**IN MAV'S WORKSHOP**

**FreHD AUTO BOOT EPROM PART 4:**

**HOW TO INSTALL IT ON THE MODEL 4P PORTABLE COMPUTER**

by

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In previous issues of TRS8Bit I've discussed how to install the FreHD Auto-boot Eprom into a TRS-80 Model III and Model 4NGA (easy - just remove an old Rom chip and replace it with a newly programmed Eprom), and a Model I (difficult - requires soldering, and a switch as well as 6 wires), and last time how to install it on the 4GA and 4D. This article explains how to add the FreHD auto boot Eprom to a Model 4P Portable Computer (cat. no. 26-1080 and 26-1080A). It's more difficult that adding the Eprom to the Model III and 4NGA but less difficult than adding one to a Model I, 4GA or 4D. Soldering is required so as I always say, if you are not confident in soldering, get someone else who is skilled to undertake this modification for you. Since no traces need to be cut the modification is easily reversible if things go wrong.

**Items required:**

Eprom: 2732

Wires: Grey 3cm and 15cm

Firstly you need to program the Eprom with this BIN file from the Downloads page on my web site:

<http://ianmav.customer.netspace.net.au/downloads/model4p_FIX-I_rom.bin>

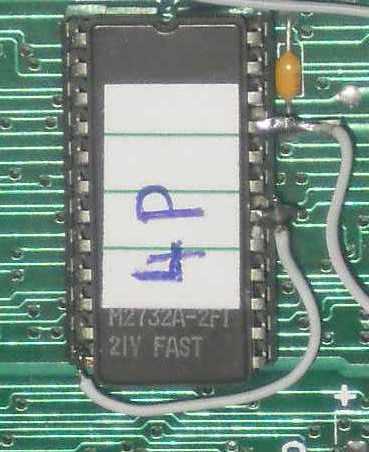
Once programmed you need to do the following work to prepare the Eprom for installation in your computer:

Bend out pin 18 and solder the short wire to it.

Solder the other end of that wire to pin 12 near the top where it enters the chip, that way the pin can still go into the IC socket.

Bend out pin 21 and solder the long wire to it.

It should look like this:

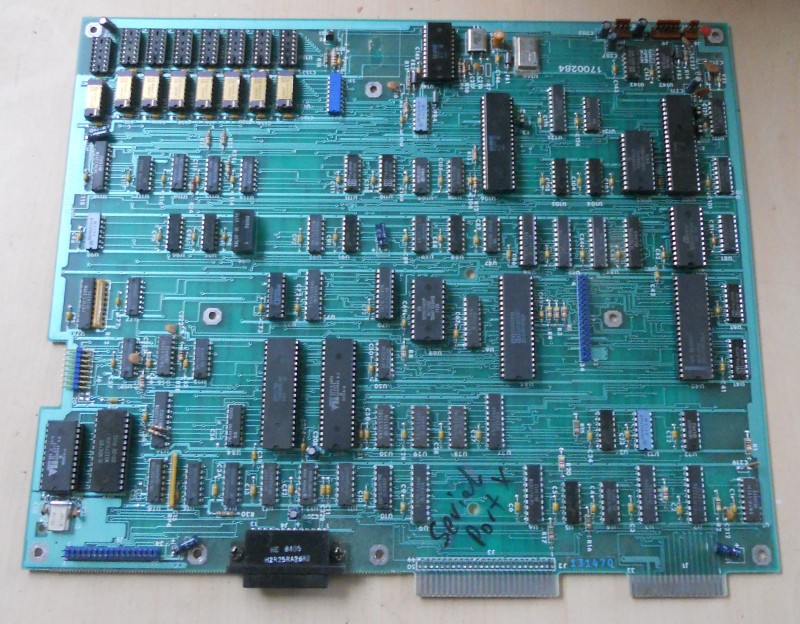


*Picture: pin 18 connects to pin 12 and pin 18 goes through a PCB hole and is soldered under the motherboard*

**Installing the Eprom:**

You will need to remove the motherboard from your 4P and this is quite a job due to the rugged nature of the design of the 4P, it's designed to be more sturdily than it's desk-bound brothers. The outer case it opened by removing the four white screws (2 either side) of the 4P case and then two more under the carry-handle. The case just slips off. Once inside you need to loosen the back black cover, and then the motherboard tray, which its held in place by eight screws (4 per side). After you unplug the disk drive cable you can fold the motherboard out.

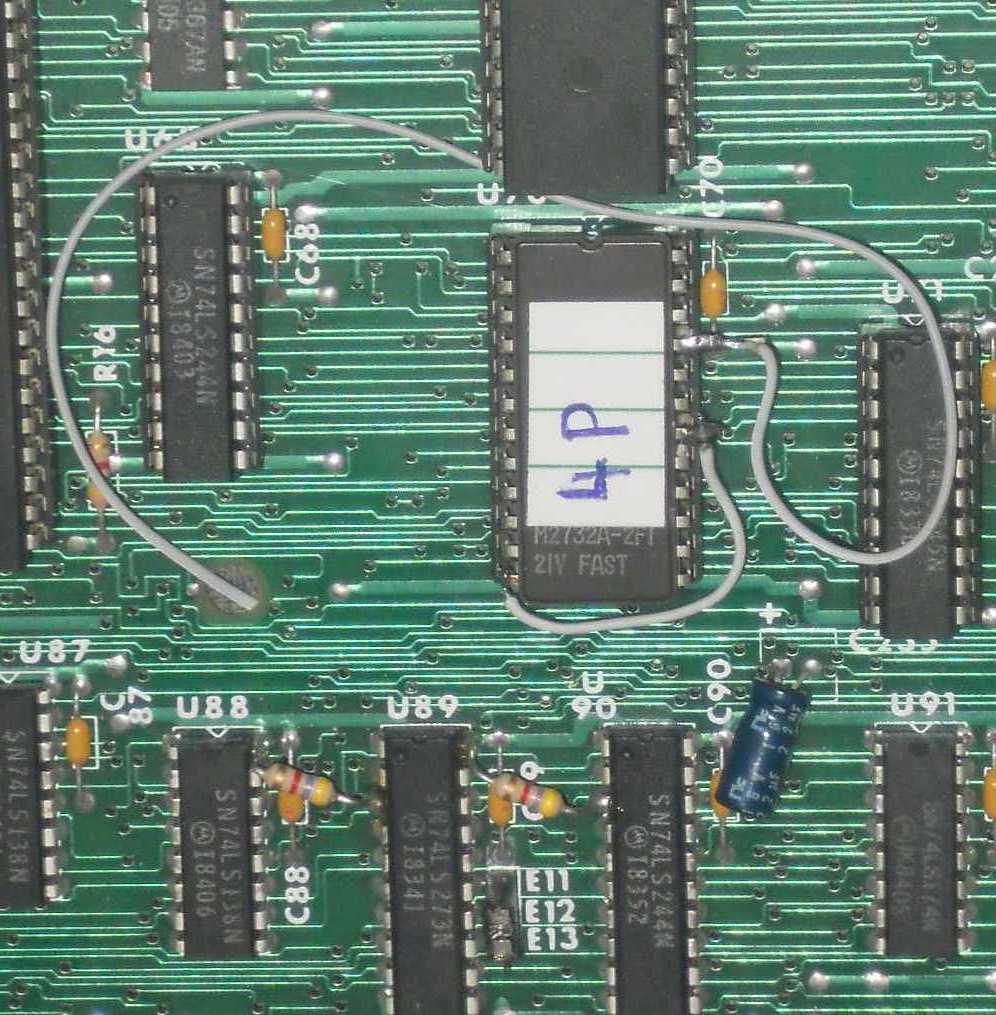
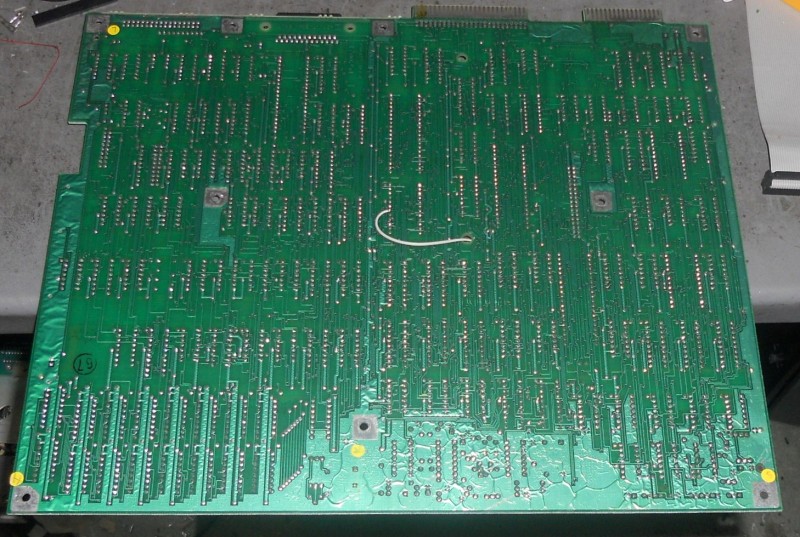
Since a wire needs to be soldered to the underside of the motherboard, you need to disconnect the motherboard connections (video, power, reset, ground) which will remove the motherboard from the rest of the system. Now you can undo the screws which hold the motherboard to the metal tray. When you remove the motherboard from the metal tray you can unplug the keyboard. Your motherboard looks like this:



*Picture: 4P Gate-Array motherboard, 4P Non-Gate Array motherboard is similar.*

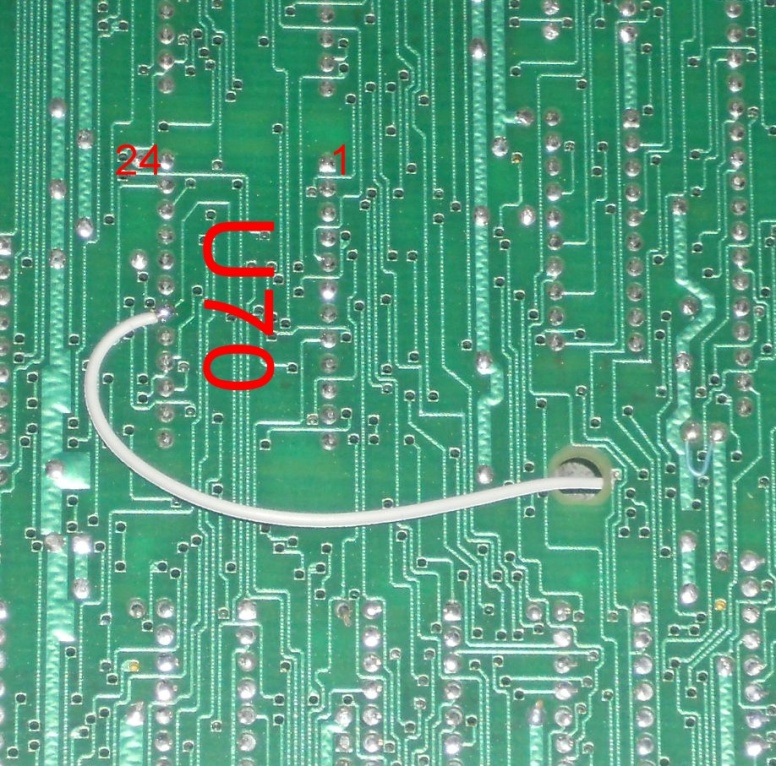
**On the 4P Non-gate array (26-1080)** the chip you are looking for is in the centre of the motherboard marked U70 and this may well look like the Eprom you just prepared with the wires. If so, life is easy, unsolder the wire which runs to pin 21 and install the Eprom into U70 socket. You are done.

If U70 has a regular 24-pin Rom, then you need to remove it and install the newly prepared Erpom into U70 socket. The wire attached to pin 21 needs to go through the hole in the motherboard right above U88 and it gets soldered to pin 18 of U70 socket. (Remember how pin 18 of the 2732 Eprom was bent out so it didn't go into the socket? The aim here is to connect pin 21 of the Eprom to where pin 18 would have gone.)

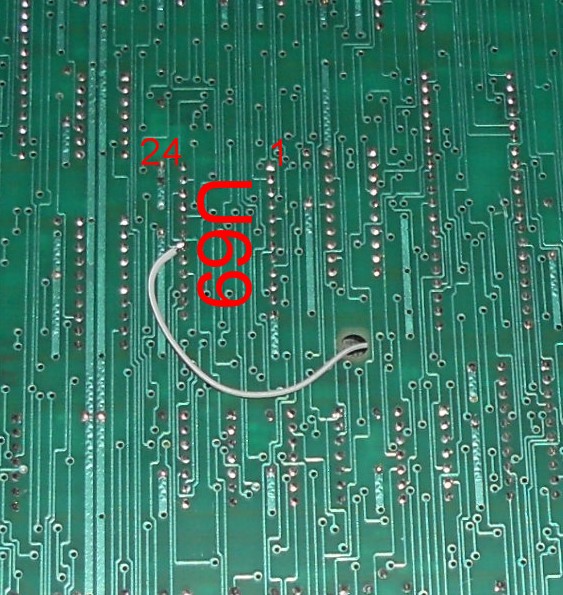
*Pictures: wire goes through hole near U88, and comes out the under the motherboard*

Since the motherboard picture above is a little hard to see, here is a close-up where the wire gets soldered (U70 pin 18):



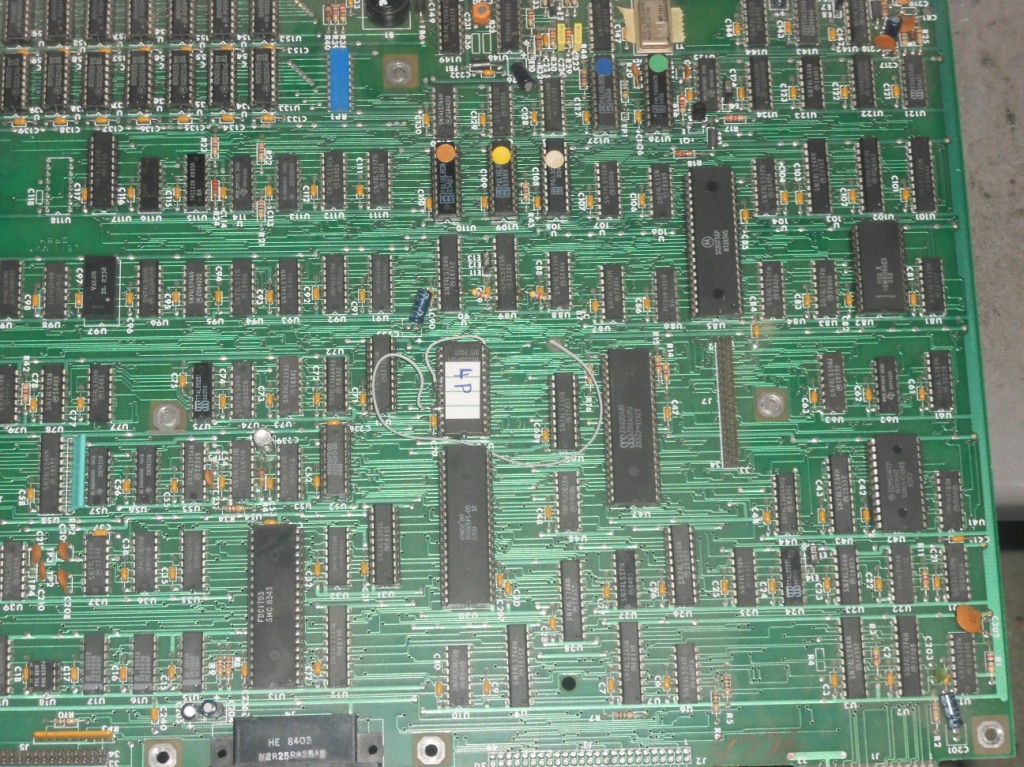
**On the 4P Gate Array (26-1080A)** is a similar process. By the time the 4PGA was released the Eprom with the wires was gone and a Rom was installed in it's place, this time in U69 but its still easy to find right in the middle of the motherboard.

U69 has a regular 24-pin Rom, and you need to remove it and install the newly prepared Erpom into U69 socket. The wire attached to pin 21 needs to go through the hole in the motherboard right above U88 and it gets soldered to pin 18 of U69 socket. (Remember how pin 18 of the 2732 Eprom was bent out so it didn't go into the socket? The aim here, again, is to connect pin 21 of the Eprom to where pin 18 would have gone.)



*Picture: underside of the 4PGA motherboard shows where the wire goes (U69 pin 18)*

Fitted it looks like this:

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**Reassembly and Testing:**

Putting the computer back together is essentially a reversal of the steps used to disassemble it taking note of the following:

1. When you put the motherboard back on the metal holding tray, you need to plug in the keyboard before you install the screws which hold it to the tray.

2. The power, video, reset plugs and ground tag at the front of the motherboard can be difficult to get connected so take your time and use long-nose pliers.

3. Once the motherboard tray assembly is re-installed don't forget to plug in the disk drive data-cable.

Before connecting your FreHD, turn the 4P on and observe the three language boot error message comes up as normal, then test a few of your favourite floppy disks to make sure the disk drives work properly.

You can now connect your FreHD noting the following:

1. The data cable exits down from the 50-way I/O bus on the Model 4P. It doesn't exit upwards even if you plan to sit your FreHD on top of the 4P (which most people do). The red-stripe on the data cable is on the printer-port side not the RS232 port side.

2. Power your FreHD up before the 4P and wait for the single flash of the green LED before powering up your 4P.

3. You will find that the FreHD auto-boot images for the Model 4 work: LS-DOS 6.3.1 and CP/M 2.2, but Model III mode images don't and won't appear on the FreHD boot menu unless you have a copy of modela/iii ROM image in the root directory of the SD card. Once that image is in place all Model III mode auto-boot images become available. If you need assistance to get modela/iii copied over to your SD card, shoot me an email.

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