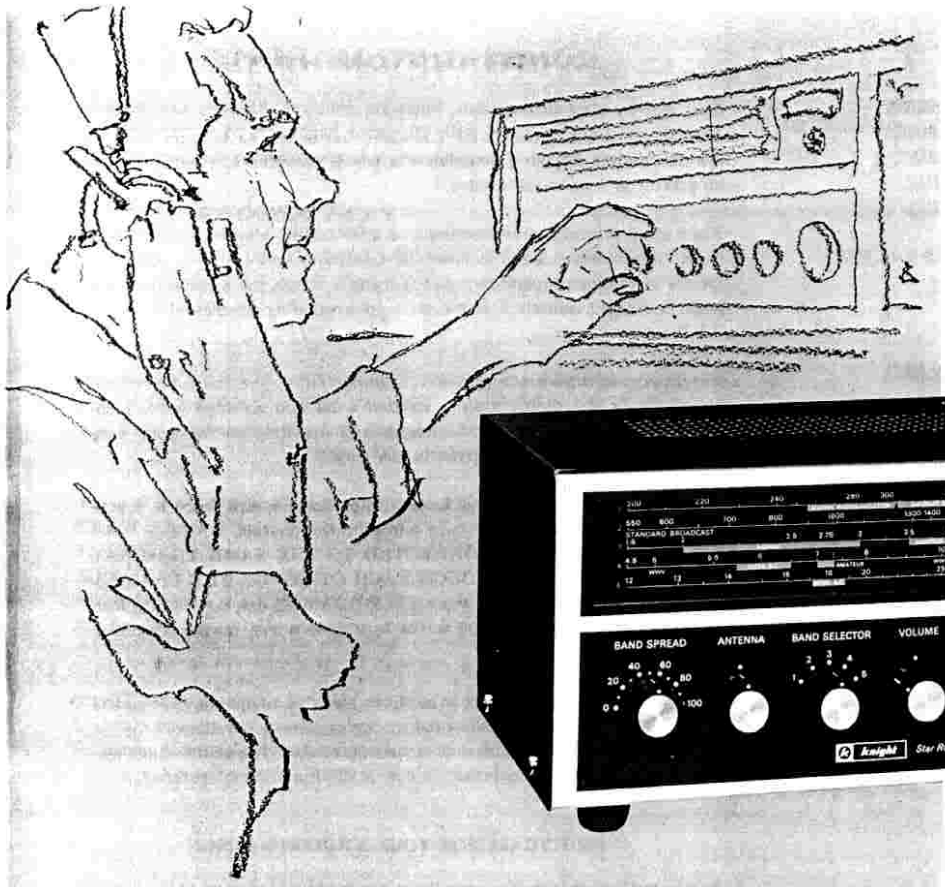


knight-kit

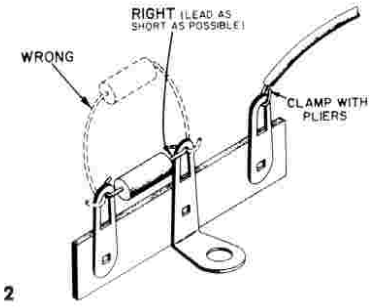
STAR ROAMER

Discover the exciting world of short-wave and marine radio with the Knight-Kit Star Roamer. Tuning from 200 KC to 30 MC in five bands, this economy-priced receiver "pulls in" the international short-wave bands... amateur radio "hams"... marine and government stations on the very low frequencies . . . as well as the standard AM broadcast band.

The Star Roamer has such deluxe features as an illuminated slide rule dial, illuminated "S" meter for accurate tuning, electrical bandspread that separates signals, built-in speaker, AVC, and many more precision features for your listening pleasure. No experience required . . . anyone can build and operate the Star Roamer. Turn it on and have the world at your finger-tips.

SPECIFICATIONS

FREQUENCY RANGE:	BAND 1 200 to 400KC. BAND 2 550 to 1800KC. BAND 3 1.8 to 4.8MC. BAND 4 4.8 to 12MC. BAND 5 12 to 30MC.
BANDSPREAD:	Electrical, calibrated 0 to 100.
SENSITIVITY:	10 μv for 10 db S/N
IF FREQUENCY:	455KC
IF BANDWIDTH:	8KC at 6 db down.
BEAT FREQUENCY:	Varies from zero to 5KC.
ANTENNA INPUT:	Unbalanced, 300Ω nominal.
ANL:	Switchable series diode.
POWER SUPPLY:	Fused, transformer operated.
POWER REQUIREMENTS:	110 to 125 V, 60 cps, 15 watts.
SPEAKER SIZE:	4″ PM.
HEADPHONE OUTPUT:	High impedance, magnetic or crystal.
TUBE COMPLEMENT:	1—6BE6 (converter) 1—6HR6 (IF amplifier) 1—12AX7 (audio amplifier) 1—6AK6 audio output)
DIMENSIONS:	Height, 5½″; width, 12½″; depth, 8″. (With legs and knobs)
NET WEIGHT:	7¾ lbs.



HOW TO MOUNT A WIRE AND A COMPONENT

CONSTRUCTION HINTS

The step-by-step instructions must be followed exactly. Occasionally, several parts are mounted with the same hardware, so be sure to read the entire step. For your convenience, a box is provided to check off each step after you have completed it.

Make good mechanical connections at solder points, clean metal to clean metal. Loop wires around connection terminals and clamp tightly. To mount a resistor or capacitor, pull the leads through the terminals so the part is tightly mounted. Bend each lead around the terminal and cut off the excess wire.

Several types of wire are supplied. It is important to use the correct type called for in the building step. Insulated solid and shielded wire, identified by color, has been cut to length and pre-stripped for your convenience. Use only the color given in the step.

Flexible tubing is used to cover bare wire or leads where there is a possibility they may touch other bare wires or the chassis. BARE WIRES AND BARE LEADS NOT CONNECTED TO THE SAME TERMINAL MUST NOT ACCIDENTLY TOUCH EACH OTHER OR THE CHASSIS. The only tools needed to build your STAR ROAMER are a soldering iron or gun rated at about 40 to 100 watts, long-nose pliers, diagonal cutters, and a screwdriver.

This book uses some symbols to give the value of components. "Ω" means ohm, "K" means one thousand ohms, "meg" means one million ohms, μf means microfarad and $\mu\mu$f means micromicrofarad. Capacitor markings may be μf or MF for microfarad; $\mu\mu$f or MMF for micromicrofarad.

HOW TO CARE FOR YOUR SOLDERING IRON

Before you start to solder, carefully clean the tip of your soldering iron with a fine file, or with steel wool, until the bright metal surface of the tip is exposed. Heat the iron; then cover (tin) the tip with a thin layer of ROSIN CORE SOLDER. While the iron is hot, remove excess solder from the tip by wiping with a clean cloth.

When the tip of the iron becomes covered with a dull, oxide film, wipe the tip with a clean cloth, and re-tin the iron.

THIS KIT MUST BE PROPERLY SOLDERED!

USE ENOUGH HEAT

This is the main idea of good soldering. Apply enough heat to the metal surfaces you are joining to make the solder spread freely, until the contour (shape) of the connection shows under the solder.

AN ELECTRONIC UNIT WILL NOT WORK . . . unless it is properly soldered. Read these instructions carefully to understand the basic ideas of good soldering.

Enough heat must be used so the solder can actually penetrate the metal surfaces, making an unbroken path over which electricity can travel. You are not using enough heat if the solder barely melts and forms a rounded ball of rough, flaky solder.

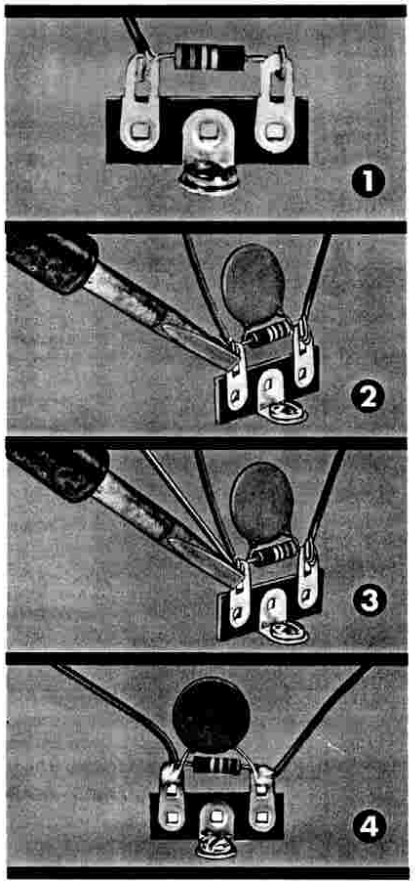
Use the Right Soldering Tool

A soldering iron in the 40-100 watt range is recommended. Any iron in this range with a clean, chisel-shaped tip will supply the correct amount of heat to make a good solder connection. You may also use a solder gun but make sure the tip reaches full heat before you solder.

Keep the iron or gun tip brightly coated with solder. When necessary, wipe the hot tip clean with a cloth. If you are using an old tip, clean it before you start soldering. Use a fine file or steel wool to expose the bright metal. Heat the iron and immediately coat the tip with solder.

Use Only Rosin Core Solder

We supply the right kind of solder (*rosin core solder*). Do not use any other kind of solder! **Use of Acid Core Solder, Paste, or Irons Cleaned on a Sal Ammoniac Block will ruin any Electronic Unit and will Void the Guarantee.**



HERE'S HOW TO DO IT . . .

1. Join bare metal to bare metal; insulation must be removed. Make good mechanical connections and keep resistor and capacitor leads as short as possible, unless otherwise specified.

2. Coat the tip of a hot iron with solder. Then **Firmly Press the Flat Side of the Tip** against the parts to be soldered together. Keep the iron there while you . . .

3. Apply the solder between the metal to be soldered and the iron tip. Use only enough solder to flow over all surfaces of the connection, and all wires in the connection. Remove the iron.

Do Not Move Parts Until the Solder Hardens. If you accidentally move the wires as the solder is hardening, apply your iron and reheat.

4. Compare your soldering with the pictures on this page. You have a good connection if your solder has flowed over all surfaces to be connected, following the shape of the surfaces. It should appear smooth and bright and all wires in the connection should be well-soldered.

You Have Not Used Enough Heat: If your connection is rough and flaky-looking, or if the solder has formed a round ball instead of spreading.

The difference between good soldering (enough heat) and poor soldering (not enough heat) is just a few extra seconds with a hot iron **firmly** applied. REMEMBER, LARGER METAL SURFACES TAKE A LONGER TIME TO HEAT.

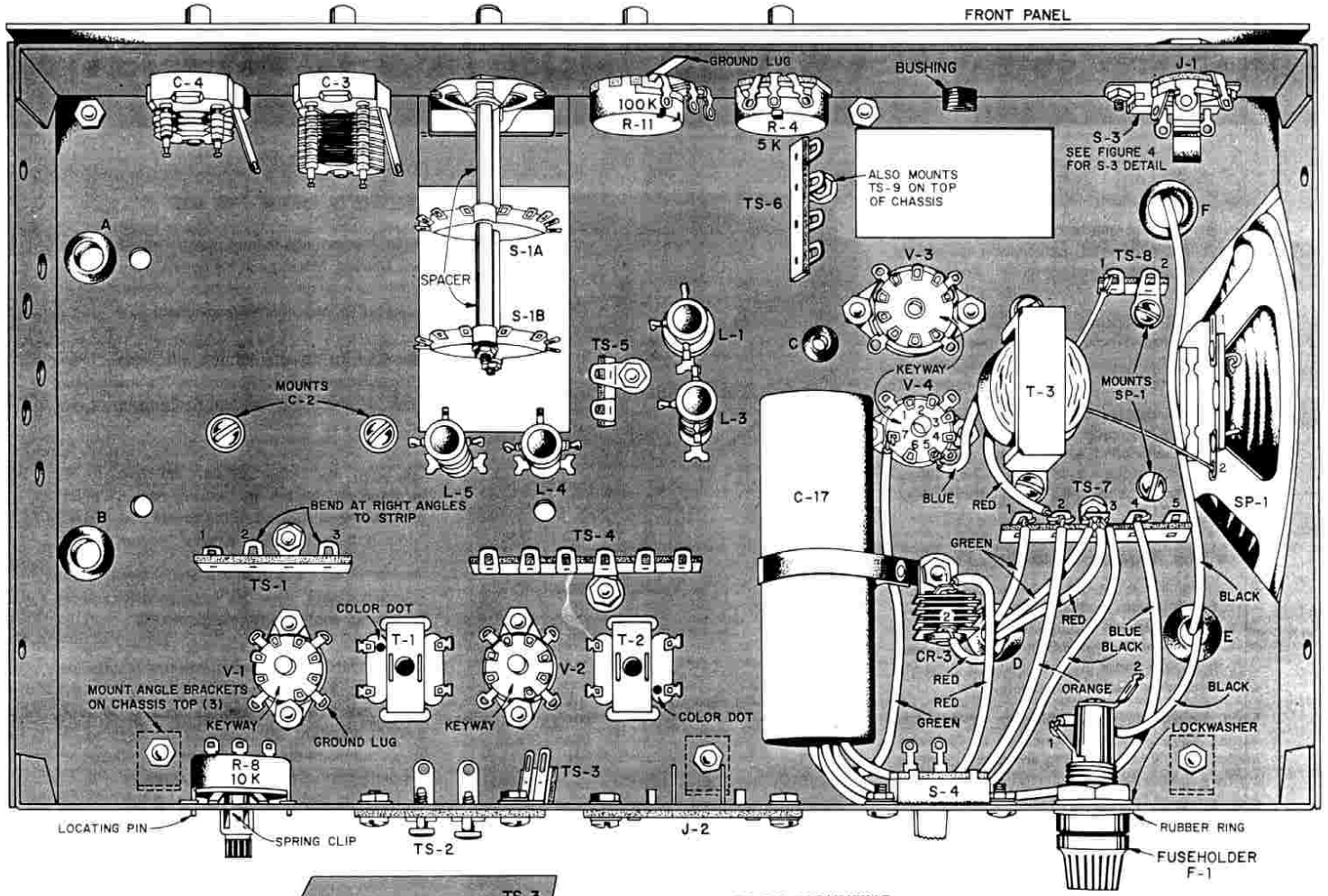
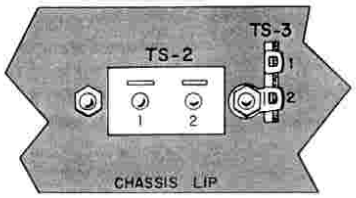


FIGURE 1. PARTS MOUNTING



DETAIL "A"

MOUNTING PARTS ON THE CHASSIS

SEE FIGURE 1.

☐ 5 large rubber grommets. Insert in holes A, B, D, E and F, as shown in Figure 1.

☐ Small grommet. Insert in hole C.

NOTE: Hardware sizes are shown on the parts identification chart.

☐ TS-2, 2-screw terminal strip, and TS-3, a 2-terminal strip. FROM OUTSIDE THE CHASSIS, mount TS-2 so the screw-terminals are positioned as shown. Fasten the end near R-8 with a 6-32 x ¼" screw, a #6 lockwasher and a 6-32 nut. At the other end of TS-2, insert a 6-32 x ¼" screw. Then FROM INSIDE THE CHASSIS, mount TS-3 on this screw and fasten with a lockwasher and nut as shown in detail "A".

☐ J-2, a 2-terminal jack. Mount from outside the chassis with two 6-32 x¼" screws, two lockwashers and nuts.

☐ S-4, a white-button slide switch. Mount inside the chassis, so the end without terminals is positioned as shown. Use two 4-40 screws, lockwashers and nuts.

☐ F-1, fuseholder. Remove the lockwasher and nut; then place the rubber ring on the body. (Rubber ring may already be in place). From outside the chassis, insert F-1 and position the terminals as shown. Fasten F-1 with a lockwasher and nut. Bend terminals 1 and 2 slightly.

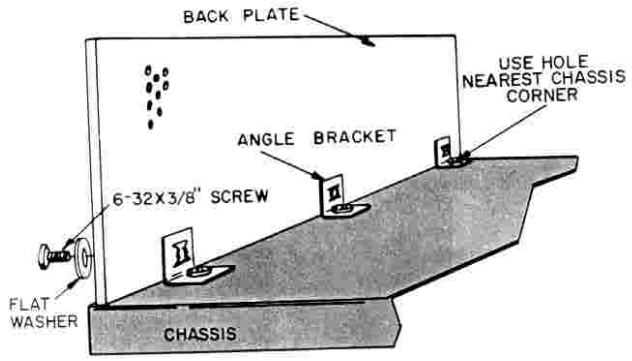


FIGURE 2.
MOUNTING BACK PLATE

SEE FIGURES 1 and 2.

NOTE: The 3 evenly spaced screws and nuts shown near the rear of the chassis mount the angle brackets used for installing the back plate.

☐ 3 angle brackets. Mount on top of the chassis, the upright portion parallel to the rear edge of chassis, with three 6-32 x ¼" screws, lockwashers and nuts, as shown in Figure 2. Use the plain, unthreaded bracket holes for this step.

☐ Perforated back plate. Attach to the angle brackets with three 6-32 x ⅜" screws and flat washers.

☐ R-8, 10K control. From inside the chassis, position R-8 so terminals are close to the bottom of the chassis. Push shaft and locating pins through the rear of the chassis until the spring clips come through and lock in position.

SEE FIGURE 3.

☐ Switch bracket. Place the switch bracket in front of you. The switch bracket is symmetrical, so it may be turned either way, at this time.

☐ S-5, the red-button slide switch. Insert the body of S-5 in the top hole, so the end without a terminal is positioned as shown in Figure 3. Fasten with two 4-40 screws, lockwashers and nuts.

☐ S-2, a white-button slide switch. Mount S-2 in the middle hole of the switch bracket, so the end without a terminal is positioned as shown. Fasten with two 4-40 screws, lockwashers and nuts.

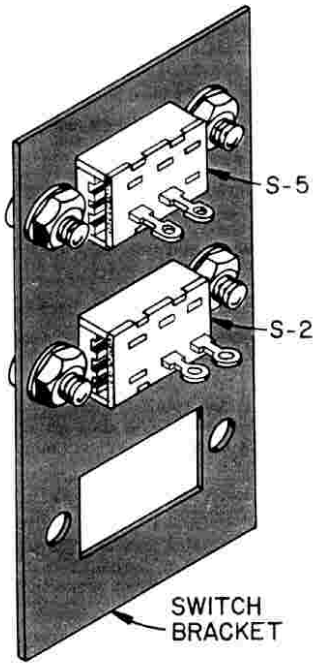


FIGURE 3

SEE FIGURES 1 and 4.

- [ ] S-3, the remaining white-button slide switch. Hardware used to mount S-3 will also be used to attach the switch bracket to the chassis. Position S-3 on the switch bracket so the end without a terminal is placed, as shown in Figure 4. Insert two 4-40 screws through S-3, through the switch bracket and through the chassis. Fasten with two lockwashers and nuts.
- [ ] J-1, 3-terminal jack. From inside the chassis, insert J-1 as shown. Fasten with a lockwasher and nut.

SEE FIGURE 17 ON A SEPARATE SHEET AND FIGURE 5.

- [ ] Reflector plate. Position the reflector plate so that the lip points away from you.
- [ ] 2 small plastic pulleys and 2 eyelets. Mount on the reflector plate as shown in Figure 5, with a 3-48 screw and nut. (The 3-48 screws are the thinnest in the kit). Make sure the eyelets are correctly positioned.
- [ ] Small plastic pulley and eyelet. Mount at the other end of the reflector plate. Insert a 3-48 screw through the plate, through the eyelet (eyelet head towards reflector plate) and through the pulley. Fasten with a 3-48 nut.
- [ ] Position the reflector plate on the chassis, with mounting lip towards the edge of the chassis. Fasten with two 6-32 x ¼" screws, lockwashers and nuts.
- [ ] Front panel and shaft bushing. Remove the protective paper from the panel. From the labeled side of the panel, insert the shaft bushing in the hole marked TUNE. Fasten to the front panel with a lockwasher and nut.

REFER BACK TO FIGURE 1.

NOTE: Protect the plates of the two single section variable capacitors from damage during assembly by rotating the shaft until the plates are fully closed (fully meshed). Do not interchange C-3 and C-4. C-4 has fewer plates than C-3.

- [ ] C-4, the smaller variable capacitor. From inside the chassis, insert the shaft of C-4 through the front of the chassis. Do not fasten at this time but save the mounting hardware supplied with C-4 for a later step.
- [ ] R-4, 5K control. Place a lockwasher on the shaft. Insert the shaft through the front of the chassis but do not fasten at this time.
- [ ] Dial crystal. Remove the protective paper. Place the dial crystal on the shafts of C-4 and R-4 so that the scale on the crystal reads from left to right when viewed from the front.
- [ ] Front panel. Now mount the front panel on the shafts of R-4 and C-4. Temporarily fasten the panel by placing a ⅜" nut over the shaft of R-4, a flat washer and ⅜" nut over the bushing of J-1 and the flat washer and nut supplied over the shaft of C-4. Tighten these nuts only to finger tightness.

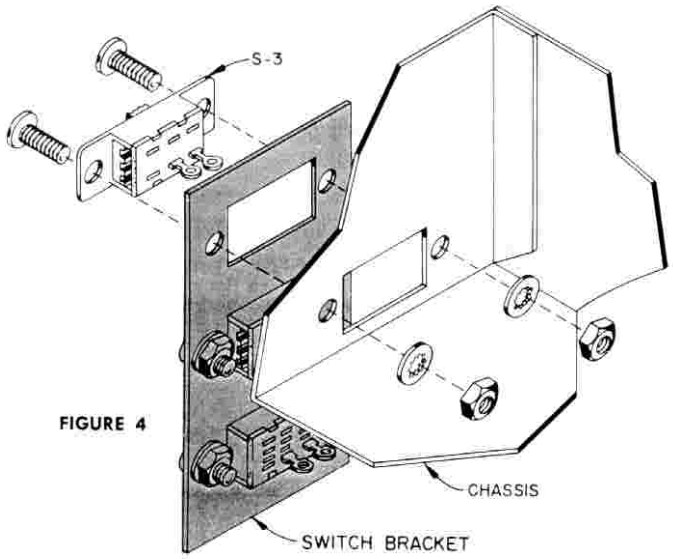


FIGURE 4

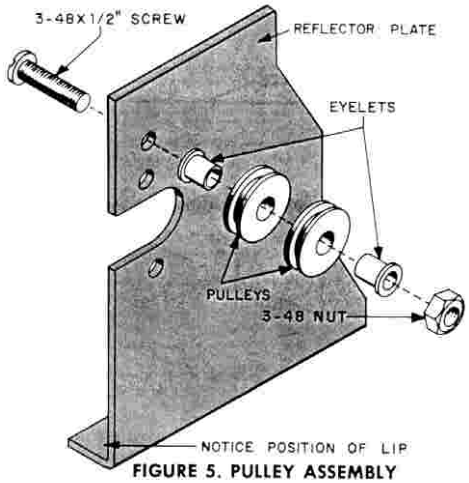


FIGURE 5. PULLEY ASSEMBLY

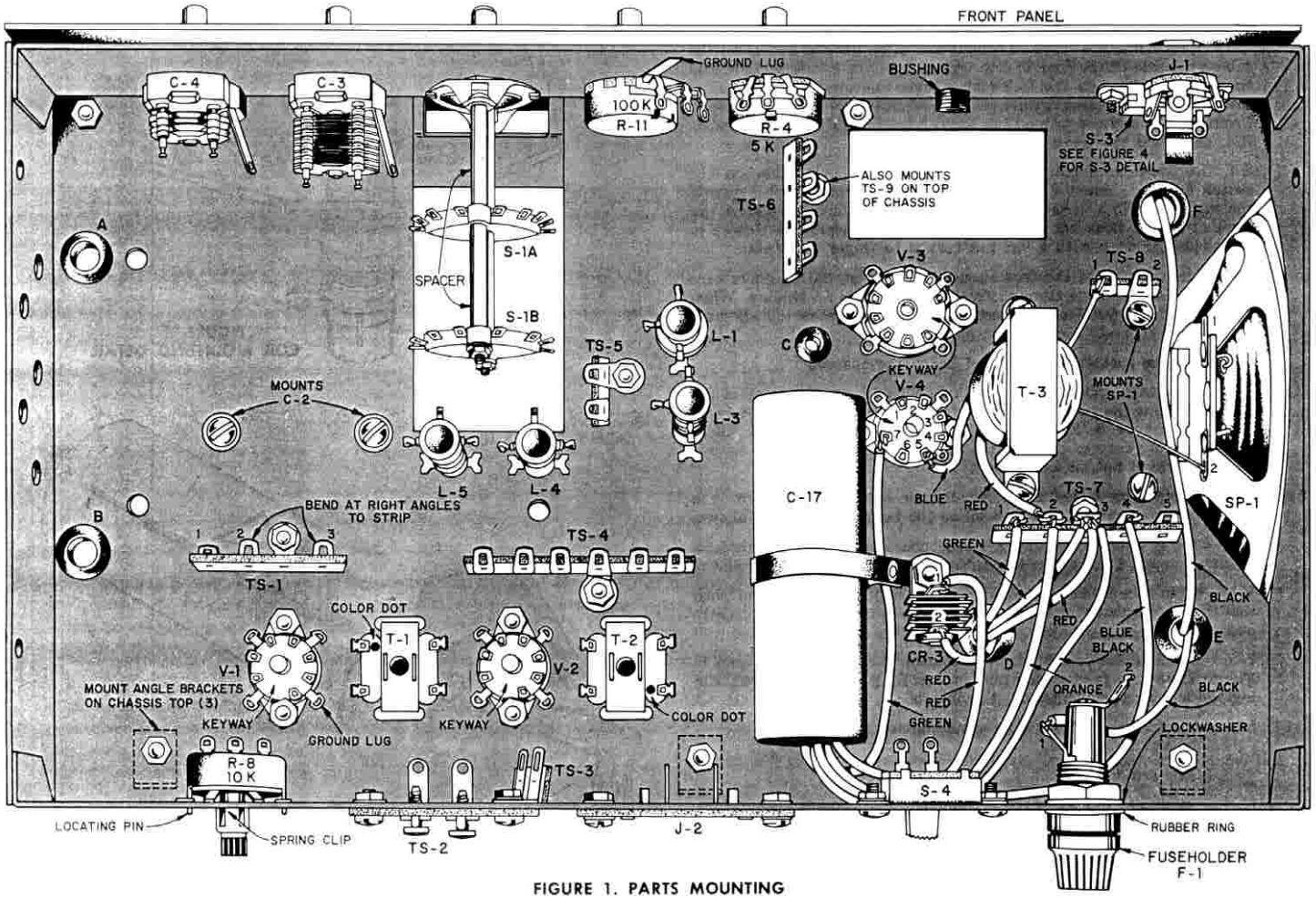


FIGURE 1. PARTS MOUNTING

MOUNTING THE PARTS—(Continued)

☐ C-3, variable capacitor with more plates than C-4. Mount next to C-4 and fasten to finger tightness with the hardware supplied.

☐ R-11, 100K control, a ⅜" lockwasher and large ground lug. Bend the tab on the side of the control flat against the face of the control. Slip the ground lug, then the lockwasher, over the shaft of R-11. Now mount R11 and fasten with a ⅜" nut turned to finger tightness. Position R-11 and the ground lug so they are turned slightly towards R-4, as shown in Figure 1.

☐ S-1, the two-section rotary switch. Place a ⅜" lockwasher on the switch bushing. Mount S-1 as shown, so the spacers which separate the wafers are in a vertical line with the shaft. Since the wafers are symmetrical, it does not matter which set of spacers are closest to the chassis. Fasten with a ⅜" nut turned to finger tightness.

☐ Check the position of the front panel and dial crystal to make sure all control shafts come through freely and there is no binding. When the panel and crystal are correctly positioned, tighten the six nuts holding the controls and panel in place.

NOTE: The tube sockets are mounted inside the chassis.

☐ V-1, a 7-pin tube socket and a small tube shield base. From top of the chassis, mount the tube shield base for V-1 with two 4-40 screws as shown in Figure 6. From inside the chassis, mount V-1 on these screws, taking care to position the keyway as shown. Fasten with a lockwasher and nut on each screw.

☐ V-2, a 7-pin tube socket and a small tube shield base. Mount in a similar manner, taking care to position the keyway of V-2, as shown.

☐ V-3, a 9-pin tube socket and a large tube shield base. Mount in a similar manner, taking care to position the keyway of V-3, as shown.

☐ V-4, a 7-pin tube socket. (No tube shield base). Mount V-4 and position the keyway, as shown. Fasten with two 4-40 screws, lockwashers and nuts.

☐ L-5, the yellow dot coil. Mount from inside the chassis, as shown in Figure 7. Be sure the locating pin is correctly positioned before pushing the locking spring through the chassis.

Mount the following coils in the same manner as L-5.

☐ L-4, the green dot coil.

☐ L-3, the red dot coil.

☐ L-1, the black dot coil.

☐ T-1, IF transformer stamped T-1. Position the color dot as shown in Figure 1. Mount with a "U" clip as shown in Figure 8.

☐ T-2, IF transformer stamped T-2. Mount in a similar manner and be sure to position the color dot, as shown.

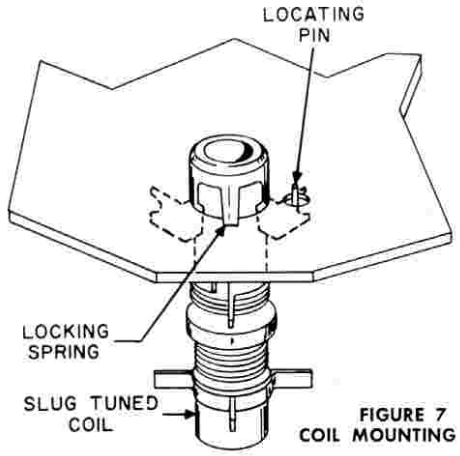


FIGURE 7
COIL MOUNTING DETAIL

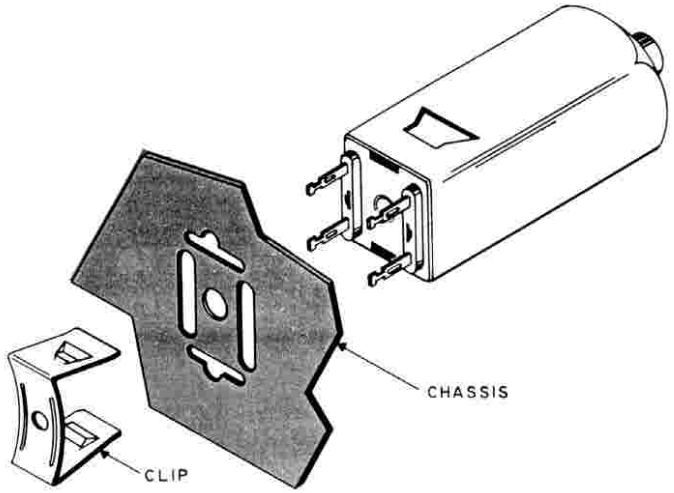


FIGURE 8. DETAIL FOR MOUNTING T-1 AND T-2

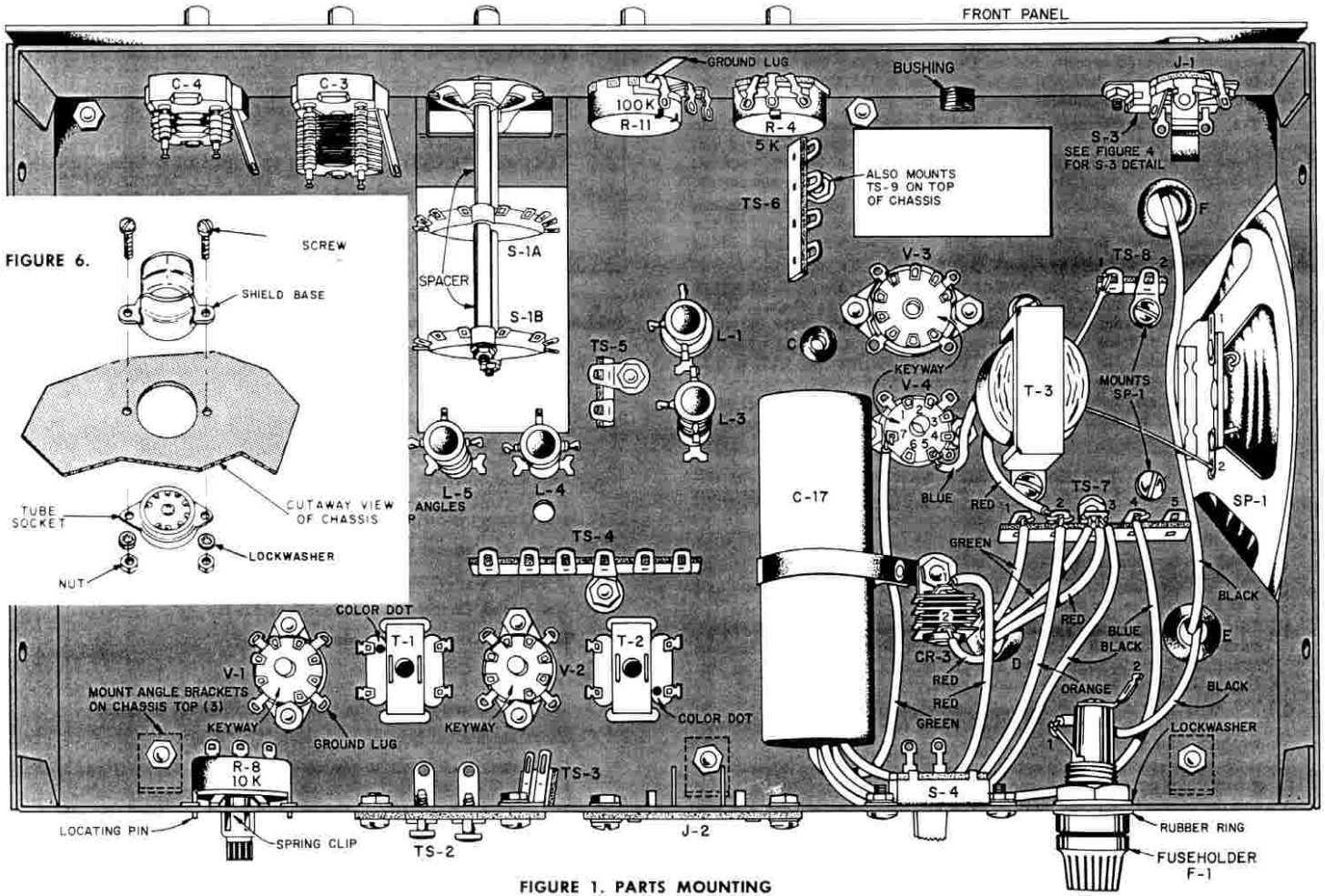


FIGURE 6.

FIGURE 1. PARTS MOUNTING

SEE FIGURE 17 FOR THE TOP VIEW OF THE CHASSIS. The following 3 parts are mounted on top of the chassis.

- ☐ C-2 tuning capacitor with large drive pulley attached. Position on top of the chassis, with the plates of the capacitor opening toward the front panel as shown in Figure 16. Place a #8 lockwasher on each of two 8-32 screws. Fasten C-2 by inserting the screws from inside the chassis, into the threaded holes in C-2, through the holes labeled for C-2, in Figure 1.
- ☐ T-4, power transformer with 6 colored leads. Place on top of the chassis so the two black leads come through grommet E. The red and green leads come through grommet D. Insert two 6-32x¼" screws through the mounting feet of T-4 and the chassis, but do not fasten.
- ☐ From inside the chassis, fasten the screw near the edge of the chassis with a lockwasher and nut. Mount TS-7, a 5-terminal strip, on the other screw used for T4. Fasten with a lockwasher and nut. Make sure TS-7 is positioned as shown in Figure 1.
- ☐ SP-1, the speaker, and TS-8, a 2-terminal strip. Place SP-1 on top of the chassis, as shown in Figure 17. From inside the chassis, use a 6-32x¼" screw and lockwasher to mount TS-8; then drive the same screw until it holds in the threaded hole in one end of the speaker bracket. Fasten the other end of the speaker bracket with a 6-32 screw and lockwasher.
- ☐ Cut a 4" square piece of cardboard from the box the speaker came in and fasten it in place over the speaker cone with a rubber band.

SEE FIGURE 1.

THE FOLLOWING TERMINAL STRIPS ARE EACH MOUNTED INSIDE THE CHASSIS WITH A 6-32x¼" SCREW, LOCKWASHER AND NUT.

- ☐ TS-4, a 6-terminal strip.
- ☐ TS-5, a 2-terminal strip.
- ☐ TS-1, a 3-terminal strip. Before mounting TS-1, bend terminals 2 and 3 at right angles, as shown in Figure 1.
- ☐ TS-6, a 4-terminal strip and TS-9, a 2-terminal strip. Use a 6-32x¼" screw to mount TS-9 on top of the chassis. From inside the chassis, mount TS-6 on the same screw and fasten with a lockwasher and nut. Figure 17 shows how TS-9 is positioned.
- ☐ T-3, output transformer. Mount from inside the chassis, with the uninsulated leads facing SP-1. Fasten with two 6-32x¼" screws, lockwashers, and nuts.
- ☐ C-17, large electrolytic capacitor and CR-3, the rectifier. These components are mounted on a common 6-32x¼" screw in the following sequence. From the top, insert the screw through the chassis, the mounting strap of C-17 and the mounting foot of CR-3. Fasten with a lockwasher and nut.
- ☐ This is a good time to stop and check your work. Make sure all parts and terminals are positioned as shown in Figure 1.
- ☐ Carefully read the soldering instructions on page 3.

IMPORTANT INSTRUCTIONS

THE INSTRUCTION *CONNECT* MEANS:	Connect the wire or lead to the given point. Make a firm mechanical connection BUT DO NOT SOLDER AT THIS TIME. Later another wire(s) will be connected to this point.
THE INSTRUCTION *SOLDER* MEANS:	Connect the wire or lead to the given point and then SOLDER THE CONNECTION AND ALL WIRES IN IT. If there is more than one wire in the connection, the number of wires will be stated—for example (2 wires).

T-3 leads. Connect the leads of T-3 in the following manner:

- ☑ Short bare lead. Cut a ¾" length of tubing from the quantity supplied, and slip it over this lead. Connect the lead to terminal 1 of TS-8.
- ☑ Long bare lead. Connect to terminal 2 of SP-1.
- ☑ Red lead. Connect to terminal 2 of TS-7.
- ☑ Blue lead. Connect to pin 5 of V-4.

C-17 leads. Connect the leads in the following manner:

- ☑ Red lead. Connect to terminal 1 of CR-3.
- ☐ Orange lead. Connect to terminal 2 of TS-7.
- ☑ Black lead. Connect to terminal 3 of TS-7.
- ☑ Blue lead. Connect to terminal 4 of TS-7.
- ☑ Green lead. Connect to pin 7 of V-4.

T-4, leads. Position and connect the leads in the following manner:

- ☑ Short black lead. Solder to terminal 1 of F-1.
- ☑ Long black lead. Position the wire as shown in Figure 1 and push the end of the wire through grommet F; it will be connected later.
- ☑ Short red lead. Solder to terminal 2 of CR-3.
- ☑ Long red lead. Connect to terminal 3 of TS-7.
- ☑ Short green lead. Connect to terminal 1 of TS-7.
- ☑ Long green lead. Connect to terminal 3 of TS-7.

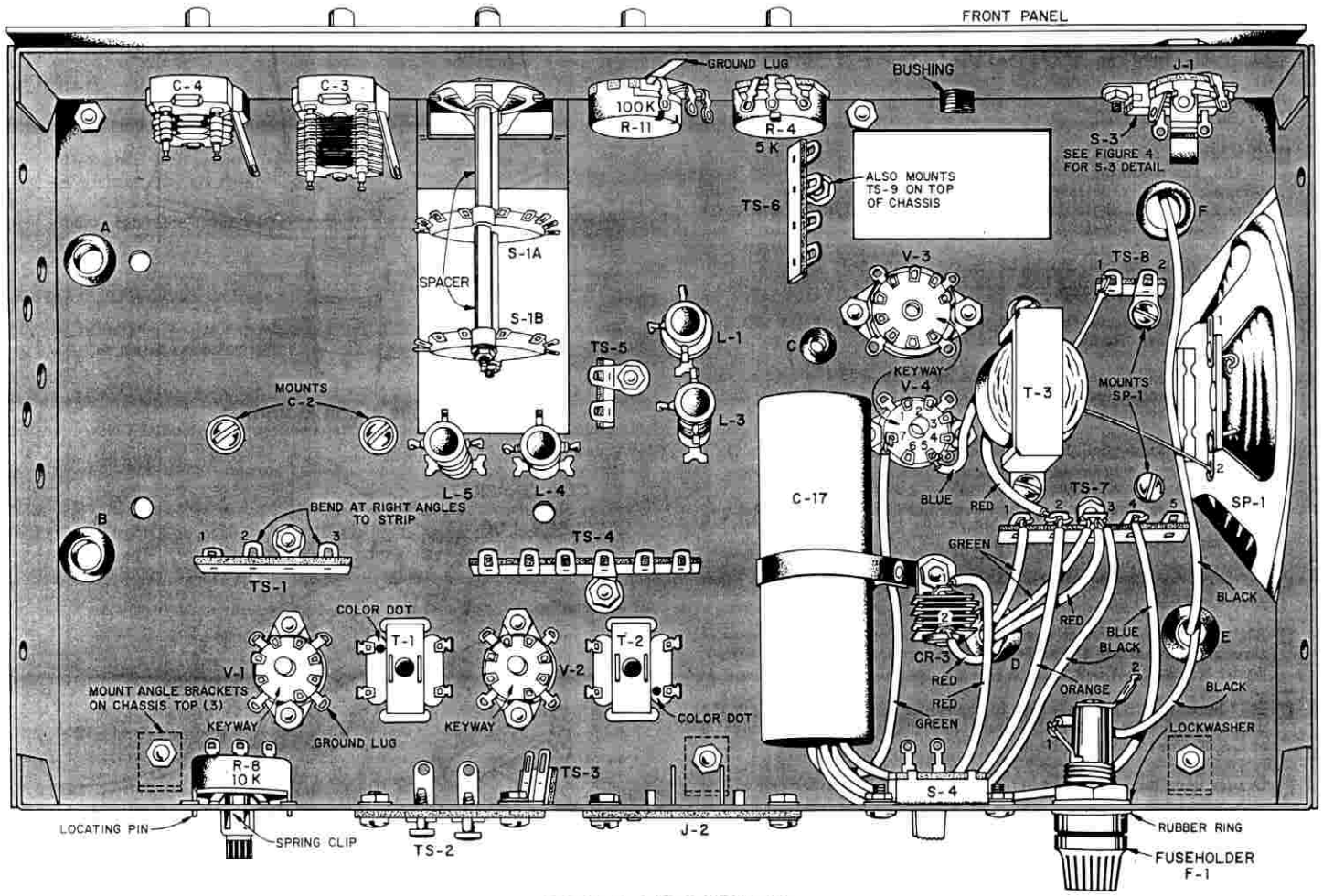


FIGURE 1. PARTS MOUNTING

COIL BRACKET ASSEMBLY

SEE FIGURES 9 and 10.

- ☐ Coil bracket and coils L-6 through L-10. Place the bracket before you so that the mounting foot is on the bottom and pointing away from you. Mount the coils in the following sequences by pressing gently into the holes until the locking spring in the head of the coil snaps into place.
  - ☐ L-7, violet dot coil. Mount in the right hand hole of the top row. Note that the locating hole is to the side of the mounting hole.
  - ☐ L-8, white dot coil. Mount in the remaining hole in the top row, again noting the location of the locating hole.
  - ☐ L-9, orange dot coil. Mount in the center hole of the bottom row. The locating holes for the bottom coils are located directly to the right of the mounting hole.
  - ☐ L-10, brown dot coil. Mount in the hole to the right of L-9.
  - ☐ L-6, blue dot coil. Mount in the remaining hole in the bracket.
  - ☐ Solder lug. Mount a solder lug in the hole above L-7 and L-8 using a 6-32x¼" screw and nut.
- ☐ ⅞" bare wire. Connect one end to terminal 2 of L-7. Connect the other end to terminal 1 of L-10.
- ☐ 2⅜" bare wire. Connect one end to the solder lug. Push the wire through terminal 3 of L-9 and solder it to terminal 1 of L-10 (2 wires). Solder terminal 3 of L-9.
- ☐ 2⅜" bare wire. Solder one end to the solder lug (2 wires). Push the wire through terminal 3 of L-6 and solder the other end to terminal 3 of L-8. Solder terminal 3 of L-6.
- ☐ Orange wire. Solder one end to terminal 3 of L-7. The other end will be connected later.
- ☐ White/black wire. Solder one end to terminal 1 of L-9. The other end will be connected later.
- ☐ Set the coil bracket aside for later mounting.

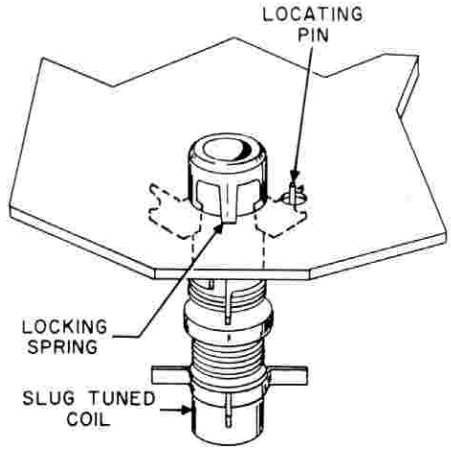


FIGURE 9. COIL MOUNTING

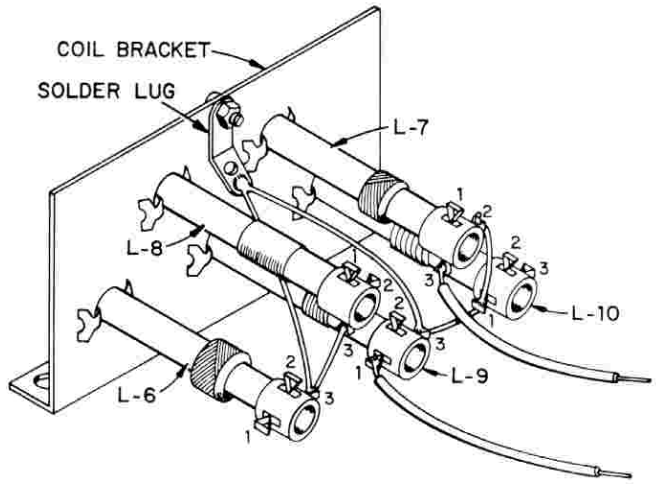


FIGURE 10. COIL BRACKET PRE-WIRING

FIRST WIRING-CHASSIS BOTTOM

SEE FIGURE 11.

- [ ] Blue wire. Connect one end to pin 4 of V-1. Position the wire as shown and push the other end through grommet A; it will be connected later.
- [ ] Yellow wire. Connect one end to terminal 1 of TS-1. Push the other end through grommet B; it will be connected later.
- [ ] 1" bare wire. Connect one end to the center pin of V-1. Push the wire through pin 3 and connect the other end to ground lug B of V-1. Solder only pin 3.
- [ ] 1" bare wire. Connect one end to the center pin of V-1. Connect the other end to ground lug A near pin 1 of V-1.
- [ ] R-1, 22K resistor (color bands marked red, red, orange). Connect one lead to pin 1 of V-1. Solder the other lead to ground lug B of V-1 (2 wires).
- [ ] R-6, 100K resistor (brown, black, yellow). Solder one lead to terminal 1 of R-8. Solder the other lead to ground lug A near pin 1 of V-1 (2 wires).
- [ ] Orange wire. Solder one end to pin 4 of V-1 (2 wires). Connect the other end to pin 4 of V-2.
- [ ] C-8, .02 μf disc capacitor. Cut a $\frac{1}{2}$" piece of tubing from the quantity supplied and slip it over one lead. Connect this lead to pin 6 of V-1. Solder the other lead to ground lug C of V-1.
- [ ] C-10, .02 μf disc capacitor. Solder one lead to ground lug D near pin 7 of V-1. Connect the other lead to terminal 4 of T-1.
- [ ] Yellow wire. Solder one end to pin 6 of V-1 (2 wires). Connect the other end to pin 6 of V-2.
- [ ] R-26, 1 K resistor (brown, black, red). Slip a $1\frac{1}{4}$" length of tubing over each lead. Connect one lead to terminal 2 of T-1. Connect the other lead to terminal 1 of T-2.
- [ ] $\frac{3}{4}$" bare wire. Solder one end to terminal 3 of T-1. Solder the other end to pin 1 of V-2.
- [ ] Gray wire. Solder one end to pin 2 of V-2. Position the wire as shown and connect the other end to terminal 2 of R-4.

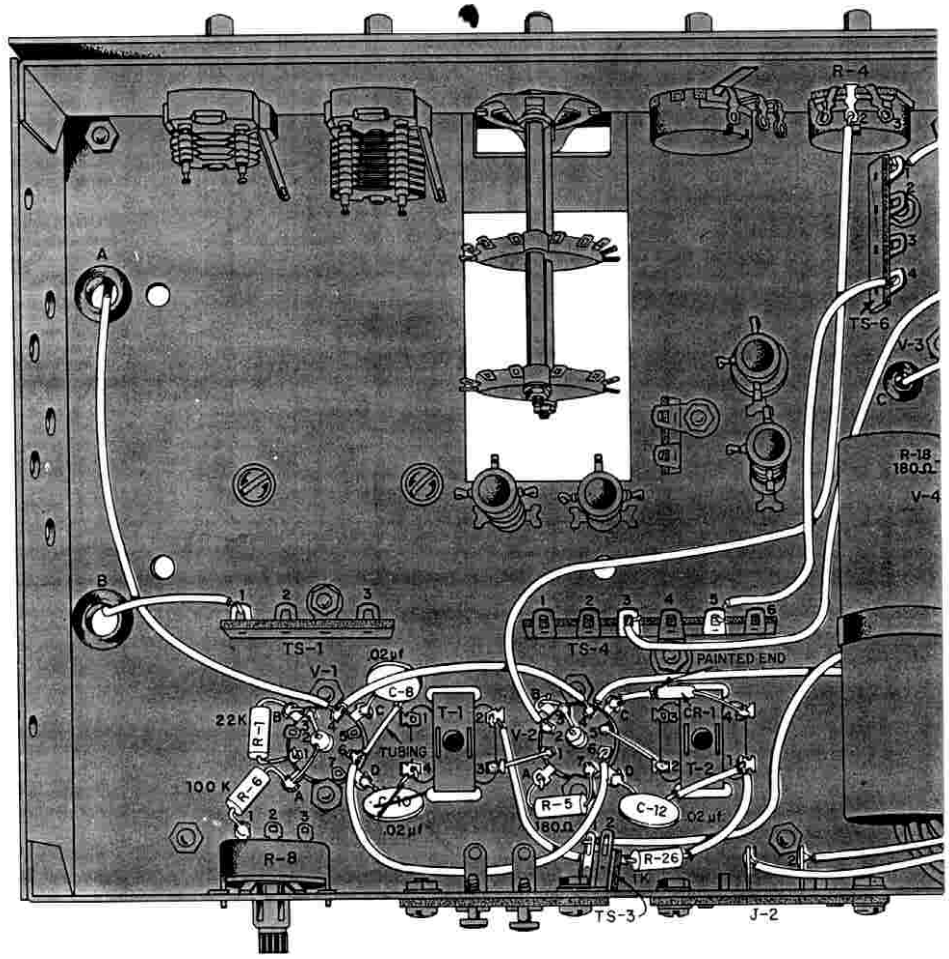


FIGURE 11. FIRST WIRING VIEW

FIRST WIRING—(Continued)

SEE FIGURE 11.

- [ ] Blue wire. Solder one end to pin 4 of V-2 (2 wires). Connect the other end to terminal 1 of TS-7.
- [ ] 1" bare wire. Solder one end to the center pin of V-2. Push the wire through pin 3 of V-2 and connect the end to ground lug B. Solder pin 3.
- [ ] 1⅛" bare wire. Solder one end to pin 5 of V-2. Solder the other end to terminal 2 of T-2.
- [ ] R-5, 180Ω resistor (brown, gray, brown). Solder one lead to pin 7 of V-2. Connect the other lead to ground lug A near pin 1 of V-2.
- [ ] Gray wire. Connect one end to terminal 4 of TS-7. Position the wire as shown and connect the other end to terminal 1 of TS-3.
- [ ] Red wire. Connect one end to terminal 1 of S-4. Solder the other end to terminal 2 of J-2.
- [ ] Orange wire. Connect one end to terminal 2 of S-4. Solder the other end to terminal 1 of J-2.
- [ ] C-12, .02 μf disc capacitor. Cut a ½" piece of tubing and slip the tubing over one lead. Connect this lead to terminal 1 of T-2. Solder the other lead to ground lug D near pin 6 of V-2.
- [ ] CR-1, OA74A diode with painted end. Cut a ½" piece of tubing and slip it over the lead of the diode at the end painted red. NOTE: When soldering the leads of the diodes, grasp the lead with a pair of pliers to prevent the diode from being damaged by the heat. Solder the lead with tubing to ground lug C near pin 4 of V-2. Solder the other lead to terminal 4 of T-2.
- [ ] Green wire. Solder one end to terminal 2 of S-3. Connect the other end to terminal 1 of TS-6.
- [ ] Orange wire. Solder one end to terminal 1 of S-3. Connect the other end to terminal 1 of J-1.
- [ ] Yellow wire. Solder one end to terminal 1 of J-1 (2 wires). Push the other end through grommet "F"; it will be connected later.
- [ ] Blue wire. Connect one end to terminal 1 of TS-8. Position the wire as shown and solder the other end to terminal 1 of S-4 (2 wires).
- [ ] Red wire. Solder one end to terminal 2 of SP-1 (2 wires). Solder the other end to terminal 3 of TS-7 (4 wires).
- [ ] Violet wire. Connect one end to terminal 5 of TS-7. Push the other end of the wire through grommet "F"; it will be connected later.
- [ ] R-13, 1K, 1 watt resistor (brown, black, red). Connect one lead to terminal 2 of TS-7. Connect the other lead to terminal 4 of TS-7.
- [ ] Red wire. Solder one end to terminal 1 of TS-7 (3 wires). Connect the other end to pin 3 of V-4.
- [ ] ½" bare wire. Connect one end to pin 4 of V-3. Solder the other end to pin 5 of V-3.
- [ ] Red wire. Solder one end to terminal 3 of V-4 (2 wires). Connect the other end to terminal 4 of V-3.
- [ ] Orange wire. Solder one end to pin 4 of V-3 (3 wires). Push the other end through grommet "C"; it will be connected later.
- [ ] 1" bare wire. Connect one end to the center pin of V-4. Push the wire through pin 2 of V-4 and solder the other end to ground lug B. Solder pin 2.
- [ ] 1" bare wire. Connect one end to the center pin of V-4. Push the wire through pin 4 of V-4 and solder the other end to ground lug C. Solder pin 4.
- [ ] 1" bare wire. Connect one end to the center pin of V-4. Connect the other end to ground lug A of V-4.
- [ ] R-18, 180Ω resistor (brown, gray, brown). Cut one lead to ½" and solder this lead to pin 7 of V-4 (2 wires). Solder the other lead to ground lug A of V-4 (2 wires).
- [ ] R-17, 470K resistor (yellow, violet, yellow). Cut both leads to ½". Connect one lead to pin 1 of V-4. Solder the other lead to ground lug A near pin 1 of V-3.
- [ ] C-16, .005 μf disc capacitor. Cut both leads to ⅜". Solder one lead to pin 1 of V-4 (2 wires). Connect the other lead to pin 1 of V-3.
- [ ] C-15, .005 μf disc capacitor. Cut both leads to ⅜". Connect one lead to pin 2 of V-3. Connect the other lead to pin 6 of V-3.
- [ ] ⅝" bare wire. Solder one end to pin 9 of V-3. Solder the other end to ground lug D near pin 9.
- [ ] Yellow wire. Connect one end to terminal 5 of TS-4. Connect the other end to terminal 4 of TS-6.
- [ ] Brown wire. Connect one end to terminal 3 of TS-4. Position the wire as shown and push the other end through grommet F; it will be connected later.
- [ ] C-21, .01 μf disc capacitor. Solder one lead to pin 5 of V-4 (2 wires). Solder the other lead to the center pin of V-4 (4 wires).

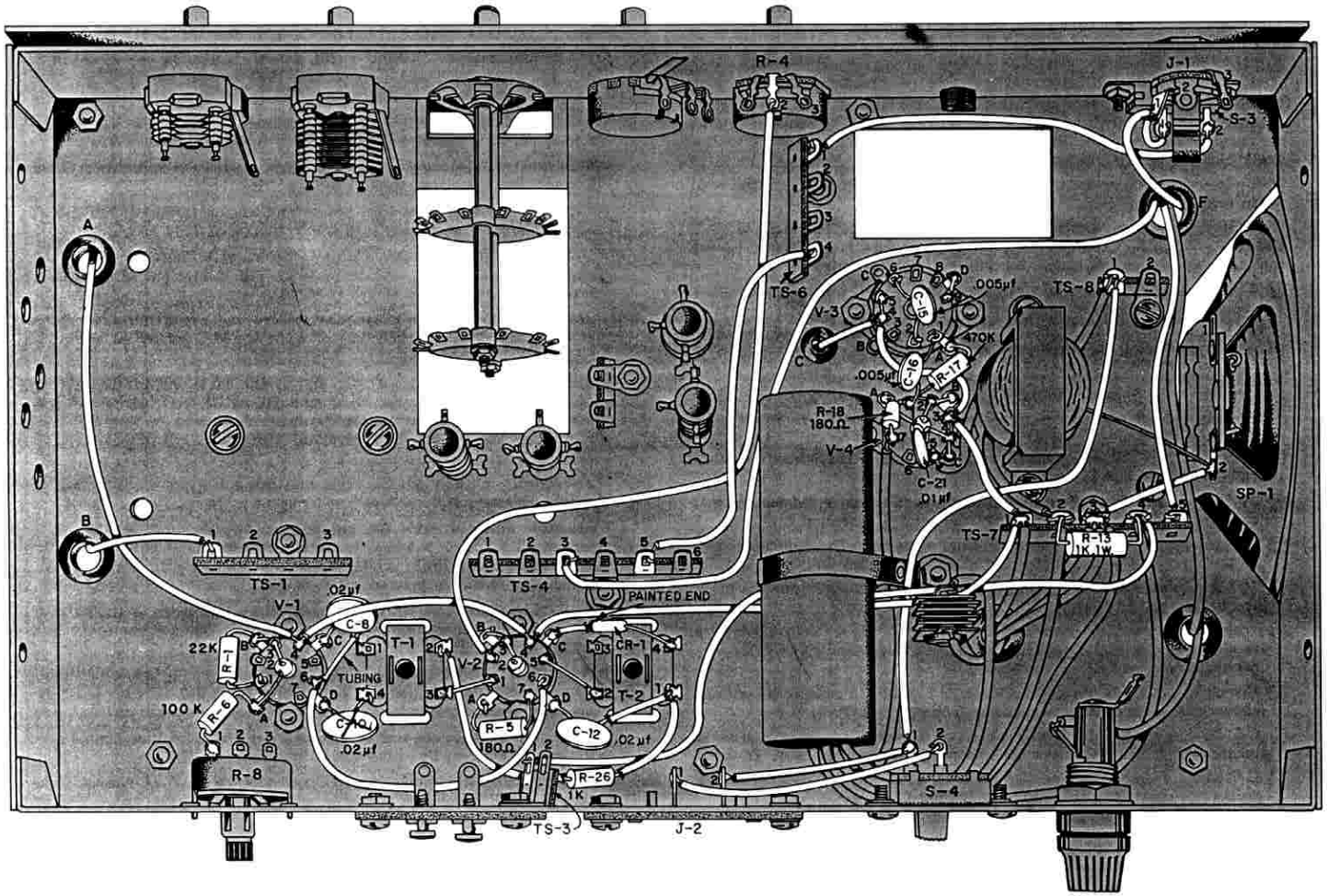


FIGURE 11. FIRST WIRING VIEW

SECOND WIRING-CHASSIS BOTTOM

SEE FIGURE 12.

- [ ] Green wire. Connect one end to terminal 1 of TS-1. Solder the other end to terminal 1 of C-4.

NOTE: To assure efficient operation of your STAR ROAMER, all wires connecting to S-1 and the coils should be as short as possible. Position the wires as shown in the illustrations. Notice that wafer A of S-1 is the wafer closest the front panel.

- [ ] Yellow wire. Solder one end to terminal 2 of C-4. Solder the other end to terminal 5 of S-1A.

CAUTION: Exercise particular care in soldering the terminals of S-1. Use only enough solder to insure an adequate connection and check to see that the solder does not bridge the gap between terminals.

- [ ] 2″ bare wire. Connect one end to terminal 3 of C-3. Solder the other end to terminal 6 of S-1A.
- [ ] 2″ bare wire. Solder one end to terminal 1 of TS-5. Push the wire through terminal 3 of L-1 and solder the other end to terminal 1 of L-3.
- [ ] Orange wire. Solder one end to terminal 2 of L-3. Push the other end through the switch cutout in the chassis. The other end will be connected later.
- [ ] 1½″ bare wire. Solder one end to terminal 3 of S-1B. Solder the other end to terminal 2 of L-4.
- [ ] 2½″ bare wire. Slip a 2″ piece of tubing over the wire. Solder one end to terminal 4 of S-1B. Solder the other end to terminal 1 of L-5.
- [ ] 2½″ bare wire. Slip a 2″ piece of tubing over the wire. Solder one end to terminal 9 of S-1B. Solder the other end to terminal 3 of L-4.
- [ ] ⅜″ bare wire. Connect one end to terminal 3 of L-5. Solder the other end to terminal 1 of L-4.
- [ ] White/gray wire. Solder one end to terminal 2 of R-8. Position the wire as shown and push it through grommet F. The other end will be connected later.
- [ ] Brown wire. Solder one end to terminal 3 of R-8. Position the wire as shown and connect the other end to terminal 4 of TS-7.
- [ ] C-5, 39 $\mu\mu$f mica capacitor. Position as shown. Connect one lead to terminal 2 of TS-1. Connect the other lead to terminal 3 of TS-1.
- [ ] C-6, 470 $\mu\mu$f disc capacitor. Solder one lead to pin 1 of V-1 (2 wires). Solder the other lead to terminal 1 of TS-1 (3 wires).
- [ ] 1″ bare wire. Solder one end to pin 5 of V-1. Slip a ⅝″ piece of tubing over the wire and solder the other end to terminal 1 of T-1.
- [ ] Orange wire. Connect one end to terminal 3 of TS-4. Connect the other end to terminal 4 of T-1.
- [ ] R-7, 3.3 meg resistor (orange, orange, green). Solder one lead to terminal 3 of TS-4 (3 wires). Connect the other lead to terminal 2 of TS-4.
- [ ] R-10, 47K resistor (yellow, violet, orange). Connect one lead to terminal 2 of TS-4. Connect the other lead to terminal 3 of T-2.
- [ ] R-24, 470K resistor (yellow, violet, yellow). Cut a ⅞″ piece of tubing and slip it over one lead. Connect this lead to terminal 5 of TS-4. Connect the other lead to terminal 1 of TS-4.
- [ ] R-23, 100K resistor (brown, black, yellow). Connect one lead to terminal 1 of TS-4. Connect the other lead to terminal 3 of T-2.
- [ ] C-14, .005 μf disc capacitor. Connect one lead to terminal 5 of TS-4. Connect the other lead to terminal 6 of TS-4.
- [ ] C-13, 470 $\mu\mu$f disc capacitor. Solder one lead to terminal 3 of T-2 (3 wires). Connect the other lead to terminal 4 of TS-4.
- [ ] C-11, .02 μf disc capacitor. Cut a ⅜″ piece of tubing and slip it over one lead. Connect this lead to pin 6 of V-2. Solder the other lead to ground lug A near pin 1 of V-2 (2 wires).
- [ ] Shielded cable. The four shielded cables are pre-stripped for your convenience. Prepare each end of each shielded cable, as shown in Figure 13.
- [ ] Prepared shielded cable. At one end of the cable, cut off the shield; solder the inner conductor to terminal 6 of TS-4 (2 wires). At the other end of the cable, solder the inner conductor to terminal 3 of R-11. Connect the shield to terminal 1 of R-11.
- [ ] White/red wire. Connect one end to terminal 1 of T-2. Position the wire as shown and push the other end through grommet F; it will be connected later.
- [ ] Prepared shielded cable. At one end, solder the inner conductor to terminal 2 of R-11; connect the shield to terminal 1 of R-11. At the other end of the cable, solder the inner conductor to pin 7 of V-3. Solder the shield to ground lug C of V-3.
- [ ] R-16, 1K resistor (brown, black, red). Slip a ⅜″ piece of tubing over one lead and connect this lead to pin 3 of V-3. Connect the other lead to terminal 2 of TS-6.
- [ ] R-15, 470K resistor (yellow, violet, yellow). Slip a ¼″ piece of tubing over one lead and solder this lead to pin 2 of V-3 (2 wires). Solder the other lead to ground lug B near pin 3 of V-3.
- [ ] Blue wire. Connect one end to terminal 4 of TS-7. Position the wire as shown and connect the other end to terminal 3 of TS-6.
- [ ] Orange wire. Solder one end to terminal 4 of TS-7 (6 wires). Take care that all wires are properly soldered. Solder the other end to pin 6 of V-4.
- [ ] R-19, 1K, 1 watt resistor (brown, black, red). Solder one lead to terminal 1 of CR-3 (2 wires). Solder the other lead to terminal 2 of TS-7 (4 wires).
- [ ] Green wire. Solder one end to terminal 1 of SP-1. Solder the other end to terminal 2 of J-1.
- [ ] White/red wire. Solder one end to terminal 2 of S-4 (2 wires). Solder the other end to terminal 3 of J-1.

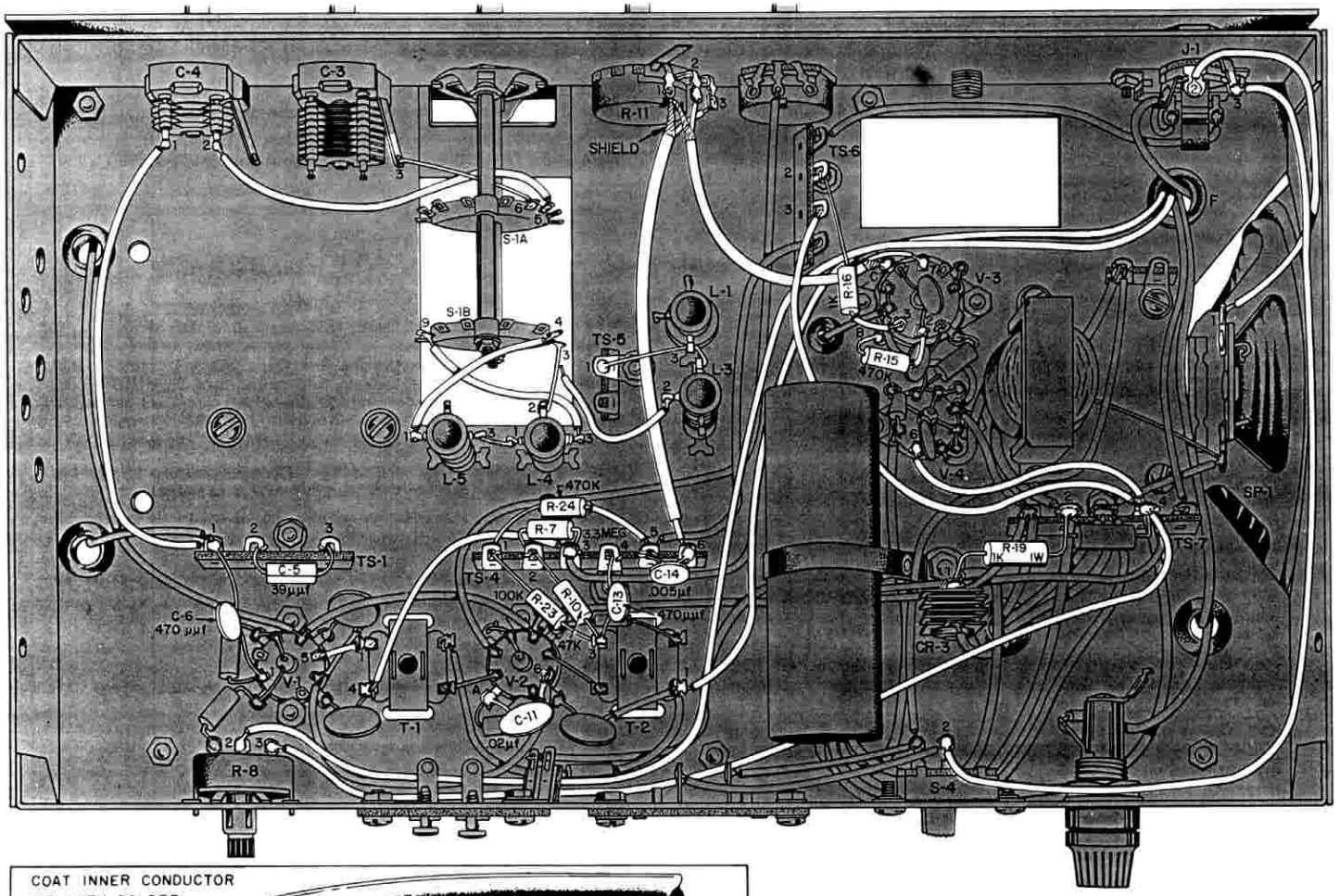


FIGURE 12.
SECOND WIRING VIEW

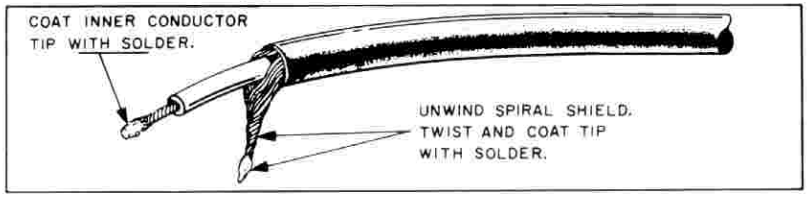


FIGURE 13. SHIELDED CABLE

THIRD WIRING-CHASSIS BOTTOM

SEE FIGURE 14.

- ☐ Coil bracket and TS-11, a 2-terminal strip. Insert a 6-32x¼" screw through the mounting foot of TS-11 and position the strip and screw as shown in Figure 17. Place the foot of the coil bracket over the screw where it protrudes through the bottom of the chassis. Fasten the coil bracket and TS-11 to the chassis with a lockwasher and nut on the screw. Fasten the other end of the coil bracket with a 6-32x¼" screw, lockwasher, and nut.
- ☐ Orange wire from terminal 3 of L-7. Push the wire down between the wafers of S-1. The other end will be connected later.
- ☐ White/black wire from terminal 1 of L-9. Solder the free end to terminal 3 of S-1A.
- ☐ Orange wire. Solder one end to terminal 3 of L-10. Solder the other end to terminal 4 of S-1A.
- ☐ 1½" bare wire. Solder one end to terminal 11 of S-1A. Slip a 1⅛" piece of tubing over the wire and solder the other end to terminal 2 of L-10.
- ☐ 1¾" bare wire and 1½" tubing. Slip the tubing over the wire. Solder one end to terminal 10 of S-1A. Solder the other end to terminal 2 of L-9.
- ☐ 2" bare wire and 1⅝" tubing. Slip the tubing over the wire. Solder one end to terminal 9 of S-1A. Solder the other end to terminal 2 of L-8.
- ☐ 1½" bare wire and 1⅛" tubing. Slip the tubing over the wire. Solder one end to terminal 8 of S-1A. Solder the other end to terminal 1 of L-7.
- ☐ 1¾" bare wire and 1¼" tubing. Slip the tubing over the wire. Solder one end to terminal 10 of S-1B. Solder the other end to terminal 2 of L-5.
- ☐ C-7, .005 μf disc capacitor. Cut a ¼" piece of tubing and slip it over one lead. Connect this lead to terminal 5 of S-1B. Connect the other lead to terminal 2 of TS-5.
- ☐ L-11, the coil with wire leads. Solder one lead to terminal 6 of S-1B. Connect the other lead to terminal 2 of L-1.
- ☐ C-20, 6800 μμf disc capacitor. Solder one lead to terminal 2 of L-1 (2 wires). Connect the other lead to terminal 3 of L-1.
- ☐ Prepared shielded cable. Clip off the shield at one end. Solder the inner conductor at this end to terminal 2 of TS-5 (2 wires). Connect the inner conductor at the other end to pin 7 of V-1. Solder the shield to the center pin of V-1 (3 wires).
- ☐ R-2, 100K resistor (brown, black, yellow). Solder one lead to pin 7 of V-1 (2 wires). Connect the other lead to terminal 4 of T-1.
- ☐ C-9, .02 μf disc capacitor. Solder one lead to terminal 2 of T-1 (2 wires). Connect the other lead to ground lug B near pin 3 of V-2.
- ☐ R-25, 100K resistor (brown, black, yellow). Connect one lead to terminal 2 of TS-4. Connect the other lead to terminal 4 of TS-4.
- ☐ 2¼" bare wire and 1¾" tubing. Slip the tubing over the wire. Connect one end to terminal 3 of L-5. Solder the other end to terminal 4 of TS-4 (3 wires).
- ☐ C-23, 470 μμf disc capacitor. Slip a ⅜" piece of tubing over one lead and connect this lead to terminal 2 of TS-4. Solder the other lead to ground lug B near pin 3 of V-2 (3 wires).
- ☐ CR-2, an OA74A diode. Note that one end of the diode has been painted red. Slip a 1" piece of tubing over the lead at the painted end and connect the lead to terminal 5 of TS-4. Slip a 1" piece of tubing over the other lead and connect to terminal 2 of TS-4. NOTE: Hold the lead connected to terminal 2 with a pair of pliers or heat-sink and solder terminal 2 of TS-4 (5 wires). Hold the lead connected to terminal 5 of TS-4 with the pliers and solder the terminal (4 wires).
- ☐ R-3, 22K resistor (red, red, orange). Connect one lead to terminal 1 of TS-3. Solder the other lead to pin 6 of V-2 (3 wires).
- ☐ R-9, 4.7K resistor (yellow, violet, red). Solder one lead to terminal 1 of TS-3 (3 wires). Solder the other lead to terminal 1 of T-2 (4 wires).
- ☐ 1½" bare wire. Connect one end to terminal 1 of R-4. Bend the ground lug mounted under R-11 down until it touches terminal 1 of R-11. Solder the other end of the bare wire and ground lug to terminal 1 of R-11 (4 wires).
- ☐ C-24, .005 μf disc capacitor. Slip a ⅜" piece of tubing over each lead and solder one lead to terminal 1 of TS-6 (2 wires). Solder the other lead to terminal 4 of TS-6 (2 wires).
- ☐ R-21, 12K resistor (brown, red, orange). Slip a 1¼" piece of tubing over one lead and solder this lead to pin 3 of V-3 (2 wires). Solder the other lead to terminal 1 of TS-8 (3 wires).
- ☐ R-12, 150K resistor (brown, green, yellow). Slip a ⅜" piece of tubing over one lead and solder this lead to pin 6 of V-3 (2 wires). Slip a ¼" piece of tubing over the other lead and connect this lead to terminal 3 of TS-6.
- ☐ R-22, 680Ω resistor (blue, gray, brown). Slip a ½" piece of tubing over one lead and solder this lead to pin 8 of V-3. Solder the other lead to terminal 2 of TS-6 (2 wires).
- ☐ Flywheel and tuning shaft. Insert the tuning shaft into the bushing as shown in Figure 15. Fasten in place by crimping a "C" ring on the front panel side of the bushing. Fasten the flywheel in place by tightening with a setscrew. Crimp the other "C" ring as shown inside the chassis.

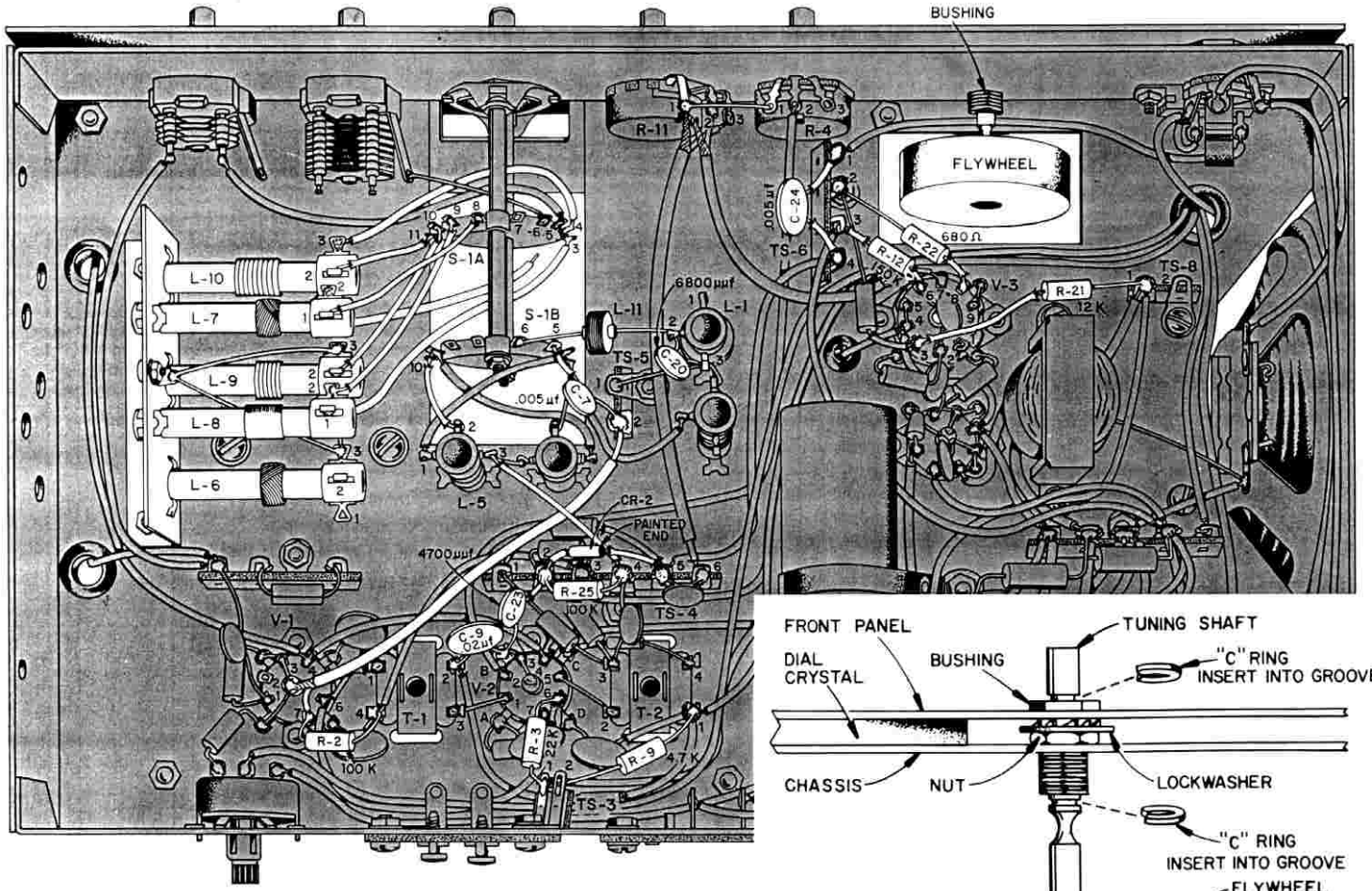


FIGURE 14. THIRD WIRING VIEW

FIGURE 15. FLYWHEEL ASSEMBLY

WIRING THE CHASSIS TOP

SEE FIGURE 17.

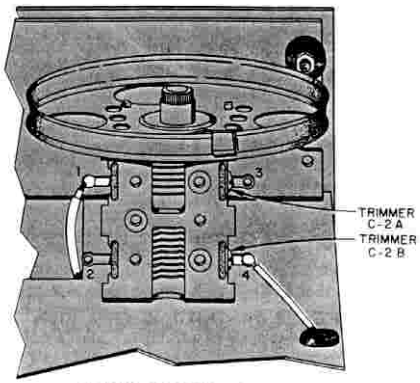
- [ ] Pilot lights I-1, I-2 and sockets. Insert the bulbs in the sockets and twist to secure them. Mount the sockets to the reflector plate by gently compressing the sockets and inserting the mounting tabs in the holes above and below the bulb cutouts.

NOTE: When connecting the leads of the sockets, the leads may be trimmed for neatness.

- [ ] I-1 socket. Solder the lead from the outer shell of the socket to terminal 1 of TS-9. Connect the lead from the back of the socket to terminal 2 of TS-9.
- [ ] I-2 socket. Solder the lead from the outer shell of the socket to terminal 1 of TS-11. Connect the lead from the back of the socket to terminal 2 of TS-11.
- [ ] Blue wire from grommet A. Solder the free end to terminal 2 of TS-11 (2 wires).
- [ ] Yellow wire from grommet B. Refer to Figure 16 for the correct terminal location. Solder the free end of the wire to terminal 4 of C-2.
- [ ] White/black wire. Refer to Figure 16. Solder one end to terminal 1 of C-2. Push the other end of the wire down through the chassis cutout; it will be connected later.
- [ ] Orange wire from terminal 3 of L-7. Solder the free end to terminal 1 of S-1A.
- [ ] Yellow wire. Solder one end to terminal 2 of S-1A. Push the other end down between the switch wafers; it will be connected later.
- [ ] Green wire. Solder one end to terminal 12 of S-1A. Push the other end down; it will be connected later.
- [ ] 1⅞" bare wire. Solder one end to terminal 13 of S-1A. Push the other end of the wire down between S-1A and the front panel; it will be connected later.
- [ ] Yellow wire. Solder one end to terminal 14 of S-1A. Push the other end down between wafer S-1B and the chassis edge; it will be connected later.
- [ ] White/blue wire. Solder one end to terminal 11 of S-1B. Push the wire back towards the rear of the chassis; it will be connected later.
- [ ] Prepared shielded wire. Clip off the shield at one end and solder the inner conductor to terminal 12 of S-1B. Push the other end down between the wafers of the switch; it will be connected later.
- [ ] TS-10, a two-terminal strip. Mount on top of chassis with a 6-32x¼" screw, lockwasher and nut.
- [ ] Red wire. Solder one end to terminal 1 of S-1B. Connect the other end to terminal 1 of TS-10.
- [ ] Orange wire from terminal 2 of L-3. Solder the free end to terminal 2 of S-1B.
- [ ] L-2, loopstick. Position L-2 so that the unsupported end (end without hole) is wedged between T-4 and the back plate. Insert a 6-32 x 1" screw through a small flat washer, through the back plate, through L-2, and fasten with a lockwasher and nut.
- [ ] Red lead from L-2. Solder to terminal 1 of TS-10 (2 wires).
- [ ] Black lead from L-2. Solder to terminal 2 of TS-10.
- [ ] Orange wire from grommet C. Solder to terminal 2 of TS-9 (2 wires).
- [ ] M-1, meter and mounting clip. Mount M-1 by inserting it through the front panel from the outside with the terminal with the "+" sign towards S-5. Fasten in place by sliding the mounting clip over the body of M-1, teeth pointing away from the front panel, and compressing the sides when the back of the clip is against the front panel.

Wires from grommet F. Solder the wires in the following sequence.

- [ ] Brown wire. Solder to terminal 1 of S-2.
- [ ] Yellow wire. Solder to terminal 2 of S-2.
- [ ] Black wire. Solder to terminal 1 of S-5.
- [ ] Violet wire. Solder to terminal 2 of S-5.
- [ ] White/gray wire. Solder to terminal 1 of M-1.
- [ ] White/red wire. Solder to terminal 2 of M-1.



TRIMMER CAPACITOR LOCATION

FIGURE 16. C-2 WIRING DETAIL

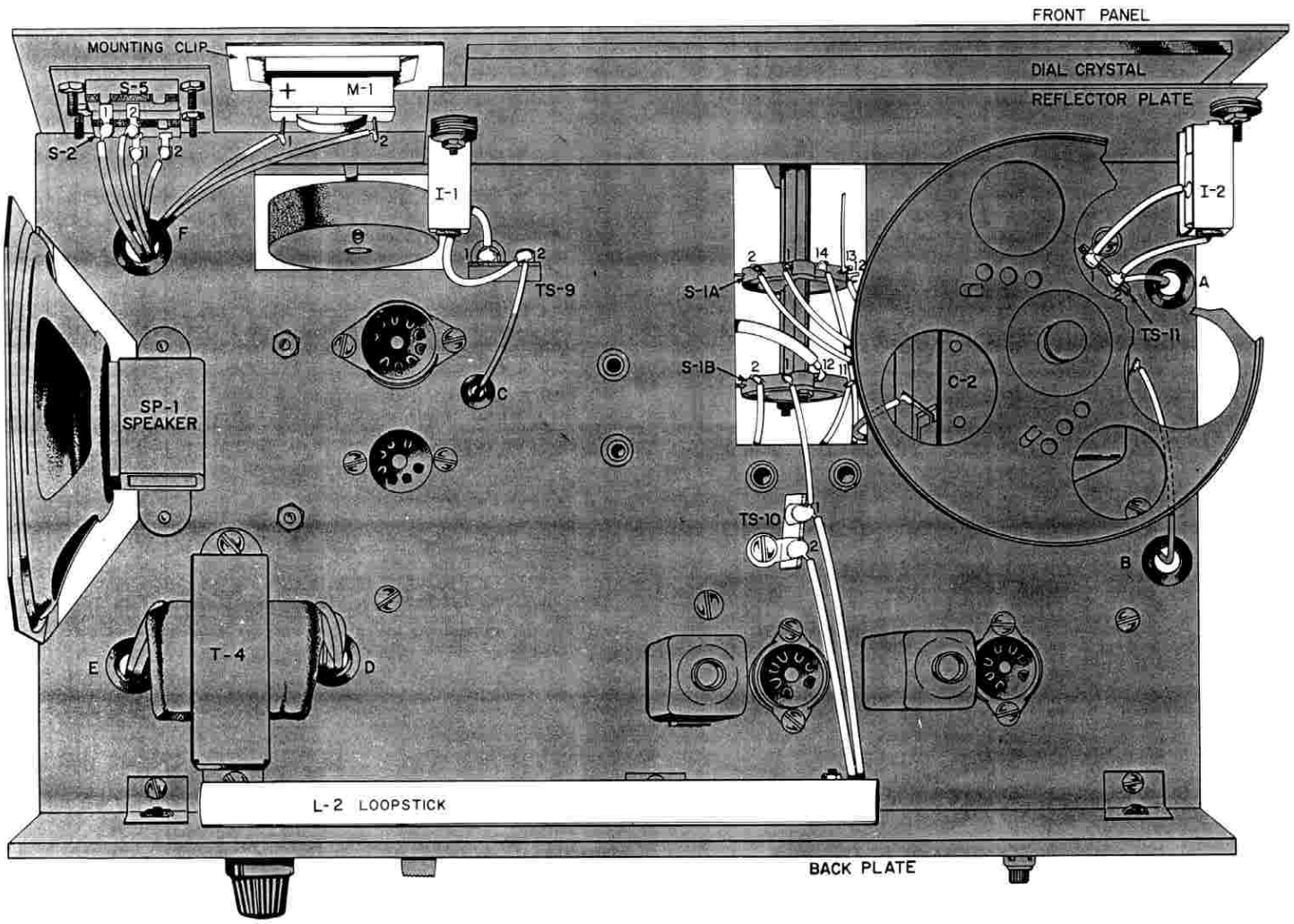


FIGURE 17. TOP WIRING VIEW

FINAL WIRING-CHASSIS BOTTOM

SEE FIGURE 20.

- [ ] 1⅜" bare wire. Connect one end to terminal 3 of C-3. Connect the other end to terminal 2 of L-7.
- [ ] 1¾" bare wire. Solder one end to terminal 3 of C-4. Solder the other end to terminal 2 of L-7 (3 wires).
- [ ] C-25, the variable trimmer capacitor. Mount C-25 to terminals 2 and 3 of TS-1 in the manner shown in Figure 18. Do not solder the mounting feet of C-25 at this time.
- [ ] Yellow wire from terminal 14 of S-1A. Solder to the mounting foot of C-25 that passes through terminal 3 of TS-1. Be sure that the mounting foot, the lead from C-5, and the yellow wire are firmly soldered to the terminal.
- [ ] Red wire. Solder to the mounting foot of C-25 that passes through terminal 2 of TS-1. Be sure that the mounting foot, the lead from C-5, and the red wire are firmly soldered to the terminal. Solder the other end to terminal 1 of L-6.
- [ ] Bare wire from terminal 13 of S-1A. Solder the free end to terminal 3 of C-3 (2 wires).
- [ ] Green wire from terminal 12 of S-1A. Solder the free end to pin 2 of V-1.
- [ ] Yellow wire from terminal 2 of S-1A. Solder the free end to terminal 1 of L-8.
- [ ] White/black wire from terminal 1 of C-2. Connect the free end to terminal 5 of S-1B.
- [ ] Orange wire. Solder one end to terminal 5 of S-1B (3 wires). Solder the other end to terminal 2 of C-3.
- [ ] 3⅛" bare wire and 2⅞" tubing. Slip the tubing over the wire and solder one end to terminal 7 of S-1A. Solder the other end to terminal 2 of L-6.
- [ ] Shielded cable from terminal 12 of S-1B. Solder the inner conductor of the free end to terminal 1 of L-1. Solder the shield to terminal 3 of L-1 (3 wires).

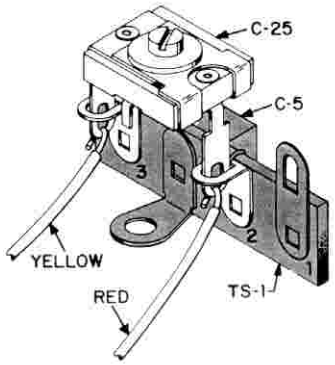


FIGURE 18. MOUNTING C-25

- [ ] Orange wire. Solder one end to terminal 8 of S-1B. Solder the other end to terminal 3 of L-3.
- [ ] White/blue wire from terminal 11 of S-1B. Solder the free end to terminal 1 of TS-2.
- [ ] C-22, .1 μf disc capacitor. Solder one lead to terminal 1 of TS-4 (3 wires). Solder the other lead to terminal 3 of L-5 (3 wires).
- [ ] C-19, .25 μf tubular capacitor. Note that the capacitor has a band at one end. Connect the lead at this end to terminal 2 of TS-2. Solder the other lead to terminal 4 of T-1 (3 wires).
- [ ] 1" bare wire. Solder one end to terminal 2 of TS-2 (2 wires). Solder the other end to terminal 2 of TS-3.
- [ ] R-14, 150K resistor (brown, green, yellow). Slip a ½" piece of tubing over one lead and solder this lead to pin 1 of V-3 (2 wires). Slip a ¾" piece of tubing over the other lead and solder it to terminal 3 of TS-6 (3 wires).
- [ ] R-20, 2.2K resistor (red, red, red). Solder one lead to terminal 1 of R-4 (2 wires). Solder the other lead to terminal 2 of R-4 (2 wires).
- [ ] Line cord and bushing. Mount as shown in Figure 19. Cut 1½" from one lead. Strip the insulation back ¼". Solder the long line cord lead to terminal 5 of TS-7 (2 wires). Solder the short line cord lead to terminal 2 of the fuse holder.
- [ ] Four clip nuts. Install four clip nuts on the sides of the chassis as shown in Figure 20. Be sure that the flat side of the clip nut is on the outside of the chassis.
- [ ] The wiring of your STAR ROAMER is now completed. Make sure that all connections have been well soldered. If a connection appears doubtful, re-heat and add solder, if required. Cut off all excess wires protruding from any connections.

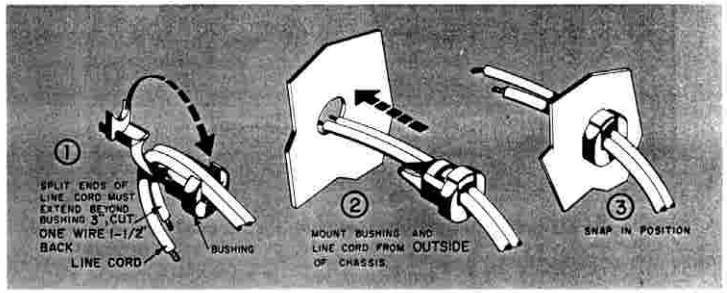


FIGURE 19. LINE CORD MOUNTING

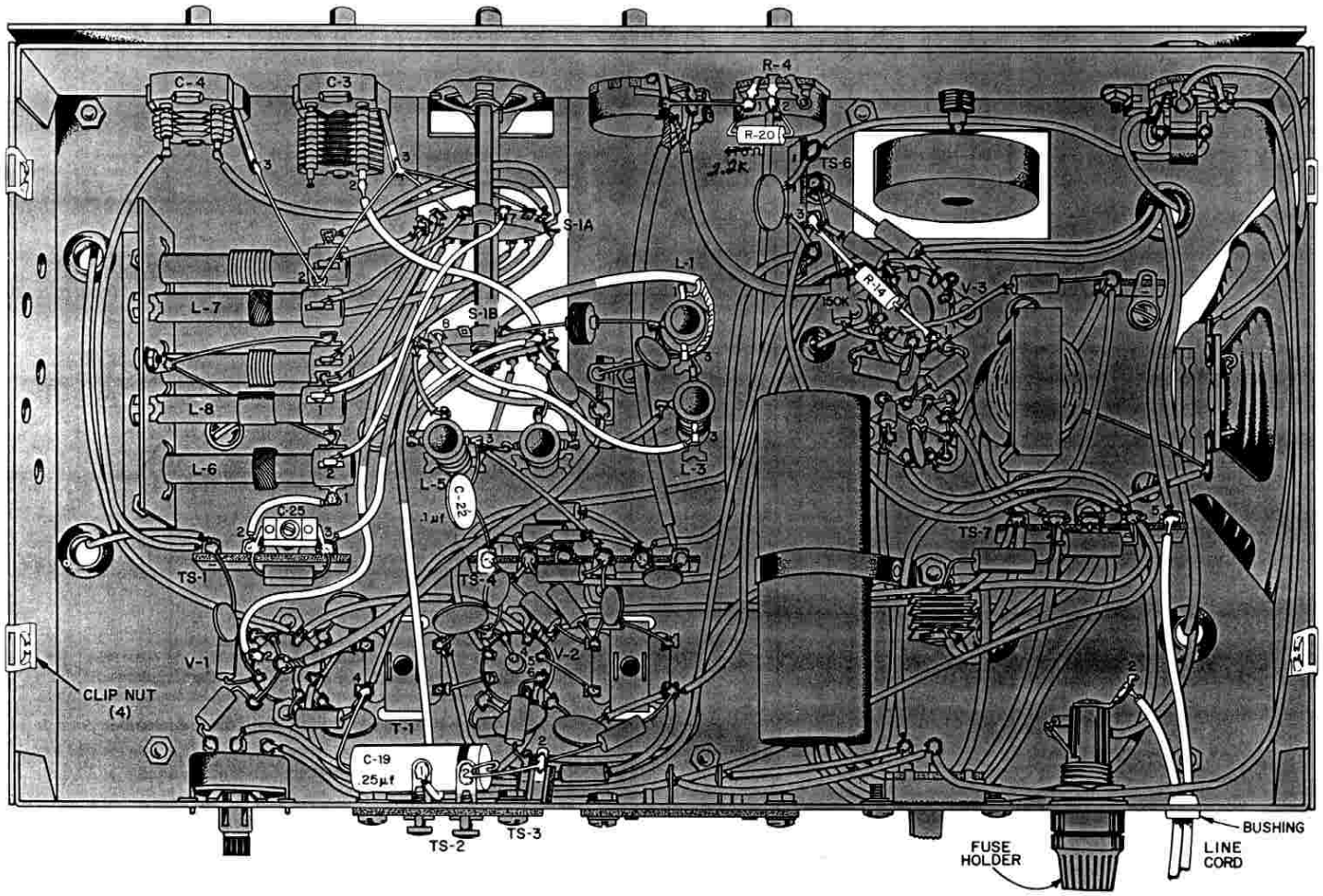
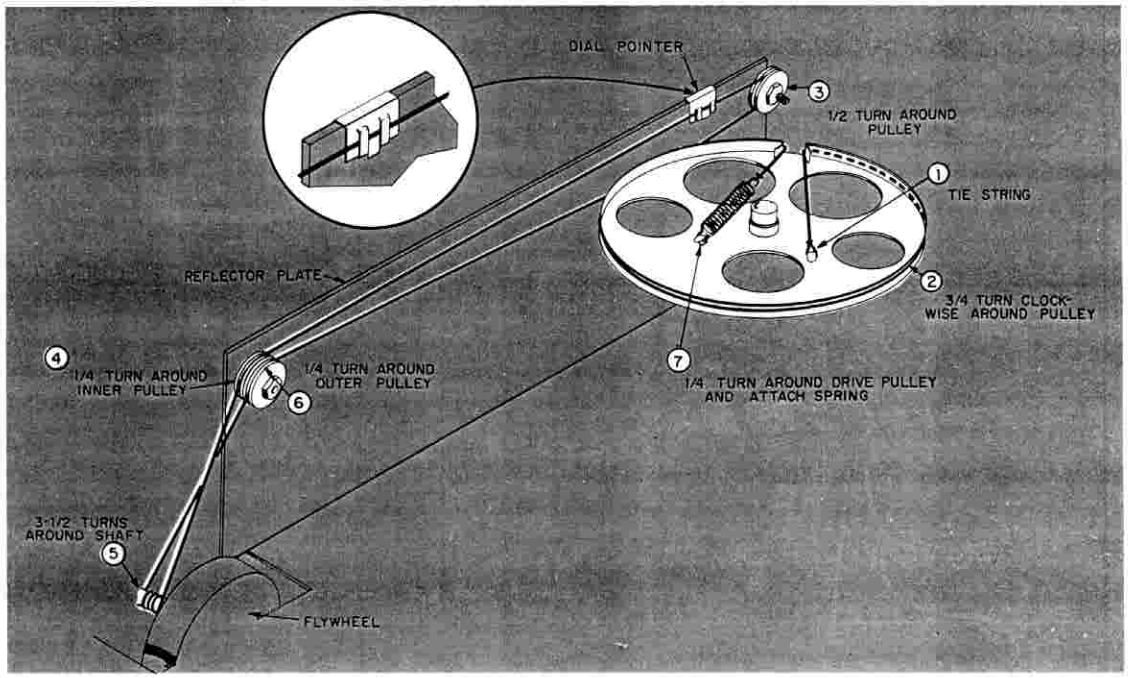


FIGURE 20. FINAL WIRING

FIGURE 21. DIAL STRINGING



☐ Cut a 42″ length of dial string from the quantity supplied.

☐ Turn the pulley of C-2 until the plates are closed (fully meshed).

SEE FIGURE 21.

☐ 1. Tie the dial spring to one end of the string. Tie the other end of the string to the projection on the face of the drive pulley.

☐ 2. Wrap the string around the drive pulley of the tuning capacitor in a clockwise direction for ¾ of a turn.

☐ 3. From the bottom, wrap ½ turn around the small plastic pulley at the end of the reflector plate nearest the chassis edge.

☐ 4. Position the string across the back of the reflector plate and make a ¼ turn around the inner pulley at that end of the reflector plate.

☐ 5. Wrap 3½ turns around the tuning shaft in a counterclockwise rotation.

☐ 6. Make a ¼ turn over the top of the outer pulley at the end of the reflector plate.

☐ 7. Position the string through the slot in the rim of the capacitor and connect the free end of the spring to the remaining projection on the face of the drive pulley.

☐ DIAL POINTER. Turn the TUNE shaft until the plates of C-2 are completely closed. Mount the dial pointer on the reflector plate and locate the pointer directly behind the left edge of the dial crystal markings. Fasten the pointer to the string.

FINAL ASSEMBLY

☐ F-1, 1 ampere fuse. Remove the cap from the fuseholder and insert the fuse in the cap. Insert the fuse and cap in the holder and twist to lock.

☐ V-1 through V-4. Insert in the proper sockets as marked on the chassis next to the sockets.

☐ Two small tube shields. Install over tubes V-1 and V-2. Push shields down until they are firmly seated.

☐ Large tube shield. Install over tube V-3. Make sure the shield is firmly seated.

Control shafts on front panel. Locate the shafts in the positions indicated:

☐ BANDSPREAD capacitor. Turn the shaft of the capacitor until the plates are half open.

☐ ANTENNA capacitor. Turn the shaft until the plates are half open.

☐ VOLUME control. Turn the shaft completely counterclockwise.

☐ SENSITIVITY control. Turn the shaft completely counterclockwise.

☐ Large knob. Fasten to the TUNE shaft by tightening the setscrew.

Five small knobs. Fasten to the controls in the following manner.

☐ BANDSPREAD capacitor. Mount the knob on the shaft with the white dot and line pointing to "50" on the panel calibrations.

☐ ANTENNA capacitor. Fasten the knob with the dot pointing to the dot on the panel.

☐ BAND SELECTOR switch. Temporarily fasten a knob on the shaft and rotate the shaft fully counter-clockwise. Position and fasten the knob to the shaft with the dot pointing to "1".

☐ VOLUME control. Fasten the knob to the shaft with the dot pointing to the 7 o'clock position.

☐ SENSITIVITY control. FASTEN the knob to the shaft with the dot pointing to the 7 o'clock position.

ALIGNMENT INSTRUCTIONS

ALIGNMENT WITHOUT TEST EQUIPMENT

The coils and IF transformers in your STAR ROAMER are pre-aligned to assure good reception when you finish building the kit. Alignment is affected by the placement of wires and components and the individual characteristics of components; therefore, a slight re-alignment using test equipment will assure optimum performance. If, however, no test equipment is available, your receiver may be "touched up" by using the procedures described in the following steps.

☐ Set the controls to the following positions;

BANDSPREAD	Set to 50 (capacitor half open).
ANTENNA	Set to white dot (capacitor half open).
BAND SELECTOR	Set to BAND 2.
VOLUME	Set for comfortable listening.
SENSITIVITY	Set fully counterclockwise.
POWER, AVC and ANL	Set to ON.
CODE-NORMAL (on rear panel)	Set to NORMAL.

☐ Tune in a station on BAND 2 and, using the tuning tool supplied, adjust both the top and bottom slugs of T-1 and T-2 for maximum on the S-meter.

☐ Listen to stations near 550 KC until you can identify one and know its exact frequency. (Broadcast stations frequently give their frequency while broadcasting and may also be listed by frequency in the newspaper). If the dial setting does not agree with the known frequency, set the dial to the correct frequency and adjust coil L-7 until the station is heard. Adjust for maximum on the S-meter.

☐ Repeat the procedure of finding and identifying a station, but near 1600 KC. If the dial setting does not correspond to the frequency listed or given for that station, set the dial to the correct frequency and adjust C-2B (See Figure 16) until the station is heard.

☐ Repeat the above steps until any interaction between adjustments is eliminated.

☐ Locate a station near 1500 KC and adjust C-2A for maximum S-meter deflection.

☐ On BANDS 1, 3, 4 and 5 the RF coils may be adjusted for maximum sensitivity in the following manner;

BAND 1	Adjust L-1 for maximum on the S-meter using a signal near 300 KC.
BAND 3	Adjust L-3 for maximum on the S-meter using a signal near 3.5 MC.
BAND 4	Adjust L-4 for maximum on the S-meter using a signal near 8 MC.
BAND 5	Adjust L-5 for maximum on the S-meter using a signal near 20 MC.

ALIGNMENT INSTRUCTIONS (Cont'd)

CALIBRATION

If desired, after you have obtained sufficient listening experience, you can further refine the calibration of your STAR ROAMER by using the following technique:

The National Bureau of Standards has a radio station with the call letters WWV which broadcasts on exactly 2.5 MC, 5 MC, 10 MC, 15 MC, and 20 MC. These signals are used as frequency standards and will serve as excellent points to check the calibration of your receiver.

To adjust the oscillator circuit on each band, first locate the WWV signal in that band range. Then note the difference between the dial reading and the actual frequency. Set the dial to the correct setting and tune the coil listed in the table below until the signal from WWV is heard.

BAND	WWV FREQUENCY	ADJUST
3	2.5 MC	L-8 until signal is heard then adjust for maximum S-meter reading.
4	5 or 10 MC	L-9 until signal is heard then adjust for maximum S-meter reading.
5	15 or 20 MC	L-10 until signal is heard then adjust for maximum S-meter reading.

ALIGNMENT WITH TEST EQUIPMENT

The coils in your STAR ROAMER are pre-aligned, but due to slight differences in components and wire placement a slight re-alignment will assure optimum performance.

The test equipment needed for this procedure:

1. An RF signal generator capable of tuning the range from 200kc to 30.455MC, modulated at 400 cps.
2. A vacuum tube volt-meter (VTVM) or oscilloscope for output measurements.

CONTROL SETTINGS FOR ALIGNMENT

Set the controls on the STAR ROAMER to the following settings:

BANDSPREAD	Set to 50 (capacitor half open).
ANTENNA	Set to white dot (capacitor half open).
BAND SELECTOR	Set as indicated in alignment chart.
VOLUME	Set to white dot.
SENSITIVITY	Set fully counterclockwise.
POWER	Set to ON.
AVC	Set to ON.
ANL	Set to ON.
CODE-NORMAL (on rear panel)	Set to NORMAL.

ALIGNMENT PROCEDURE

Use the following procedure to align the receiver:

- ☐ Turn all equipment on and allow to warm up for at least a half hour.
- ☐ Connect the VTVM or oscilloscope to terminals 1 and 2 of SP-1.
- ☐ Adjust the VTVM or oscilloscope controls to a 1.5 to 5 volt AC voltage range.
- ☐ Connect the signal generator to the point indicated in the alignment chart and set to the specified frequency.

ALIGNMENT NOTES

When using the signal generator for aligning the coils, keep the signal input as low as possible, consistent with accurate output readings. Too much signal output from the generator will overload the receiver and cause broad, hard-to-peak responses. When the signal from the generator has been found on the receiver dial, leave the receiver set and tune the generator 910kc above the former frequency. Another signal or "image" will be heard if the receiver is set correctly. Always be sure that the image frequency is 910kc above the frequency the receiver is tuned to and that you are not attempting alignment on the image. The receiver cannot be correctly aligned on that image.

ALIGNMENT CHART

STEP	GEN. FREQUENCY	CONNECT GEN. TO:	BAND SELECTOR	SET DIAL TO:	ADJUST	TUNE FOR
1	455kc	pin 1 of V-1	1	a point where no stations are present	T-2 top & bottom slugs	maximum output
2	SAME AS STEP 1				T-1 top & bottom slugs	maximum output
3	Repeat steps 1 and 2 until both transformers are peaked for maximum.					
4	550kc	ANT. terminals	2	550kc	L-7	max. signal output
5	1800kc	ANT. terminals	2	1800kc	C-2B (See Fig. 16)	max. signal output
6	Repeat steps 4 and 5 until the interaction is eliminated.					
7	1500kc	ANT. terminals	2	1500kc	C-2A	max. signal output
8	200kc	ANT. terminals	1	200kc	C-25	max. signal output
9	400kc	ANT. terminals	1	400kc	L-6	max. signal output
10	Repeat steps 8 and 9 until interaction between adjustments is eliminated.					
11	300kc	ANT. terminals	1	300kc	L-1	max. signal output
12	2MC	ANT. terminals	3	2MC	L-8	max. signal output
13	3.5MC	ANT. terminals	3	3.5MC	L-3	max. signal output
14	5MC	ANT. terminals	4	5MC	L-9	max. signal output
15	8MC	ANT. terminals	4	8MC	L-4	max. signal output
16	14MC	ANT. terminals	5	14MC	L-10	max. signal output
17	20MC	ANT. terminals	5	20MC	L-5	max. signal output

MOUNTING THE BOTTOM PLATE AND CABINET

☐ Bottom plate, two large rubber feet and two small rubber feet. Note that the bottom plate has a raised lip on three sides. The side without a lip is the front of the plate. Mount the two large rubber feet in the holes at the front of the plate. Fasten with two 6-32 x 3/8" screws, lockwashers and nuts. Fasten the two small rubber feet to the back of the plate with 6-32 x 3/8" screws, lockwashers and nuts.

☐ Bottom plate and chassis. Mount the chassis on the bottom plate by placing it on the plate, with the lips on the side of the bottom plate on the outside of the chassis. The lip at the back of the bottom plate should slip inside the chassis. Move the two pieces back and forth until the clip nuts on the chassis are visible through the holes in the sides of the bottom plate.

☐ Perforated speaker grille and cabinet. Remove the protective backing from the grille and press the sticky side to the inside of the cabinet over the speaker opening.

☐ Remove the rubber band and cardboard used as a temporary cover for the speaker.

☐ Cabinet and chassis. Note that the cabinet has a lip at one end—this is the back of the cabinet. Mount the cabinet to the chassis by gently spreading the sides of the cabinet apart, and lowering the cabinet over the bottom plate and chassis. Be sure the lip at the back of the cabinet is on the outside of the back plate. Fasten in place with four 6-32 x 3/8" screws, and lockwashers through the cabinet, the bottom plate, and into the clip nuts.

OPERATING INSTRUCTIONS

CONTROL SETTINGS FOR STANDARD BROADCAST RECEPTION

POWER switch	Set to ON.
BAND SELECTOR	Set to 2.
TUNE	Set to the frequency of the desired station.
AVC switch	Set to ON.
ANL switch	Set to OFF or ON, depending on the amount of noise present.
BANDSPREAD	The BANDSPREAD control is not used for standard broadcast.
SENSITIVITY	Turn fully counter-clockwise.
ANTENNA	Adjust for strongest signal.
VOLUME	Adjust for desired volume.
CODE-NORMAL switch on the rear panel	Set to the NORMAL position.

CONTROL SETTINGS FOR LOW FREQUENCY OR SHORT WAVE RECEPTION

Set the controls in the same positions as for standard broadcast except for these changes:

BAND SELECTOR	Set to Band 1 for low frequency reception or to Bands 3, 4, or 5 for shortwave reception, depending on the frequency of the station desired.
BANDSPREAD	After the station is tuned in with the TUNE knob, Adjust the BANDSPREAD knob for fine tuning. The BANDSPREAD control may be used in two ways. The BANDSPREAD may be left at 50 when the station is tuned in and then "rocked" back and forth to bring the station in. Or, the receiver may be tuned to a frequency just below (to the left) of the desired signal with the BANDSPREAD control set to 0. The BANDSPREAD may then be tuned to the desired station.

CONTROL SETTINGS FOR CODE RECEPTION ON LOW FREQUENCY OR SHORTWAVE

Set the controls to the same settings for LOW FREQUENCY (LF) or shortwave (SW) except:

AVC	Set the AVC to OFF.
SENSITIVITY	Set the SENSITIVITY control to the point where a "beat note" makes the code (CW) station audible. Do not turn the SENSITIVITY control farther clockwise than is necessary to obtain a clear beat note.

CONTROL SETTINGS FOR CODE PRACTICE OPERATION

To use the Star Roamer as an audio oscillator for code practice, tune the receiver to a steady signal—either broadcast or shortwave—turn the AVC off, and advance the SENSITIVITY control clockwise until the receiver starts oscillating. When oscillation starts, a "beat note" or whistle will be heard in the speaker. Adjust the BANDSPREAD control for the desired tone. Push the CODE-NORMAL switch on the rear panel to the CODE position. The speaker will now be cut out of the circuit. Insert the leads from a code key in the pin jacks of J-2. Closing the key will restore the speaker to the circuit and the beat note will be heard again. Headphones may be plugged in the PHONE jack for quiet practicing. A listing of the International Morse code will be found on page 32.

THE CONTROLS AND THEIR FUNCTIONS

CONTROL	FUNCTION
TUNE	Tunes in the desired stations.
BANDSPREAD	A fine tuning control to separate stations close together.
BAND SELECTOR	Selects the proper set of coils to tune to the desired frequency.
ANTENNA	A control that matches the antenna to the receiver for maximum sensitivity.
SENSITIVITY	Controls the sensitivity of the receiver and provides a beat note for code reception or code practice.
AVC switch	Turns the automatic volume control (AVC) circuit on and off. On voice stations the AVC prevents fading and blasting as the signal strength varies. The AVC should be turned off for code reception or when the receiver is used as a code practice oscillator.
ANL switch	Turns the automatic noise limiter on and off. The noise limiter is used as required, depending on the amount of signal and noise.
POWER switch	Turns the receiver on and off.
PHONE jack	Provides an output connection when headphones are used. The speaker is automatically disconnected when the headphone is inserted in the jack.
"S"-METER	Tune the receiver for maximum deflection of the meter. The meter indicates relative signal strength.

REAR PANEL CONTROLS

S-4, the CODE-NORMAL switch and J-2.	S-4 opens one of the speaker leads so that it may be keyed for code practice. J-2 provides terminals for a key when the receiver is used for a code practice oscillator.
TS-2, the two screw strip.	Provides connections for the antenna and ground. The terminal nearest J-2 is the antenna terminal (marked "A") and the other is the ground terminal (marked "G").
R-8.	R-8 is the "S-meter adjust" for the S-meter and sets the meter to zero when no signals or noise is being received.

GETTING THE MOST OUT OF YOUR STAR ROAMER

ANTENNA CONTROL. On the higher frequencies (Bands 3, 4 and 5) there are two settings of the ANTENNA control that will cause the S-meter to indicate peak signal strength. One setting will increase the volume of the signal and the other will reduce the volume. Tune the station in with either the TUNE or BANDSPREAD controls and then peak the signal with the setting of the ANTENNA control that increases the volume.

This double setting occurs because the ANTENNA control has sufficient range to peak both the received signal and the local oscillator in the receiver. Refer to the circuit description for an explanation of the function of the local oscillator. This is a normal response in this receiver and does not indicate oscillation or malfunction.

By providing this wide range of control to the ANTENNA control, almost any antenna may be matched to the STAR Roamer.

INCREASING THE SENSITIVITY ON BAND 1. A filter composed of L-11 and C-20 is built into the circuits of this band to filter out images caused by near-by broadcast stations. If you live in a area of high-power broadcast stations, the filter will prevent these stations from "creeping" in on Band 1. If, however, you live in an area free of such stations or you wish to increase the sensitivity of the receiver at the expense of losing the filtering action, perform the following steps.

- ☐ Tune the STAR ROAMER across Band 1 until a weak station is found. Note the S-meter reading and the frequency of the station.
- ☐ Turn the receiver off and disconnect it from the power line. Remove the antenna and ground wires from TS-2 and remove the cabinet and bottom plate from the receiver.
- ☐ By referring to Figure 14, locate L-11. Short out L-11 by soldering a red wire across the coil. Take care not to damage the coil. Reassemble the bottom plate and cabinet.
- ☐ Attach the antenna and ground wires and apply power to the receiver. Tune the receiver to the station logged in the first step and note the S-meter reading. Tune across Band 1 and note the broadcast interference if any.
- ☐ On the basis of the amount of increase in signal strength of the stations and the amount of BC interference, determine which mode of operation, with or without the filter, best suits your needs.

SIGNAL STRENGTH READINGS USING THE S-METER. You may notice that the S-meter setting at the left or "no signal" edge of the dial varies when changing bands. To obtain accurate relative signal strength readings on the S-meter, adjust R-8 on the rear panel for zero with no signal present on the band you wish to compare signals.

The change in S-meter readings is due to the change in operating characteristics of the circuits when the tuning range is changed. Adjusting R-8 calibrates the S-meter to these circuit changes.

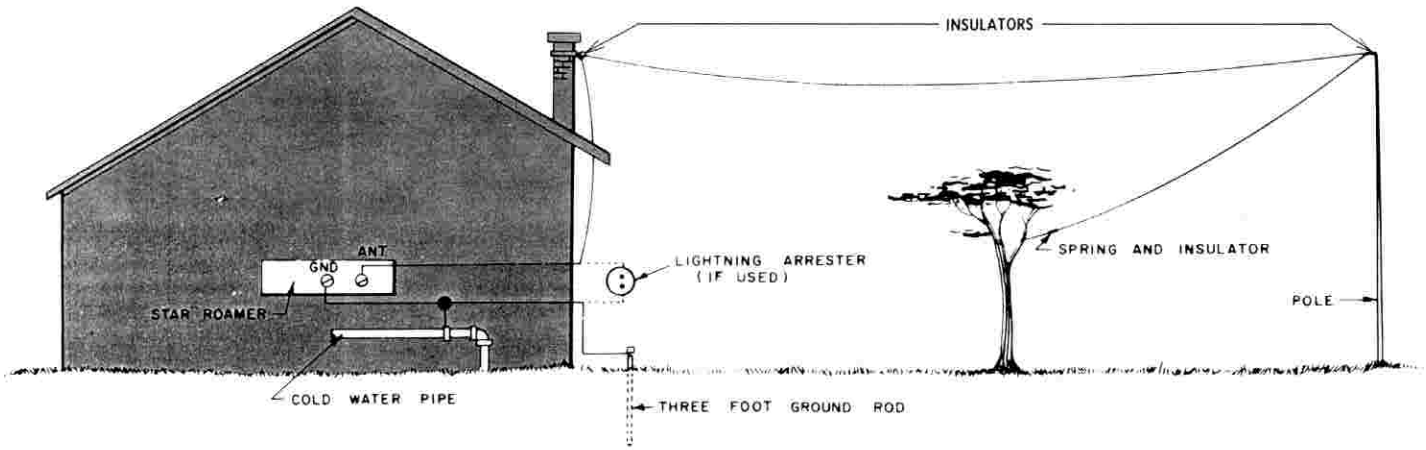


FIGURE 22. TYPICAL ANTENNA INSTALLATION

ANTENNAS

A good antenna is the most essential accessory you will need for your Star Roamer. By making the antenna as high and as long as possible, you will be able to log in stations all over the world.

For best performance on all the bands, a long wire antenna of at least 50 feet and good ground connection should be used. The Star Roamer has an unbalanced antenna input; that is, one terminal is connected to the receiver input and the other terminal is connected to ground. The antenna should be as high in the air as possible and erected away from obstructions such as houses, trees, and power lines.

The antenna may be bent in an "L" or "Z" shape to take advantage of mounting facilities or to gain additional length. See Figure 22. A good ground is essential to good reception especially on Band 1. On this Band a good connection to a water pipe or a metal rod driven into moist earth will increase the signal strength of the stations, and reduce the amount of noise and interference from broadcast stations by a large factor. The ground is required because a long wire "works" against ground; that is, the signal developed on the antenna by the radio signal exists as a potential difference or voltage between the antenna and earth. The connection between the receiver and earth assures a low resistance path for this voltage after it has passed through the coils in the receiver.

On Bands 1, 2, and 3 the Star Roamer will receive stations best if they are at 45° to 90° angles to the antenna. On the other two bands, the antenna may become directional, especially if the ends of the antenna are bent. Lengthening or shortening the bent ends or changing direction in which the largest part of the antenna points will have a marked effect on the signal strength of stations.

WHEN TO LISTEN

Under normal atmospheric conditions, with patience and practice, it's possible to hear stations from all over the world in a single evening—at times even within a few minutes. All you need is your receiver, a good antenna, a knowledge of where and when to listen—plus persistence.

Short-wave radio transmitters include land communications stations, maritime stations, aeronautical stations, Amateur (Ham) stations, and broadcasting stations. Of these, the broadcasting and Amateur (Ham) stations are of most interest to the short-wave listener (SWL). However, there are many other "specialties" to listen to such as international radio telegraph or telephone point-to-point communications; shipping and coastal radio; plane and ground communications; weather station reports and time signals; special expeditions, and other unusual events.

By international agreement, each type of station is assigned certain bands for operations.

You'll find that the short-wave portions of the dial on your receiver are calibrated in megacycles. A megacycle is 1000 kilocycles (kc).

Short-wave stations operate in these megacycle bands—5.95 to 6.20 mc; 7.0 to 7.3 mc amateur band; 9.5 to 9.8 mc; 11.7 to 12.0 mc, 14.0 to 14.3 mc amateur band; 15.10 to 15.45 mc; 17.5 to 17.7 mc and 28.0 to 29.7 mc amateur band. Sometimes these bands are given in terms of meters (m) —such as the 49, 41, 50, 31, 25, 20, and 19 meter bands. Thus, megacycles refer to frequency; meters refer to wavelength.

Reception conditions on each of the short-wave broadcast bands vary a lot at different times of the day and night, and also at different seasons of the year. Experience will teach you when to listen on each band.

In general, for SWL's in North America, the best reception on each of these bands during the fall and spring months should be:

The 6 mc band—evening for Latin America and Europe.

The 7 mc bands—late afternoon and evening for Europe; evening and early morning for Amateur stations.

The 9 mc band—morning (6 to 8 a.m. your local time) for Asia and Australia; afternoon for Europe and Africa; evening for Europe and Latin America.

The 11 mc band—morning (6 to 9 a.m. your local time) for Asia and Australia; afternoon for Europe and Africa; evening for Latin America.

The 14 mc band—late morning and afternoon for Amateur stations.

The 15 mc band—morning and afternoon for Europe and North America; evening for North and South America.

The 29 mc band—daylight hours for Amateur stations.

During the winter months, the best bands for evening reception are lower than during the fall and spring. For instance, the 9 mc band becomes poor for reception from Europe during the evening hours, and the 6 mc band becomes the best band for European reception. However, the 29 mc Amateur band is best during winter months, especially at the peak of the sunspot cycle.

In the summer months, the best evening reception shifts to the higher bands. Evening reception from Europe becomes good in the 11 mc band, although the 9 mc band remains good for reception from that area.

Year-around DX (Distant reception) bands are the 9 mc and 11 mc bands, although consideration there must be given to receiving different parts of the world best in summer or winter.

The expected reception just outlined is for normal conditions. The factors which affect long-distance radio transmissions vary from day to day. On some days, for instance, reception will be quite good, but at times, generally for periods of several consecutive days, transmission conditions will be "disturbed" and only the more powerful stations can be heard.

But don't get discouraged because normal conditions will return after the disturbance has ended, and reception will again be good.

Here's a special caution: Short-wave broadcasting stations often change their schedules and/or frequencies with little or no prior notice. Always be on the alert for announcements of such changes.

SERVICE HINTS

The proper operating voltages for each tube will be found on the schematic diagram, Figure 23. The resistance chart will help to locate any errors in a particular stage or circuit.
Never measure resistances with the receiver turned on or plugged into a power outlet.

TROUBLE	POSSIBLE CAUSE	SERVICE PROCEDURE
Receiver dead.	Defective tube(s).	Check and replace defective tubes.
	Tubes in wrong sockets or not seated.	Inspect visually and correct.
	Line cord not plugged in.	
	Fuse open.	Visually check fuse. If open, check power supply wiring, particularly the wiring near TS-7.
	Phone jack miswired or not making contact.	Check wiring and position of contact arm in jack.
	CODE-NORMAL switch in CODE position.	Check and set to NORMAL position.
	Speaker defective or not properly soldered.	Check speaker cone for damage and solder connections.
Poor sensitivity on one band only.	Check for miswired or poorly soldered coils and terminals on BAND SELECTOR switch.	Correct wiring error and/or resolder poor connections to coils or switch.
Poor sensitivity on all bands.	Defective tube(s).	Check the 6BE6 and 6HR6.
	IF stage misaligned.	
	RF and oscillator coils misaligned.	Repeat alignment procedure.
	Low B+ voltages.	Check C-17 and wiring of TS-7.
Output distorts on strong AM signals when AVC switch is on.	AVC line grounded.	Check wiring of S-2, T-1 and T-2.
	Receiver overloading.	Reduce signal strength by tuning ANTENNA control for null rather than peak.
Receiver oscillates on AM signals.	SENSITIVITY control set too high.	Reduce setting of control.
	SENSITIVITY control defective or poorly soldered.	Check control and solder connections for high resistance.
	Tube shields not seated on bases.	Reseat all shields.
	Ground wires on coil bracket poorly soldered.	Check ground connections to coils on bracket and to BANDSPREAD and ANTENNA capacitors.
	Poor solder connections to 6HR6 socket ground lugs.	Check soldering on ground lugs and center pin.
Hum.	C-17 defective or incorrectly wired.	Check condition and wiring.
	Shorted tube.	Test tubes.
	Poor ground connections on 12AX7 or 6AK6 sockets.	Check the socket ground lug connections and center pin connections.
SENSITIVITY control does not produce beat note for code reception.	SENSITIVITY control miswired or defective.	Check wiring and control.
	IF stage misaligned.	Re-align IF.
	AVC switch on.	Turn AVC off.

RESISTANCE MEASUREMENTS

Resistance measurements should be taken from the indicated point to ground. When making resistance measurements, set the following controls to their indicated positions. There should be no signal or antenna input connected to the receiver. DO NOT TAKE RESISTANCE MEASUREMENTS WITH THE RECEIVER OPERATING OR CONNECTED TO A POWER OUTLET.

VOLUME	Set fully counter-clockwise.
SENSITIVITY	Set fully counter-clockwise.
AVC	Set to ON.
ANL	Set to OFF.

	PIN								
TUBE	1	2	3	4	5	6	7	8	9
V-1	22K	0	0	0	110K	140K	4M		
V-2	4M	0	0	0	115K	140K	200Ω		
V-3	220K	500K	1K	0	0	220K	0	750Ω	0
V-4	500K	0	0	0	100K	100K	200Ω		

All readings taken with a VTVM.
K=1,000Ω. M=1,000,000Ω.

THE INTERNATIONAL MORSE CODE

The important thing when beginning to study code is to think of it as a language of sound, never as combinations of dots and dashes. It is easy to "speak" code by using "dit" for dots and "DAH" for dashes, so that "A" would be "diDAH". The "t" at the end of "dit" is dropped except at the end of a character. The sound "di" should be sharp; a code character like the number "5" should sound like a machine-gun burst-dididididit! Stress each "DAH" equally; they are capitalized in this chart because they should be slightly accented and drawn out.

Learn the code by **listening** to it. **Don't think about speed to start;** the first requirement is to learn the characters to the point where you can recognize each of them without any hesitation whatsoever. Concentrate on any difficult letters. Learning the code is not hard—it merely requires time and a little effort.

CHARACTER	CODE	PRONUNCIATION OF CODE	PHONETIC LETTER
A	• —	diDAH	**A**ble
B	— • • •	DAHdididit	**B**aker
C	— • — •	DAHdiDAHdit	**C**harlie
D	— • •	DAHdidit	**D**og
E	•	dit	**E**asy
F	• • — •	dididiDAHdit	**F**ox
G	— — •	DAHDAHdit	**G**eorge
H	• • • •	dididididit	**H**ow
I	• •	didit	**I**tem
J	• — — —	diDAHDAHDAH	**J**ohn
K	— • —	DAHdiDAH	**K**ing
L	• — • •	diDAHdidit	**L**ove
M	— —	DAHDAH	**M**ike
N	— •	DAHdit	**N**an
O	— — —	DAHDAHDAH	**O**boe
P	• — — •	diDAHDAHdit	**P**eter
Q	— — • —	DAHDAHdiDAH	**Q**ueen
R	• — •	diDAHdit	**R**oger
S	• • •	dididit	**S**ugar
T	—	DAH	**T**are
U	• • —	dididiDAH	**U**ncle
V	• • • —	dididiDAH	**V**ictor
W	• — —	diDAHDAH	**W**illiam
X	— • • —	DAHdididiDAH	**X**-ray
Y	— • — —	DAHdiDAHDAH	**Y**oung
Z	— — • •	DAHDAHdididit	**Z**ebra

CHARACTER	CODE	PRONUNCIATION OF CODE
1	• — — — —	diDAHDAHDAHDAH
2	• • — — —	dididiDAHDAHDAH
3	• • • — —	dididiDAHDAH
4	• • • • —	dididididiDAH
5	• • • • •	dididididit
6	— • • • •	DAHdididididit
7	— — • • •	DAHDAHdididit
8	— — — • •	DAHDAHDAHdidit
9	— — — — •	DAHDAHDAHDAHdit
Ø	— — — — —	DAHDAHDAHDAHDAH
Period (.)	• — • — • —	diDAHdiDAHdiDAH
Comma (,)	— — • • — —	DAHDAHdididiDAHDAH
Question mark (?)	• • — — • •	dididiDAHDAHdidit
Double dash (—)	— • • • —	DAHdididiDAH
Fraction bar (/)	— • • — •	DAHdididiDAHdit
Invitation to transmit	— • —	DAHdiDAH
Error	• • • • • • • •	dididididididididit
Wait	• — • • •	diDAHdididit
End of message	• — • — •	diDAHdiDAHdit
End of work	• • • — • —	dididiDAHdiDAH

CIRCUIT DESCRIPTION

RADIO FREQUENCY AND CONVERTER CIRCUITS

When the radio signal enters the STAR ROAMER from the antenna, it is first routed into one of the radio frequency (RF) coils selected by wafer S-1B of the BAND SELECTOR switch. The switch is wired so that the coil selected by the switch is in parallel with one section of the main tuning capacitor C-2, and the ANTENNA capacitor C-3.

The ANTENNA capacitor compensates for the effect the antenna has on the circuits at different frequencies and assures that the radio frequency circuits are properly tuned to the received signal.

At the same time the signal from the antenna is being fed to the tuned circuit, wafer S-1A of the BAND SELECTOR switch has selected an oscillator coil corresponding to the RF coil in use. Again, the coil is in parallel with the other section of C-2, and the BANDSPREAD capacitor C-4. The combination of the selected coil, the section of C-2, C-4, and part of tube V-1 produces an RF signal, 455 kc higher in frequency than the signal received on the antenna. This circuit is called the local ocillator.

The two signals, the one from the antenna and the local oscillator, are mixed in V-1, the 6BE6 converter tube, in a process called heterodyning. The two signals beat, or heterodyne, against each other, producing a number of frequencies at the output of V-1. Most of the output is at two frequencies, one equal to the sum of the antenna signal and the local oscillator, and the other equal to the difference between the antenna signal and the local oscillator. Since the local oscillator is always tuned to a frequency 455kc higher than the antenna signal, the difference signal V-1 is always 455kc regardless of the frequency of the antenna and local oscillator signal. (The sum frequencies are rejected by the tuned circuits). Hence, the converter tube gains its name by converting signals of any frequency in the tuning range of the receiver to one frequency, 455kc. Since only one frequency is involved past the converter, the remaining tuned circuits are adjusted to 455kc and require no further tuning.

INTERMEDIATE FREQUENCY AMPLIFIER CIRCUITS

The Intermediate Frequency (IF) amplifier is the intermediate stage between the RF signals of the converter stage and the audible signals of the audio stages. The 455kc signal, which is identical to the antenna signal except for frequency, is amplified by V-2, the 6HR6 IF amplifier. Besides increasing the strength of the signal, the IF stage performs another important function by increasing the selectivity (the ability to separate stations) of the receiver.

The IF transformers T-1 and T-2 are sharply peaked on 455kc, and any signal not exactly on 455kc will not be passed through the transformer. Hence, undesired signals which may slip through the broadly tuned converter stage will be filtered out in the IF stage.

DETECTOR AND AUDIO CIRCUITS

Most of the stations in the frequency range of the STAR ROAMER that broadcast voice and music use amplitude (AM) Modulation to add the audio to the RF signal, or carrier, generated by the transmitter. In AM operation, the amplitude of the RF carrier varies in accordance with the audio; that is the audio causes peaks and nulls in the strength of the RF carrier. In the STAR ROAMER, diode detector CR-1 recovers the audio from the IF signal (remember that the IF signal is identical to the antenna signal in all respects except frequency). CR-1 acts like a gate, responding to the amplitude changes and rejecting the remaining RF carrier by shorting it to the chassis. These amplitude changes are the audio signals impressed on the RF carrier at the transmitter. The audio signals pass through R-11 the VOLUME control which limits the amount of signal that reaches V-3, the audio amplifier. V-3, a 12AX7, is actually two tubes in one envelope. The audio is amplified by V-3 and raised to a point where it can be used by V-4, the audio output tube. A 6AK6 is used to develop enough audio power to drive a speaker or headset.

POWER SUPPLY CIRCUITS

The power transformer T-4 provides the necessary filament and plate voltages for the tubes. It also isolates the receiver from the power lines so that there is no danger of electrical shock between the receiver and earth ground. Diode CR-3 acts as a rectifier and changes the AC from T-4 into DC. Sections A and B of capacitor C-17 and resistor R-19 provide filtering and voltage dropping so that the output from the power supply is at the correct voltage and is hum free.

AVC, S-METER AND SENSITIVITY CONTROLS

These controls all have their origin in or near the IF stage. The AVC, or automatic volume control, is actually a voltage derived from the output of the IF stage. The function of this voltage is to cut down the amplitude of V-1 and V-2 when the signal is quite strong. This tends to "even out" the signal and keep the signal strength from varying widely and alternately blasting and fading as the signal strength varies. The S-meter measures a portion of the plate current going to V-1 and V-2. Since the plate current varies with the strength of the signal, an accurate comparison of signal strengths can be made. The SENSITIVITY control causes the IF tube to oscillate, producing a beat note so that code signals will be audible.

ANL CIRCUITS

The automatic noise limiter functions only on noise peaks greater in amplitude than the signal. A voltage set up by resistors R-10 and R-25 causes CR-2 to operate at a point that will pass all audio signals at the amplitude set by the VOLUME control. When a noise peak appears, the peak is passed to ground through CR-2 and is not heard in the output of the audio.

PARTS LIST

RESISTORS

Unless specified all values are ½ watt ± 10% carbon.

Symbol No.	Description	Part No.
R-1	22K	301223
R-2	100K	301104
R-3	22K	301223
R-4	5K Control	390115
R-5	180Ω	301181
R-6	100K	301104
R-7	3.3 Meg	301335
R-8	10K Control	392187
R-9	4.7K	301472
R-10	47K	301473
R-11	100K control	392151
R-12	150K	301154
R-13	1K, 1 watt	304102
R-14	150K	301154
R-15	470K	301474
R-16	1K	301102
R-17	470K	301474
R-18	180Ω	301181
R-19	1K, 1 watt	304102
R-20	2.2K	301222
R-21	12K	301123
R-22	680Ω	301681
R-23	100K	301104
R-24	470K	301474
R-25	100K	301104
R-26	1K	301102

CAPACITORS

Unless specified all Capacitors are rated in μf, 600V.

C-1	not used	not used
C-2	2 gang variable, tuning	286066
C-3	50 μμf trimmer	281011
C-4	Band spread variable	286068
C-5	39 μμf mica ± 5%, 500V	266552
C-6	470 μμf disc	276478
C-7	.005 disc	296000
C-8	.02 disc	277025
C-9	.02 disc	277025
C-10	.02 disc	277025
C-11	.02 disc	277025
C-12	.02 disc	277025
C-13	470 μμf disc	276478
C-14	.005 disc	296000
C-15	.005 disc	296000
C-16	.005 disc	296000
C-17	30-30-30-50 μf tubular electrolytic	214400
C-19	.25 tubular, 400V	295003
C-20	6800 μμf disc	276687
C-21	.01 μf disc	276015
C-22	.1 disc 50V	272014
C-23	470 μμf disc	276478
C-24	.005 disc	276054
C-25	Trimmer capacitor, variable	283005

SWITCHES

S-1	BAND SELECTOR, 5 position, 2 wafer	437091
S-2	SPST, white button	431008
S-3	SPST, white button	431008
S-4	SPST, white button	431008
S-5	SPST, red button	437076

TUBES and DIODES

Symbol No.	Description	Part No.
CR-1	Diode, AM rectifier	630007
CR-2	Diode, Limiter	630007
CR-3	Selenium rectifier	620007
V-1	6BE6	610045
V-2	6HR6	614160
V-3	12AX7	611012
V-4	6AK6	610040

COILS and TRANSFORMERS

L-1	R.F. coil, black dot	142062
L-2	Loopstick	122255
L-3	R.F. coil, red dot	142063
L-4	R.F. coil, green dot	142064
L-5	R.F. coil, yellow dot	142065
L-6	Oscillator coil, blue dot	142066
L-7	Oscillator coil, violet dot	142067
L-8	Oscillator coil, white dot	142068
L-9	Oscillator coil, orange dot	142069
L-10	Oscillator coil, brown dot	142070
L-11	Choke coil	152042
T-1	First I.F. transformer	113253
T-2	Second I.F. transformer	113254
T-3	Output transformer	107273
T-4	Power transformer	107270

METER

M-1	"S" meter	659256

HARDWARE

Description	Qty.	Part No.
Angle Bracket, #6, 90 degree	3	531016
"C" Washers	2	585002
Clip nut, #6	4	531009
Clip, I.F. Can Mounting	2	532008
Ground lug, large	1	553001
Eyelets, small brass	3	551008
Flat washer, large	1	580702
Flat washer, small	4	580301
Lockwasher, #4	16	582200
Lockwasher, #6	26	582300
Lockwasher, #8	2	582400
Lockwasher, ⅜"	5	582700
Nut, 3-48	2	570110
Nut, 4-40	16	570221
Nut, 6-32	24	570340
Nut, ⅜"	6	570840
Screw, 3-48x½"	2	560113
Screw, 4-40x¼"	16	560222
Screw, 6-32x¼"	25	560342
Screw, 6-32x⅜"	11	560344
Screw, 6-32x1"	1	560349
Screw, 8-32, Round head	2	563442
Setscrew, #8 (for flywheel)	1	563445
Solder lug #6	3	553005
Spring, Dial spring	1	470076

WIRE, SOLDER and TUBING

Line cord, 6 ft.	1	802001
Solder, 10 ft. roll	1	930005
Wire, Red	7	801002
Wire, Orange	12	801003
Wire, Yellow	7	801004
Wire, Green	4	801005

WIRE, SOLDER and TUBING (Cont.)

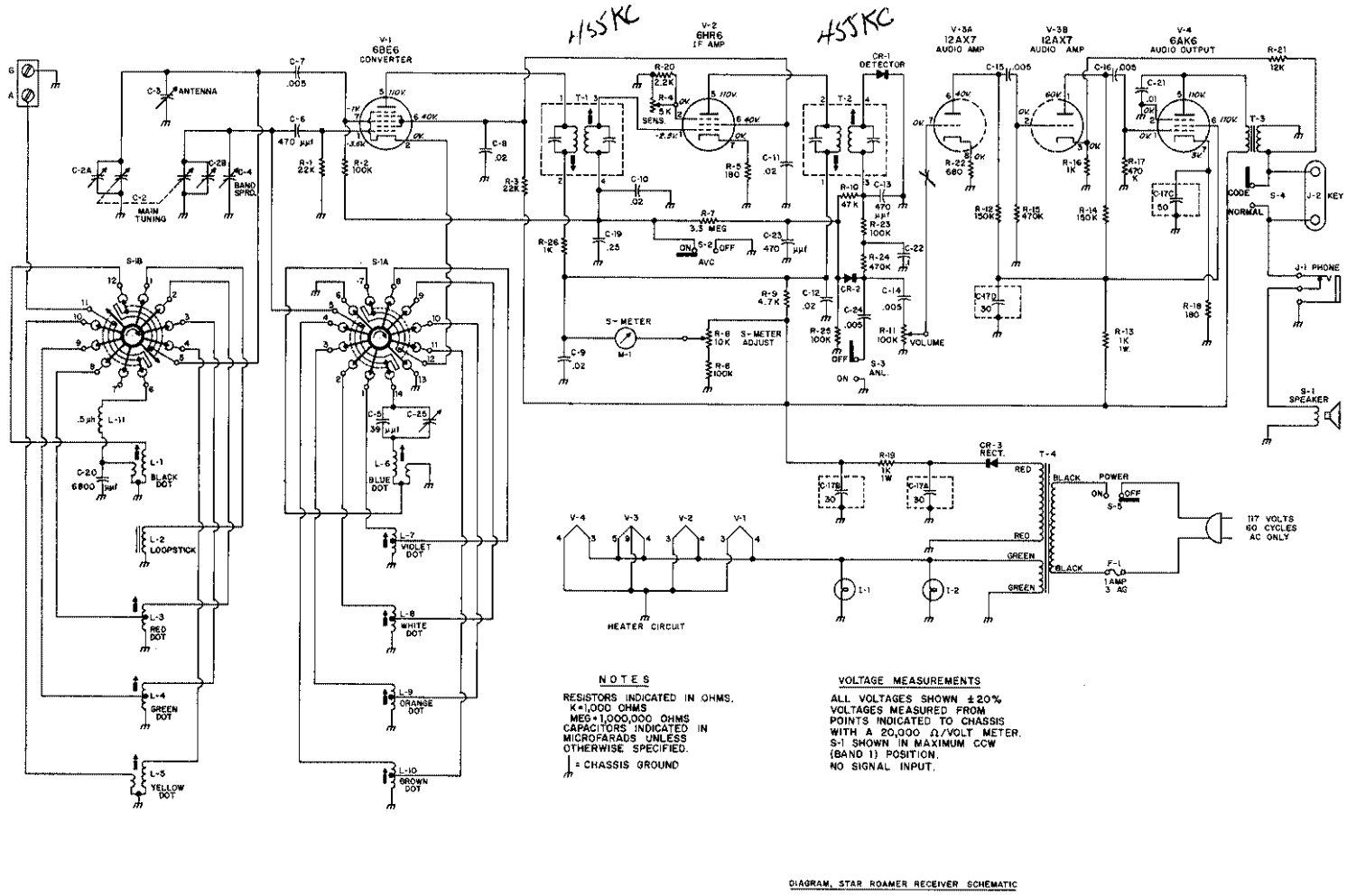
Description	Qty.	Part No.
Wire, Blue	4	801006
Wire, Violet	2	801007
Wire, Gray	2	801008
Wire, Brown	2	801010
Wire, White/Gray	1	801018
Wire, White/Black	2	809086
Wire, White/Red	2	801012
Wire, White/Blue	1	809085
Wire, Shielded	4	809087
Wire, Bare, 48"	1	806048
Tubing, 36"	1	812031

MISCELLANEOUS

Bracket, coil	1	470531
Bracket, switch	1	470530
Bushing, tuning shaft	1	470075
Cabinet	1	702069
Chassis	1	463517
Dial crystal	1	870159
Dial pointer	1	470291
Dial string, 48"	1	860001
Flywheel	1	480021
Foot, Rubber ⅝"	2	880018
Foot, Rubber 11/32"	2	831001
F-1, 1 Amp Fuse	1	491001
Grille, speaker	1	734060
Grommet, 5/16", rubber	1	830100
Grommet, 11/32", rubber	5	830600
Knob, ⅞"	5	765054
Knob, 1⅜"	1	765053
Lamps, #47, I-1 and I-2	2	640002
Line cord bushing	1	880029
Panel, bottom	1	463515
Panel, front	1	463516
Plate, back	1	850155
Pulley, small plastic	3	880014
Reflector plate	1	463514
Shaft, tuning	1	470078
Shield base, 7 pin	2	511005
Shield base, 9 pin	1	511001
Shield, tube, 7 pin	2	510006
Shield, tube, 9 pin	1	510001
Speaker	1	730024
Tube socket, 7-pin	3	509056
Tube socket, 9-pin	1	501190
Tuning tool	1	957007

JACKS and TERMINAL STRIPS

Symbol No.	Description	Part No.
F-1	Fuse holder	492200
I-1	Pilot light socket	501524
I-2	Pilot light socket	501524
J-1	Phone jack	509051
J-2	Jack strip	502227
TS-1	3 terminal strip	440302
TS-2	2 screw terminal strip	441201
TS-3	2 terminal strip	440202
TS-4	6 terminal strip	440602
TS-5	2 terminal strip	440202
TS-6	4 terminal strip	440403
TS-7	5 terminal strip	440501
TS-8, 9, 10, 11	2 terminal strip	440202



DIAGRAM, STAR ROAMER RECEIVER SCHEMATIC

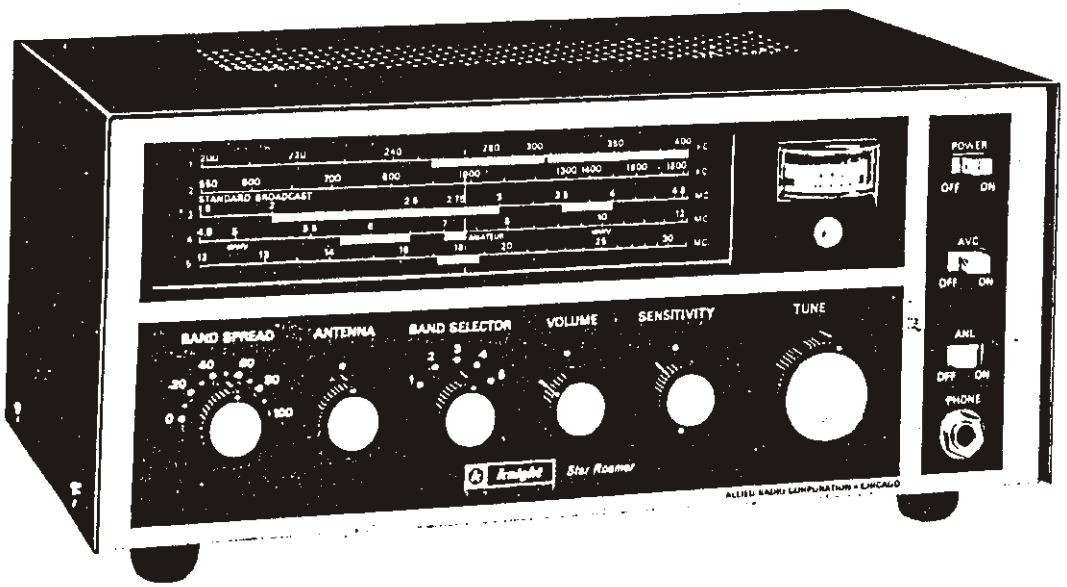
NOTES

RESISTORS INDICATED IN OHMS.
K=1,000 OHMS
MEG=1,000,000 OHMS
CAPACITORS INDICATED IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
⏚ = CHASSIS GROUND

VOLTAGE MEASUREMENTS

ALL VOLTAGES SHOWN ±20%
VOLTAGES MEASURED FROM POINTS INDICATED TO CHASSIS WITH A 20,000 Ω/VOLT METER.
S-1 SHOWN IN MAXIMUM CCW (BAND 1) POSITION.
NO SIGNAL INPUT.

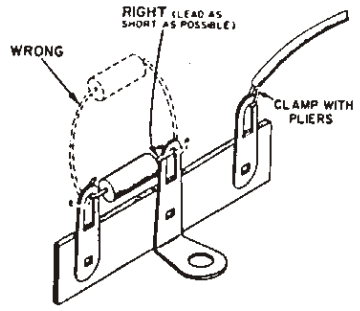
FIGURE 23. SCHEMATIC DIAGRAM—STAR ROAMER


STANDARD BROADCAST
BAND SPREAD
ANTENNA
BAND SELECTOR
VOLUME
SENSITIVITY
TUNE
POWER
OFF ON
AVC
OFF ON
ANL
OFF ON
PHONE
Star Roamer

STAR ROAMER®

SPECIFICATIONS

FREQUENCY RANGE:	BAND 1 200 to 400KC. BAND 2 550 to 1800KC. BAND 3 1.8 to 4.8MC. BAND 4 4.8 to 12MC. BAND 5 .12 to 30MC.
BANDSPREAD:	Electrical, calibrated 0 to 100.
SENSITIVITY:	10 μv for 10 db S/N
IF FREQUENCY:	455KC
IF BANDWIDTH:	8KC at 6 db down.
BEAT FREQUENCY:	Varies from zero to 5KC.
ANTENNA INPUT	Unbalanced, 300Ω nominal.
ANL:	Switchable series diode.
POWER SUPPLY	Fused, transformer operated.
POWER REQUIREMENTS:	110 to 130 V, 60 cps, 15 watts.
SPEAKER SIZE:	4" PM.
HEADPHONE OUTPUT:	High impedance, magnetic or crystal.
TUBE COMPLEMENT:	1—6BE6 (converter) 1—6HR6 (IF amplifier) 1—12AX7 (audio amplifier) 1—6AK6 or 6AR5 (audio output)
DIMENSIONS:	Height, 5½"; width, 12½"; depth, 8". (With legs and knobs)



HOW TO MOUNT A WIRE AND A COMPONENT

CONSTRUCTION HINTS

The step-by-step instructions must be followed exactly. Occasionally, several parts are mounted with the same hardware, so be sure to read the entire step. For your convenience, a box is provided to check off each step after you have completed it.

Make good mechanical connections at solder points, clean metal to clean metal. Loop wires around connection terminals and clamp tightly. To mount a resistor or capacitor, pull the leads through the terminals so the part is tightly mounted. Bend each lead around the terminal and cut off the excess wire.

Several types of wire are supplied. It is important to use the correct type called for in the building step. Insulated solid and shielded wire, identified by color, has been cut to length and pre-stripped for your convenience. Use only the color given in the step.

Flexible tubing is used to cover bare wire of leads where there is a possibility they may touch other bare wires or the chassis. BARE WIRES AND BARE LEADS NOT CONNECTED TO THE SAME TERMINAL MUST NOT ACCIDENTLY TOUCH EACH OTHER OR THE CHASSIS. The only tools needed to build your STAR ROAMER are a soldering iron or gun rated at about 40 to 100 watts, long-nose pliers, diagonal cutters, and a screwdriver.

This book uses some symbols to give the value of components. "Ω" means ohm, "K" means one thousand ohms, "meg" means one million ohms, μf means microfarad and $\mu\mu$f means micromicrofarad. Capacitor markings may be μf or MF for microfarad; $\mu\mu$f or MMF for micromicrofarad.

IMPORTANT NOTICE: Since your receiver is designed to tune in radio frequency signals from 200 KC all the way up to 30 MC, it is extremely important that you keep all leads as short as possible and all wires pressed down near the chassis.

We can not overemphasize this point. KEEP ALL LEADS AS SHORT AS POSSIBLE AND DOWN NEAR THE CHASSIS. The efficiency of operation and reception of your receiver depends on this. Cut off any excess wire ends.

When you wire capacitors or resistors into the circuit, clip the leads to a length sufficient to reach between the two terminals. Never use more lead length on parts than is required.

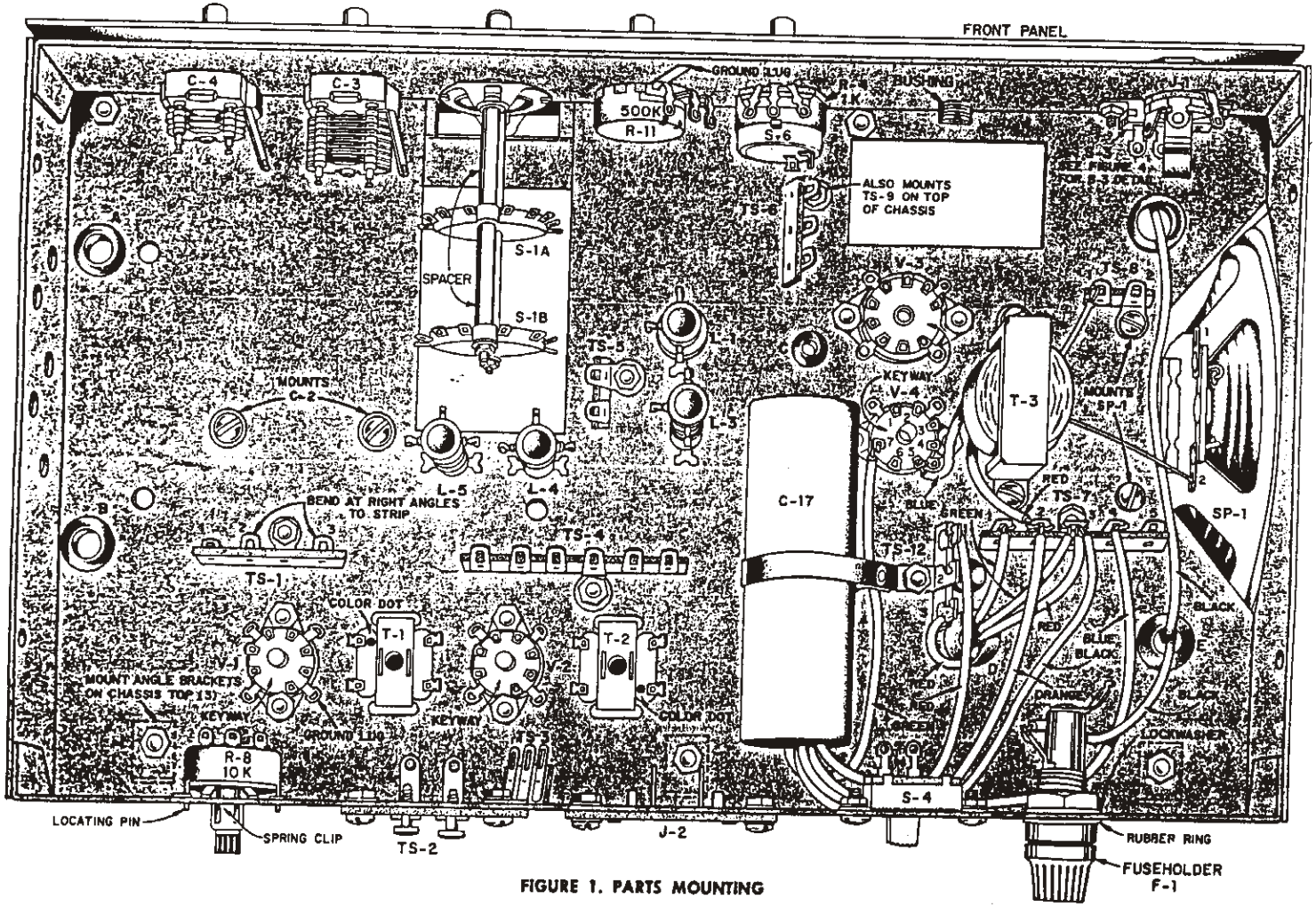


FIGURE 1. PARTS MOUNTING

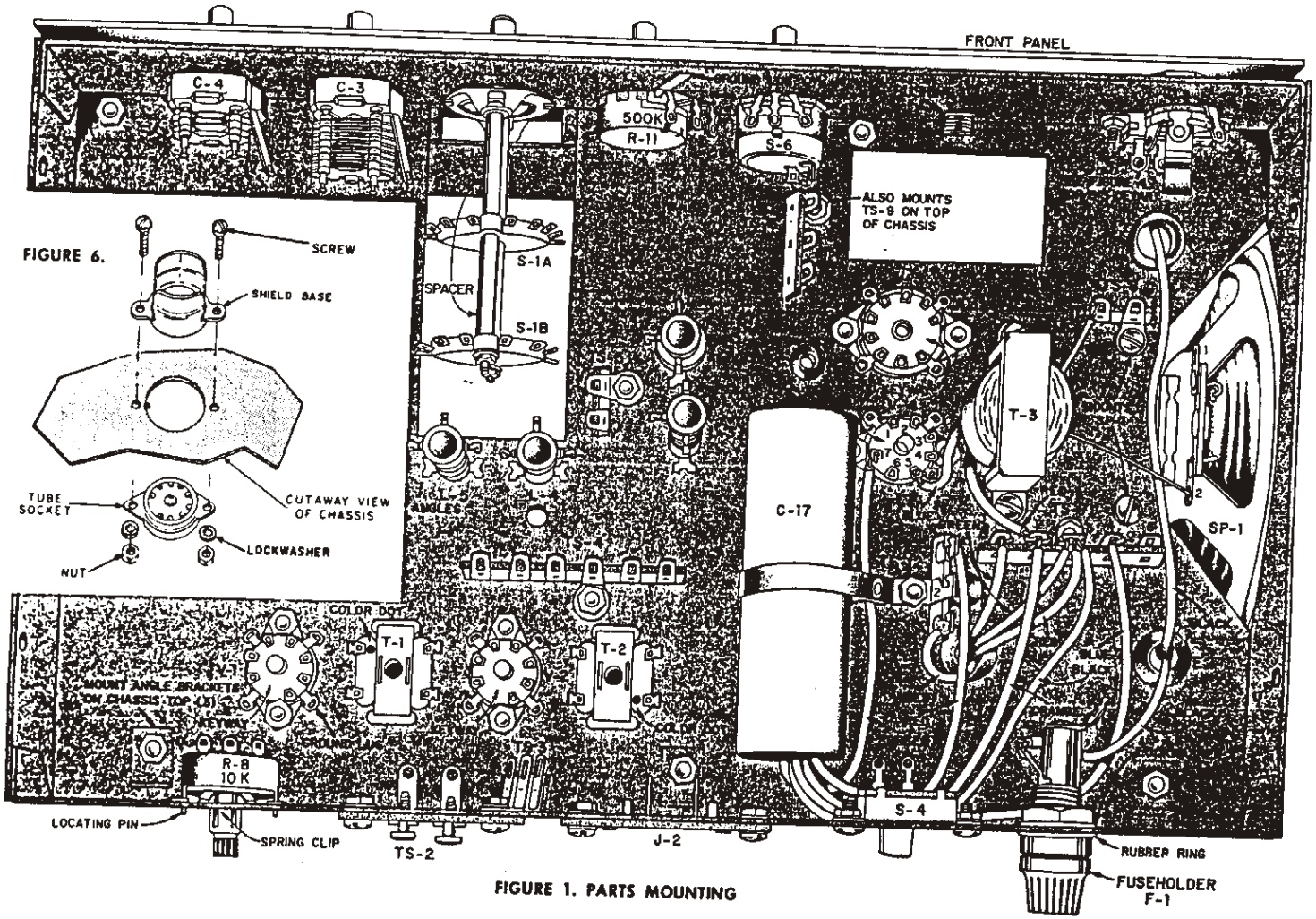
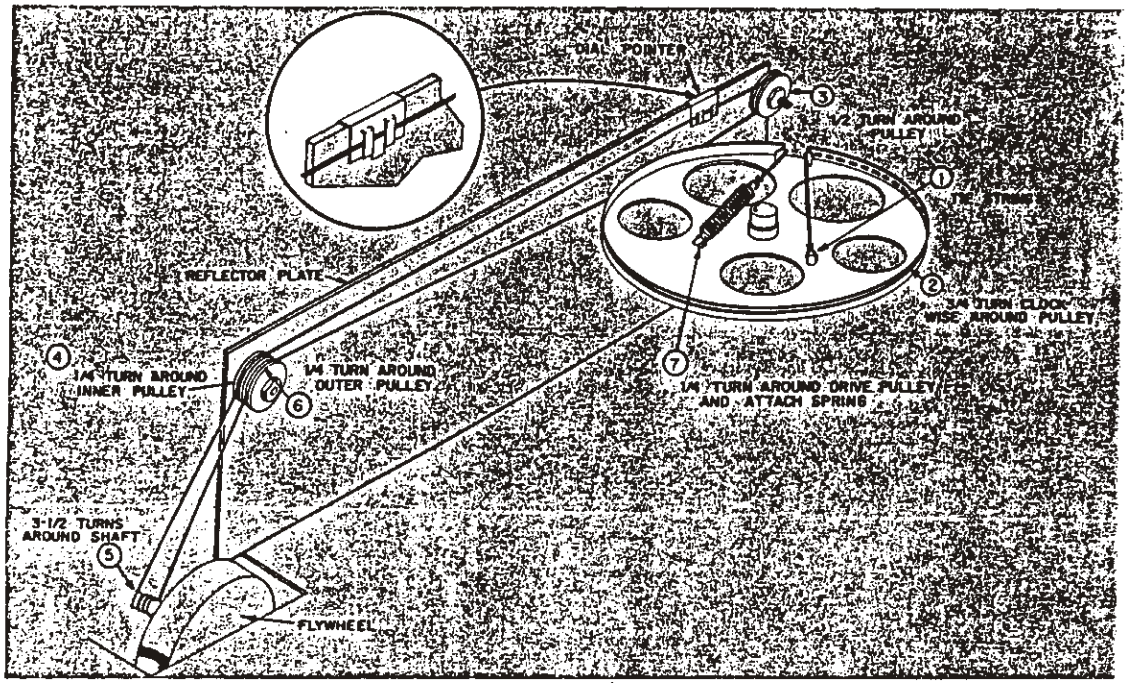


FIGURE 6.

FIGURE 1. PARTS MOUNTING

FIGURE 21. DIAL STRINGING



☑ Cut a 42" length of dial string from the quantity supplied.

☑ Turn the pulley of C-2 until the plates are closed (fully meshed).

SEE FIGURE 21.

☑ 1. Tie the dial spring to one end of the string. Tie the other end of the string to the projection on the face of the drive pulley.

☑ 2. Wrap the string around the drive pulley of the tuning capacitor in a clockwise direction for ¾ of a turn.

☑ 3. From the bottom, wrap ½ turn around the small plastic pulley at the end of the reflector plate nearest the chassis edge.

☑ 4. Position the string across the back of the reflector plate and make a ¼ turn around the inner pulley at that end of the reflector plate.

☑ 5. Wrap 3½ turns around the tuning shaft in a counterclockwise rotation.

☑ 6. Make a ¼ turn over the top of the outer pulley at the end of the reflector plate.

☑ 7. Position the string through the slot in the rim of the capacitor and connect the free end of the spring to the remaining projection on the face of the drive pulley.

☑ DIAL POINTER. Turn the TUNE shaft until the plates of C-2 are completely closed. Mount the dial pointer on the reflector plate and locate the pointer directly behind the left edge of the dial crystal markings. Fasten the pointer to the string.

FINAL ASSEMBLY

☑ F-1, 1 ampere fuse. Remove the cap from the fuseholder and insert the fuse in the cap. Insert the fuse and cap in the holder and twist to lock.

☑ V-1 through V-4. Insert in the proper sockets as marked on the chassis next to the sockets. V-4 may be either a 6AR5 or a 6AK6 tube. These tubes are directly interchangeable in this circuit.

☑ Two small tube shields. Install over tubes V-1 and V-2. Push shields down until they are firmly seated.

☐ Large tube shield. Install over tube V-3. Make sure the shield is firmly seated.

Control shafts on front panel. Locate the shafts in the positions indicated:

☑ BANDSPREAD capacitor. Turn the shaft of the capacitor until the plates are half open.

☑ ANTENNA capacitor. Turn the shaft until the plates are half open.

☑ VOLUME control. Turn the shaft completely counterclockwise.

☑ SENSITIVITY control. Turn the shaft completely counterclockwise.

☐ Large knob. Fasten to the TUNE shaft by tightening the setscrew.

Five small knobs. Fasten to the controls in the following manner.

☑ BANDSPREAD capacitor. Mount the knob on the shaft with the white dot and line pointing to "50" on the panel calibrations.

☑ ANTENNA capacitor. Fasten the knob with the dot pointing to the dot on the panel.

☑ BAND SELECTOR switch. Temporarily fasten a knob on the shaft and rotate the shaft fully counter-clockwise. Position and fasten the knob to the shaft with the dot pointing to "1".

☑ VOLUME control. Fasten the knob to the shaft with the dot pointing to the 7 o'clock position.

☑ SENSITIVITY control. FASTEN the knob to the shaft with the dot pointing to the 7 o'clock position.

ALIGNMENT INSTRUCTIONS

ALIGNMENT WITHOUT TEST EQUIPMENT

The coils and IF transformers in your STAR ROAMER are pre-aligned to assure good reception when you finish building the kit. Alignment is affected by the placement of wires and components and the individual characteristics of components; therefore, a slight re-alignment using test equipment will assure optimum performance. If, however, no test equipment is available, your receiver may be "touched up" by using the procedures described in the following steps.

☑ Place the bottom plate under the chassis.

☑ Set the controls to the following positions;

BANDSPREAD	Set to 50 (capacitor half open).
ANTENNA	Set to white dot (capacitor half open).
BAND SELECTOR	Set to BAND 2.
VOLUME	Set for comfortable listening.
SENSITIVITY	Set fully counterclockwise (off).
POWER	Set to ON.
AVC switch	Set to ON.
ANL switch	Set to OFF.
CODE-NORMAL (on rear panel)	Set to NORMAL.

☑ Set the TUNE control for a quiet (no signal) location. Now adjust the METER control on the rear panel so the S-meter needle is below 1, near the left edge of the scale.

☑ Listen to stations between 550 KC and 700 KC until you can identify one and know its exact frequency. (Broadcast stations frequently give their frequency while broadcasting and may also be listed by frequency in the newspaper). If the dial setting does not agree with the known frequency, set the dial to the correct frequency and adjust coil L-7 until the station is heard. Adjust for maximum on the S-meter. If the signal is too weak to give a good S-meter indication, adjust L-7 for the greatest volume. The ANTENNA control can also be adjusted to give a greater S-meter indication or greater volume.

☑ Repeat the procedure of finding and identifying a station, but near 1600 KC. If the dial setting does not correspond to the frequency listed or given for that station, set the dial to the correct frequency and adjust C-2B (See Figure 16) until the station is heard.

☑ Repeat the above steps until any interaction between adjustments is eliminated.

☐ Keep the receiver tuned to the station near 1600 KC and recheck the adjustment of ANTENNA for maximum S-meter indication and loudest volume. Turn C-2A (see Figure 16) completely clockwise, as far as it will go easily. Now turn the other way (counterclockwise) for maximum volume or maximum S-meter indication. **Do not turn C-2A more than 2 turns counterclockwise.**

☑ On BANDS 1, 3, 4 and 5 the RF coils may be adjusted for maximum sensitivity in the following manner. Set the ANTENNA control to the white dot.

BAND 1	Adjust L-1 for maximum on the S-meter using a signal of known frequency near 300 KC.
BAND 3	Adjust L-3 for maximum on the S-meter using a signal of known frequency near 3.5 MC.
BAND 4	Adjust L-4 for maximum on the S-meter using a signal of known frequency near 10 MC. Turn the ANTENNA control clockwise until the white dot on the knob points to 3 o'clock.
BAND 5	Adjust L-5 for maximum on the S-meter using a signal of known frequency near 30 MC.

ALIGNMENT INSTRUCTIONS (Cont'd)

CALIBRATION

If desired, after you have obtained sufficient listening experience, you can further refine the calibration of your STAR ROAMER by using the following technique:

The National Bureau of Standards has a radio station with the call letters WWV which broadcasts on exactly 2.5 MC, 5 MC, 10 MC, 15 MC, and 20 MC. These signals are used as frequency standards and will serve as excellent points to check the calibration of your receiver.

To adjust the oscillator circuit on each band, first locate the WWV signal in that band range. Then note the difference between the dial reading and the actual frequency. Set the dial to the correct setting and tune the coil listed in the table below until the signal from WWV is heard. On each band, adjust the ANTENNA control for greatest volume or maximum S-meter indication.

BAND	WWV FREQUENCY	ADJUST
3	2.5 MC	L-8 until signal is heard; then adjust for maximum S-meter reading.
4	5 or 10 MC	L-9 until signal is heard; then adjust for maximum S-meter reading.
5	15 or 20 MC	L-10 until signal is heard; then adjust for maximum S-meter reading.

Ordinarily the IF transformers, T-1 and T-2, should not be adjusted unless test equipment is available. T-1 and T-2 are closely preset at the factory. However, if you wish, you may perform the following step.

☐ Tune in a station on BAND 2. Use the tuning tool supplied and carefully adjust both the top and bottom slugs of T-1 and T-2 for maximum indication on the S-meter.

ALIGNMENT WITH TEST EQUIPMENT

The coils in your STAR ROAMER are pre-aligned, but due to slight differences in components and wire placement a slight re-alignment will assure optimum performance.

The test equipment needed for this procedure:

1. An RF signal generator capable of tuning the range from 200kc to 30.455MC, modulated 30% at 400 cps.
2. A vacuum tube volt-meter (VTVM) or oscilloscope for output measurements.

CONTROL SETTINGS FOR ALIGNMENT

Set the controls on the STAR ROAMER to the following settings:

BANDSPREAD	Set to 50 (capacitor half open).
ANTENNA	Set to white dot (capacitor half open). Except BAND 5; set at 3 o'clock.
BAND SELECTOR	Set as indicated in alignment chart.
VOLUME	Set to white dot.
SENSITIVITY	Set fully counterclockwise (switched OFF).
POWER	Set to ON.
AVC	Set to OFF.
ANL	Set to OFF.
CODE-NORMAL (on rear panel)	Set to NORMAL.

ALIGNMENT PROCEDURE

Use the following procedure to align the receiver:

☐ Turn all equipment on and allow to warm up for at least a half hour.

☐ Connect the VTVM or oscilloscope to terminals 1 and 2 of SP-1.

☐ Adjust the VTVM or oscilloscope controls to a 1 to 1.5 volt AC voltage range.

☐ Connect the signal generator to the point indicated in the alignment chart and set to the specified frequency.

ALIGNMENT NOTES

When using the signal generator for aligning the coils, keep the signal input as low as possible, consistent with accurate output readings. Too much signal output from the generator will overload the receiver and cause broad, hard-to-peak responses. When the signal from the generator has been found on the receiver dial, leave the receiver set and tune the generator 910kc above the former frequency. Another signal or "image" will be heard if the receiver is set correctly. Always be sure that the image frequency is 910kc above the frequency the receiver is tuned to and that you are not attempting alignment on the image. The receiver cannot be correctly aligned on that image.

ALIGNMENT CHART

STEP	GEN. FREQUENCY	CONNECT GEN. TO:	BAND SELECTOR	SET DIAL TO:	ADJUST	TUNE FOR
1	455kc	pin 1 of V-1	1	a point where no stations are present	* T-2 top & bottom slugs	maximum output
2	SAME AS STEP 1				* T-1 top & bottom slugs	maximum output
3	Repeat steps 1 and 2 until both transformers are peaked for maximum.					
4	550kc	ANT. terminals	2	550kc	L-7	max. signal output
5	1800kc	ANT. terminals	2	1800kc	C-2B (See Fig. 16)	max. signal output
6	Repeat steps 4 and 5 until the interaction is eliminated.					
7	1500kc	ANT. terminals	2	1500kc	C-2A	max. signal output
8	200kc	ANT. terminals	1	200kc	C-1B	max. signal output
9	400kc	ANT. terminals	1	400kc	L-6	max. signal output
10	Repeat steps 8 and 9 until interaction between adjustments is eliminated.					
11	300kc	ANT. terminals	1	300kc	L-1	max. signal output
12	2MC	ANT. terminals	2	2MC	L-8	max. signal output
13	3.5MC	ANT. terminals	3	3.5MC	L-3	max. signal output
14	5MC	ANT. terminals	4	5MC	L-9	max. signal output
15	10MC	ANT. terminals	4	10MC	L-4	max. signal output
16	14MC	ANT. terminals	† 5	14MC	L-10	max. signal output
17	20MC	ANT. terminals	† 5	20MC	L-5	max. signal output

NOTES:

* The IF transformer adjustments will result in double peaks. The correct adjustment is obtained with the top slug near the center of the transformer and the lower slug near the bottom of the transformer.

† Set the ANTENNA control at 3 o'clock.

MOUNTING THE BOTTOM PLATE AND CABINET

☐ Bottom plate and four rubber feet. Note that the bottom plate has a raised lip on three sides. The side without a lip is the front of the plate. Mount two rubber feet in the holes at the front of the plate. Fasten with two 6-32 x 3/8" screws, lockwashers and nuts. Fasten two rubber feet to the back of the plate with 6-32 x 3/8" screws, lockwashers and nuts.

☐ Bottom plate and chassis. Mount the chassis on the bottom plate by placing it on the plate, with the lips on the side of the bottom plate on the outside of the chassis. The lip at the back of the bottom plate should slip inside the chassis. Move the two pieces back and forth until the clip nuts on the chassis are visible through the holes in the sides of the bottom plate.

☐ Remove the rubber band and cardboard used as a temporary cover for the speaker.

☐ Cabinet and chassis. Note that the cabinet has a lip at one end—this is the back of the cabinet. Mount the cabinet to the chassis by gently spreading the sides of the cabinet apart, and lowering the cabinet over the bottom plate and chassis. Be sure the lip at the back of the cabinet is on the outside of the back plate. Fasten in place with four 6-32 x 3/8" screws through the cabinet, the bottom plate, and into the clip nuts.

OPERATING INSTRUCTIONS

CONTROL SETTINGS FOR STANDARD BROADCAST RECEPTION

POWER switch	Set to ON.
BAND SELECTOR	Set to 2.
TUNE	Set to the frequency of the desired station.
AVC switch	Set to ON.
ANL switch	Set to OFF or ON, depending on the amount of noise present.
BANDSPREAD	The BANDSPREAD control is not used for standard broadcast.
SENSITIVITY	Turn fully counter-clockwise (switched off).
ANTENNA	Adjust for strongest signal.
VOLUME	Adjust for desired volume.
CODE-NORMAL switch on the rear panel	Set to the NORMAL position.

CONTROL SETTINGS FOR LOW FREQUENCY OR SHORT WAVE RECEPTION

Set the controls in the same positions as for standard broadcast except for these changes:

BAND SELECTOR	Set to Band 1 for low frequency reception or to Bands 3, 4, or 5 for shortwave reception, depending on the frequency of the station desired.
BANDSPREAD	After the station is tuned in with the TUNE knob, Adjust the BANDSPREAD knob for fine tuning. The BANDSPREAD control may be used in two ways. The BANDSPREAD may be left at 50 when the station is tuned in and then "rocked" back and forth to bring the station in. Or, the receiver may be tuned to a frequency just below (to the left) of the desired signal with the BANDSPREAD control set to 0. The BANDSPREAD may then be tuned to the desired station.

CONTROL SETTINGS FOR CODE RECEPTION ON LOW FREQUENCY OR SHORTWAVE

Set the controls to the same settings for LOW FREQUENCY (LF) or shortwave (SW) except:

AVC	Set the AVC to OFF.
SENSITIVITY	Set the SENSITIVITY control to the point where a "beat note" makes the code (CW) station audible. Do not turn the SENSITIVITY control farther clockwise than is necessary to obtain a clear beat note.

CONTROL SETTINGS FOR CODE PRACTICE OPERATION

To use the STAR ROAMER as an audio oscillator for code practice, tune the receiver to a steady signal—either broadcast or shortwave—turn the AVC off, and advance the SENSITIVITY control clockwise until the receiver starts oscillating. When oscillation starts, a "beat note" or whistle will be heard in the speaker. Adjust the BANDSPREAD control for the desired tone. Push the CODE-NORMAL switch on the rear panel to the CODE position. The speaker will now be cut out of the circuit. Insert the leads from a code key in the pin jacks of J-2. Closing the key will restore the speaker to the circuit and the beat note will be heard again. Headphones may be plugged in the PHONE jack for quiet practicing. A listing of the International Morse code will be found on page 32.

THE CONTROLS AND THEIR FUNCTIONS

CONTROL	FUNCTION
TUNE	Tunes in the desired stations.
BANDSPREAD	A fine tuning control to separate stations close together.
BAND SELECTOR	Selects the proper set of coils to tune to the desired frequency.
ANTENNA	A control that matches the antenna to the receiver for maximum sensitivity.
SENSITIVITY	Provides a beat note for code reception or code practice and controls sensitivity to a minor degree.
AVC switch	Turns the automatic volume control (AVC) circuit on and off. On voice stations the AVC prevents fading and blasting as the signal strength varies. The AVC should be turned off for code reception or when the receiver is used as a code practice oscillator.
ANL switch	Turns the automatic noise limiter on and off. The noise limiter is used as required, depending on the amount of signal and noise.
POWER switch	Turns the receiver on and off.
PHONE jack	Provides an output connection when headphones are used. The speaker is automatically disconnected when the headphone is inserted in the jack.
"S"-METER	Tune the receiver for maximum deflection of the meter. The meter indicates relative signal strength.

REAR PANEL CONTROLS

S-4, the CODE-NORMAL switch and J-2.	S-4 opens one of the speaker leads so that it may be keyed for code practice. J-2 provides terminals for a key when the receiver is used for a code practice oscillator.
TS-2, the two screw strip.	Provides connections for the antenna and ground. The terminal nearest J-2 is the ground terminal (marked "G") and the other is the antenna terminal (marked "A").
R-8.	R-8 is the "S-meter adjust" for the S-meter and sets the meter to zero when no signals or noise is being received.

GETTING THE MOST OUT OF YOUR STAR ROAMER

ANTENNA CONTROL. On the higher frequencies (Bands 3, 4 and 5) there are two settings of the ANTENNA control that will cause the S-meter needle to move up-scale. One setting will increase the volume of a signal, and the other results in little or no reception. Tune in a station with either the TUNE or BANDSPREAD controls. Then peak the signal with the setting of the ANTENNA control that increases the volume of the station. Disregard, for the moment, the S-meter indication. Now adjust the BANDSPREAD control for maximum S-meter indication.

This double peak occurs because the ANTENNA control has sufficient range to peak both the received signal and the local oscillator in the receiver. Refer to the circuit description for an explanation of the function of the local oscillator. This is a normal response in this receiver and does not indicate oscillation or malfunction.

By providing this wide range of control to the ANTENNA control, almost any antenna may be matched to the STAR Roamer.

INCREASING THE SENSITIVITY ON BAND 1. A filter composed of L-11 and C-20 is built into the circuits of this band to filter out images caused by near-by broadcast stations. If you live in a area of high-power broadcast stations, the filter will prevent these stations from "creeping" in on Band 1. If, however, you live in an area free of such stations or you wish to increase the sensitivity of the receiver at the expense of losing the filtering action, perform the following steps.

- ☐ Tune the STAR ROAMER across Band 1 until a weak station is found. Note the S-meter reading and the frequency of the station.
- ☐ Turn the receiver off and disconnect it from the power line. Remove the antenna and ground wires from TS-2 and remove the cabinet and bottom plate from the receiver.
- ☐ By referring to Figure 14, locate L-11. Short out L-11 by soldering a red wire across the coil. Take care not to damage the coil. Reassemble the bottom plate and cabinet.
- ☐ Attach the antenna and ground wires and apply power to the receiver. Tune the receiver to the station logged in the first step and note the S-meter reading. Tune across Band 1 and note the broadcast interference if any.
- ☐ On the basis of the amount of increase in signal strength of the stations and the amount of BC interference, determine which mode of operation, with or without the filter, best suits your needs.

SIGNAL STRENGTH READINGS USING THE S-METER. You may notice that the S-meter setting at the left or "no signal" edge of the dial varies when changing bands. To obtain accurate relative signal strength readings on the S-meter, adjust R-8 on the rear panel for zero with no signal present on the band you wish to compare signals.

The change in S-meter readings is due to the change in operating characteristics of the circuits when the tuning range is changed. Adjusting R-8 calibrates the S-meter to these circuit changes.

SERVICE HINTS

The proper operating voltages for each tube will be found on the schematic diagram, Figure 23. The resistance chart will help to locate any errors in a particular stage or circuit.
Never measure resistances with the receiver turned on or plugged into a power outlet.

TROUBLE	POSSIBLE CAUSE	SERVICE PROCEDURE
Receiver dead.	Defective tube(s).	Check and replace defective tubes.
	Tubes in wrong sockets or not seated.	Inspect visually and correct.
	Line cord not plugged in.	
	Fuse open.	Visually check fuse. If open, check power supply wiring, particularly the wiring near TS-7.
	Phone jack miswired or not making contact.	Check wiring and position of contact arm in jack.
	CODE-NORMAL switch in CODE position.	Check and set to NORMAL position.
	Speaker defective or not properly soldered.	Check speaker cone for damage and solder connections.
Poor sensitivity on one band only.	Check for miswired or poorly soldered coils and terminals on BAND SELECTOR switch.	Correct wiring error and/ or resolder poor connections to coils or switch.
Poor sensitivity on all bands.	Defective tube(s).	Check the 6BE6 and 6HR6.
	IF stage misaligned. RF and oscillator coils misaligned.	Repeat alignment procedure.
	Low B+ voltages.	Check C-17 and wiring of TS-7.
Output distorts on strong AM signals when AVC switch is on.	AVC line grounded.	Check wiring of S-2, T-1 and T-2.
	Receiver overloading.	Reduce signal strength by tuning ANTENNA control for null rather than peak.
Receiver oscillates on AM signals.	SENSITIVITY control set too high.	Reduce setting of control.
	SENSITIVITY control defective or poorly soldered.	Check control and solder connections for high resistance.
	Tube shields not seated on bases.	Reseat all shields.
	Ground wires on coil bracket poorly soldered.	Check ground connections to coils on bracket and to BANDSPREAD and ANTENNA capacitors.
	Poor solder connections to 6HR6 socket ground lugs.	Check soldering on ground lugs and center pin.
Hum.	C-17 defective or incorrectly wired.	Check condition and wiring.
	Shorted tube.	Test tubes.
	Poor ground connections on 12AX7, 6AR5 or 6AK6 sockets.	Check the socket ground lug connections and center pin connections.
SENSITIVITY control does not produce beat note for code reception.	SENSITIVITY control miswired or defective.	Check wiring and control.
	IF stage misaligned.	Re-align IF.
	AVC switch on.	Turn AVC off.

RESISTANCE MEASUREMENTS

Resistance measurements should be taken from the indicated point to ground. When making resistance measurements, set the following controls to their indicated positions. There should be no signal or antenna input connected to the receiver. DO NOT TAKE RESISTANCE MEASUREMENTS WITH THE RECEIVER OPERATING OR CONNECTED TO A POWER OUTLET.

VOLUME	Set fully counter-clockwise.
SENSITIVITY	Set fully counter-clockwise.
AVC	Set to ON.
ANL	Set to OFF.

	PIN								
TUBE	1	2	3	4	5	6	7	8	9
V-1	22K	0	0	0	110K	140K	3.4M		
V-2	3.4M	0	0	0	115K	140K	150Ω		
V-3	220K	470K	1K	0	0	220K	0	3.3K	0
V-4	470K	180Ω	0	0	100K	100K	180Ω		

All readings taken with a VTVM.
K=1,000Ω. M=1,000,000Ω.

CIRCUIT DESCRIPTION

RADIO FREQUENCY AND CONVERTER CIRCUITS

When the radio signal enters the STAR ROAMER from the antenna, it is first routed into one of the radio frequency (RF) coils selected by wafer S-1B of the BAND SELECTOR switch. The switch is wired so that the coil selected by the switch is in parallel with one section of the main tuning capacitor C-2, and the ANTENNA capacitor C-3.

The ANTENNA capacitor compensates for the effect the antenna has on the circuits at different frequencies and assures that the radio frequency circuits are properly tuned to the received signal.

At the same time the signal from the antenna is being fed to the tuned circuit, wafer S-1A of the BAND SELECTOR switch has selected an oscillator coil corresponding to the RF coil in use. Again, the coil is in parallel with the other section of C-2, and the BANDSPREAD capacitor C-4. The combination of the selected coil, the section of C-2, C-4, and part of tube V-1 produces an RF signal, 455 kc higher in frequency than the signal received on the antenna. This circuit is called the local ocillator.

The two signals, the one from the antenna and the local oscillator, are mixed in V-1, the 6BE6 converter tube, in a process called heterodyning. The two signals beat, or heterodyne, against each other, producing a number of frequencies at the output of V-1. Most of the output is at two frequencies, one equal to the sum of the antenna signal and the local oscillator, and the other equal to the difference between the antenna signal and the local oscillator. Since the local oscillator is always tuned to a frequency 455kc higher than the antenna signal, the difference signal V-1 is always 455kc regardless of the frequency of the antenna and local oscillator signal. (The sum frequencies are rejected by the tuned circuits). Hence, the converter tube gains its name by converting signals of any frequency in the tuning range of the receiver to one frequency, 455kc. Since only one frequency is involved past the converter, the remaining tuned circuits are adjusted to 455kc and require no further tuning.

INTERMEDIATE FREQUENCY AMPLIFIER CIRCUITS

The Intermediate Frequency (IF) amplifier is the intermediate stage between the RF signals of the converter stage and the audible signals of the audio stages. The 455kc signal, which is identical to the antenna signal except for frequency, is amplified by V-2, the 6HR6 IF amplifier. Besides increasing the strength of the signal, the IF stage performs another important function by increasing the selectivity (the ability to separate stations) of the receiver.

The IF transformers T-1 and T-2 are sharply peaked on 455kc, and any signal not exactly on 455kc will not be passed through the transformer. Hence, undesired signals which may slip through the broadly tuned converter stage will be filtered out in the IF stage.

DETECTOR AND AUDIO CIRCUITS

Most of the stations in the frequency range of the STAR ROAMER that broadcast voice and music use amplitude (AM) Modulation to add the audio to the RF signal, or carrier, generated by the transmitter. In AM operation, the amplitude of the RF carrier varies in accordance with the audio; that is the audio causes peaks and nulls in the strength of the RF carrier. In the STAR ROAMER, diode detector CR-1 recovers the audio from the IF signal (remember that the IF signal is identical to the antenna signal in all respects except frequency). CR-1 acts like a gate, responding to the amplitude changes and rejecting the remaining RF carrier by shorting it to the chassis. These amplitude changes are the audio signals impressed on the RF carrier at the transmitter. The audio signals pass through R-11 the VOLUME control which limits the amount of signal that reaches V-3, the audio amplifier. V-3, a 12AX7, is actually two tubes in one envelope. The audio is amplified by V-3 and raised to a point where it can be used by V-4, the audio output tube. A 6AR5 or 6AK6 is used to develop enough audio power to drive a speaker or headset.

POWER SUPPLY CIRCUITS

The power transformer T-4 provides the necessary filament and plate voltages for the tubes. It also isolates the receiver from the power lines so that there is no danger of electrical shock between the receiver and earth ground. Diode CR-3 acts as a rectifier and changes the AC from T-4 into DC. Sections A and B of capacitor C-17 and resistor R-19 provide filtering and voltage dropping so that the output from the power supply is at the correct voltage and is hum free.

AVC, S-METER AND SENSITIVITY CONTROLS

These controls all have their origin in or near the IF stage. The AVC, or automatic volume control, is actually a voltage derived from the output of the IF stage. The function of this voltage is to cut down the amplitude of V-1 and V-2 when the signal is quite strong. This tends to "even out" the signal and keep the signal strength from varying widely and alternately blasting and fading as the signal strength varies. The S-meter measures a portion of the plate current going to V-1 and V-2. Since the plate current varies with the strength of the signal, an accurate comparison of signal strengths can be made. The SENSITIVITY control causes the IF tube to oscillate, producing a beat note so that code signals will be audible.

ANL CIRCUITS

The automatic noise limiter functions only on noise peaks greater in amplitude than the signal. A voltage set up by resistors R-10 and R-25 causes CR-2 to operate at a point that will pass all audio signals at the amplitude set by the VOLUME control. When a noise peak appears, the peak is passed to ground through CR-2 and is not heard in the output of the audio.

PARTS LIST

RESISTORS

Unless specified all values are ½ watt ± 10% carbon.

Symbol No.	Description	Part No.
R-1	22K	NS301223
R-2	100K	NS301104
R-3	22K	NS301223
R-4	1K Control	NS392194
R-5	150Ω	NS301151
R-6	10K	NS301103
R-7	3.3 Meg	NS301335
R-8	10K Control	NS392187
R-9	4.7K	NS301472
R-10	47K	NS301473
R-11	500K control	NS392195
R-12	150K	NS301154
R-13	1K, 1 watt	NS304102
R-14	150K	NS301154
R-15	470K	NS301474
R-16	1K	NS301102
R-17	470K	NS301474
R-18	180Ω	NS301181
R-19	1K, 2 watt	NS304102
R-20	560Ω	NS301561
R-21	12K	NS301123
R-22	3.3K	NS301332
R-23	100K	NS301104
R-24	470K	NS301474
R-25	100K	NS301104
R-26	1K	NS301102

CAPACITORS

Unless specified all Capacitors are rated in μf, 600V.

C-1	not used	not used
C-2	2 gang variable, tuning	NS286066
C-3	50 μμf trimmer	NS281011
C-4	Band spread variable	NS286068
C-5	39 μμf mica ± 5%, 500V	NS266552
C-6	470 μμf disc	NS276478
C-7	.005 disc	NS296000
C-8	.02 disc	NS276025
C-9	.02 disc	NS276025
C-10	6800 μμf disc	NS276687
C-11	.005 disc	NS296000
C-12	.02 disc	NS276025
C-13	470 μμf disc	NS276478
C-14	.005 disc	NS296000
C-15	.005 disc	NS296000
C-16	.005 disc	NS296000
C-17	30-30-30-50 μf tubular electrolytic	NS214400
C-18	Trimmer capacitor, variable	NS283005
C-19	.1 50V disc	NS278056
C-20	6800 μμf disc	NS276687
C-21	.005 disc	NS296000
C-22	.1 disc 50V	NS272014
C-23	470 μμf disc	NS276478
C-24	.005 disc	NS296000

SWITCHES

S-1	BAND SELECTOR, 5 position, 2 wafer	NS437091
S-2	SPST, white button	NS431008
S-3	SPST, white button	NS431008
S-4	SPST, black button	NS431005
S-5	SPST, red button	NS437078

TUBES and DIODES

Symbol No.	Description	Part No.
CR-1	Diode, AM rectifier	NS630007
CR-2	Diode, Limiter	NS630007
CR-3	Silicon rectifier mounted on TS-12	NS620007
V-1	6BE6	NS610045
V-2	6HR6	NS614160
V-3	12AX7	NS611012
V-4	6AK6	NS610040
V-4	(alternate) 6AR5	NS614257

COILS and TRANSFORMERS

L-1	R.F. coil, black dot	NS142062
L-2	Loopstick	NS122255
L-3	R.F. coil, red dot	NS142063
L-4	R.F. coil, green dot	NS142064
L-5	R.F. coil, yellow dot	NS142065
L-6	Oscillator coil, blue dot	NS142066
L-7	Oscillator coil, violet dot	NS142067
L-8	Oscillator coil, white dot	NS142068
L-9	Oscillator coil, orange dot	NS142069
L-10	Oscillator coil, brown dot	NS142070
L-11	Choke coil	NS152042
T-1	First I.F. transformer	NS113274
T-2	Second I.F. transformer	NS113275
T-3	Output transformer	NS107273
T-4	Power transformer	NS107270

METER

M-1	"S" meter	NS658256

HARDWARE

Description	Qty.	Part No.
Angle Bracket, #6, 90 degree	3	NS531016
"C" Washers	2	NS585002
Clip nut, #6	4	NS531009
Clip, I.F. Can Mounting	2	NS532008
Ground lug, large	1	NS553001
Eyelets, small brass	3	NS551008
Flat washer, large	1	NS580702
Flat washer, small	3	NS580301
Lockwasher, #4	16	NS582200
Lockwasher, #6	29	NS582300
Lockwasher, #8	2	NS582400
Lockwasher, ⅜" thin	6	NS582701
Lockwasher, ⅜" thick	1	NS582700
Nut, 3-48	2	NS570110
Nut, 4-40	16	NS570221
Nut, 6-32	28	NS570340
Nut, ⅜"	6	NS570840
Screw, 3-48x½"	2	NS560113
Screw, 4-40x¼"	16	NS560222
Screw, 6-32x¼"	24	NS560342
Screw, 6-32x⅜"	13	NS560344
Screw, 8-32, Round head	2	NS563442
Setscrew, #8 (for flywheel)	1	NS569001
Solder lug, #6	1	NS553005
Spring, Dial spring	1	NS470078

WIRE, SOLDER and TUBING

Line cord, 6 ft.	1	NS802001
Solder, 10 ft. roll	1	NS930005
Solder, 1 ft. hank	1	NS930004
Wire, Red	7	NS801002
Wire, Orange	9	NS801003

WIRE, SOLDER and TUBING (Cont.)

Description	Qty.	Part No.
Wire, Yellow	8	NS801004
Wire, Green	5	NS801005
Wire, Blue	2	NS801006
Wire, Violet	2	NS801007
Wire, Gray	3	NS801008
Wire, Brown	2	NS801010
Wire, White/Yellow	1	NS801014
Wire, White/Gray	1	NS801018
Wire, White/Black	2	NS809086
Wire, White/Red	1	NS801012
Wire, White/Blue	1	NS809085
Wire, Shielded	4	NS809087
Wire, Bare, 48"	1	NS806048
Tubing, 36"	1	NS812031

MISCELLANEOUS

Bracket, coil	1	NS470531
Bracket, switch	1	NS470530
Bushing, tuning shaft	1	NS470075
Cabinet	1	NS702077
Cable clamp, plastic	2	NS880056
Chassis	1	NS463517
Dial crystal	1	NS870159
Dial pointer	1	NS470291
Dial string, 48"	1	NS860001
Flywheel	1	NS485085
Foot, Rubber 11/32"	4	NS831001
F-1, 1 Amp Fuse	1	NS491001
Grommet, 5/16", rubber	1	NS830003
Grommet, 7/16", rubber	5	NS830006
Knob, ⅞"	5	NS765074
Knob, 1¾"	1	NS765073
Lamps, #47, I-1 and I-2, 6.3V	2	NS640002
Line cord bushing	1	NS880029
Panel, bottom	1	NS463515
Panel, front	1	NS463516
Plate, back	1	NS850155
Pulley, large		
Pulley, small plastic	3	NS880014
Reflector plate	1	NS463514
Shaft, tuning	1	NS470078
Shield base, 7 pin	2	NS511005
Shield base, 9 pin	1	NS511001
Shield, tube, 7 pin	2	NS510006
Shield, tube, 9 pin	1	NS510001
Speaker	1	NS734072
Tube socket, 7-pin	3	NS509056
Tube socket, 9-pin	1	NS501190
Tuning tool	1	NS957007

JACKS and TERMINAL STRIPS

Symbol No.	Description	Part No.
F-1	Fuse holder	NS492200
I-1	Pilot light socket	NS501524
I-2	Pilot light socket	NS501524
J-1	Phone jack	NS509051
J-2	Jack strip	NS502227
TS-1	3-terminal strip	NS440302
TS-2	2-screw terminal strip	NS441201
TS-3	3-terminal strip	NS440301
TS-4	6-terminal strip	NS440602
TS-5	2-terminal strip	NS440202
TS-6	3-terminal strip	NS440305
TS-7	5-terminal strip	NS440501
TS-8, 9, 10, 11	2-terminal strip	

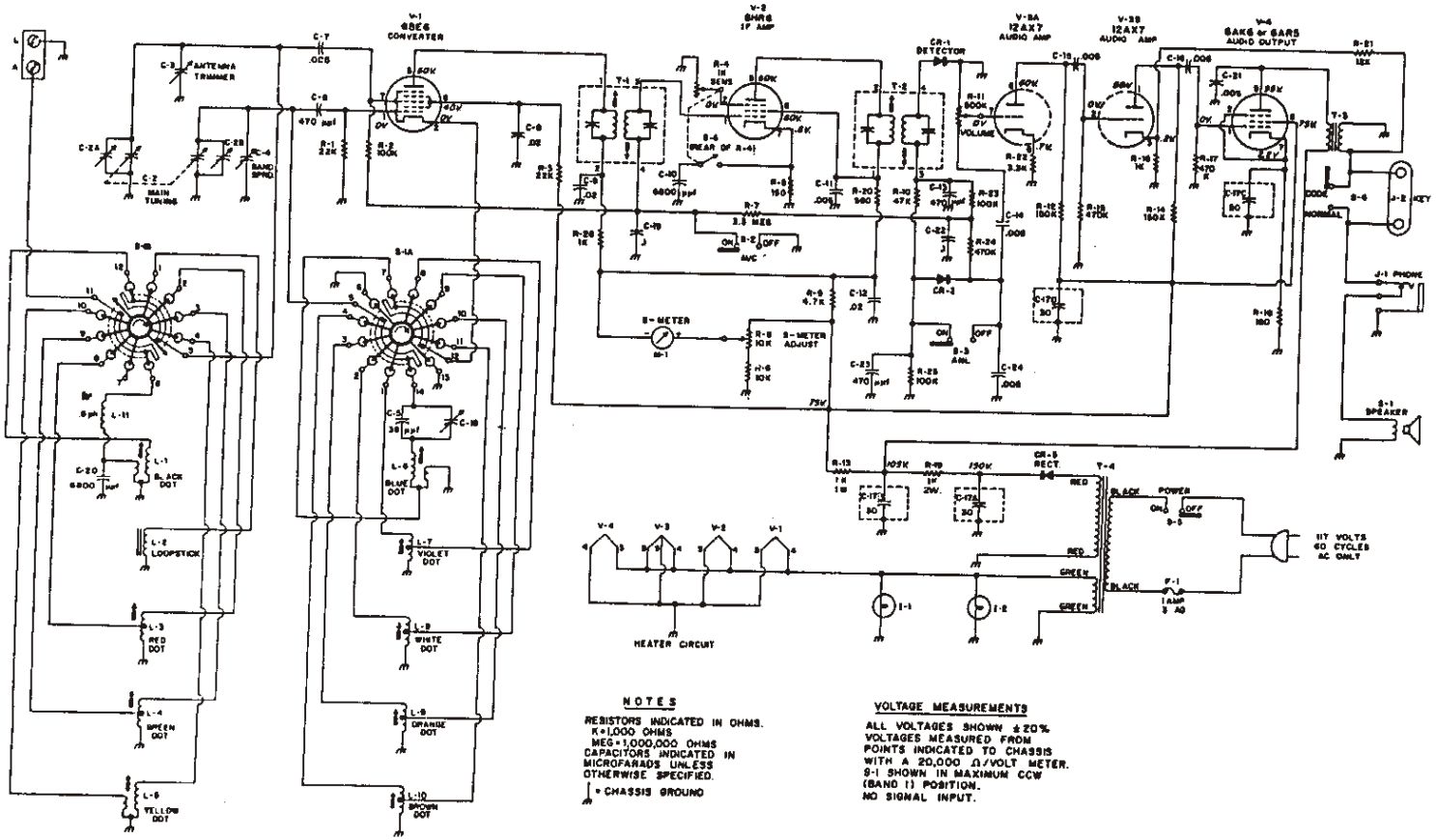


FIGURE 23. SCHEMATIC DIAGRAM—STAR ROAMER

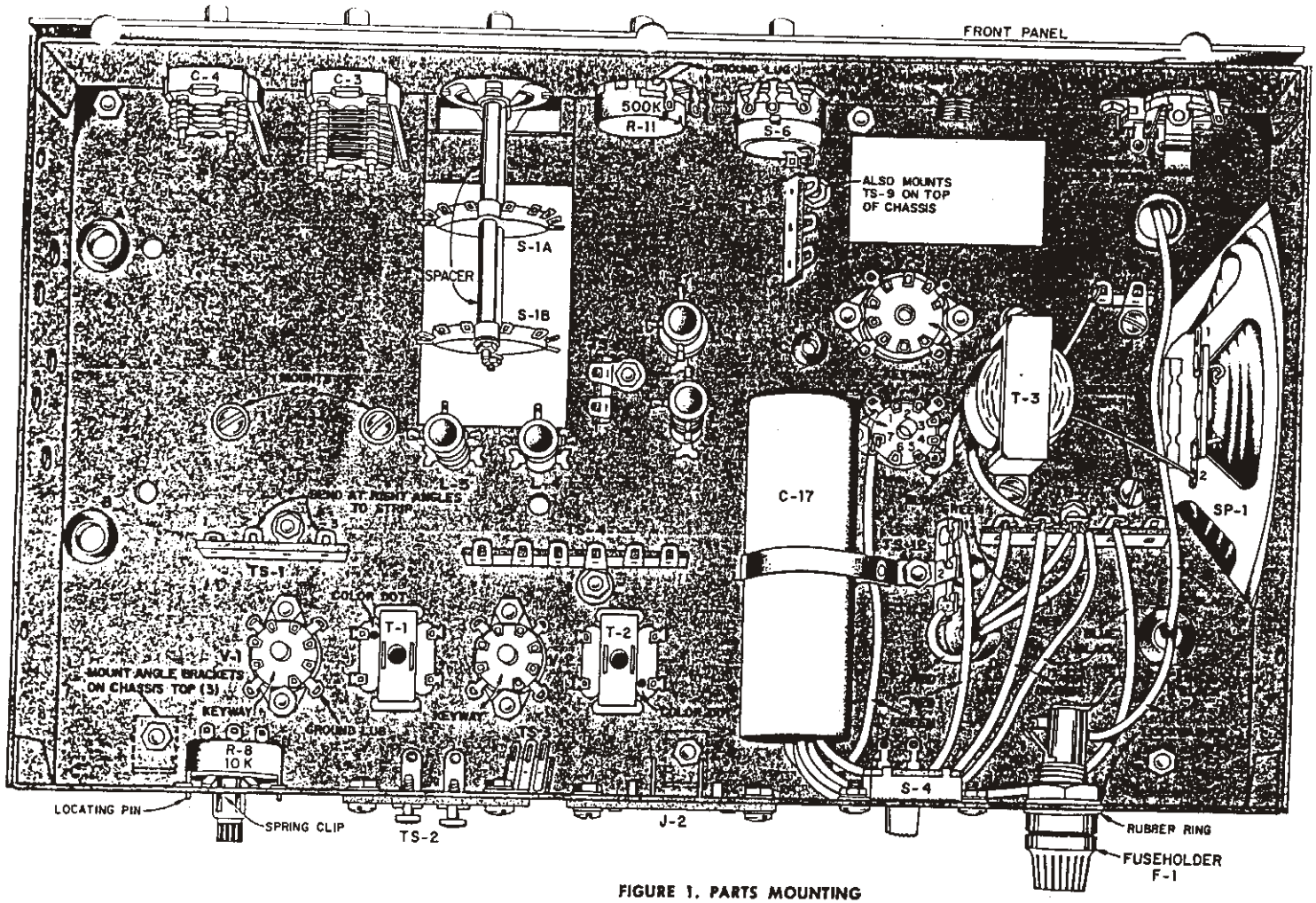


FIGURE 1. PARTS MOUNTING