MHD-T34™

MHD-T34:
Hard Drive Kit
OPERATOR MANUAL

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The limited warranty applies to hardware products only.

MHD-T34: Hard Drive Kit

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General Information

Your pre-assembled kit consists of five components which have been assembled for you by MISOSYS into a fully-functional hard drive ready to plug into your computer. The five components are: (1) drive case manufactured by Leadman Electronics, Inc.; (2) Power supply and fan, also manufactured and/or supplied by Leadman Electronics; (3) hard disk drive manufactured by Seagate Technology, Inc. (note that a separate manufacturer's manual is included which provides information on the hard disk drive); (4) hard disk controller manufactured by either Xebec or Adaptec; and (5) a host adaptor manufactured by MISOSYS, Inc. A number of cables interconnect the component parts.

This manual will describe the interconnections between the components so that you may be able to open up and investigate your drive kit. Perhaps you may want to install the joystick option at some future date, or change the clock module. You may even want to add a second drive.

Warning: Your hard drive kit is shipped optioned for 115V AC power; if your installation supplies 230V AC, you must open up the drive case and change the plug adaptor from 115V to 230V input. See the section on "Power Supply".

About your hard drive kit

Your hard drive kit assembled by MISOSYS is equipped with either a 20 or 40 Megabyte hard drive, or as otherwise specified. Unless specified elsewhere, drives are ST406-type (MFM recording). The drive kit uses a hard disk controller (HDC) with a Small Computer Systems Interface (SCSI) on the host side to interface to the drive. A proprietary host adaptor (H/A) designed by Practical Micro Design and manufactured by MISOSYS connects the SCSI interface of the HDC to the expansion bus of the TRS-80.

The drive can be powered from either 115V or 230V AC. This is optioned by means of a plug inside the unit mounted on the power supply. **Note that the unit as provided by MISOSYS is optioned for 115 Volt AC.** Consult this hardware operators manual for any conversion required.

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Connecting your hard drive

A 50-pin ribbon cable with a SCSI male connector on one end and an edgecard connector on the other end connects the hard drive to your machine. The SCSI connector looks like a standard Centronics printer connector, but it is larger as it contains 50-pins. This connector can only be oriented one way on the hard drive. The other end containing the 50-pin edgecard connector should be plugged into the 50-pin expansion port of your computer. On a desktop Model 4 or 4D, this port is on the bottom rear middle of the computer. With the power turned off, turn your computer on end and plug in the edgecard connector with the ribbon cable exiting towards the rear. One end of the ribbon cable has a blue stripe running down its side. This side will be oriented towards the right of your computer as you are looking at the screen. On a Model 4P, the ribbon cable is facing downward. Restore your computer to its proper position.

Plug the supplied AC power cable into the hard drive power receptacle and the other end into an AC power socket. Turn on the hard drive power using the switch located on the rear of the hard drive cabinet. Turn on your computer. Proceed to the sections in the *Software Interface Package OPERATOR MANUAL* covering software installation.

Hard disk drive case

The HD-6A external drive case can support either two half-height or one full-height hard drive. The cabinet dimensions are:

Length:	15.5"/39.5cm
Width:	6.875"/17.5cm
Height:	5.125"/13.0cm

The hard drive unit has a rear panel which includes the following facilities:

1. AC Power receptacle
2. on/off power switch
3. fuse socket
4. 50-pin SCSI female bus connector
5. optional DB9 joystick port connector
6. fan air flow screen

The respective facilities are identified in figure 1.

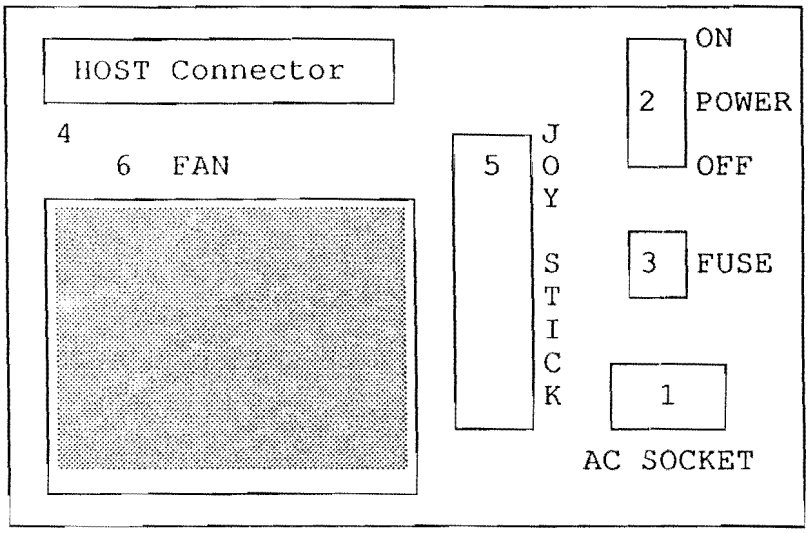

Figure 1: Rear of hard drive case

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Opening the drive case

Access to all interior components of the drive case can be accomplished once the case is opened. To open the hard drive case, place the case on its top side so that the bottom is facing up. Remove the four exterior Phillips head screws which are located approximately 3/8" from the sides of the case (two on each side). Turn the hard drive case back on its feet. The front, top, and sides are one piece which is now loose from the bottom and rear of the case, which is another piece. Slide the top piece forward approximately six inches. Note that a wire which comes from the power-on LED, which connects to the top piece, is plugged into the power supply. To fully remove the top piece of the cabinet, it is necessary to unplug the LED wire from the supply. The wire connects to the extreme right of the power supply as you are facing the unit from the front. Exert a gentle upward pressure on the plug and it will be removed from the socket. Once that is accomplished, remove the top piece portion of the cabinet from the bottom piece. Caution: there are a few LED wire guides taped to the top part of the cabinet. It may be possible that other DC power wires may catch on the guide. If you feel some resistance to fully opening the cabinet top, that may be the cause. Attempt to move the DC power wires out of the way.

After the cover is removed, the interior of the case is exposed. At the rear is the host adaptor which is mounted on standoffs above the power supply. If you must gain access to the power supply (perhaps to alter the AC supply voltage requirement), you may need to remove the host adaptor.

The host adaptor may be removed by unplugging the two 50-pin header connectors and the DC power connector. Please exercise care so that you do not bend any pins when you remove these connectors; they fit tightly. Also, the standoffs are not the Rock of Gibraltar; when you are removing cables, do not pull a great deal on the host adaptor board. You may wish to hold the host adaptor board with one hand while you remove the header connectors with the other. To remove the host adaptor, remove the four Phillips head 4-40 screws located at the four corners of the circuit board.

60 watt power supply

Figure two sketches the parts of the power supply for which you may need information. These parts are:

1. Power socket SK1
2. Power on LED socket (unlabeled on the board)
3. Fuse F1: GMA pigtail 5mm x 20mm 0.5 Amp
4. 115V/230V AC power option

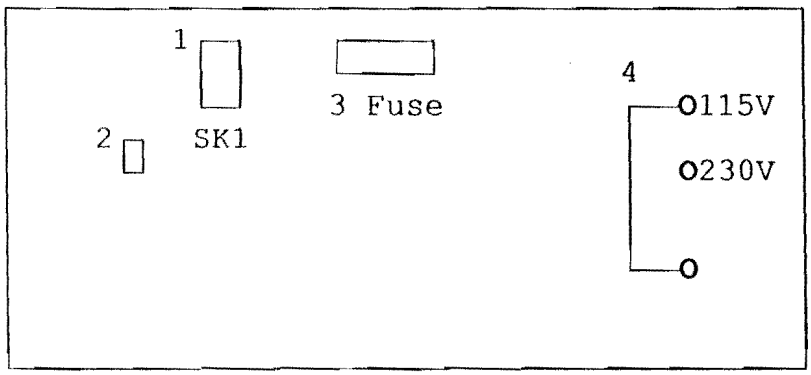

Figure 2: 60 watt DC Power supply

In order to convert the power supply to utilize 230 Volt AC power, locate the black wire connected to the grey plug attached to the pin marked 115 (position 4 on the figure). Pull up the grey plug from the position marked "115" and re-insert onto the pin marked "230". It is advisable that you indicate the power change option to 230 Volt AC somewhere on the rear of the case, perhaps on a label.

Hard disk drive mounting

The hard drive is mounted onto the two vertical brackets with two screws on either side. These screws are positioned in the bottom holes of the pairs of two holes at each of the four positions. The support brackets can hold a second half-height drive, if only one half-height drive is attached.

On each bracket at the bottom is a channel which holds the hard disk controller card. Access to the card can be accomplished by either (1) removing the vertical brackets as a single assembly by removing the four screws in the bottom of the case, which allows the card to slide out the front or rear of the assembly, or (2) removing one bracket by removing the two screws in the bottom of the case and the two screws which hold the hard disk drive to that side; the hard disk controller can then be removed from the side. A blocking plate covering up the unused mounting is at the front of the case. This blocking plate is contained by prongs on either side of the plate which fit into holes on each vertical bracket.

To add a second hard drive, the drive blocking plate is removed and the drive inserted into the vacant area. It then must be screwed in with two screws on each bracket. The cables which connect the drives to the hard disk controller must be routed between the drives. It may be possible to route some ribbon cables underneath the controller; do not do this with the power cable.

A second drive requires the 20-pin data cable to be connected to the second drive connector on the hard disk controller. The appropriate header connector will be shown in the section covering the controller. The 34-pin control cable is daisy chained from the controller to both drives. As the 34-pin control cable provided with your one-drive drive kit contains a connector for only a single disk drive, you must either add a second 34-pin edgecard connector 1.75" in distance from the existing drive connector (measured center to center or same edge to same edge), or obtain a "dual-drive" control cable which already has the second connector installed.

The second drive should be jumpered as "drive select 2" according to any instructions supplied with your additional drive. Consult the Software interface manual for specifying a second drive to the software. Finally, when you add a second drive, the disk drive connected on the cable closest to the hard disk controller should have its termination resistor removed. Consult the manual for the disk drive for location and instructions.

Host adaptor

The host adaptor uses state of the art components. Figure 3 sketches the significant components for which you may need information. These components are:

1. Clock module (or socket U4): DS1287
2. 50-pin header socket P4 to hard disk controller
3. DC power connector P3; only +5V used
4. Jumper header JP1
5. 50-pin header socket P2 to host computer
6. Option switch S1
7. Joystick interface header socket P1

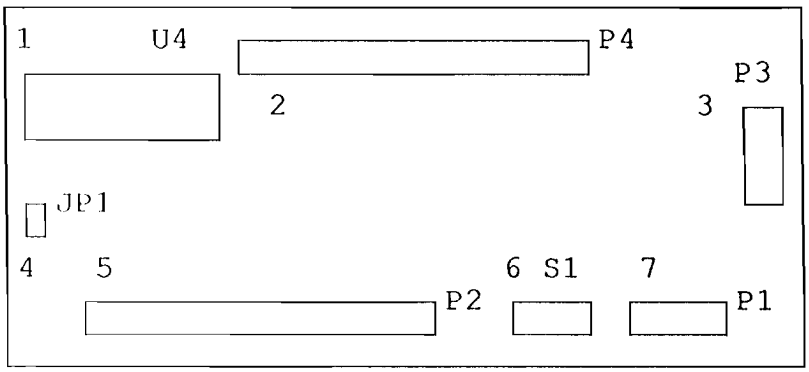

Figure 3: Host adaptor circuit board

All sockets and components are oriented so that the silk-screened part number is at pin 1. Pin one of the integrated circuits is also designated on the solder side of the circuit board by means of a square pad in lieu of a round pad.

Socket U2 contains an Intel 5AC312 Programmable Logic Device (PLD). Boards may contain either an erasable device (EPLD) or a non-erasable (one time programmable or OTP) device.

Socket U4 contains the optional clock module. This part is a Dallas Semiconductor DS1287 real time clock module. It contains an embedded lithium battery which has a usable life of approximately ten years. When the battery is exhausted, the module must be replaced.

The jumper plug JP1 is reserved for future use. It is read from the hard disk status port, port C2 bit 7. The jumper position is assigned for future use as a hardware write protect option. Do not add a shorting jumper to JP1 as the MSCSI software will assume the drive is write protected. Note that no actual hardware write protection is in effect with a jumper in place; the software will only **think** write protection is in place.

Switch S1 is a 4-position DIP switch. Positions 1-3 are reserved for future use. They can be read from port 00 (bits 5-7). When OFF, the switch reads as a ONE bit. Note that some programs which read a joystick port may not mask off those "unused" positions and may in fact become confused if the switch is operated. Switch position 4 is used by the MSCSI software package to indicate what kind of hard disk controller (HDC) is attached: either a Xebec autoinitializing HDC (Xebec 1420 or equivalent) if the switch is OFF, or an Adaptec autoinitializing HDC (Adaptec 4000 or equivalent) if the switch is ON. Switch 4 is read from the hard disk status port, port C2 bit 6.

An optional joystick can be connected to header socket P1. This socket is read from port 00; the pinout is covered in the *Technical Information*.

Hard Disk Controller

Your hard disk drive kit contains a hard disk controller (HDC) located in a card slot mounted beneath the disk drive(s). This manual will contain information pertinent only to the location of connectors on the controller.

Your kit may include either a Xebec 1420 or an Adaptec 4000(A) HDC, or equivalent. Figure 4 shows the layout of the Xebec 1420 HDC. The board is oriented in the cabinet's card slot so that the end containing the power connector is towards the front of the cabinet; this places the 50-pin header connector towards the host adaptor.

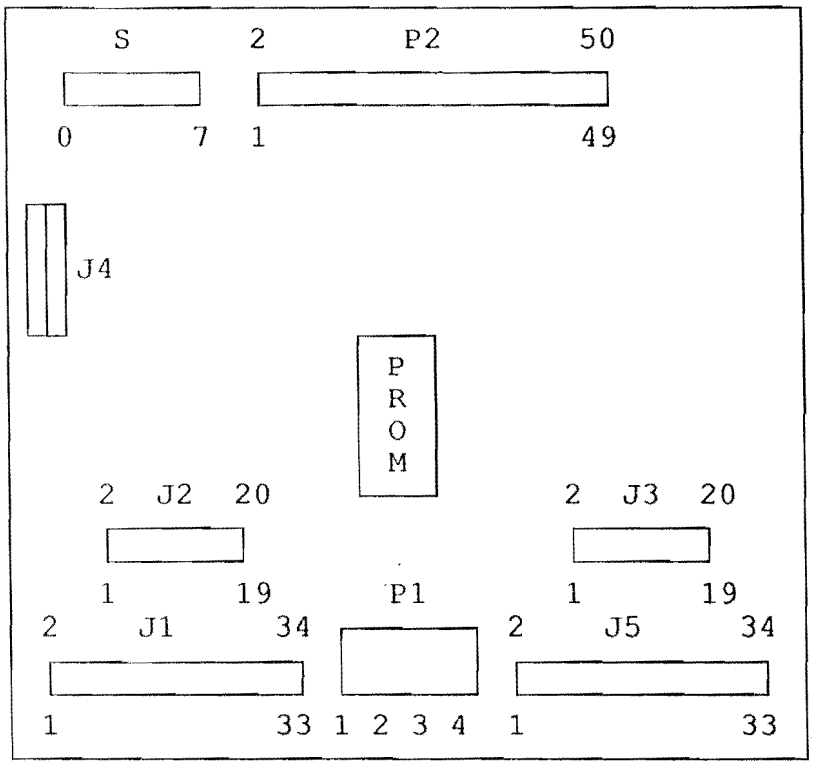

Figure 4: Xebec 1420 layout

Header connector labeled "S" is used to select the controller address, address 0-7. For the MHD-T34 drive kit and associated software, this should be jumpered for address 0.

Header connector labeled "J1" connects to the 34-pin control signal cable going to the hard disk drive. A two-drive installation uses a daisy chain cable, identical to a two-drive floppy cable.

Header connector labeled "P2" is the 50-pin SCSI interface which connects to the host adaptor header socket labeled "P4".

Header connectors labeled "J2" and "J3" are for connecting the disk drives' 20-pin data cable; the first drive selected as drive select 1 (DS1) connects to J2 while the second drive selected as drive select 2 (DS2) connects to J3.

Header connector labeled "J5" is a floppy disk drive interface which is not supported by the associated MSCSI software.

Connector labeled "P1" is used to supply +5 and +12 volts DC to the HDC.

The header connector labeled "J4" is restricted to Xebec's use only; nothing must be plugged into this connector.

The PROM is a 2K 2764 device and contains firmware for the HDC.

Figure 5 depicts the layout of the Adaptec 4000 HDC. This board would be oriented so that the 50-pin header connector is towards the front of the cabinet while the power and disk drive interface connectors are towards the power supply.

Header connectors labeled "J0" and "J1" are for connecting the disk drives' 20-pin data cable; the first drive selected as drive select 1 (DS1) connects to J0 while the second drive selected as drive select 2 (DS2) connects to J1.

Edgecard fingers labeled "J2" connect to the 34-pin control signal cable using a standard 34-pin edgecard connector going to the hard disk drive. A two-drive installation uses a daisy chain cable, identical to a two-drive floppy cable.

Connector labeled "J3" is used to supply +5 and +12 volts DC to the HDC.

Header connector labeled "J4" is the 50-pin SCSI interface which connects to the host adaptor header socket labeled "P4".

The LED labeled "DS1" lights whenever the controller has been selected.

The header connector labeled "J5" is used to select the controller address. Jumpers A-B, C-D, and E-F set the controller address on the SASI/SCSI bus. An installed jumper is a 1 and a removed jumper is a 0. Jumper E-F is most significant and jumper A-B is least significant. The MSCSI software uses a controller address of 0; thus, all three jumpers are removed. Jumpers G-H, I-J, K-L, and M-N are not used by the controller and should be left open. Jumper O-P is for factory use only.

A jumper near J1 sets the pre-comp to be used for the drive. If jumpers R-S are shorted, the pre-comp starts at the reduce write current point. If jumpers R-T are shorted, pre-comp is applied to all tracks. If no jumper is installed, no tracks are pre-comped. See the drive's manual to determine the pre-comp requirements of your drive. Note that the pre-comp applies to both drives.

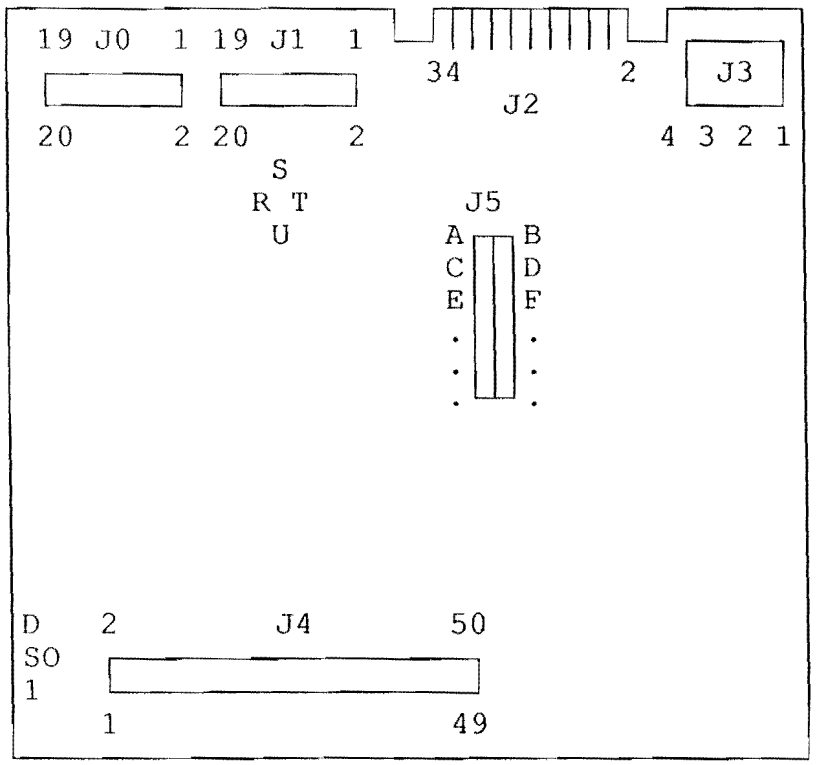

Figure 5: Adaptec 4000 layout

DS1287 RealTime clock

General

The following discussion is by no means an attempt to fully document the RealTime clock. It is intended to give you a flavor of the clock module. For details concerning the specific operation of the clock module, consult the appropriate Dallas Semiconductor data sheet.

The DS1287 RealTime Clock Plus RAM is designed to be a direct replacement for the MC146818. A lithium energy source, quartz crystal and write-protection circuitry are contained within a 24-pin dual in-line package. As such, the DS1287 is a complete subsystem replacing 16 components in a typical application. The functions include a nonvolatile time-of-day clock, an alarm, a one-hundred-year calendar, programmable interrupt, square wave generator, and 50 bytes of nonvolatile static RAM. The RealTime Clock Plus RAM is distinctive in that time-of-day and memory are maintained even in the absence of power.

Address map

Addr	Function	Addr	Function
0	Seconds	8	Month
1	Seconds alarm	9	Year
2	Minutes	10	Register A
3	Minutes alarm	11	Register B
4	Hours	12	Register C
5	Hours alarm	13	Register D
6	Day of the week	14-63	User RAM
7	Day of the month		

The 50 general purpose nonvolatile RAM bytes are not dedicated to any special function within the DS1287. They can be used by the processor program as nonvolatile memory and are fully available during the update cycle.

Time and calendar data

The time and calendar information is obtained by reading the appropriate memory bytes. The time, calendar, and alarm are set or initialized by writing the appropriate RAM bytes. The contents of the ten time, calendar, and alarm bytes may be either Binary or Binary-coded Decimal (BCD) format. All ten bytes must use the same data mode. Once initialized, the RealTime Clock makes all updates in the selected mode. The data mode cannot be changed without reinitializing the ten data bytes.

When the 12-hour format is selected, the high order bit of the hours byte represents PM when it is a logic one. The 24/12 bit cannot be changed without reinitializing the hour locations. Once per second the ten bytes are advanced by one second and checked for an alarm condition.

Interrupts

The RTC plus RAM includes three separate, fully automatic sources of interrupt for a processor. The alarm interrupt may be programmed to occur at rates from once per second to once per day. The periodic interrupt may be selected for rates from 500 ms to 122 µs. The update-ended interrupt may be used to indicate to the program that an update cycle is complete.

The processor program can select which interrupts, if any, are going to be used. Three bits in Register B enable the interrupts. Writing a Logic 1 to an interrupt-enable bit permits that interrupt to be initiated when the event occurs. A "0" in an interrupt-enable bit prohibits the IRQ pin from being asserted from that interrupt condition. If an interrupt flag is already set when an interrupt is enabled, IRQ is immediately set at an active level.

When an interrupt event occurs, the relating flag bit is set to Logic 1 in Register C. These flag bits are set independent of the state of the corresponding enable bit in Register B. All bits which are set (high) are cleared when read and new interrupts which are pending during the read cycle are held until after the cycle is completed. When an interrupt flag bit is set and the corresponding interrupt enable bit is also set, the IRQ pin is asserted low. The IRQF bit in Register C is a one whenever the IRQ pin is being driven low. Determination that the RTC initiated an interrupt is accomplished by reading Register C. A logic one in Bit 7 (IRQF bit) indicates that one or more interrupts have been initiated by the DS1287.

Technical Information

Host Adaptor port assignments

Port 00H (000D) - Joystick

bit 0: UP position bit 1: DOWN position bit 2: LEFT position bit 3: RIGHT position bit 4: FIRE button bit 5: S1, switch 1 - reserved bit 6: S1, switch 2 - reserved bit 7: S1, switch 3 - reserved

Port 0B0H (176D) - Clock address

Port 0B1H (177D) - Clock data

Port 0C0H (192D) - HDC data I/O

Port 0C1H (193D) - HDC data I/O with automatic ACK

Port 0C2H (194D) - HDC Status read

bit 0: REQ	bit 4: C/D
bit 1: MSG	bit 5: INUSE
bit 2: BSY	bit 6: S1, switch 4
bit 3: I/O	bit 7: JP1 - reserved

Port 0C2H (194D) - HDC Control write

bit 0: ACK	bit 4: n/a
bit 1: SEL	bit 5: n/a
bit 2: RST	bit 6: n/a
bit 3: n/a	bit 7: n/a

Host Adaptor interface

P2 - Host interface

1	XD0: DATA BUS
3	XD1
5	XD2
7	XD3
9	XD4
11	XD5
13	XD6
15	XD7
17	XA0: ADDRESS BUS
19	XA1
21	XA2
23	XA3
25	XA4
27	XA5
29	XA6
31	XA7
33	XIN*: PORT INPUT REQUEST
35	XOUT*: PORT OUTPUT REQUEST
37	XRESET*: MASTER RESET
39	XIOBUSINT*: CLOCK INTERRUPT
41	XIOBUSWAIT*: N/C
43	EXTIOSEL*: H/A TO HOST
45	N/C
47	XM1*: N/C
49	XIORQ*: EXTERNAL I/O REQUEST

Note: all even-numbered pins are GND

P3 - Power connector

1	+12V
2	+12 ground return
3	+5 ground return
4	+5V

P4 - To Hard Disk Controller

2	DB0
4	DB1
6	DB2
8	DB3
10	DB4
12	DB5
14	DB6
16	DB7
34	INUSE* (reserved)
36	BSY*
38	ACK*
40	RST*
42	MSG*
44	SEL*
46	C/D*
48	REQ*
50	I/O*

Note: all odd-numbered pins GND;
even-numbered 18-32 are N/C.

P1 - joystick

P1 Pin	Function	DB9 Pin	Port bit
1	UP	1	0
2	FIRE	6	4
3	DOWN	2	1
4	N/C	7	
5	LEFT	3	2
6	COMMON	8	
7	RIGHT	4	3
8	N/C	9	
9	N/C	5	
10	N/C	N/C	