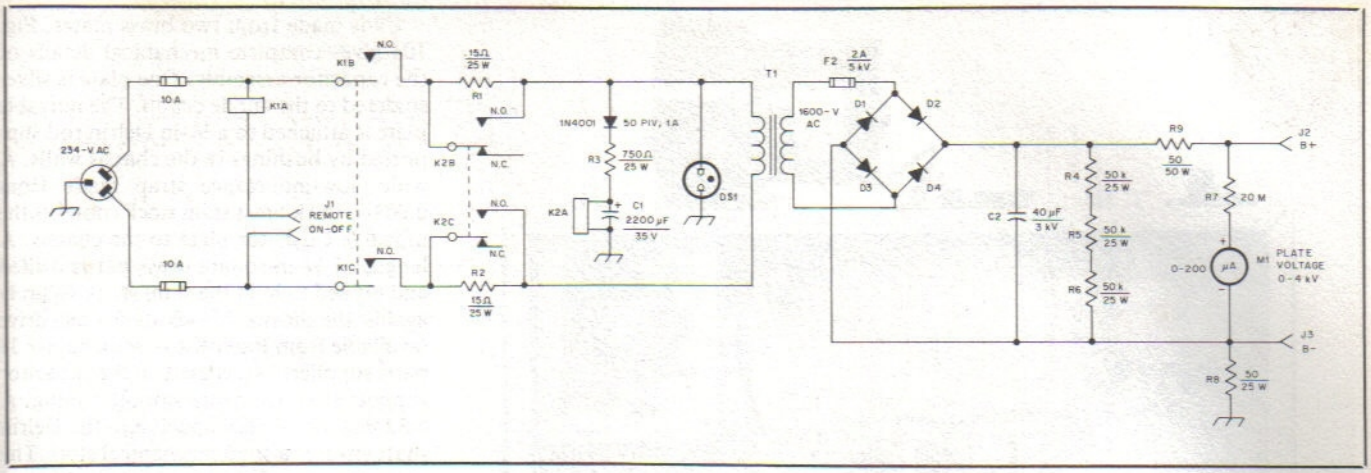

Fig. 100 — Schematic diagram of the high-voltage power supply for the 8930 2-m amplifier.

D1-D4 — High-voltage rectifier, 14 kV, 1 A (K2AW HV14-1 or equiv.).
F2 — High-voltage fuse, 5 kV, 2 A (Buss HVJ-2 or equiv.).
J1 — Two-conductor socket (Cinch S-402AB or equiv.).
J2, J3 — High-voltage connector (Millen 37001 or equiv.).
K1 — Power relay, DPST, 234-V ac coil, 277-V ac, 25-A contacts (Potter & Brumfield PRD7AYO-240V or equiv.).
K2 — Power relay, DPDT, 24-V dc coil, 277-V ac, 25-A contacts (Potter & Brumfield PRD11DYO-24V or equiv.).
T1 — Power transformer; primary 117/234-V; secondary 1600 V, 1.2 A (Hammond Mfg. 126270 or equiv.).

supply from the RF deck, is wired so it is impossible to key the amplifier until the B+ is applied. When S2 is thrown, the filaments, bias and screen supplies all come on together. If operating bias was placed on the tube (by keying the amplifier) and no B+ was present, the screen would draw excessive current, as described before. As long as the tube is cut off, having screen voltage present without plate voltage is not a problem.

Construction

The 8930 amplifier is built using three separate chassis (see Figs. 101 and 102). The main chassis measures 10 × 17 × 3-in and is bolted to a standard 19-in-wide, 8¾-in-high rack panel. The plate compartment is a 13 × 5 × 3-in chassis, while the input compartment is a 4 × 5 × 2-in chassis. Use of separate enclosures ensures good shielding.

Amplifier cooling is accomplished using a split airflow, rather than the conventional base-to-anode flow. The blower pressurizes the plate compartment. A special chimney, fabricated from Teflon sheet and phenolic tubing (see Fig. 105), seals the area between the tube cooler and the plate compartment top cover. Air enters the plate compartment and exits through the anode cooler. Some of the air exits through the tube socket to cool the tube seals and input compartment. Measurements by ARRL TA Dick Jansson, WD4FAB, indicate that this cooling system reduces blower back-pressure requirements by about 50 percent with this tube. The blower chosen is capable of supplying 25 cubic feet per minute at 0.4-in of static column pressure — more than enough to cool the amplifier, even at full dissipation.

An EIMAC SK-620A socket is used in this project. The SK- 620A and SK-630A sockets feature built-in low-inductance screen bypass capacitors and screen shielding rings. These features are essential to amplifier stability. If possible, an SK-630A should be used because it features grounded cathode pins. The SK-620A was used here because one was on hand. The four cathode pins are bent in toward the socket center ring and soldered to it, assuring a solid, low-inductance cathode ground.

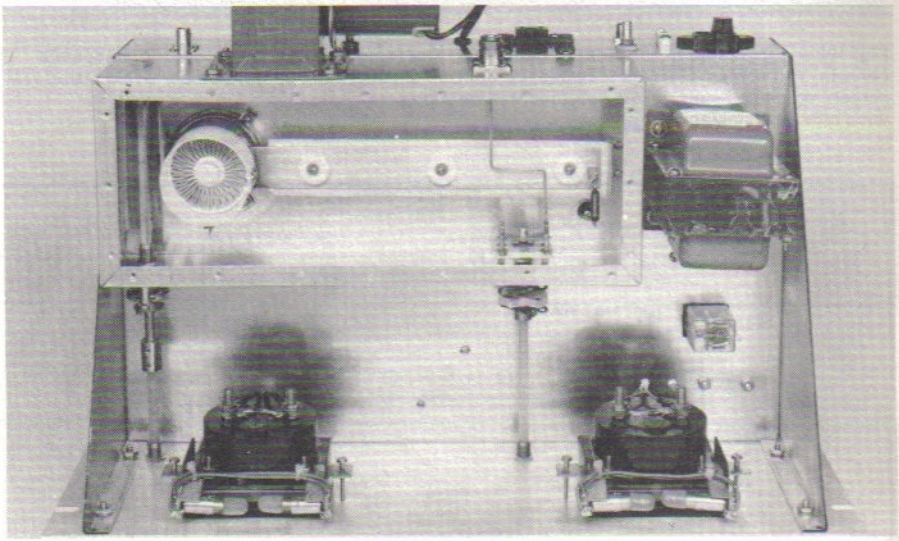

Fig. 101 — Top view of the 8930 2-m amplifier. The tube and plate circuitry are mounted in a separate chassis that bolts to the main chassis. The plate compartment top cover has been removed for clarity, although it must be installed during amplifier operation.

The input compartment is centered on the tube socket. Filament, bias and screen voltages enter the input box through feedthrough capacitors. All leads are kept as short as possible. The swamping resistor is connected between the feedthrough capacitor and the grid terminal. Likewise, the 100- ohm screen isolation resistor connects the screen pin and the feedthrough capacitor. L2 is supported by C2 and the socket grid pin. L1 is mounted on a small ceramic standoff insulator near L2. J1 is a panel-mount BNC connector attached to the rear panel and connected to L1 by a short length of 50-ohm coaxial cable.

The plate compartment is mounted along the rear of the main chassis. Fig. 103 shows the relationships of the pieces inside the compartment. Details of L3, L4, C8 and C9 are given in Fig. 104.

L3 is a ¼-wavelength strip line made from brass and aluminum sheet. Complete details are shown in Fig. 104. One end bolts to the chassis, while the other end is silver-soldered to a copper strap that clamps around the anode cooler. C8, the plate blocking capacitor, is a "sandwich" capacitor formed by the two pieces of the plate line. The dielectric is a piece of 0.01-in

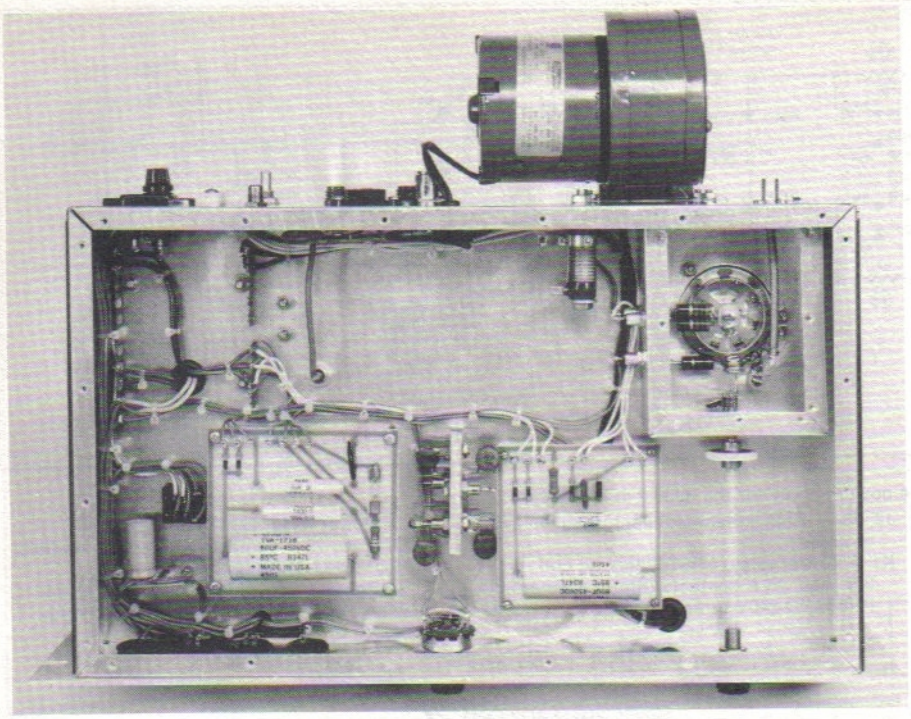

Fig. 102 — Underside of the 8930 2-m amplifier. The input circuitry is enclosed in a separate chassis. The screen and bias supplies are built on small printed-circuit boards. D7-D11, the screen regulator Zener diodes, are mounted on a piece of ¼-in-thick aluminum plate for adequate heat-sinking.

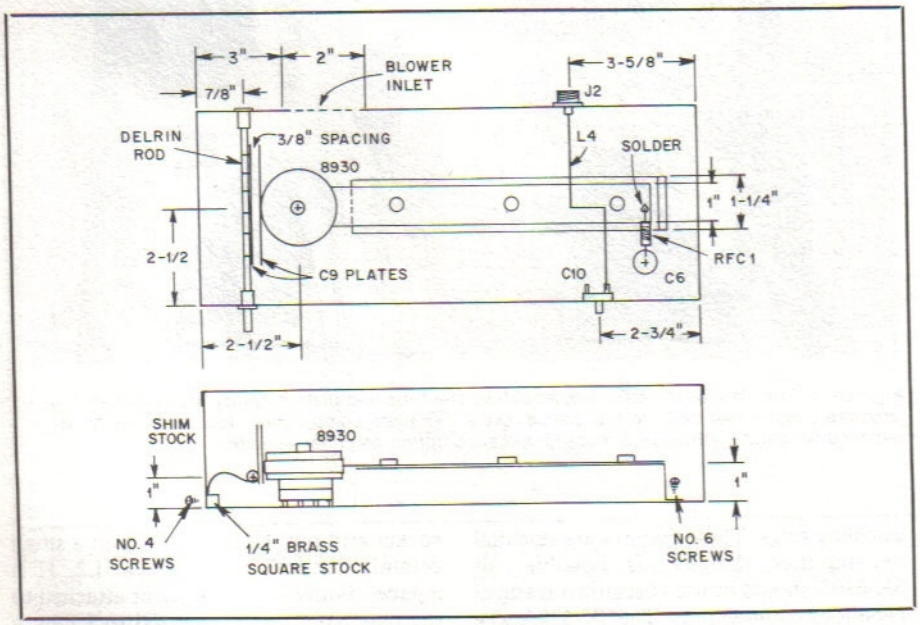

Fig. 103 — Component mounting information for the plate compartment.

thick Teflon sheet. Three 6-32 brass screws hold the sandwich together. The top half of the line has B+ on it, and the bottom half is grounded, so Teflon shoulder washers are used to insulate the screws from the top half of the line. The shoulder washers used here were cut on a lathe from ¾-in-diameter Teflon rod. A light coating of Dow Corning DC-4 silicone grease is spread on each side of the Teflon sheet to fill in any irregularities.

In this amplifier, the bottom half of the plate line is formed from a single piece of aluminum sheet bent in a sheet metal brake. With patience and a good bench vise and hammer, it should be possible to get a clean bend. If the builder does not have sheet metal bending capability, the bottom half of the line may be made from two separate pieces bolted together. The plate line may be made from copper or brass if this method is used. The top half of the sandwich must be made from copper or brass because it is soldered to the tube clamp.

C9 is made from two brass plates. Fig. 104 gives complete mechanical details of the capacitor assembly. One plate is silver soldered to the anode clamp. The movable plate is attached to a ¼-in Delrin rod supported by bushings in the chassis walls. A wide, low-inductance strap made from 0.003-in thick brass shim stock connects the movable capacitor plate to the chassis. A length of ¼-in-square brass bar is drilled and tapped to hold the shim stock securely against the chassis. A Jackson 6:1 ball drive (available from RadioKit — see Chapter 35 parts suppliers list) is used on the capacitor support shaft to ensure smooth tuning. A 6-32 machine screw tapped into the Delrin shaft ensures a solid mechanical stop. The two capacitor plates must *not* be allowed to touch — one plate is at ground potential, while the other is at 2 kV.

The copper, brass, Teflon, Delrin and aluminum stock necessary for this project are available from Small Parts, Inc. (see Chapter 35 parts suppliers list). Brass or plated brass hardware should be used throughout the plate compartment. Steel is unacceptable for use in strong RF fields. After assembly, the anode clamp, C9 plates and brass half of the plate line were treated with rub-on silver plating.

L4 is made from a piece of no. 14 tinned wire suspended over the cold end of the plate line. Details are shown in Fig. 104. It is supported on the ends by J2 and C10. Greatest coupling occurs when the section of the link that runs parallel to the strip line is placed over the center of the line. In this amplifier, best coupling occurred with the link spaced about ¼-in above the line, but the builder should experiment with different spacings to find the optimum distance for best efficiency.

High-voltage enters the plate compartment through feedthrough C6. RFC1 is soldered between C6 and the cold end of the line. Carefully clean away all flux from the plate line after soldering. Any flux left near the end of the line may offer a path for a high-voltage arc across the sandwich capacitor.

Brass screen, soldered to a brass plate, covers the blower inlet to ensure good shielding. Similarly, a piece of screen soldered to a plate shields the hot air exhaust. A liberal number of machine screws are used to secure the plate compartment top cover to the chassis to keep the RF in. The machine screws thread into aluminum captive fasteners pressed into the chassis. These fasteners are available from Penn Engineering and Mfg. Co., Danboro, PA 18916.

All parts for the screen and bias supplies except D7 through D11 and their 0.01-μF bypass capacitors are mounted on printed-circuit boards. Parts layouts for these boards are given in Fig. 106, and full-size etching patterns are given at the back of this book. The resistors tend to run warm, so they are spaced about ¼-in off the board to allow airflow on all sides. D7