



***knight-kit***<sup>®</sup>  
**V-44 VFO**  
**83Y725**

**ALLIED RADIO**

C O R P O R A T I O N

100 N. WESTERN AVE. • CHICAGO 80, ILL.



TELEPHONE  
HAYMARKET 1-6800

38K180

750187-13-CA-659

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## SPECIFICATIONS

Frequency Coverage: 80, 40, 20, 15, and 10 meter bands.  
RF Output: Approximately 10 volts.  
Power Supply: Self-contained with power transformer, 6X4 rectifier, and OA2 voltage regulator.  
Size: 6" x 6" x 8-3/4".

## INTRODUCTION

The KNIGHT VFO (Variable Oscillator) is designed to give the ever-growing group of Radio Amateurs an economical, highly stable VFO with a self-contained power supply. Coverage on the 80, 40, 20, 15, and 10 meter bands is provided. The output on any band is more than enough to excite the oscillator stage of any transmitter.

The built-in voltage regulated power supply is exceptionally stable. The 6BH6 Clapp oscillator is drift-free, fast break-in is easy because of the excellent keying characteristic, TVI suppression is built-in, the bandspread is good over each of the five bands with vernier drive tuning.

Your KNIGHT VFO is small, only 8-3/4" x 6" x 6", so the operating position will not be crowded. The output cable is coaxial, terminated in a plug to fit directly into the crystal socket on your transmitter.

The KNIGHT VFO gives you top quality performance at much lower cost than any comparable unit.

## CHECKING YOUR KIT

Before starting to build your KNIGHT VFO, check each part against the Parts List, on page 24. If you are unable to identify some of the parts by sight locate them on the pictorial diagrams. Capacitor and resistor values, if not printed on the part, can be found with the aid of the color code chart.

Study the pictorial diagrams and note how the parts are mounted. These pictorial diagrams show the actual location of all parts and wiring. The schematic diagram shows how the parts are connected electrically and is helpful in understanding how the circuits work.

We recommend that the step by step instructions be followed exactly. Do not wire this kit from the pictorials alone. Occasionally several parts are mounted with the same hardware or in a particular order; so be sure to read each step all the way through.

The only tools required for building your KNIGHT VFO are: long-nose pliers, diagonal cutters, screwdriver, set screwdriver, and a solder-iron. A good set of tools is listed at the end of the Parts List.

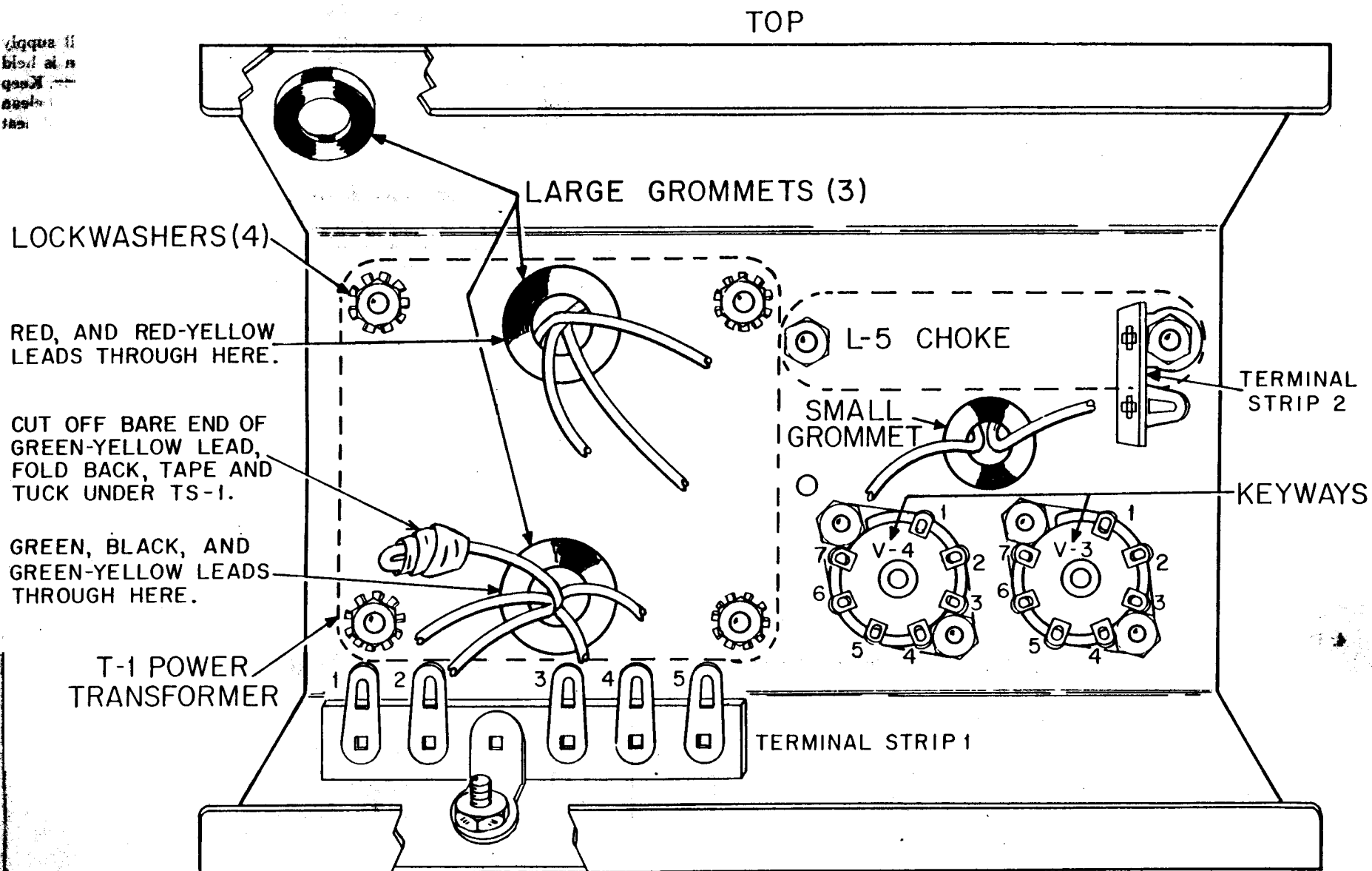
## CONSTRUCTION

Begin building your KNIGHT VFO by mounting the parts on the power supply chassis. This is the smaller chassis.

### SEE FIGURE 1.

- ( ) Mount two of the dark tube sockets inside the chassis. The keyways, the wide space between two of the pins, must be toward the upper left with the chassis positioned as shown in Figure 1. Use two of the small machine screws and nuts, packed with the hardware, to mount each socket.
- ( ) Insert the small rubber grommet in the hole next to the two tube sockets.
- ( ) Insert three of the large rubber grommets in the two holes near the left end of the chassis and in the hole in the top of the chassis.
- ( ) Pass the two leads of L-5, the 5.5 henry choke, through the small grommet from the outside of the chassis. Mount terminal strip 2 (TS-2) inside the chassis with the same larger machine screw and nut which holds the right mounting tab of L-5. TS-2 is the terminal strip which has the solder terminal to the right of the mounting tab when viewed from the rear. Use another of the larger machine screws and nuts to fasten the other mounting tab of L-5.
- ( ) Pass the two red leads and the red-and-yellow lead from T-1, the power transformer, through the grommet nearer the top of the chassis. Pass the green leads, the green-and-yellow lead, and the black leads through the other grommet. Mount T-1 on the outside of the chassis. Use four of the larger machine screws, lock-washers, and nuts to fasten it.
- ( ) Mount terminal strip 1 (TS-1), the strip with 5 terminals, on the inside of the chassis. Use one of the larger machine screws and nuts to fasten it.
- ( ) Clip off the bare end of the green-and-yellow lead. Fold the lead back on itself about an inch and tape it tightly with electrical tape, friction tape, or adhesive tape. Tuck the taped lead under TS-1.
- ( ) Check all of the work against Figure 1. Be sure the keyways are toward the upper left. It is easier to do some of the wiring before the rest of the parts are mounted.

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## THIS KIT MUST BE PROPERLY SOLDERED!

**WITHOUT GOOD SOLDERING, AN ELECTRONIC UNIT WILL NOT WORK . . .** just as a suit of clothing will fall apart if the stitches are loose . . . no matter how excellent the material.

### USE ENOUGH HEAT

This is the main idea of good soldering. The purpose of soldering is to join metal parts, making an **UNBROKEN** metal path over which electricity can travel. To do this you must apply enough heat to the metal surfaces to make the solder spread freely on them, until the contour (shape) of the connection shows under the solder. If the solder barely melts and forms a rounded ball, *you are not using enough heat*. If you do not use enough heat, there may be no electrical connection, although it appears soldered.

### HERE'S HOW TO DO IT . . .

1. Join bare metal to bare metal. Insulation must be removed.
2. Coat the tip of a hot iron with solder.
3. **FIRMLY PRESS THE FLAT SIDE OF THE TIP OF A HOT IRON FLAT** against the parts to be soldered together. Keep it there while you apply the solder **BETWEEN THE IRON TIP AND THE METAL TO BE SOLDERED**. Use only enough solder for it to flow over **ALL** the surfaces of the connection. Remove the iron.
4. **DO NOT MOVE PARTS UNTIL THE SOLDER HARDENS**. If you accidentally move the wires as the solder is hardening, apply your iron and reheat.

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.

**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.

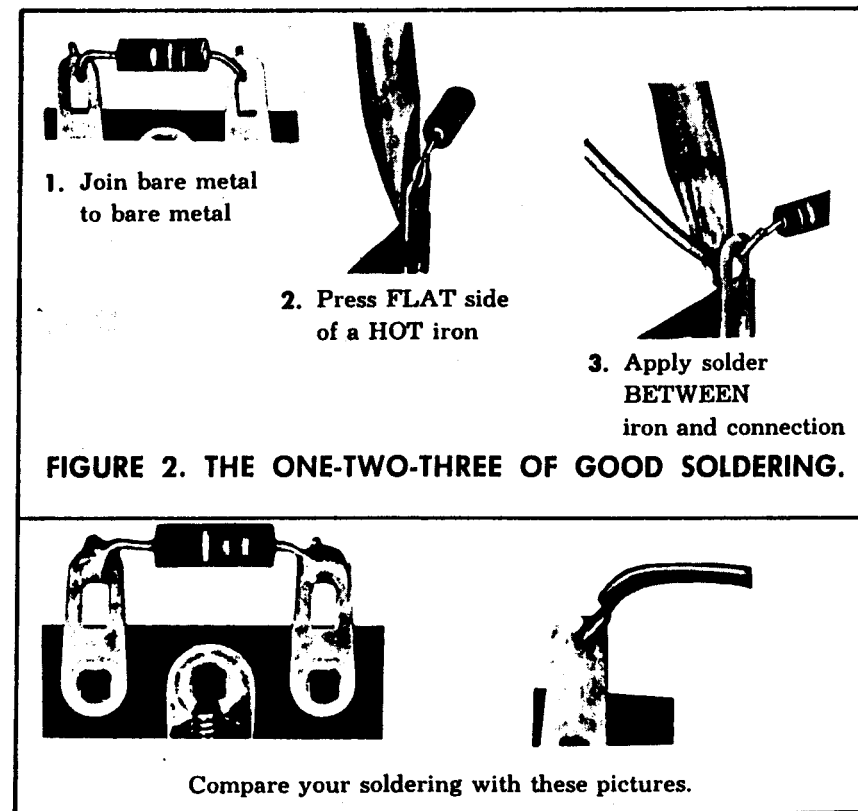
The difference between good soldering (enough heat) and poor soldering (not enough heat,) is just a few extra seconds with a hot iron **FIRMLY** applied. Remember, larger metal surfaces take a longer time to heat.

### USE A 100-WATT IRON

A 100-watt soldering iron with a clean, chisel-shaped tip will supply the right amount of heat when used correctly. Notice how the iron is held in the picture. Heat the iron for 10 minutes before you start soldering. Keep the tip brightly coated with solder. When necessary, wipe the hot tip clean with a cloth. (If you use a soldering gun, be sure the tip reaches full heat before you 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.**



## WIRING HINTS

The soft tubing supplied is called "spaghetti". Spaghetti is used to cover the bare end leads of some of the parts. Whenever it is necessary to use some of this spaghetti, the exact length is given. The spaghetti must cover the entire lead where there is a chance it will touch another lead, a connection, or the chassis.

The coils are sensitive to heat. When you solder the connections to the coils be careful not to touch the winding with the iron and do not allow the iron to remain close to the coils any longer than necessary to make the solder connection.

Unless otherwise stated all the leads on the resistors, capacitors and transformers should be as short as possible. Figure 2 shows how a component lead should be pulled through a terminal so that the part is tightly mounted. After a lead is pulled through a terminal bend it around the terminal and cut off the excess lead length. Bare wires and bare leads not connected to the same terminal must not accidentally touch each other or the chassis.

### SEE FIGURE 4.

- ( ) Solder one of the red leads from T-1 to pin 6 of V-4. Solder the other red lead from T-1 to pin 1 of V-4.
- ( ) Trim each green lead from T-1 to 2½ inches. Remove the insulation from ½ inch of the end of each. Coat both of them with solder. Connect but do not solder one green lead to terminal 3 of TS-1. Connect but do not solder the other green lead to terminal 4 of TS-1.
- ( ) Trim each black lead from T-1 to 3 inches. Remove the insulation from ½ inch of the end and coat each end with solder. Connect but do not solder one black lead to terminal 2 of TS-1. Connect but do not solder the other black lead to terminal 1 of TS-1.
- ( ) Solder one of the leads from L-5 to pin 7 of V-4. Connect but do not solder the other lead to terminal 1 of TS-2.
- ( ) Connect but do not solder one end of an orange wire to terminal 3 of TS-1. Solder the other end to pin 4 of V-4.
- ( ) Connect but do not solder one end of another orange wire to terminal 4 of TS-1. Solder the other end to pin 3 of V-4.
- ( ) Connect but do not solder one end of a yellow wire to terminal 1 of TS-2. Connect but do not solder the other end to terminal 5 of TS-1.

### SEE FIGURE 5.

- ( ) Mount C-13, the 40 MF'D, 450 V electrolytic capacitor, and a ground lug as shown in Figure 5. The red lead must be toward TS-2. Use the same larger machine screw and nut to fasten both.
- ( ) Trim the red lead of C-13 to 1½ inches. Remove the insulation from ½ inch of the end and coat the bare end with solder. Solder it to terminal 1 of TS-2. Connect but do not solder the black lead to the ground lug.
- ( ) Solder one end of an orange wire to pin 7 of V-3. Connect but do not solder the other end to the ground lug.
- ( ) Connect but do not solder the red-and-yellow lead from T-1 to the ground lug.
- ( ) Connect but do not solder one end of R-7 to pin 1 of V-3. Connect but do not solder the other end to terminal 5 of TS-1.
- ( ) Solder one end of a brown wire to the ground lug. Pass the other end through the grommet in the top of the chassis.
- ( ) Solder one end of a white-yellow wire to pin 1 of V-3. Pass the other end through the grommet in the top of the chassis.
- ( ) Solder one end of a white-red wire to terminal 5 of TS-1. Pass the other end through the grommet in the top of the chassis.
- ( ) Connect but do not solder one end of a white wire to terminal 4 of TS-1. Pass the other end through the grommet in the top of the chassis.
- ( ) Connect but do not solder one end of another white wire to terminal 3 of TS-1. Pass the other end through the grommet in the top of the chassis.
- ( ) Solder one end of a yellow wire to terminal 4 of TS-1.
- ( ) Solder one end of another yellow wire to terminal 3 of TS-1. Now, twist these two yellow wires together.
- ( ) Solder one of the twisted yellow wires to one of the terminals on the pilot lamp socket. Solder the other twisted yellow wire to the other terminal on the pilot lamp.
- ( ) Solder one end of a grey wire to terminal 2 of TS-1. Pass the other end through the grommet in the top of the chassis.
- ( ) Solder one end of another grey wire to terminal 1 of TS-1. Pass the other end through the grommet in the top of the chassis.

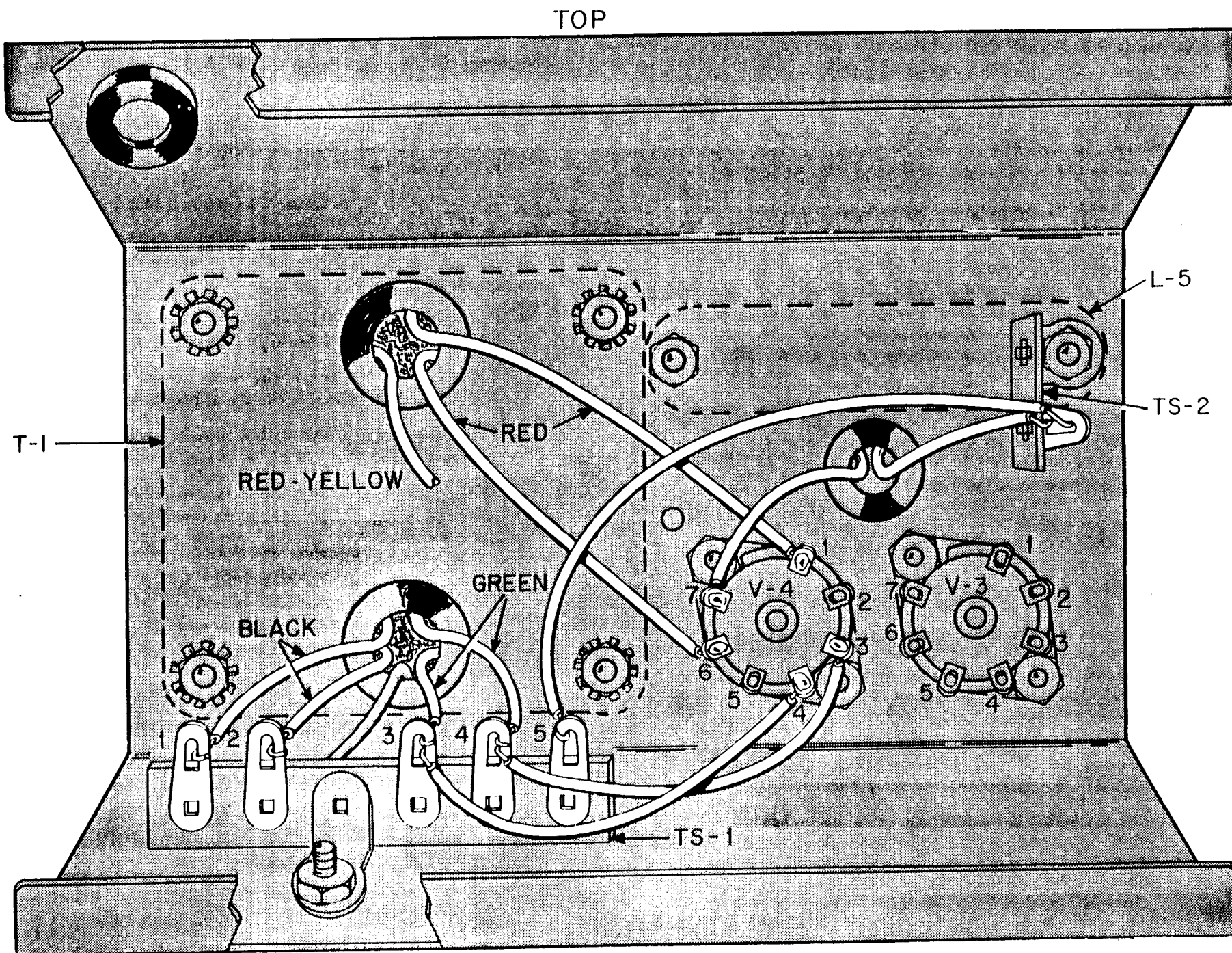


FIGURE 4. FIRST WIRING VIEW, POWER SUPPLY CHASSIS



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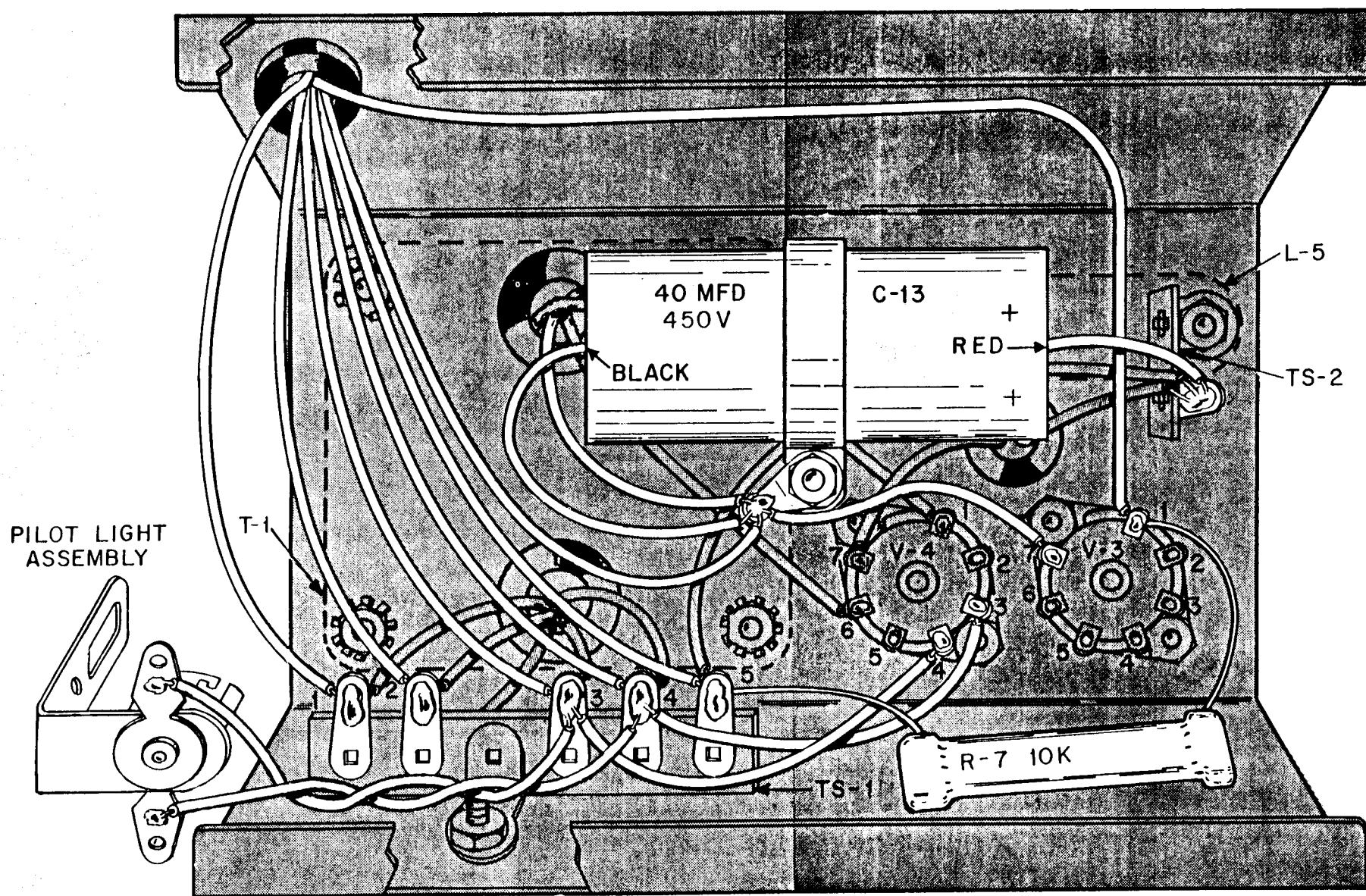


FIGURE 5. SECOND WIRING VIEW, POWER SUPPLY CHASSIS

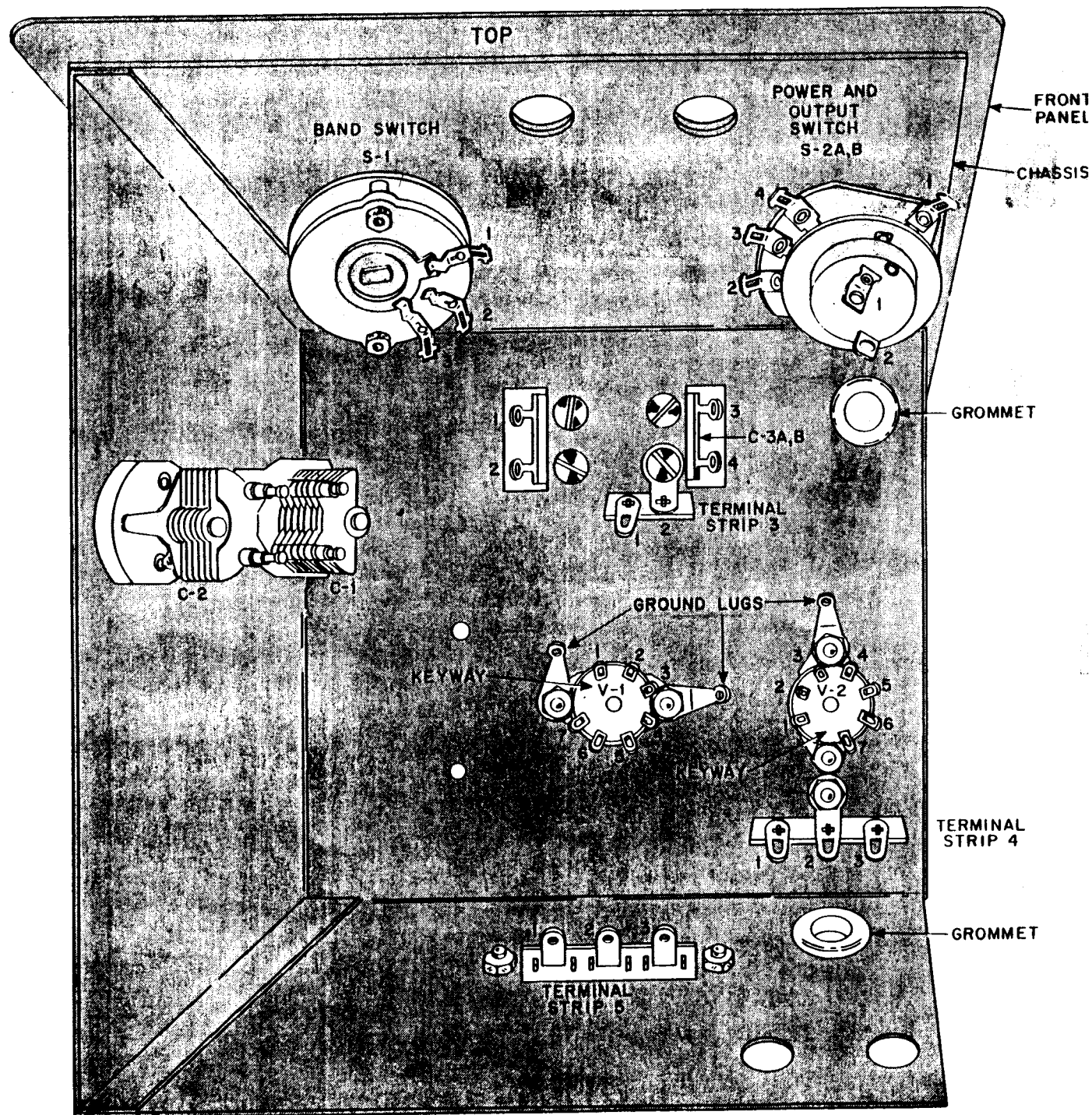


FIGURE 6. HOW TO MOUNT THE PARTS ON THE OSCILLATOR CHASSIS



- ( ) Check all of the work against Figure 5. You have finished wiring the power supply chassis of your KNIGHT VFO. All connections must be strong mechanically and all should now be well soldered.

The ends of the long wires which pass through the top grommet will be connected when most of the wiring on the oscillator chassis is finished.

## SEE FIGURE 6.

- ( ) Mount C-3A, B, the tuning capacitor, on top of the oscillator chassis. The two terminals on each side of C-3A,B extend through the slots in the chassis, but must not touch the sides of the slots. Use three of the larger machine screws. Tighten one into the upper left hole, one into the lower left hole, and the other into the upper right hole of C-3.
- ( ) Now mount terminal strip 3 (TS-3), the other single terminal strip which has the solder terminal to the left of the mounting tab when viewed from the rear. Use another of the larger machine screws to mount TS-3 and tighten it into the lower right hole of C-3.
- ( ) Mount the light colored socket for V-1, the 6BH6 oscillator tube, inside the chassis in the large hole nearer the center. The keyway or wide space between two of the pins must be toward the left as shown in Figure 6. Place a ground lug under each mounting nut and use two of the smaller machine screws and nuts to fasten V-1.
- ( ) Mount the last bakelite socket for V-2, the 6AK6 buffer tube, from inside the chassis. The keyway or wide space between two of the pins must be toward the back of the chassis as shown in Figure 6. Put a ground lug under the front mounting nut and use two of the smaller machine screws and nuts to fasten V-2.
- ( ) Mount terminal strip 4 (TS-4), in the right rear corner of the chassis. This is the 3-terminal strip with the center terminal and the mounting tab made in one piece. Use one of the larger machine screws and nuts to fasten it.
- ( ) Mount terminal strip 5 (TS-5), the other three terminal strip, on the back of the chassis. Use two of the larger machine screws and nuts to fasten it.
- ( ) Insert one of the grommets in the hole in the upper right corner of the chassis. Insert the other grommet in the hole in the back of the chassis.

## SEE FIGURES 6 AND 7.

The front panel and oscillator chassis are fastened together with S-1, S-2A, B, S-3, and J-1.

- ( ) Mount S-1, the band switch, in the large hole on the left front of the chassis and the panel. The three terminals must be toward the open side of the chassis. Screw a large nut over the threaded bushing several turns, place one of the large lockwashers on the shaft, and insert the shaft through the hole in the chassis and the hole in the panel. Tighten another large nut over the threaded bushing. See Figure 7.

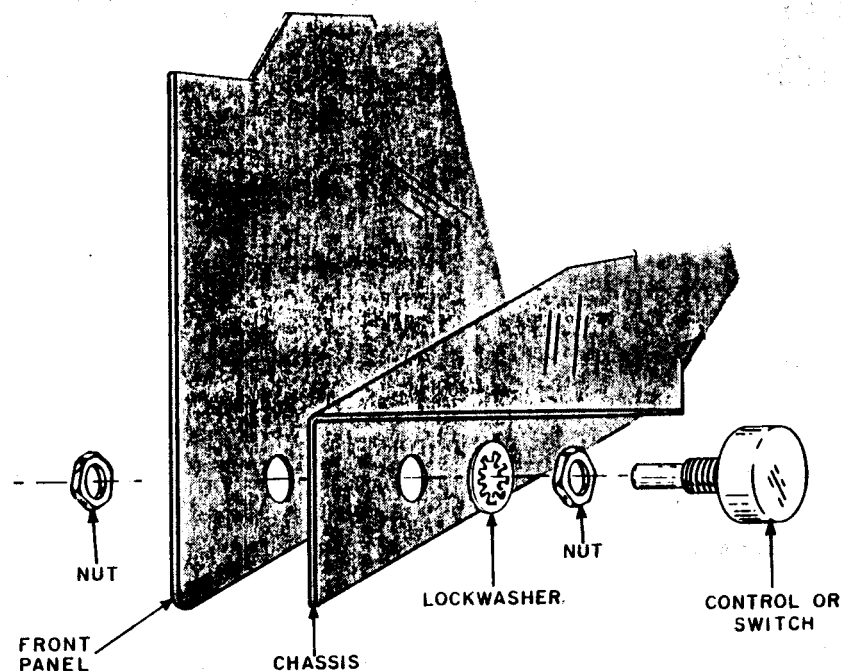
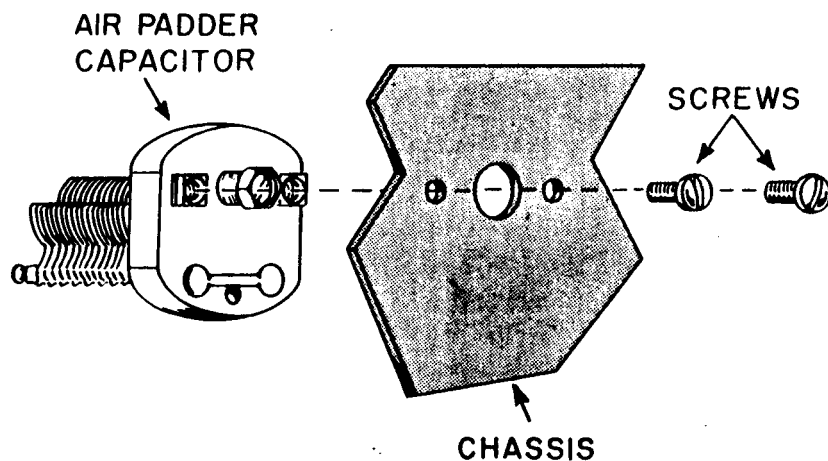


FIGURE 7. HOW TO MOUNT THE PANEL WITH A CONTROL OR SWITCH

- ( ) Mount S-2A, B, the 'ON-OFF' and Output switch, in the same manner in the large hole on the right front of the chassis and panel. The three terminals which are close together must be on the left toward the closed side of the chassis.

It is easier to do most of the wiring in the oscillator chassis if the other switch and the jack are not mounted until later.



**FIGURE 8. HOW TO MOUNT C-1 and C-2**

**SEE FIGURES 6 AND 8**

- ( ) C-1 and C-2 are both 75 MMFD air padder capacitors. Mount one on the left inside the chassis as shown in Figure 6. Use two of the four machine screws packed with C-1 and C-2. Use the other two machine screws to mount the other air padder right above the first.
- ( ) Check all of the work. Be sure the parts are positioned as shown in Figure 6. The socket keyways must be as shown, the terminals on the switches must be toward each other, and the air pad- ders must be as shown.

**SEE FIGURE 9.**

- ( ) Solder one end of a 3 inch bare wire to terminal 3 of S-1. The

other end will be connected later.

- ( ) Solder one end of a 1½ inch bare wire to terminal 2 of C-3. Connect but do not solder the other end to terminal 2 of S-1.
- ( ) Solder one end of a 1½ inch bare wire to terminal 2 of S-1. Solder the other end to terminal 1 of C-1. C-1 is the air padder nearer the closed top of the chassis.
- ( ) Solder one end of a 1½ inch bare wire to terminal 1 of C-3. Connect but do not solder the other end to terminal 1 of S-1.
- ( ) Solder one end of a 1½ inch bare wire to terminal 1 of S-1. Solder the other end to terminal 1 of C-2.
- ( ) Solder one end of C-5, 780 MMFD mica capacitor, to terminal 2 of TS-3. Terminal 2 is the same as the mounting tab for TS-3. Connect but do not solder the other end of C-5 to pin 2 of V-1.
- ( ) Connect but do not solder one end of a red wire to pin 3 of V-1. Connect but do not solder the other end to pin 3 of V-2.
- ( ) Solder one end of a 1 inch bare wire to pin 3 of V-1. Connect but do not solder the other end to the ground lug under the right mounting nut of V-1.
- ( ) Solder one end of an orange wire to pin 4 of V-1. Connect but do not solder the other end to pin 4 of V-2.
- ( ) Connect but do not solder one end of R-1, 10,000 ohm resistor marked with the color bands brown, black, and orange, to pin 1 of V-1. Connect but do not solder the other end to the ground lug under the left mounting nut of V-1.
- ( ) Connect but do not solder one end of C-8, 100 MMFD mica capacitor, to pin 5 of V-1. Connect but do not solder the other end to pin 1 of V-2.
- ( ) L-2, the 120 uH coil, is wound on R-3, a 27,000 ohm resistor. Solder one end to pin 5 of V-1. Connect but do not solder the other end to terminal 1 of TS-4.
- ( ) Connect but do not solder one end of R-2, 6800 ohm resistor, (blue, grey, red), to pin 6 of V-1. Connect but do not solder the other end to terminal 1 of TS-4.
- ( ) Solder one end of C-6, .01 MFD disc capacitor, to pin 6 of V-1. Pass the other end through pin 7 of V-1 and connect it to the ground lug under the left mounting nut of V-1. Solder both of these.

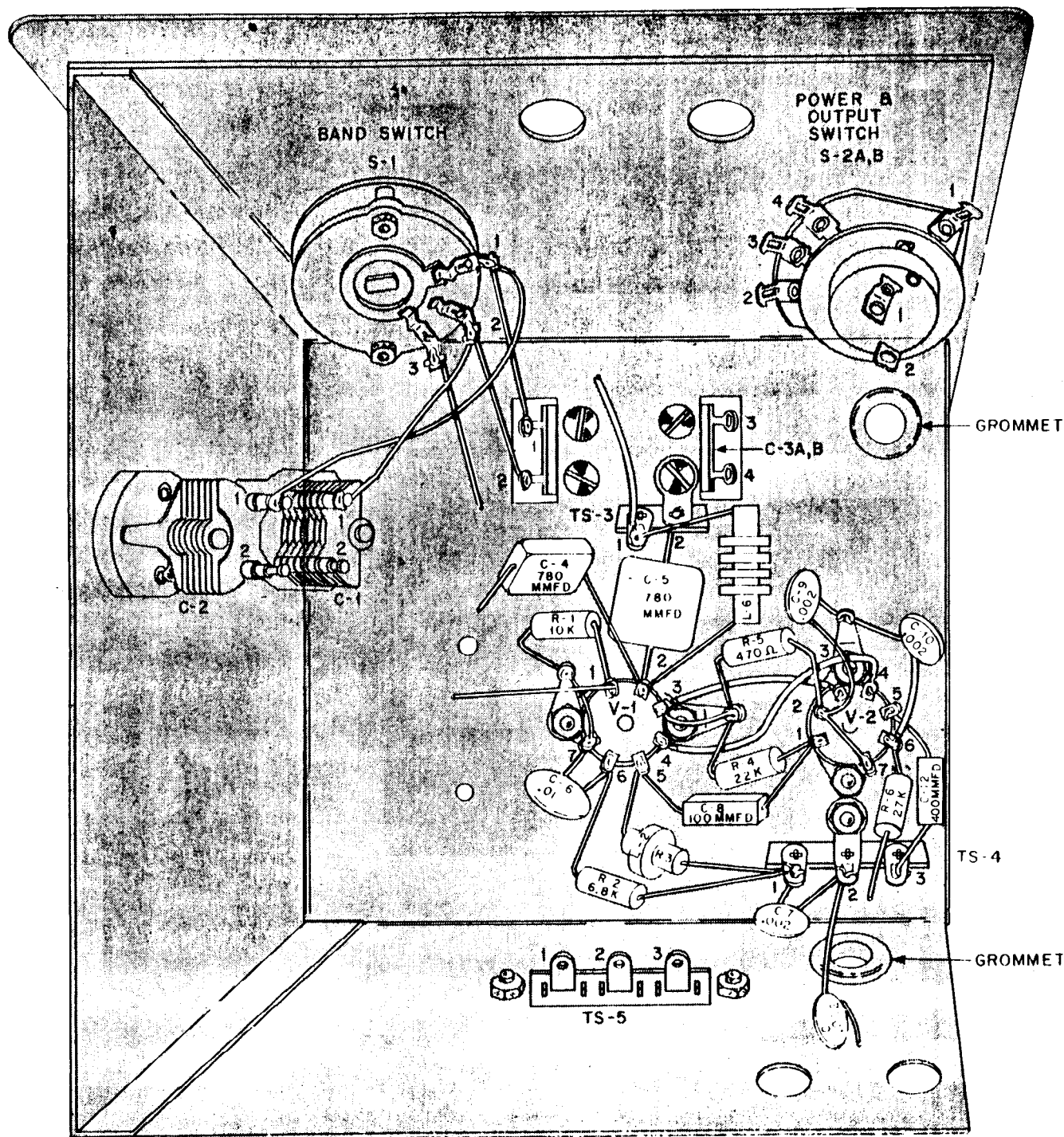


FIGURE 9. FIRST WIRING VIEW, OSCILLATOR CHASSIS

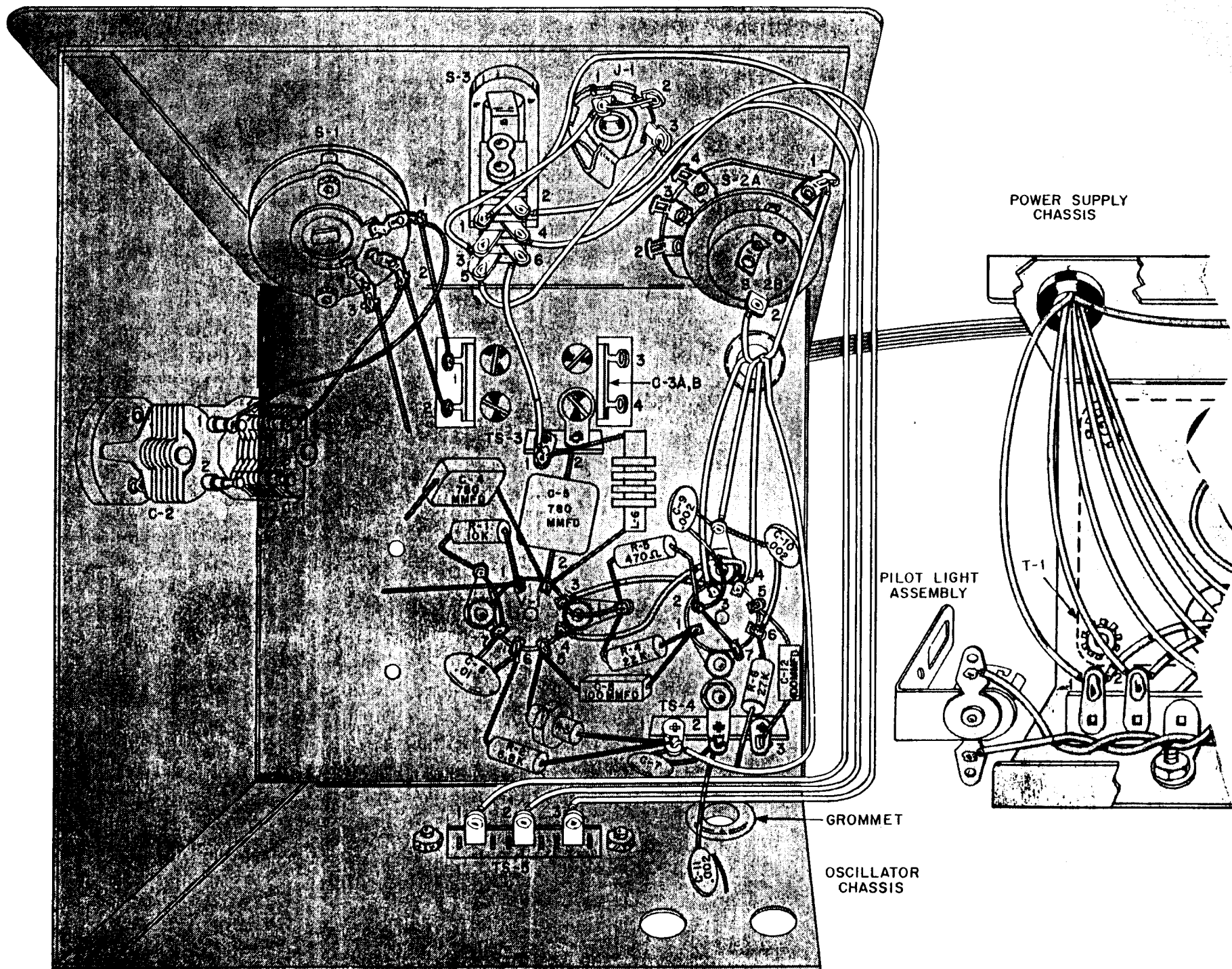


FIGURE 10. SECOND WIRING VIEW, OSCILLATOR CHASSIS AND WIRING BETWEEN THE POWER SUPPLY AND OSCILLATOR CHASSIS

- ( ) Solder one end of a 2½ inch bare wire to pin 1 of V-1. The other end will be connected later.
- ( ) Solder one end of R-4, 22,000 ohm resistor (red, red, orange), to pin 1 of V-2. Connect but do not solder the other end to the ground lug under the right mounting nut of V-1.
- ( ) Solder one end of R-5, 470 ohm resistor (yellow, violet, brown) to the ground lug under the right mounting nut of V-1. Pass the other end through pin 2 and connect it to pin 7 of V-2. Do not solder pin 2. Solder pin 7.
- ( ) Solder one end of C-9, .002 MFD disc capacitor, to pin 2 of V-2. Connect but do not solder the other end to the ground lug under the front mounting nut of V-2.
- ( ) Connect but do not solder one end of C-12, 400 MMFD mica capacitor, to pin 5 of V-2. Connect but do not solder the other end to terminal 3 of TS-4.
- ( ) Insert one end lead of C-10, .002 MFD disc capacitor, through a 1 inch length of spaghetti. Connect but do not solder it to pin 6 of V-2. Connect but do not solder the other end to the ground lug under the front mounting nut of V-2.
- ( ) Solder one end of R-6, 27,000 ohm resistor (red, violet, orange) to pin 6 of V-2. The other end will be connected later.
- ( ) Connect but do not solder one end of C-7, .002 MFD disc capacitor, to terminal 1 of TS-4. Connect but do not solder the other end to terminal 2 of TS-4.
- ( ) Connect but do not solder one end of C-11, .002 MFD disc capacitor, to terminal 2 of TS-4. The other end will be connected later.
- ( ) Connect but do not solder one end lead of L-6, the 2.5 mH choke, to pin 2 of V-1. Connect but do not solder the other end to terminal 1 of TS-3.
- ( ) Solder one end lead of C-4, 780 MMFD mica capacitor, to pin 2 of V-1. The other end will be connected later.
- ( ) Solder one end of a yellow wire to terminal 1 of TS-3. The other end will be connected later.
- ( ) Check all of the work against Figure 9.

#### SEE FIGURE 10.

Pass all of the wires coming from the power supply chassis through

the grommet in the upper right corner of the oscillator chassis.

- ( ) Solder the white-yellow wire from the power supply chassis to terminal 1 of TS-4.
- ( ) Solder the brown wire from the power supply chassis to the ground lug under the front mounting nut of V-2.
- ( ) Solder one of the white wires from the power supply chassis to pin 3 of V-2.
- ( ) Solder the other white wire from the power supply chassis to pin 4 of V-2.
- ( ) Solder one of the grey wires from the power supply chassis to terminal 2 of S-2B.
- ( ) Connect but do not solder the other grey wire from the power supply chassis to terminal 1 of S-2A.

All of the wires coming from the power supply chassis are now connected, except the white-red wire. It will be connected when the slug-tuned coils, L-3 and L-4, are mounted.

- ( ) Mount S-3, the lever switch. Position this switch so that the terminals are in a line up and down. Use one of the large nuts to fasten it.
- ( ) Mount J-1, the jack, so the three terminals are toward the open side of the chassis. Use one of the large nuts to fasten it.
- ( ) Solder one end of a yellow wire to terminal 3 of J-1. Solder the other end to terminal 5 of S-3.
- ( ) Solder the loose end of the yellow wire from terminal 1 of TS-3 to terminal 6 of S-3.
- ( ) Pass one end of a yellow wire through terminal 1 and connect it to terminal 2 of J-1. Solder both of these connections. Solder the other end to terminal 3 of S-3.
- ( ) Solder one end of a white-orange wire to terminal 3 of TS-5. Bring it over to the edge of the open side of the chassis, along the side of the chassis to the front, and across to S-3, as shown in Figure 10. Solder the other end to terminal 4 of S-3.
- ( ) Solder one end of a white-yellow wire to terminal 2 of TS-5. Position it the same as the wire in the step above. Solder the other end to terminal 1 of S-3.
- ( ) Solder one end of a white-green wire to terminal 1 of TS-5. Posi-



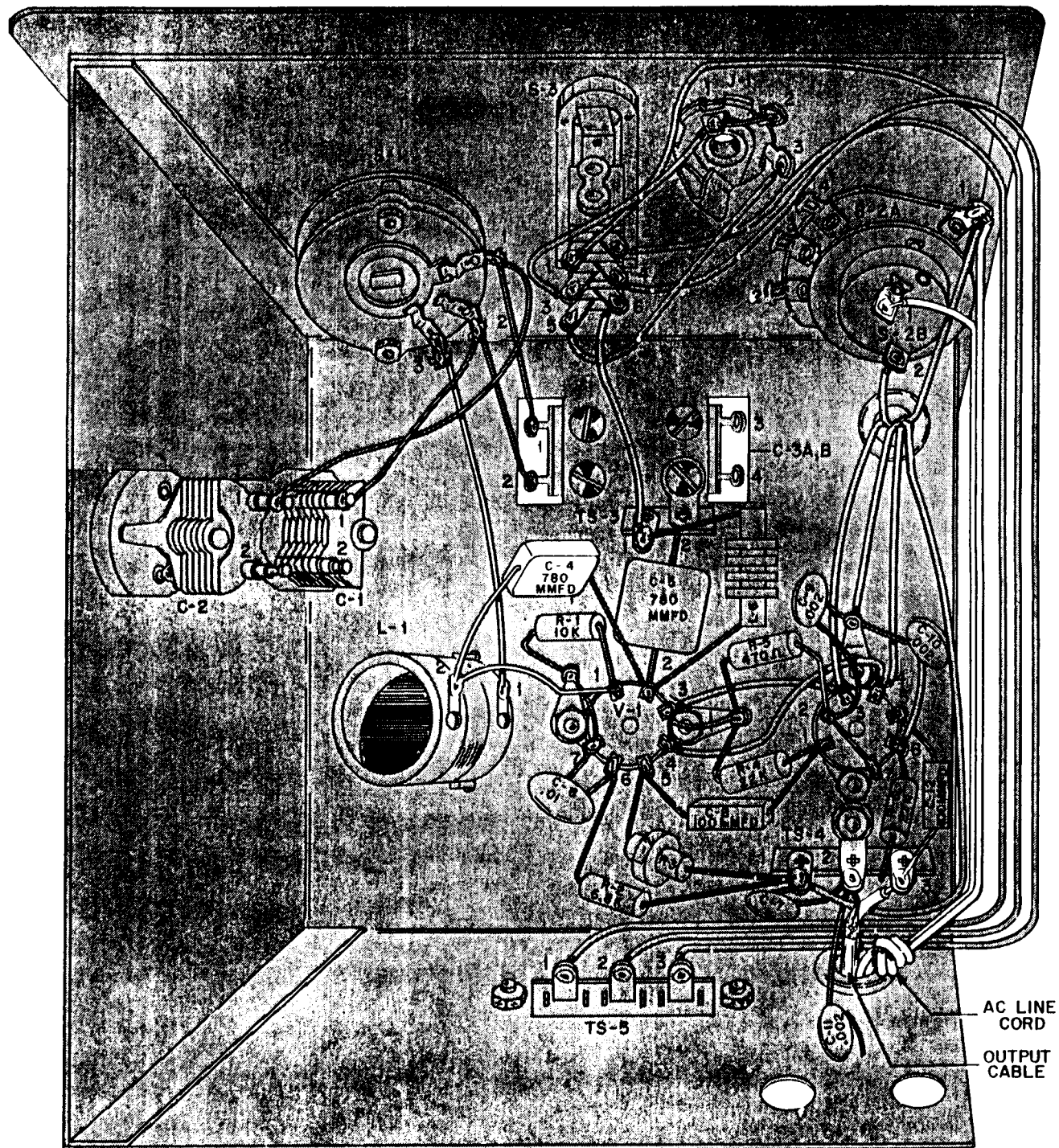
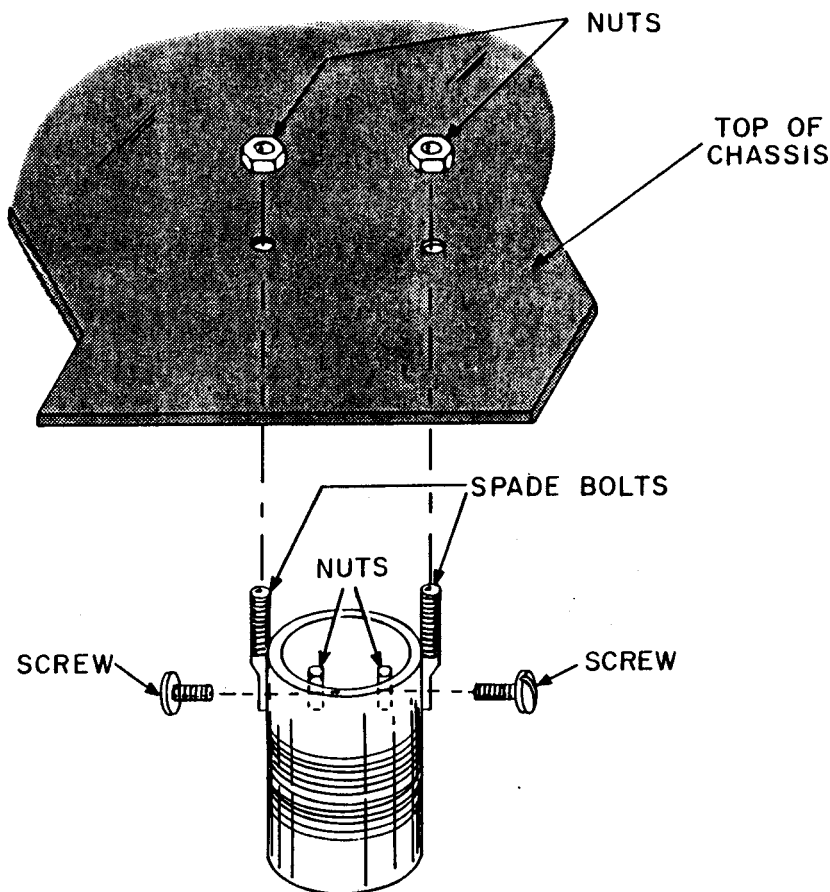
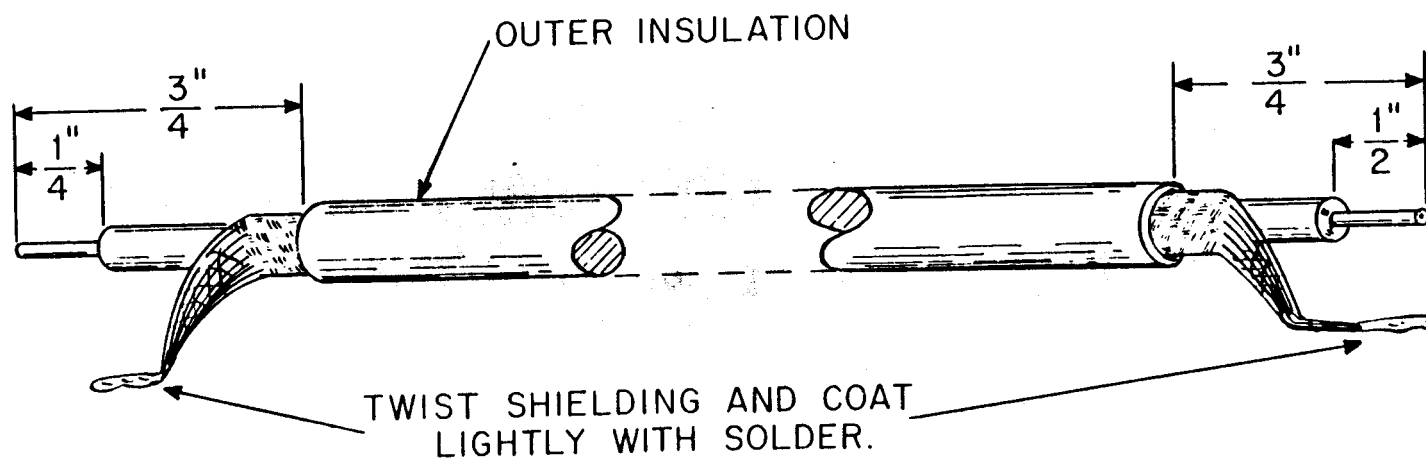


FIGURE 11. THIRD WIRING VIEW, OSCILLATOR CHASSIS



**FIGURE 12. HOW TO MOUNT L-1**



**FIGURE 13. HOW TO PREPARE THE ENDS OF THE CABLE**

tion it the same as the wire in the step before. Solder the other end to terminal 2 of S-3.

- ( ) Check all of the work against Figure 10.

**SEE FIGURES 11 AND 12.**

- ( ) Mount a spade bolt on each side of L-1, the oscillator tank coil wound on the large form. The nuts must be inside L-1 as shown in Figure 12.
- ( ) Mount L-1 from the inside of the chassis to the left of V-1. Use two of the larger nuts to fasten it.
- ( ) Solder the bare wire from terminal 3 of S-1 to terminal 1 of L-1.
- ( ) Connect but do not solder the bare wire from pin 1 of V-1 to terminal 2 of L-1.
- ( ) Solder the loose end of C-4 to terminal 2 of L-1.

**SEE FIGURE 13.**

- ( ) Prepare both ends of the output cable as shown in Figure 13. Remove  $\frac{3}{4}$  of an inch of the outer insulation from each end of the cable. Unravel the shielding back to the cut off insulation. Twist the unraveled shielding tightly. Coat it with solder. Remove  $\frac{1}{4}$  inch of the insulation from the inner conductor on one end. On the other end remove  $\frac{1}{2}$  inch of the insulation from the inner conductor. Twist the inner conductor at each end tightly and coat it with solder.



- ( ) Insert the solder coated shielding and the 1/2 inch long inner conductor into the two prongs of J-2. J-2 is the plug which fits into the crystal socket of your transmitter. Tighten the screw of each prong so that the wires are held firmly.

#### SEE FIGURE 11.

- ( ) Pass the other end of the cable through the grommet right behind TS-4. Solder the inner conductor to terminal 3 of TS-4. Solder the shielding to terminal 2 of TS-4.
- ( ) Pass the line cord through the same grommet. Knot it 8 inches from the bare ends on the inside of the chassis. Split the line cord back about 2 inches. Solder one section of the cord to terminal 1 of S-2B. Solder the other section to terminal 1 of S-2A.

**CAUTION:** Never touch any part of the under chassis wiring while the line cord plug is connected to the power outlet. NEVER use or test the unit on or near a GROUNDED METAL bench, radiator, or other grounded metal objects.

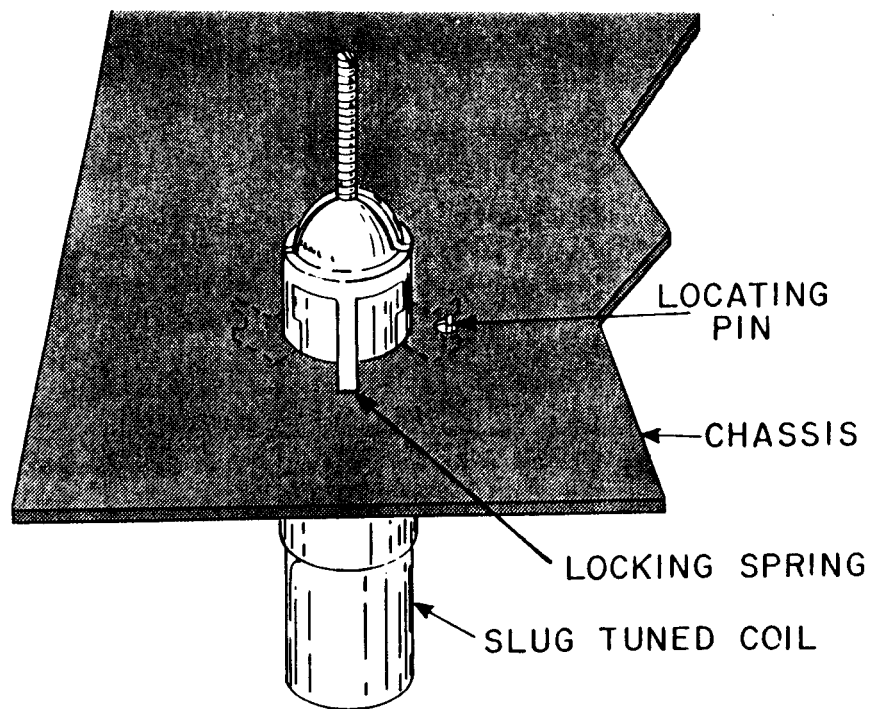


FIGURE 15. HOW TO MOUNT THE SLUG-TUNED COILS

#### SEE FIGURES 14 AND 15.

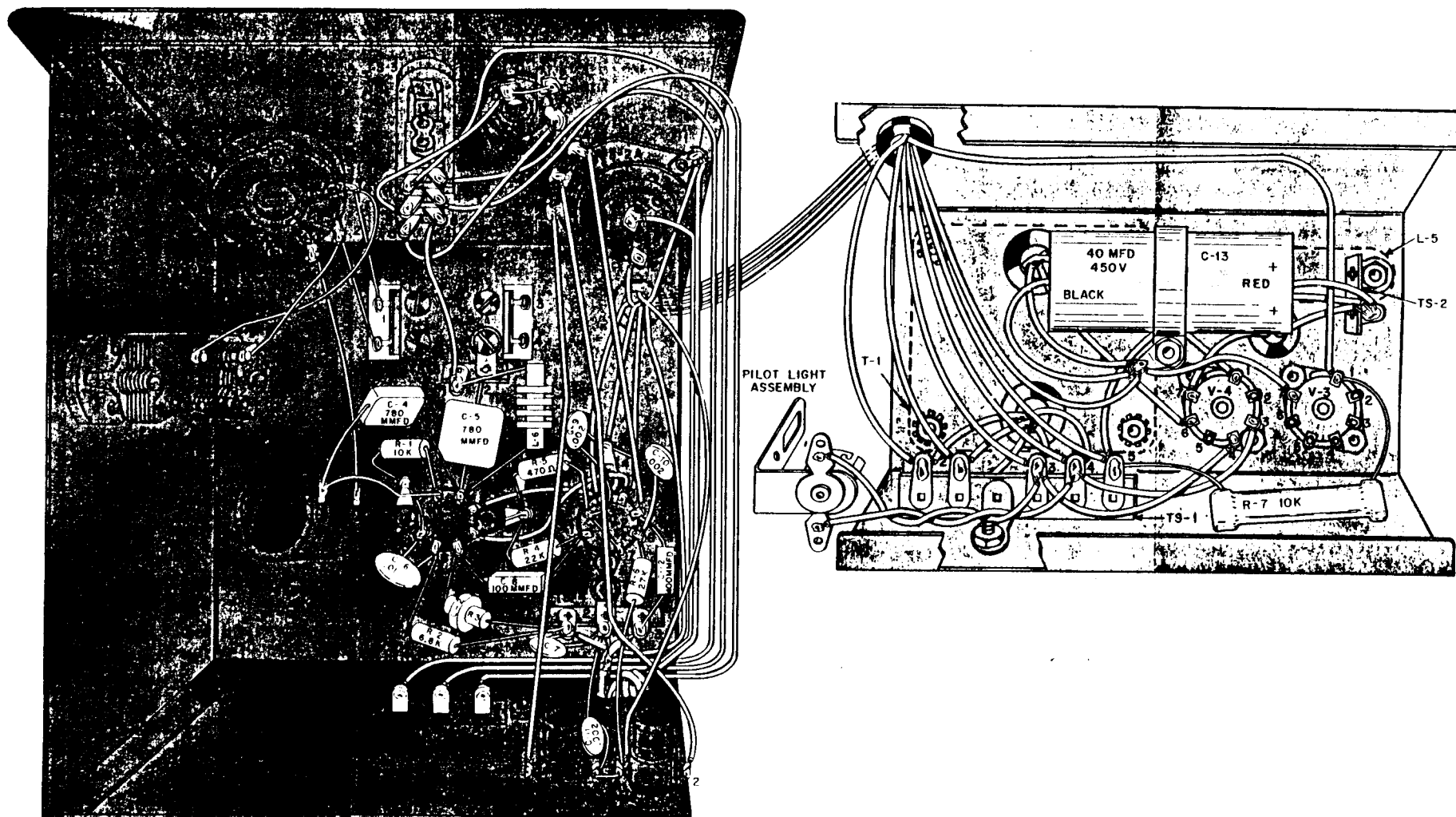
L-3 and L-4 are the same. It makes no difference which one is mounted first.

- ( ) Mount L-3 from the inside in the large hole nearer the open side of the chassis. Put the metal cap through the hole, line up the small locating pin with the small hole beside the larger hole, and push firmly on the end of the coil until the locking springs snap into position.
- ( ) Mount L-4 in the same way.
- ( ) Pass the loose end lead of C-11 through terminal 2 of L-4 and connect it to terminal 1 of L-3. Do not solder the connection to L-3. Solder terminal 2 of L-4.
- ( ) Connect but do not solder the loose end of R-6 to terminal 1 of L-3.
- ( ) Solder the end of the white-red wire from the power supply chassis to terminal 1 of L-3.
- ( ) Solder one end of a green wire to terminal 2 of S-2A. Solder the other end to terminal 1 of L-4.
- ( ) Solder one end of another green wire to terminal 3 of S-2A. Solder the other end to terminal 2 of L-3.
- ( ) Solder one end of a yellow wire to terminal 4 of S-2A. Solder the other end to pin 5 of V-2.
- ( ) Check all of the work. Every connection must be strong mechanically, and all should now be well soldered. A single loose or unsoldered connection will make the unit intermittent, or it may not work at all.

The wiring of your KNIGHT VFO is completed.

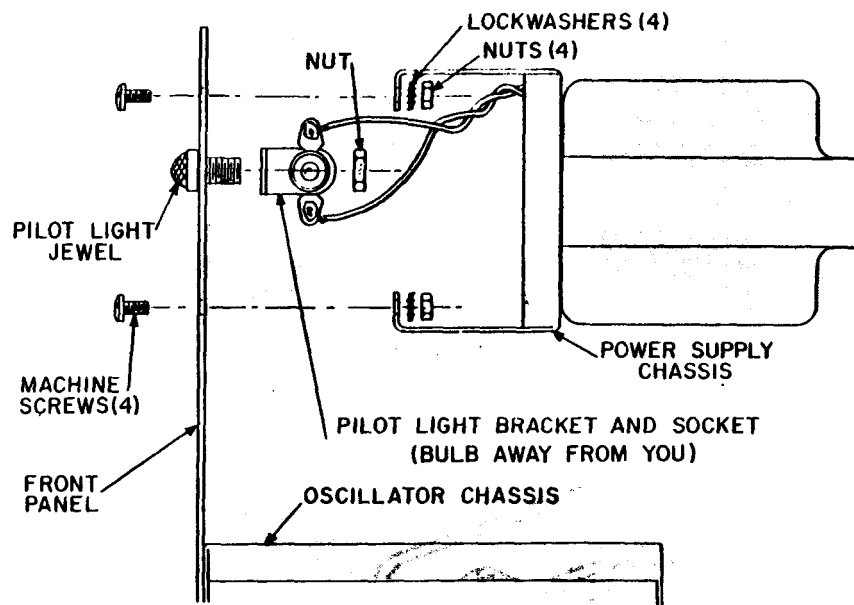
#### SEE FIGURE 17.

- ( ) Insert the threaded shaft of the pilot light jewel through the large hole near the top center of the panel. Place the pilot light bracket over the threaded shaft. Position the bracket so that it is over the terminal strip. Tighten the nut over the threaded shaft. Insert the pilot lamp in the socket.
- ( ) Now, mount the power supply chassis to the front panel. Use four of the larger machine screws, lockwashers, and nuts to fasten the power supply chassis to the panel.



**FIGURE 16. COMPLETE WIRING VIEW OF THE OSCILLATOR AND POWER SUPPLY CHASSIS**





**FIGURE 17. HOW TO MOUNT THE POWER SUPPLY CHASSIS TO THE PANEL**

There are two tubes on each chassis.

- ( ) Install V-1, 6BH6, and V-2, 6AK6, on the oscillator chassis. Install the OA2 voltage regulator tube, V-3, in the socket on the corner of the power supply chassis. Install the 6X4 rectifier tube, V-4, in the other socket on the power supply chassis.
- ( ) Close the plates of the tuning condenser, C-3, entirely. Place the dial pointer on the shaft of the tuning condenser. Line up the black line on the pointer with the horizontal line along the bottom of the scales on the left side. Tighten the set screw against the shaft of C-3. Push the large knob on the shaft and tighten the set screw. See Figure 18.
- ( ) Put the two small knobs on the other two shafts. Tighten the set screws against the flat portion of the shaft.

**CAUTION:** NEVER touch any part of the under-chassis wiring while the line cord plug is connected to the power outlet. NEVER use or test the unit on or near a grounded metal bench, radiator, or other grounded metal objects.

It is best not to use the VFO with your transmitter or radiate a signal into an antenna until you have calibrated it and it is operating

within the limits of the various amateur bands.

## HOW TO TEST AND OPERATE YOUR KNIGHT VFO

The rotary switch, S-1, marked "BANDS" is a two position switch. The 80 meter band is covered by one position of the switch which places section "A" of the tuning capacitor and C-1, the air padder capacitor, in the frequency determining circuit. The 40, 20, 15, and 10 meter bands are covered by the other position of the Band Switch, which puts C-3B and C-2 in the frequency determining circuit.

The rotary switch, S-2A, B, marked "OUTPUT", is a three position switch. The AC power is removed when the switch is in the first position, the 80 meter band is covered by the second position which puts L-3 into the output circuit. The third position of the switch puts L-4 into the output circuit for the 40, 20, 15, and 10 meter bands.

The lever switch, S-3, is marked "CALIBRATE - STANDBY - TRANSMIT". This switch has an extra set of terminals so that auxiliary equipment may be controlled from the VFO position. The Standby position of this switch enables you to leave the VFO continuously in operating condition without waiting for it to warm up for each transmission.

Your key plugs directly into the KEY jack on the front panel of the KNIGHT VFO.

To check the operation of the KNIGHT VFO, plug the line cord into the power source. Put the lever switch in the Standby position. Turn the Band Switch to either position. Turn the Output Switch to the position corresponding to the Band Switch. The pilot light should light. The tubes should also light, and the OA2 should have a violet glow.

If the pilot light and the tubes light, you are ready to install the KNIGHT VFO in the cabinet.

Remove the line cord plug from the power source. Push the line cord plug and the output cable plug through the large hole in the back of the cabinet.

Slide the VFO into the cabinet. Use the ten small sheet metal screws supplied in the holes in the front panel and tighten them into the holes in the cabinet. Tighten the two larger sheet metal screws into the holes in the back of the oscillator chassis.

You are now ready to calibrate your KNIGHT VFO.

## HOW TO CALIBRATE YOUR KNIGHT VFO

Do not use your KNIGHT VFO with your transmitter until you have

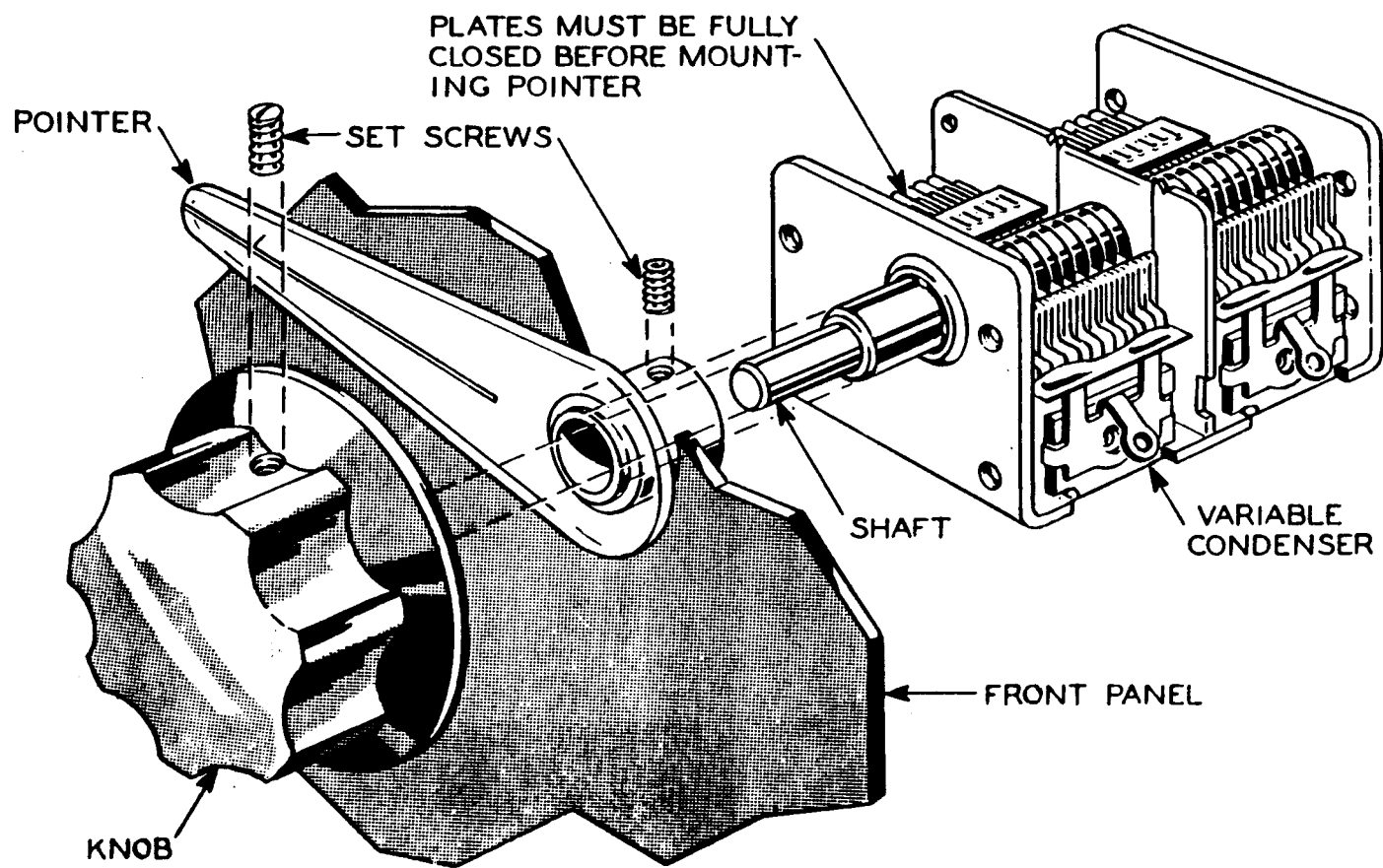


FIGURE 18. HOW TO ASSEMBLE THE DIAL POINTER AND KNOB

calibrated it, because it may be operating outside of the bands.

Before you begin calibration of the KNIGHT VFO turn the slug on L-3, which is the coil nearer the edge of the back of the cabinet, almost all of the way into the coil form. Turn the slug on L-4 almost all of the way out of the coil form. This approximate adjustment will assure more than enough output for calibration purposes.

If you have a 1750 KC crystal, install it in your transmitter. If not, use any crystal whose frequency is within the 80 meter band, preferably near the low end of the band.

Place the oscillator of your transmitter in operation, but do not apply plate voltage to the final amplifier. Turn on your receiver and the VFO. Put S-3 on the VFO in the Calibrate position. Allow about one-half hour for all of the equipment to warm up.

In the meantime, clip a piece of wire about 10 inches long to the inner conductor prong of J-2. Lay this piece of wire close to the antenna connection of your receiver.

Set the VFO Band Switch to the position marked "80". Set the Output switch to the position marked "80". Set the dial pointer of the VFO to 3.5 megacycles if you are using a 1750 KC crystal. If not, set the dial of the VFO according to the frequency of the crystal. Tune the receiver to pick up the signal from the transmitter. Close the plates of C-1, which is the air padder nearer the top of the cabinet, by turning the screw.

When the equipment is warmed up, adjust C-1 until the VFO zero beats with the crystal as heard in the receiver.

This adjustment completes the calibration of the 80 meter band.

To calibrate the other bands, turn the Band Switch to the position marked "40, 20, 15, and 10", and the Output Switch to the position marked "40, 20, 15, and 10". If you have a 3500 KC crystal, use it in your transmitter, or you can use the 1750 KC crystal, to calibrate the other bands. Set the dial of the VFO to 7.0 megacycles, if you are using either a 3500 or 1750 KC crystal. If not, use any crystal whose frequency falls within either the 40, 20, 15, or 10 meter band, and set the dial of the VFO accordingly. Tune the receiver to pick up the signal from the transmitter. Adjust C-2 to zero beat with the crystal as heard in your receiver.

After you have calibrated the VFO and it is operating within the limits of each band, set the dial of the VFO to the middle of the 80 meter band. Tune the circuits of your transmitter for resonance and then adjust

the slug-tuned coil L-3, the coil nearest the side of the cabinet, for maximum reading on the first metered circuit of your transmitter.

Set the Band Switch and the Output Switch to the other band position. Set the dial of the VFO to 14 megacycles. Tune the circuits of your transmitter for resonance and then adjust the slug-tuned coil L-4 for maximum reading on the first metered circuit of the transmitter. By making this adjustment at 14 megacycles all of the other bands will also be operating with good output.

## SERVICE HINTS

If you have followed all of the previous instructions carefully your KNIGHT VFO should operate properly. If it does not, here are some helpful hints:

If there is no power supplied to the other tubes, and the 6X4 rectifier tube lights, check L-5 and R-7. Also check the other tubes.

If there is operation with the Band Switch and Output Switch in the 40 meter band position, check the circuit components controlled by the 80 meter position of these two switches. Repeat this procedure for the other band components.

If your KNIGHT VFO still does not operate properly, have one of your friends, preferably another Ham, check your wiring.

## ALLIED'S SERVICE FACILITIES

In the event that the kit still does not operate properly, we recommend the following:

Please write our Kit Department with full details, and include the stock number and the date of purchase of the kit. We may be able to determine any wiring error or replace a component which may be at fault.

This wired KNIGHT kit may be returned for inspection within 1 year after purchase. The kit will be placed in proper operating condition for \$5.00. Faulty parts will be replaced without charge unless damage was caused in construction or because of a wiring error.

**PLEASE NOTE: KITS WIRED WITH ACID CORE SOLDER OR ACID FLUX ARE NOT ELIGIBLE FOR REPAIR OR SERVICE AND WOULD HAVE TO BE RETURNED NOT REPAIRED AT YOUR EXPENSE.**

Allied's facilities primarily provide an inspection and trouble-shooting service. Kits not completed, which require extensive work, will be returned collect with a letter of explanation.

If you must return this kit, pack it well. Use the original packing carton and use cushioning material around the front panel. Send the kit prepaid and insured. We will return the repaired kit to you C.O.D. as soon as repairs are completed. If you wish to save C.O.D. fees, your advance remittance may be enclosed for standard repair charges plus transportation costs. Any excess remittance will be refunded.

## ALLIED'S GUARANTEE ON KNIGHT KITS

The designs and components selected for KNIGHT kits represent over a quarter of a century of experience in kit development. KNIGHT kits are easy to assemble even for the beginner. Instructions are complete, panels are drilled, the chassis is punched and formed, and every last part is included as listed.

Allied extends these firm guarantees on KNIGHT Kits:

We guarantee that the circuits on all KNIGHT kits have been carefully engineered and tested.

We guarantee that only high-quality components are supplied. All parts are covered by the standard FIA 90-day warranty. Any faulty components will be replaced prepaid and without charge if reported to us within the warranty period. We reserve the right to request the return of defective parts.

If your kit was shipped by parcel post and is received in a damaged condition, please write us at once describing the state in which the shipment was received. If your kit was part of a Railway Express shipment that was damaged in transit, please notify the Railway Express agent at once and then write us.

Allied Radio cannot accept responsibility or liability for injury or damage sustained in the assembly or operation of the kit.

The efficiently engineered KNIGHT kits are moderately priced. When you buy a KNIGHT kit you get best design, best quality, and best value. Recommend KNIGHT kits to your friends.

## HOW THE KNIGHT VFO WORKS

Stability is of utmost importance in the design of any frequency determining equipment. There are three principal things which can change the frequency setting of a VFO — mechanical movement between parts, temperature changes of critical parts, or a change in the electrical value of a part.

Mechanical stability has been achieved in the KNIGHT VFO by the following: The oscillator tank coil is wound on a heavy ceramic form, the padders are of the air dielectric type, there are two separate and distinct chassis — one for the power supply and one for the oscillator, the oscillator chassis is flange welded for rigidity, the band switch is the ceramic wafer type.

Temperature stability results from the following: The power supply chassis is above the oscillator chassis so that all heat generated does not affect the frequency determining components, each chassis and the cabinet are well ventilated, all frequency determining components are under the oscillator chassis which isolates them from convection currents.

Electrical stability is largely achieved by the use of large series capacities so that the capacity of the tubes is negligible whenever a tube change is necessary.

The KNIGHT VFO uses the famous series-tuned Clapp oscillator circuit. The voltage divider in this circuit consists of C-4 and C-5, the 780 MMFD 1% silver mica capacitors, which furnish an in-phase voltage between the grid and the cathode of V-1 to maintain oscillation. The basic output frequencies are developed through the use of L-1 and C-3A, B. Two padder capacitors, C-1 and C-2, are in parallel with the tuning capacitor to calibrate the VFO.

The KNIGHT VFO is keyed in the cathode of V-1, the oscillator tube. The three-position lever switch permits changing from Calibrate to Standby to Transmit. When this switch is in Transmit position the key is placed in the circuit. This lever switch is connected to the terminal strip on the back of the chassis for control of external equipment, such as a relay to switch the antenna from your transmitter to your receiver, or to control the voltage to the tubes in the following stages.

The output of the oscillator is capacity coupled to the 6AK6 buffer amplifier. The output of the buffer amplifier is peaked in the center of the respective bands by the two slug-tuned coils that are resonated by the capacity of the output cable and slugs.

The KNIGHT VFO has a transformer type power supply. The output of the 6X4 rectifier tube feeds into a choke input filter consisting of L-5 and C-13. The output of the filter section feeds the buffer amplifier, while the OA2 voltage regulator supplies 150 volts regulated to the oscillator. The power switch is located on the Output Switch.





## VOLTAGE CHART

All measurements made with a vacuum tube voltmeter.  
Both switches in the 80 meter band position.

PIN NUMBER							
TUBE	1	2	3	4	5	6	7
V-1 6BH6	-6	0.25	0	6.3AC	150	140	0
V-2 6AK6	-32	4.75	0	6.3AC	250	175	4.5
V-3 OA2	150	0	NC	0	150	NC	0
V-4 6X4	300AC	NC	0 6.3AC	6.3AC 0	NC	300AC	250AC

- \* If pin 3 shows 0, pin 4 should show 6.3AC.  
If pin 3 shows 6.3AC, pin 4 should show 0.

NC: No Connection.

## RESISTANCE CHART

K = 1,000 ohms; M = 1,000,000 ohms.  
All readings taken between specified point and ground.

PIN NUMBER							
TUBE	1	2	3	4	5	6	7
V-1 6BH6	10K	40	0	0	Infinite	Infinite	0
V-2 6AK6	22K	470	0	0	Infinite	Infinite	470
V-3 OA2	Infinite	0	NC	0	Infinite	NC	0
V-4 6X4	270	NC	0	0	NC	270	Infinite

## PARTS LIST

Symbol Number	Description	Part Number
<b>Capacitors</b>		
C-1	Air padder, 75 $\mu$ fd	281009
C-2	Air padder, 75 $\mu$ fd	281009
C-3A, B	Tuning, 2-section, 10-27 $\mu$ fd	282006
C-4	Silver mica, 780 $\mu$ fd, 1%	294002
C-5	Silver mica, 780 $\mu$ fd, 1%	294002
C-6	Disc, .01 $\mu$ fd	276015
C-7	Disc, .002 $\mu$ fd	276026
C-8	Mica, 100 $\mu$ fd	266017
C-9	Disc, .002 $\mu$ fd	276026
C-10	Disc, .002 $\mu$ fd	276026
C-11	Disc, .002 $\mu$ fd	276026
C-12	Mica, 400 $\mu$ fd	266408
C-13	Electrolytic, 40 $\mu$ fd, 450 V	205400

### Resistors

Note: When ordering resistors give complete description and part number.

R-1	10K ohm, 1/2 watt	301103
R-2	6800 ohm, 1/2 watt	300682
R-3	27K ohm, 1/2 watt	See L-2
R-4	22K ohm, 1/2 watt	301223
R-5	470 ohm, 1/2 watt	301471
R-6	27K ohm, 1/2 watt	301273
R-7	Wirewound, 10K ohm, 7 watt	373007

### Inductors & Transformers

L-1	Coil, oscillator tank	152014
L-2	Coil, oscillator impedance, 120 $\mu$ h (wound on R-3)	152003
L-3	Coil, slug-tuned, output peaking	152004
L-4	Coil, slug-tuned, output peaking	152004
L-5	Choke, 5.5 Henry	140003
L-6	Choke, RF, 2.5 mh	151001
T-1	Power transformer	101302

### Switches

S-1	BAND, ceramic rotary, SPDT	432109
S-2	POWER & OUTPUT, rotary	432108
S-3	CALIBRATE, STANDBY & TRANSMIT, lever, DPDT	434301

Symbol Number	Description	Part Number
<b>Jacks, Plugs &amp; Terminal Strips</b>		
J-1	KEY jack, shorting type	502228
J-2	OUTPUT plug, male	502125
TS-1	5-terminal strip	440502
TS-2	Right-terminal strip	440101
TS-3	Left-terminal strip	440102
TS-4	3-terminal strip	440301
TS-5	3-screw terminal strip	441301
<b>Tubes</b>		
V-1	6BH6	610021
V-2	6AK6	610040
V-3	OA2	610019
V-4	6X4	610023

Description	Quantity	Part Number
<b>Miscellaneous</b>		
Cabinet	1	700008
Chassis, oscillator	1	461310
Chassis, power supply	1	461309
Cord, line	1	802001
Grommet, rubber, 1/2"	5	830002
Grommet, rubber, 3/8"	1	830200
Knob, 1-1/4"	2	760201
Knob, 2"	1	760401
Panel	1	462227
Pointer, dial	1	870010
Socket, 7-pin miniature, light colored	1	501270
Socket, 7-pin miniature, dark colored	3	501170
Manual, instruction	1	750036
Pilot light assembly	1	040011
Jewel	1	641002
Nut	1	579401
Socket	1	501721
Bulb	1	640007

Description	Quantity	Part Number
<b>Hardware</b>		
Ground lugs	4	553002
Lockwashers, #6	8	582300
Lockwashers, 3/8"	2	582700
Nuts, 4-36x1/4"	8	570230
Nuts, 6-32x1/4"	19	570340
Nuts, 3/8" x 1/2"	4	570840
Screws, machine, 4-40x3/16"	4	560221
Screws, machine, 4-36x3/8"	8	560234
Screws, machine, 6-32x1/4"	21	560342
Screws, self-tapping, #6 x 1/2"	2	562396
Screws, self-tapping, #4 x 1/4"	10	562292
Spade, bolts, offset type	2	568344
<b>Wire, Solder, &amp; Spaghetti</b>		
2" red	1	801002
3" orange	4	801003
4" yellow	7	801004
5" green	2	801005
8" grey	2	801008
9" white	2	801009
10" brown	1	801010
12" white-red	1	801012
13" white-orange	1	801013
14" white-yellow	2	801014
15" white-green	1	801015
#20 bare	15"	806001
Cable, shielded	2'	803009
Spaghetti	3"	812001
Solder, ROSIN CORE	30"	930001
<b>Tools Needed for Construction</b>		
Stock No	Description	Price*
46N852	Soldering iron plug iron	\$ 4.73
46N449	6" long-nose pliers	1.76
46N403	6" diagonal cutters	2.28
45N796	6" screwdriver	.72

\*Subject to change