

MM ONE The MM/1 FAQ : Part 2 - Hardware

Update History:

02/28/96 seielstad html-ified.
07/01/95 seielstad split from faq.
06/29/95 seielstad improved some answers.
03/09/95 seielstad Added numerous questions.
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Q. What's on the CPU Board?

(from Andrzej Kotanski)

The chip list is the list of all the IC's and jumpers on the boards. The first column is the chip name (like U3), usually printed on the board, second column is the chip type (read off from my MM/1) and the last column is the comment describing the function.

[note: I updated some of the pinouts from the "Installing your MM/1 Extended kit" - els]

1. CPU Board:

U1	SCC 66470	VSC
U2-U9	M5 142561-80R	RAM
U10	PAL 16L8 ALC	PAL
U11	74 HC 05 N	hex inverter
U12	WD 37C65	floppy controller
U13	MAX 233 CPP	bus/line transceiver /t0
U14	74 HC 138	3 to 8 decod/demult
U15	74 HC 04 N	hex inverter
U16	OSC 4.9152 MHz	oscillator for CPU
U17	74 HC 138 N	3-bit decoder/demult
U18	74 HC 74 AN	dual D-type
U19	74 HC 32 AN	quad OR
U20	68070	microprocessor
U21	27C512	ROM
U22	27C512	ROM
U23	74 HC 74 AN	dual D-type
U24	74 LS 299	8-bit shift reg
U25	MC 68901	MFP /t1
U26	74 HCT 06 E	hex inverter
U53	BT 478	palette controller

2. CPU Board Jumpers/Connectors

P1	DB-9 video	p1 = Ground p2 = Ground p3 = Red p4 = Green p5 = Blue p6 = No Connection p7 = Sound p8 = Horizontal Sync. p9 = Vertical Sync.
P2	DB-9 /t0	
P3	power/reset	
P4	VSC -> palette	
P5	sound	p1 = sound-out, p2=ground
P6	DIN keyboard	p1 = Keyboard Clock p2 = Keyboard Data p3 = RESET*

		p4 = Ground
		p5 = +5 volts
P7	memory size	p1-p3 & p2-p4 = Set for 3 megabytes unjumpered = Set for 1 Megabyte
P8	sync logic	sets VSYNC* and HSYNC* to high or low
P9	/t1	p1 = tx p2 = rx p5 = +5 volts p6 = Ground
P10	68901 XTAL freq	
P11	backplane conn.	
P12	ROM mon/CTS for /t1	p1-p2 = toggle ROM Monitor p3-p4 = set CTS* on /t1 p5-p6 = set Master/Slave mode on I2C bus.
P13	floppy pin 2	sets pin 2 of floppy drive high or low
P14	floppy disk connector	
P15	IIC	p1 = sda (serial data) p2 = scl (serial clock)
P16	palette VAA,SETUP	

Q. What's on the I/O Board

(from Andrzej Kotanski)

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[note: I updated some of the pinouts from the "Installing your MM/1 Extended kit" - els]

1. I/O Board:

U1	PAL 22 V 10 APC	refresh PAL
U2	74 HC 4040 N	binary counter
U3-U4	SIMM	SIMM socket
U5	74 AC 257 PC	quad 2 to 1 select
U6	74 AC 257 PC	quad 2 to 1 select
U7	74 AC 257 PC	quad 2 to 1 select
U8	MAX 233 CPP	bus/line transceiver /t2
U9	MC 68901	MFP /t2
U10	WD 33C93 A	SCSI controller
U11	AD 7569 KN	analog I/O system
U12	AD 7569 KN	analog I/O system
U13	PAL 16L8 ANS	sound PAL
U14	OSC 8 MHz	oscillator for SCSI
U15		
U16	74 HC 05 N	hex inv
U17	74 HCV 04 N	hex inv
U18	PAL 18L8 ANC	device address PAL
U19	74 HC 32 N	quad OR
U20	74 HC 74 AN	dual D-type
U21	MC 68230	PIT /p /p1
U22	MC 14053 BCF	analog multiplexer
U23	MC 68681	DUART /t3 /t4
U24	DS 1287	RT clock
U25	74 HC 32 N	quad OR
U26	74 HC 00	quad NAND
U27	79 L 05	-5V regulator

2. I/O Board Jumpers/Connectors

P1	/p	p1 = STROBE* p2 = busy p3 = d0
----	----	--------------------------------------

		p5 = d1
		p7 = d2
		p9 = d3
		p11= d4
		p13= d5
		p15= d6
		p17= d7
		p19= ACK*
		(even # pins 10-20 are grounded)
P2	DIN /t2	
P3		
P4	backplane conn.	
P5	printer LF	p1-p2 toggles linefeed for /p
		p3-p4 toggles linefeed for /p1
P6	DIN sound	p1 = Channel B sound in
		p2 = Ground
		p3 = Channel A sound in
		p4 = Channel B sound out
		p5 = Channel A sound out
P7	SCSI light	
P8	DIN joystick.	
P9	/t3	p1 = tx
		p2 = rx
		p3 = RTS*
		p4 = CTS*
		p5 = +5 volts
		p6 = Ground
		p7 = dcd
		p8 = dtr
P10	/p1	(* same pinouts as /p *)
P11	refresh rate	
P12	/t4	(* same pinouts as /t3 *)
J1	SCSI power	p1-p2 = Selects SCSI power from Bus or the I/O board. Only used if another SCSI Master is on the Bus.
H1/H2	I/O wait states	

Q. Does the MM/1 have an MMU?

- Yes and no.
 1. The 68070-based MM/1 has an MMU, but it has minimal features, but there is no SSM (System Security Module) for it.
 2. The 68340-based MM/1a does not have an MMU.

Q. Does the MM/1 have ethernet?

- No. However, SLIP is available for those wishing net access. There have been discussions of using Parallel port or SCSI based ethernet interfaces with the MM/1, but nobody has been able to get the necessary documentation on how those devices operate.

Q. What SLIP is available for the MM/1?

- There is a public domain version, KA9Q (ported from MS-DOS). Also, Microware's internet support package (ISP) which contains SLIP has been verified to work with the MM/1.

Q. What is the i2c bus used for?

- At the moment, nothing. It's one of the items built into the Signetics 68070 CPU. Inter Integrated Circuit (IIC, I2C or Access Bus) is an industry standard connector which allows access to a number of devices. There are Keyboards, mice, track balls, and serial-port connectors available for the bus. As far as I know nobody has tried using it on the MM/1. (probably because of the expense of the i2c keyboards and mice.)
- In July 1993, I received information from Computer Access Technology Corp. 3375 Scott Blvd, Suite 410, Santa Clara, CA 95054. (408) 727-6600 (e-mail: catc@netcom.com) which sells (in addition to \$75 i2c logitech mice, and \$125 i2c keyboards) a \$25 access bus application developers guides (M-ADK-01), and \$25 access bus peripheral developers guide (M-PDK-01).
- There is also an Access Bus/i2c FAQ available at:
http://www.paranoia.com/~filipg/HTML/LINK/ELE/F_I2C.html
- the MM/1a (68340) does not have an i2c device.

Q. Where are the drivers for the Joystick?

At this time, I don't think there are any drivers for the joystick. but you can access the joystick without drivers by:

From: ANDRZEJ KOTANSKI kotanski@13.74.DECNET.CERN.CH
Subject: joystick readout on MM/1

```

/* demo program to read the joystick on MM/1 - Andrzej Kotanski, March 1995 */
/* WARNING : this is just a demo program. It reprograms the sound/joystick */
/*          port and does not care about other processes possibly using */
/*          this port. */

/* Please note that the AD 7569 chips are set to the -2.5 to +2.5 Volt range */
/* This is hard-wired on the board. These chips are 8-bit AD/DA converters. */
/* Joystick gets the supply of +5.0 V and returns a value between 0 and 5 V */
/* Therefore only 7 bits can be read from the joystick, giving the range of */
/* 0 to 127. */

#include

main()
{
    unsigned char *mfp = (unsigned char *)0xe00381; /* MFP 68901 */
    unsigned char *left = (unsigned char *)0xe00100; /* AD 7569 left */
    unsigned char *right = (unsigned char *)0xe00101; /* AD 7569 right */
    unsigned char *pit = (unsigned char *)0xe00181; /* PIT 68230 */

    *mfp |= 0x80; /* select input (AD) not output (DA) */
    *(pit + 8) |= 1; /* set bit 0 of port C of PIT to output */
    *(pit + 24) |= 1; /* select joystick not sound by setting bit 0 port C */

    *(mfp + 4) &= ~0xc; /* set fire button bits to input */

    system("tmode -w=1 nopause");

    for (;;) {
        tsleep(10);
        printf("x = %3d    y = %3d    Fire 1 = %d    Fire 2 = %d\n",
            *left, *right, *mfp & 4, *mfp & 8);
        fflush(stdout);
    }
}

```

Q. MM/1 disk drivers apparently use less than 1.44 meg format. What are details on this?

- I don't know if there is anything unusual about this. the /d0 and /d1 descriptors included with the MM/1 use a format of around 5000 sectors, which is about 1.28 meg. You can change the device descriptor using the 'dmode' command.
 - some common dmode settings are:
 - /d0 (standard MM/1 format)
 - /c0 (coco format)
 - /u0 (universal format - 720k 3.5")
 - /s0 (Atari ST os-9 format - another 720k 3.5" disk)
 - IMS originally included a "drive" utility which would allow access to at least 3 common drive types. (mm/1, st, and coco)
 - Hint: included popular descriptors in your bootlist. For example if you have a 5-1/4 drive (or your coco has a 3-1/2 drive). I keep two called /c0 and /c1. /c0 is my /d0 (3.5) with coco params, and /c1 is my /d1 (5.25) with coco params. I also have a /u0 for universal format disks.
-

Q. How do I access IBM PC formatted disks on my MM/1?

- you need to have the PCF (pc filemanager) in memory, along with a descriptor for the type of disk you are using. the two common ones are /hpc0 (1.44m 3.5") and /pc0 (720k 3.5"). then you can access the disks just like any other OS-9 disk.
 - Hint: there is no need to make a special boot disk with the PCF driver, you can just load the driver and the descriptors into memory when you need it.
-

Q. My floppy drives are VERY intermittant. Sometimes they work fine, other times they give Error 247s.

A. Anyone have an answer for this?

Q. How much data can I store on a Floppy disk?

- (from Colin McKay) This one gives about 1.8 meg, takes about 30 seconds less time to format than the stock descriptor, and is great for backups!

```
name=b0
drv=0 stp=3 typ=$27 dns=$03 cyl=80 sid=2 vfy=0 (on) sct=11 t0s=11
sas=1 ilv=2 tfm=0 toffs=0 soffs=0 ssize=1024 cntl=$0000 trys=0 lun=0
wpc=0 rwr=0 park=0 lsnoffs=0 totcyls=80 ctrlrid=0 rates=$30
scsipt=$0000 maxcount=65535
```

Q. When formatting /D0, access to /D1 will cause the format to abort. Why?

- I don't know...but you may wish to try 'iniz /d0 /d1' in your startup file.
-

Q. Cpu board P13 Sets floppy pin 2 (What is pin 2? why might it need setting?)

A. anyone?

Q. Anything else about floppy drives?

- A note about 3.5" floppy drives. Most come with an adapter to adapt a standard (large) floppy power connector to the smaller one used on the drive. If yours does, use that adapter. Some 3.5" drives use a slightly different power connection (notably, TEAC drives require that the power connector NOT have +12v), and can be damaged by just plugging directly to the smaller connector from the IMS-provided power supply.

Very old 3.5" drives sometimes used the data cable to provide power. Be wary of such drives, as they require special cabling to connect to more recent computers.

- A note about high-density 5.25" floppy drives. There are two different methods commonly used to switch between high-density and low-density. One involves changing the speed at which the disk turns, and the other involves only changing the rate at which data is sent to the drive. The current MM/1 floppy drivers only support one of these (details?), and thus only certain 5.25" high-density (1.2meg) drives can be used successfully.

Q. Is there a way to adjust the sensitivity of the mouse? Mine is slow.

- Prior to Windio54 there was no way to adjust the mouse.
- Windio #56 provides KMouse, a user-state process which allows you to adjust the sensitivity of the mouse, as well as left- and right-handed configurations. Windio #56 is free, and can be found on os9archive.rtsi.com.

Q. What are the capabilities of the MM/1 serial ports?

- "x" indicates the pin is connected.

Ports	/t0	/t1	/t2	/t3	/t4	/t5	
1 = DCD	x		x	x	x	x	Lines 6 and 9 are N/C on all ports.
2 = Rx	x	x	x	x	x	x	/t0 is a DB9 on the motherboard
3 = Tx	x	x	x	x	x	x	/t1 is a paddle board which mounts on a 6-pin header on the motherboard
4 = DTR	x		x	x	x	x	/t2 (/ms) is on the I/O board
5 = Gnd	x	x	x	x	x	x	/t3 and /t4 are paddle boards which mount on headers on the I/O board
7 = RTS				x	x		/t5 is located on the 68340 processor upgrade board.
8 = CTS				x	x		

- The Midi adapter replaces the /T1 paddleboard. The paddle board connectors on the motherboard and I/O board are different, even though the paddle boards themselves are the same, so using a T1 paddle for T3 requires changing a connector (anyone have details?).
- Note: /T0 is the serial port built in to the 68070 or 68340 processor. It does not support all of the baud rates available through the XMode command. You can check by setting the baud rate with XMode, then attempting to initalize the port. If the baud rate is not supported, a "Bad Unit Number" error will be returned.

Q. What should we know about the Stereo Sound Port?

- From the back of the machine, the port looks like:

left input	5	1	right input
left output	4	2	right output
ground	3		

- Modifications to sound output circuitry from Kevin Pease via Mike Knudsen:
 1. Problem: The resistor/capacitor network on the sound output can overload the D/A converter and introduce distortion.

Fix: Between the sound output connector and the ADA converter chip on the I/O board is a group of four 520 ohm resistors (together with some small capacitors). Remove the two middle ones (which shunt the sound output to ground).

2. Problem: The audio input of the MM/1 can overload some output sources. Older systems designed for 600 ohm line levels should work fine, but some newer equipment may be more sensitive.

Fix: Remove the two outer 520 ohm resistors in the group mentioned above. If possible, replace with 47k ohm resistors to provide static protection without overloading. Note that if you use earphone outputs or some similar source, then you should probably not perform this change.

3. Problem: The MM/1 audio input and outputs both expect and deliver audio levels higher than are typical for line-level audio.

Fix: Note that this fix will tend to make the MM/1 audio more sensitive to digital noise from inside the case, so this is only recommended if you're having trouble using the MM/1 with specific audio equipment.

Bend up Pin 4 of each of the two A/D/A chips (long thin DIPs near the audio connector) and jumper it to pin 1. This will cut the audio levels in half. If you do this fix, you should also do fix #2 above.

Q. What should we know about connecting monitors?

- o The 9-pin din on the back of the CPU board has the following pinouts:

1	2	3	4	5	6	7	8	9
Gnd	Gnd	Red	Grn	Blu	N/C	Snd	Hor	Vert

- o Specs: Analog video, Separate TTL sync, composite sync on each video line Sound 1v p-p (?), Sync polarity controlled by jumper P8 on motherboard. Video scan rates: 60 hz vertical, 15.75 khz/31.5 khz horizontal. (31.5 khz horizontal scan is not supported by current software.) Video output is RS-343/RS-170 compatible. Maximum white level is 1 volt.
- o Modification to video circuitry by Tim Kientzle:

1. Problem: Some monitors (such as the NEC 3D) cannot handle both the composite and separate TTL syncs presented by the MM/1 video output. Some such monitors may be able to work in a "Macintosh" or "sync-on-green" mode by simply not connecting the horizontal and vertical sync signals, but the NEC 3D (in particular) can't handle Macintosh format video at this low scan rate.

Fix: Disconnect Pin 5 of the RAMDAC. This will disable the composite sync signal. The Brooktree RAMDAC is a small square chip-carrier package near the video connector. Carefully remove it from the socket, put a piece of tape or other insulator over pin 5, and reinsert the chip. Pins are numbered counterclockwise from the small mark above pin 1 in the middle of the bevelled side. Pin 6 is next to the cut-off corner. Note that you will lose the ability to use composite monochrome monitors directly.

CONNECTING VARIOUS MONITORS TO THE MM/1

General comments: On most monitors, the interlace modes are only suitable for graphics; when used with text, the flicker is generally quite annoying. Use of overscan modes (larger screens) depends on the monitor. The better monitors have picture size adjustments to allow you to see the entire display.

- o MAGNAVOX 1CM135
 - Cable: Use the DB9-to-DB9 cable supplied with the monitor.
 - Monitor settings: Analog/TTL should be pushed In (for Analog)
 - CVBS/RGB should be Out (for RGB video)

- CVBS/LCA Doesn't matter for MM/1 (Set IN for composite if you want to also connect a CoCo.)
 - Adjust the horizontal/vertical size and vertical shift controls to center and size the picture. Can be adjusted for overscan modes.
- MM/1 settings: Jumper P8 doesn't matter.
- Overall picture: Good.
- Other notes: The "green screen" switch on the front helps clear up some displays. Also, it is possible to have another video source (such as a Color Computer) connected to the Composite Video input and switch between the two with a single switch (which is unfortunately on the back). The monitor also has stereo sound inputs.

o TANDY CM8

- Cable: Connect male DB9 to male 10-pin header pin-for-pin, (i.e. pin 1 to pin 1, pin 2 to pin 2, etc.). Be careful about IDC (crimp-on) connectors; you'll have to re-arrange the wires if you use them. Break off pin 6 on the 10-pin header to match the keying on the CM8's captive cable.
- Monitor settings: None.
- Can entire display be seen in overscan modes?
- MM/1 Settings: Is picture affected by settings of jumper P8?
- Overall Picture: Fair.
- Other Notes: Supports MM/1 1-bit sound through the built-in speaker.

o NEC MULTISYNC 3D

- Cable: TTL Mode: Use adapter supplied with monitor.
- Analog Mode: Adapter needs to be made from DB9 Male (for connecting to MM/1) to either compact 15-pin female (for connecting directly to the captive cable) or DB9 female (for connecting through the supplied adapter). Connect as follows:

MM/1	Compact DB15	DB9
2 (Grnd)	10	9
3 (Red)	1	1
4 (Grn)	2	2
5 (Blue)	3	3
8 (HSync)	13	4
9 (VSync)	14	5

Note that this setup requires the modification described above to disable the composite sync. Monitor will work for short periods without that mod if you disconnect the HSync and VSync from this adapter, although this is not recommended.

- Monitor Switches: Color switch ignored in Analog mode; in TTL mode, set to 8. Adjust the horizontal/vertical size and horizontal/vertical position controls to center and size the picture. Can be adjusted for Overscan. The monitor remembers two sets of picture sizes, one for each setting of the Mode switch. This can be useful, for example, if you use both normal and overscan screens.
- MM/1 settings: Jumper P8 doesn't matter.
- Overall picture: Very good.
- Other notes: When connected in TTL mode, you'll only get 8 colors. The adapter described above also works for an unmodified CoCo3.

o SONY KV1311CR

- Cable: Marty Goodman CoCo->Sony cable (available from Rainbow advertisers) works if you change the CoCo connector (10-pin header) to a DB9. You can simply add a DB9 to allow the same cable to work with both a CoCo3 and MM/1. The adapter cable uses a NOR gate to combine and invert the sync, which in turn requires a source of +5V for the chip. Some Sony's supply this on the RGB-A port (pins 1, 2, and 18). If yours doesn't, it is easy to

add, but does require voiding the warrantee. To get sound from the monitor cable, connect pin 34 (audio select) to pin 18 (+5) to get sound from the RGB connector (pin 24) when the RGB button is pressed. Otherwise, the RGB button sound comes from the TV tuner.

- Monitor settings: Switch on side of monitor should be set to RGB-A. Push RGB button in to see computer screen. Push both RGB and VIDEO buttons in to get sound from the RCA audio input jack. Picture size can be adjusted for overscan.
 - MM/1 settings: P8 should be unjumpered.
 - Overall picture: Very good. Dot pitch = 0.39.
 - Other notes: Has internal speaker. Also has NTSC tuner, remote control, is cable-ready, has video inputs for RGB-I and color composite and some outputs as well. Probably is not made any more and may not be available new.
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- (I've heard of the following monitors being used with the MM/1, but know no details about hooking them up. If anyone can contribute information about these or other monitors, I'd be happy to add them to my list.)
 - MITSUBISHI DIAMONDSCAN
 - NEC MULTISYNC

[end of mm1.hardware - last update 02/28/96 - erik seielstad spooky@iinc.com]