LOW-COST EPROM PROGRAMMER

BY DAN VINCENT

PART 2 *Power supply, construction and checkout.*

Power Supply. The supply (Fig. 5) delivers approximately +75 volts to a transistor switch/current limiter consisting of *Q1*, *Q2*, *Q3*, *R1*, *R2* and *R3*. Transistors *Q4* and *Q5*, in conjunction with *D5*, *R6*, *R7*, and *R8* regulate the +75-volt output down to +47 volts. Diode *D6* and resistor *R5* provide the V_{BB} bias supply. Resistor *R9* insures a minimum load on the regulator and provides a path for the *D6* zener current. Capacitor *C2* and resistor *R20* prevent the high-gain circuit of *Q5* from oscillating.

Construction. Although the Program-

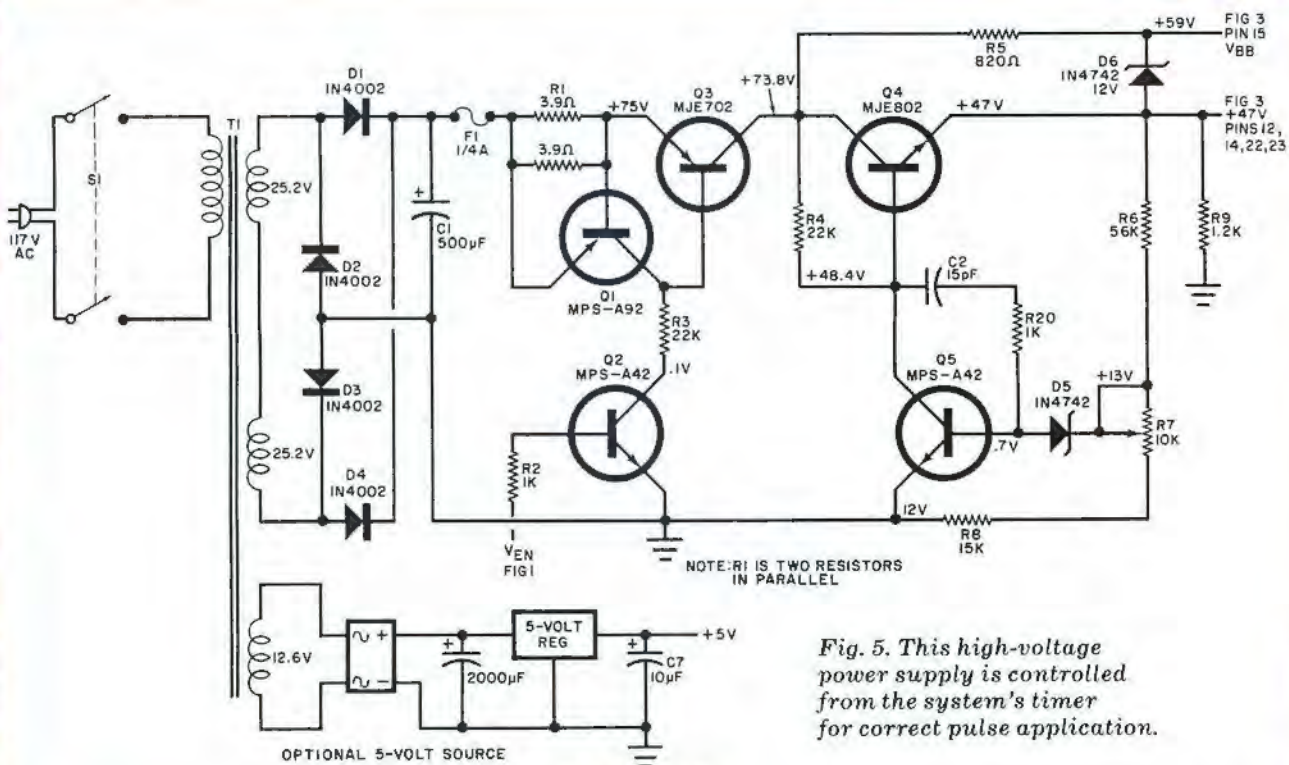


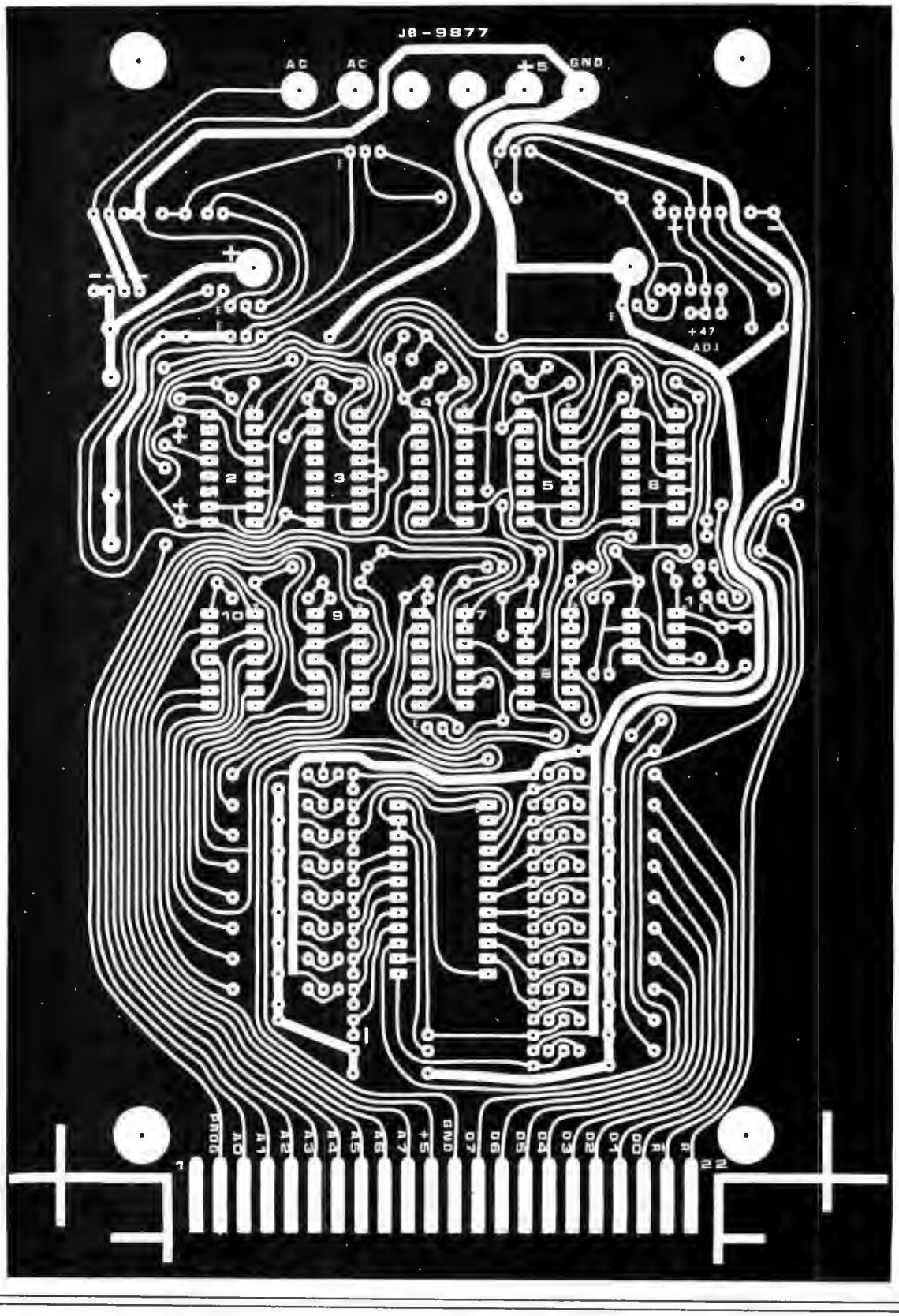
Fig. 5. This high-voltage power supply is controlled from the system's timer for correct pulse application.

PARTS LIST

C1—400-µF, 75-V electrolytic capacitor
C2—15-pF ceramic capacitor
C7—10-µF, 15-V electrolytic capacitor
D1 through D4—1-A, 200-V silicon diode (1N4002 or similar)
D5, D6—12-V, 1-W, 10% zener diode (1N4742 or similar)
F1—¼-A fast-blow fuse and holder
Q1—MPS-A92, 300-V silicon pnp transistor
Q2,Q5—MPSA42, 300-V silicon npn transistor
Q3—MJE702, 80-V silicon Darlington pnp transistor
Q4—MJE802, 80-V silicon Darlington npn transistor

The following are ¼-W, 10% resistors unless otherwise noted:
R1—1.9-ohm, 5%, 1-W resistor (two 3.9-ohm, ½-W, 5% in parallel)
R2, R20—1000 ohms
R3,R4—22,000 ohms
R5—820 ohms, ½-W
R6—56,000 ohms
R7—10,000-ohm, 10%, ½-W trimmer potentiometer (Bourns 3389 series)
R8—15,000 ohms
R9—1200 ohms, 2 W
S1—Dpdt, 1-A toggle switch
T1—2 each 25.2-V, 300-mA transformer with 5-V power-supply winding

Note—The following are available from DIA, Inc., Box 343, Dayton OH 45459: etched and drilled pc board at $8.95; basic 1702A EPROM Programmer kit (TTL option), including pc board and all components except power supply and connector, at $39.95; special transformer that also includes 5-volt power supply winding at $9.98; complete kit, including pc board and all components for stand-alone Programmer with switches, power supply, zero-insertion-force socket and case, at $79.95; complete stand-alone Programmer, assembled and tested, at $99.95. All prices postpaid. Check, money order, Visa, or Master Charge accepted. Ohio residents, please add 4½% sales tax.



mer can be built using any desired construction technique, a printed circuit board such as that shown in Fig. 6 is suggested. Observe the correct polarities when installing capacitors, diodes, transistors and IC's (using sockets, if desired). Do not install transistors *Q8* and *Q14* through *Q29* until after reading the checkout section of this article. Mount 1-inch by ½-inch thin metal heat sinks on transistors *Q3* and *Q4* . Using the fuse as a guide, install a fuseholder or fuse clips at the *F1* position. Do not install a socket at position *S02* or the LED for *LED1* if you are going to mount the board in an enclosure.

The component installation shown in Fig. 6 uses the TTL option so that the

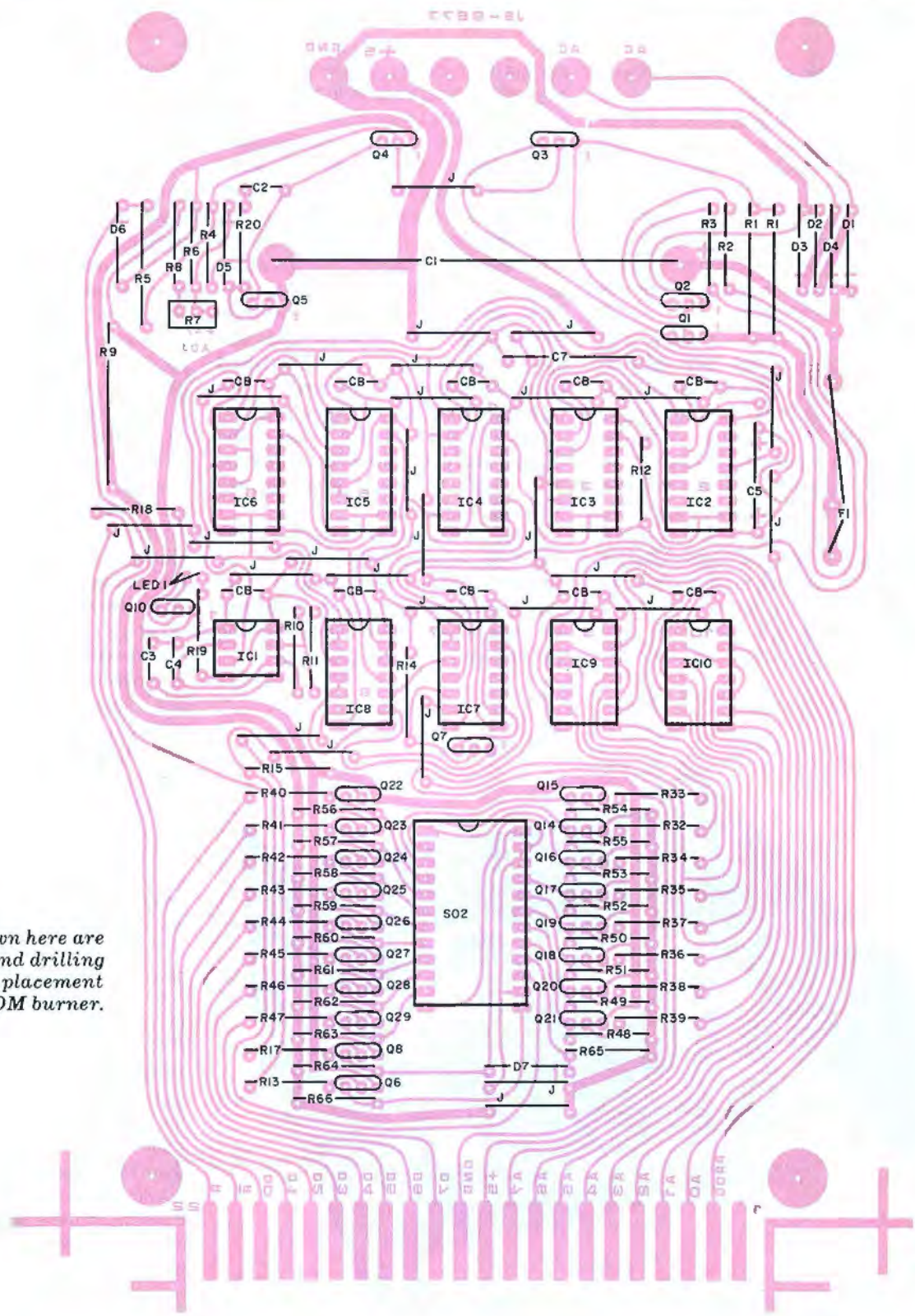


Fig. 6. Shown here are etching and drilling and component placement guides for PROM burner.

Programmer can be used with a computer at some later date.

Select a suitable enclosure whose front panel can support the eight address and write data switches in two rows (see photo). Also on the front panel are the on/off switch, the program push-button switch, *LED1*, and a zero-insertion-force 24-pin PROM socket. Identify the switches and controls properly.

Use a length of heavy bare wire to interconnect all of the upper lugs of the top row of address switches. Interconnect the bottom row of address switch lugs similarly. Use the same technique on the data switches. Using insulated wire, connect the upper lugs of the address switches to the upper lugs of the data

switches. Do the same with the lower lugs—lower lugs to lower lugs.

Using the small insert schematic of the *S18* circuit shown in Fig. 2, connect the normally closed contact of this switch to the top bare wire (gnd) of the address or data switches. Connect the two resistors and capacitor to the switch as shown, using the bottom lugs of either the address or data switches for the 5-volt connection.

Mount transformer T1 on one side of the chassis bottom plate. The rectifier, filter capacitor, and 5-volt regulator for this supply can also be mounted on the bottom plate of the chassis. The pc board will be mounted on spacers so that it will not contact the components mounted within the chassis. Using the four large corner holes in the pc board as a guide, and with the edge connector toward the front panel, mark and drill the four spacer mounting holes.

With the pc board held in its final mounting position (edge connector facing the front panel), cut lengths of insulated wire long enough to fit easily between the *S02* board position and the 24-pin front-panel socket. Do the same for the program switch and *LED1* . Make similar connections from the edge connector to the center lug of each of the address and data switches. A pair of wires will also be needed from the edge-connector 5-volt pad to the bottom lugs of the switches. You will also need insulated leads from the two ac-pads and the 5-volt ground pads (on the pc board edge opposite the connector) to interconnect to the power supply circuits.

Drill a hole in the rear apron of the chassis and put a grommet in it for the ac line cord. Make sure all ac connections are well insulated.

After all the wiring is installed, the board can be mounted on spacers. Do not tighten the mounting hardware, however, because the missing transistors will have to be installed after performing the following Checkout procedure.

The 5-volt supply is mounted under the pc board. With a little care, as shown here, a very professional look can be attained.

Checkout. Be sure transistors *Q8* and *Q14* through *Q29* and the +47-volt line connection are not installed until after the regulator checkout is complete.

After double checking the wiring (and pc board), adjust potentiometer *R7* to its maximum series resistance, then temporarily jumper the collector of *Q2* (Fig. 5) to ground to enable the regulator. Apply ac power to the high-voltage and 5-volt power supplies and check for the presence of +75-volt dc across filter capacitor *C1*. If necessary, reverse the secondary connections.

Using a dc voltmeter of known accuracy, monitor the voltage across *R9* (Fig. 5) and adjust *R7* to obtain +47 ±1 volts. Leave the voltmeter connected across the 47-volt line.

The current limiter is checked by *momentarily* shunting *R9* with a 68-ohm, 2-watt resistor. The voltage should drop to approximately 25 volts. If not, check *Q1* , *Q3* and *R1*.

Remove the temporary jumper from the collector of *Q2* and note that the output voltage drops to zero. If not, *Q2* is faulty or is being prematurely enabled by *IC7* . Between programming cycles, *IC7* should be completely cleared.

Using pushbutton switch *S1B* (Fig. 2), apply a pulse to the program command line and verify that the +47 volts occurs for about half a second. If it does, it is a good indication that the counters and clock are functioning normally.

The 47-volt line and the transistors can now be installed.

If you do not have a zero insertion-force socket, before installing the first PROM, loosen up the holes in the PROM socket using the leads of a ¼-watt resistor. This should be done since the pins of many 1702A PROM's are fragile and may be bent trying to force them into a tight socket.

With power applied, insert an erased EPROM in the socket, set the address and data switches in accordance with the first location of your truth table, and apply the programming command (*S18*). That location will be programmed within half a second. The optional LED programming indicator may be used to watch this timing.

You now have 255 more locations to go. If you use the microprocessor option (Fig. 3) and a suitable program, the EPROM can be programmed in just a few minutes. ◇