

A 64-Patch CZ RAM Cartridge for \$15

Got more patches than money? Looking for some additional storage space?

\$15 and a little time is all it takes to add 64 more patches to your CZ-series synthesizer.

BY JULES RYCKEBUSCH

Memory—we all want more. I can remember way back when you could build an IMSAI 8080 computer for under \$1,000 that came with 256 bytes of memory! Now you can get an Atari ST with a Megabyte for about \$600.

So why does a memory cartridge for a CZ-101 cost \$50? Well, if you build it yourself, it will cost only about \$15.

When I started this project the hardest thing to find was the edge connector. Casio uses a 30-pin connector with 1/10th-inch pin spacings. Fortunately, I found a 60-pin connector (30 pins on either side) that is just the ticket. The circuit board used for the cartridge is a standard Radio Shack special.

Fig. 1 shows our circuit. IC1 and IC2 are 8K × 8 low-power static RAM chips, which gives us more memory than the synthesizer can address. To address the additional memory, S1 and S2 switch among four banks (two switches give four possible combinations), just like the way old timers did bank selection back in the '70s. Address line A11 on the CZ is worth noting (not to be confused with the A11

address lines on the RAM chips); Casio uses this to select between the two ICs. Initially I tried to switch this line, but for some reason this technique didn't work.

IC3 is also a low-power chip and provides three inverters. This is a CMOS chip, so all its inputs must connect to either ground or the positive supply. The resistors on the data and address lines provide protection to the synthesizer should anything go wrong (e.g., plugging the cartridge in backwards). Note that the double lines signifying the data bus and the address bus indicate that all the D0s are electrically connected, all the D1s are electrically connected, etc.

Diode D1 lets the synthesizer know that a cartridge is available. D2 and D3 "float" the battery when the cartridge is inserted, and therefore prevent the alkaline cells from charging (which is not a good idea, since charging alkaline batteries can cause them to explode). Battery B1 is two AAA cells in series, although a 2V lithium cell will also work.

CONSTRUCTION

The first step is to carefully drill out the two holes for S1 and S2 to 5/16-inch (Fig. 2). Now start wiring the edge connector; I

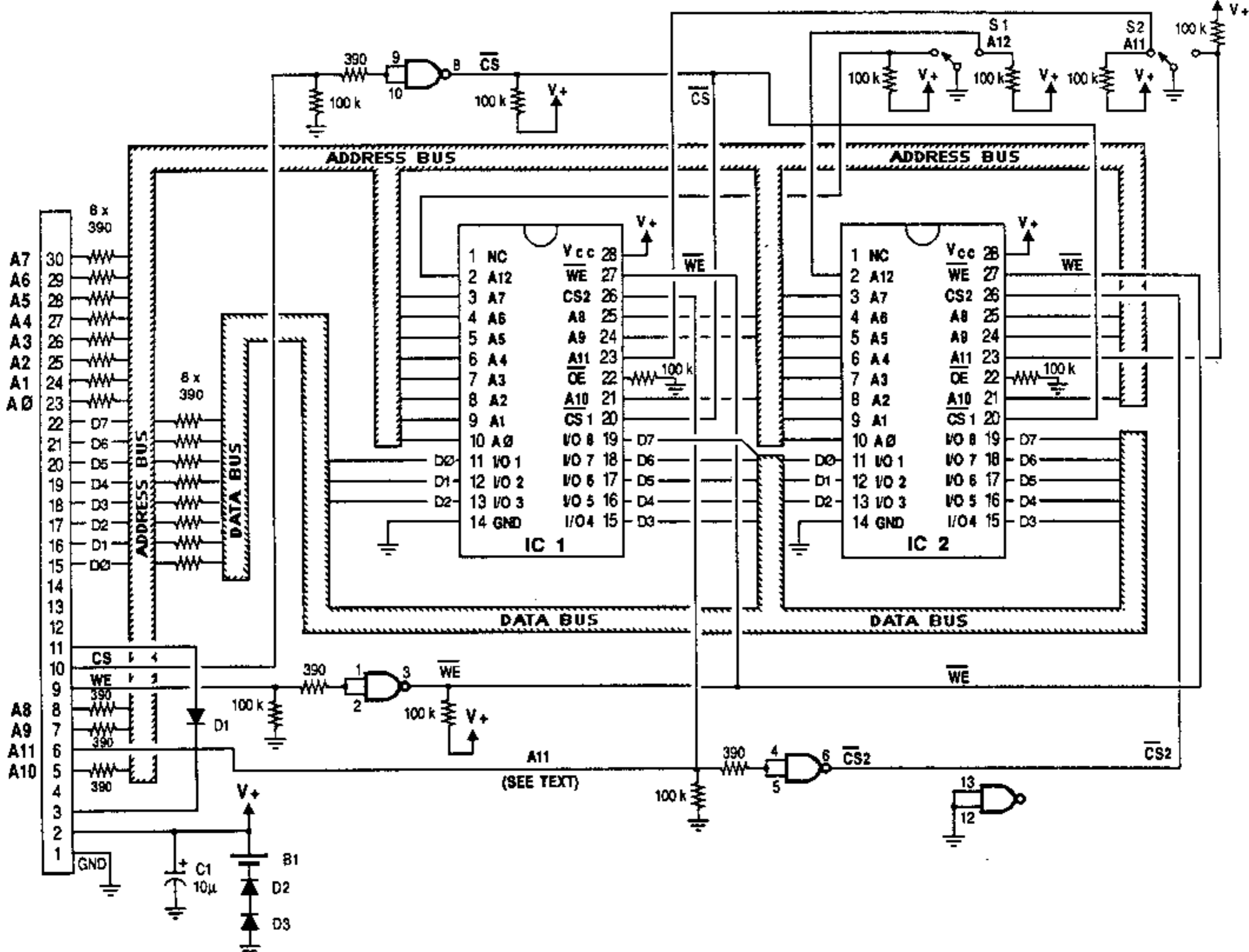


FIG. 1: Schematic diagram for the CZ RAM cartridge.

used wirewrap wire, but soldered it point to point (tweezers are a great help). With the back of the connector facing you, connect one-inch leads to the top row of the connector. Referring to Fig. 1, note that not all 30 pins are used. The best way I found to attach a wire is to strip 1/8 inch of insulation from a piece of wire, press

the bare wire into the slot of the connector, then lightly solder. This really isn't as hard as it sounds!

When all the leads are soldered to the connector, glue it to the edge of the circuit board (Fig. 2). Silicone seal is excellent for this. Mount the three IC sockets as shown, and check the bottom of the board for best positioning. Now comes the important part—the resistors. Fig. 3 shows the way these have to be installed so that the cartridge will fit. The diodes are next, followed by the battery (but don't glue the battery down yet). After all the wiring is finished, carefully insert the ICs. We are now ready for the "smoke test."

doesn't bind, and that no component sticks up too high. Also, make sure that you are catching the right pins, and not shifting the cartridge to the right or left. When satisfied that all is properly positioned, turn on the synthesizer. On a CZ-101 or CZ-1000, press the cartridge button; it should light. If it does not,

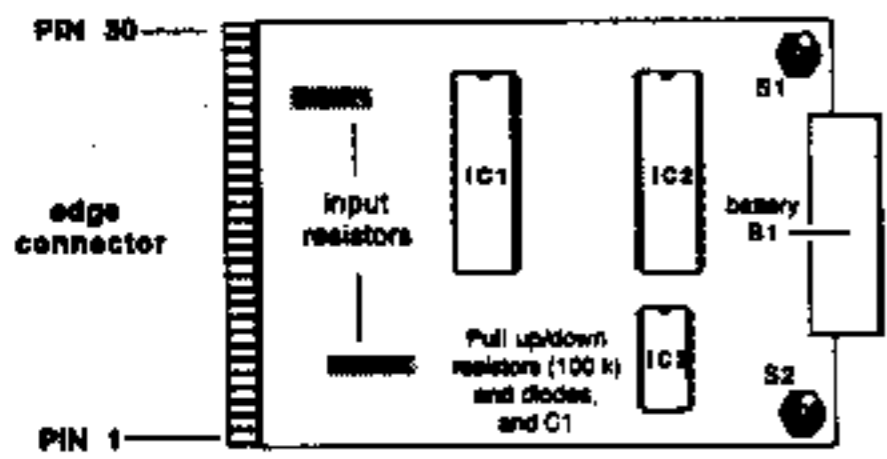


FIG. 2: RAM cartridge diagram. Note the locations of S1 and S2, as well as the edge connector.

TESTING

With the synthesizer off, cautiously insert the cartridge. Make sure the cartridge

PARTS LIST

- IC1, IC2 74HC00
- IC3 74HC00
- D1, D2, D3 Any small signal diode
- C1 10 µF
- (22) 390 kΩ resistors
- (11) 100 kΩ resistors
- 30-pin edge connector
- silicone sealant
- wirewrap wire

check that the cartridge is inserted correctly, that D1 is oriented properly, and that your wiring is correct. If the light is on, select a preset patch and attempt to load it into the cartridge. You should get an OK! from the CZ's display after following the usual commands to save a patch to the cartridge. If not, don't despair; go over your wiring. Check the saved patch by selecting another patch, then re-selecting the one stored in the cartridge. Make sure you test out all the banks.

For a CZ-3000 or 5000, try and save banks A and B into one of the cartridge banks. Now here is the bummer—if you try to load them back in, and there is a problem, the patches will be lost. But, life is tough all over. If you can, check the cartridge on a CZ-101 or 1000 first, or make sure you save your patches on a cartridge known to work before experimenting.

Now comes the really fun part. After turning off the synthesizer, remove the cartridge. Liberally coat the bottom of the circuit board with silicone sealant; the layer should be just thick enough to insulate the board and even out the bottom (a popsicle stick works great for applying the sealant). Glue the batteries on the top between the two toggle switches. When all of this mess dries, you are finished and can say "Hey! I built it myself." Have fun!

EM

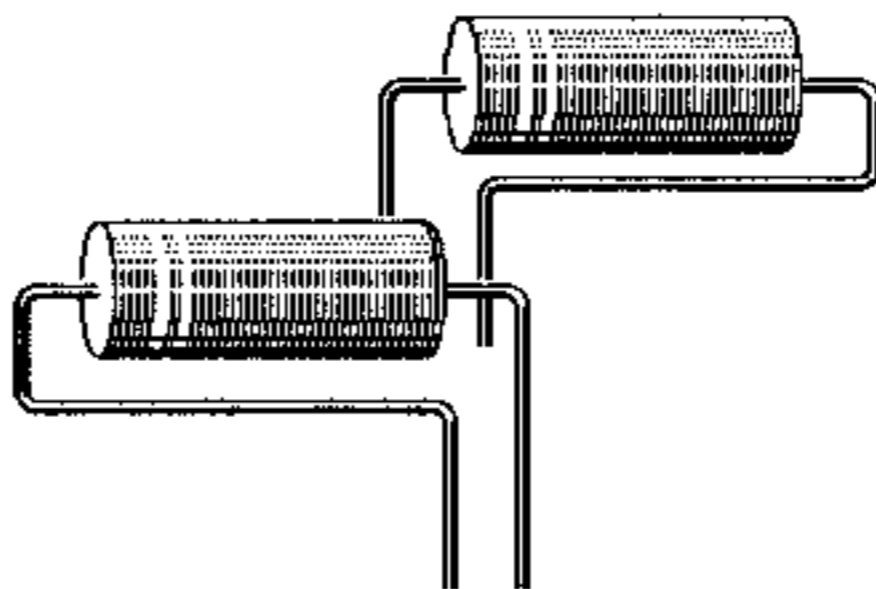


FIG. 3: How to mount the resistors.

FOR THE BEGINNER **Doing It Yourself**

A good way to learn about electronics, and save money at the same time, is to build some of your own equipment and accessories. While the CZ RAM cartridge is a fairly simple project, it should not be attempted unless you have some prior knowledge or experience in electronic construction. For a good guide on how to build electronic devices from scratch, we highly recommend *Electronic Projects for Musicians* by Craig Anderson (published by AMSCO; available through Mix Bookshelf, 6400 Hollis St. #12, Emeryville, CA 94608). Also, Heathkit (Hilltop Rd., St. Joseph, MI 49085; tel. (616) 983-6004) manufactures a line of easy-to-assemble kits, and offers beginning courses in electronics. Many of their kits are suitable for beginners and can serve as a painless introduction to electronic construction; write Heathkit for their current catalog (and tell them you saw it in EM).