

Installing new MultiTrak Code EPROM R. Grieb 3/11/14

Please read all of the directions first, to see what you will be doing, and decide exactly how you want to proceed.

By the way, if your Multi-Trak has not had the battery drain issue fixed, you may want to do that now, while it's apart. It's a very simple fix, and is clearly documented on the web.

First you will need to remove the two upper screws on either end, and all of the back panel screws. Keep track of where each screw goes, in case over the years someone has installed replacement screws and enlarged the holes. To separate the top electronics module from the case, you will need to unplug the keyboard cable. I suggest that you draw a line on the pcb and on the connector with a magic marker, as the connector is not keyed and can easily be plugged on backwards. It's also easy to offset it so that only one row is connected (to the wrong pins). Set the bottom part of the cabinet with the keyboard in it aside.

The Multi-Trak has three pc boards. The smaller one is part of the power supply, together with the external transformer. The larger board close to the front panel is the digital board. The CPU, RAM, and EPROM are on this board. On top of this board, mounted on standoffs, is the analog board. To perform the mod, you will need to first remove the analog board, and then remove the digital board and the power supply board as well, since those two are permanently connected together. You need to remove the digital board because some of the connection points are on the front (underneath) side of the board. Alternatively, you could solder wires directly to the pins of the combo custom chip, but I prefer not to do that. Replacing that chip would cost about \$30 incl S&H from Wine Country. It's also possible to remove only the digital board and attach the wires. Here's how it looks:

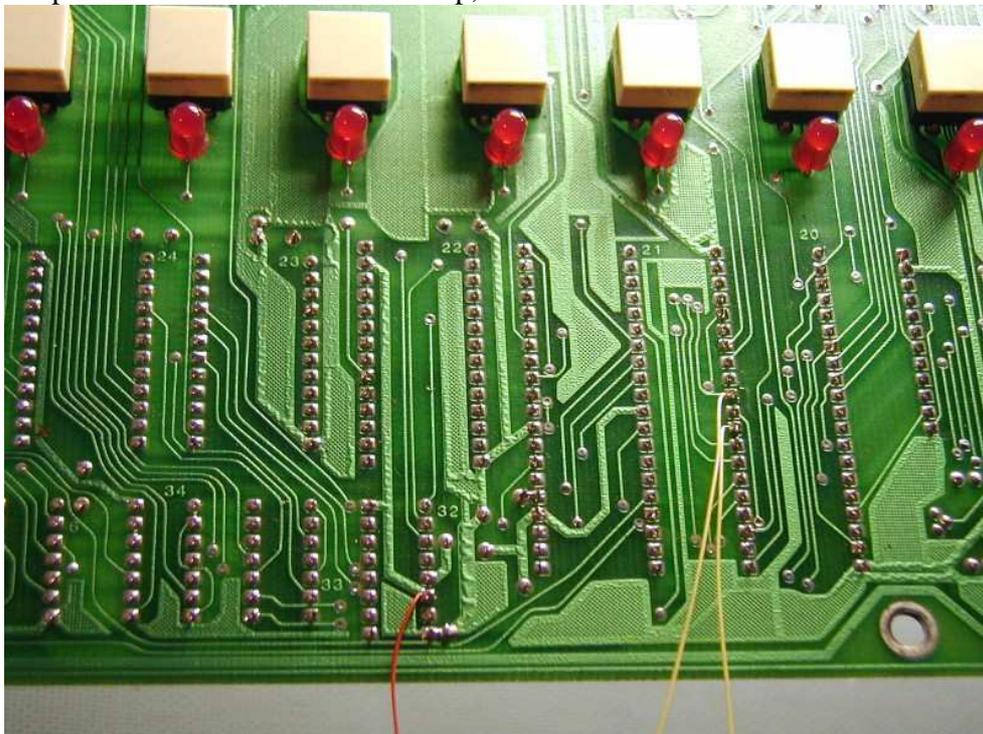


After I did it this way, I decided that probably removing both the digital board and the power supply board would have been easier. I will leave that up to you.

The first step is removing the analog board. There are two connectors, one at each end, which mate with headers on the digital board. There is also a Molex connector for power. Unplug that one first, being careful not to bump into the voltage regulator heat sink as you do it. It will take a fair amount of force to unplug that connector. Just pull it straight out. Now carefully remove all of the screws that hold the analog board to the standoffs. Most are #6 with lock-washers, and possibly insulating washers. Keep track of where the insulating washers were if you have any. Two of the screws are smaller (#4). These are close to the two connectors to the digital board. Note where they go. Once you have removed all of the screws, gently pull up on the analog board at both ends, near the two connectors, to unplug it from the digital board. Notice how the connectors mate with the headers on the digital board, as you will need to put it back later. Pull up evenly at both ends of the board to keep it more or less parallel with the digital board. Set the analog board aside.

Now it's time to unscrew and separate the digital board from the front panel. You will need to remove the front panel knobs first, by pulling them straight up, slowly. Keep track of where the standoffs were located. I marked the holes on the digital board that had standoffs to make this easier. Some standoffs may have insulating washers under them. If so, note their position. If you are also removing the power supply board, take those screws out as well. Try not to bend the flex cable between the two boards any more than necessary while you are working on the digital board. Once you have the two boards loose, remove them carefully from the front panel and set the panel aside.

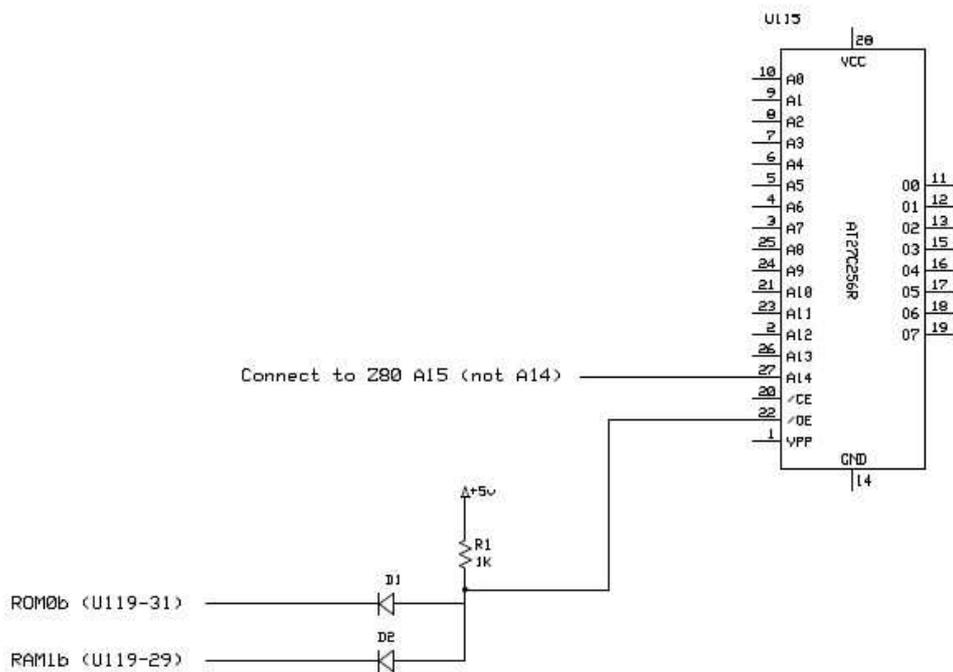
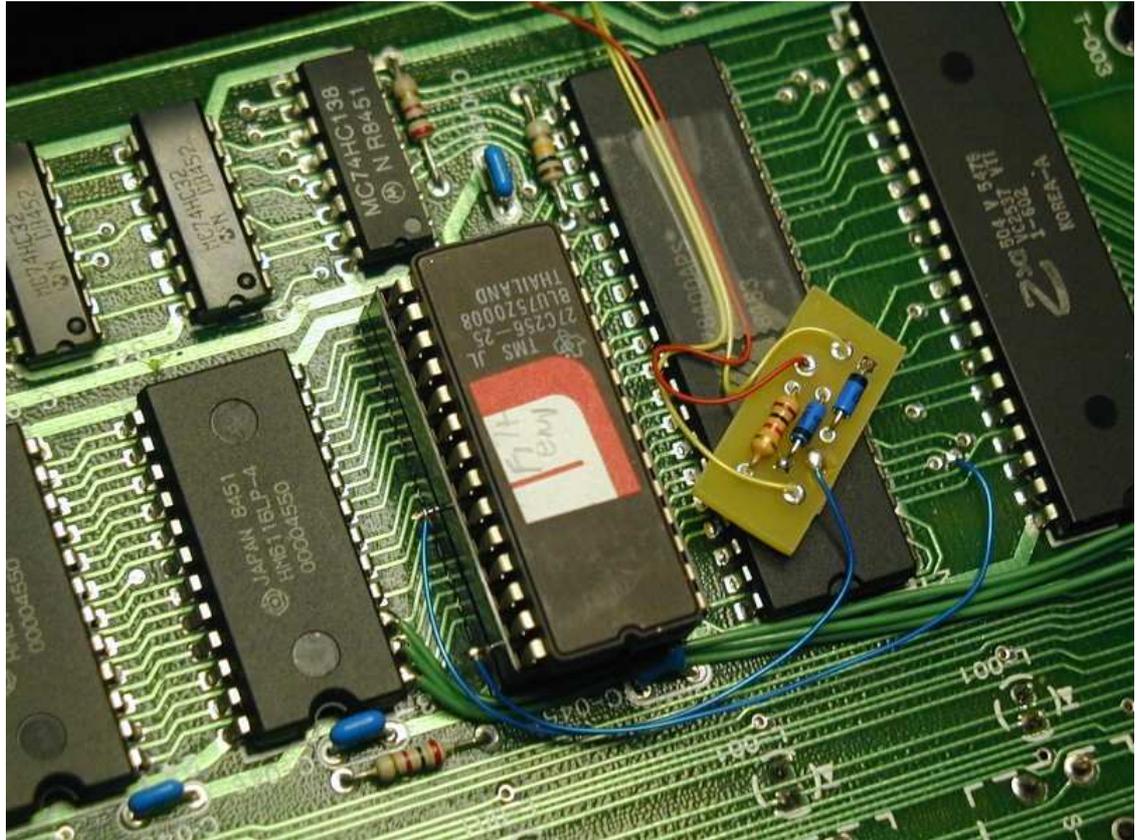
This picture shows the three wire connection points on the front side of the digital board. They are pins 29 and 31 of the combo chip, and +5 volts.



Carefully solder wires to these three points, keeping track of which color wire goes where. (Your wire colors probably won't match the photo) The (insulated) lengths of the wires are: +5V wire 3", Pin 31 wire 4.5", Pin 29 wire 4". Trim the wires so that only about 1/8" is exposed at one end. Put a little extra solder on those pins first, then reheat them and stick the wire end into the solder. Make sure the wire only touches the pin that you want it to. Bend the wires so that they look like the photo. I don't think it's necessary to glue the wire or tape it to the front of the pc bd. Now you can turn the board over, and if you are confident of your work, you can re-install the front two pcbs at this point. (See directions below)

It's easy to locate the EPROM, as it is in a socket, and will probably have a label on it saying SCI 1985 or something similar. The original part was a 27128. Before you remove the EPROM, prepare a place to store it. If you have a small flat piece of styrofoam, you can wrap it with a layer of aluminum foil to make it conductive, and then stick the EPROM leads into that. The foil will short all of the leads together and protect the chip from static electricity damage, in case you ever want to re-install it. You can remove the EPROM easily by sliding a flat screwdriver blade under the chip, between it and the IC socket. Then pry up gently. As soon as the chip starts to come up at one end, slide the screwdriver in further so that you can pry up at the other end as well. You can use a finger on the top of the chip to help it stay level as it comes up, so that you don't bend the pins. Try not to touch the pins, especially when the chip is free of the socket. Hold the chip with a finger on each end, and not touching the pins, to prevent static damage. You can also grab the chip with needle-nose pliers if you want. Place the chip directly into the foam or wherever you plan to store it long-term. Do not put it down on a non-conductive surface. Note that you have not cut any traces, so if you decide to put back the SCI EPROM at any point you just need to remove the wires and the extra IC socket.

Install the two diodes and the 1K resistor on the small pc bd. The diodes must be installed with the line end positioned as shown in the photograph below. If they are reversed, the circuit will not work. Make sure the other pc bd eyelets are as shown in the photo before you solder the diodes. Now attach the three wires from the front of the digital board to this pc bd. The two chip selects can be interchanged. The +5V connection must go to the non-diode end of the resistor. Now you need to attach one of the remaining wires to the output of the diode-OR on the pc bd, and the other wire to an eyelet on the Multi-Trak pc bd. This photo shows the position of that eyelet and of the diodes. The schematic shows the diode OR circuit.



Since the new EPROM requires two pins to be connected differently from how the digital board connects them, we need to bend out those pins on our additional IC socket, so they do not connect to the IC socket mounted on the PCB. The pins that need to be bent out are 27 and 22. Double-check that you have the correct ones before you bend them out. You may also want to put a little piece of tape under those pins on top of the SCI IC socket, just to be sure that they cannot touch. Not sure this is necessary. Once you have bent out the two pins, solder the wires to them. You can wrap the wire around the pin to help it stay in place while you solder it. Pin 27 connects to the PCB eyelet. This is address A15 of the Z80. Pin 22 connects to the OR'd chip select from the diode board. Plug the new IC socket into the one on the digital board, and carefully plug the new EPROM into it, with the notch as shown in the photo. I fastened the diode board to the top of the Z80 with double-stick foam. Also, I would suggest taping the three wires from the front side of the PCB to the top of the Z80 as shown, to protect them. AWG 30 wire wrap wire is not designed for lots of flexing. If you move it enough, it will snap right where it is soldered.

With the extra socket, the EPROM sits higher off of the digital board, and may touch the bottom of the analog board. It does on my unit. I think this is OK. Once you have the mod looking like the photo and are happy with it, re-install the digital board and the power supply board onto the front panel if you didn't do that before. Make sure all of the switch caps are correctly lined up with the holes before you screw the boards in place. Once the two front boards are re-installed, carefully line the connectors on the analog board up with the headers on the digital board. On my unit, it seems to work better to push the single-row header on a little bit before lining up the dual-row header. It's important to get both of these lined up properly before you push down to re-seat the analog board. Once you feel that it's properly re-connected and down on the standoffs, re-install the screws, including the two #4 ones that are near the connectors. You can sight through the holes for these two screws to see if the connectors are lined up correctly. If the connector is offset by one pin, the screw hole won't line up correctly. Plug the Molex power connector onto the analog board last, after the screws are in place. Re-install the front panel knobs if you haven't already done so.

Re-connect the keyboard cable, making sure that both rows of pins are connected and it's not offset. Re-install the electronics assembly into the bottom case, and replace the two end screws and the back panel ones.

That's it! On my site there is a separate document that talks about using the new features.