at 400 cycles  
 Accessory Earphone.....B39-24 impedance 15 ohms at 1000 cycles

### PRINTED CIRCUIT SERVICING

Servicing "printed" circuit sets is, in general, much the same as servicing ordinary receivers. However, certain tools and techniques are well suited for this type of work. The following items are especially useful:

1. Good pair of long-nose pliers.
2. Sharp wire cutters.
3. Small stiff glue brush (for solder removal).
4. Pencil type soldering iron with a small tip (25 watts or less)

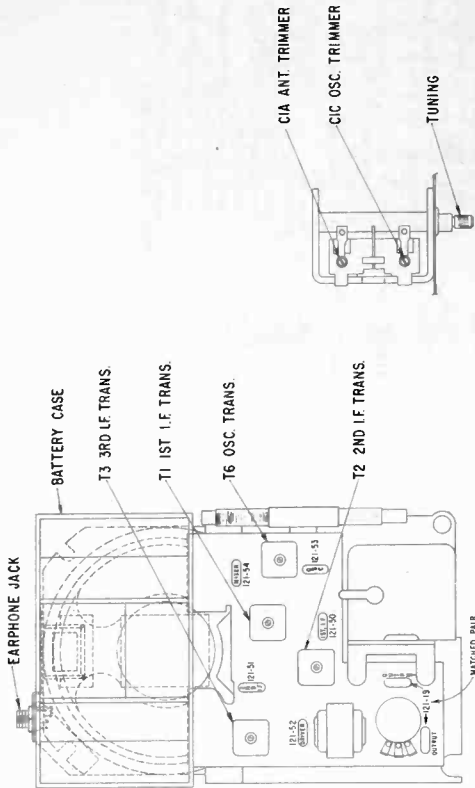
**WARNING:** Excessive heat may damage the "printed" circuit during component replacement if a soldering pencil, iron or gun of higher wattage rating is used.

5. Tin leads on component before soldering.
6. Use only EUTECTIC solder 63% tin 37% lead. This solder has an extremely low melting point.
7. Metal pick (soldering aid).

### COMPONENT REPLACEMENT

Resistors and capacitors should be replaced by clipping out the defective part and neatly soldering in the new part. If a unit, such as the oscillator coil or IF transformer, is to be removed heat the mounting lugs with a pencil type soldering iron and move them away from the soldered connection with a long-nose pliers or metal pick. Continue heating the lugs and brush away the molten solder with a small stiff glue brush. Remove the defective unit by lifting it off the chassis. Before inserting the new unit, be certain that the lug holes are open and free from solder. Forcing a lug against a solder filled lug hole may break the bond between the chassis base and the "printed" wiring. It is, therefore, necessary to exercise care when replacing units.

An open or damaged section of "printed" circuit wiring can be replaced by soldering a short jumper wire across the points to be connected.



TRANSISTOR & TRIMMER LAYOUT FOR CHASSIS 7AT45Z1

### ALIGNMENT PROCEDURE

Operation	Input Signal Frequency	Connect Inner Conductor From Oscillator To	Connect Outer Shield Conductor From Oscillator To	Set Dial At	Trimmers	Purpose
1	455 KC	ONE TURN	CHASSIS	600 KC	Adj. T1, T2, T3 for maximum output.	For I.F. Alignment
2	1620 KC	LOOSELY COUPLED TO WAVEMAGNET	—	Gang wide open.	CIC	Set Oscillator to dial scale.
3	535 KC	—	—	Gang Closed	Adjust slug in T6	Set Oscillator to dial scale.
4	REPEAT STEPS 2 & 3	—	—	—	—	—
5	1260 KC	—	—	1260 KC	CIA	Align loop ant.

### CHASSIS INFORMATION CHART

Chassis Color Dot	Chassis Color Label	Transistor Layout Label Color	Part No.	Mixer	Osc.	1st I.F.	2nd I.F.	Crystal Diode Detector	Driver	Output-Output	Supplier
Black	Black 102-3782	Black	Zenith RETMA Type	121-54 2N252 PNP	121-53 R119 PNP	121-50 2N253 PNP	121-51 2N254 NPN	103-19 1N87G	121-52 R120 PNP	121-19 R16 Matched Pair PNP	Texas Instrument

CHASSIS PARTS

Chassis 7AT45Z1

PART NO.	DIA. NO.	DESCRIPTION	PRICE
12-2611		Back mounting bracket	.25
22-18	C2,4	.0022 mfd. ceramic disc - 500V	.60
22-2728	6,14	.001 mfd. ceramic disc - 25V	.25
22-2729	C15	.001 mfd. ceramic disc - 25V	.25
22-2883	C9	50 mfd. electrolytic - 12V	1.10
22-2884	C8,13	3 mfd. electrolytic - 12V	1.50
22-2885	C3,5	.02 mfd. ceramic disc - 25V	.25
22-2998	12,17	(4 used) .1 mfd. mylar - 50V	.35
22-3010	C11	.01 mfd. ceramic disc - 25V	.45
22-3062	C18	2x100 mfd. electrolytic - 10V	2.25
22-3069	C1A,B, C,D	2 section variable	4.00
44-34	T1	Miniature jack	.90
49-848	SP1	3 1/2" PM speaker	6.00
54-417		1/4-32x3/8 hex. nut brass	.10
63-1715		22 ohm 1/2W Ins. 10%	.17
63-1744		100 ohm 1/2W Ins. 20%	.17
63-1775		560 ohm 1/2W Ins. 10%	.17
63-1782		820 ohm 1/2W Ins. 10%	.17
63-1785		1000 ohm 1/2W Ins. 10%	.17
63-1786		1000 ohm 1/2W Ins. 20%	.17
63-1792		(3 used) 1500 ohm 1/2W Ins. 10%	.17
63-1793		1500 ohm 1/2W Ins. 20%	.17
63-1796		1800 ohm 1/2W Ins. 10%	.17
63-1845		2200 ohm 1/2W Ins. 20%	.17
63-1855		3300 ohm 1/2W Ins. 10%	.17
63-1863		4700 ohm 1/2W Ins. 10%	.17
63-1880		(2 used) 5600 ohm 1/2W Ins. 10%	.17
63-3663		5600 ohm 1/2W Ins. 10%	.17
63-4071		12 K ohm 1/2W Ins. 10%	.17
63-4071		27 K ohm 1/2W Ins. 10%	.17
78-1067		47 K ohm 1/2W Ins. 10%	.17
80-1075		180 K ohm 1/2W Ins. 10%	.17
80-1076		Thermistor	1.10
80-1238		4.7 ohm 1/2W Ins. 20%	.17
80-1239		Volume control & switch	2.05
83-2943		3 contact socket (7 used)	.30
83-2952		Battery contact spring	.15
95-1289		(4 part of S-43841)	.15
95-1513		Battery contact spring	.15
95-1514		(2 part of S-43841)	.25
95-1515		Battery contact spring	.25
		Polyethylene strip	.10
		(Rubber pull out)	.03
		Rubber strip	.03
		Fibre washer (2 used)	.03
		Osc. transformer	2.00
		1st I.F. transformer	3.50
		2nd I.F. transformer	3.50

CHASSIS PARTS

Chassis 7AT45Z1

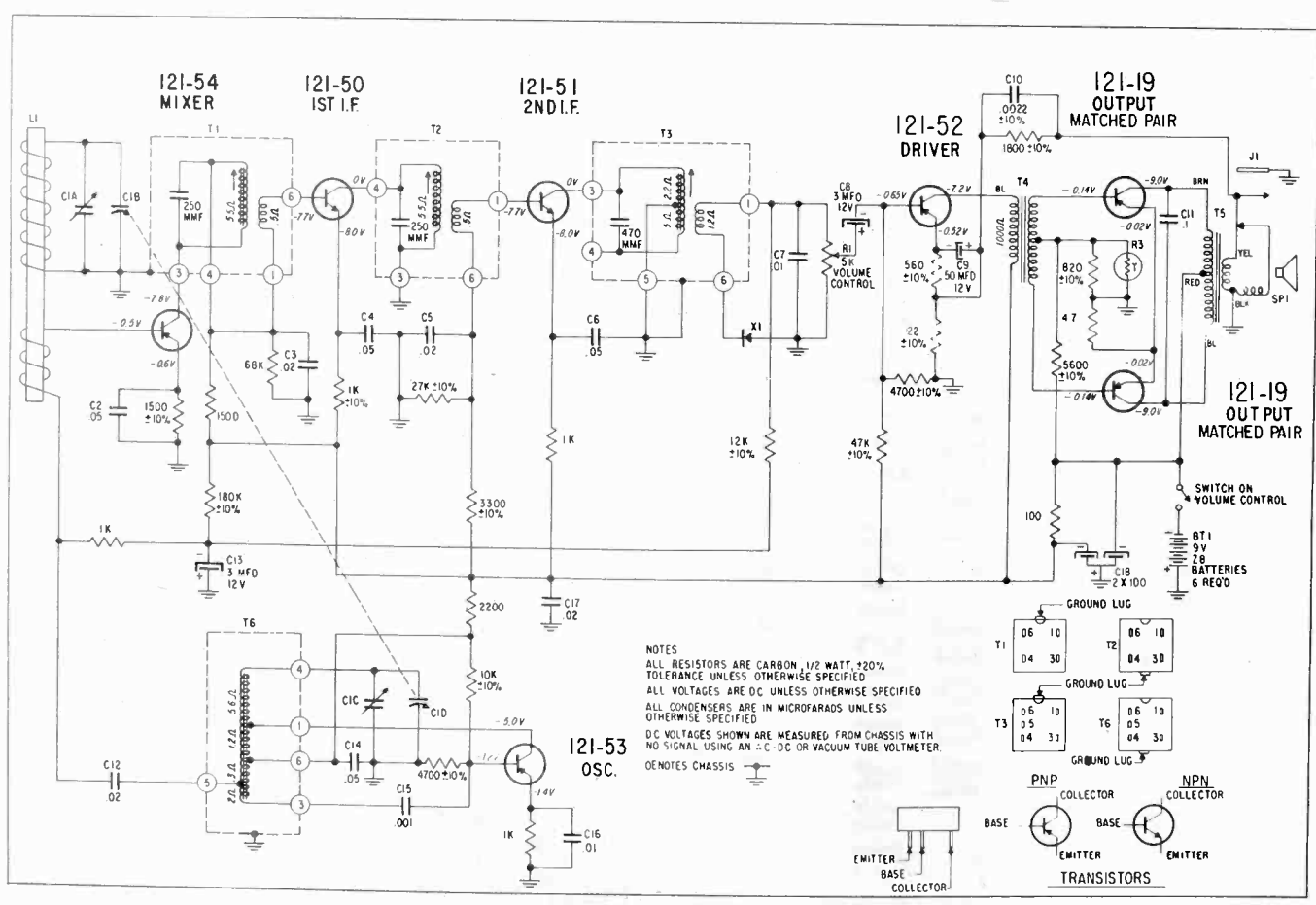
PART NO.	DIA. NO.	DESCRIPTION	PRICE
95-1576	T3	3rd I.F. transformer	3.50
95-1587	T4	Driver transformer	5.00
95-1611	T5	Audio output transformer	.75
103-101	X1	Crystal diode	.03
112-1014		6-32x5/16 phils. pan hd. mach. screw	.03
113-10		6-32x3/16x1/4 hex. hd. mach. screw - lock washer att. (5 used on 22-3069)	.03
114-26		8-18x1/4x1/4 hex. hd. self-tap screw (3 used)	.03
121-19		Transistor (output - matched pair)	5.60
121-50		Transistor (1st I.F.)	3.15
121-51		Transistor (2nd I.F.)	3.60
121-52		Transistor (driver)	3.15
121-53		Transistor (oscillator)	4.05
121-54		Transistor (mixer)	4.95
S-43693	L1	Antenna	1.75
S-43841		Housing, spring & wire assembly	4.95
S-43842		Chassis mtg. bracket	1.75

CABINET PARTS

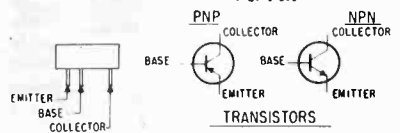
PART NO.	DIA. NO.	DESCRIPTION	PRICE
Z-9		1 1/2 volt battery	3.00
14-2406		Plastic cabinet-front - Royal 450Y	3.00
14-2407		Plastic cabinet-front - Royal 450V	3.00
14-2408		Plastic cabinet-front - Royal 450W	3.00
16-1447		Packing carton	.60
24-902		Battery cover - Royal 450Y	.35
24-903		Battery cover - Royal 450V	.35
24-904		Battery cover - Royal 450W	.35
46-1990		Tuning control knob	.50
46-1991		Volume control knob	.35
57-2498		Emblem plate	.40
59-340		Pointer	.60
83-2939		Trim strip	.03
112-1014		6-32x5/16 phils. pan hd. mach. screw	.03
112-1162		6-32x5/8 slotted pan hd. mach. screw (1 used on ea. S-43800 & S-43801)	.03
114-492		6-20x3/8 hex. hd. self-tap screw = flat washer att. (2 used on 7AT45Z1)	.03
114-625		6-20x1/4 hex. hd. self-tap screw - flat washer att. (2 used on 7AT45Z1)	.03
188-204		Knob retaining ring (used on 46-1991)	.03
188-228		Trim ring	.20
192-256		Dial crystal	.15
199-253		Sleeve (2 used on 114-493)	.10
199-256		Sleeve (2 used on 114-625)	.10
202-1363		Instruction book	6.00
S-43800		Cabinet & handle assembly (rear section) Royal 450Y	6.00
S-43974		Cabinet & handle assembly (rear section) Royal 450V	6.00
S-43976		Cabinet & handle assembly (rear section) Royal 450W	6.00

All prices shown are suggested retail prices which include Federal Manufacturers' Excise Tax where applicable and are subject to change without notice.

ZENITH RADIO CORP. 6001 Dickens Ave. Chicago 39, Ill.



NOTES  
 ALL RESISTORS ARE CARBON, 1/2 WATT, ±20% TOLERANCE UNLESS OTHERWISE SPECIFIED  
 ALL VOLTAGES ARE DC UNLESS OTHERWISE SPECIFIED  
 ALL CONDENSERS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED  
 DC VOLTAGES SHOWN ARE MEASURED FROM CHASSIS WITH NO SIGNAL USING AN A.C. DC OR VACUUM TUBE VOLTMETER.  
 ○ENOTES CHASSIS



SCHEMATIC DIAGRAM FOR 7AT45Z1



# MODEL "ROYAL 500D" ALL TRANSISTOR PORTABLE RADIO

## CHASSIS 8AT40Z2

### GENERAL

This transistor portable chassis is a conventional super-heterodyne receiver. It has an untuned R.F. stage, with an individual mixer and oscillator to produce the 455 Kc intermediate frequency. The first and second intermediate frequency amplifiers are conventional. It is necessary to use neutralization in the I.F. amplifier stages as in circuits using a triode tube. A 1N87G is used as the diode detector and AVC voltage source. This is then followed by a driver stage and a class 'B' push-pull output stage. As you can see from the chart, the chassis use matched transistor pairs in the final output stage and therefore should one transistor fail, both transistors must be replaced simultaneously as chances are they will not perform properly unless so matched.

Power Supply - Carbon Penlite Batteries 6 volts D.C. approx. life 100 hrs.

Mercury Batteries .... 5.36 volts D.C. approx. life 400 hrs.

Frequency Range ..... 540 to 1600 KC  
 Intermediate Frequency ..... 455 KC  
 Sensitivity ..... Approximately 110 microvolts/meter for 50 milliwatts output  
 Power Output Undistorted ..... 100 milliwatts  
 Power Output Maximum ..... 180 milliwatts  
 Speaker ..... 2 3/4 inch P.M.

Alnico V Voice Coil Impedance 15 ohms @ 1000 cycles  
 Accessory Earphone ... 39-22 impedance 15 ohms @ 1000 cycles.

### CHASSIS IDENTIFICATION

The "Royal 500D", eight transistor portable has been produced with one basic chassis 8AT40Z2. The first 2000 chassis were produced with 121-66 transistors used for both the 1st and 2nd I.F. amplifiers. In later production we used transistor 121-73 for the 1st I.F. amplifier and transistor 121-74 for the 2nd I.F. amplifier. Two 121-66 transistors can be used as pairs in early or late run chassis or a 121-73 for 1st I.F. and 121-74 for 2nd I.F. can be used as a pair in early or late run chassis.

Because of this each chassis has its individual transistor layout label. The color of the printing on these labels conforms respectively to the color dot on the chassis. The accompanying chart gives all the necessary information on chassis number, color dot, transistor layout labels, transistor numbers, Zenith part number, transistor supplier, etc.

### PRINTED CIRCUIT SERVICING

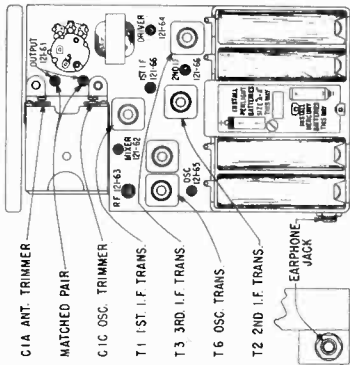
Servicing "printed" circuit sets is, in general, much the same as servicing ordinary receivers. However, certain tools and techniques are well suited for this type of work. The following items are especially useful:

1. Good pair of long-nose pliers.
  2. Sharp wire cutters.
  3. Small stiff glue brush (for solder removal)
  4. Pencil type soldering iron with a small tip (25 watts or less)
- WARNING: Excessive heat may damage the "printed" circuit during component replacement if a soldering pencil, iron or gun of higher wattage rating is used.
5. Tin leads on component before soldering.
  6. Use only EUTECTIC solder 63% tin 37% lead. This solder has an extremely low melting point.
  7. Metal pick (soldering aid).

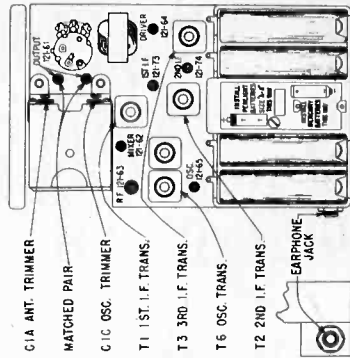
### COMPONENT REPLACEMENT:

Resistors and capacitors should be replaced by clipping out the defective part and neatly soldering in the new part. If a unit, such as the oscillator coil or IF transformer, is to be removed heat the mounting lugs with a pencil type soldering iron and move them away from the soldered connection with a long-nose pliers or metal pick. Continue heating the lugs and brush away the molten solder with a small stiff glue brush. Remove the defective unit by lifting it off the chassis. Before inserting the new unit, be certain that the lug holes are open and free from solder. Forcing a lug against a solder filled lug hole may break the bond between the chassis base and the "printed" wiring. It is, therefore, necessary to exercise care when replacing units.

An open or damaged section of "printed" circuit wiring can be replaced by soldering a short jumper wire across the points to be connected.



TRANSISTOR & TRIMMER LAYOUT FOR CHASSIS 8AT40Z2 USING 121-66 TRANSISTORS IN BOTH 1ST AND 2ND I.F.



TRANSISTOR & TRIMMER LAYOUT FOR CHASSIS 8AT40Z2 USING 121-73 TRANSISTOR IN 1ST I.F. AND 121-74 TRANSISTOR IN 2ND I.F.

### ALIGNMENT PROCEDURE

Operation	Input Signal Frequency	Connect Inner Conductor From Oscillator To	Connect Outer Shield Conductor From Oscillator To	Set Dial At	Trimmers	Purpose
1	455 KC	ONE TURN	Chassis	600 KC	Adj. T1, T2, T3 for maximum output.	For I.F. Alignment
2	1620 KC	LOOSELY COUPLED TO	—	Gang wide open.	C1C	Set Oscillator to dial scale.
3	535 KC	TO	—	Gang	Adjust slug in T6	Set Oscillator to dial scale.
4	REPEAT STEPS 2 & 3	WAVEMAGNET	—	—	—	—
5	1260 KC	—	—	1260 KC	C1A	Align loop ant.

Chassis	Chassis Color Dot	Transistor Layout Color	Part No.	R.F. Mixer	Osc.	1st I.F.	2nd I.F.	Crystal Diode Detector	Driver	Output-Output	Supplier
8AT40Z2	Red	Red 102-3762	Zenith Type	121-63 PNP	121-62 PNP	121-65 PNP	121-74 PNP	103-19 IN87G	121-64 PNP	Matched Pair PNP	R.C.A.
8AT40Z2	Black	Black 102-3488	Zenith Type	121-63 PNP	121-62 PNP	121-65 PNP	121-66 PNP	103-19 IN87G	121-64 PNP	Matched Pair PNP	R.C.A.



CHASSIS PARTS  
Chassis 8AT40Z2

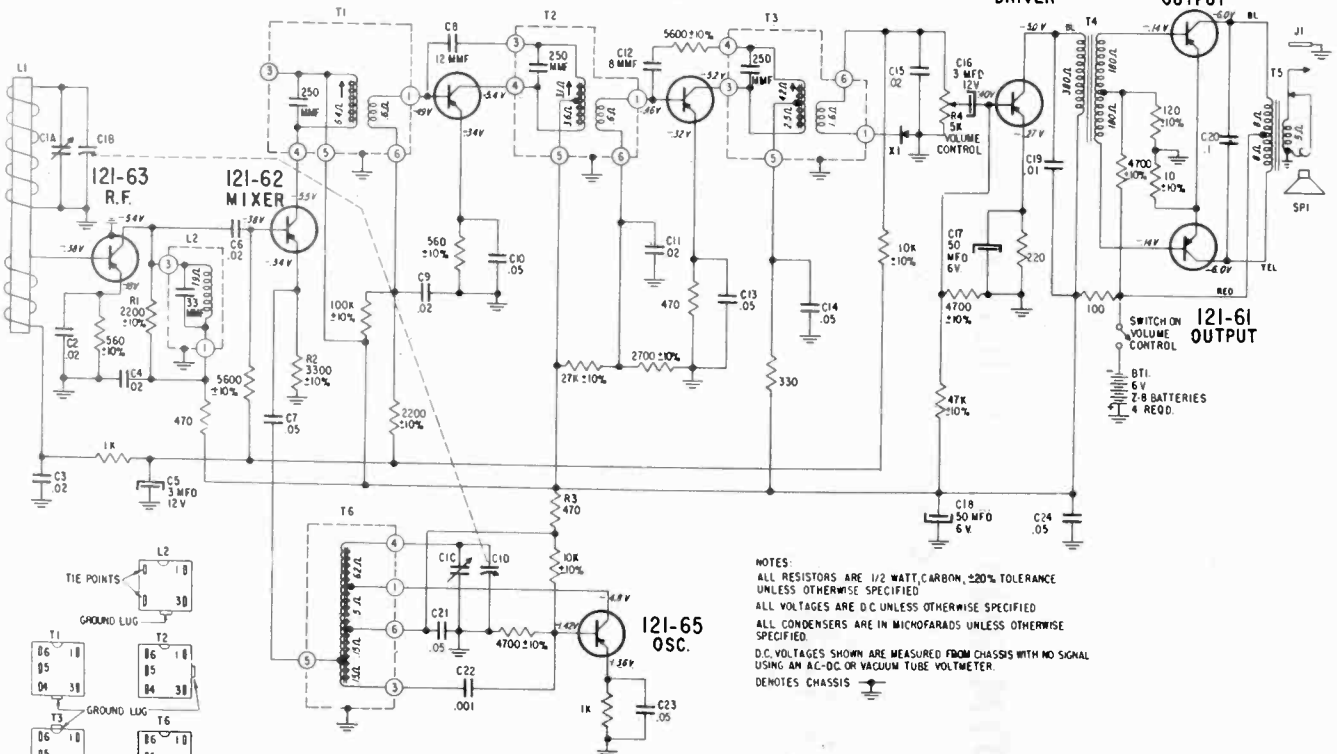
PART NO.	DIA. NO.	DESCRIPTION	PRICE	PART NO.	DIA. NO.	DESCRIPTION	PRICE
12-2364		Variable Capacitor Mounting Bracket	.10	112-1016		6-32 x 1/4 Brnd. Hd. Mach. Screw (used on 49-840)	.02
22-2481 C12		8 Mmf. Ceramic Disc - 500V	.25	112-1048		2-56 x 1/4 Brnd. Hd. Mach. Screw (2 mt. 2, 80-1076)	.02
22-2726 C17,18		50 Mfd. Electrolytic - 6V (2 used)	1.50	113-6		4-40 x 3/16 Rd. Mach. Screw - lockwasher att. (used on S-40123)	.02
22-2728 C10,13,		.05 Mfd. Ceramic Disc - 25V (4 used)	.60	113-69		4-40 x 5/32 Hex. Hd. Mach. Screw - lockwasher att. (2 used on 22-3011)	.03
14,24				S-40123 L1		Antenna Housing & Spring Assembly	1.75
22-2729 C22		.001 Mfd. Ceramic Disc - 25V	.25				
22-2884 C5,16		3 Mfd. Electrolytic - 12V (2 used)	1.50				
22-2885 C4,11,		.02 Mfd. Ceramic Disc - 25V (3 used)	.35				
15			.45				
22-2998 C20		.1 Mfd. Mylar - 50V 20%	.35				
22-3010 C19		.01 Mfd. Ceramic Disc - 25V	.45				
22-3011		Variable Capacitor (2 section)	4.25				
22-3033 C2,3,		.02 Mfd. Ceramic Disc - 25V (4 used)	.30				
6,9							
22-3034 C7,23,		.05 Mfd. Ceramic Disc - 25V (3 used)	.45				
21			.25				
22-3035 C8		12 Mmf. Ceramic Disc - 500V	.90				
44-34 J1		Miniature Jack	6.00				
49-840 SP1		2 3/4" PM Speaker	.03				
54-74		2-56 x 3/16 Hex Nut (1 used on ea. 112-1048)	.10				
54-417		1/4-32 x 3/8 Hex Nut - Brass (1 mts. ea. 44-34 & 63-3693)	.15				
57-2214		Battery Instruction Plate	.17				
63-1701		10 Ohm 1/2W Ins. 10%	.17				
63-1744		100 Ohm 1/2W Ins. 20%	.17				
63-1747		120 Ohm 1/2W Ins. 10%	.17				
63-1758		220 Ohm 1/2W Ins. 20%	.17				
63-1765		330 Ohm 1/2W Ins. 20%	.17				
63-1772		470 Ohm 1/2W Ins. 10% (2 used)	.17				
63-1775		560 Ohm 1/2W Ins. 10% (2 used)	.17				
63-1786		1000 Ohm 1/2W Ins. 20% (2 used)	.17				
63-1803		2700 Ohm 1/2W Ins. 10%	.17				
63-1813		4700 Ohm 1/2W Ins. 10% (3 used)	.17				
63-1817		5600 Ohm 1/2W Ins. 10% (2 used)	.17				
63-1827		10 K Ohm 1/2W Ins. 10% (2 used)	.17				
63-1845		27 K Ohm 1/2W Ins. 10%	.17				
63-1855		47 K Ohm 1/2W Ins. 10%	.17				
63-1869		100 K Ohm 1/2W Ins. 10%	.17				
63-1884		220 K Ohm 1/2W Ins. 20%	.17				
63-3693 R4		Vol. Control & Switch	2.05				
63-3772 R3		470 Ohm 1/3W Ins. 20%	.17				
63-3799 R1		2200 Ohm 1/3W Ins. 10%	.17				
63-3806 R2		3300 Ohm 1/3W Ins. 10%	.17				
78-1067		3 Contact Socket (7 used)	.50				
78-1103		4 Contact Socket	.50				
80-1075		Battery Contact Spring (4 part of S-43019)	.15				
80-1076		Battery Contact Spring (2 part of & 2 used on S-43019)	.15				
83-2489		Rubber Strip	.02				
83-2515		Polyethylene Strip	.05				
86-302		Insertion Terminal (2 used)	.02				
9-3-1270		.095 x 1/4 x 1/32 Bakelite Washer (1 used with ea. 112-1048)	.01				
95-1518 T4		Driver Transformer	5.00				
95-1519 T5		Audio Output Transformer	3.50				
95-1583 L2		R.F. Transformer					
95-1584 T2		2nd I.F. Transformer					
95-1585 T1		1st I.F. Transformer					
95-1586 T3		3rd I.F. Transformer					
95-1589 T6		Oscillator Transformer					
103-19		Crystal Diode	.75				

121-66  
1ST I.F.  
121-73  
1ST I.F.

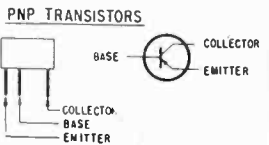
121-66  
2ND I.F.  
121-74  
2ND I.F.

121-64  
DRIVER

121-61  
OUTPUT



NOTES:  
ALL RESISTORS ARE 1/2 WATT, CARBON, ±20% TOLERANCE UNLESS OTHERWISE SPECIFIED  
ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED  
ALL CONDENSERS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED  
D.C. VOLTAGES SHOWN ARE MEASURED FROM CHASSIS WITH NO SIGNAL USING AN AC-DC OR VACUUM TUBE VOLTMETER.  
DENOTES CHASSIS



**SCHEMATIC DIAGRAM FOR 8AT40Z2**



## MODEL "ROYAL 700L" ALL TRANSISTOR PORTABLE RADIO CHASSIS 7AT43 & 7AT43Z3

### GENERAL

The "Royal 700L" transistor portable using chassis 7AT43 & 7AT43Z3 is a conventional superheterodyne receiver using an individual mixer and oscillator to produce the 455 Kc intermediate frequency. The first and second intermediate frequency amplifiers are conventional. It is necessary to use neutralization in the I.F. amplifier stages as in circuits using a triode tube. A 1N87G germanium diode is used as the diode detector and AVC voltage source. This is then followed by a driver stage and a class "B", push-pull output stage.

- Power Supply..... Six Zenith type Z-7 1 1/2 volt batteries or six type "C", 1 1/2 volt dry cells
- Frequency Range..... 540 to 1600 KC
- Intermediate Frequency..... 455 KC
- Sensitivity..... 50 microwatts/meter for approximately 250 microvolts output
- Power Output Undistorted..... 275 milliwatts
- Power Output Maximum..... 400 milliwatts
- Speaker..... 4 inch P.M.
- Antico V Voice Coil Impedance 3.2 ohms @ 400 cycles
- Accessory Earphone..... 39-22 impedance 15 ohms @ 1000 cycles

### CHASSIS IDENTIFICATION

The "Royal 700L" seven transistor portable has been produced with two basic chassis. Chassis 7AT43 uses transistors manufactured by Sylvania. Chassis 7AT43Z3 uses all Sylvania transistors except the two output transistors which are manufactured by R.C.A.

Each receiver has its individual transistor layout label. The color of the printing on the 7AT43 layout label is Red, the color of the printing on the 7AT43Z3 is Green. The accompanying chart gives all the necessary information on chassis number, color of transistor layout labels, transistor numbers, Zenith part number, RETWA part number (where available) transistor supplier, etc.

### PRINTED CIRCUIT SERVICING

Servicing "printed" circuit sets is, in general, much the same as servicing ordinary receivers. However, certain tools and techniques are well suited for this type of work. The following items are especially useful:

1. Good pair of long-nose pliers.
2. Sharp wire cutters.
3. Small stiff blue brush (for solder removal).
4. Pencil type soldering iron with a small tip (25 watts or less.)

- WARNING: Excessive heat may damage the "printed" circuit during component replacement if a soldering pencil, iron or gun of higher wattage rating is used.
5. Tin leads on component before soldering.
  6. Use only EUTECTIC solder 63% tin 37% lead.
  7. This solder has an extremely low melting point.
  7. Metal pick (soldering aid).

### COMPONENT REPLACEMENT

Resistors, capacitors and integnets should be replaced by clipping out the defective part and neatly soldering in the new part. If a unit, such as the oscillator coil or IF transformer, is to be removed heat the mounting lugs with a pencil type soldering iron and move them away from the soldered connection with a long-nose pliers or metal pick. Continue heating the lugs and brush away the molten solder with a small stiff glue brush. Remove the defective unit by lifting it off the chassis. Before inserting the new unit, be certain that the lug holes are open and free from solder. Forcing a lug against a solder filled lug hole may break the bond between the chassis base and the "printed" wiring. It is, therefore, necessary to exercise care when replacing units.

An open or damaged section "printed" circuit wiring can be replaced by soldering a short jumper wire across the points to be connected.

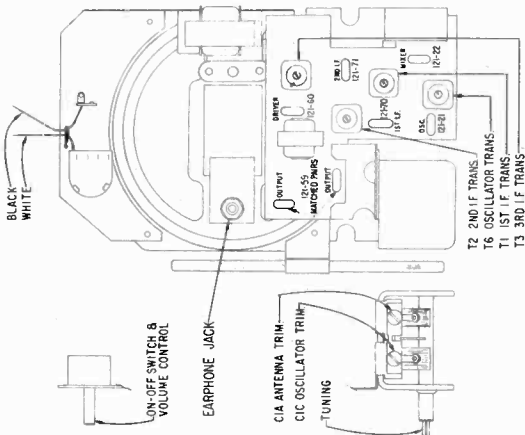
### RESISTANCE MEASUREMENTS

When making resistance measurements in the circuit, it is most important to remove the transistors in the circuit under test otherwise readings obtained will be incorrect. This is the direct result of a transistor acting as a diode.

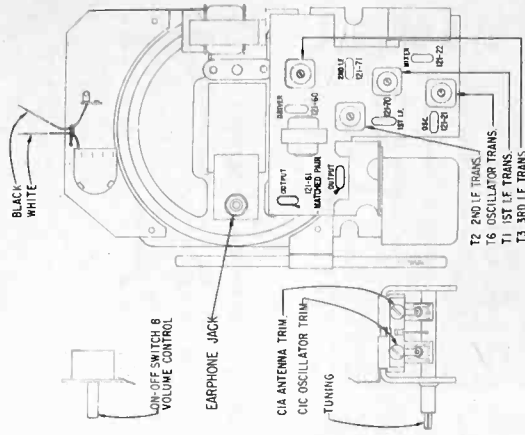
In addition to this, it is important to know the internal battery voltage of the ohm meter as well as battery polarity of the meter leads since incorrectly placing ohm meter leads across an electrolytic condenser with low working voltage may damage the capacitor due to excessive reverse current or excessive voltage.

### VOLTAGE READINGS

It is suggested that a VTVM with an excellent low range scale be used to measure all circuit voltages. All voltages indicated on the accompanying diagram have been measured under no signal conditions and a battery supply voltage of nine volts. Under these no signal conditions, a check can be made of the batteries. The total voltage should be nine volts.



TRANSISTOR & TRIMMER LAYOUT FOR 7AT43

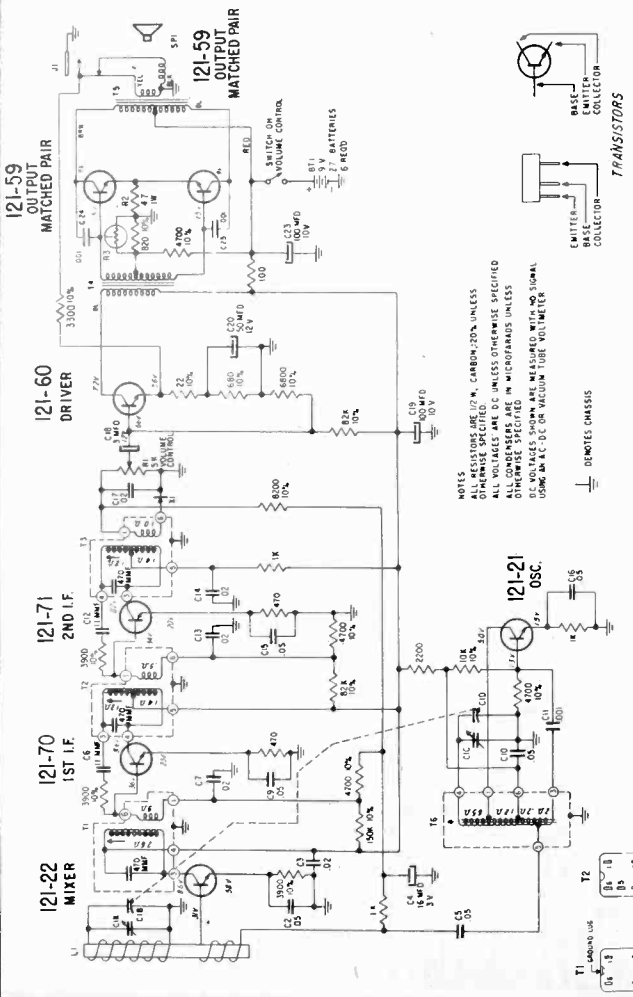


TRANSISTOR & TRIMMER LAYOUT FOR 7AT43Z3

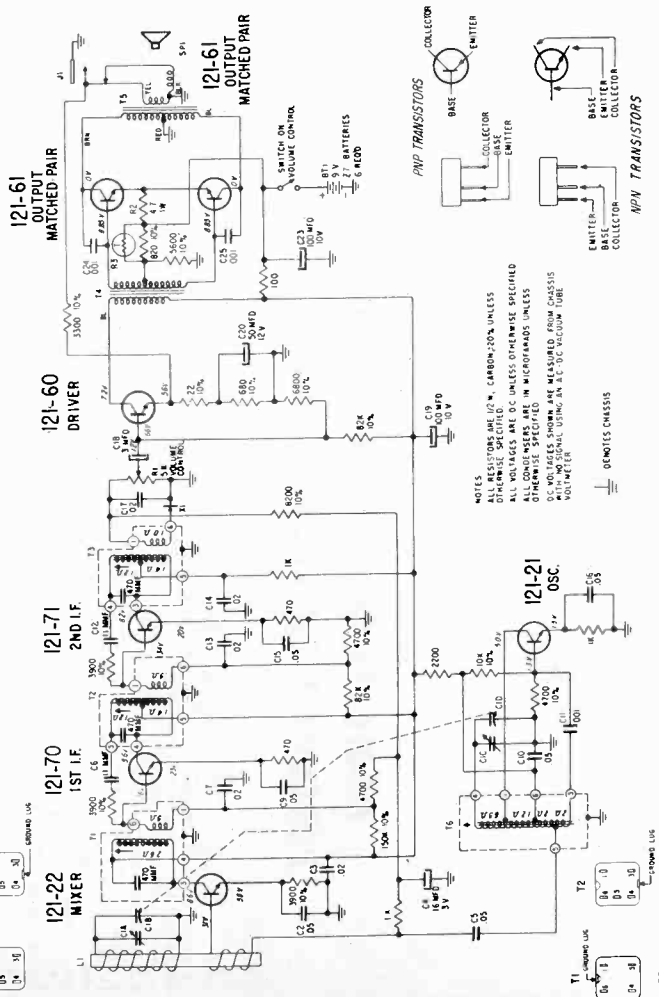
## ALIGNMENT PROCEDURE

Operation	Input Signal Frequency	Connect Inner Conductor From Oscillator To	Connect Outer Shield Conductor From Oscillator To	Set Dial At	Trimmers	Purpose
1	455 KC	ONE TURN	Chassis	600 KC	Adj. T1, T2, T3 for maximum output.	For I.F. Alignment
2	1620 KC	LOOSELY COUPLED TO	---	Gang wide open.	C1C	Set Oscillator to dial scale.
3	535 KC	TO	---	Gang	Adjust slug in T6	Set Oscillator to dial scale.
4	REPEAT STEPS 2 & 3	---	---	---	---	---
5	1260 KC	WAVEMAGNET	---	1260 KC	C1A	Align loop ant.

Chassis	Chassis Color Dot	Transistor Layout Label Color	Part No.	Mixer	Osc.	1st I.F.	2nd I.F.	Crystal Diode Detector	Driver	Output-Output	Supplier
7AT43	Red	Red 102-3499	Zenith RETMA Type	121-22 2N194 NPN	121-21 2N193 NPN	121-70 NPN	121-71 NPN	103-19 1N87G	121-60 NPN	Matched Pair NPN	Sylvania
7AT43Z3	Green	Green 102-3761	Zenith RETMA Type	121-22 2N194 NPN	121-21 2N193 NPN	121-70 PNP	121-71 NPN	103-19 1N87G	121-60 NPN	Matched Pair PNP	All transistors are Sylvania except 121-61 which is R.C.A.



**SCHEMATIC DIAGRAM FOR 7AT43**



**SCHEMATIC DIAGRAM FOR 7AT43Z3**

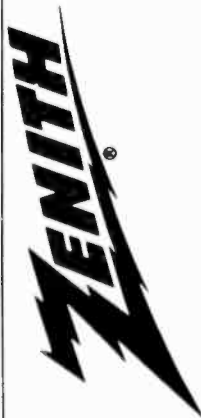
CHASSIS PARTS		CHASSIS PARTS	
Chassis 7AT43		Chassis 7AT43	
PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
12-2505	Chassis Mounting Bracket	114-49	49-839 & 1 Mt. ea. 12-2577 & 17-151)
12-2512	Antenna Mounting Bracket	114-50	6-32 x 5/8 x 1/4 Hex Hd. Mach. Screw
12-2577	Antenna Shield Bracket	121-21	(used on 49-839)
17-151	Cable Clamp (2 used)	121-22	Transistor (Osc.)
22-14	.0047 Mfd. Ceramic Disc - 1 K V	121-59	Transistor (Mixer)
22-2617	.001 Mfd. Ceramic Disc - 500V (2 used)	121-60	Transistor (Output) matched pair
22-2729	.001 Mfd. Ceramic Disc - 25V (6 used)	121-60	Transistor (Driver)
22-2871	16 Mfd. Electrolytic - 3V	121-70	Transistor (1st I.F.)
22-2883	50 Mfd. Electrolytic - 12V	121-71	Transistor (2nd I.F.)
22-2884	3 Mfd. Electrolytic - 12V	125-47	Rubber Grommet (used on 114-49)
22-2885	.02 Mfd. Ceramic Disc - 25V (5 used)	S-42779	Vol. Control Mfg. Bracket Assembly
22-2940	.047 Mfd. Paper - 100V (2 used)	S-42781	Antenna Assembly
22-3013	2 Section Variable Capacitor	S-43010	Contact Spring & Strip Assembly
22-3023	100 Mfd. Electrolytic - 10V (2 used)		
44-34	Battery Cover		
49-839	Miniature Jack		
54-347	4" PM Speaker		
54-417	6-32 "KEPS" Nut (used on 114-49)		
	1/4-32 x 3/8 Hex Nut - Brass (Mts. 44-34)		

CABINET PARTS		CABINET PARTS	
2-7	Type C Dry Cell Battery - 1.1/2V (use 6)	2-7	Type C Dry Cell Battery - 1.1/2V (use 6)
14-2327	Portable Cabinet (Leather)	14-2327	Portable Cabinet (Leather)
16-1406	Packing Carton	16-1406	Packing Carton
46-1671	Tuning Knob	46-1671	Tuning Knob
46-1673	Volume Control Knob	46-1673	Volume Control Knob
54-417	1/4-32 x 3/8 Brass Hex Nut (used on 83-2889)	54-417	1/4-32 x 3/8 Brass Hex Nut (used on 83-2889)
54-450	Thread Forming Palnut (6 Mt. 57-2446)	54-450	Thread Forming Palnut (6 Mt. 57-2446)
57-1725	Emblem Plate	57-1725	Emblem Plate
57-2446	Escutcheon	57-2446	Escutcheon
83-2889	Chassis Cover Strip	83-2889	Chassis Cover Strip
102-3473	Label (Battery Instruction) 3 used	102-3473	Label (Battery Instruction) 3 used
110-311	Grille Cloth	110-311	Grille Cloth
112-901	6-20 x 3/8 Philips. Rd. Hd. Self-tap Screw (4 Mt. 7AT43)	112-901	6-20 x 3/8 Philips. Rd. Hd. Self-tap Screw (4 Mt. 7AT43)
114-248	6-20 x 5/16 x 1/4 Hex Hd. Self-tap Screw (2 join S-42785 & 42991)	114-248	6-20 x 5/16 x 1/4 Hex Hd. Self-tap Screw (2 join S-42785 & 42991)
188-204	Knob Clamping Ring (used on 46-1673)	188-204	Knob Clamping Ring (used on 46-1673)
189-209	Knob Clamping Ring (part of S-42733)	189-209	Knob Clamping Ring (part of S-42733)
202-1330	Instruction Book	202-1330	Instruction Book
S-42733	Knob & Ring Assembly (dial knob)	S-42733	Knob & Ring Assembly (dial knob)
S-42785	Battery Housing Assembly	S-42785	Battery Housing Assembly
S-42991	Battery Cover & Spring Assembly	S-42991	Battery Cover & Spring Assembly

PARTS USED ON CHASSIS 7AT43Z3 ONLY	
12-2507	Transformer Mtg. Bracket (part of 49-839)
63-1806	3300 Ohm 1/2W Ins. 10%
63-1817	5600 Ohm 1/2W Ins. 10%
S-43589	Chassis Mtg. Bracket
83-2919	Vol. Control Cover Strip
159-86	Trimount Stud

NOTES:  
 ALL RESISTORS ARE 1/4" CARBON-20% UNLESS OTHERWISE SPECIFIED.  
 ALL VOLTAGES ARE DC UNLESS OTHERWISE SPECIFIED.  
 ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.  
 DC VOLTAGES SHOWN ARE MEASURED WITH NO SIGNAL USING AN A.C. OR VACUUM TUBE VOLTMETER.

NOTES:  
 ALL RESISTORS ARE 1/4" CARBON-20% UNLESS OTHERWISE SPECIFIED.  
 ALL VOLTAGES ARE DC UNLESS OTHERWISE SPECIFIED.  
 ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.  
 DC VOLTAGES SHOWN ARE MEASURED FROM CHASSIS WITH NO SIGNAL USING AN A.C. OR VACUUM TUBE VOLTMETER.

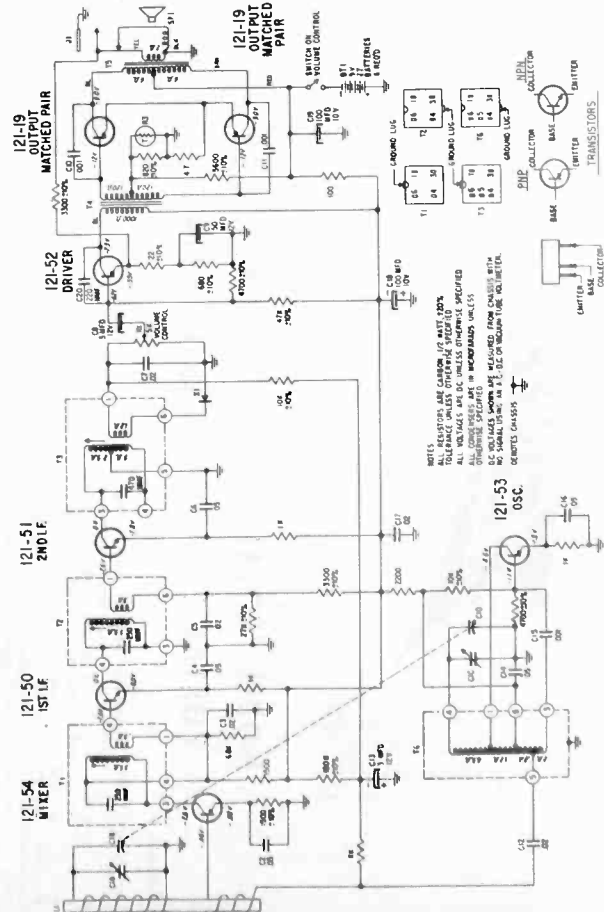


# SUPPLEMENTARY

## MODEL "ROYAL 700L" ALL TRANSISTOR PORTABLE RADIO CHASSIS 7AT43Z1

NOTE: FOR GENERAL INFORMATION AND CABINET PARTS LIST, REFER TO PREVIOUS ROYAL 700L SERVICE MANUAL

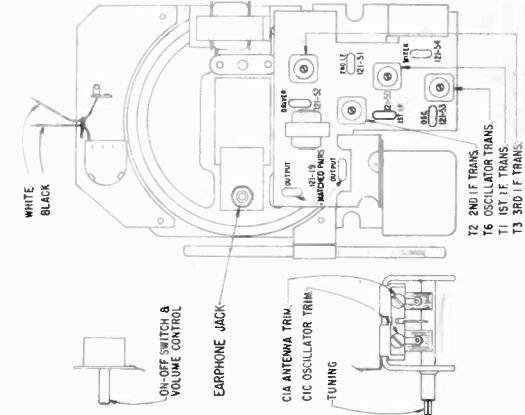
Chassis Color	Chassis Label	Transistor Layout Label Color	Part No.	Mixer	Osc.	1st I.F. 2nd I.F.	Crystal Diode Detector	Driver	Output-Output	Supplier
Blue	7AT43Z1	Blue 102-3766	Zenith RETMA Type	121-54 2N252 PNP	121-53 PNP	121-50 NPN 121-51 NPN	103-19 1N87G	121-52 PNP	121-19 Matched Pair PNP	Texas Instrument



SCHEMATIC DIAGRAM FOR 7AT43Z1

### ALIGNMENT PROCEDURE

Operation	Input Signal Frequency	Connect Inncr Conductor From Oscillator To	Connect Outer Shield Conductor From Oscillator To	Set Dial At	Trimmers	Purpose
1	455 KC	ONE TURN	Chassis	600 KC	Adj. T1, T2, T3 for maximum output.	For I.F. Alignment
2	1620 KC	LOOSELY COUPLED TO WAVE MAGNET			C1C	Set Oscillator to dial scale.
3	535 KC				Adjust slug in T0	Set Oscillator to dial scale.
4	REPEAT STEPS 2 & 3					
5	1260 KC			1260 KC	C1A	Align loop ant.



TRANSISTOR & TRIMMER LAYOUT FOR 7AT43Z1

PART NO.	DESCRIPTION	DIA. NO.	PRICE
24-890	Battery Cover		.25
44-34	Miniature Jack	I1	.90
49-839	4" PM Speaker	SP1	5.00
54-347	6-32 "KEPS" Nut (used on 114-49)		.05
54-417	1/4-32x3/8 Hex. Nut - Brass (Mts. 44-34)		.10
63-1715	22 Ohm 1/2 W Ins. - 10%		.17
63-1744	100 Ohm 1/2 W Ins. - 20%		.17
63-1778	680 Ohm 1/2 W Ins. - 10%		.17
63-1782	820 Ohm 1/2 W Ins. - 10%		.17
63-1786	1000 Ohm 1/2 W Ins. 20% (3 used)		.17
63-1792	1500 Ohm 1/2 W Ins. 10%		.17
63-1793	1500 Ohm 1/2 W Ins. 20%		.17
63-1800	2200 Ohm 1/2 W Ins. 20%		.17
63-1806	3300 Ohm 1/2 W Ins. 10%		.17
63-1813	4700 Ohm 1/2 W Ins. 10% (4 used)		.17
63-1817	5600 Ohm 1/2 W Ins. 10%		.17
63-1827	10 K Ohm 1/2 W Ins. 10%		.17
63-1845	27 K Ohm 1/2 W Ins. 10%		.17
63-1855	47 K Ohm 1/2 W Ins. 10%		.17
63-1863	68 K Ohm 1/2 W Ins. 20%		.17
63-1880	180 K Ohm 1/2 W Ins. 10%		.17
63-3663	Thermistor		1.10
63-3665	4-7 Ohm 1 W Ins. 20%	R3	.25
63-4035	Volume Control & Switch	R1	2.05
63-4094	3 Contact Socket (7 used)		2.05
78-1067	Miniature 1 Lug Terminal Strip (part of S-42776)		.30
83-2697	Spacer Bushing (used on 114-49)		.05
94-295	Osc. Transformer	T6	2.00
95-1513	1st I.F. Transformer	T1	3.50
95-1514	2nd I.F. Transformer	T2	3.50
95-1515	3rd I.F. Transformer	T3	3.50
95-1576	Driver Transformer	T4	5.00
95-1587	Driver Transformer	T5	5.00
95-1588	Audio Output Transformer	T5	4.25
103-19	Crystal Diode		4.75
113-10	6-32x3/16x1/4 Hex. Hd. Mach. Screw (3 Mt. 22-3013)		.02
114-26	8-18x1/4x1/4 Hex. Hd. Self-Tap. Screw (3 Mt. 12-2505, 1 used on S-42781, 4 Mt 49-839 & 1 Mts. ea. 12-2577 & 17-151)		.01
114-49	6-32x5/8x1/4 Hex. Hd. Mach. Screw (used on 49-839)		.01
121-19	Transistor - Output - Matched Pair		5.60
121-50	Transistor - 1st I.F.		3.15
121-51	Transistor - 2nd I.F.		3.60
121-52	Transistor - Driver		3.15
121-53	Transistor - Osc.		4.05
121-54	Transistor - Mixer		4.05
121-57	Rubber Grommet (used on 114-49)		.03
125-47	Volume Control Mtg. Bracket Assembly		.20
S-43589	Chassis Mtg. Bracket		.50
S-43632	Antenna		
S-43703	Contact Spring & Strip Assembly (used on 24-890)		.75

CHASSIS 7AT43Z1, Supplementary



## MODEL "ROYAL 750L" ALL TRANSISTOR PORTABLE RADIO CHASSIS 8AT41Z2

### GENERAL

The "Royal 750L" transistor portable using chassis 8AT41Z2 is a conventional superheterodyne receiver with a tuned R.F. amplifier. It uses an individual mixer and oscillator to produce the 455 Kc intermediate frequency. The first and second intermediate frequency amplifiers are conventional. It is necessary to use neutralization in the I.F. amplifier stages as in circuits using a triode tube. A 1N87G germanium diode is used as the diode detector and AVC voltage source. This is then followed by a driver stage and a class "B" push-pull output stage.

Power Supply..... Six Zenith type Z-7 1 1/2 volt batteries or six type "C" 1 1/2 volt dry cells  
 Frequency Range..... 540 to 1600 KC  
 Intermediate Frequency..... 455 KC  
 Sensitivity..... Approximately 95 microvolts/meter for 50 milliwatts output  
 Power Output Undistorted..... 250 milliwatts  
 Power Output Maximum..... 450 milliwatts  
 Speaker..... 4 inch P.M.  
 A.M. V Voice Coil Impedance 3.2 ohms at 400 cycles  
 Accessory Earphone..... B39-24 impedance 15 ohms at 1000 cycles

### CHASSIS IDENTIFICATION

The "Royal 750L" eight transistor portable has been produced with one basic chassis. Chassis 8AT41Z2 uses transistors manufactured by R.C.A.

The accompanying chart gives all the necessary information on chassis number, color of transistor layout labels, transistor numbers, Zenith part number, RETMA part number (where available) transistor supplier, etc.

### PRINTED CIRCUIT SERVICING

Servicing "printed" circuit sets is, in general, much the same as servicing ordinary receivers. However, certain tools and techniques are well suited for this type of work. The following items are especially useful:

1. Sharp pair of long-nose pliers.
2. Sharp wire cutters.
3. Small stiff glue brush (for solder removal).
4. Pencil type soldering iron with a small tip (25 watts or less.)

WARNING: Excessive heat may damage the "printed"

circuit during component replacement if a soldering pencil, iron or gun of higher wattage rating is used.

5. Tin leads on component before soldering.
6. Use only EUTECTIC solder 63% tin, 37% lead. This solder has an extremely low melting point.
7. Metal pick (soldering aid).

### COMPONENT REPLACEMENT

Resistors and capacitors should be replaced by clipping out the defective part and neatly soldering in the new part. If a unit, such as the oscillator coil or I.F. transformer, is to be removed heat the mounting lugs with a pencil type soldering iron and move them away from the soldered connection with a long-nose pliers or metal pick. Continue heating the lugs and brush away the molten solder with a small stiff glue brush. Remove the defective unit by lifting it off the chassis. Before inserting the new unit, be certain that the lug holes are open and free from solder. Forcing a lug against a solder filled lug hole may break the bond between the chassis base and the "printed" wiring. It is, therefore, necessary to exercise care when replacing units.

An open or damaged section "printed" circuit wiring can be replaced by soldering a short jumper wire across the points to be connected.

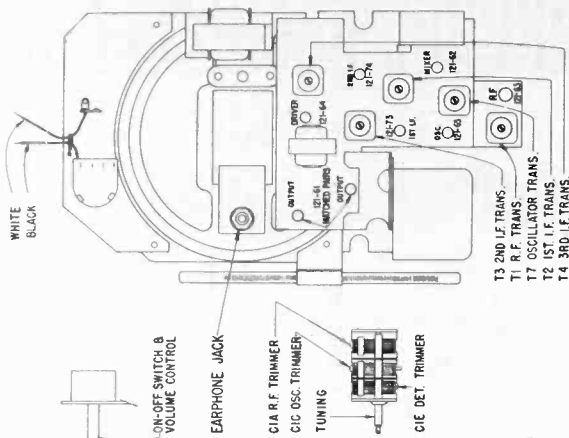
### RESISTANCE MEASUREMENTS

When making resistance measurements in the circuit it is most important to remove the transistors in the circuit under test otherwise readings obtained will be incorrect. This is the direct result of a transistor acting as a diode.

In addition to this, it is important to know the internal battery voltage of the ohm meter as well as battery polarity of the meter leads since incorrectly placing ohm meter leads across an electrolytic condenser with low working voltage may damage the capacitor due to excessive reverse current or excessive voltage.

### VOLTAGE READINGS

It is suggested that a VTVM with an excellent low range scale be used to measure all circuit voltages. All voltages indicated on the accompanying diagram have been measured under no signal conditions and a battery supply voltage of nine volts. Under these no signal conditions, a check can be made of the batteries. The total voltage should be nine volts.



TRANSISTOR & TRIMMER LAYOUT FOR 8AT41Z2

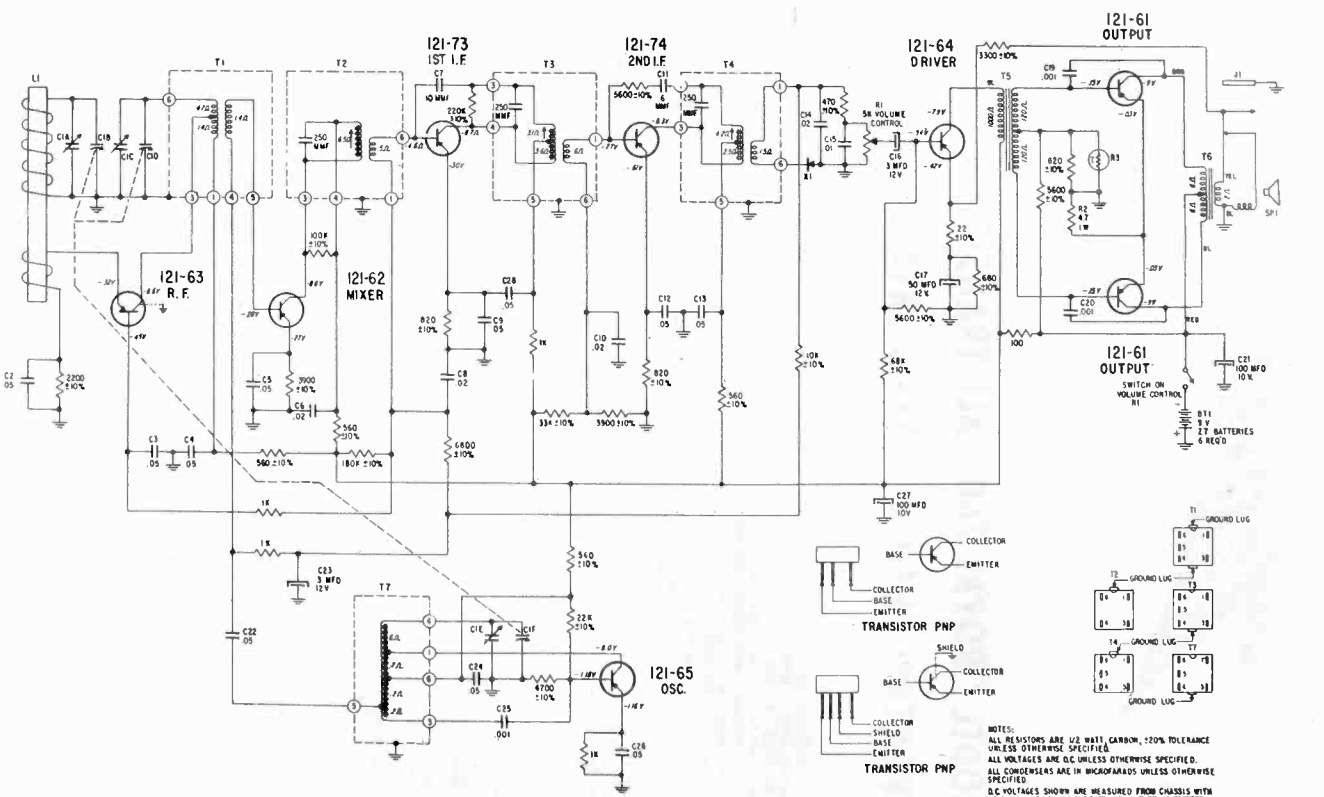
### ALIGNMENT PROCEDURE

Operation	Input Signal Frequency	Connect Inner Conductor From Oscillator To	Connect Outer Shield Conductor From Oscillator To	Set Dial At	Trimmers	Purpose
1	455 KC	ONE TURN	CHASSIS	600 KC	Adj. T1, T2, T3 for maximum output.	For I.F. Alignment
2	1620 KC	LOOSELY COUPLED TO	—	Gang wide open.	C1C	Set Oscillator to dial scale.
3	535 KC	TO	—	Gang closed	Adjust slug in T6	Set Oscillator to dial scale.
4	REPEAT STEPS 2 & 3	WAVEMAGNET	—	—	—	—
5	1260 KC	—	—	1260 KC	C1A	Align loop ant.

Chassis	Chassis Color Dot	Transistor Layout Label Color	Part No.	R.F.	Mixer	Osc.	1st I.F.	2nd I.F.	Crystal Diode Detector	Driver	Output-Output	Supplier
8AT41Z2	Black	Black 102-3497	Zenith Type	PNP	PNP	PNP	121-73	121-74	103-19 1N87G	121-64 PNP	121-61 Matched Pair PNP	R.C.A.

CHASSIS PARTS			CHASSIS PARTS			CABINET PARTS		
PART NO.	DESCRIPTION	PRICE	PART NO.	DESCRIPTION	PRICE	PART NO.	DESCRIPTION	PRICE
95-1594	1st I.F. Transformer	.10	12-2506	Chassis Support Bracket	.10	24-890	Battery Cover	.25
95-1595	2nd I.F. Transformer	.10	12-2507	Transformer Mtg. Bracket	.10	44-34	Miniature Jack	.50
95-1596	R.F. Transformer (used on S-43309)	.15	12-2577	Antenna Shield Bracket	.15	49-839	4" Pk. Speaker	5.00
95-1597	Driver Transformer	.75	17-151	Cable Clamp (2 used on S-43160)	.10	54-347	4" Pk. SPEPS Nut (used with 114-49)	.05
103-19	Crystal Diode	.02	22-17	6 Mmf. Ceramic Disc - 1KV (2 used)	.25	54-417	1/4-32x3/8 Hex. Nut	.10
113-10	Screw - lockwasher att. (3 Mt. 22-3044)	.02	C11	6 Mmf. Ceramic Disc	.25	54-450	Thread Forming Palnut (6 used on 57-2497)	.02
			C2,3,4	.05 Mfd. Ceramic Disc	.25	57-1725	Escutcheon	.25
			5,9,12	(11 used)		57-2497	Retaining Spring (2 part of S-42785)	.10
			24,26,			80-1093	Chassis Cover Strip	.10
			28			83-2892	Volume Control Cover Strip	.10
						83-2919	Emblem Cushioning Strip	.03
						83-2929	Battery Case Pull-out Strip	.20
						83-2955	Grille Cloth	.01
						110-311	6-20x5/16 Phails. Pan Hd. Self-tap Screw (4 used on 8AT41Z2)	.03
						112-1165	6-20x5/16x1/4 Hex. Hd. Self-tap Screw (2 join S-42785 & S-43744)	.01
						114-248	Rubber Bumper (2 used)	.02
						166-109	Knob Clamping Ring (part of S-42733)	.03
						188-204	Rubber Bumper (2 used)	.02
						188-209	Knob Clamping Ring (part of S-42733)	.03
						202-1343	Instruction Book	.15
						S-42733	Knob & Ring Assembly - Dial	.25
						S-42785	Battery Housing	1.50
						S-43704	Battery Cover & Spring Assembly	4.25

CHASSIS PARTS			CHASSIS PARTS			CABINET PARTS		
PART NO.	DESCRIPTION	PRICE	PART NO.	DESCRIPTION	PRICE	PART NO.	DESCRIPTION	PRICE
22-2729	10 Mmf. Ceramic Disc - 25V	.60	C19,20	.001 Mfd. Ceramic Disc - 1KV (2 used)	.25	54-417	1/4-32x3/8 Hex. Nut	.10
22-2731	10 Mmf. Ceramic Disc - 500V 5%	.25	C11	6 Mmf. Ceramic Disc	.25	54-450	Thread Forming Palnut (6 used on 57-2497)	.02
22-2883	50 Mfd. Electrolytic - 12V	1.10	C2,3,4	.05 Mfd. Ceramic Disc (11 used)	.25	57-1725	Escutcheon	.25
22-2884	3 Mfd. Electrolytic - 12V (2 used)	1.50	5,9,12	(11 used)		57-2497	Retaining Spring (2 part of S-42785)	.10
22-2885	.02 Mfd. Ceramic Disc - 25V (4 used)	.25	24,26,			80-1093	Chassis Cover Strip	.10
22-3010	.01 Mfd. Ceramic Disc - 25V (2 used)	.45	28			83-2892	Volume Control Cover Strip	.10
22-3023	100 Mfd. Electrolytic - 10V	1.50				83-2919	Emblem Cushioning Strip	.03
22-3044	Section Variable					83-2929	Battery Case Pull-out Strip	.20
						83-2955	Grille Cloth	.01
						110-311	6-20x5/16 Phails. Pan Hd. Self-tap Screw (4 used on 8AT41Z2)	.03
						112-1165	6-20x5/16x1/4 Hex. Hd. Self-tap Screw (2 join S-42785 & S-43744)	.01
						114-248	Rubber Bumper (2 used)	.02
						166-109	Knob Clamping Ring (part of S-42733)	.03
						188-204	Rubber Bumper (2 used)	.02
						188-209	Knob Clamping Ring (part of S-42733)	.03
						202-1343	Instruction Book	.15
						S-42733	Knob & Ring Assembly - Dial	.25
						S-42785	Battery Housing	1.50
						S-43704	Battery Cover & Spring Assembly	4.25



SCHEMATIC DIAGRAM FOR 8AT41Z2

NOTES:  
 ALL RESISTORS ARE 1/2 WATT CARBON, ±20% TOLERANCE UNLESS OTHERWISE SPECIFIED.  
 ALL VOLTAGES ARE 0.0 UNLESS OTHERWISE SPECIFIED.  
 ALL CONDENSERS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.  
 D.C. VOLTAGES SHOWN ARE MEASURED FROM CHASSIS WITH NO SIGNAL USING AN A.C.-D.C. OR MIDRANGE TUBE VOLTMETER.  
 ♦ DENOTES CHASSIS

**ALIGNMENT PROCEDURE**

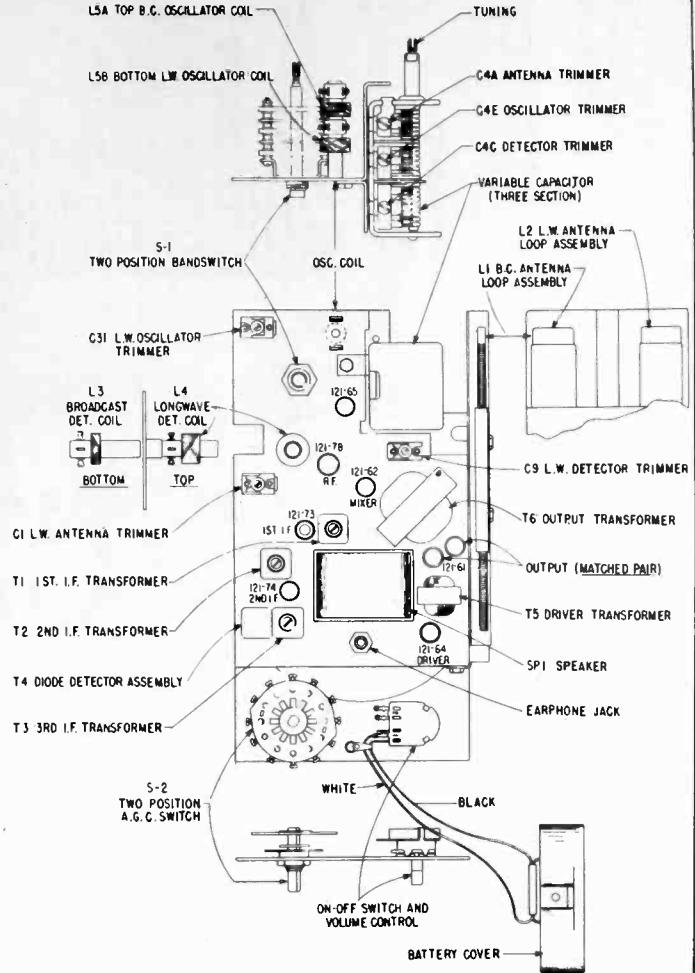
NOTE: Alignment must be made with Nor. - Nav. switch in Nor. position.

OPER.	CONNECT GEN. TO DUMMY ANTENNA	INPUT SIG. FREQUENCY	BAND	SET DIAL AT	TRIMMERS	PURPOSE
1	One turn loop coupled loosely to Broadcast Wavemagnet	455 Kc	BC	1600 Kc	T1, T2, T3	Align I.F.
* 2	One turn loop coupled loosely to Broadcast Wavemagnet	600 Kc	BC	600 Kc	Rock Gang, Adjust L5A	Alignment of BC at 600 Kc
3	One	1600 Kc	BC	1600 Kc	C4E	Set osc. to scale
4	Turn Loop	REPEAT OPERATIONS 2 & 3				
* 5	Coupled	600 Kc	BC	600 Kc	Rock, Adjust L3	Alignment of BC detector at 600 Kc
6	Loosely to Broadcast Wavemagnet	1400 Kc	BC	1400 Kc	C4C	Alignment BC detector
7		REPEAT OPERATIONS 5 & 6				
8		1400 Kc	BC	1400 Kc	C4A	Alignment of BC antenna
* 9	One turn coupled loosely to Long Wave Wavemagnet	165 Kc	LW	165 Kc	Rock Gang, Adjust L5B	Alignment of LW at 165 Kc
* 10	One	400 Kc	LW	400 Kc	C31	Set osc. to scale
11	Turn Loop	REPEAT OPERATIONS 9 & 10				
* 12	Coupled	165 Kc	LW	165 Kc	Rock, Adjust L4	Alignment LW detector at 165 Kc
* 13	Loosely to Long Wave Wavemagnet	370 Kc	LW	370 Kc	C9	Alignment LW detector
14		REPEAT OPERATIONS 12 & 13				
15		370 Kc	LW	370 Kc	C1	Alignment of LW antenna

\* NOTE: Rock tuning condenser when making alignment under Operations 2, 5, 9, 10, 12, 13.

Chassis	Chassis Color Dot	Transistor Layout Label Color	Part No.	R.F.	Mixer	Osc.	1st I.F.	2nd I.F.	Crystal Diode Detector	Driver	Output-Output	Supplier
8AT42Z2	Black	Black 102-3497	Zenith Type	121-78 PNP	121-62 PNP	121-65 PNP	121-73 PNP	121-74 PNP	103-22 IN295	121-64 PNP	121-61 Matched Pair PNP	R.C.A.

**TRANSISTOR & TRIMMER LAYOUT FOR 8AT42Z2**



# ZENITH

## MODEL "ROYAL 760" ALL TRANSISTOR PORTABLE RADIO CHASSIS 8AT42Z2

**GENERAL**

The "Royal 760" transistor portable using chassis 8AT42Z2 is a conventional superheterodyne receiver with a tuned R.F. amplifier. It uses an individual mixer and oscillator to produce the 455 Kc intermediate frequency. The first and second intermediate frequency amplifiers are conventional. It is necessary to use neutralization in the I.F. amplifier stages as in circuits using a triode tube. A IN295 germanium diode is used as the diode detector and AVC voltage source. This is then followed by a driver stage and a class "B" push-pull output stage.

Power Supply..... Six Zenith type Z-7 1 1/2 volt batteries or six type "C", 1 1/2 volt dry cells

Frequency Ranges..... (BC 540 to 1600 KC) (LW 150 to 400 KC)

Intermediate Frequency..... 455 KC

Sensitivity... (BC Approximately 45) Microvolts/meter for (LW Approximately 80) 50 milliwatts output

Power Output Undistorted..... 250 milliwatts  
 Power Output Maximum..... 450 milliwatts  
 Speaker..... 4 inch P.M.  
 Alnico V Voice Coil Impedance 3.2 ohms at 400 cycles  
 Accessory Earphone..... B39-24 impedance 15 ohms at 1000 cycles

**CHASSIS IDENTIFICATION**

The "Royal 760" eight transistor portable has been produced with one basic chassis. Chassis 8AT42Z2 uses transistors manufactured by R.C.A.

The accompanying chart gives all the necessary information on chassis number, color of transistor layout labels, transistor numbers, Zenith part number, RETMA part number (where available) transistor supplier, etc.

**RESISTANCE MEASUREMENTS**

When making resistance measurements in the circuit, it is most important to remove the transistors in the circuit under test otherwise readings obtained will be incorrect. This is the direct result of a transistor acting as a diode.

In addition to this, it is important to know the internal battery voltage of the ohm meter as well as battery

polarity of the meter leads since incorrectly placing ohm meter leads across an electrolytic condenser with low working voltage may damage the capacitor due to excessive reverse current or excessive voltage.

**VOLTAGE READINGS**

It is suggested that a VTVM with an excellent low range scale be used to measure all circuit voltages. All voltages indicated on the accompanying diagram have been measured under no signal conditions and a battery supply voltage of nine volts. Under these no signal conditions, a check can be made of the batteries. The total voltage should be nine volts.

**COMPONENT REPLACEMENT**

When soldering components at the base of the transistor socket, it is suggested that the transistor be removed to avoid any possibility of excessive heat being transferred through the socket to the transistor. When soldering the low voltage electrolytics and germanium diodes, it is suggested that the wire be held with a pair of long nose pliers while soldering. The long nose pliers will act as a heat sink.

**TRANSISTORS**

At the present time we do not know of any satisfactory commercially available transistor tester.

If the transistor is suspected of being defective for any other reason than a barrier short, the only reliable check is to substitute a new transistor and then check performance. There is a possibility that if transistors are replaced in the IF or RF circuit, these circuits may need re-alignment as the result of slight differences in transistor characteristics.

**SIGNAL TRACING**

Past practices used in radio repair commonly known as "Screw driver testing" in which the B+ at the plate of the tube is shorted to ground to check for "clicks" in the speaker, is definitely not recommended. This practice would be comparable to shorting the collector of a transistor to ground which could damage the transistor. Standard point to point signal checking with the proper RF, IF and audio signals, should only be used.

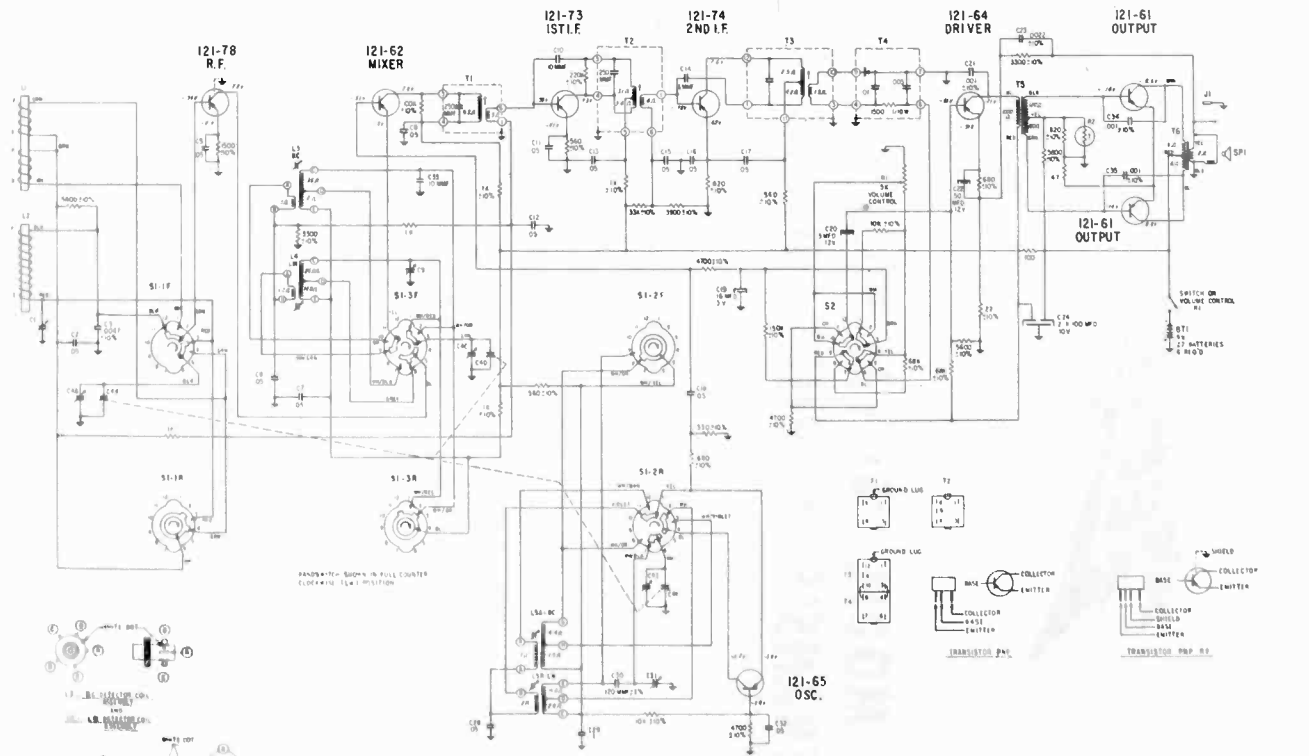
**CHASSIS PARTS**  
Chassis 8AT42Z2

PART NO.	DIA. NO.	DESCRIPTION	PRICE
95-1614	T1	1st I.F. transformer	.75
95-1615	T2	2nd I.F. transformer	.03
95-1616	T3	3rd I.F. transformer (part of S-43923)	.03
95-1619	T6	Audio Output transformer	.03
95-1621	T5	Driver transformer	.03
103-22		Crystal diode (part of S-43923)	.03
112-1145		8-18 x 3/16 x 1/8 AF hex. hd. mach. screw (used on 22-3084)	.03
113-10		6-32 x 3/16 x 1/8 AF hex. hd. mach. screw (used on 22-3084)	.03
114-26		1 1/2 x 4 x 1/8 AF hex. hd. self-tapping screw (used on 22-3084)	.03
114-180		6-20 x 1/2 x 1/8 AF hex. hd. self-tapping screw (used on 22-3084)	.03
114-545		8-15 x 1/4 x 1/8 AF hex. hd. self-tapping screw (2 used on S-44318)	.03
121-61		Transistor (output 2 used)	4.50
121-62		Transistor (mixer)	2.25
121-64		Transistor (driver)	2.25
121-65		Transistor (oscillator)	2.25
121-72		Transistor (1st I.F.)	2.25
121-73		Transistor (2nd I.F.)	2.25
121-78		Transistor (R.F.)	2.25
149-211		Iron core (1 part of ea. S-43961 & S-43963, & 2 part of S-43965)	.10
199-241		Paper sleeve (part of S-43923)	.03
S24266		Base & Terminal assembly	.15
S43010		Contact spring & diode assembly	.75
S43923		3rd I.F. transformer & diode assembly	
S43956	L2	Antenna (L.W.)	
S43957	L3	Antenna (B.C.)	
S43963	L4	Detector coil (B.C.)	
S43965	L5A, L5B	Detector coil (L.W.)	
S43317	B	Oscillator coil	
S43318		Bracket & terminal strip assembly	
S43318		Antenna shield bracket	

**CHASSIS PARTS**  
Chassis 8AT42Z2

PART NO.	DIA. NO.	DESCRIPTION	PRICE
12-248		Antenna shield bracket	.40
19-322		Coil mfg. clip (1 mts. ea. S-43961, S-43963 & S-43965)	.25
22-14	C3	.0047 Mfd. ceramic disc capacitor - 500V	.05
22-17	C21, C34, C35	.001 Mfd. ceramic disc capacitor - 1KV (3 used)	.25
22-18	C23	.0022 Mfd. ceramic disc capacitor - 500V	.25
22-2728	C2, C5, C7, C8, C11, C12, C13, C17, C18, C28, C32	Mfd. ceramic disc capacitor - 25V	.60
22-2381	C14	Mfd. ceramic disc capacitor - 500V	.25
22-2721	C10, C33	Mfd. ceramic disc capacitor - 200V (2 used)	.25
22-2871	C19	Mfd. electrolytic capacitor - 3V	1.50
22-2883	C22	Mfd. electrolytic capacitor - 12V	1.10
22-2884	C20	Mfd. electrolytic capacitor - 12V	1.50
22-2998	C29	Mfd. mylar capacitor - 50V	.35
22-3010	C24	Mfd. ceramic disc - 25V (part of S-43923)	.45
22-3022	C20	Mfd. ceramic disc - 25V (part of S-43923)	.45
22-3082	C1, C9	Trimmer capacitor (2 used)	.50
22-3083	C31	Trimmer capacitor	.50
22-3097	C30	Three section variable capacitor	6.00
24-890	J1	Battery Cover	.25
44-34		Miniature jack	.90
49-854	SP1	4" P.M. Speaker	5.75
54-139		3/8-32 x 9/16 Nut (1 mts. ea. 85-608 & 85-609)	.03
54-421		Specter retaining nut (1 mts. ea. 78-1063 & 78-1064)	.03
63-1715		5-10 Ohm resistor 1/2W ins. 10%	.17
63-1744		100 Ohm resistor 1/2W ins. 20%	.17
63-1744		330 Ohm resistor 1/2W ins. 10%	.17
63-1775		560 Ohm resistor 1/2W ins. 10%	.17
63-1778		680 Ohm resistor 1/2W ins. 10%	.17
63-1782		820 Ohm resistor 1/2W ins. 10%	.17
63-1785		1 K Ohm resistor 1/2W ins. 10%	.17
63-1786		1 K Ohm resistor 1/2W ins. 20%	.17
63-1792		1 K Ohm resistor 1/2W ins. 20%	.17
63-1806		1500 Ohm resistor 1/2W ins. 10%	.17
63-1813		3000 Ohm resistor 1/2W ins. 10%	.17
63-1813		4700 Ohm resistor 1/2W ins. 10%	.17
63-1817		10 K Ohm resistor 1/2W ins. 10%	.17
63-1827		33 K Ohm resistor 1/2W ins. 10%	.17
63-1848		68 K Ohm resistor 1/2W ins. 10%	.17
63-1862		100K Ohm resistor 1/2W ins. 10%	.17
63-1869		150K Ohm resistor 1/2W ins. 10%	.17
63-1876		220K Ohm resistor 1/2W ins. 10%	.17
63-1883		1500 Ohm resistor 1/10W ins. 10%	.17
63-3392		(part of S-43923)	.17
63-3663	R2	Volume control switch	1.10
63-407	R1	4.7 ohm 1/2W ins. 20%	2.05
63-4530		Three contact socket (7 used)	.35
78-1063		Four contact socket	.35
78-1096		Three lug terminal strip	2.02-1373
83-2975		Seven lug terminal strip (2 used)	1.90
83-2981		A.V.C. switch	.50
85-608	S2	Band switch	.50
85-609	S1	Terminal	.03
86-30		Terminal	.03

PART NO.	DIA. NO.	DESCRIPTION	PRICE
25.00		Cabinet Parts	
		Type C dry cell battery 1 1/2V (kit # 14)	25.00
		Portable cabinet (leather)	.75
		Packing carton	.15
		Compass scale (part of 14-2377)	.03
		Tuning knob	.03
		Knob - band switch & A.V.C. control (2 used)	4.23
		Therm forming paint (6 used on 57-2560)	.23
		Emblem plate	.03
		5-archon plate (2 part of 14-2377)	.10
		Emblem pin (2 part of S-42785)	.03
		Emblem pin (2 part of S-42785)	.03
		Battery case pull-out strip	.10
		Volume control cover strip	.05
		Brass washer (part of 14-2377)	.20
		Label (battery installation) (3 used)	.03
		Grille cloth	.03
		6-20 x 5/16 Phillips pan. hd. self-tapping screw (used on 14-2377)	.03
		4-20 x 5/16 Phillips pan. hd. self-tapping screw (2 used on S-42785 & S-42901)	.03
		Rubber bumper (2 used)	.10
		Knob clamping ring (part of S-45375)	.03
		Knob clamping ring (part of S-45376)	.25
		Instruction book	1.90
		Battery housing	.50
		Battery cover & spring assembly	.50
		Knob & ring assembly (dial)	.03



**NOTES:**  
 ALL RESISTORS ARE 1/2 WATT. CARBON 120% TOLERANCE UNLESS OTHERWISE SPECIFIED.  
 ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.  
 ALL CONDENSERS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.  
 D.C. VOLTAGES SHOWN ARE MEASURED FROM CHASSIS WITH BANDSWITCH IN BROADCAST POSITION AND NAVIGATE NORMAL SWITCH IN NORMAL POSITION WITH NO SIGNAL USING AN A.C. D.C. OR VACUUM TUBE VOLTMETER.

**SCHEMATIC DIAGRAM FOR 8AT42Z2**





# MODEL "ROYAL 900" ALL TRANSISTOR PORTABLE RADIO

## CHASSIS 7AT44Z1

### GENERAL

This transistor portable chassis is a conventional super-heterodyne receiver. It has an individual mixer and oscillator to produce the 455 Kc intermediate frequency. The first and second intermediate frequency amplifiers are conventional. It is necessary to use neutralization in the 1st I.F. amplifier stage as in circuits using a triode tube. A 1N87G is used as the diode detector and AVC voltage source. This is then followed by a driver stage and a class "B" push-pull output stage. As you can see from the chart, the chassis uses a pair of matched transistors in the final output stage and therefore should one transistor fail, both transistors must be replaced simultaneously as chances are they will not perform properly unless so matched.

Power Supply - Eight Zenith type Z-7 1½ volt batteries or Eight Type "C" 1½ volt dry cells

Frequency Range . . . . . 540 to 1600 KC  
Intermediate Frequency . . . . . 455 KC  
Sensitivity . . . . . Approximately 160 microvolts/meter for 50 milliwatts output  
Power Output Undistorted . . . . . 500 milliwatts  
Power Output Maximum . . . . . 650 milliwatts  
Speaker . . . . . 4 inch P.M.  
Alnico

V Voice Coil Impedance 3.2 ohms @ 400 cycles  
Accessory Earphone . . B39-24 impedance 15 ohms @ 1000 cycles.

### PRINTED CIRCUIT SERVICING:

Servicing "printed" circuit sets is, in general, much the same as servicing ordinary receivers. However, certain tools and techniques are well suited for this type of

work. The following items are especially useful:

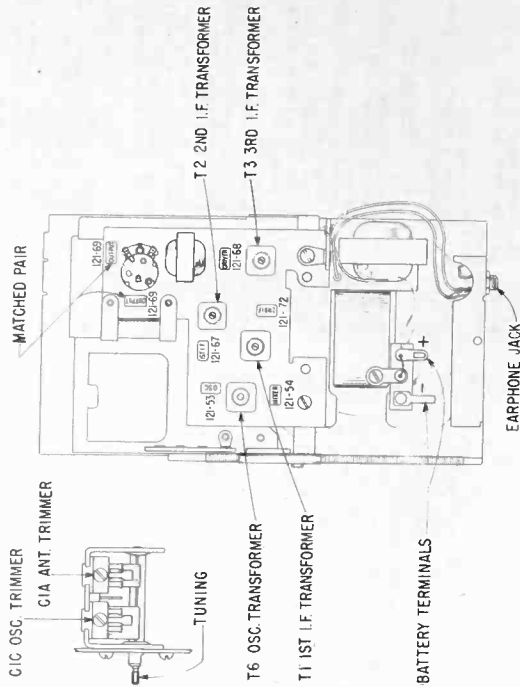
1. Good pair of long-nose pliers.
2. Sharp wire cutters.
3. Small stiff glue brush (for solder removal).
4. Pencil type soldering iron with a small tip (25 watts or less)

- WARNING:** Excessive heat may damage the "printed" circuit during component replacement if a soldering pencil, iron or gun of higher wattage rating is used.
5. Tin leads on component before soldering.
  6. Use only EUTECTIC solder (63% tin 37% lead. This solder has an extremely low melting point.
  7. Metal pick (soldering aid).

### COMPONENT REPLACEMENT:

Resistors and capacitors should be replaced by clipping out the defective part and neatly soldering in the new part. If a unit, such as the oscillator coil or IF transformer, is to be removed heat the mounting lugs with a pencil type soldering iron and move them away from the soldered connection with a long-nose pliers or metal pick. Continue heating the lugs and brush away the molten solder with a small stiff glue brush. Remove the defective unit by lifting it off the chassis. Before inserting the new unit, be certain that the lug holes are open and free from solder. Forcing a lug against a solder filled lug hole may break the bond between the chassis base and the "printed" wiring. It is, therefore, necessary to exercise care when replacing units.

An open or damaged section of "printed" circuit wiring can be replaced by soldering a short jumper wire across the points to be connected.



TRANSISTOR & TRIMMER LAYOUT FOR CHASSIS 7AT44Z1

### ALIGNMENT PROCEDURE

Operation	Input Signal Frequency	Connect Inner Conductor From Oscillator To	Connect Outer Shield Conductor From Oscillator To	Set Dial At	Trimmers	Purpose
1	455 KC	ONE TURN LOOSELY COUPLED TO WAVEMAGNET	Chassis	600 KC	Adj. T1, T2, T3 for maximum output.	For I.F. Alignment
2	1620 KC			Gang wide open.	C1C	Set Oscillator to dial scale.
3	535 KC			Gang Closed	Adjust slug in T6	Set Oscillator to dial scale.
4	REPEAT STEPS 2 & 3					
5	1260 KC			1260 KC	C1A	Align loop ant.

Chassis	Chassis Color Dot	Transistor Layout Label Color	Part No.	Mixer	Osc.	1st I.F.	2nd I.F.	Crystal Diode Detector	Driver	Output-Output	Supplier
7AT44Z1	Black	Black 102-3750	Zenith Type	121-54 PNP	121-53 PNP	121-67 PNP	121-72 PNP	103-19 1N87G	121-68 PNP	121-69 Matched Pair PNP	Texas Instrument

MODEL'S ROYAL 900G, P & W  
Chassis 7AT44Z1

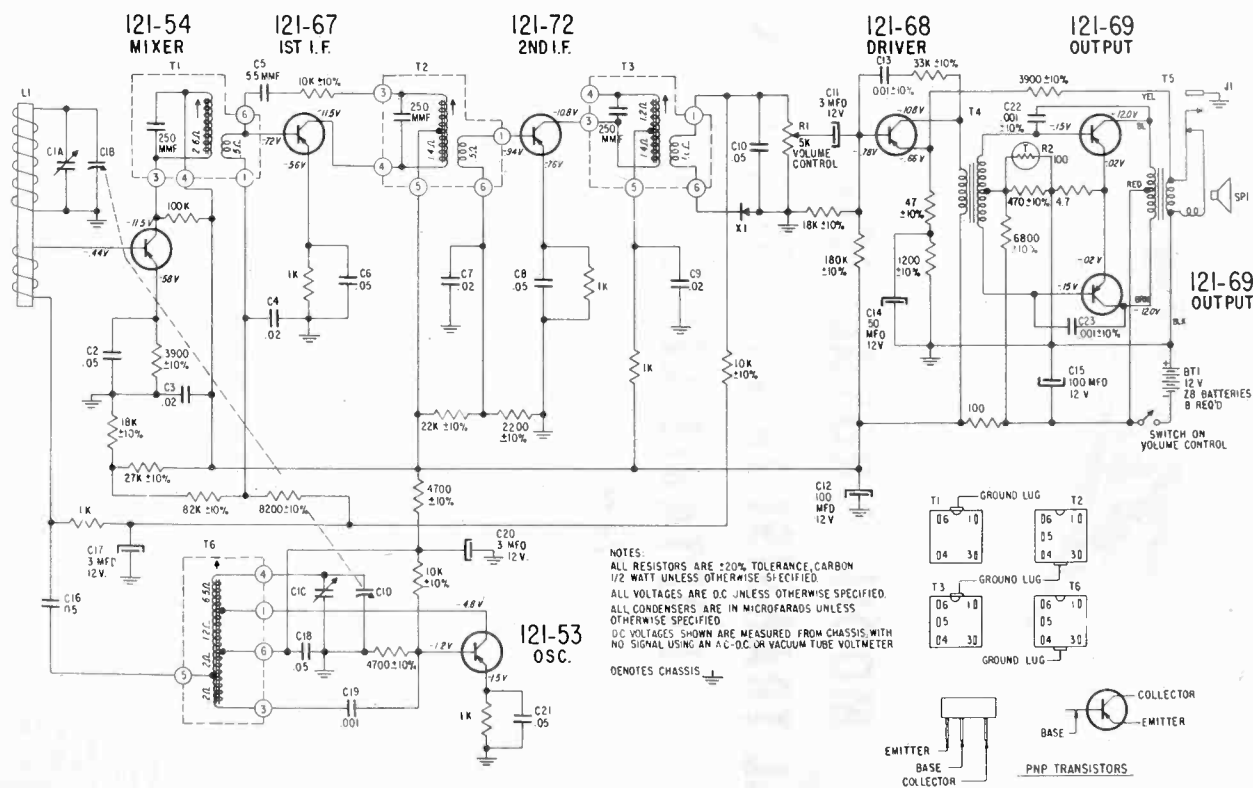
Part No.	Dia. No.	Description	Price
103-19	x 1	Crystal Diode	.75
113-10		6-32 x 3/16 x 1/2 Hex hd mach. Screw lock Washer 4 t. (3 used on 22-3054 and 1 on 83-2910)	.03
114-26		8-18 x 1/4 x 1/4 Hex hd Self-tap Screw (2 mt. ea. 49-843 & S-43448)	.03
121-53		Transistor (oscillator)	
121-54		Transistor (mixer)	
121-67		Transistor (1st I.F.)	
121-68		Transistor (driver)	
121-69		Transistor (output-matched pair)	
121-72		Transistor (2nd I.F.)	
S-43448	L1	Antenna	2.00
S-43534		Chassis Mounting Bracket	.75

Part No.	Dia. No.	Description	Price
12-2585		Transformer Mfg. Bracket (part of 49-843)	.10
12-2592		Jack Mounting Bracket (part of 49-843)	.35
22-17	C13,22, 23	.001 mfd. Ceramic disc 1 KV(3 used)	.25
22-2728	C2,6,8, 10,16, 18,21	.05 mfd. Ceramic disc 25V (7 used)	.60
22-2729	C19	.001 mfd. Ceramic disc 25V	.25
22-2883	C14	50 mfd. Electrolytic 12V	1.10
22-2884	C11,17, 20	3 mfd. Electrolytic 12V (3 used)	1.50
22-2885	C3,4,7, 9	.02 mfd. Ceramic disc 25V (4 used)	.25
22-3047	C12,15	100 mfd. Electrolytic 12V (2 used)	1.50
22-3053	C5	5.5 mmf. Ceramic disc	.35
22-3054	C1A,B, C,D	2 Section Gang	4.00
44-34	J1	Miniature Jack	.90
49-843	SP1	4" P.N. Speaker	5.00
54-417		1/4-32 x 3/8 Hex Nut - Brass (1 mt. ea. 44-34 & 63-4071)	.10
63-1729		47 ohm 1/2W Ins. 10%	.17
63-1744		100 ohm 1/2W Ins. 20%	.17
63-1771		470 ohm 1/2W Ins. 10%	.17
63-1786		1000 ohm 1/2W Ins. 20% (5 used)	.17
63-1789		1200 ohm 1/2W Ins. 10%	.17
63-1799		2200 ohm 1/2W Ins. 10%	.17
63-1810		3900 ohm 1/2W Ins. 10% (2 used)	.17
63-1813		4700 ohm 1/2W Ins. 10%	.17
63-1820		6800 ohm 1/2W Ins. 10%	.17
63-1824		8200 ohm 1/2W Ins. 10%	.17
63-1827		10 K ohm 1/2W Ins. 10% (3 used)	.17
63-1834		15 K ohm 1/2W Ins. 10%	.17
63-1838		18 K ohm 1/2W Ins. 10%	.17
63-1841		22 K ohm 1/2W Ins. 10%	.17
63-1845		27 K ohm 1/2W Ins. 10%	.17
63-1848		33 K ohm 1/2W Ins. 10%	.17
63-1866		82 K ohm 1/2W Ins. 10%	.17
63-1870		100K ohm 1/2W Ins. 20% (2 used)	.17
63-1880	R2	Thermistor	1.10
63-3663	R3	4.7 ohm 1 W Ins. 20%	.25
63-4071	R1	Volume Control & Switch	2.05
78-1067		3 Contact Socket (7 used)	.30
83-2489		Rubber Strip (2 used)	.03
83-2795		1 Lug Terminal Strip	.05
83-2910		2 Lug Terminal Strip	.10
93-1289		Fibre Washer (2 used)	.03
95-1513	T6	Oscillator Transformer	2.00
95-1587	T4	Driver Transformer	5.00
95-1600	T1	1st I.F. Transformer	3.50
95-1601	T2	2nd I.F. Transformer	3.50
95-1602	T3	3rd I.F. Transformer	3.50
95-1605	T5	Audio Output Transformer	4.00

Part No.	Dia. No.	Description	Price
Z-7		1 1/2 Volt Battery	
14-2378		Plastic Cabinet - front Royal 900W	3.00
14-2379		Plastic Cabinet - front Royal 900G	3.00
14-2380		Plastic Cabinet - front Royal 900P	3.00
14-2383		Plastic Cabinet - rear Royal 900G	3.00
14-2384		Plastic Cabinet - rear Royal 900W	3.00
14-2385		Plastic Cabinet - rear Royal 900P	3.00
14-1437		Packing Carton	
19-330		Handle Mfg. Clip (2 used)	.10
26-600		Dial Scale	.75
36-200		Cabinet Handle - Royal 900G	.50
36-201		Cabinet Handle - Royal 900W	.50
36-202		Cabinet Handle - Royal 900P	.50
46-1945		Tuning Control Knob	.50
46-1946		Volume Control Knob	.50
57-2498		Background Plate	.35
57-2504		Emblem Plate	1.75
59-337		Pointer	.50
86-254		Connector Terminal	.05
86-300		Connector Terminal	.05
86-310		Terminal (2 part of S-43471)	.05
86-311		Terminal (part of S-43472)	.05
112-1147		6-32 x 2 1/4 Mach. Screw (2 used on 14-2383-85)	.05
112-1148		4-40 x 1 1/2 Mach. Screw (mts. 2G-600)	.05
114-492		6-20 x 3/8 x 1/2 Hex Hd. Self-tap Screw - Flat Washer att. (5 used on 7AT44Z1, and 2 on S-43470)	.03
188-204		Knob Ret. Ring (used on 46-1946)	.03
199-246		Sleeve	.15
199-253		Sleeve (2 used on 2, 114 - 492)	.15
202-1347		Instruction Book	.60
S-43470		Battery Cover & Ret. Spring Assembly	.90
S-43472		Contact Strip & Spring Assembly	.90
S-43810		Contact Strip & Spring Assembly	.90



SCHEMATIC DIAGRAM FOR 7AT44Z1



# MODEL "ROYAL 1000D" ALL TRANSISTOR TRANSOCEANIC PORTABLE RECEIVER

To the Serviceman

### GENERAL

The transistor portable chassis is a conventional super-heterodyne receiver using an individual mixer and oscillator to produce the 455 Kc intermediate frequency. The intermediate frequency amplifiers are conventional. It is necessary to use neutralization in the I.F. amplifier stages as in circuits using a triode tube. The 103-22 diode is used as a detector and AVC voltage source. This diode is part of I.F. Transformer T4. This is then followed by a first audio amplifier and a driver stage for the class B push pull output. The 121-47 output transistors are a matched pair and will be coded with paint dots, red, white, yellow and green. Should one transistor fail it must be replaced with another 121-47 transistor with corresponding color. Do not use 121-47 transistors in pairs unless their color codes are identical.

The iron core slugs of the RF, mixer and oscillator coils have hex-holes through their centers. This will enable the technician to tune the top slug then drop alignment wrench No. 68-32 down through the slug to adjust the slug in the lower coil.

Power Supply — Eight Zenith Z2NL 1½ volt or Standard Flashlight Batteries total 12 volts D.C. Approximate battery life 300 hours. One Zenith Z2NL 1½ volt or Standard Flashlight Battery for the dial light.

Frequency Ranges:	9.4 to 10.1 Mc
150 to 400 Kc	11.4 to 12.3 Mc
540 to 1600 Kc	14.6 to 15.8 Mc
2 to 4 Mc	17.1 to 18.5 Mc
4 to 9 Mc	20.7 to 22.5 Mc

Intermediate Frequency: 455 Kc  
 Power Output Undistorted: 500 Milliwatts  
 Speaker: 4 inch P.M.  
 Alnico V, Voice Coil Impedance — 3.2 ohms @ 1000 cycles  
 Accessory Earphone B39-24 Impedance 15 ohms @ 1000 cycles

### RESISTANCE MEASUREMENTS

When making resistance measurements in the circuit, it is most important to remove the transistors in the circuit under test otherwise readings obtained will be incorrect. This is the direct result of a transistor acting as a diode.

When making measurements across an electrolytic capacitor, be certain the ohm meter leads are correctly polarized; also be certain the battery voltage of the meter does not exceed the working voltage of the capacitor. Otherwise damage to the capacitor may result.

### VOLTAGE READINGS

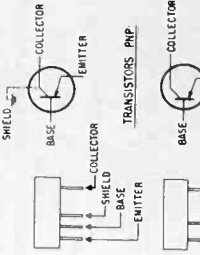
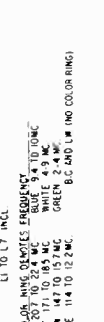
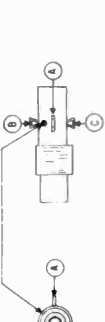
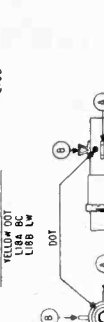
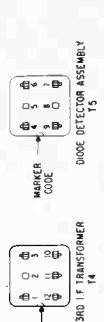
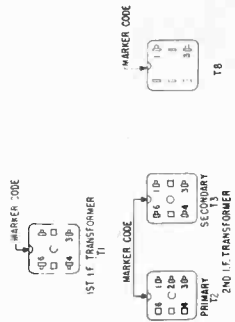
It is suggested that a VTVM with an excellent low range scale be used to measure all circuit voltages. All voltages indicated on the accompanying diagrams have been measured under no signal conditions and a carbon battery supply voltage of 12.0 volts. Under these no signal conditions, a check can be made of the batteries. With carbon batteries, the total voltage should be 12.0 volts.

### COMPONENT REPLACEMENT

When soldering components at the base of the transistor socket, it is suggested that the transistor be removed to avoid any possibility of excessive heat being transferred through the socket to the transistor. When soldering the low voltage electrolytics and germanium diodes, it is suggested that the wire be held with a pair of long nose pliers while soldering. The long nose pliers will act as a heat sink.

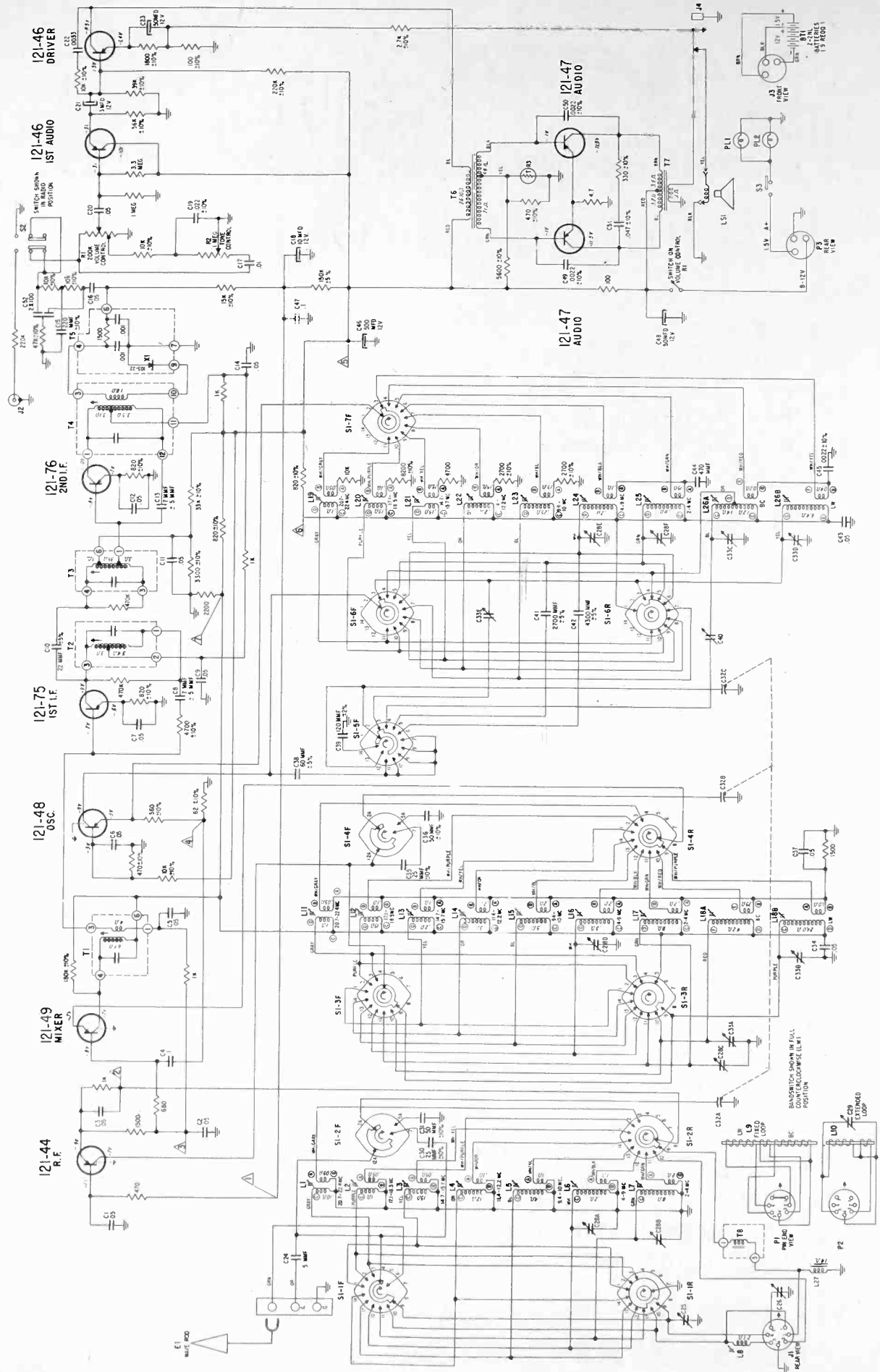
### TRANSISTORS

At the present time we do not know of any satisfactory commercially available transistor tester.



- NOTES
1. ALL RESISTORS — 20% TOLERANCE, 1/4 WATT, CARBON UNLESS OTHERWISE SPECIFIED.
  2. RADIO-PHONO SWITCH SHOWN IN RADIO POSITION.
  3. RESISTANCE VALUES IN OHMS, CAPACITANCE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
  4. ALL VOLTAGES ARE DC UNLESS OTHERWISE SPECIFIED.
  5. DC VOLTAGES SHOWN ARE MEASURED WITH NO SIGNAL UNDER NO SIGNAL CONDITIONS.
  6. NUMBERS IN TRIANGLES INDICATE VOLTAGES TEST POINTS.
  7. 123-724 TRANSISTION AND TRIMMER LAYOUT.
  8. NO SIGNAL CURRENT DRAIN IS 14.5 MA.
  9. ELECTROLYTIC CAPACITORS MUST BE PROTOTYPIC COMPENSATORS FOR REPLACEMENT IN ANY OTHER TYPE OF ELECTROLYTIC. IF USED, IT WILL BE NECESSARY TO ADD C47 SHOWN IN DOTTED LINES.

DOT DENOTES CHASSIS



CHASSIS PARTS

Table with columns: PART NO., DIA. NO., DESCRIPTION, PRICE. Includes parts like coil mfg. city, spring clip, ceramic disc, etc.

CHASSIS PARTS

Table with columns: PART NO., DIA. NO., DESCRIPTION, PRICE. Includes parts like 150 K ohm 1/2W ins., 200 K ohm 1/2W ins., etc.

CHASSIS PARTS

Table with columns: PART NO., DIA. NO., DESCRIPTION, PRICE. Includes parts like drive cord & eyelid, terminal & wire, base & terminal, etc.

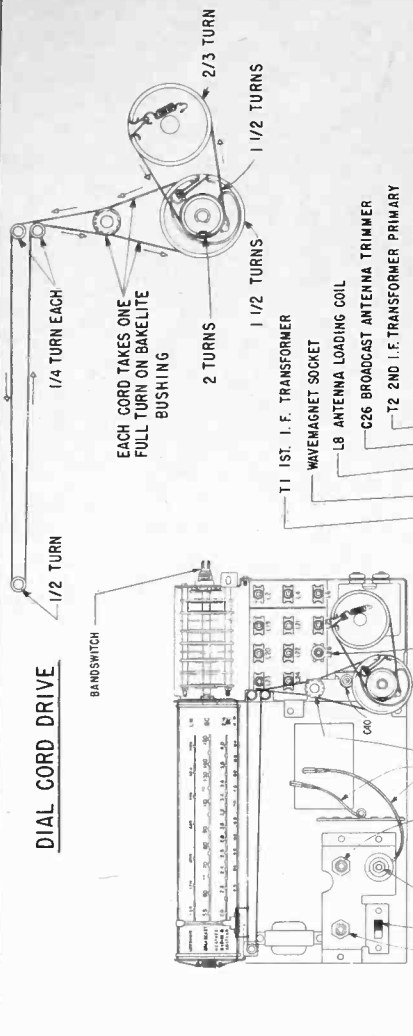
CABINET PARTS

Table with columns: PART NO., DIA. NO., DESCRIPTION, PRICE. Includes parts like volume control knob, tone control knob, PH speaker, etc.

CABINET PARTS

Table with columns: PART NO., DIA. NO., DESCRIPTION, PRICE. Includes parts like 8-1/8x4 Philips hd. self-tap, 4-1/2x1/4 Philips hd. mach. screw, etc.

**DIAL CORD DRIVE**



**ALIGNMENT PROCEDURE**

OPER.	CONNECT GEN. TO DUMMY ANTENNA	BAND	INPUT SIG. FREQUENCY	SET DIAL AT	TRIMMERS	PURPOSE
1	One turn loop coupled loosely to Broadcast Wavemagnet	BC	455 Kc	1600 Kc	T1, T2, T3, T4	Align I.F.
*2	One turn loop coupled loosely to Long Wave Wavemagnet	LW	160 Kc	160 Kc	Rock Gang, Adjust C33E	Alignment of LW at 160 Kc
*3	One	LW	400 Kc	400 Kc	C33D	Set osc. to scale
4	Turn Loop	REPEAT OPERATIONS 2 & 3				
*5	Loosely to	LW	160 Kc	160 Kc	Rock, adjust L18B	Alignment LW mixer at 160 Kc
*6	Loosely to	LW	375 Kc	375 Kc	C33B	Alignment LW mixer
7	Wavemagnet	REPEAT OPERATIONS 5 & 6				
*8	One	LW	375 Kc	375 Kc	C25	Alignment of LW antenna
*9	One turn loop coupled loosely to Broadcast Wavemagnet	BC	600 Kc	600 Kc	Rock Gang, Adjust C40	Alignment of BC at 600 Kc
10	One	BC	1600 Kc	1600 Kc	C33C	Set osc. to scale
11	Turn Loop	REPEAT OPERATIONS 9 & 10				
*12	Coupled	BC	600 Kc	600 Kc	Rock, adjust L18 A	Alignment of BC mixer at 600 Kc
13	Loosely to	BC	1400 Kc	1400 Kc	C33A	Alignment BC mixer
14	Broadcast Wavemagnet	REPEAT OPERATIONS 12 & 13				
15	One	BC	1400 Kc	1400 Kc	C26	Alignment of BC antenna
16	One turn loop coupled loosely to Detachable Wavemagnet	BC	1400 Kc	1400 Kc	C29	Place Detachable Wavemagnet in center of dial, adjust down & adj. C29 for max.
*17	3 Feet of wire	2-4 Mc	2.1 Mc	2.1 Mc	Rock, L25, L17, L7	Alignment of SW osc., mixer & antenna
18	Approximately 1 Foot and Parallel from Extended Wavemagnet	2-4 Mc	3.9 Mc	3.9 Mc	C28F, C28D, C28B	Alignment of SW osc., mixer & antenna
*19	Approximately 1 Foot and Parallel from Extended Wavemagnet	4-9 Mc	4.25 Mc	4.25 Mc	Rock, L24, L16, L6	Alignment of SW osc., mixer & antenna
20	Approximately 1 Foot and Parallel from Extended Wavemagnet	4-9 Mc	8.75 Mc	8.75 Mc	C28E, C28C, C28A	Alignment of SW osc., mixer & antenna
21	Approximately 1 Foot and Parallel from Extended Wavemagnet	4-9 Mc	8.75 Mc	8.75 Mc	C28E, C28C, C28A	Alignment of SW osc., mixer & antenna
22	Approximately 1 Foot and Parallel from Extended Wavemagnet	4-9 Mc	8.75 Mc	8.75 Mc	C28E, C28C, C28A	Alignment of SW osc., mixer & antenna
23	Approximately 1 Foot and Parallel from Extended Wavemagnet	4-9 Mc	8.75 Mc	8.75 Mc	C28E, C28C, C28A	Alignment of SW osc., mixer & antenna
24	Approximately 1 Foot and Parallel from Extended Wavemagnet	4-9 Mc	8.75 Mc	8.75 Mc	C28E, C28C, C28A	Alignment of SW osc., mixer & antenna
25	Approximately 1 Foot and Parallel from Extended Wavemagnet	4-9 Mc	8.75 Mc	8.75 Mc	C28E, C28C, C28A	Alignment of SW osc., mixer & antenna
26	Approximately 1 Foot and Parallel from Extended Wavemagnet	4-9 Mc	8.75 Mc	8.75 Mc	C28E, C28C, C28A	Alignment of SW osc., mixer & antenna
27	Approximately 1 Foot and Parallel from Extended Wavemagnet	4-9 Mc	8.75 Mc	8.75 Mc	C28E, C28C, C28A	Alignment of SW osc., mixer & antenna

\*NOTE: Rock tuning condenser when making alignment under Operations 2, 3, 5, 6, 8, 9, 12, 17 & 20.

If the transistor is suspected of being defective for any other reason than a barrier short, the only reliable check is to substitute a new transistor and then check performance. There is a possibility that if transistors are replaced in the IF or RF circuit, these circuits may need re-alignment as the result of slight differences in transistor characteristics.

**SIGNAL TRACING**

Practices used in radio repair commonly known as "Screw driver testing" in which the B+ at the plate of the tube is shored to ground to check for "clicks" in the speaker, is definitely not recommended. This practice would be comparable to shorting the collector of a transistor to ground which could damage the transistor. Standard point to point signal checking with the proper RF, IF and audio signals, should only be used.

**REPAIR EQUIPMENT**

The following list of equipment is what we recommend and use for repair of transistor chassis:

1. An RF signal generator supplying frequencies from 150 Kc to 23 Mc.
2. An audio generator or an audio signal source to be used for signal tracing after the diode detector.
3. A VTVM with a good low range voltage scale and a reliable resistance scale.
4. M209B Dazor floating lamp & magnifier or equivalent.
5. A set of opmetrist tools—pliers, cutters, picks, etc.
6. A soldering iron with a very fine tip, not to exceed \$5 watts.

**TRANSISTOR and TRIMMER LAYOUT**

**REAR VIEW**



**FRONT VIEW**

