

# HAMTRONICS® RPA-40 220 MHZ REPEATER POWER AMPLIFIER ASSEMBLY, OPERATION, & MAINTENANCE INSTRUCTIONS

## CONSTRUCTION.

a. Set heatsink on bench. Note where PA transistor is to be mounted to two adjacent holes. Align the pc board with the heatsink, matching the cutout for the transistor and the pc board mounting holes with the holes on the heatsink. *Note that the heatsink is used for several products; so there will be extra holes to the left of the pc board which are not used in this model.*

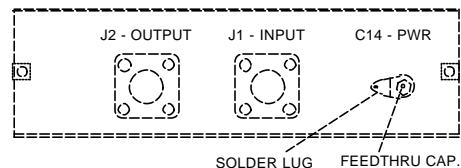
b. Temporarily remove the pc board, and set two #8 flat washers over each of the four mounting holes on the heatsink to use as spacers. *The two washers provide the proper thickness for the pc board spacing needed for the transistor. Be sure to use the ones supplied to prevent damage to the transistor.* Set the pc board in place, and secure with four each 6-32 x 3/8 inch thread cutting screws. The screws go through the pc board and spacer washers and thread into the aluminum heatsink. *Be careful not to over tighten the screws and strip*

*the threads.*

c. Locate the power transistor, and note that the collector lead is the narrow one (see component location diagram). The collector lead should face the right-hand side (toward connectors). Apply a small amount of heatsink compound to the bottom surface of the transistor, and set it in place through the cutout in the board.

d. Secure the transistor with two 4-40 x 5/8 inch screws inserted through the transistor flange into the heatsink. Use lockwashers and nuts on the fin side of the heatsink. Align the transistor with the board before tightening screws.

e. There are two end plates: one has holes for connectors. Each end plate has two clearance holes for attachment to the heatsink and two Pem nuts which allow the cover to be secured. Position the end plate with holes for connectors as shown, and attach to heatsink with two 4-40 x 3/8 inch screws through the heatsink and two 4-40 nuts on the flange



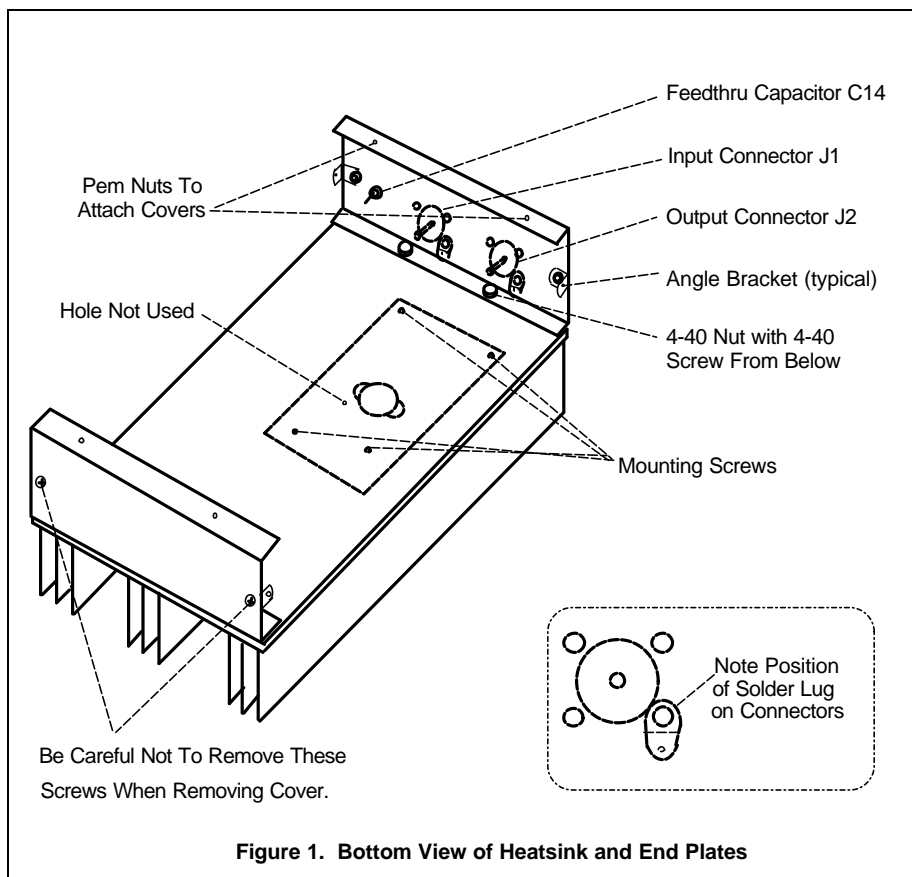
**Figure 2. Outside View of End Plate.**

of the end plate. In like manner, attach the end plate without connector holes on the other end of the heatsink. Before tightening screws, align the end plates carefully with the edges of the heatsink so the cover later fits neatly.

f. The cover is secured to the chassis with four angle brackets, which are threaded on both sides but have slightly different dimensions on the two sides. It is important to install them correctly. These angle brackets should be fastened to the inside of the chassis as shown in the diagram, using 4-40 screws. The leg with the **shorter** dimension from the bend to the hole goes over the screw, leaving the side with the longer dimension for the cover screws to engage. Before tightening the screws, carefully align the angle nuts flush with the edge of the chassis. After the angle brackets are installed, you can set the cover over the heatsink/end plate assembly and see if any minor adjustments are necessary to make the cover screw holes line up with the angle brackets. It may be necessary to temporarily loosen the screws holding the end plates to the heatsink to realign the end plates farther apart or closer together.

g. Install feedthru capacitor C14 from the outside of the end plate as shown in figure 2. Insert the capacitor through a #8 ground lug, through the outside of the end plate, and secure with a #8 lockwasher and nut on the inside. Tighten the nut on the inside of the assembly with a 1/4-inch nut driver. Be careful not to break the ceramic by putting force on capacitor leads, and be careful not to over tighten nut.

h. Attach two SO-239 or 'N' connectors to the outside of the end plate, using three 4-40 x 1/4 inch



**Figure 1. Bottom View of Heatsink and End Plates**

screws with nuts and one 4-40 x 3/8 inch screw with a ground lug and nut for each connector. The ground lugs should be positioned as shown in the inset in figure 1 so that they are as close as practical to the center lug of the connectors.

Refer to the pc board component location diagram in the rear of the manual for the following assembly operations.

i. Solder the six transistor leads to the pc board. It is important to solder the entire surface of each lead and use enough solder to form a bond under the leads.

j. Install the metal clad mica capacitors in the exact positions shown. The flat side with the value markings should be up. Bend the tabs down so they just touch the board with the case flat against the board. Hold each capacitor in place and solder the tab to the board; then, solder each side of the metal case to the ground plane. C6, C7, C15, and C16 should be over the emitter leads.

k. Solder C11, C12, and C13 in place as shown. The .01uF capacitor may be marked "103". The 0.15 uF mylar capacitor is red. Observe polarity of electrolytic capacitor C13.

l. Install variable mica capacitors C1-C3, and C8 as shown, and solder them in the exact positions shown, which leaves room for the coils. The leads need not be bent; they will stand up on the board as is.

m. Form hairpin coils L1-L3 as shown in the component location diagram, using #14 bus wire supplied. Coils are soldered with the feet (see detail) flat against the board.

n. Ferrite chokes Z1-Z3 are 6-hole balun cores with 2½ turns of #22 bus wire threaded through the holes in the manner shown in the detail. The turns go only through the holes, not around the outside of the core, except at the ends. Cut a 3 inch length of wire. Feed it through a hole with about ½ inch protruding, and hold this short end. Then, thread the long end through the adjacent hole and pull tight. Thread through a third hole as shown until 2½ turns are complete. (One hole is not used.) Tack solder the leads of the balun chokes to the board in the positions shown.

o. Solder the two resistors in

place with short leads. R1 goes from the base of Q1 to ground, positioned as shown. R2 goes across balun choke Z2.

p. Strip and solder short length of hookup wire from B+ land area on pc board to feedthru capacitor.

q. Cut a 2½ inch length of miniature coax. Strip it, and solder it from output of board (C5 and ground plane) to uhf connector J2 and adjacent ground lug. Keep stripped lead lengths to no more than 3/8 inch to avoid losses.

r. Connect the remaining length of miniature coax from input connector J1 to the pc board input circuit (C8 and ground plane) as shown.

s. Check to be sure all parts have been installed. Check for potential short circuits and other workmanship problems. Double check circuit to schematic diagram.

## ALIGNMENT

a. Preset the variable capacitors about 1½ turns ccw from fully tight.

b. Connect J1 to repeater output or other source of 15 Watts drive. Connect J2 through power meter to a good 50Ω vhf dummy load.

c. Connect regulated +13.6Vdc power source to feedthru capacitor and power supply ground to adjacent ground lug. (If your power supply has adjustable voltage, it is better to start tuning with about 10Vdc and increase it to 13.6 Vdc after you determine there are no problems.)

*Note: Do not retune repeater output stage or other driving source with PA connected.* Driving source should be tuned into 50 ohm load and left alone afterwards. Input of PA is tuned then to present 50 ohm load to driver.

d. Apply drive to PA, and alternately adjust C1/C8 and C2/C3 for maximum output. Do this several times to work out any interactions. Use an insulated tool.

e. When fully tuned, the PA should deliver about 45 to 55 Watts with 13-15 Watts drive when using a 13.6Vdc power supply. If the dc voltage is low, the output will be less. You may also experience a little loss in the output coax if it is not a good low-loss type. The PA will draw about 6 to 7 Amp at full output.

## COVER.

The cover slides over the PA assembly and is secured to the Pem nuts and angle brackets on the end plates, using eight 4-40 x ¼ inch screws. Tighten the screws on the bottom first to draw the cover down tight, and then tighten the screws on the sides. The four rubber feet should be stuck in place about ½ inch in from each corner on the bottom of the cover. If you remove the cover for service, be careful not to inadvertently loosen the screws on the outside surface of the end plates which attach the angle brackets to the end plates.

## MOUNTING.

There are several ways to install the RPA-40, none of which is critical as long as air flow is not restricted around fins. The simplest is merely to set the PA, fins up, on a shelf near the repeater. If you wish to mount the PA to a blank rack panel or other vertical surface, such as a cabinet wall, simply drill a few holes in the cover and mount the cover. Then, slide the PA assembly into the cover, and secure with eight 4-40 x ¼ inch screws. (The cover must be installed to prevent repeater de-sense.)

## POWER.

The RPA-40 requires well-regulated 13.6Vdc, free of transients, at about 6 to 7 Amp. An 8 Amp continuous-duty power supply would have some reserve. Use fairly short, heavy leads to connect positive to feedthru capacitor and negative to adjacent ground lug. If there are any relays or other inductive devices on the same power supply, be sure to put a reverse diode across the device to absorb reverse voltage spikes generated by inductive kick-back. It would be wise to connect an 8 Amp, fast-acting fuse in series with the PA power lead if the power supply is capable of more than 8 Amps.

*CAUTION: RF power transistors are fully tested by the manufacturer and are not guaranteed because they are easily damaged by physical or electrical abuse. They are very expensive to replace. Be sure to use adequate precautions to avoid damage.*

## OPERATION.

Once tuned, the RPA-40 will automatically operate when sufficient drive is applied. Since it operates class C, it will draw no current when no rf power is applied. It is designed for continuous duty at up to 55 Watts. Do not operate it above that level. Reduce drive if necessary so it will operate at this level, which is sufficiently conservative if heatsink is not blocked and ambient temperature is below 100 degrees F.

## REPAIR.

Should it be necessary to replace the transistor, be sure to use an exact replacement. To remove old transistor, carefully peel each lead away from the pc board while applying heat to melt solder. Then, remove transistor from unit, and clean excess solder from board. This is important to avoid tearing leads from new transistor when hardware is tightened. Also, clean off old heatsink compound, which may be dirty, and apply a fresh coat to the new transistor. Remember to resolder any components removed for access to transistor.

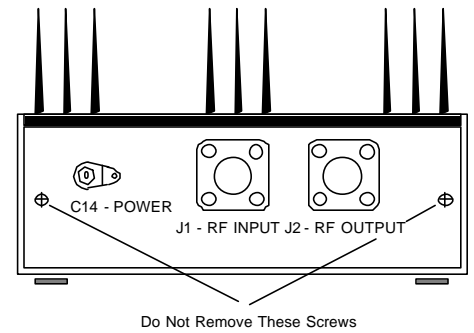


Figure 3. PA in Operating Position

