

# Do-It-All Expansion Board for KIM

*The following design and repackaging information should appeal to many, if not all, the KIM-1 owners out there who are looking for more in this very popular system.*

George Young  
Sierra High School  
Tollhouse CA 93667

Breathes there a KIM-1 owner who is completely satisfied with his KIM-1? The number of articles appearing about this very popular computer and about repackaging it surely mean that many owners seek a more presentable micro-computer with expanded capa-

bilities. This article presents an expansion board for the KIM-1 as well as some ideas for repackaging the basic KIM-1 circuit board.

## The Expansion Board

The expansion board is the same size as the KIM-1 circuit board and is designed to mount below the KIM-1 board with stand-offs. The board is a "universal type," meaning that it will take 14-, 16-, 24- and 40-pin ICs and that it can be either wire-wrapped or hard-

wired. I plan to use my board to add: (1) more memory, (2) Don Lancaster's TVT-6L circuitry from *Kilobaud* No. 6, (3) Bob Grater's SAB-1 circuitry from *Kilobaud* No. 1, (4) a Selectric interface similar to the one described in "another magazine," (5) whatever else is published for KIM that I need and can use.

Since the expansion board is almost the same size as a page of *Kilobaud*, some reduction of the artwork is required to fit it into the magazine. If you are going to home-brew your own board, you will need to use the skills and techniques presented in "Make Your Own PC Boards" (*Kilobaud* No. 16, page 24).

In trying to anticipate your needs, we have made arrangements for the Byte Shop, 3139 E. McKinley Ave., Fresno CA 93703, to produce the board for you at \$35 postpaid. It will be a single-sided, G-10 glass-epoxy board with numerically controlled drilled holes. (You couldn't drill all the holes on that artwork for \$35 worth of labor!) Mating connectors for the board are also available from the same source for \$5 per pair.

Should you find it necessary to have contact fingers available on both sides of the board, there are two ways to accomplish this.

The first way is the easiest for those who live close enough to an Electronic Supermarket. Obtain Circuit Stik™ part number 3396-002; you will need just one package per KIM-1 expansion board. This 22-pin printed-circuit-board edge connector will mate with the sockets and comes two per package. (Just be sure you get them anchored at the correct location on the back of the KIM-1 board.)

Should you be "out of range" of the Electronic Supermarket, the task will be a little more difficult. You'll have to home-brew a device like the Circuit Stik edge connectors. There is a flexible copper-clad epoxy board available that you can print on in the fashion described in "Make Your Own PC Boards." The edge connectors formed in this fashion can be glued to the back of the KIM-1 board. I use Goodyear Pliobond™ general-purpose adhesive for this purpose.

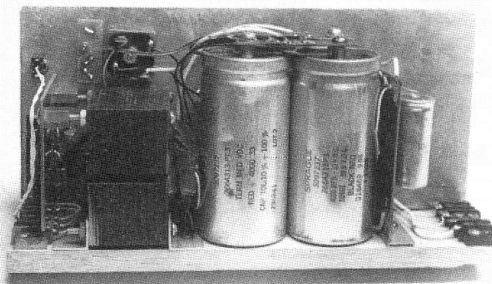


Photo 1. Expansion power supply.

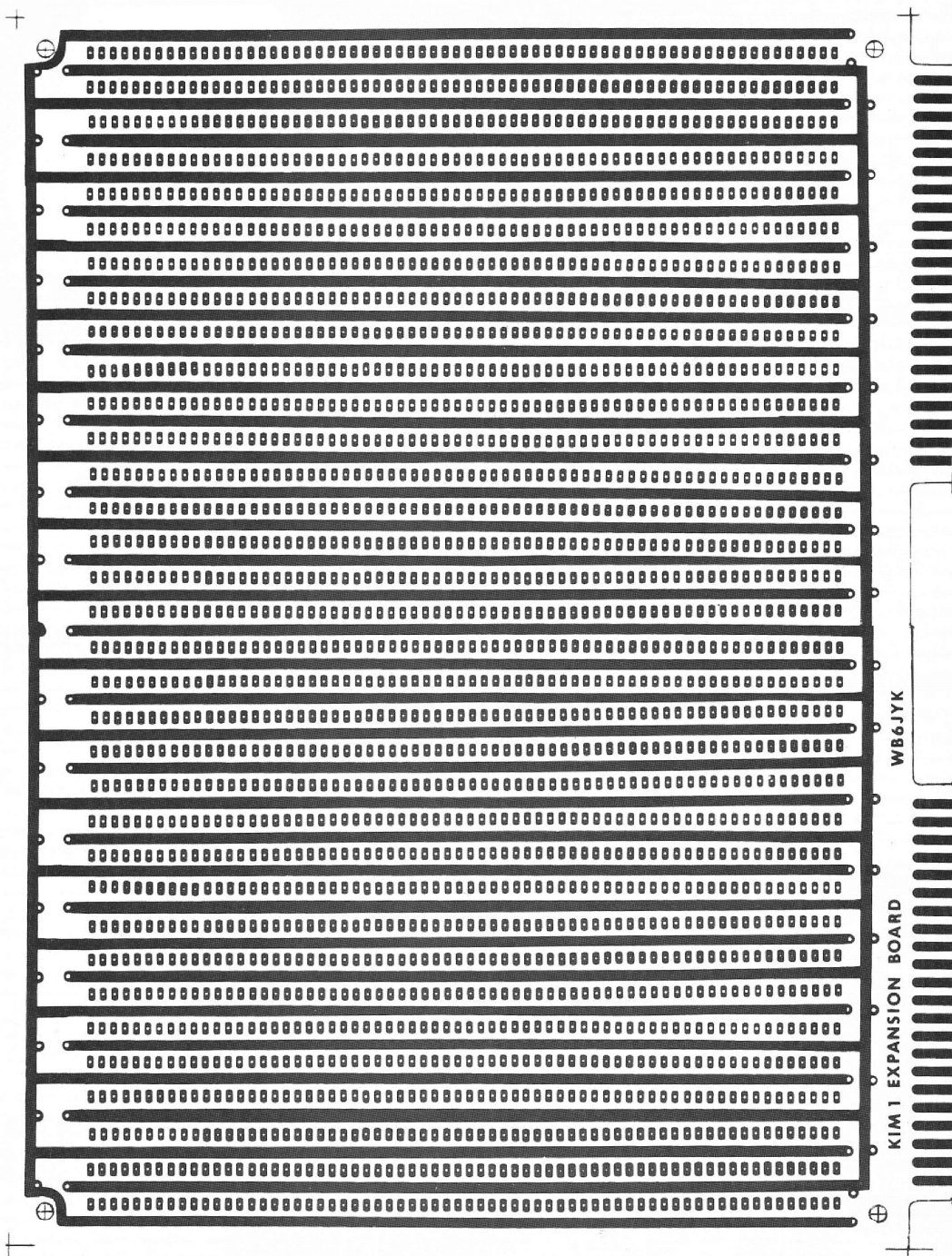


Fig. 2. Original artwork for the KIM-1 expansion board (reproduced here at 85 percent).

Extra-thin copper clad is also available in the Circuit Stik line as part number 9252 (3 × 4 inches) and part number 9251 (5 × 6 inches). The Circuit Stik material comes with a self adhesive backing, so use of this material bypasses the gluing problem. If you cannot find it locally, then order from Circuit Stik, 24015 Garnier Street, PO Box 3396, Torrance, CA 90510, or call (213) 530-5530 and ask where you can buy their products.

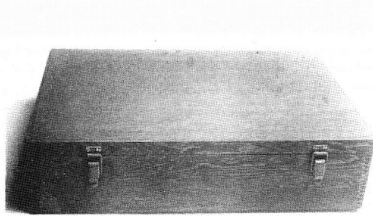


Photo 2. The wooden "briefcase."

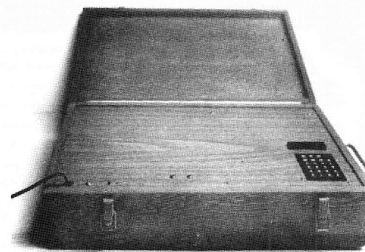


Photo 3. KIM's new "home," ready to travel.

#### KIM-1 Power Expansion

The first thing that will be needed for the expansion circuitry is additional power capability. Fig. 1 shows my version of the new KIM-1 power supply. Photo 1 also shows the new power supply. The transformer used is a rewound core from the vacuum-tube era and has a capacity of about 100 Watts. Details of the power-supply theory of operation have been covered in the Kilobaud Classroom series, so I shouldn't have to repeat it here. (How else will I get you to read my other stuff?)

#### A New Enclosure

After studying the various ways that others have given KIM a new housing, I decided to do mine the easiest way possible. The problem is that those capacitors on the KIM circuit board stick up too high. What

can be done is to raise the keyboard and the display about 1/2 inch so a panel will clear these capacitors.

Using a temperature-controlled iron and a vacuum desoldering device, I carefully desoldered the keyboard. I

stripped hookup wire and soldered pieces about 1 inch long to the keyboard contacts. I placed a 1/2-inch-thick block of wood under the keyboard and reconnected the hookup wire to the KIM-1 circuit board. Then I carefully checked out KIM for

normal operation.

The display also had to be elevated about 1/2 inch; so I carefully desoldered the display module and then cleaned solder from the seven-segment readout pins. I removed pins from an Augat™ wire-wrap module and slipped each pin over one of the pins on the LED readouts. Finally, I soldered the Augat pins to the KIM circuit board. This raised the display (see photo). Again, I carefully checked KIM for normal operation.

Everything looked OK, so I made a cardboard template that would exactly fit over the KIM keyboard and the display module, and then used this to make the cutouts in a 1/16-inch-thick piece of plastic laminate.

A briefcase-style case made of walnut-stained wood formed the new home for KIM (a simpler method would be to use an actual briefcase). Photos 2 and 3 show the completed KIM-1 package. I plan to add connectors, probably down the middle of the plastic laminate, for connection of the various peripherals. In the meantime, KIM-1 is now well protected and is portable. My students can (and are) packing it home almost every night so they can use KIM in its more-or-less original configuration.

#### A Final Note

The 1/16th inch plastic laminate is too flexible and bends when the keyboard is operated. To overcome this, I glued wooden strips to the back of the plastic laminate with a hot-glue gun to give the panel sufficient rigidity. ■

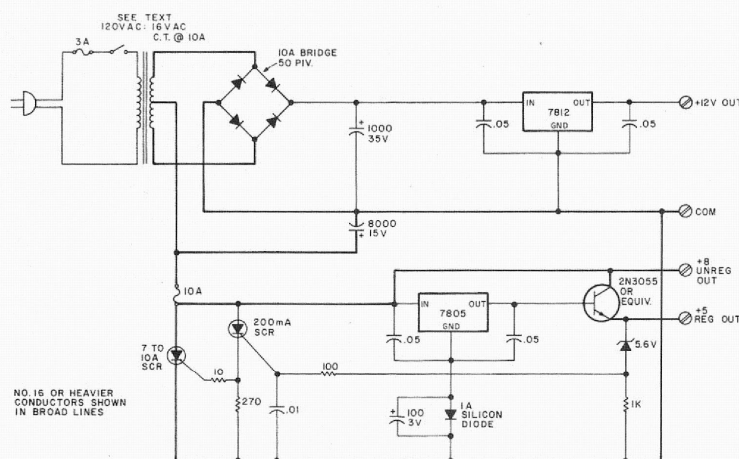


Fig. 1. KIM-1 expansion power supply.