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256K MIO Upgraded to 1 MEG.  
Using 1 MEG DRAMs  
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Written with ATARIWRITER PLUS and SpartaDOS X.

The first thing I have to tell you is, Don't Do it! Talk to ICD and have them Upgrade your MIO for you. The price of RAMs at the time of this writing is coming down almost weekly. Also, let's look at what you will need to do this project.

1. You Must have the tools and be VERY experienced with soldering and working with 30 ga. wire. This is NOT a job for the Average Kit Builder. Wiring up the board for the RAM chip sockets will take you well over 3 hours, IF you know what you are doing. Still game are you? ICD can do it for you with a lot fewer headaches! It was just the challenge that made me do it. If so, read on.
2. You MUST have the ROM from ICD for a 1 Meg MIO. It is marked as "v 1.1i MIO", "1987 ICD,Inc".
3. 8-1MegBit DRAM's. At the time of this writing, I just saw an ad for \$18.00 each. Also, you will need 8-18 Pin chip sockets, the GOOD ones! The 'Machined' ones made by Augat or Gerry. Mine cost me \$1.05 each at a surplus store. Why these? Because the pins have a shoulder that sits on top of the board, holding the sockets up off the board. This extra pin length is needed for the multiple wires. The Perf-board has to be drilled out so each socket sits tight to the board, thus, giving that 'little' extra length. Still with me? Want to go on? Then here is the complete parts list:

8 - 1 MegBit DRAMs (DIL's or DIP's as they are called.)  
(I used Motorola MCM511000-12)  
8 - 18 Pin Sockets  
1 - 74LS158  
1 - 74LS00  
1 - 74LS08  
1 - 33 ohm, 1/4 watt resistor  
1 piece of Perf-board cut to 4 1/2" X 1 3/4"  
Approx. 15-20 feet of insulated 30 ga. wire.  
A 5 inch piece of Clear, 2 inch wide, wrapping tape.  
Glue. (Silicon)

#### TOOLS:

Very Good Soldering Station.  
Extra Very Good Solder Sucker!  
(Lots of experience with this!)  
Tweezers  
Small needlenose pliers  
Small side cutters  
Small drill and drill bit (1/16 inch?)  
Very Good 30 ga. wire stripper.  
Large Coffee Pot and 3 lb can of Coffee. Cream and sugar to taste.  
Asiprin and any good nerve medicine to steady the hands.  
TIME. I didn't do it in one setting so I don't know how long it will take. I'd guess from 8 to 12 hours.

Still with me? We'll do one of the harder parts first. Building the Perf-board up with the Sockets.

Lay out the sockets on the Perf-board so there is one unused row of holes between each socket. Slightly shift (One row) the pin 1 end of the sockets towards the edge of the board. When everything is correct, mark and drill ALL the holes that the Sockets use.

Next, glue the sockets onto the board. I used Silicon glue very sparingly, between the rows of pins and pressed the sockets into place. Keep it off the pins. Let it dry and have a cup of coffee. Think about what you are doing. Is it worth it?

Next, let's wire the sockets. Here's what has to be done. ALL the pins except pin 1 and 17 have to connect together in a 'BUS'. That is, Socket 1, pin 2, to Socket 2, pin 2, to Socket 3, pin 2, etc, etc. This is 16 pins times 8 Sockets equal 128 connection points. This is the easiest method I found to do this: Take 8 inches of 30 ga wire. Strip approx 2-3 inches of insulation from one end. Starting at either end on the bottom side of the board, make the first connection and solder it. Not too much solder so as to 'Glob' it! On this same end of the wire, strip approx .4 to 1/2 inch of insulation and push it down against the pin you just soldered. Route the wire to the next socket, same pin #, and make one wrap around it, keeping the wire down against the board. Solder this pin and keep the wire as low on the pin as possible. Now, strip another piece of insulation and push it down against this pin and continue on across the board until all 8 sockets have the same pin connected. Cut the wire off at the far end. If you think you might be short of wire later, better save the ends. Repeat this procedure for all pins Except pins 1 and 17.

Let's see. How long has it been? Three, Four hours now? OK. Now pins 1 and 17. Cut a 4 inch piece of wire and strip off approx 1/4 inch of insulation. Connect this end to pin 17 and solder. Strip a 1/4 inch piece of insulation and push it against the pin just as you did before, only now, route it to pin 1 of the same chip, wrap and solder. Take the extra wire and run it through the hole next to pin 1 to the top side of the board. Carefull you don't break it. Repeat this for all 8 sockets. For your information, these 2 pins are the Data In and Data Out of the RAMs.

For purposes of the balance of this project, place the board so the sockets are UP and Pin # 1 and 18 are away from you. RAM #1 is on the left and RAM #8 is on the right. Now you have 14 - 4 inch wires to connect and route up through the board. Each of these wires will connect to only one point. Here is the list:

RAM 1,	pin 5	(A0)
" 2,	" 6	(A1)
" 3,	" 7	(A2)
" 4,	" 8	(A3)
" 5,	" 10	(A4)
" 6,	" 11	(A5)
" 7,	" 12	(A6)
" 8,	" 13	(A7)
" 8,	" 14	(A8)
" 4,	" 3	(RAS)
" 1,	" 2	(R/W)
" 1,	" 9	(VCC)
" 1,	" 18	(GRD)
" 4,	" 16	(CAS)

The last wires on this board: Install the 33 ohm resistor one hole up from RAM 4, pins 9 and 10, across the end of the socket. Run a wire from RAM 4, pin 15 to the nearest end of the resistor and from the other end, connect a 4 inch wire, routing it up through the board. This is the added Address bit, A9. The only pin without a external wire on it should be pin 4. This is a 'Test Function' input and is not used. It should be left open. For those of you that know TTL logic, It takes a 'Super Vcc' to enable it (= or Greater then, but not to exceed 10.5 volts).

Now is the time to inspect your handiwork VERY carefully. Put on another pot of coffee, say a few prayers, and reconsider going on with this foolishness. Boot up your XL/XE and MIO and use it for awhile. Might be the last time! Pop a few asprin and some of that nerve medicine because next we are going to tear into the MIO! Do IT! Open it up, 4 screws on the bottom and remove the logic board, 4 more screws. Remove the Aluminum heat sink plate from the voltage regulator and put everything aside except the logic board. Last chance to back out! One miswire and you've had it! Is that Great Programmer in the Sky smiling down at you?

Let's look at those RAMs. That's what is known as a 'ZIP' package. Zig-Zag, single Inline Package, staggered pins. With the connector cable toward you, pin 1 is the furthest away from you and on the left. All ODD numbered pins are on the left and the EVEN on the right. REMEMBER THIS! In fact, ALL pin 1's are away from you and on the left side, even the Perf-board will be installed as such.

You need a Very Good Solder Sucker now. Carefully Remove all the RAM's. If you don't know where they are located, you shouldn't even be doing this! Eight of them, and don't break any foils. Also, DON'T use Wicking to remove the solder. You'll be lifting and/or breaking foils and that's a no-no. Got the 8 RAMs out? Now, remove U22, a 74LS139 chip. You won't be needing it anymore.

Take the 74LS158 chip. Bend up pins 1-7, 9-12, and 15 and cut most of the narrow part of the bent up pins off. Install it in U22, observing correct pin # 1 position. Pins 8, 13, 14, and 16 should be soldered in the Via's. Take the 74LS08 chip and bend up pins 2-6, 9-13. Shorten these pins as you did the 'LS158. Also, fit the chip over U21 and make sure it sits on the top of it. If not, nip a little off the 4 pins still bent down. Don't solder yet! Only pin 7 and 14 get soldered to their respective pin of U21. Now you can solder these 2 pins. Bend up pins 1 and 8 with the others.

Take the 74LS00 chip and do the same as above, only it will be mounted on top of U8.

From now on we'll call these chips TU21 and TU8 (Top of U21, U8! Neat, huh!). Now for some short, bare jumpers. Solder as you go:

TU8-1 to 2; TU21-9 to 10; TU21-12 to 13.  
Keep the following jumpers reasonably short and low to the board:  
U22-lifted pin 15 to any GRD.  
U22-lifted pin 12 to TU8-1  
U22-lifted pin 1 to TU8-8  
U22-Via pin 1 to TU21-13  
U22-Via pin 15 to TU21-10  
TU8-9 to U20-9  
TU8-10 to U10-13

(Note: 'Via' is the pad on the board where the pin use to go to.)  
Coffee pot and medicine time! Also, you might want to go outside and kick a few garbage cans around for awhile. Helps vent frustrations. That 'Great' programer in the Sky is really getting a chuckle out of this. He wasn't smiling at you. He was laughing!

The FINAL wiring List. Connecting the Perf-board to the MIO logic board. All of these points on the Perf board are wires you already connected. Allow enough wire for the board to rest on top of them when you are finished. Also, Cut any excess wire from the bottom of the Logic board as you go. These forgotten pig-tails can really do a job on you.

First, place a piece of 2 inch wide, clear wrapping tape over the complete RAM area of the MIO board. When you connect a wire to a Via, just a touch of the soldering iron will clear a hole for the wire and solder.

RAM	PIN	
1	5	to U31-9
2	6	to U33-11
3	7	to U35-10
4	8	to U37-16
5	10	to U40-15
6	11	to U43-14
7	12	to U44-1
8	13	to U46-13
8	14	to **TU8-3**
4	15 (Res)	to U37-5
8	1	to U46-6
7	1	to U45-6
6	1	to U44-6
5	1	to U43-6
4	1	to U35-6
3	1	to U36-6
2	1	to U37-6
1	1	to U38-6
1	2	to U31-7
1	9	to U31-12 (Vcc)
1	18	to U31-4 (GRD)
4	16	to **TU21-11**
4	3	to **TU21-8**

Any loose wires hanging around? There shouldn't be! Go over your work very carefully, looking for solder bridges, pigtails, loose wire clippings laying around. Be very carefull with the Perf-board. The wires will break from the main logic board VERY easily.

If you noticed, the power and GRD are swapped from the normal TTL pins. This is correct. They are made to work with ECL logic which is like this. Also, if you have any pin-outs of the RAMs, you'll notice that I swapped the old Address bit A8 and the new Address bit A9, around. This because the MIO A8 doesn't have any 'Refresh switching' comming through it and Adrs A9 does. This was one of my biggest problems when I was troubleshooting the original Mod. I had Spec. sheets on the RAMs and it said that A6, pin 1, wasn't used for Refresh. So when ICD said they used a special RAM chip they're correct. Internally, pin #1 and 5 have been swapped! Anyway, on the 1 Meg RAMs, it's A9 that isn't used for Refresh.

That's it for the wire changes. Install your 1 Meg RAMs and swap the ROM for the 'v 1.1m MIO' one. Reassemble the MIO but I wouldn't put the top on just yet, nor would I put the printer or modem cable on. Give it a shot before you do that. It's an awful lot of wires and very easy to put a wire in the wrong hole.

The date at the top of this article is when I finally got this change to work. Three of the 4 'LS08 gates used are strickly to keep the same timing (delays). If I had cut some foils and added a few more wires, I could have done a logic reduction on the MIO, but, without the full schematics, I didn't want to take a chance. There are 5 logic elements used on A8 that could have be eliminated and A8 run through the 'LS158 that I had to add for A9. Even then, only half the chip would be used. I though about it, but why add more wires? Well, I'm NOT going to release this article for a few months. Let's just say that I think a LOT of ICD and their products and want them to continue with their GREAT support for the ATARI 8 and 16 bitters. I did this Mod because, 'It was there'. A Challenge! And someone said 'It couldn't be done'. Don't tell me that! Tell me WHY and/or how difficult it would be and I might reconsider.

Now that it's finished and working, I'm going to go back to that 512K XL mod I was looking at. How about going to 1 Meg using 1 Meg DRAM's? A plug-in PC board to fit into the 8 RAM sockets and reconfigure to 18 Pin sockets. Only one external wire. Also, The RAM spacing on the XL matches the XE. Just need the sockets on the XE. Another plug in board to replace the PIA chip with the PIA chip plugged into it, could handle the balance of the logic. Just a few wires would have to come off of this board. A switch in the rear for 1MEG (No BASIC) and 1/2 MEG (with BASIC). If I did it, would I get any Ramdisk support for it? Hummm - Price of 1 Meg RAMs is down to \$18.00 each today. How low will they go?

I can be contacted on the SPACE BBS, (612)-784-9667. 3,12,2400. 130XE, 1 MEG MIO and 10 MEG HD. Running BBS EXPRESS! PRO. Also, GEnie and CServe, but I only get on them once or twice a month.

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