Digital AXPpci 33 Alpha PC Motherboard OEM Design Guide

Order Number: EK–AXPCI–DG. C01

This guide supplies reference, configuration, and installation information for the Digital AXPpci 33 Alpha PC motherboard.

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The postpaid Reader's Comments form at the end of this document requests your critical evaluation to assist in preparing future documentation.

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Preface

This guide supplies reference, configuration, and installation information for the Digital AXPpci 33 Alpha PC motherboard. Included are details on physical, electrical, environmental, and operational characteristics.

The guide furnishes system integration customers with design details of the motherboard so they can integrate this subsystem component into a standard or custom application. Information about console commands is also supplied.

Digital tried to provide every detail required for design integration in one complete and concise document. If you find any errors or omissions, please inform Digital so that the quality and completeness of this and future documents can be enhanced.

Document Structure

This guide contains three chapters and seven appendixes:

Chapter 1	Provides overall system characteristics.
Chapter 2	Describes dimensions, connectors, mounting, and configurable features of the module and connectors.
Chapter 3	Supplies required environmental constraints.
Appendix A	Contains part numbers for orderable main logic boards (MLBs), bundled kit configurations, MLB options, and accessories.
Appendix B	Lists and briefly describes all connectors and jumpers used on the MLB.
Appendix C	Lists tested options.
Appendix D	Provides installation and handling instructions.
Appendix E	Describes the console commands.
Appendix F	Presents information for installing Digital UNIX and Windows NT.
Appendix G	Lists frequently asked questions about configuring the AXPpci 33 for Digital UNIX and Windows NT systems.

Conventions

The following conventions are used in this guide:

Table 1 Conventions

Convention	Meaning
Ctrl/*x*	Press the key labeled Ctrl while you simultaneously press another key. For example: Ctrl/C.

Table 1 (Cont.) Conventions

Convention	Meaning
italic type	The following items appear in italic type: • Variable information, such as user-supplied information in commands. For example: `>>> set envar value [-default] [-integer] [-string]` • Directory and file specifications when these appear in text. For example: The files are located in the directory *pub/Digital/axppci*.
bold type	This typeface indicates the name of a console command or command option when it appears in text. For example: Use the **set boot_osflags** command to set an environment variable that specifies a default boot flag value.
[ ]	Square brackets, in command syntax, enclose optional items. For example: `>>> set envar value [-default] [-integer] [-string]`
. . .	Horizontal ellipsis points indicate that the preceding item can be repeated one or more times. These are used in syntax descriptions and function definitions. Horizontal ellipsis points also indicate that a portion of an example or figure is omitted.
$\boxed{\text{Key}}$	In tables, key names are designated by a box. For example, $\boxed{\text{Return}}$.
DECchip 21066	Except where noted differently, DECchip 21066 refers to the DECchip 21066/21066A/21068/21068A processor.
MLB	Main logic board refers to the system module or motherboard with the DECchip 21066 processor chip socket.
PCB	Printed circuit board, also known as a printed wire board.
Side 1	The primary component (DECchip 21066) side of a printed circuit board.
Side 2	The passive component side of a printed circuit board.
Figure dimensions	Except where noted differently, all figure dimensions are in inches.

Reference Documents

The next sections list associated documents to which you may want to refer.

Digital Documents

- *Digital AXPpci 33 Data Sheet* (EC–F2938–56)
- *Alpha AXP Architecture Reference Manual* (EY–L520E–DP)
- *Alpha AXP Architecture Handbook* (EC–H1689–10)
- *AlphaServer 2000/2100 Firmware Guide* (EK–AXPFW–RM)
- *DECchip 21066/21066A Microprocessor Chip Data Sheet* (EC–QC4HA–TE)
- *DECchip 21068 Microprocessor Chip Data Sheet* (EC–N0627–72)
- *DECchip 21066 and DECchip 21068 Alpha AXP Microprocessor Hardware Reference Manual* (EC–N2681–72)

Third-Party Documents

Contact these organizations for the latest revisions of the documents:

- *PCI Local Bus Specifications*

  PCI Special Interest Group
  M/S HF3–15A
  5200 N.E. Elam Young Parkway
  Hillsboro, Oregon 97124–6497

  Telephone: (503) 696-2000

- *ISA Bus Specification P996*

  IEEE Service Center
  445 Hoes Lane
  P.O. Box 1331
  Piscataway, New Jersey 08855

- *Intel 180 Watt Baby–AT +3.3/5 V Switching Power Supply Specification*

  Intel Corporation
  Literature Sales
  P.O. Box 7641
  Mt. Prospect, IL 60056–7641

  Telephone: (800) 879-4683

1 System Summary

This chapter presents the physical, performance, and operating characteristics of the Digital AXPpci 33 motherboard.

Table 1–1 includes features of the DECchip 21066 processor used for the Digital AXPpci 33. Features are common across all versions of the motherboard unless specifically differentiated.

Table 1–1 Digital AXPpci 33 System Summary

Software	
Operating systems	Microsoft Windows NT, Digital UNIX
System Characteristics	
CPU and clock speed	DECchip 21066 RISC microprocessor at 166 MHz (6 ns) DECchip 21066A RISC microprocessor at 233 MHz (4.3 ns) DECchip 21068 RISC microprocessor at 66 MHz (15 ns) DECchip 21068A RISC microprocessor at 100 MHz (10 ns)
Processor upgradeable	ZIF socket for DECchip 21066 processor upgrades
Instruction issue	Up to two instructions issued per clock cycle
Word size	64 bits
Address size	• Physical address: 34 bits • Virtual address: 43 bits
Floating-point format	VAX (F and G) and IEEE
Memory (RAM)	
Minimum	8 MB ECC protected
Maximum	256 MB ECC protected
Recommended minimums	Windows NT: 16 MB Digital UNIX: 32 MB
Memory (ROM)	512 KB flash ROM
External cache	Configurable for 0, 256 KB, or 1 MB (64 data bits and 8 ECC protection bits; 20 ns or 15 ns access)
Memory bus width	64 data bits and 8 ECC bits
Memory bus speed (peak)	80 MB/s
Graphics	
Integral graphics	None included.
Graphics options	See Appendix C for a list of tested options.

Table 1–1 (Cont.) Digital AXPpci 33 System Summary

Input/Output	
Input device interfaces	AT or PS/2 style keyboard and mouse.
Serial	Two RS–423 (9-position) compatible serial communications ports.
Parallel	One parallel (Centronics compatible) communications port.
Bus options	Total of seven option slots.
PCI	Peripheral component interconnect. Supports three 5 V/32-bit PCI (33 MHz) option slots with a peak performance of 132 MB/sec: two long (12.354 inches) and one short (6.946 inches) module. One long PCI slot shares the same bulkhead slot with one long ISA (industry-standard architecture) slot. See Appendix C for a list of tested options.
ISA	Supports five ISA option slots: two long (13.415 inches) and three short (6.945 inches) modules. One long ISA slot shares the same bulkhead with one long PCI slot. See Appendix C for a list of tested options.
FAST SCSI–2	One NCR 53C810 SCSI controller supporting a single-ended bus. One internal SCSI connector; seven devices plus a controller. Asynchronous operation at 5 MB/s or synchronous operation at 10 MB/s. See Appendix C for a list of tested options.
IDE	One IDE interface supporting up to two drives.
Floppy	One 82077-compatible diskette controller supporting up to two drives: • For Windows NT: 1.2 MB, 1.44 MB, and 2.88 MB formats. • For Digital UNIX: 1.44 MB and 2.88 MB formats. See Appendix C for a list of tested options.
Physical Characteristics	
Form factor	Baby–AT system module
Width/depth/height (with the DECchip 21066, high-profile heatsink and option modules)	English: 8.65 inches/13.865 inches/5.573 inches Metric: 220 mm/353 mm/142 mm
Weight (with the DECchip 21066 and high-profile heatsink)	1.85 lbs/840 grams
Power supply voltages (main logic board [MLB] only)	+5 V, +12 V, -12 V, -5 V (+3.3 V supply connection is available for PCI options.) Refer to Chapter 3 for current consumption.
Environmental Characteristics (Operational)	
Temperature	See Chapter 3 for air flow ambient temperatures.
Temperature change rate (maximum)	20°C/hr (36°F/hr)
Relative humidity	10–95% noncondensing
Maximum wet bulb	32°C (90°F)
Minimum dew point	2°C (36°F)

Tables 1–2 and 1–3 show the configuration performance metrics for the Alpha processor type, clock frequency, and cache. All benchmarks were performed using the Digital UNIX operating system.

Table 1–2 SPECint92, SPECfp92, Dhrystone VI, and Whetstone Performance Metrics

Alpha Processor	Clock Frequency	Cache	SPECint92	SPECfp92	Dhrystone VI	Whetstone
DECchip 21066	166 MHz	1 MB 15 ns	76.05	86.59	333,374	178,500
DECchip 21066A	233 MHz	1 MB 15 ns	91.23	107.83	263,012	249,900

Table 1–3 Rhealstone Performance Metrics

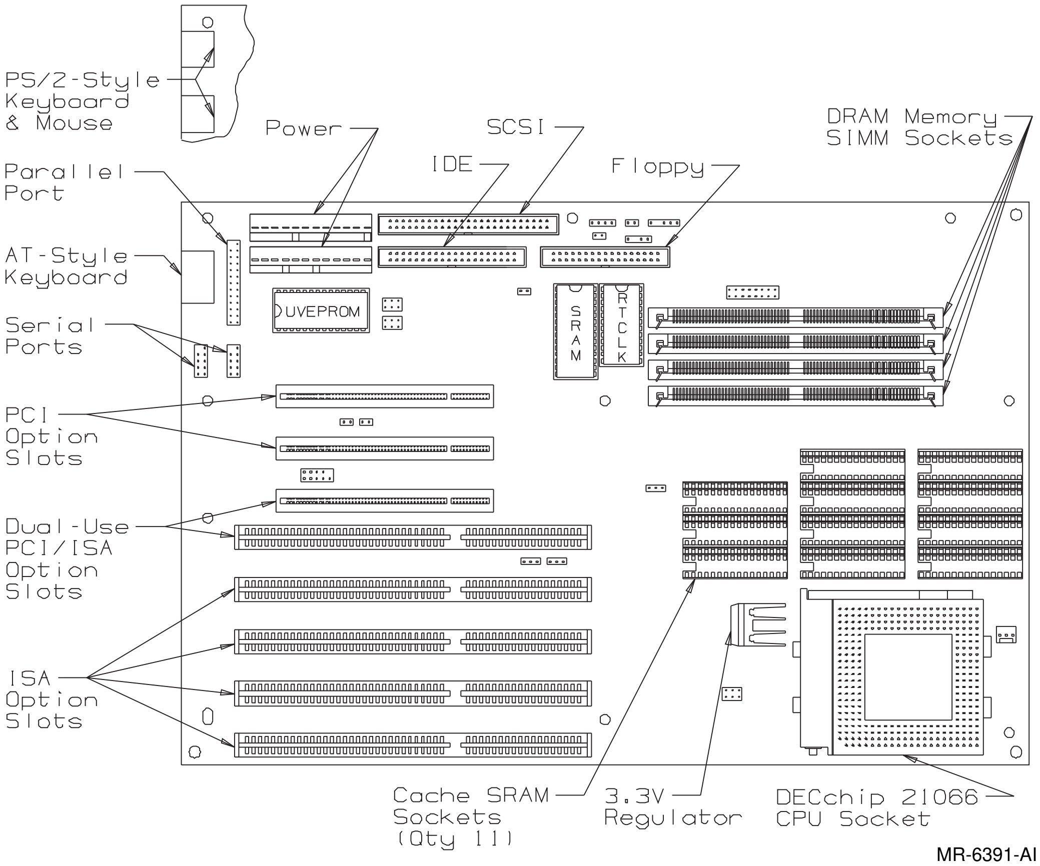
Alpha Processor	Clock Frequency	Cache	Context Switch Time[1]	Preemption Time[1]	Intertask Message Latency[1]	Semaphore Shuffle Time[1]
DECchip 21066	166 MHz	1 MB 15 ns	22.6	52.97	116.17	239.74
DECchip 21066A	233 MHz	1 MB 15 ns	18.6	44.02	93.83	189.57

[1]All Rhealstone results are reported in microseconds (μsec).

Figure 1–1 identifies the MLB major components and connectors. The main figure shows the AT style keyboard connector, and the breakout figure in the top-left corner shows the configuration using the PS/2 style keyboard and mouse connectors.

CAUTION: You must follow proper antistatic protection procedures whenever you handle the MLB or its components. Failure to do so may damage the components.

Figure 1–1 Main Logic Board



2 Physical Description

This chapter describes the following physical features of the Digital AXPpci 33:

- Core module assembly
- Main logic board (MLB)
- Single inline memory modules (SIMMs)
- ISA option modules
- PCI option modules

2.1 Core Module Assembly

Figure 2–1 depicts a typical core module assembly consisting of:

- MLB
- DECchip 21066 processor
- Four SIMMs
- Socketed cache SRAMs
- PCI and ISA option modules

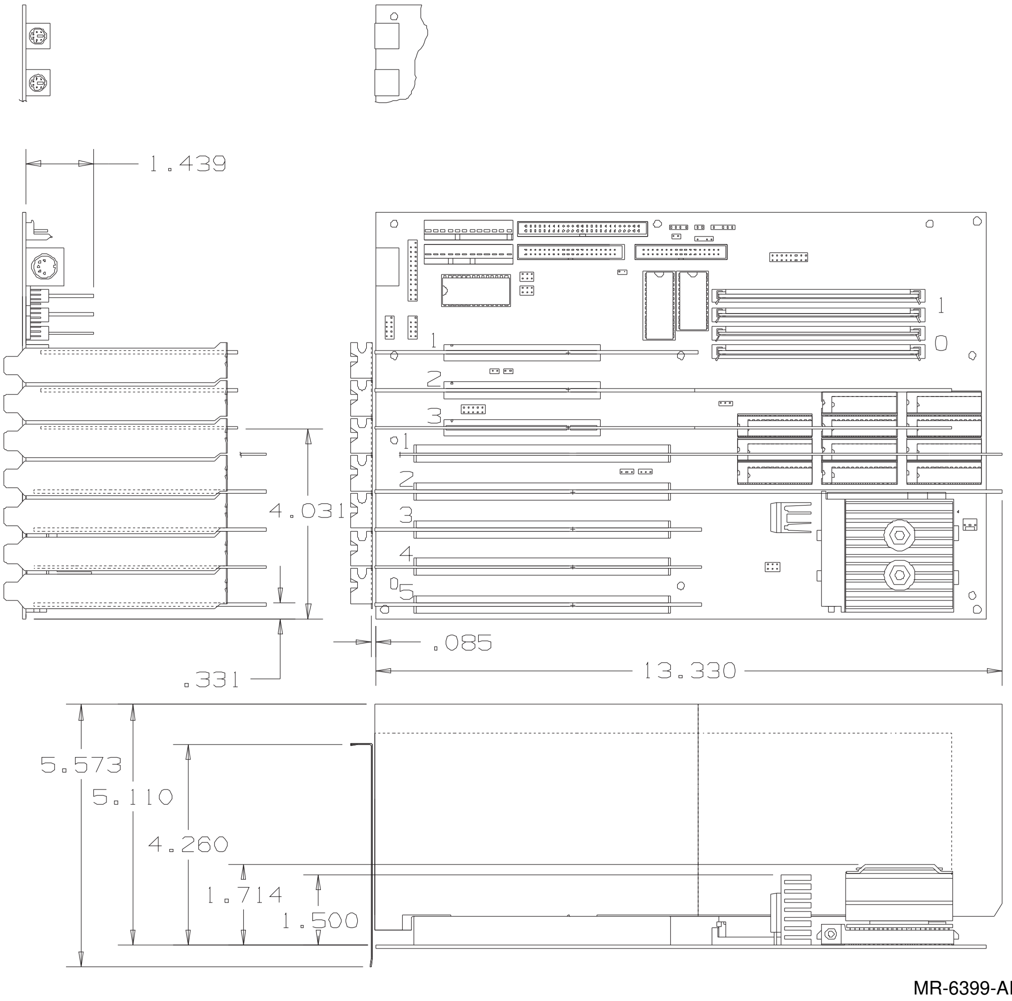
Not shown are any bulkhead connector adapters required for external serial ports, parallel ports, and a SCSI port. Use the core module assembly dimensions to size the overall module assembly for a specific enclosure.

2.2 Main Logic Board

The MLB contains these sockets and connectors:

- Zero insertion force (ZIF) socket for a DECchip 21066 processor chip
- Sockets for cache
- Connector for the floppy disk controller (FDC)
- Connector for the integrated device electronics (IDE) disk controller
- Connector for the SCSI controller
- Connector for the parallel port
- Connectors for two serial ports
- Connectors for the keyboard/mouse controller
- Connectors for the memory subsystem, which supports four SIMMs

Figure 2–1 Core Module Assembly Outline



- Connectors for the PCI and ISA option modules
- Connectors for the light emitting diodes (LEDs)
- Connector for the Reset switch
- Connector for the speaker

All MLB sockets and connectors are on side 1.

2.2.1 Physical Mounting

The AXPpci 33 MLB is a standard Baby–AT form factor with the addition of three 0.157 inch diameter ‘‘B’’ holes. The ‘‘B’’ holes are module tooling holes used during manufacturing. As shown in Figure 2–2, nine 0.157 inch diameter holes and one 0.157 inch x 0.256 inch slot are available for securing the MLB to the chassis. The maximum screw-head diameter or stand-off diameter used in any hole is 0.380 inches. An exception is the hole next to the PS/2 mouse connector (J40), which is limited to 0.250 inches.

The two holes adjacent to the keyboard connector have grounding pads or etch that requires electrical contact with the chassis. Metal screws are required at these locations to reduce electromagnetic emissions and electrostatic discharge (ESD) sensitivity. These screws must provide electrical contact between the metal chassis and the grounding holes.

WARNING: The system integrator must provide ground continuity between the power supply output ground and the safety ground. Failure to do so can damage the AXPpci 33 motherboard and attached equipment. Connection can be supplied using grounding screws as just described.

Figure 2–2 shows dimensions of the MLB and location of its major components and mounting holes.

2.2.2 Connectors

All connectors and headers are on side 1 of the MLB. Sections 2.2.2.1–2.2.2.18, arranged alphabetically by function, describe the connectors. Appendix B summarizes the connectors in numerical order. Figure 2–3 identifies connector locations and pin orientations for the MLB.

2.2.2.1 DC Power Input Connectors (J33 and J34)

The MLB has two power input connectors (J33 and J34). The main power connector (J33) is a 12-position (1 x 12) vertical male-keyed connector. The mating connectors required by the main power source are a Molex 90331 style housing (or equivalent) for positions 1–6 with a key at position 4, and a Molex 90331 style housing (or equivalent) for positions 7–12 with a key at position 1.

Connector J34 supplies +3.3 V to the PCI option slots. This is a 12-position (1 x 12) male-shrouded keyed connector. The mating connectors required by the +3.3 V power source are a Molex 90331 style housing (or equivalent) for positions 1–6 with a key at position 5, and a Molex 90331 style housing (or equivalent) for positions 7–12 with a key at position 6.

WARNING: The system integrator must provide ground continuity between the power supply output ground and the safety ground. Failure to do so can damage the AXPpci 33 motherboard and attached equipment. Connection can be supplied using grounding screws as described in Section 2.2.1.

Table 2–1 lists the pins and functions of the dc power connector (J33).

Figure 2–2 MLB Mechanical Drawing

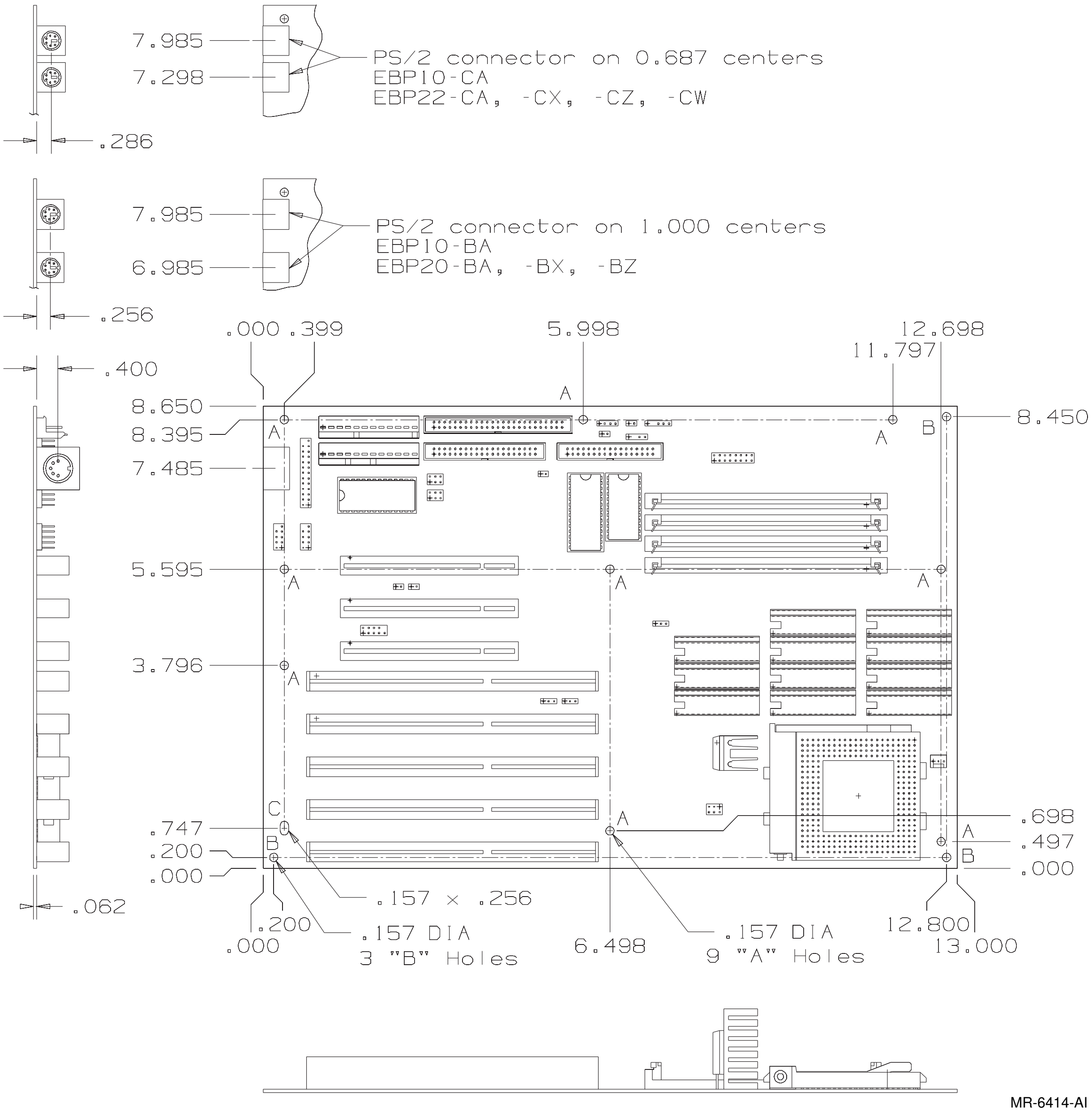


Figure 2–3 MLB Component Outline Drawing

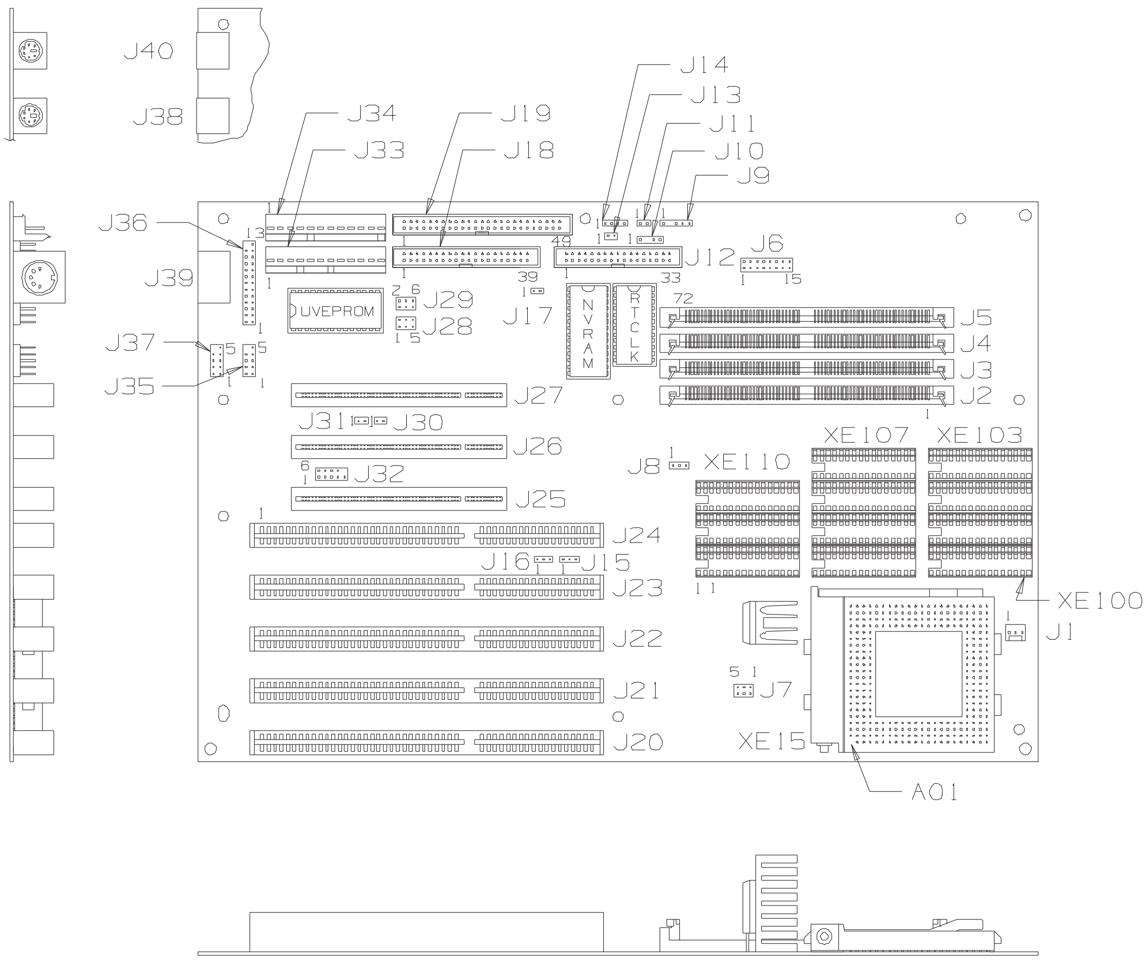


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Table 2–1 DC Power Connector (±5 V/±12 V) Pin-Out (J33)

Pin Number	Function
1	POWER GOOD
2	+5 V
3	+12 V
4	-12 V
5	Ground
6	Ground
7	Ground
8	Ground
9	-5 V
10	+5 V
11	+5 V
12	+5 V

Table 2–2 lists the pins and functions of the dc power connector (J34).

Table 2–2 DC Power Connector (+3.3 V) Pin-Out (J34)

Pin Number	Function
1	Ground
2	Ground
3	Ground
4	PCI +3.3 V
5	PCI +3.3 V
6	PCI +3.3 V
7	PCI +3.3 V
8	PCI +3.3 V
9	PCI +3.3 V
10	Ground
11	Ground
12	Ground

2.2.2.2 Engineering and Manufacturing Test Connector (J32)

The engineering and manufacturing test connector (J32) is a 10-position (2 x 5) connector for Digital engineering and manufacturing use only; DO NOT CONNECT.

2.2.2.3 Fan Connector (J1)

The fan connector (J1) is intended to power the DECchip 21066 processor's specified heatsink fan, or an enclosure mounted fan, not to exceed 250 mA. J1 is a 3-position vertical male-keyed connector.

CAUTION: Exceeding 250 mA may damage the MLB.

Table 2–3 lists the pin numbers and functions for the fan connector.

Table 2–3 Fan Connector Pin-Out (J1)

Pin Number	Function
1	+12 V
2	No connection
3	Ground

2.2.2.4 Floppy Disk Connector (J12)

The AXPpci 33 supports one floppy disk controller interface (J12). This is a 34-position (2 x 17) male-shrouded keyed connector.

Table 2–4 lists the pin numbers and functions for the floppy disk connector.

Table 2–4 Floppy Disk Connector Pin-Out (J12)

Pin Number	Function	Pin Number	Function
1	Ground	2	DENSEL
3	Ground	4	MTR3 L
5	Ground	6	DRATE0
7	Ground	8	INDEX L
9	Ground	10	MTR0 L
11	Ground	12	DR1 L
13	Ground	14	DR0 L
15	Ground	16	MTR1 L
17	No connection	18	DIR L
19	Ground	20	STEP L
21	Ground	22	WRDATA L
23	Ground	24	WGATE L
25	Ground	26	TRK0 L
27	No connection	28	WP L
29	Ground	30	RDDATA L
31	Ground	32	HDSEL L
33	Ground	34	DISKCH L

2.2.2.5 Halt/Reset Switch Connector (J11)

Use the 2-position Halt/Reset switch connector (J11) to attach a normally open switch for either halting the system or resetting the system, depending on the select jumper setting. For further information, see Section 2.2.4.3.

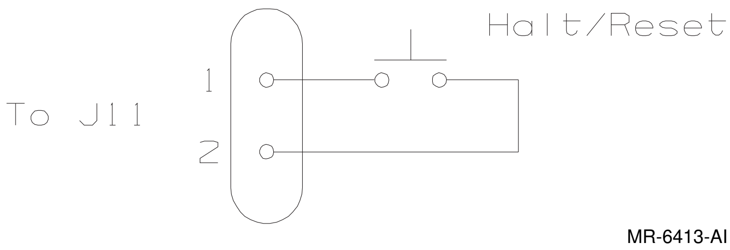
Table 2–5 lists the pins and functions of the Halt/Reset switch connector.

Table 2–5 Halt/Reset Switch Connector Pin-Out (J11)

Pin Number	Function
1	Ground
2	Halt/Reset Normally open

Figure 2–4 shows the Halt/Reset switch circuit.

Figure 2–4 Halt/Reset Switch Circuit



2.2.2.6 IDE Disk Connector (J18)

The AXPpci 33 supports one IDE compatible interface (J18) for the Windows NT operating system. This is a 40-position (2 x 20) male-shrouded keyed connector.

The IDE interface does not currently support the Digital UNIX operating system.

Table 2–6 lists the pin numbers and functions of the IDE disk connector.

Table 2–6 IDE Disk Connector Pin-Out (J18)

Pin Number	Function	Pin Number	Function
1	Reset	2	Ground
3	Data 7	4	Data 8
5	Data 6	6	Data 9

Table 2–6 (Cont.) IDE Disk Connector Pin-Out (J18)

Pin Number	Function	Pin Number	Function
7	Data 5	8	Data 10
9	Data 4	10	Data 11
11	Data 3	12	Data 12
13	Data 2	14	Data 13
15	Data 1	16	Data 14
17	Data 0	18	Data 15
19	Ground	20	No connection
21	DMA REQ	22	Ground
23	IOWC	24	Ground
25	IORC	26	Ground
27	IO CH RDY	28	Idebale
29	DMA Grant	30	Ground
31	Interrupt	32	IOCS16
33	A1	34	No connection
35	A0	36	A2
37	SEL 0	38	SEL 1
39	Busy	40	Ground

2.2.2.7 ISA Slot Connectors (J20–J24)

The AXPpci 33 supports five ISA option slots (J20–J24). Three slots support short ISA modules; two support long ISA modules. See Section 2.4 for further details about ISA option modules.

The ISA option in slot 1 (J24) occupies the same bulkhead that the PCI option in slot 3 (J25) occupies, making the slots mutually exclusive. For definition of signal and power pin assignments, refer to the ISA specification referenced in the Preface.

2.2.2.8 Keyboard Connectors (J39 and J38)

The AXPpci 33 is orderable with either the AT style (J39) 5-position DIN keyboard connector or with a 6-position mini-DIN PS/2 style (J38) keyboard connector. These connectors are mutually exclusive. The PS/2 style MLB also includes a PS/2 style mouse connector (see J40). Digital UNIX does not support the serial mouse or AT style keyboard.

CAUTION: Use +5 V for the keyboard or pointing device only. Do not exceed 250 mA.

Table 2–7 lists the pin numbers and functions of the AT style keyboard connector.

Table 2–7 Keyboard Connector — AT Style Pin-Out (J39)

Pin Number	Function	Pin Number	Function
1	Clock	4	Ground
2	Data	5	+5 V
3	No connection		

Table 2–8 lists the pin numbers and functions of the PS/2 keyboard connector.

Table 2–8 Keyboard Connector — PS/2 Style Pin-Out (J38)

Pin Number	Function	Pin Number	Function
1	Data	4	+5 V
2	No connection	5	Clock
3	Ground	6	No connection

2.2.2.9 Keylock and Power LED Connector (J9)

The keylock and power LED (J9) is a 5-position (1 x 5) connector that serves two purposes:

- Pins 1 and 3 provide +5 V and ground for an optional LED indicating dc power is present.
- Pins 4 and 5 supply a connection point for a keylock that could be used for disabling the keyboard.

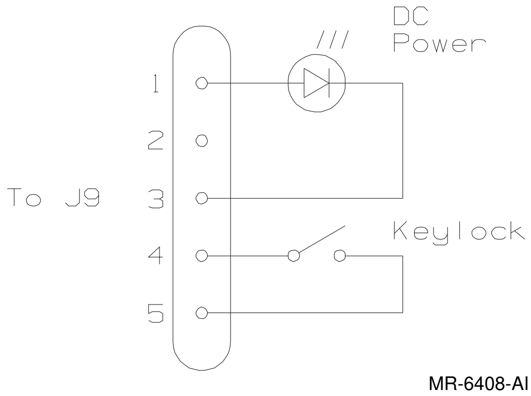
Table 2–9 lists the pin numbers and functions of the keylock and power LED connector.

Table 2–9 Keylock and Power LED Connector Pin-Out (J9)

Purpose	Pin Number	Function
Power LED	1	+5 V (through 470 ohm pull-up)
	2	No pin installed
	3	Ground
Keylock	4	Keylock signal
	5	Ground

Figure 2–5 shows the keylock and power LED circuit.

Figure 2–5 Keylock and Power LED Circuit



2.2.2.10 LED Display Connector (J6)

The 16-position (2 x 8) LED display connector (J6) supplies power and signals to an optional circuit board (system integrator provided) with 8 LEDs. The LEDs light with various codes to show the state of the boot and power-up-self-test (POST) diagnostic firmware. The LEDs show the results of writes to the lowest 8 bits of any address in the range 0.3880.0000 through 0.38ff.ffff. For consistency, it is recommended that address 0.3880.0000 be used. At the successful conclusion of self-test, the resulting code shows the cache size detected.

Use the LED ENABLE L signal to enable an 8-bit register chip such as 74F377, and the LEDCLK signal to strobe the 8 bits of data (Data 0–Data 7) into the register on the rising edge.

Table 2–10 lists the pins and functions of the LED display connector.

Table 2–10 LED Display Connector Pin-Out (J6)

Pin Number	Function	Pin Number	Function
1	+5 V	2	LED 7
3	No connection	4	LED 6
5	No connection	6	LED 5
7	LED ENABLE L	8	LED 4
9	LEDCLK	10	LED 3
11	No connection	12	LED 2
13	No connection	14	LED 1
15	Ground	16	LED 0

Figure 2–6 shows the LED display circuit.

Figure 2–6 LED Display Circuit

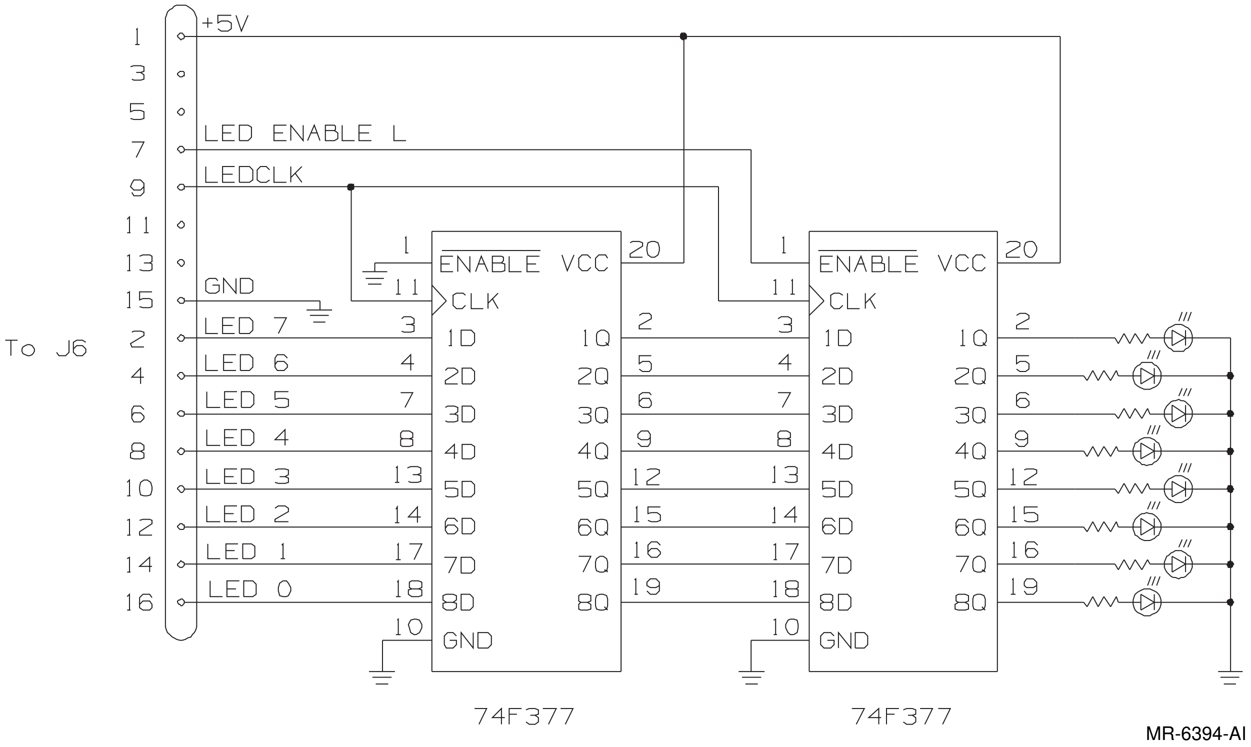


Table 2–11 lists LED codes and the related states.

Table 2–11 LED Display Codes

LED Code Data Bits [7:0] (1=On; 0=Off)[1]	Test	Condition
1111 1110	Size memory	Empty bank
1111 1101	" "	Sizing complete
1111 1011	Configure memory	Configuration complete
1111 1010	Test memory	Bcache Off/Dcache Off
1111 1001	" "	Bcache On/Dcache Off
1111 1000	" "	Bcache Off/Dcache On
1111 0111	" "	Bcache On/Dcache On
1111 0110	53C810 SCSI test	ID not detected
1111 0101	" "	Data path test done
1111 0100	Load flash to memory	Flash data path test
1111 0011	" "	Flash checksum test
1111 0000	Exit SROM	Pass control to image
1010 0000	0 KB cache	No cache found
1010 0001	256 KB cache	256 KB cache found
1010 0010	1 MB cache	1 MB found
0010 0000	Run time	Machine check

[1]All unused codes are reserved.

2.2.2.11 Mouse Connector — PS/2 Compatible (J40)

Use the PS/2 style 6-position mini-DIN mouse connector (J40) along with the PS/2 style keyboard connector on this variation of MLB. (One of the serial ports is used to connect a mouse when using an AT style keyboard. Digital UNIX does not support the serial mouse or AT style keyboard).

CAUTION: Use +5 V for the keyboard or pointing device only. Do not exceed 250 mA.

Table 2–12 lists the pin numbers and functions of the mouse connector.

Table 2–12 Mouse Connector Pin-Out (J40)

Pin Number	Function	Pin Number	Function
1	Data	4	+5 V
2	No connect	5	Clock
3	Ground	6	No connect

2.2.2.12 Parallel Port Connector (J36)

This is a parallel port 26-position (2 x 13) connector (J36). You can add an adapter cable from this MLB connector to an appropriate user connector, if required. You can interface the pin-out of this connector to a 25-position D connector using insulation displacement connectors (IDCs) on both ends.

Table 2–13 lists the pin numbers and functions of the parallel port connector.

Table 2–13 Parallel Port Connector Pin-Out (J36)

Pin Number	Function	Pin Number	Function
1	STROBE L	14	AUTOFD L
2	Data 0	15	ERROR L
3	Data 1	16	INIT L
4	Data 2	17	SLCTIN L
5	Data 3	18	Ground
6	Data 4	19	Ground
7	Data 5	20	Ground
8	Data 6	21	Ground
9	Data 7	22	Ground
10	ACK	23	Ground
11	Busy	24	Ground
12	PE	25	Ground
13	Select	26	No pin installed

2.2.2.13 PCI Slot Connectors (J25–J27)

The AXPpci 33 supports three PCI option slots (5 V/32 bit). Connector J34 connects 3.3 V to 3.3 V capable PCI cards. One slot supports a short PCI module; two support long PCI modules. The PCI option components in PCI slot 3 (J25) occupy the same space the ISA option in ISA slot 1 (J24) would occupy, making the slots mutually exclusive. For definitions of the signal and power pin assignments, see the document *PCI Local Bus Specifications* referred to in the Preface. For further information about PCI option modules, see Section 2.5.

2.2.2.14 SCSI/IDE Busy LED Connector (J14)

The 4-position (1 x 4) J14 connector provides the BUSY L signal to drive a LED that indicates bus traffic on either the SCSI bus or IDE bus.

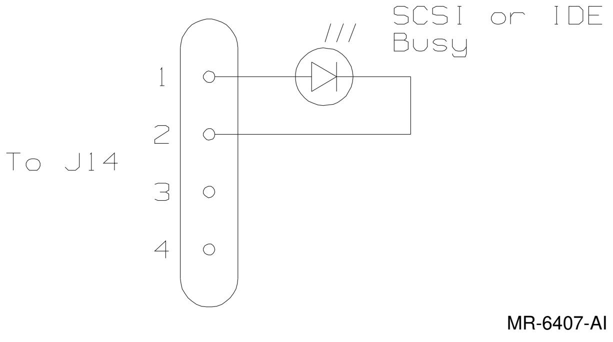
Table 2–14 lists the pin numbers and functions of the SCSI/IDE Busy LED connector.

Table 2–14 SCSI/IDE Busy LED Connector Pin-Out (J14)

Pin Number	Function
1	+5 V (through 470 ohm pull-up)
2	BUSY L
3	No connection
4	+5 V (through 470 ohm pull-up)

Figure 2–7 shows the SCSI/IDE Busy LED circuit.

Figure 2–7 SCSI/IDE Busy LED Circuit



2.2.2.15 SCSI–2 Cable Connector (J19)

The AXPpci 33 supports one SCSI–2 bus using the NCR 53C810 SCSI controller chip. The internal SCSI is a 50-position (2 x 25) male-shrouded keyed connector.

CAUTION: SCSI terminator power (TERM POWER) is always supplied.

Table 2–15 lists the pin numbers and functions of the SCSI–2 connector.

Table 2–15 SCSI–2 Connector Pin-Out (J19)

Pin Number	Function	Pin Number	Function
1	Ground	2	DB 0 L
3	Ground	4	DB 1 L
5	Ground	6	DB 2 L
7	Ground	8	DB 3 L
9	Ground	10	DB 4 L
11	Ground	12	DB 5 L
13	Ground	14	DB 6 L

Table 2–15 (Cont.) SCSI–2 Connector Pin-Out (J19)

Pin Number	Function	Pin Number	Function
15	Ground	16	DB 7 L
17	Ground	18	PB L
19	Ground	20	Ground
21	Ground	22	Ground
23	No connection	24	No connection
25	No connection	26	TERM POWER
27	No connection	28	No connection
29	Ground	30	Ground
31	Ground	32	ATN L
33	Ground	34	Ground
35	Ground	36	BSY L
37	Ground	38	ACK L
39	Ground	40	RST L
41	Ground	42	MSG L
43	Ground	44	SEL L
45	Ground	46	C/D L
47	Ground	48	REQ L
49	Ground	50	I/O L

2.2.2.16 Serial Ports COM1 (J35) and COM2 (J37)

Each serial port has a 10-position (2 x 5) connector (J35 and J37). If required, you can add an adapter cable from these serial port connectors to an appropriate user connector. You can interface the pin-out of these two connectors to 9-position D connectors using IDCs on both ends. If you use this 9-position cable adapter, it must be an industry-standard DTK type for compatibility.

Table 2–16 lists the pin numbers and functions of the serial ports COM1 and COM2 connectors.

Table 2–16 Serial Ports COM1 (J35) and COM2 (J37) Pin-Outs

Pin Number	Function	Pin Number	Function
1	DCD	6	DSR
2	Serial In	7	RTS
3	Serial Out	8	CTS
4	DTR	9	RI
5	Ground	10	No pin installed

2.2.2.17 SIMM Interconnect (J2–J5)

The AXPpci 33 MLB supports up to 256 MB of DRAM memory. On power up, the CPU automatically determines memory size. The memory SIMM devices are socketed to allow easy installation by the system integrator or end user.

The AXPpci 33 is designed to use 70 ns access time SIMMs. The recommended minimum memory size for the AXPpci 33 depends on the operation system used:

For Windows NT: 16 MB

For Digital UNIX: 32 MB

Each SIMM has a 36-bit-wide data path. SIMMs must be used in pairs: each member of the pair has data and ECC bits within that SIMM. Both members of the pair must be the same size and type. Bank 0, comprised of J2 and J3, is closest to the DECchip 21066 CPU. Bank 1, comprised of J4 and J5, is farthest from the CPU.

Note: SIMMs must be 36-bit SIMMs, sometimes called parity SIMMs. 32- or 33-bit SIMMs will not work.

Table 2–17 lists the SIMM connector pin-outs.

Table 2–17 SIMM Connector Pin-Outs (J2–J5)

Pin Number	Function	Pin Number	Function
1	Ground	37	Data
2	Data	38	Data
3	Data	39	Ground
4	Data	40	CAS
5	Data	41	CAS
6	Data	42	CAS
7	Data	43	CAS
8	Data	44	RAS
9	Data	45	RAS
10	+5 V	46	No connection
11	No connection	47	Write
12	A0	48	No connection
13	A1	49	Data
14	A2	50	Data
15	A3	51	Data
16	A4	52	Data
17	A5	53	Data
18	A6	54	Data
19	A10	55	Data
20	Data	56	Data

Table 2–17 (Cont.) SIMM Connector Pin-Outs (J2–J5)

Pin Number	Function	Pin Number	Function
21	Data	57	Data
22	Data	58	Data
23	Data	59	+5 V
24	Data	60	Data
25	Data	61	Data
26	Data	62	Data
27	Data	63	Data
28	A7	64	Data
29	A11	65	Data
30	+5 V	66	No connection
31	A8	67	No connection
32	A9	68	No connection
33	RAS	69	No connection
34	RAS	70	No connection
35	Data	71	No connection
36	Data	72	Ground

2.2.2.18 Speaker Connector (J10)

The speaker uses a 4-position (1 x 4) connector (J10). The drive circuit is designed for a 4–16 ohm dynamic speaker. Available audio power is 109 MW into an 8 ohm speaker.

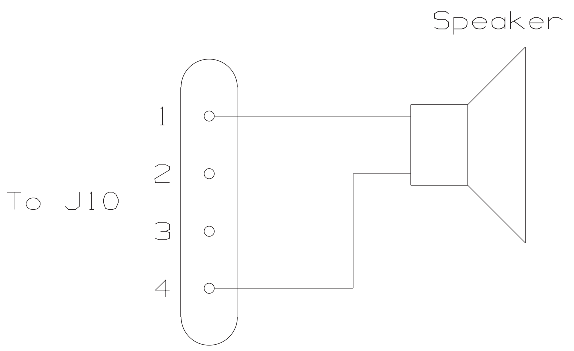
Table 2–18 lists the pin numbers and functions of the speaker connector.

Table 2–18 Speaker Connector Pin-Out (J10)

Pin Number	Function
1	Speaker output
2	No pin installed
3	No connection
4	+5 V

Figure 2–8 shows the speaker circuit.

Figure 2–8 Speaker Circuit



2.2.3 Device Sockets

The following sections describe the MLB device sockets. Sockets allow the system integrator to easily add components specifically designed for the MLB. These components include the cache SRAM devices and the DECchip 21066 processor.

CAUTION: Correct installation of these parts is critical. Significant damage results if these parts are not installed as specified in Appendix D.

2.2.3.1 AXPpci 33 Processor Socket (XE15)

The DECchip 21066 processor is installed in a 287-position ZIF socket (XE15). Refer to Appendix D for installation and handling instructions.

2.2.3.2 Cache Sockets (XE100–XE110)

The AXPpci 33 MLB can operate without cache or with an optional 256 KB or 1 MB of cache using either 11 32K x 8 or 11 128K x 8 SRAM devices. On power up, the CPU automatically determines the cache size. Cache devices are socketed to allow easy installation by the system integrator. Appendix A lists tested SRAM part numbers and associated vendors.

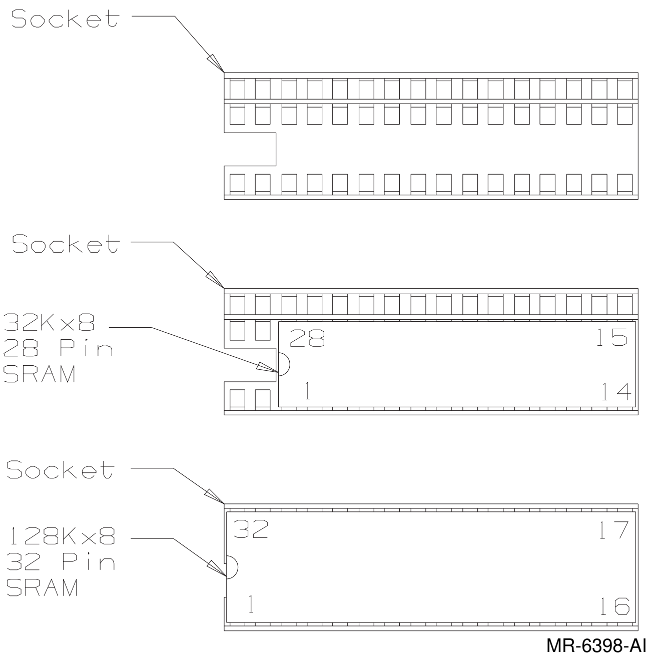
Cache sockets can accept either 28-pin (32K x 8) or 32-pin (128K x 8) SRAM devices. All devices must be of the same size and vendor. See Section 2.2.4.1 for information about cache speed selection, and Section D.4 for cache installation instructions.

Note: If cache is used, it must be installed to fill all 11 sockets, XE100–XE110. Provisions for error correction and detection require 352 KB to have 256 KB user accessible, and 1.408 MB to have 1 MB user accessible.

Figure 2–9 shows the cache socket.

CAUTION: The SRAM devices must be installed in the correct orientation with regard to pin 1; otherwise, significant damage results. Use either 0 or 11 devices.

Figure 2–9 Cache Socket



2.2.4 MLB Jumpers

The MLB has numerous sets of jumpers, which are described in Sections 2.2.4.1–2.2.4.6. The jumpers are installed onto unshrouded headers that consist of 0.025 inch square posts on 0.1 inch centers. When jumper plugs are not used for shorting two pins, they may be stored by pushing them onto a single post.

2.2.4.1 Cache Speed Select (J17)

J17 is a 2-position (1 x 2) header. The processor is informed of what speed cache memories are installed through this jumper, as outlined in Table 2–19.

Table 2–19 Cache Speed Select Jumper (J17)

15 ns Cache	20 ns Cache[1]
Jumper out	Jumper in

[1]Factory default

2.2.4.2 CPU Clock Frequency Select Jumper (J7)

J7 is a 6-position (2 x 3) header used to select the Alpha processor clock frequency. This jumper provides the processor with information about the clock speed to program a phase lock loop (PLL) circuit for the appropriate frequency.

Table 2–20 shows the select frequencies supported for each processor.

Table 2–20 CPU Clock Frequency Select Jumper (J7)

Frequency	Alpha Processor	Pin 1–2 Jumper	Pin 3–4 Jumper	Pin 5–6 Jumper
66 MHz	DECchip 21068	Out	Out	Out
100 MHz	DECchip 21068A	Out	Out	In
166 MHz	DECchip 21066	Out	In	In
233 MHz[1]	DECchip 21066A	In	Out	In

[1]Upgrade of 166 MHz boards to 233 MHz operation requires Digital Part Number EBPXU–AA upgrade kit (factory installable only). For 233 MHz operation, the minimum firmware revision is Version 1.3. See Section F.2 for details on how to obtain the latest firmware.

See Section 2.2.4.5 for required SROM boot code selection.

2.2.4.3 Halt/Reset Select Jumper (J8)

The Halt/Reset select jumper (J8) is a 3-position (1 x 3) header that determines if the system halts or resets when the Halt/Reset switch (see connector J11) is closed, if installed. This jumper may be left off if the Halt/Reset function is not required.

Table 2–21 lists the Halt/Reset select jumper pins.

Table 2–21 Halt/Reset Select Jumper (J8)

Reset Enable	Halt Enable[1]
PIn 1–2	PIn 2–3

[1]Factory default

The factory setting for this jumper is always Halt Enable. The Reset Enable position is for Digital manufacturing use only.

Note: Use of the Reset Enable function with Digital UNIX or Windows NT may result in loss of data.

Table 2–22 lists the Halt/Reset operational settings.

Table 2–22 Halt/Reset Operational Settings

J8 Setting	Windows NT Action	Digital UNIX Action
Reset Enable (Pin 1–2)	Reset (same as power up)	Reset (same as power up)
Halt Enable (Pin 2–3)	Not supported	Halt

2.2.4.4 IDE DMA Request and Grant Jumpers (J15 and J16)

The IDE DMA Request jumper (J15) and IDE DMA Grant jumper (J16) are 3-position (1 x 3) headers. These jumpers must be set to the same DMA request/grant level; otherwise operation is unpredictable.

Notes:

- **The Digital UNIX operating system does not currently support the IDE interface.**
- **Windows NT does not currently support the DMA REQUEST and GRANT signals or jumpers; DO NOT INSTALL THEM.**

Tables 2–23 and 2–24 list the IDE DMA request and grant jumper pins, respectively.

Table 2–23 IDE DMA Request Jumper (J15)

DMA Request 6	DMA Request 7
Pin 1–2	Pin 2–3

Table 2–24 IDE DMA Grant Jumper (J16)

DMA Grant 6	DMA Grant 7
Pin 1–2	Pin 2–3

2.2.4.5 SROM Select Jumpers (J28 and J29)

Use these two sets of 6-position (2 x 3) headers (J28 and J29) to define console action on power up or reset. You must only install one jumper to select one bit of an 8-bit-wide serial ROM output.

Table 2–25 lists the bit positions, jumper settings, pin connections, and functions of the SROM select jumpers.

Table 2–25 SROM Select Jumpers (J28 and J29)

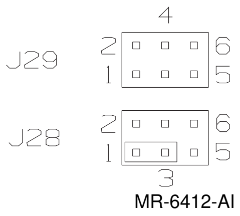
Bit Position	Jumper Set	Pin Connection	Function
0	J28	1–3	Boot operating system console from flash ROM[1]
1	J28	3–5	Boot service console with BCache Enabled
2	J28	2–4	Boot service console with BCache Disabled
3	J28	4–6	Reserved
4	J29	1–3	Boot from fail-safe loader floppy
5	J29	3–5	Reserved
6	J29	2–4	Reserved
7	J29	4–6	Reserved

[1]Factory default

CAUTION: Only one jumper must be installed at any time. Missing or multiple jumpers can cause unpredictable operation or damage.

Figure 2–10 shows a jumper positioned to select bit 0, the factory setting.

Figure 2–10 SROM Select Jumper Positions (J28 and J29)



2.2.4.6 SCSI Terminator Jumper (J13)

J13 is a 2-position (1 x 2) header. When installed, the SCSI terminator jumper enables SCSI–2 termination. SCSI termination is not a software-configurable feature.

Table 2–26 lists the SCSI terminator jumper.

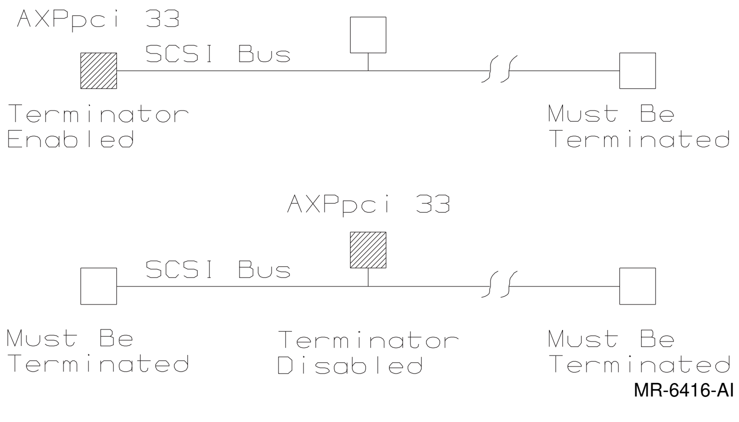
Table 2–26 SCSI Terminator Jumper (J13)

Terminator Enabled[1]	Terminator Disabled
Jumper in	Jumper out

[1]Factory default

Always enable the terminator when this MLB is at the end of the SCSI bus (as shown in Figure 2–11). Devices at the end of the SCSI bus must have the terminator installed or enabled.

Figure 2–11 Use of the Terminator on the SCSI Bus



2.3 Single Inline Memory Modules

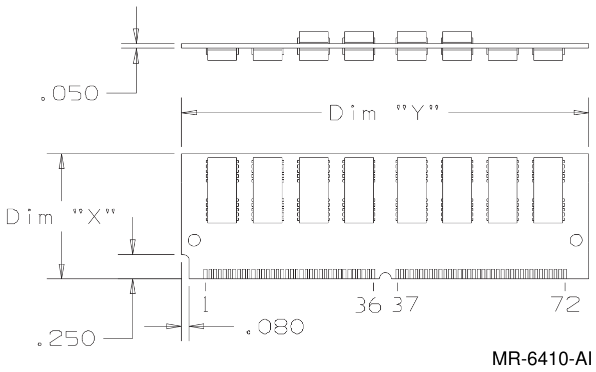
Each single inline memory module (SIMM) provides a 36-bit-wide data path. Like SIMMs must be installed in pairs. The AXPpci 33 uses industry-standard 70 ns SIMMs and supports 4, 8, 16, 32, and 64[1] MB SIMMs for a maximum of 256 MB of memory. The first SIMM pair may be installed in either of the two banks. Any combination of SIMM pairs is allowed as long as both members of a SIMM pair are of the same size and type.

The recommended minimum memory size for the AXPpci 33 depends on the operating system used:

For Windows NT:	16 MB
For Digital UNIX:	32 MB

Figure 2–12 shows a SIMM outline. Note that chip placement is for example only. Actual quantity and placement of chips vary by SIMM size and vendor.

Figure 2–12 Example SIMM Outline



2.3.1 Connector

Each SIMM has 72 finger-type contacts. One end of the SIMM PCB is keyed to ensure proper installation in the socket.

[1] Support for 64 MB SIMMs is available with installation of serial ROM Version 0.4 or higher. See Table A–2 for information about the 233 MHz upgrade kit for 166 MHz boards (factory installable only). Alternatively, Intel hex format code to reprogram the existing serial ROM can be obtained over the Internet. See Section F.2 for details.

2.3.2 Physical Mounting

SIMM modules are inserted into edge connectors on the MLB and held in place with metal locking clips. Refer to Appendix D for installation instructions.

Table 2–27 lists SIMM options and associated dimensions available from Digital.

Table 2–27 SIMM Options

Digital Option Number	Dimension "X"	Dimension "Y"
EBPXM–AA	1.000 inches	4.250 inches
EBPXM–AB	1.250 inches	4.250 inches
EBPXM–AC	1.350 inches	4.250 inches
EBPXM–AD	1.350 inches	4.250 inches
EBPXM–AE/AF	1.900 inches	4.550 inches

2.4 ISA Option Modules

Figure 2–13 shows a typical ISA option module; it is for reference only. Note that the PCB is fastened to the opposite edge of the bulkhead bracket than for a PCI option. Thus, the PCI option components in PCI slot 3 (J25) occupy the same space that the ISA option in ISA slot 1 (J24) would occupy, making the slots mutually exclusive.

Figure 2–13 Typical ISA Option Module

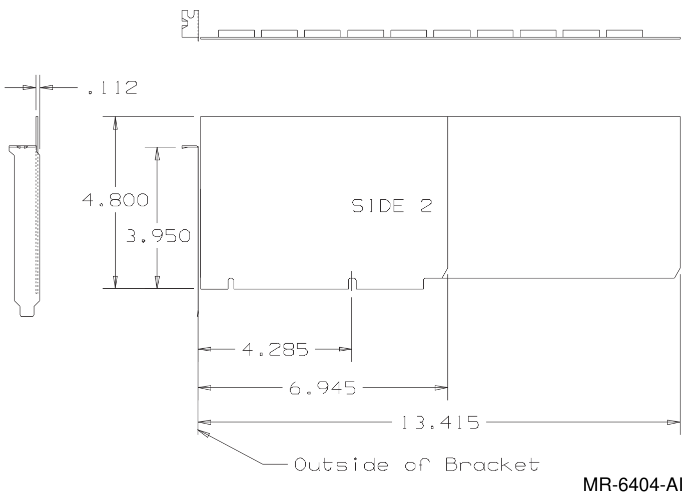


Table 2–28 lists the variable lengths for ISA options given other MLB physical limits.

Table 2–28 Variable Lengths of ISA Options

ISA Slot Number	Maximum Length	Notes
1	13.415 inches	—
2	13.415 inches	—
3	8.250 inches	1
4	11.400 inches	2
5	11.400 inches	2

Notes:

1 Maximum length is limited by the +3.3 V regulator heatsink.
2 Maximum length is limited by the DECchip 21066 processor heatsink.

2.5 PCI Option Modules

Figure 2–14 shows a typical PCI option module and is for reference only. Note that the PCB is fastened to the opposite edge of the bulkhead bracket than an ISA option. Thus, the PCI option components in PCI slot 3 (J25) occupy the same space that the ISA option in ISA slot 1 (J24) would occupy, making the slots mutually exclusive.

Figure 2–14 Typical PCI Option Drawing

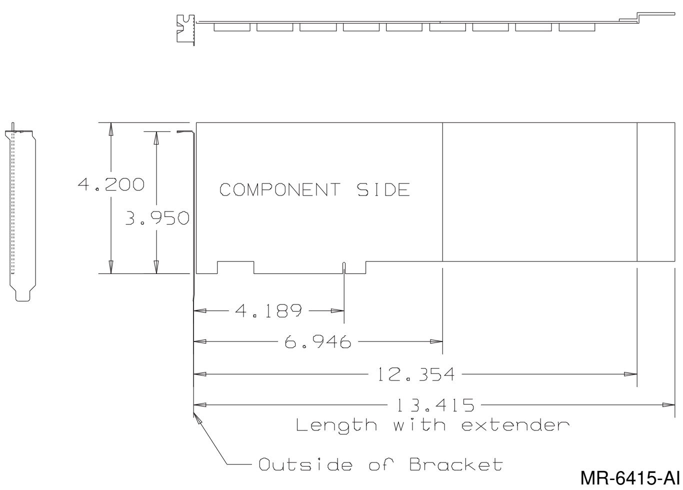


Table 2–29 lists the variable lengths for PCI options given other MLB physical limits.

Table 2–29 Variable Lengths of PCI Options

PCI Slot Number	Maximum Length	Notes
1	7.000 inches	1
2	13.415 inches	2
3	13.415 inches	2

Notes:

1 Maximum length is limited by the SIMM in J2.
2 The maximum length of 13.415 inches is accomplished by adding an extender. This allows a PCI module to be of equal length to an ISA module and to be supported by the card guides.

3 Environmental Data

This chapter gives environmental data for:

- Cooling requirements
- DC power inputs
- Electrostatic discharge (ESD) considerations
- Telecommunication regulatory standards
- Electromagnetic compatibility (EMC) considerations
- Reliability data

3.1 Cooling Requirements

Maintaining proper component case or junction temperatures is important in maintaining system reliability.

3.1.1 Air Flow

Air-flow direction relative to the core module set must be parallel to the SIMMs, the DECchip 21066 heatsink fins, and the PCI/ISA option modules. Air-flow velocity must be sufficient to maintain component case temperatures below their maximum rating. A guideline for maximum case temperatures, excluding the DECchip 21066, is 75°C (167°F) for metal oxide semiconductor (MOS) devices and 100°C (212°F) for bipolar devices.

Table 3–1 lists the DECchip 21066 maximum case temperature limits.

Table 3–1 DECchip 21066 Maximum Case Temperature Limits

Alpha Processor	Maximum Case Temperature
DECchip 21066–166	85°C (185°F)
DECchip 21066A–233	84°C (183°F)
DECchip 21068–66	93°C (199°F)
DECchip 21068A–100	93°C (199°F)

3.1.2 DECchip 21066 Heatsink Selection

The DECchip 21066 requires a heatsink, thermal interface pad, and sufficient air flow to keep it below its maximum case temperature. Tables 3–2 through 3–7 include various tested and recommended heatsink and airflow combinations. Appendix A lists suppliers and associated part numbers.

CAUTION: Tables 3–2 through 3–7 present the maximum ambient temperature for the DECchip 21066. Other limitations on ambient operating temperature may apply, including storage devices, power supplies, PCI or ISA option modules, or other chips on the MLB.

The three recommended DECchip 21066 heatsinks are made from 6061–T6 aluminum with clear anodized finish:

- Low profile (2.20 inches L x 2.20 inches W x 0.34 inches H)
- High profile (2.27 inches L x 2.27 inches W x 0.90 inches H)
- Integral fan/heatsink (2.20 inches L x 2.20 inches W x 0.42 inches H)

The third heatsink uses an attached fan. Dimensions for the fan are 2.36 inches L x 2.36 inches W x 0.59 inches H. The fan delivers 14 CFM at 12 Vdc and 90 mA.

3.1.2.1 DECchip 21066 (166 MHz) Cooling Requirements

Tables 3–2 through 3–4 list the DECchip 21066 (166 MHz) cooling requirements using a low-profile heatsink, high-profile heatsink, and fan/heatsink, respectively.

Table 3–2 DECchip 21066 (166 MHz) Cooling Using Low-Profile Heatsink

Air Velocity LFM	AXPpci 33 CPU Power	T_c Max	Theta jc	Theta ja	Theta ca	Maximum Ambient Temperature	Notes
400	21 W	85°C	0.70°C/W	3.80°C/W	3.10°C/W	20°C	1
600	21 W	85°C	0.70°C/W	2.80°C/W	2.10°C/W	41°C	1
800	21 W	85°C	0.70°C/W	2.35°C/W	1.65°C/W	50°C	1, 2
1,000	21 W	85°C	0.70°C/W	2.10°C/W	1.40°C/W	56°C	1, 2

Using part number 12–35739–18 low-profile heatsink.

Notes:

1 If the recommended thermal pad (thermal interface between the 21066 and heatsink) is not used, the Theta jc and Theta ja values will increase by 0.45°C/W. The end result is a decrease in maximum allowable ambient temperature by 9.5°C.

2 Operation above 40°C ambient temperature requires further thermal analysis by the system integrator. This ensures that maximum operating temperatures are not exceeded for any other device including storage devices, power supplies, PCI or ISA option modules, or other chips on the MLB.

Table 3–3 DECchip 21066 (166 MHz) Cooling Using High-Profile Heatsink

Air Velocity LFM	AXPpci 33 CPU Power	T_c Max	Theta jc	Theta ja	Theta ca	Maximum Ambient Temperature	Notes
100	21W	85°C	0.70°C/W	3.50°C/W	2.80°C/W	26°C	1
200	21W	85°C	0.70°C/W	2.55°C/W	1.85°C/W	46°C	1, 2
400	21W	85°C	0.70°C/W	2.00°C/W	1.30°C/W	58°C	1, 2
600	21W	85°C	0.70°C/W	1.80°C/W	1.10°C/W	62°C	1, 2
800	21W	85°C	0.70°C/W	1.60°C/W	0.90°C/W	66°C	1, 2
1,000	21W	85°C	0.70°C/W	1.50°C/W	0.80°C/W	69°C	1, 2

Using part number 12–35739–22 high-profile heatsink.

Notes:

1 If the recommended thermal pad (thermal interface between the 21066 and heatsink) is not used, the Theta jc and Theta ja values will increase by 0.45°C/W. The end result is a decrease in maximum allowable ambient temperature by 9.5°C.

2 Operation above 40°C ambient temperature requires further thermal analysis by the system integrator. This ensures that maximum operating temperatures are not exceeded for any other device including storage devices, power supplies, PCI or ISA option modules, or other chips on the MLB.

Table 3–4 DECchip 21066 (166 MHz) Cooling Using Fan/Heatsink

Fan Voltage	AXPpci 33 CPU Power	T_c Max	Theta jc	Theta ja	Theta ca	Maximum Ambient Temperature	Notes
12 V	21 W	85°C	0.70°C/W	2.10°C/W	1.30°C/W	58°C	1, 2

Using part number 12–35739–34 for heatsink and specified fan.

Notes:

1 If the recommended thermal pad (thermal interface between the 21066 and heatsink) is not used, the Theta jc and Theta ja values will increase by 0.45°C/W. The end result is a decrease in maximum allowable ambient temperature by 9.5°C.

2 Operation above 40°C ambient temperature requires further thermal analysis by the system integrator. This ensures that maximum operating temperatures are not exceeded for any other device including storage devices, power supplies, PCI or ISA option modules, or other chips on the MLB.

3.1.2.2 DECchip 21066A (233 MHz) Cooling Requirements

Tables 3–5 through 3–7 list the DECchip 21066A (233 MHz) cooling requirements using a low-profile heatsink, high-profile heatsink, and fan/heatsink, respectively.

Table 3–5 DECchip 21066A (233 MHz) Cooling Using Low-Profile Heatsink

Air Velocity LFM	AXPpci 33 CPU Power	T_c Max	Theta jc	Theta ja	Theta ca	Maximum Ambient Temperature	Notes
400	23 W	84°C	0.70°C/W	3.80°C/W	3.10°C/W	13°C	1
600	23 W	84°C	0.70°C/W	2.80°C/W	2.10°C/W	36°C	1
800	23 W	84°C	0.70°C/W	2.35°C/W	1.65°C/W	46°C	1, 2
1,000	23 W	84°C	0.70°C/W	2.10°C/W	1.40°C/W	52°C	1, 2

Using part number 12–35739–18 low-profile heatsink.

Notes:

1 If the recommended thermal pad (thermal interface between the 21066A and heatsink) is not used, the Theta jc and Theta ja values will increase by 0.45°C/W. The end result is a decrease in maximum allowable ambient temperature by 10.4°C.

2 Operation above 40°C ambient temperature requires further thermal analysis by the system integrator. This ensures that maximum operating temperatures are not exceeded for any other device including storage devices, power supplies, PCI or ISA option modules, or other chips on the MLB.

Table 3–6 DECchip 21066A (233 MHz) Cooling Using High-Profile Heatsink

Air Velocity LFM	AXPpci 33 CPU Power	T_c Max	Theta jc	Theta ja	Theta ca	Maximum Ambient Temperature	Notes
100	23W	84°C	0.70°C/W	3.50°C/W	2.80°C/W	20°C	1
200	23W	84°C	0.70°C/W	2.55°C/W	1.85°C/W	41°C	1, 2
400	23W	84°C	0.70°C/W	2.00°C/W	1.30°C/W	54°C	1, 2
600	23W	84°C	0.70°C/W	1.80°C/W	1.10°C/W	59°C	1, 2
800	23W	84°C	0.70°C/W	1.60°C/W	0.90°C/W	63°C	1, 2
1,000	23W	84°C	0.70°C/W	1.50°C/W	0.80°C/W	66°C	1, 2

Using part number 12–35739–22 high-profile heatsink.

Notes:

1 If the recommended thermal pad (thermal interface between the 21066A and heatsink) is not used, the Theta jc and Theta ja values will increase by 0.45°C/W. The end result is a decrease in maximum allowable ambient temperature by 10.4°C.

2 Operation above 40°C ambient temperature requires further thermal analysis by the system integrator. This ensures that maximum operating temperatures are not exceeded for any other device including storage devices, power supplies, PCI or ISA option modules, or other chips on the MLB.

Table 3–7 DECchip 21066A (233 MHz) Cooling Using Fan/Heatsink

Fan Voltage	AXPpci 33 CPU Power	T_c Max	Theta jc	Theta ja	Theta ca	Maximum Ambient Temperature	Notes
12 V	23 W	84°C	0.70°C/W	2.10°C/W	1.30°C/W	54°C	1, 2

Using part number 12–35739–34 for heatsink and specified fan.

Notes:

1 If the recommended thermal pad (thermal interface between the 21066A and heatsink) is not used, the Theta jc and Theta ja values will increase by 0.45°C/W. The end result is a decrease in maximum allowable ambient temperature by 10.4°C.
2 Operation above 40°C ambient temperature requires further thermal analysis by the system integrator. This ensures that maximum operating temperatures are not exceeded for any other device including storage devices, power supplies, PCI or ISA option modules, or other chips on the MLB.

3.1.2.3 DECchip 21068 (66 MHz) Cooling Requirements

Tables 3–8 through 3–10 list the DECchip 21068 (66 MHz) cooling requirements using a low-profile heatsink, high-profile heatsink, and fan/heatsink, respectively.

Table 3–8 DECchip 21068 (66 MHz) Cooling Using Low-Profile Heatsink

Air Velocity LFM	AXPpci 33 CPU Power	T_c Max	Theta jc	Theta ja	Theta ca	Maximum Ambient Temperature	Notes
100	9W	93°C	0.70°C/W	7.25°C/W	6.55°C/W	34°C	1
200	9W	93°C	0.70°C/W	5.70°C/W	5.00°C/W	48°C	1
400	9W	93°C	0.70°C/W	3.80°C/W	3.10°C/W	65°C	1, 2
600	9W	93°C	0.70°C/W	2.80°C/W	2.10°C/W	74°C	1, 2
800	9W	93°C	0.70°C/W	2.35°C/W	1.65°C/W	78°C	1, 2
1,000	9W	93°C	0.70°C/W	2.10°C/W	1.40°C/W	80°C	1, 2

Using part number 12–35739–18 low-profile heatsink.

Notes:

1 If the recommended thermal pad (thermal interface between the 21068 and heatsink) is not used, the Theta jc and Theta ja values will increase by 0.45°C/W. The end result will be a decrease in maximum allowable ambient temperature by 4°C.
2 Operation above 40°C ambient temperature will require further thermal analysis by the system integrator. This ensures that maximum operating temperatures are not exceeded for any other device including storage devices, power supplies, PCI or ISA option modules, or other chips on the MLB.

Table 3–9 DECchip 21068 (66 MHz) Cooling Using High-Profile Heatsink

Air Velocity LFM	AXPpci 33 CPU Power	T_c Max	Theta jc	Theta ja	Theta ca	Maximum Ambient Temperature	Notes
0	9W	93°C	0.70°C/W	4.60°C/W	3.90°C/W	58°C	1
100	9W	93°C	0.70°C/W	3.50°C/W	2.80°C/W	68°C	1, 2
200	9W	93°C	0.70°C/W	2.55°C/W	1.85°C/W	76°C	1, 2
400	9W	93°C	0.70°C/W	2.00°C/W	1.30°C/W	81°C	1, 2
600	9W	93°C	0.70°C/W	1.80°C/W	1.10°C/W	83°C	1, 2
800	9W	93°C	0.70°C/W	1.60°C/W	0.90°C/W	85°C	1, 2
1,000	9W	93°C	0.70°C/W	1.50°C/W	0.80°C/W	86°C	1, 2

Using part number 12–35739–22 high-profile heatsink.

Notes:

1 If the recommended thermal pad (thermal interface between the 21068 and heatsink) is not used, the Theta jc and Theta ja values will increase by 0.45°C/W. The end result will be a decrease in maximum allowable ambient temperature by 4°C.

2 Operation above 40°C ambient temperature will require further thermal analysis by the system integrator. This ensures that maximum operating temperatures are not exceeded for any other device including storage devices, power supplies, PCI or ISA option modules, or other chips on the MLB.

Table 3–10 DECchip 21068 (66 MHz) Cooling Using Fan/Heatsink

Fan Voltage	AXPpci 33 CPU Power	T_c Max	Theta jc	Theta ja	Theta ca	Maximum Ambient Temperature	Notes
12 V	9 W	93°C	0.70°C/W	2.10°C/W	1.30°C/W	81°C	1, 2

Using part number 12–35739–34 for heatsink and specified fan.

Notes:

1 If the recommended thermal pad (thermal interface between the 21068 and heatsink) is not used, the Theta jc and Theta ja values will increase by 0.45°C/W. The end result will be a decrease in maximum allowable ambient temperature by 4°C.

2 Operation above 40°C ambient temperature will require further thermal analysis by the system integrator. This ensures that maximum operating temperatures are not exceeded for any other device including storage devices, power supplies, PCI or ISA option modules, or other chips on the MLB.

3.1.2.4 DECchip 21068A (100 MHz) Cooling Requirements

Tables 3–11 through 3–13 list the DECchip 21068A (100 MHz) cooling requirements using a low-profile heatsink, high-profile heatsink, and fan/heatsink, respectively.

Table 3–11 DECchip 21068A (100 MHz) Cooling Using Low-Profile Heatsink

Air Velocity LFM	AXPpci 33 CPU Power	T_c Max	Theta jc	Theta ja	Theta ca	Maximum Ambient Temperature	Notes
100	10W	93°C	0.70°C/W	7.25°C/W	6.55°C/W	28°C	1
200	10W	93°C	0.70°C/W	5.70°C/W	5.00°C/W	43°C	1
400	10W	93°C	0.70°C/W	3.80°C/W	3.10°C/W	62°C	1, 2
600	10W	93°C	0.70°C/W	2.80°C/W	2.10°C/W	72°C	1, 2
800	10W	93°C	0.70°C/W	2.35°C/W	1.65°C/W	77°C	1, 2
1,000	10W	93°C	0.70°C/W	2.10°C/W	1.40°C/W	79°C	1, 2

Using part number 12–35739–18 low-profile heatsink.

Notes:

1 If the recommended thermal pad (thermal interface between the 21068A and heatsink) is not used, the Theta jc and Theta ja values will increase by 0.45°C/W. The end result will be a decrease in maximum allowable ambient temperature by 5°C.

2 Operation above 40°C ambient temperature will require further thermal analysis by the system integrator. This ensures that maximum operating temperatures are not exceeded for any other device including storage devices, power supplies, PCI or ISA option modules, or other chips on the MLB.

Table 3–12 DECchip 21068A (100 MHz) Cooling Using High-Profile Heatsink

Air Velocity LFM	AXPpci 33 CPU Power	T_c Max	Theta jc	Theta ja	Theta ca	Maximum Ambient Temperature	Notes
0	10W	93°C	0.70°C/W	4.60°C/W	3.90°C/W	44°C	1
100	10W	93°C	0.70°C/W	3.50°C/W	2.80°C/W	65°C	1, 2
200	10W	93°C	0.70°C/W	2.55°C/W	1.85°C/W	75°C	1, 2
400	10W	93°C	0.70°C/W	2.00°C/W	1.30°C/W	80°C	1, 2
600	10W	93°C	0.70°C/W	1.80°C/W	1.10°C/W	82°C	1, 2
800	10W	93°C	0.70°C/W	1.60°C/W	0.90°C/W	84°C	1, 2
1,000	10W	93°C	0.70°C/W	1.50°C/W	0.80°C/W	85°C	1, 2

Using part number 12–35739–22 high-profile heatsink.

Notes:

1 If the recommended thermal pad (thermal interface between the 21068A and heatsink) is not used, the Theta jc and Theta ja values will increase by 0.45°C/W. The end result will be a decrease in maximum allowable ambient temperature by 5°C.

2 Operation above 40°C ambient temperature will require further thermal analysis by the system integrator. This ensures that maximum operating temperatures are not exceeded for any other device including storage devices, power supplies, PCI or ISA option modules, or other chips on the MLB.

Table 3–13 DECchip 21068A (100 MHz) Cooling Using Fan/Heatsink

Fan Voltage	AXPpci 33 CPU Power	T_c Max	Theta jc	Theta ja	Theta ca	Maximum Ambient Temperature	Notes
12 V	10 W	93°C	0.70°C/W	2.10°C/W	1.30°C/W	80°C	1, 2

Using part number 12–35739–34 for heatsink and specified fan.

Notes:

1 If the recommended thermal pad (thermal interface between the 21068A and heatsink) is not used, the Theta jc and Theta ja values will increase by 0.45°C/W. The end result will be a decrease in maximum allowable ambient temperature by 5°C.

2 Operation above 40°C ambient temperature will require further thermal analysis by the system integrator. This ensures that maximum operating temperatures are not exceeded for any other device including storage devices, power supplies, PCI or ISA option modules, or other chips on the MLB.

3.1.2.5 Custom Heatsink Design

If you use alternative heatsinks, use this formula to determine the maximum ambient air temperature for the DECchip 21066:

$$T_{ambient} = T_C - [Power\ (Interface\ Thermal\ Resistance + Heatsink\ Thermal\ Resistance)]$$

where the variables have these meanings:

T_c	Maximum device case temperatures based on processor type: • For DECchip 21068–66, 93°C. • For DECchip 21068A–100, 93°C. • For DECchip 21066–166, 85°C • For DECchip 21066A–233, 84°C
Power	Worst-case values based on processor type: • For DECchip 21068–66, 9 W. • For DECchip 21068A–100, 10 W. • For DECchip 21066–166, 21 W. • For DECchip 21066A–233, 23 W.
Interface Thermal Resistance	°C/W between the DECchip 21066 and the heatsink.
Heatsink Thermal Resistance	°C/W between the heatsink and ambient air flow at some known velocity.

When using other heatsink designs, consider:

- If the custom heatsink footprint is larger than the DECchip 21066 PGA chip, interference may occur with side 2 of the ISA module in slot 2 (J23).
- If the custom heatsink footprint is larger than the DECchip 21066 PGA chip, the length of the ISA modules in slots 4 and 5 (J21 and J20) may be reduced.
- Operation of the ZIF socket lever is inhibited with a larger heatsink, requiring that the heatsink be installed after the DECchip 21066 processor is installed into the ZIF socket. This practice is not recommended.

- If the custom heatsink footprint is larger than the DECchip 21066 PGA chip, the retaining clip may not fit.

3.2 DC Power Inputs

This section describes the DECchip 21066 power requirements, power sequencing, and signals.

3.2.1 System Power Requirements

Tables 3–14 through 3–17 list the power requirements for the MLB DECchip 21066 processor. Not included in these figures are any SIMMs, cache, option modules, or fan. The +3.3 V used by the Alpha processor is derived from the +5 V with an onboard regulator/sequencer.

Table 3–14 System DC Power Requirements (Using 21066 at 166 MHz)

Nominal Input	Typical Load Current	Maximum Load Current	Required Regulation
+5 V	8.5 A	11 A	±5%
+12 V	—	25 mA	±5%
-12 V	—	23 mA	±10%

Table 3–15 System DC Power Requirements (Using 21066A at 233 MHz)

Nominal Input	Typical Load Current	Maximum Load Current	Required Regulation
+5 V	8.5 A	13 A	±5%
+12 V	—	25 mA	±5%
-12 V	—	23 mA	±10%

Table 3–16 System DC Power Requirements (Using 21068 at 66MHz)

Nominal Input	Typical Load Current	Maximum Load Current	Required Regulation
+5 V	6.0 A	7.3 A	±5%
+12 V	—	25 mA	±5%
-12 V	—	23 mA	±10%

Table 3–17 System DC Power Requirements (Using 21068A at 100 MHz)

Nominal Input	Typical Load Current	Maximum Load Current	Required Regulation
+5 V	6.5 A	8 A	±5%
+12 V	—	25 mA	±5%

Table 3–17 (Cont.) System DC Power Requirements (Using 21068A at 100 MHz)

Nominal Input	Typical Load Current	Maximum Load Current	Required Regulation
-12 V	—	23 mA	±10%

3.2.2 Power Sequencing

Power sequencing of +3.3 V for the Alpha processor by the power supply is not required. The +3.3 V supply is derived from +5 V and sequenced by an onboard circuit. The +3.3 V power connector provides power only to the PCI slots.

3.2.3 POWER GOOD Signal

The POWER GOOD (assert HIGH) signal to the MLB is required to ensure that the logic to the system comes up and goes down in a defined state. On power up, the AXPpci 33 power supply asserts the POWER GOOD signal 100–500 ms after the dc power is within the operating range. On power down, the power supply must furnish regulated power levels for a period greater than 1 ms after the POWER GOOD signal negates (see Figure 3–1). The POWER GOOD signal input is TTL compatible.

Tables 3–18 and 3–19 define the recommended electrical characteristics for the power supply and POWER GOOD signal, which is fed into a 74F00 type gate. No required relationship exists between +5 V valid levels and the turn on or turn off of the ±12 V, -5 V, or +3.3 V supplies.

Figure 3–1 POWER GOOD Timing Diagram

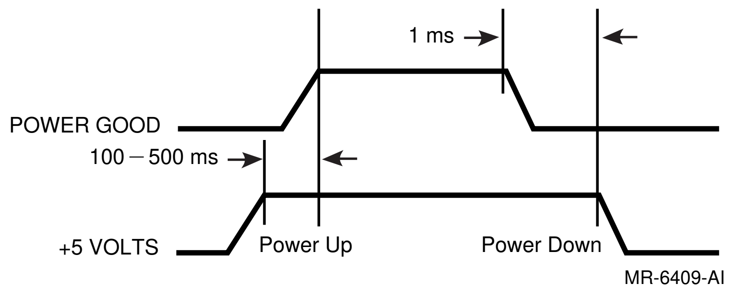


Table 3–18 POWER GOOD — Undervoltage Threshold

Output	Minimum Output for POWER GOOD Assertion
+5 V	4.8 V

Table 3–19 POWER GOOD — Electrical Characteristics

Characteristic	Test Condition	Minimum	Maximum	Units
V_{il}	$I_{il} = -0.6mA$	—	0.8	V
V_{ih}	$I_{ih} = 20uA$	2.0	—	V

3.3 Electrostatic Discharge Considerations

Enclosure design, specified by the system integrator, is key to protection against electrostatic discharge (ESD). Protection of the circuitry against ESD depends upon this enclosure design. Adequate precautions were included in the module design at the interface point to the enclosure and cable interconnects.

3.4 Telecommunication Regulatory Standards

The AXPpci 33 board was evaluated for compliance with international telecommunication regulatory standards and met these requirements. Formal certification is the responsibility of the system integrator.

3.5 Electromagnetic Compatibility Considerations

The AXPpci 33 board was evaluated in typical production quality and commercially available enclosures. The board proved to be adequately designed to allow system integrators to pass electromagnetic compatibility (EMC) compliance testing. Specifics for the enclosure design are the responsibility of the system integrator.

The following EMC controls, which may help the system integrator pass EMC inspection, were established when the MLB was tested for EMC compliance in commercial enclosures:

- Both serial port flat-ribbon cables were passed through one ferrite bead (material 43). A separate ferrite bead was around the parallel-port cable.
- Depending on the power supply, another ferrite might be required around the dc power cable of the supply.

3.6 Reliability Data

Table 3–20 lists the mean time between failure (MTBF) data for the AXPpci 33 system components. The MTBF data is calculated for 25°C and 40°C environments and assumes that airflow of at least 200 LFM is always available to cool the CPU. Items not listed, such as the power supply and PCI or ISA options, are explicitly excluded from these calculations.

Table 3–20 MTBF Data for the AXPpci 33 MLB

Alpha Processor	Cache	Memory	MTBF at 25°C Hours	MTBF at 40°C Hours
None	None	None	460,000	260,000
DECchip 21066	None	None	450,000	250,000
DECchip 21066	256 KB, 20 ns	None	390,000	210,000
DECchip 21066	256 KB, 20 ns	32 MB	295,000	155,000
DECchip 21066	1 MB, 20 ns	None	330,000	170,000
DECchip 21066	1 MB, 20 ns	32 MB	260,000	130,000

A Suppliers and Part Numbers

This appendix contains part numbers for orderable:

- Main logic boards (MLBs)
- MLB bundled kit configurations
- MLB options
- Accessories

A.1 Main Logic Board Configurations

Table A–1 provides MLB and bundled kit configurations and part numbers.

Table A–2 lists orderable MLB options and associated part numbers. Consult your Digital sales representative for the lastest offerings.

Table A–1 MLB and Bundled Kit Configurations

Console Firmware	Operating System	Keyboard Interface	Alpha Processor	Digital Part Number	Notes
MLB					
Windows NT (ARC)	N/A	AT style	N/A	EBP10–AA	1
	N/A	PS/2 style	N/A	EBP10–BA	1
	N/A	PS/2 style	N/A	EBP10–CA	1
MLB and Processor					
Windows NT (ARC)	Windows NT	AT style	DECchip 21066–166	EBP20–AA	2, 3, 4
		PS/2 style	DECchip 21066–166	EBP20–BA	2, 3, 4
		AT style	DECchip 21066A–233	EBP22–AA	2, 3, 4
		PS/2 style	DECchip 21066A–233	EBP22–CA	2, 3, 4

Notes:

1 This configuration does not include the DECchip 21066 processor, cache, or RAM.
2 This DECchip 21066 processor configuration uses the high-profile heatsink.
3 No preconfigured MLB is offered using the DECchip 21068 processor.
4 This preconfigured MLB does not include cache or RAM.

Table A–1 (Cont.) MLB and Bundled Kit Configurations

Console Firmware	Operating System	Keyboard Interface	Alpha Processor	Digital Part Number	Notes
MLB and Processor					
Digital UNIX (SRM)	3 Digital UNIX licenses: — 2 User License — Server extensions — C kit	PS/2 style	DECchip 21066–166	EBP20–BX	2, 3, 4
	1 Digital UNIX license: — 2 User License	PS/2 style	DECchip 21066–166	EBP20–BZ	2, 3, 4
	3 Digital UNIX licenses: — 2 User License — Server extensions — C kit	PS/2 style	DECchip 21066A–233	EBP22–CX	2, 3, 4
	1 Digital UNIX license: — 2 User License	PS/2 style	DECchip 21066A–233	EBP22–CZ	2, 3, 4
	VxWorks Run-Time License	PS/2 style	DECchip 21066A–233	EBP22–CW	2, 3, 4
MLB, Processor, and Enclosure					
Windows NT (ARC)	Windows NT	AT style	DECchip 21066A–233	ETN22–AA	2, 3, 4
	Windows NT	PS/2 style	DECchip 21066A–233	ETN22–CA	2, 3, 4
Digital UNIX (SRM)	3 Digital UNIX licenses: — 2 User License — Server extensions — C kit	PS/2 style	DECchip 21066A–233	ETN22–CX	2, 3, 4
	1 Digital UNIX license: — 2 User License	PS/2 style	DECchip 21066A–233	ETN22–CZ	2, 3, 4
	VxWorks Run-Time License	PS/2 style	DECchip 21066A–233	ETN22–CW	2, 3, 4

Notes:

1 This configuration does not include the DECchip 21066 processor, cache, or RAM.
2 This DECchip 21066 processor configuration uses the high-profile heatsink.
3 No preconfigured MLB is offered using the DECchip 21068 processor.
4 This preconfigured MLB does not include cache or RAM.

Table A–1 (Cont.) MLB and Bundled Kit Configurations

Console Firmware	Operating System	Keyboard Interface	Alpha Processor	Digital Part Number	Notes
MLB, Processor, Enclosure, and Peripherals					
Windows NT (ARC)	Windows NT	PS/2 style	DECchip 21066A–233	ETN42–CA	2, 3, 4
Digital UNIX (SRM)	3 Digital UNIX licenses: — 2 User License — Server extensions — C kit	PS/2 style	DECchip 21066A–233	ETN42–CX	2, 3, 4

Notes:

1 This configuration does not include the DECchip 21066 processor, cache, or RAM.
2 This DECchip 21066 processor configuration uses the high-profile heatsink.
3 No preconfigured MLB is offered using the DECchip 21068 processor.
4 This preconfigured MLB does not include cache or RAM.

Table A–2 MLB Options

Description	Digital Part Number
8-slot enclosure including: — Fan — 200 W power supply — Serial/parallel cables	EBPXB–AA
Rackmount kit for 8-slot enclosure	EBPXB–AR
256 KB cache, 28-pin DIPs, 20 ns, 11 chips	EBPXC–AA
1 MB cache, 32-pin DIPs, 20 ns, 11 chips	EBPXC–AC

A.2 Accessories and Suppliers

Table A–3 lists accessory part numbers and associated suppliers.

Table A–3 Accessories and Suppliers

Part Description	Quantity Per MLB	Suggested Supplier	Part Number
Alpha Processor (Choose One)			
DECchip 21066–166	1	Digital	21066–AA
DECchip 21066A–233	1	Digital	21066–CB
DECchip 21068–66	1	Digital	21068–AA
DECchip 21068A–100	1	Digital	21068–AB
Heatsink (Choose One) and Accessories			
Heatsink, low profile	1	United Machine & Tool Design Freemont, N.H., USA 03044 Telephone: (603) 642-3601	12–35739–18
Heatsink, high profile	1	United Machine & Tool Design Freemont, N.H., USA 03044 Telephone: (603) 642-3601	12–35739–22
Heatsink, with fan mounting holes	1	United Machine & Tool Design Freemont, N.H., USA 03044 Telephone: (603) 642-3601	12–35739–34
Retaining clip, heatsink	1	Thermalloy Inc. Dallas, Tx., USA Telephone: (214) 243-4321	20070
Fan (for 12–35739–34 heatsink; includes 11 inch cable and appropriate connector)	1	Matsushita Elec Ind. Co. Ltd. Tokyo, Japan 10500 435 4507 Telephone: (214) 243-4321	FBA06T12HSC
Guard, fan (for 12–35739–34 heatsink fan)	1	Qualtek Electronics Corp Mentor, Ohio, USA 44060 Telephone: (216) 951-3300	08147
Screws, fan/guard, #6–32 x 7/8 inches long	4		
Thermal pad, Grafoil (use for all heatsinks)	1	Aavid Engineering Inc. Laconia, N.H., USA Telephone: (603) 528-3400	NV1M–4
Hex nuts, heatsink, #10–32 aluminum, 2011–T3	2		

Table A–3 (Cont.) Accessories and Suppliers

Part Description	Quantity Per MLB	Suggested Supplier	Part Number
Memory			
SIMM 8 MB (2 x 4 MB) 70 ns	1–2	Digital	EBPXM–AA
SIMM 16 MB (2 x 8 MB) 70 ns	1–2	Digital	EBPXM–AB
SIMM 32 MB (2 x 16 MB) 70 ns	1–2	Digital	EBPXM–AC
SIMM 64 MB (2 x 32 MB) 70 ns	1–2	Digital	EBPXM–AD
SIMM 128 MB (2 x 64 MB) 70 ns	1–2	Digital	EBPXM–AE
SIMM 256 MB (4 x 64 MB) 70 ns	1–2	Digital	EBPXM–AF
Cache			
32K x 8, 15 ns, 28-pin DIP	11	Cypress	CY–7C199–15PC
	11	Micron	MT5C2568–15
	11	Motorola	MCM6206DP15
	11	UMC	UM61256AK–15
	11	Winbond	W24257AK–15
32K x 8, 20 ns, 28-pin DIP	11	Cypress	CY7C199–20PC
	11	Micron	MT5C2568–20
	11	Motorola	MCM6206CP20
	11	Paradigm	PDM41256SA–20–P
	11	Samsung	KM68257BP–20
	11	Sharp	LH52258AD–20
	11	Sony	CXK58258AP–20
128K x 8, 15 ns, 32-pin DIP	11	Micron	MT5C1008–15
128K x 8, 20 ns, 32-pin DIP	11	Alliance	AS7C024–20PC
	11	Micron	MT5C1008–20

B Connector Summary

Table B–1 lists all connectors and jumpers used on the MLB.

Table B–1 MLB Connectors and Jumpers

Designation	Description	Vendor Part Number or Equivalent
J1	Fan power (connector)	Molex 22–27–2031
J2–J5	SIMMs (connector)	AMP 822021–4
J6	LED display interface (connector)	DUPONT 68602–416
J7	CPU clock frequency (jumper)	AMP 531220–3
J8	Halt/Reset select (jumper)	AMP 531220–3
J9	Keylock (connector)	DUPONT 68003–605
J10	Speaker (connector)	DUPONT 68000–104
J11	Halt/Reset (connector)	DUPONT 65633–402
J12	Floppy disk interface (connector)	DUPONT 66506–353
J13	SCSI terminator enable (jumper)	AMP 531220–3
J14	SCSI/IDE Busy LED (connector)	DUPONT 68000–104
J15	IDE DMA Request select (jumper)	AMP 531220–3
J16	IDE DMA Grant select (jumper)	AMP 531220–3
J17	Cache speed select (jumper)	AMP 531220–3
J18	IDE interface (connector)	DUPONT 66506–354
J19	SCSI interface (connector)	DUPONT 66506–032
J20–J24	ISA slots (connector)	AMP 645169–3
J25–J27	PCI slots (connector)	AMP 145035–1
J28 and J29	SROM code select (jumpers)	AMP 531220–3
J30 and J31	Parallel port interface select (jumpers)	AMP 531220–3
J32	Test console (connector)	DUPONT 65611–110
J33	Power input: ±5 V/±12 V (connector)	Molex 87218–1202
J34	Power input: +3.3 V (connector)	Molex 87218–1205

Table B–1 (Cont.) MLB Connectors and Jumpers

Designation	Description	Vendor Part Number or Equivalent
J35 and J37	Serial COM ports 1 and 2 (connector)	DUPONT 65611–110
J36	Parallel port interface (connector)	AMP 1–103186–3
J38	PS/2 keyboard port (connector)	HON HAI PRECS MH11067–H1
J39	AT keyboard port (connector)	PREH ELEKTRO 71222–152
J40	PS/2 mouse port (connector)	HON HAI PRECS MH11067–H1
XE15	ALPHA processor ZIF socket	AMP 93–1847–022–002
XE100–XE110	Cache chip sockets	AMP G818–7048–1

C Tested Options

Table C–1 lists tested options, associated option numbers, and the operating systems under which they were tested.

Table C–1 Tested Options

Description	Option Number	Digital UNIX	Windows NT
Mass Storage: Disk			
3.5 inch LP 340 MB SCSI HD RZ24M	PCXAR–AM	Yes	Yes
3.5 inch LP 535 MB SCSI HD RZ25L	PCXAR–AH	Yes	Yes
3.5 inch LP 1.0 GB SCSI HD RZ26L	PCXAR–AL	Yes	Yes
3.5 inch HH 2.0 GB SCSI HD RZ28	PCXAR–AK	Yes	Yes
Conner Peripherals CFA1080A IDE		No	Yes
Mass Storage: CD–ROM			
Internal, low cost, double speed SCSI (RRD43)	PCXCR–AD	Yes	Yes
Internal, full feature, double speed SCSI (RRD44)	PCXCR–AE	Yes	Yes
Mitsumi FX300 IDE (ATAPI)		No	Yes
Memory			
8 MB (2 x 4 MB SIMM) 70 ns	EBPXM–AA	Yes	Yes
16 MB (2 x 8 MB SIMM) 70 ns	EBPXM–AB	Yes	Yes
32 MB (2 x 16 MB SIMM) 70 ns	EBPXM–AC	Yes	Yes
64 MB (2 x 32 MB SIMM) 70 ns	EBPXM–AD	Yes	Yes
128 MB (2 x 64 MB SIMM) 70 ns	EBPXM–AE	Yes	Yes
256 MB (4 x 64 MB SIMM) 70 ns	EBPXM–AF	Yes	Yes
Floppy			
1.44 MB 3.5 inches — RX23L	PC7XR–AA	Yes	Yes

Table C–1 (Cont.) Tested Options

Description	Option Number	Digital UNIX	Windows NT
Video Adapters			
PCI: #9 GXE64		No	Yes
PCI: ATI Mach 64 CX	PB2GA–FA/FN	Yes	Yes
PCI: Diamond Stealth 64		No	Yes
PCI: Digital PCXAG–AL	PCXAG–AL	No	Yes
PCI: MiroCrystal 10SD VGA		No	Yes
PCI: MiroCrystal 32S VGA		No	Yes
PCI: Orchid Fahrenheit 64		No	Yes
PCI: TGA 8 Plane	PBXGA–AA	Yes	Yes
ISA: Diamond Stealth 24 ISA 1 MB 10 x 7 x 256		No	Yes
ISA: #9 GXE ISA 1280 x 1024	PB2GA–CA	No	Yes
Communications			
ISA: Ethernet TP/BNC/AUI	DE202–AB	No	Yes
ISA: Ethernet TP/BNC/AUI	DE204–AB	Yes	Yes
ISA: Ethernet TP/BNC/AUI	DE205–AB	Yes	Yes
PCI: Ethernet Option TP/BNC/AVI	DE435–AA	Yes	Yes
ISA: FAX/Modem 14.4 K/14.4 K	PCXDF–AA	No	Yes
ISA: Serial/Parallel	PC4XD–AA	No	Yes
ISA: DW110 Token Ring (Proteon P1390)	DW110–AA	Yes	Yes
Mouse/Tablet			
3-button PS/2 mouse	PC7XS–CA	Yes	Yes
A4Tech 3-button serial mouse		No	Yes
Genius serial mouse		No	Yes
Logitech 3-button serial mouse		No	Yes
Microsoft serial mouse, Version 2.0		No	Yes

Table C–1 (Cont.) Tested Options

Description	Option Number	Digital UNIX	Windows NT
Keyboards			
Belgian	PCXAL–GB	Yes	Yes
Danish	PCXAL–FD	Yes	Yes
Finland/Sweden	PCXAL–FF	Yes	Yes
French	PCXAL–FP	Yes	Yes
German	PCXAL–FG	Yes	Yes
Italian	PCXAL–FI	Yes	Yes
North American	PCXAL–FA	Yes	Yes
Norwegian	PCXAL–FN	Yes	Yes
Portuguese	PCXAL–FV	Yes	Yes
Russian	PCXAL–QT	Yes	Yes
Spanish	PCXAL–FS	Yes	Yes
Switzerland/French	PCXAL–FK	Yes	Yes
United Kingdom	PCXAL–FE	Yes	Yes
U.S. keyboard, 101 keys, IBM PS/2 compatible	PCXAL–AA	Yes	Yes

D Installation and Handling Instructions

This appendix describes antistatic precautions and installation and handling instructions for various components of the AXPpci 33 board.

D.1 Antistatic Precautions

Due to electronic component sensitivity to static electricity, anyone handling the AXPpci 33 MLB or accessory components should wear a properly grounded antistatic wrist strap. Use of antistatic mats, an ESD approved workstation, and exercising other good ESD practices is recommended wherever possible (manufacturing or assembly areas).

D.2 Installation Instructions

The following sections describe installation instructions for various components of the DECchip 21066.

D.2.1 Heatsink Labeling

No specific heatsink labeling is recommended. However, if labeling is required, it should be done before heatsink assembly to the Alpha processor. You may want to transfer date codes or record other markings from the Alpha processor so that they can be viewed on the fully assembled MLB.

D.2.2 Grafoil Thermal Pad — Pick and Place

1. **Observe antistatic handling precautions.**
2. Visually inspect the DECchip 21066 to ensure it is free of contamination.
3. Pick up the Grafoil thermal pad at the center using a vacuum pick-up tool. (Do not do this by hand.)
4. Align the Grafoil thermal pad over the threaded studs and place it on the Alpha chip's gold-plated surface.

D.2.3 Heatsink Attachment

- **Observe antistatic handling precautions.**
- Align the heatsink holes with the threaded studs on the ceramic package.

- Place the heatsink by lowering it onto the component (handle it by the edges).
- Insert a nut into the nut driver or placement tool and place it on the stud until the nut separates from the tool. The nut material is 2011–T3 aluminum (this grade is critical). Set the calibrated torque driver to 15 inch-lbs +/- 2 inch-lbs (1.7 Newton-meters +/- 0.2 N-m) and tighten.

D.2.4 Heatsink Removal/Replacement

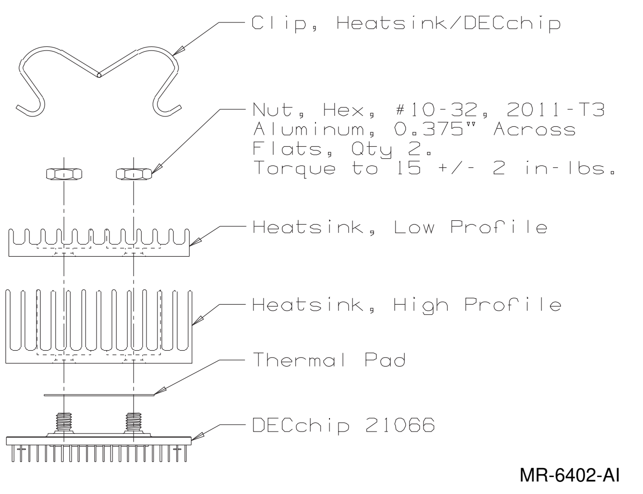
If heatsink removal is necessary:

- Completely remove the Grafoil thermal pad
- Clean the stud and mounting plate area of the heatsink surface with Isopropyl alcohol
- Replace with the new Grafoil and nuts

D.2.5 Heatsink Assembly Instructions

Figure D–1 shows both the low-profile and high-profile heatsinks for the DECchip 21066 processor. Use of the thermal pad with the heatsink is recommended. Install the heatsink onto the DECchip 21066 processor before you install the processor into the ZIF socket. This prevents ZIF damage due to unnecessary torque forces placed on the ZIF by installation of the nuts.

Figure D–1 Heatsink Assembly

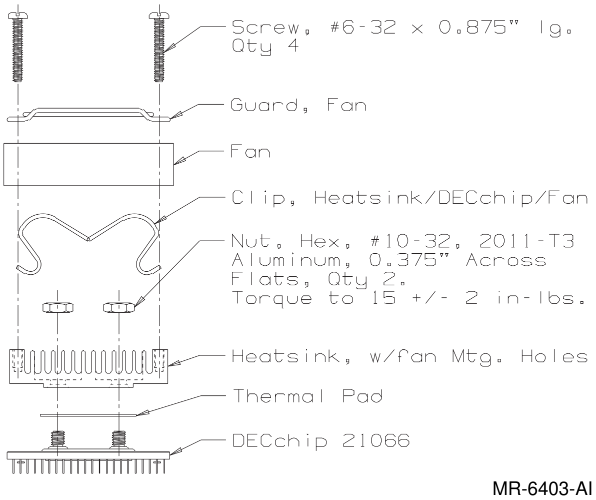


D.2.6 Heatsink/Fan Assembly Instructions

Figure D–2 shows the DECchip 21066 integrated fan/heatsink assembly. Use of the thermal pad with the heatsink is recommended.

Install the heatsink assembly onto the DECchip 21066 processor before you install the processor into the ZIF socket. This prevents ZIF damage due to torque forces placed on the ZIF by installation of the nuts. You must install the heatsink onto the DECchip 21066 before you install the fan onto the heatsink.

Figure D–2 Fan/Heatsink Assembly



D.2.7 Installation into ZIF Socket

1 **Observe antistatic handling precautions.**

2 Lift the ZIF socket actuator handle to a full 90° angle.

3 Make sure that all pins on the Alpha processor are straight.

4 The ZIF socket and Alpha processor are keyed to allow for proper installation.

5 Align the Alpha processor, with its missing A01 pin, with the corresponding plugged A01 position on the ZIF socket. Gently lower the processor into position.

6 Close the ZIF socket actuator handle to its locked position.

7 If the heatsink retaining clip is used, install it properly by hooking its ends around the ZIF socket retainers.

D.3 SIMM Installation and Removal Instructions

1 **Observe antistatic handling precautions.**

2 Five types of SIMMs are supported on the AXPpci 33. SIMMs must be installed in pairs consisting of identical devices. It is recommended that all SIMMs be purchased from the same vendor. See Table A–3 for supported SIMM sizes. SIMM pairs in banks 0 and 1 can be of different sizes.

3 To prevent damage, only handle SIMMs at the edges.

4 The first pair of SIMMs can be installed in either bank 0 or 1.

5 To install:

   a. Hold the SIMM at an angle with the notch facing the key in the socket.

   b. Firmly push the module into the connector and stand the module upright.

   c. Make sure that the SIMM snaps into the metal locking clips on both ends.

6 To remove:

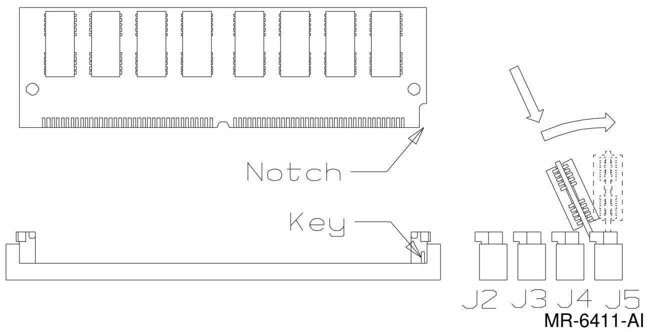
   a. Release the spring clips at both ends of the SIMM by gently pushing out the clips.

   b. Holding the module by its edge, tilt the module forward and remove.

   c. Temporarily place SIMMs on antistatic material or store them in an antistatic bag.

Figure D–3 shows how to install a SIMM.

Figure D–3 SIMM Installation



D.4 Cache Installation Instructions

The AXPpci 33 cache is made up of 11 static random access memory (SRAM) devices.

1 **Observe antistatic handling precautions.**

2 Two sizes of cache SRAMs are supported on the AXPpci 33. If installed, SRAMs of the same size and speed must be installed in all 11 sockets. See Section 2.2.3.2 for information on supported cache sizes. All SRAMs should be purchased from the same vendor and have the same data access time.

3 To prevent damage, only handle SRAMs at the edges. Ensure that the SRAM pins are straight and in line before installation.

4 To install:

   a. Hold the SRAM with the notch or pin 1 designator facing the key in the socket.

Note: The cache sockets are designed to accept either 28-pin or 32-pin devices, depending on the physical size of the SRAM. These cache devices must have the power and ground pins arranged in the evolutionary configuration, that is, on the corner pins.

   b. Align the SRAM pins over the socket holes ensuring that the SRAM is oriented correctly.

   c. To avoid bending or distorting the pins, evenly and firmly push the SRAM into the socket.

   d. Check the SRAMs to be sure each pin is in the correct socket hole and aligned.

   e. Repeat steps a–d until all 11 SRAMs are installed.

5 To remove:

a. A chip extraction tool is recommended. If you use a small flat-blade screwdriver to pry out the SRAM chips, take care not to damage the SRAM bodies, pins, or the sockets.

b. Temporarily place SRAMs on antistatic material or store them on antistatic foam or in an antistatic bag.

E Console Commands

This appendix describes console commands for the Digital AXPpci 33.

E.1 Overview

The Digital AXPpci 33 MLB can contain either of these console subsystems:

- ARC (Advanced RISC Computing) firmware, which supports the Windows NT operating system
- SRM firmware, which supports the Digital UNIX operating system

The AXPpci 33 MLB does not currently support the OpenVMS operating system.

The console firmware resides in 512 KB of flash ROM on the system board. The flash ROMs can be updated in the field.

E.2 ARC Console

The ARC console supports use of the Windows NT operating system. This console uses a menu interface. Example E–1 shows a typical console menu displayed when an AXPpci 33 system with Windows NT is powered on.

Example E–1 Typical Windows NT Console Menu

```
ARC Multiboot Alpha AXP Version n.n
Copyright (c) 1993 Microsoft Corporation
Copyright (c) 1993 Digital Equipment Corporation

Boot menu:

   Boot Windows NT
   Boot an alternate operating system
   Run a program
   Supplementary menu...

Use the arrow keys to select, then press Enter.
```

E.2.1 Menu Option: Boot Windows NT

Choosing this menu item causes the system to boot the Windows NT operating system.

E.2.2 Menu Option: Boot an Alternate Operating System

This selection prompts you for boot information for other ARC console-supported operating systems, when available.

E.2.3 Menu Option: Supplementary Menu

Example E–2 shows a sample Supplementary menu.

Example E–2 Sample Supplementary Menu

```
ARC Multiboot Alpha AXP Version n.n
Copyright (c) 1993 Microsoft Corporation
Copyright (c) 1993 Digital Equipment Corporation

Supplementary menu:

   Install new firmware
   Install Windows NT from CD-ROM
   Set up the system...
   Display hardware configuration
   Boot menu...

Use the arrow keys to select, then press Enter.
```

E.2.3.1 Menu Option: Install New Firmware

When you choose this menu item, the floppy drive and CD–ROM are checked for the firmware update utility. If the proper media is not present, this command times out.

E.2.3.2 Menu Option: Install Windows NT from CD–ROM

You need the Windows NT CD–ROM distribution to perform this function.

E.2.3.3 Menu Option: Set Up the System

Use the Setup menu to install new firmware, list the available devices, and modify the system ROM. Example E–3 shows a sample Setup menu.

Example E–3 Sample Setup Menu

```
ARC Multiboot Alpha AXP Version n.n
Copyright (c) 1993 Microsoft Corporation
Copyright (c) 1993 Digital Equipment Corporation

Setup menu:

   Set system time
   Set default environment variables
   Set default configuration
   Manage boot selection menu...
   Setup autoboot

   Edit environment variables
   Reset system to factory defaults


   Help
     Supplementary menu, and do not save changes...

Use the arrow keys to select, then press Enter.
```

Menu Option: Set Default Configuration

The Set default configuration menu option prompts for information about these system components:

- Monitor resolution
- Number of floppy drives and their capacity (the default value of 2.88 MB must be changed to 1.44 MB for this system)

- Keyboard
- SCSI controller (host) ID

Menu Option: Manage Boot Selection Menu

Use the Manage boot selection menu to add new boot devices, change selections, and rearrange the device list. Example E–4 shows a sample boot selection menu.

Example E–4 Sample Boot Selection Menu

```
ARC Multiboot Alpha AXP Version n.n
Copyright (c) 1993 Microsoft Corporation
Copyright (c) 1993 Digital Equipment Corporation

Boot selection menu:

   Add a boot selection
   Change a boot selection
   Check boot selections
   Delete a boot selection
   Dump boot selections
   Rearrange boot selections
   Setup menu...

Use the arrow keys to select, then press Enter.
```

E.2.3.3.1 Menu Option: Display Hardware Configuration

This selection prompts for the location of the default system partition. For example, it asks you to select the media and gives you choices of SCSI hard disk, floppy disk, or CD–ROM.

E.3 SRM Console

The SRM console supports the Digital UNIX operating system. These commands are part of the SRM console:

- **boot**
- **set**
- **show**
- **examine**
- **deposit**
- **isacfg**

The AXPpci 33 MLB currently supports the Windows NT and Digital UNIX operating systems.

E.3.1 Conventions

Table E–1 lists the SRM console conventions.

Table E–1 SRM Console Conventions

Item	Convention
Console prompt	>>>
Continuation line prompt	_>
Maximum command length	255 characters.
Multiple contiguous spaces or tabs	Treated as a single space.
Command abbreviations	Allowed, if not ambiguous.
Command qualifiers or options	Prefix with a space and a dash "–".
Numbers	Hexadecimal, unless otherwise specified. (Note that registers such as R0–R31 are shown in decimal notation.)

E.3.2 Special Characters

Table E–2 lists the SRM console special characters and their functions.

Table E–2 SRM Console Special Characters

Character/Key(s)	Function
Return	Terminates command line input.
Backspace	Deletes the previously typed character.
Ctrl/A	Toggles insert/overstrike mode. Overstrike is the default.
Ctrl/B	Recall previous commands. The last 16 commands are stored.
Ctrl/C	Terminates the foreground process.
Ctrl/D	Moves the cursor left one position.
Ctrl/E	Moves the cursor to the end of the line.
Ctrl/F	Moves the cursor right one position.
Ctrl/H	Moves the cursor to the beginning of the line.
Ctrl/O	Suppresses/resumes (toggles) console output.
Ctrl/Q	XON. Resumes the flow of data to the console.
Ctrl/S	XOFF. Stops the flow of data to the console.
Ctrl/U	Deletes the entire line.
Ctrl/R	Retypes the current command line.

E.3.3 boot Command

The **boot** command performs these functions:

- Initializes the processor
- Loads a program image from the specified boot device
- Transfers control to the loaded image

E.3.3.1 Syntax

Here is the syntax of the **boot** command (broken across multiple lines for display purposes):

```
>>> boot [-file filename] [-flags longword[,longword]]
    [-protocols enet_protocol] [-halt] [boot_device]
```

E.3.3.2 Options

Table E–3 describes the **boot** command options.

Table E–3 boot Command Options

Command Option	Description
–file *filename*	A file name to load into the system. For booting from Ethernet, the file name is limited to 15 characters. Use the **set boot_file** command to set an environment variable that specifies a default boot file.
–flags *longword* [,*longword*]	Additional information for the operating system. For Digital UNIX systems, valid values are: i Interactive boot s Boot to single user mode A Autoboot to multiuser mode Use the **set boot_osflags** command to set an environment variable that specifies a default boot flag value.
–protocols *enet_protocol*	An Ethernet protocol(s) that will be used for a network boot. Valid values are: mop bootp
–halt	After the image is loaded and the page tables and other data structures are set up, forces the bootstrap operation to halt and invoke the console program.
boot_device	A device path or list of devices that the firmware will attempt to boot. Use the **set bootdef_dev** command to set the default boot device environment variable.

E.3.3.3 Examples

Table E–4 shows **boot** command examples and their descriptions.

Table E–4 boot Command Examples

Command	Description
>>> boot	Boots the system from the default boot device.
>>> boot era0	Boots the system from Ethernet port era0.
>>> boot –file dec2.sys mke0	Boots the file named dec2.sys from Ethernet port mke0.
>>> boot –protocol bootp eza0	Boots using TCP/IP BOOTP protocol from Ethernet post eza0.
>>> boot –flags 0,1	Boots the system from the default boot device using flag settings 0,1.
>>> boot –halt dka0	Loads the image from disk dka0, but remains in console mode.

E.3.4 set Command

The **set** command sets or modifies the value of an environment variable. Environment variables pass configuration information between the console and the operating system.

E.3.4.1 Syntax

Here is the syntax of the **set** command:

```
>>> set envar value [-default] [-integer] [-string]
```

E.3.4.2 Options

Table E–5 describes the **set** command options.

Table E–5 set Command Options

Command Option	Description
envar	The environment variable to be assigned a new value.
value	The value that is assigned to the environment variable. It can be either a numeric value or an ASCII string.
–default	Restores an environment variable to its default value.
–integer	Creates an environment variable as an integer.
–string	Creates an environment variable as a string.

E.3.4.3 Examples

Table E–6 presents **set** command examples and associated descriptions.

Table E–6 set Command Examples

Command	Description
>>> set bootdef_dev era0	The default boot device is set to era0.
>>> set auto_action boot	The console will attempt to boot following an error, halt, or power up.
>>> set boot_osflags 0,1	The default boot flags are set to 0,1.
>>> set foobar 5	An environment variable called foobar is created and given a value of 5.

E.3.5 show Command

The **show** command displays:

- The current value of a specified environment variable
- Information about the system in accordance with the command line arguments

E.3.5.1 Syntax

Here is the syntax of the **show** command:

```
>>> show [{config, device, hwrpb, memory, pal, version,...}] [envar]
```

E.3.5.2 Options

Table E–7 describes the **show** command options.

Table E–7 show Command Options

Command Option	Description
config	Displays the current system configuration.
device [*device name*]	Displays the devices and controllers in the system. Specifying a device name returns information on that device only.
envar	Displays the value of the environment variable specified.
error	Displays error log information.
map	Displays the system virtual memory map.
memory	Displays the memory module configuration.
pal	Displays the version of Digital UNIX PALcode.
version	Displays the version of the console firmware.

E.3.5.3 Examples

Table E–8 lists **show** command examples and their descriptions.

Table E–8 show Command Examples

Command	Description
>>> show device	Lists device information, such as system designation, drive model, or Ethernet address.
>>> show memory	Lists system RAM, bank sizes, starting addresses, and versions of SROM and DROM used.
>>> show *	Lists all variables and their settings.
>>> show boot*	Lists all boot variables and their settings.

E.3.6 Environment Variables

Table E–9 lists environment variables and their descriptions.

Table E–9 Environment Variables

Variable	Description
auto_action	Sets/shows the console action following an error, halt, or power up. The action can be halt, boot, or restart. Halt is the default.
bootdef_dev	Sets/shows the default device or device list from which the system will attempt to boot. If the system software is preloaded, the variable is preset to point to the device containing the preloaded software. Otherwise, the default value is null.
boot_file	Sets/shows the file name to be used when a bootstrap requires a filename. The default setting is null.
boot_osflags	Sets/shows additional parameters to be passed to system software. The default setting is 0,0.
pci_parity	Sets/shows the state of PCI parity on the system.

E.3.7 examine Command

The **examine** command displays the contents of an address you specify. The address can be a memory location, register, device, or file.

E.3.7.1 Syntax

Here is the syntax of the **examine** command (broken across multiple lines for display purposes):

```
>>> examine [-{b,w,l,q,o,h,d}] [-{physical, virtual, gpr, fpr, ipr}]
    [-n count] [-s step] [device:]address
```

E.3.7.2 Options

Table E–10 describes the **examine** command options.

Table E–10 examine Command Options

Command Option	Description
–b	A byte of data.
–w	A word of data.
–l	A longword of data.
–q	A quadword of data.
–o	An octaword of data.
–h	A hexaword of data.
–d	Display data as a decoded macro instruction.
–physical	Reference physical address space.
–virtual	Reference virtual address space.
–gpr	Reference general-purpose register address space.
–fpr	Reference floating-point register address space.
–ipr	Reference internal processor register address space.
–n *count*	Specifies the number of consecutive locations to examine.
–s *step*	Specifies the address increment as a hexadecimal value. This option allows you to override the increment that is normally derived from the data size.
[device:]	Selects the device to access.
address	Specifies the address of the first location to examine within the current device.

E.3.7.3 Examples

Table E–11 shows **examine** command examples and their descriptions.

Table E–11 examine Command Examples

Command	Description
>>> e r0 gpr: 0(R0) 0000000000000002	Examine R0 using a symbolic address.
>>> e –g 0 gpr: 0(R0) 0000000000000002	Examine R0 using address space.
>>> e gpr:0 gpr: 0(R0) 0000000000000002	Examine R0 using the device name.
>>> examine pc gpr: 0000000F(PC) FFFFFFFC	Examine the PC.
>>> examine psl	Examine the processor status longword.

Table E–11 (Cont.) examine Command Examples

Command	Description
>>> examine –n 5 r7 gpr:00000007 (R7) 00000000 gpr:00000008 (R8) 00000000 gpr:00000009 (R9) 00000000 gpr:0000000A(R10) 00000000 gpr:0000000B(R11) 00000000 gpr:0000000C(R12) 00000000	Examine R7 and the next 5 registers.
>>> examine ipr:11	Examine internal processor register 11.

E.3.8 deposit Command

The **deposit** command writes data to a user-specified address. The address can be a memory location, register, device, or file.

E.3.8.1 Syntax

Here is the syntax of the **deposit** command (broken across multiple lines for display purposes):

```
>>> deposit [-{b,w,l,q,o,h}] [-{physical,virtual,gpr,fpr,ipr}]
    [-n count] [-s step] [device:]address data
```

E.3.8.2 Options

Table E–12 describes the **deposit** command options.

Table E–12 deposit Command Options

Command Option	Description
–b	Byte of data.
–w	Word of data.
–l	Longword of data.
–q	Quadword of data.
–o	Octaword of data.
–h	Hexaword of data.
–physical	Reference physical address space.
–virtual	Reference virtual address space.
–gpr	Reference general-purpose register address space.
–fpr	Reference floating-point register address space.
–ipr	Reference internal processor register address space.
–n count	Specifies the number of consecutive locations to examine.

Table E–12 (Cont.) deposit Command Options

Command Option	Description
–s step	Specifies the address increment as a hexadecimal value. This option allows you to override the increment that is normally derived from the data size.
[device:]	Selects the device to access. These devices are supported: pmem: Physical memory. vmem: Virtual memory. All access and protection checking will occur.
address	An address that specifies the offset within a device into which data is deposited. The address may also be any legal symbolic address. Valid symbolic addresses are: gpr-name — A general purpose register. ipr-name — An internal processor register. PC — The program counter. + — The location immediately following the last location referenced by an **examine** or **deposit** command. – — The location immediately preceding the last location referenced by an **examine** or **deposit** command. * — The location last referenced by an **examine** or **deposit** command. @ — The location addressed by the last location referenced by an **examine** or **deposit** command.
data	The data to be deposited.

E.3.8.3 Examples

Table E–13 shows **deposit** command examples and their descriptions.

Table E–13 deposit Command Examples

Command	Description
>>> d –n 1FF pmem:0 0	Clears the first 512 bytes of physical memory.
>>> d –l –n 3 vmem:1234 5	Deposits 5 into four longwords starting at virtual memory address 1234.
>>> d –n 8 R0 FFFFFFFF	Loads GPRs R0 through R8 with -1.
>>> d –l –n 10 –s 200 pmem:0 8	Deposits 8 in the first longword of the first 17 pages in physical memory.

E.3.9 ISA Configuration Utility, isacfg

ISA devices are not capable of being probed for configuration information. Consequently, the ISA configuration utility is used to enter ISA option information manually. The **isacfg** command is used when a new ISA option module is installed on the AXPpci 33 system running the Digital UNIX operating system.

At first power-on, the configuration table is initialized to a default condition. This setup contains entries for the CPU devices MOUSE, KBD, COM1, COM2, LPT1, and FLOPPY. They are all slot 0 devices and are alloted their default architected resources.

E.3.9.1 Syntax

Here is the syntax of the **isacfg** command (broken across multiple lines for display purposes):

```
>>> isacfg [-slot {slot#}] [-dev {device#}]
    [-all|-rm|-mk|-mod] [-{field} {value}] . . .
```

E.3.9.2 Options

Table E–14 describes the **isacfg** command options.

Table E–14 isacfg Command Options

Command Option	Description
–slot {slot#}	Allows you to enter the slot number of the ISA adapter. Valid values are: 0 Local multiport adapter 1–5 Physical ISA slots in the MLB
–dev {dev#}	Optional, defaults to 0 if not entered. On a multifunction or multiport adapter, this specifies the device on the adapter.
–all	Shows the entire configuration table. Overrides all other commands.
–init	Returns the configuration to the default condition.
–mk	Adds an entry into the table.
–rm	Deletes an entry from the table.
–mod	Modifies an entry in the table.
–etyp {#}	Defines an entry type for this entry. The # sign can be: 0 Unused 1 Single option 2 Embedded multiport device 3 Multiport option device
–handle {string}	Binds a name to the driver (up to 15 characters).
–enadev	Specifies if an entry in the configuration table should be enabled. Valid settings are: 0 Disable device 1 Enable device
–totdev {#}	Placeholder to keep track of the total number of devices (specified by the # sign) at this slot. Modify this for your own use.
–membase{0–2} {#}	Specifies up to 3 R/W ISA memory regions.
–memlen{0–2} {#}	Specifies the length corresponding to membase{0–2}.
–rombase {#}	Specifies an address for ISA BIOS extended ROM.
–romlen {#}	Specifies the length of ROM.

Table E–14 (Cont.) isacfg Command Options

Command Option	Description
–irq{0–3} {#}	Allows you to assign up to four IRQ channels to the device.
–dmachan{0–3} {#}	Allows you to specify up to four DMA channels for the device.
–dmamode{0–3} {#}	Allows you to specify the DMA type for –dmachan{0–3}. DMA modes are: 1 Block 2 Demand 4 Single 8 Cascade

E.3.9.3 Examples

Table E–15 shows **isacfg** command examples and their descriptions.

Table E–15 isacfg Command Examples

Command	Description
>>> isacfg –slot 1 –dev 0 –mk –etyp 1 –irq0 14 –dmachan0 3 –handle WIDGET109	An entry is created in the configuration table for the ISA option occupying device zero in slot 1. ISA IRQ 14 and ISA DMA channel 3 are allocated for the option. The name WIDGET109 is bound to the driver.
>>> isacfg –slot 1	This command will display the entire configuration information for all devices configured for slot 1 in the configuration table. In this example, only the above entry is displayed: handle: WIDGET109 etyp: 1 slot: 1 dev: 0 enadev: 0 totdev: 1 iobase0: 8000000000000000 membase0:8000000000000000 iobase1:8000000000000000 memlen0:8000000000000000 iobase2:8000000000000000 membase1:8000000000000000 iobase3:8000000000000000 memlen1:8000000000000000 iobase4:8000000000000000 membase2:8000000000000000 iobase5:8000000000000000 memlen2:8000000000000000 rombase:8000000000000000 romlen:8000000000000000 dmamode0/chan0: 3 irq0: 14 dmamode1/chan1: 80000000 irq1: 80000000 dmamode2/chan2: 80000000 irq2: 80000000 dmamode3/chan3: 80000000 irq3: 80000000

E.3.9.4 add_de205 Command

The **add_de205** command is used to configure DE204 and DE205 Ethernet cards. This command assumes that the option has been pre-configured to use the resources assigned and makes no effort to perform any device configuration. It adds the first instance of a DE204 or DE205 Ethernet card to the configuration table. The card is configured at slot 1, device 0, I/O base address 300, memory base d0000, memory length 10000, and interrupt IRQ 5.

Here is the syntax of the **add_de205** command executing the isacfg command (broken across multiple lines for display purposes):

```
>>> isacfg -slot 1 -dev 0 -mk -handle DE200-LE -irq0 5
-iobase0 300 -membase0 d0000 -memlen0 10000 -etyp 1 -enadev 1
```

F Operating System Installation Notes

This appendix presents information about installing the Windows NT and Digital UNIX operating systems on the Digital AXPpci 33 board.

F.1 Getting Started

Always ensure that the system firmware is compatible with the operating system version you plan to install. Operating system installation notes typically specify a minimum supported firmware revision number. Although your AXPpci 33 board comes preconfigured with either the ARC or SRM console, it may not be the correct version for your operating system.

There is 512 KB of flash memory onboard the AXPpci 33 MLB. This memory can be loaded with either the ARC console (to run Microsoft Windows NT) or the SRM console (to run Digital UNIX or another SRM console-compliant operating system).

An update utility is available to load flash memory with the latest firmware console. Two forms of the utility are available: one that can be used from the ARC console, and another that can be booted from the SRM console.

F.2 How to Obtain the Latest Firmware

The latest firmware update utility and associated instructions can be obtained over the Internet via anonymous **ftp** from *ftp.digital.com*. The files are located in the directory */pub/Digital/axppci*.

Firmware update files are also distributed on the Digital Alpha Systems Firmware Update CD–ROM.

F.3 Windows NT Installation Notes

The *Microsoft Windows NT Installation Guide* supplies general installation instructions for the Windows NT operating system. In addition, Alpha systems require that a system partition be created on the system disk using the **arcinst.exe** utility. This utility is located in the */ALPHA* directory on the Windows NT CD–ROM distribution, Part Number AG–PTMWN–BG or higher.

If you are using an IDE drive, it must be preformatted to enable the **arcinst.exe** utility to create a system partition. SCSI drives do not have this restriction.

F.3.1 How to Plan and Create Your Disk Partitions

The ARC console requires that the system partition is formatted for the file allocation table (FAT) file system. The system partition will contain hardware-specific files.

If you want to use NTFS for the rest of your Windows NT installation, you must create:

- One FAT system partition of at least 5 MB
- A second system partition large enough to contain all the files you want to protect with NTFS

Perform these steps to create your disk partitions:

1. Insert the Windows NT CD–ROM into the CD–ROM drive.
2. Choose the Run a Program menu item from the Boot Menu.
3. Run the **arcinst.exe** utility. For instance, in the next example, *cd:* points to the lowest numbered SCSI CD–ROM:

   ```
   run:  cd:\alpha\arcinst.exe
   ```
4. Choose the Configure Partitions menu item.
5. Choose the Create Partition menu item. If you have more than one drive connected, highlight the drive you want to contain the partition and press the ENTER key. Take care to select the correct drive; the **arcinst.exe** utility does not use the same drive naming convention as the firmware console.
6. Enter the partition size (at least 5 MB). Then press any key to format the partition.
7. To leave the **arcinst.exe** utility, choose the Exit menu item. This returns you to the Boot menu.

F.3.2 Installing ISA and PCI Option Cards

You can install a wide variety of ISA and PCI option cards in the Digital AXPpci 33 board. The *Microsoft Windows NT Hardware Compatibility List* enumerates many option cards and peripherals for Alpha platforms. Note that some manufacturers require that you run an Intel x86 setup utility to configure parameters on an x86 compatible card. In some instances, you must do this before the card functions properly in the Digital AXPpci 33.

F.4 Digital UNIX Installation Notes

For information about installing the Digital UNIX operating system on the AXPpci 33 board, consult the *Digital UNIX Installation Guide*.

G Frequently Asked Questions

This appendix includes some frequently asked questions about Windows NT and Digital UNIX system planning and configuration. Information is presented in a question-and-answer format.

G.1 Windows NT System Configuration

Following are some frequently asked questions about configuring the AXPpci 33 system with the Windows NT operating system:

- **What is the minimum memory recommended for the Windows NT operating system?**

  The minimum memory recommended for Windows NT is 16 MB.

- **What sort of main memory should be used?**

  Sections 2.2.2.17 and A.2 provide information about main memory. The AXPpci 33 accepts industry-standard 70 ns, 36-bit SIMMs. 32- or 33-bit SIMMs will not work.

- **What build devices are available for Windows NT?**

  At this time, the only available build device for Windows NT is a SCSI CD–ROM drive. The ARC console expects the (SCSI) device ID to be 4; however, this is configurable using the ARC console.

- **What is the recommended disk size?**

  A 0.5 GB disk drive (minimum) is recommended for Windows NT.

- **What are the recommended disk types?**

  Recommended disk types are IDE and SCSI disks. SCSI disk is the default.

- **What are the recommended installation parameters for disk partitions?**

  Recommended installation parameters are:

System:	5 MB FAT partition (created with the **arcinst.exe** utility)
Remainder:	NTFS partition

- **What is the performance impact of using an IDE disk?**

  Generally, an IDE drive performs as well as a SCSI drive, but this may vary for some applications.

- **What are the available ISA interrupts, DMA channels, and I/O address spaces?**

  The following applies to ISA interrupts, DMA channels, and I/O address space:

  — 16 ISA interrupts: 0–15.

  PCI options are automatically assigned IRQs after ISA options are configured. IRQs 5, 9, 10, and 15 can be driven by ISA and/or PCI slots. In the SRM console IRQ 14 is also available. Care must be taken to avoid conflicts with the interrupt lines used by the system base logic and other options. Table G–1 describes the default assignments.

Table G–1 IRQ Defaults

IRQ	Use
00	Counter-timer
01	Keyboard
02	Unavailable
03	COM 2
04	COM 1
05	ISA/PCI
06	Floppy
07	Parallel/printer
08	Unavailable
09	ISA/PCI
10	ISA/PCI
11	SCSI
12	Mouse
13	Unavailable
14	(IDE) ISA/PCI
15	ISA/PCI

  — 8 DMA channels: 0–7.

  DMA channel 2 is reserved for floppy.

  DMA channel 4 is not available for use by ISA options.

  — 3 GB of I/O address space.

  The ARC console has provisions for examining and displaying the hardware configuration. This is useful for troubleshooting.

- **Do I need to use a graphics adapter?**

  Yes, a graphics adapter is required.

Note: An unsupported graphics adapter may interfere with and halt the boot.

- **How do I configure ISA options with NVRAM?**

Options with onboard configuration memory may need to be configured in a x86 system until device suppliers provide AXPpci 33 compliant configuration routines.

- **What happens during system startup?**

  During system startup:

  1. The system loads an initial bootstrap from SROM, which transfers control to the flash ROM.
  2. The flash ROM contains the ARC console for Windows NT.
  3. If a supported adapter is present, the console(s) attempts to use a graphics adapter.

     If no recognizable adapter is found, the console routes I/O to the COM1 port at 9600 baud, 8 bits, with no stop bit.

     A Digital H8571J adapter allows connection via DECconnect cable. See Appendix E for a list of console commands.

- **If the system does not boot, what should be checked?**

  If the system does not boot, try the following:

  — Check all cables, including a check for:

  + Proper termination of the SCSI cable.
  + Proper cabling of the CD–ROM drives.
  + Proper cabling of the floppy disk cable. There are two ways to key a floppy cable; both are used. You may have to ignore the keying when you insert the cable.

  — Check for the supported boot device.

  — Check that all socketed components are seated.

  — Check for the supported graphics adapter, if used.

  — Check for console output on the COM1 port.

  — Use the system console to check that all installed devices are accessible:

  1. From the ARC console Boot menu, select the Supplementary menu option.
  2. From the Supplementary menu, select the Display hardware configuration menu option.

G.2 Digital UNIX System Configuration

Following are some frequently asked questions about configuring the AXPpci 33 system with the Digital UNIX operating system:

- **What is the minimum memory recommended for Digital UNIX?**

  The minimum memory recommended for Digital UNIX is 32 MB.

- **What sort of main memory should be used?**

Sections 2.2.2.17 and A.2 provide information about main memory. The AXPpci 33 accepts industry-standard 70 ns, 36-bit SIMMs. 32- or 33-bit SIMMs will not work.

- **What is the proper disk size?**

  A 1 GB disk drive (minimum) is recommended for the Digital UNIX operating system.

- **What are the required disk types?**

  A Digital UNIX disk must be a SCSI disk.

- **What are the available interrupt DMA and address spaces?**

  The following applies to ISA interrupts, DMA channels, and I/O address space:

  — 16 ISA interrupts: 0–15.

  Interrupts 0, 2, 8, and 13 are not available for use by ISA options.

  — 8 DMA channels: 0–7.

  DMA channel 2 is reserved for floppy.

  DMA channel 4 is not available for use by ISA options.

  — 3 GB of I/O address space.

  The SRM console has provisions for examining and displaying the hardware configuration. This is useful for troubleshooting.

- **Do I need to use a graphics adapter?**

  No. If a graphics adapter and keyboard are not present, the SRM console will transfer I/O to the terminal.

  Attach a terminal to the COM1 port and use these settings:

  - 9600 baud
  - 8 bits
  - 1 stop bit
  - No parity

Note: An unsupported graphics adapter may interfere with and halt the boot.

- **What happens during system startup?**

  During system startup:

  1. The system loads an initial bootstrap from SROM, which transfers control to the flash ROM.
  2. The flash ROM contains the SRM console for Digital UNIX systems.
  3. If a supported adapter and keyboard are present, the console(s) attempts to use a graphics adapter.

     If no recognizable adapter is found, the console routes I/O to the COM1 port at 9600 baud, 8 bits, with no stop bit.

     A Digital H8571J adapter allows connection via DECconnect cable. See Appendix E for a list of console commands.