

LPA 2-45/LPA 8-45 TWO-METER LINEAR POWER AMPLIFIER CONSTRUCTION, ALIGNMENT, & OPERATION INSTRUCTIONS

The LPA 2-45 is designed to amplify the 2W pep output of the XV2 Transmitting Converter or the 150 FM Exciter or any other 2W two-meter rf source to 45W p.e.p. It is a linear amplifier; so it may be used on any mode of operation, including ssb, am, cw, and fm. It has a 50 ohm input and output impedance. A spin-off from the LPA 2-45, a second model, called the LPA 8-45, is designed to amplify the output of an 8-10 W exciter to 45W pep output. It uses the same circuitry, with the exception that the first of two stages is omitted. Both units operate on +13.6 Vdc at 8-10 Amp. They may be tuned to any frequency in the 140-175 MHz range, and have a passband of 2 MHz.

CIRCUIT DESCRIPTION.

Refer to the schematic diagram. Amplifier transistors Q1 and Q2 are of the new generation, high gain, emitter ballasted rf power transistors. They are both operated well below their full output capability to remain in the linear range. Impedance matching is done with high Q, discrete oil-capacitor tuned circuits to aid signal purity.

The transistors are biased slightly above class B for linearity. Q1 is biased from a voltage regulated source for stiffness. The bias for Q2 is adjusted by installing either one or two 2 Watt resistors. Both bias circuits use silicon diodes (CR1 and CR2), which are thermally coupled to the heatsink to regulate bias according to temperature for a stable idle current over a wide range of operating temperatures. As the transistors warm up, they tend to conduct more, but CR1 and CR2 reduce the bias, as warm up occurs to counteract the drift in idle current. R1, L4, C4, and C5 provide feedback to suppress low frequency oscillations, which can occur in vhf rigs due to extremely high low-frequency gain of transistors.

CONSTRUCTION.

Most of the pertinent construction details are given on the component location and schematic diagrams. Following are details of coil winding and special parts mounting procedures. Note that all parts are tack soldered to the pc board, so it is necessary to cut and form leads so that they seat properly on the board. The power transistors and pc board have been preassembled for you so that the proper spacing, heatsink compound application, and transistor stud torque are taken care of for you.

Note that the diagrams show both models. The LPA 8-45 uses only those components shown on the right hand side of the dashed line.

1. Begin construction by forming the transistor leads down against the board. Then, tack solder them to the foil, using sufficient solder so that a bond is formed under the leads.

2. Cut tabs of the variable mica capacitors as shown on the component location diagram, and solder them to the board in the exact positions shown. Doing so leaves adequate space for coil connections.

3. Wind the coils exactly as specified in the component location diagram, and tack solder them to the board. It helps to prestrip the #24 magnet wire by application of heat from the iron and solder before mounting. Note that all pertinent details of coil winding are given in the diagram. Sometimes, people add lib when winding coils because they think something more special has to be done because of their past experiences at coil winding. The job is very simple, as specified, and there is no need to complicate it. Any rod of the proper diameter can be used as a forming tool for coil winding. In the case of the 1/8 inch i.d. coils, the shank of a tuning tool may be used. Coil winding is not critical, so some deviation from dimensions given can be tolerated without affecting operation.

The ferrite chokes are wound (threaded) with #26 bus wire (fine) as shown in the diagram, by feeding the wire through adjacent holes and pulling tight. One hole will not be used. Ferrite chokes are mounted flat against the pc board, and its leads are tack soldered to the board.

4. Install CR1 and CR2 (1N4001, 1N4003, 1N4005, etc.) through holes provided in heatsink. Solder cathode (banded end) to solder lug on fin side of heatsink. Use short, direct lead connection to provide thermal connection to ground lug as well as electrical connection. On the pc board side of the heatsink, bend the anode leads over to the pad provided, and tack solder to the board. Note that the bodies of the diodes should be centered in the thickness of the heatsink for best thermal coupling. Be careful not to short anode leads to ground.

5. Tack solder all other parts to the pc board in the positions shown. Use short, direct lead dressing. Observe polarity on components, such as diodes, electrolytic capacitors, and transistor Q3. Note that leads may be tack soldered to the top side of power transistor leads if necessary. To mount mica capacitors, the tabs should be bent down so they just touch the board when the case is flat against the board. The open side of the case should be against the board. Z1 is a ferrite bead installed over the hot lead of C19. Resistor R6 should not be installed, but room should be left for it.

INPUT/OUTPUT CONNECTIONS.

The input and output connections are made with lengths of 50 ohm coax cable connected to the appropriate input and output pads and ground (shield) of the pc board. Connect cables by stripping as illustrated and tacking to board with solder. Keep leads short and neat. Connect shield by prefinning all around shield and then tack soldering just the part of the shield which contacts the board. Avoid melting polyethylene insulation on cable by prefinning board and cable and then tacking them together quickly. If desired, light gauge wire can be wrapped around the shield before soldering to make a neater shield termination. Connectors were deliberately avoided at the pads, since connectors must be used at the other ends of the cable at the Exciter and rear panel and short connections to the pc board are desired. RG-174/U cable is convenient to use for short connections to the pads. (See catalog.) The input connection for the LPA 8-45 should be made to the pad normally used for the collector of Q1.

The unit does not have provisions for t/r switching of the antenna. If one antenna is to be used with the PA and a receiver, some form of coax relay must be provided between the pads and the antenna.

POWER CONNECTIONS.

+13.6 Vdc should be connected to the B+ pad at the top of the pc board. A ground return cable should be connected from the power supply to the ground plane of the pc board as shown in the component location diagram. The cable should be #16 or larger wire to minimize voltage drop. A 10 Amp, quick acting fuse should be connected in the positive supply line for protection.

A well regulated power supply should be used for any ssb equipment, including the PA. Current drain of the PA at full output is 8 Amp for the LPA 8-45 and 10 Amp for the LPA 2-45. Note that the output capability of the PA drops rapidly as the voltage is reduced below 13.6 Vdc; therefore, you should try to use a power source of sufficient voltage and minimize cable losses so that you have full B+ available at the PA.

If the unit is used in a mobile application, or on anything other than a well regulated and protected power supply, the circuit in the following diagram is recommended to be connected ahead of the PA for hash and transient filtering and reverse polarity protection. The rest of the transmitter may also be operated on the same protected line if desired. Values for the filter circuit are not critical, so junk box parts can be used.

In addition, both power lines should be run directly to the battery or power supply. Do not depend on other conductors for a good, low impedance ground connection. The battery in a car acts as a huge filter capacitor for the electrical system, and it is the only place good, clean power can be obtained in a vehicle. If ignition switch operation is desired, use a relay.