SPARCengine™ Ultra™ AX*i*

OEM Technical Manual

THE NETWORK IS THE COMPUTER™

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Electromagnetic and Safety Information

Compliance with EMI and safety regulations for products including the SPARCengine Ultra AX*i* is entirely the responsibility of OEMs. The SPARCengine Ultra AX*i* is expected to pass FCC class B tests in a representative enclosure. The printed wiring boards within the product are manufactured by UL recognized manufacturers and have a flammability rating of 94-V0 or better.

Note that the product includes a lithium battery, the disposal of which is subject to regulation in some jurisdictions.

The SPARCengine Ultra AX*i* is intended for inclusion in systems meeting the following regulations:

- USA EMC FCC Class B
- USA Safety UL 1950

- Canadian EMC IC Class B
- Canadian Safety CSA C22.2 No 950

- European Union EMC CE Mark EN55022 & EN50082-1
- European Union Safety CE Mark EN60950

- Japanese EMC VCCI Class 2

Preface

The SPARCengine Ultra AX*i* product is a highly integrated, high performance motherboard designed for the use of OEMs who want to develop products that have UltraSPARC performance in a PC-ATX environment.

The *SPARCengine Ultra AXi* OEM Technical Manual describes the functions of the SPARCengine Ultra AX*i* motherboard, its controls, indicators, connectors and pinouts, boot sequence, diagnostics, troubleshooting, installation and removal procedures, and its specifications. It also provides some of the critical mechanical drawings for the motherboard and CPU module.

Who Should Use This Book

The *SPARCengine Ultra AXi* OEM Technical Manual is written for computer hardware engineers, system programmers, computer technicians and others involved in the integration of the Ultra AX*i* motherboard. References are provided for further details.

How This Book Is Organized

The *SPARCengine Ultra AXi* OEM Technical Manual is organized as follows:

Chapter 1, "Introduction" explains the capabilities and major features of the Ultra AX*i* motherboard.

Chapter 2, "Specification Summary" provides a summary of specifications of the Ultra AX*i* motherboard.

Chapter 3, "Functional Description" provides a short description of the function of each component on the Ultra AX*i* motherboard.

Chapter 4, "Sequence of Events at Power Up" details the sequence of events that occur at Power Up and discusses interaction with OBP and Solaris where applicable.

Appendix A, "Jumpers, Headers, Connectors, and Adapters" describes the jumper settings, header pinouts, connector pinouts, and adapters on the Ultra AX*i* motherboard.

Appendix B, "Mechanical Drawings" provides the drawings for the I/O panel, CPU module, Ultra AX*i* motherboard, Creator Graphics module and a thermal map of the motherboard.

Appendix C, "Assembly, Installation and Initial Start Up Procedures" describes how to assemble and install a motherboard in a typical ATX-type enclosure and describes how to install the required software and initially start the system.

Appendix D, "OpenBoot Firmware" provides information on the OpenBoot Firmware used in the Ultra AX*i* system.

Appendix E, "System Software Solaris 2.6 Operating Environment" provides information on the Solaris 2.6 Software used in the Ultra AX*i* system.

Appendix F, "System Software SunVTS Validation Test Suite" provides information on the SunVTS suitable for the Ultra AX*i* system based on SunVTS 2.1 Ultra AX*i* version.

Related References

System Architecture:

- *The SPARC Architecture Manual, Version 9,* David L. Weaver and Tom Germond, editors, PTR Prentice Hall
- *PCI System Architecture,* by Shanley and Anderson, MindShare Press

Specifications and Standards

- *ATX Specification Version 2.01* (http://www.data-tech.co.za/ATX-FORM.htm)
- *PCI Local Bus Specification,* Revision 2.1, PCI Special Interest Group, Portland
- *IEEE Standard 1275-1994, Standard For Boot (Initialization, Configuration) Firmware*, Core Practices and Requirements
- *IEEE Standard 1275.1-1994, Standard For Boot (Initialization, Configuration) Firmware*, ISA Supplement for IEEE P1754 (SPARC)

- *IEEE Standard P1275.6/D4, Standard For Boot (Initialization, Configuration) Firmware, 64 Bit Extensions*
- *PCI Bus Binding to IEEE 1275-1994, Standard for Boot (Initialization, Configuration) Firmware*, Revision 1.0, 14 April 1994, Prepared by the Open Firmware Task Force of the PCI Alliance

Integrated Circuit Specifications:

- *UltraSPARC IIi User's Manual* (805-0087-01)
- *SME1040 Highly Integrated 64-bit RISC Processor, PCI Interface Data Sheet* (805-0086-02)
- *STP2003QFP PCI Input Output Controller (PCIO) User's Manual* (802-7837-01)
- *STP2210QFP Reset/Interrupt/Clock Controller (RIC) User's Manual* (805-0167-01)
- *SME2411BGA-66 Advanced PCI Bridge (APB) User's Manual* (805-1251-01)

Other Sun Publications

- *Open Boot 3.X Command Reference Manual* (802-5837-10)
- *Open Boot 3.X Command Supplement for PCI (Solaris 2.5.1, 8/97)* (805-1627-10)
- *Writing Fcode 3.x Programs* (802-6287-10)
- *ASM Utilization and Calibration Application Note* (805-4877-01)
- *Sun VTS 2.1 Users Guide* (802-7299-10)
- *SunVTS 2.1 Test Reference Manual* (802-7300-10)

What Typographic Changes Mean

The following table describes the typographic changes used in this book.

TABLE P-1 Typographic Conventions

Typeface or Symbol	Meaning	Example
AaBbCc123	The names of commands, files, and directories; on-screen computer output	Edit your .login file. Use ls -a to list all files. machine_name% You have mail.
AaBbCc123	What you type, contrasted with on-screen computer output	machine_name% **su** Password:
AaBbCc123	Command-line placeholder: replace with a real name or value	To delete a file, type rm *filename*.
AaBbCc123	Book titles, new words or terms, or words to be emphasized	Read Chapter 6 in *User's Guide*. These are called *class* options. You *must* be root to do this.

Prompts in Command Examples

The following table shows the default system prompt and superuser prompt for the C shell, Bourne shell, and Korn shell and OBP.

TABLE P-2 Prompts

Shell	Prompt
C shell prompt	`machine_name%`
C shell superuser prompt	`machine_name#`
Bourne shell and Korn shell prompt	`$`
Bourne shell and Korn shell superuser prompt	#
OBP Prompt	`ok`

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CHAPTER 1

Introduction

The SPARCengine Ultra AX*i* is one of the latest members of Sun's PCI-based platform family. The Ultra AX*i* motherboard conforms to the ATX form factor, supports six PCI expansion slots, and is designed to use industry standard peripheral devices. SPARC architecture allows direct execution of Solaris operating environment in native mode, with CPU speeds up to 440 MHz and the capability to upgrade to faster processors as they become available. The SPARCengine Ultra AX*i* motherboard makes it possible to build a general purpose computer using the Solaris operating environment in a simple, modular assembly. Powered by the UltraSPARC II*i* processor, the Ultra AX*i* is designed to meet critical, high demand application needs.

The Ultra AX*i* motherboard is intended for use in reliable, high performance applications. The Ultra AX*i* uses the UltraSPARC II*i* processor. The design objectives include:

- The basis for building robust general purpose computing platforms for communications, networking or imaging
- Complete I/O subsystem: Ethernet, keyboard, mouse, serial ports, parallel port, disk drives and floppy disk
- Industry standard components
- Industry standard expansion: six 32-bit PCI slots
- Industry standard DRAM DIMMs, monitor, enclosure, and power supply

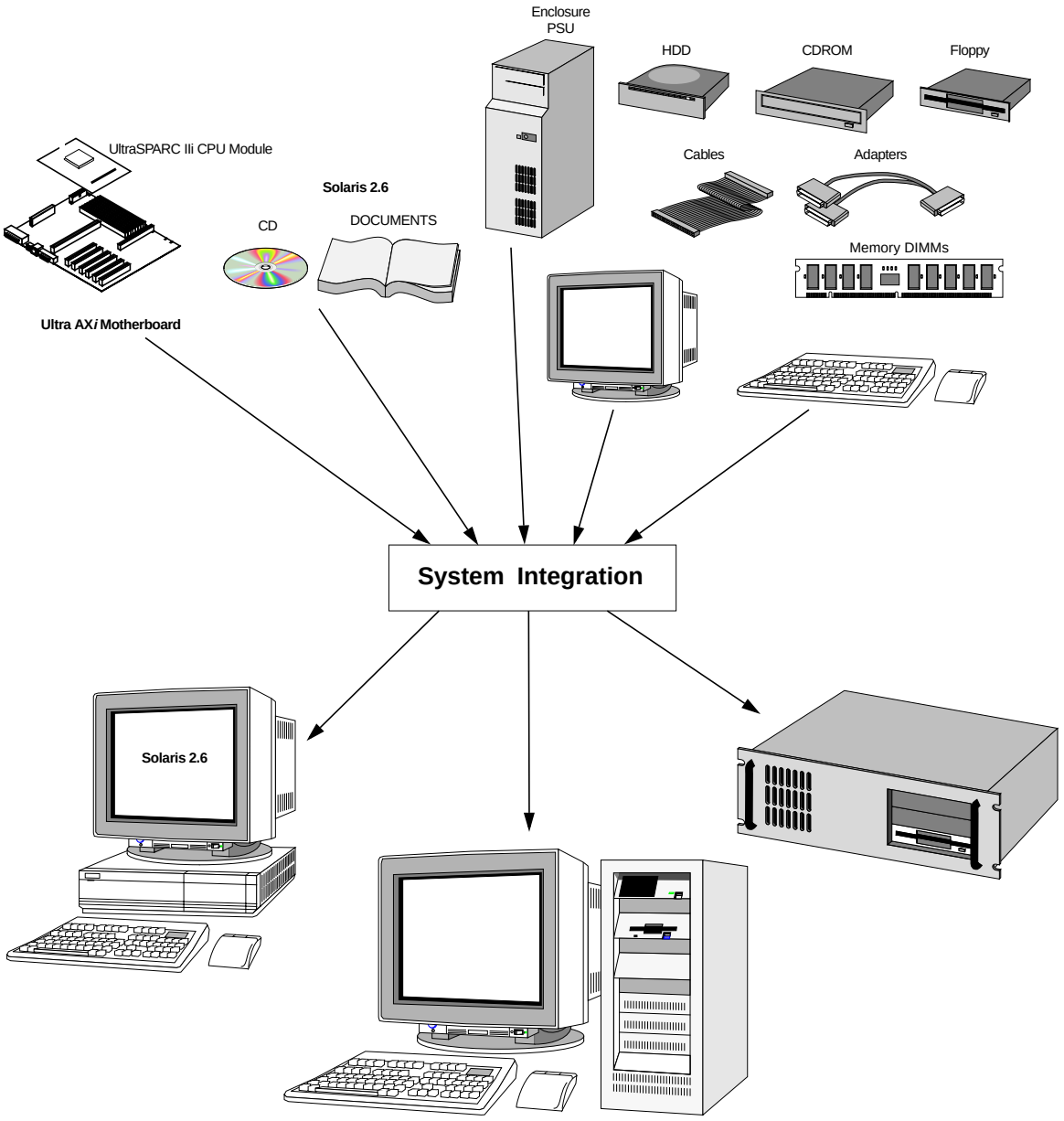


FIGURE 1-1 Possible Configuration Examples

1.1 Features

- Complies with ATX Specification and can utilize a wide variety of standard enclosures
- Operates under Solaris 2.6 HW 3/98 and later (Solaris 7 recommended)
- Uses UltraSPARC II*i* 270 MHz, 300 MHz, 333 MHz, and 360 MHz processors
- Supports up to 1GB memory on-board (32MB minimum)
- PCI Local Bus master/slave interface
- Autosensed 10BASE-T (802.3) or 100BASE-T (802.30) Ethernet, with fully-buffered transmit and receive channels
- Two Ultra-Wide SCSI buses, one internal, one external
- Floppy drive interface
- Parallel port, P1284-compliant, with ECP and EPP
- Two high speed serial ports
- Interface for Sun keyboard and mouse and PS/2 keyboard and mouse
- NVRAM/Real Time Clock module
- Flash EPROM
- Creator Graphics Module supported

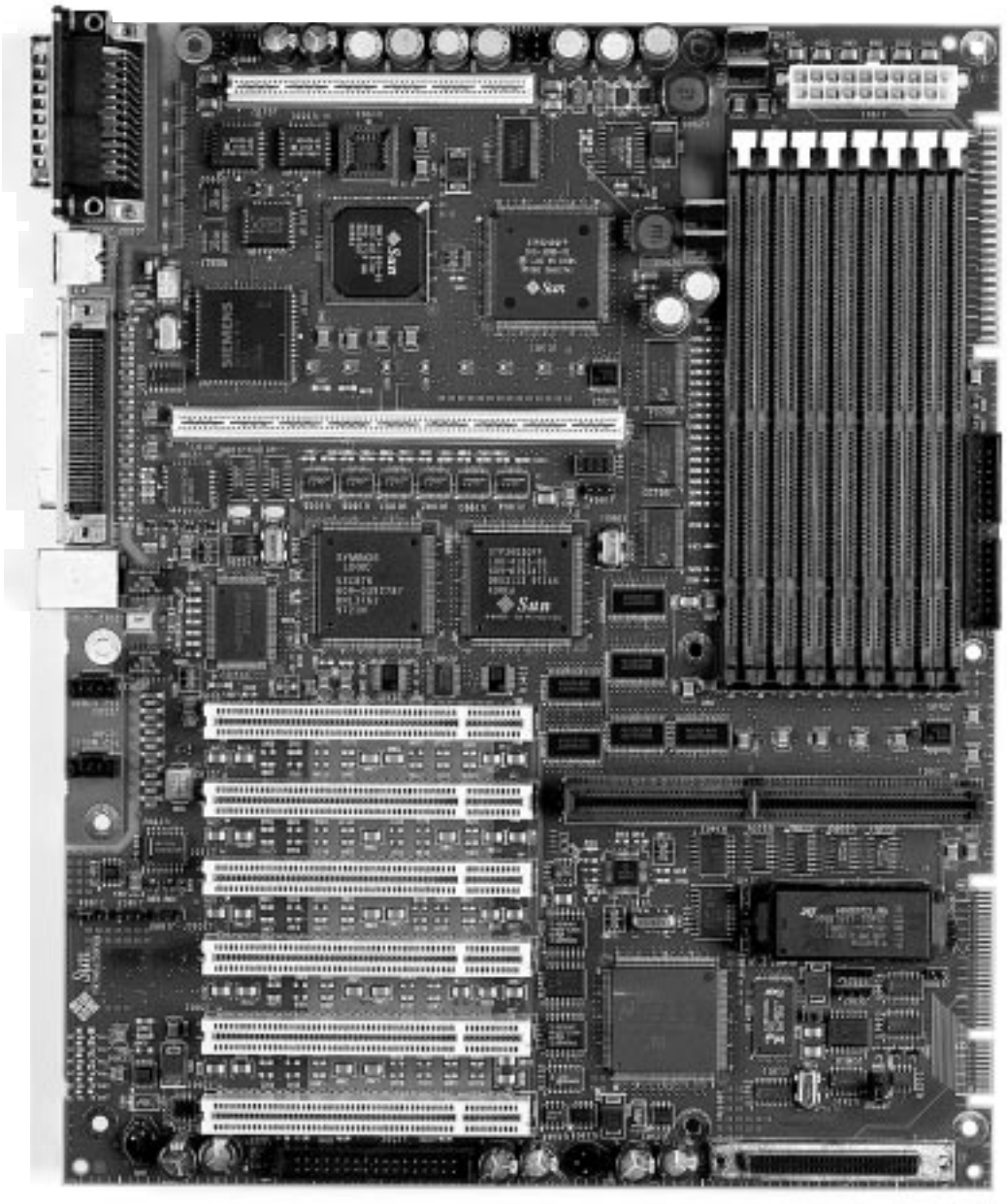


FIGURE 1-2 SPARCengine Ultra AX*i* Motherboard

1.2 Determination of Serial Number and Version

1.2.1 Motherboard

The Ultra AX*i* Motherboard serial number, version number and date code can be found on stickers located next to the internal SCSI connector (J1001). See FIGURE 1-3, following and FIGURE 3-2 on page 3-4. The version number typically appears as “-05 Rev.50”. The date code “0798” would mean the board was assembled in the seventh week of 1998.

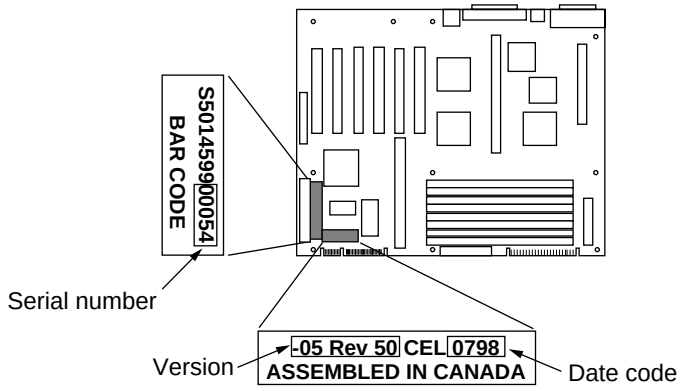


FIGURE 1-3 Motherboard Serial Number, Version Number and Date Code Locations

1.2.2 CPU Module

The UltraSPARC II*i* module Part Number and Serial Number can be found on a sticker located on the side of the 180 pin module connector (J0101) facing the PCI expansion slots. See FIGURE 1-4, following and FIGURE C-5 on page C-8.

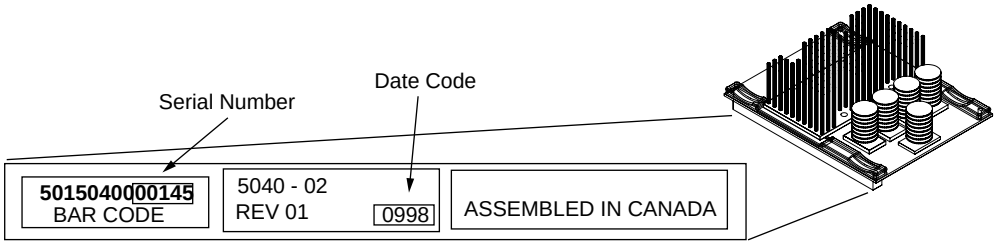


FIGURE 1-4 CPU Module Serial Number and Date Code Locations

1.2.3 Firmware

To determine which version of OBP is installed, enter the appropriate command:

If running OBP, at the OK prompt type:

```
ok> .version<cr>
```

The system will display:

```
OBP 3.10.X <creation date>
POST 2.Y.0 <creation date>
```

If running Solaris, at the <machine_name> prompt type:

```
<machine_name> /usr/sbin/prtconf -V
```

The system will display:

```
OBP 3.10.X <creation date>
```

The third character group (X) in OBP is the revision number.

1.2.4 Software

To determine the release number of Solaris, at the <machine_name prompt> type:

```
<machine_name> uname -r
```

The machine will display the OS version in the following format:

```
X.X.X
```

1.3 Technical Support and Warranty

Should you have any technical questions or issues that are not addressed in the *SPARCengine Ultra AXi OEM Manual* or on the Web site, contact your local SunService Solution Center. To contact SunService in the U.S., phone (800) USA-4SUN (800-872-4786). To find the SunService Worldwide Solution Center nearest you go to this URL:
http://www.sun.com/service/contacting/solution.html

When you call SunService, be sure to indicate that the motherboard and CPU module was purchased separately and is not associated with a system. Identify the product by its part number.

- SPARCengine Ultra AX*i* Motherboard — 501-4559-xx
- UltraSPARC-II*i* 270 MHz Module — 501-5039-xx
- UltraSPARC-II*i* 300 MHz Module — 501-5040-xx
- UltraSPARC-II*i* 333 MHz Module — 501-5090-xx
- UltraSPARC-II*i* 360 MHz Module — 501-5222-xx
- UltraSPARC-II*i* 360 MHz Module — 501-5148-xx
- UltraSPARC-II*i* 440 MHz Module — 501-5149-xx

The SPARCengine Ultra AX*i* includes a 1-year return-to-depot warranty. Should your board fail during this period, contact your local SunService representative for instructions. Before you call, get the motherboard date code (for example, 0798 for the seventh week of 1998) and serial number from the stickers located next to the internal SCSI connector (J1001). The module date code and serial number are on stickers on the 180 pin connector of the module. See FIGURE 1-3 on page 1-5 and FIGURE 1-4 on page 1-6 for a detailed illustration.

1.4 Independent Hardware Vendors (IHV)

Independent Hardware Vendors generally supply non-Sun parts, components and peripherals such as PCI and graphics cards, enclosures, power supplies, memory, hard disk drives, floppy disk drives, CD-ROM drives, monitors, keyboards, mouse devices, cables and adapters.

A list of these IHVs can be found on the Internet at:
http://www.sun.com/microelectronics/ihv

1.5 Version History

This section summarizes the version history of the Ultra AX*i* board, CPU modules, OBP, and Solaris operating environment.

1.5.1 Ultra AX*i* Board

There are four versions of the Ultra AXi board:

- -04 — The initial release of the Ultra AX*i* board (March 1998)
- -05 — Upgrade to OBP 3.10.7 (November 1998)
- -06 — Fabrication rework to improve manufacturability (March 1999)
- -08 — The latest release of the Ultra AX*i* board (April 1999), which added the J3303 jumper to specify the power on/off default (see Section 2.1.15 “Default Power On/Off Jumper” on page 2-11 for a functional description) and upgraded to OBP 3.10.8.

1.5.2 CPU Module

There are five versions of the CPU module. These are supplied with the Ultra AX*i* board when the Ultra AX*i* board is ordered. These modules can also be ordered separately to upgrade an existing Ultra AX*i* board (see Section 2.1.1 “CPU Module” on page 2-2 for more information about the available CPU module choices).

- 270 MHz CPU — UltraSPARC-II*i* 270 MHz module (501-5039-xx)
- 300 MHz CPU — UltraSPARC-II*i* 300 MHz module (501-5040-xx)
- 333 MHz CPU — UltraSPARC-II*i* 333 MHz module (501-5090-xx)
- 360 MHz CPU — UltraSPARC-II*i* 360 MHz module (501-5222-xx)
- 360 MHz CPU — UltraSPARC-II*i* 360 MHz module (501-5148-xx)
- 440 MHz CPU — UltraSPARC-II*i* 440 MHz module (501-5149-xx)

Faster CPU modules will be supported as they become available.

1.5.3 OBP

The OBP is an integral part of the Ultra AX*i* board. The OBP can also be field upgraded, with the binaries distributed over the SunWeb (refer to Section D.15 “Field Upgrade of OBP” on page D-16 for information on how to do this).

- OBP 3.10.4 — The initial release for the Ultra AXi board (March 1998)
- OBP 3.10.6 — Upgrade in April 1998, which fixed minor bugs and added support for additional video graphics cards
- OBP 3.10.7 — Upgrade in November 1998, which fixed minor bugs and added miscellaneous enhancements
- OBP 3.10.8 — Upgrade in April 1999, which added support for the UltraSPARC-IIi 360 MHz module (501-5148-xx) and UltraSPARC-II*i* 440 MHz module (501-5149-xx)

An OBP upgrade will be required to support faster CPU modules as they become available.

1.5.4 Solaris

The SPARC Platform version of Solaris is distributed through SunExpress.

- Solaris 2.6 3/98 — The initial release for the Ultra AX*i* board
- Solaris 2.6 5/98 — The next upgrade for the Ultra AX*i* board
- Solaris 2.7 (Solaris 7) — The latest release for the Ultra AX*i* board

CHAPTER 2

Specification Summary

2.1 Functional Specifications

These specifications describe the Ultra AX*i* motherboard and the applicable version of the OpenBoot Firmware and Solaris. (Solaris must be purchased separately.)

2.1.1 CPU Module

TABLE 2-1 CPU Module Options

Description	Choice 1 (270 MHz)	Choice 2 (300 MHz)	Choice 3 (333 MHz)	Choice 4 (360 MHz)	Choice 5 (360 MHz)	Choice 6 (440 MHz)
CPU module features	Compliant with V9 SPARC architecture specification, extended VIS support, integrated E-Cache support, integrated interface similar to PCI Rev. 2.1					
CPU Module (packaged separately)	UltraSPARC II*i*-270	UltraSPARC II*i*-300	UltraSPARC II*i*-333	UltraSPARC II*i*-360	UltraSPARC II*i*-360R	UltraSPARC II*i*-440R
Processor speed	270 MHz	300 MHz	333 MHz	360 MHz	360 MHz	440 MHz
Part No.	501-5039-03	501-5040-03	501-5090-01	501-5222-01	501-5148-02	501-5149-04
Cache	256 KB	512 KB	2 MB	2 MB	256 KB	2 MB
Power requirement	See TABLE C-2 on page C-3					
Core voltage used	See TABLE 2-2 on page -11					
CPU Module Board dimensions	4 inches (101.6 mm) x 5 inches (127 mm)					
	1.65 inches (41.9 mm) in height				2.8 inches (71.12 mm) in height[2]	
Interface connectors	120-pin, 180-pin See A.3.3 on page A-10 and A.3.4 on page A-13					
Maximum heat sink temperature[1]	93°C	92°C	91°C	90°C	75°C	73°C
Air flow requirement	300 lfm. (91.5 M/min.) on the heatsink				Sun-supplied CPU fan required[3]	

1. The maximum heat sink temperature was measured by gluing a thermal couple in a #60 hole in the heat sink located in the center of the CPU area. The thermal couple was flush with the bottom of the heat sink.
2. Includes height of the CPU fan that is part of the CPU module hold-down bracket (see FIGURE C-6 on page C-9 for an illustration).
3. The typical heat sink temperature is less than 12°C above the inlet temperature when the CPU fan is running at maximum speed.

2.1.2 Main Memory Modules

Min. required memory	32MB
Max. supported memory	1GB 8 sockets provided (4 Pairs)
Access size	128 DATA bits + 16 ECC bits = 144 bits = 1 Pair 1 Pair = 2 sockets of 72 + 72 bits DIMM

Sockets for memory	8 sockets, 2 min. populated with DIMMs of identical capacity. Pairs of different size auto configured, accepted
DIMM modules	DRAM, EDO, Inputs Buffered except RAS, 3.3V, 60nS, 72bits, 168 Pins 10-bit column address up to 128 MB 11-bit column address up to 128 MB

Caution – Use 60 ns DIMMs only on the Ultra AX*i* motherboard.

Refresh Rate	CAS before RAS, 2K rows refreshed in 32 ms, (15.5 µs)
ECC features	Single bit error correction Double bit error detection
Height	Enclosure restriction may apply

Note – Some standard ATX chassis have height restrictions

Width	The connectors are 0.297 inches (7.544 mm.) wide. A module thicker than this will partially block the adjacent connector
Other References	See A.3.2 on page A-9, TABLE C-4 on page C-18 and TABLE C-5 on page C-20

2.1.3 UPA64S Interface (Optional FFB)

SunExpress Part Number	X3663A
Interface connector	UPA64S, J0601, see A.3.5 on page A-15
Functional specification	Refer to Data sheet PN 270-4172-02
Monitor supported	Sun Monitor, 13W3 connector

Note – The optional FFB card will block access to one PCI slot.

2.1.4 Ultra-Wide SCSI Interface (SYM53C876)

Interface connector	68-pin UW connector rear panel for external devices 68-pin UW connector J1001 for internal devices See A.3.7 on page A-19 and A.3.8 on page A-20 for pinouts and part numbers
No. of devices	Up to 8 devices on internal SCSI interface Up to 8 devices on external SCSI interface (The SCSI controller is considered one device)
Modes of operation	Both narrow 8-bit and wide 16-bit in DMA modes are supported
Electrical interface	Single ended, fast-20, 16-bit wide bus
Cable length	Max. 3 Meters for 2 devices (2 connectors) Max. 3 Meters for 3 devices (3 connectors) Max. 3 Meters for 4 devices (4 connectors) Max. 3 Meters for 5 devices (5 connectors) Max. 1.5 Meters for 6 devices (6 connectors) Max. 1.5 Meters for 7 devices (7 connectors) Max. 1.5 Meters for 8 devices (8 connectors)
Cable termination	Required for both ends of internal and external cables OnBoard termination always active for internal OnBoard termination always active for external Last device on cable end needs to be terminated
SCSI ID selection (Solaris default settings, internal SCSI bus)	OnBoard controller: 7 CD-ROM: 6 Hard Disk 1: 0 Hard Disk 2: 1
Boot Support	Solaris CD-ROM: Single user, install operations Solaris installed hard disk: single user, multi user, all operations
SCSI Devices Supported	CD-ROM drive with (512Bytes block size for bootable) Hard disk drives Tape drive units Other devices need suitable Solaris device drivers Additional SCSI information can be found at the following URL: http://scitexdv.com:8080/SCSI2/Frames/SCSI2.html

2.1.5 Ethernet 10/100 BASE-T Interface

Interface Connector	RJ-45, 8-pin connector Bootable via Network
Data Bit rate	10BASE-T @ 10Mbits/sec 100 BASE-T @ 100Mbits/sec IEEE 802.3u Auto Negotiation
External Cables	Category 3, 4 or 5 unshielded twisted pair cable, 1000 Meter max for 10BASE-T operation Category 5 unshielded twisted pair cable, 100 Meter max for 100BASE-T operation

2.1.6 PCI Connectors

Compatibility	Compliant with PCI Rev 2.1 specifications Full 32bit support
Interface connector	62-pin PCB edge connector, See A.3.5 on page A-15 Will accept long card or short card Can support up to 25W per slot depending upon the power supply selected
PCI-Bus segments	3 slots on PCI-A (bus segment) 3 slots on PCI-B (bus segment) PCI-A and PCI-B segments are functionally identical
Signalling	Interface level ‘5V signalling’ only Supports 33MHz operation only
Address space	2GB address space within the same bus segment 2GB address space beyond its bus segment IO, memory, configuration space mapped into UltraSPARC PCI address space is NON-CACHEABLE
Transactions	All types and modes of PCI transactions are supported Peer to peer transfers possible within the same bus segment Direct Data Transfers between bus segments are not supported
Data transfer rates	In PIO mode 124MB/s max In DMA mode, read 78MB/s max In DMA mode, write 124MB/s max

2.1.7 Sun Keyboard and Mouse Interface

Sun Express part no.	Type 5 Keyboard (Unix) 320-1234, Mouse X494A (Other keyboard language options are available)
Interface connector	8 Pin DIN type, J0902, see A.3.13 on page A-25
Baud rate, framing	1200N1 for kbd data, 1200N1 for mouse data

Note – Sun Type-5 Keyboard-Mouse must be used for full functionality

2.1.8 PS/2 Keyboard Interface

Interface Connector	4-Pin Header, J2501 see A.2.4 on page A-5 Use Adapter as found in A.4.1 on page A-26
Baud Rate, framing	9600N1, auto detected
Type	Scan Code Set 2

2.1.9 PS/2 Mouse Interface

Interface Connector	4-Pin Header, J2500 see A.2.3 on page A-5 Use adapter as found in A.4.1 on page A-26
Baud Rate, framing	9600N1, auto detected

2.1.10 Parallel Port Interface

Interface Connector	DB25S female connector on rear panel
Interface Standard	IEEE 1284 compatible
Data Transfer rate	Up to 2MB/sec
System Support	Standard Centronics, Compatibility, Nibble and Byte modes, and EPP/ECP protocol modes EPP and Byte mode not supported in the drivers
Interconnect Cable	IEEE 1284 compliant printer cable not exceeding 2 Meters

2.1.11 Serial Port Interface

Interface Connector	DB25P Male, wired for TTY-A and TTY-B, see A.3.10 on page A-22 for PinOut Need “Y” splitter cable to use TTY-B
Mode of operation	Async @ 460.8 KBps max, Sync @ 384 Kbps max
HandShake signals	CTS, RTS, DTR, DSR, fully supported, optional
Interface Voltage	RS423 levels: J1804 = 2 & 3, J1806 = 2 & 3 RS232 levels: J1804 = 1 & 2, J1806 = 1 & 2
Slew Rate control	Normal speed <100Kbps, 5V/µS J1805 = 2 & 3 High speed >100Kbps, 10V/µS J1805 = 1 & 2
Baud Rate	Programmable: 300...460800 asynchronous mode
Parity Bit	Programmable: Odd Parity, Even Parity, No Parity
Stop Bits	Programmable: 1, 2
Interconnect cable	Standard cable up to 30 Meters long Synchronous Mode and HiSpeed need special attention
Standard IO default	At boot time if video or keyboard is absent, OBP and OS default console communications to TTY-A
OBP default initialize	TTY-A: 9600N1; TTY-B: 9600N1

2.1.12 Floppy Disk Drive Interface

Interface connector	34 Pin Dual Row, J1902, see A.3.9 on page A-21
Interface cable	34 pin Flat Ribbon Cable, 13 inches or less 1:1 connection, 1 connector on each end
Device supported	3.5 inch Floppy Drive, 1 Drive only, DS0 or DS1 auto search. Manual Eject only
Data transfer rate	500Kbps @ 1.44MB High Density ReadWrite operation 250Kbps @ 720KB double Density ReadWrite operation
Media, format supported	1.44MB Unix format only 1.44MB, 720KB DOS format
Boot support	Booting from floppy disk is not supported

2.1.13 Non-Volatile Memory, Time-of-Day

Field removable module with integral battery, clock circuitry.

Note – Field removal allows removal and retention of module to preserve Host ID, software license information, MAC address and other information if the motherboard needs to be replaced.
The TOD / NVRAM may also contain configuration data specific to your installation. Be sure to keep a copy of this information.

Battery Life	7 years min., 10 years typ.
Time accuracy	Approx. 1.5 sec. / mo. Can be calibrated for increased accuracy
User Memory Capacity	8KB usable as OBP NVRAMRC. Used to store OBP environment variables
Reserved Memory Space	2KB, Non-modifiable by user. Used to store System ID, EtherNet Address

2.1.14 Advanced System Monitoring

The Advanced System Monitoring (ASM) (formerly referred to as RAS) feature utilizes dedicated hardware to function. This hardware enables the Firmware and Software to monitor temperatures and voltages, and monitor and control cooling fans. Further details can be found in Chapter 3, “Functional Description”.

Caution – You must use the `boot -r` reconfiguration command each time the machine is booted to attach the ASM drivers. Otherwise, the system runs without ASM protection at the Solaris level.

2.1.14.1 Temperature Sensing

Monitoring Points	One thermistor is under the CPU module heatsink. This is used by ASM as the decision point to issue a warning or to shut down the system. There are also three thermistors on the Motherboard. See Mechanical Drawings FIGURE B-9 on page B-7 and FIGURE B-13 on page B-12
Warning	55°C

Shutdown	58°C

2.1.14.2 Fan Monitoring and Control

Fan Control	Both fans controlled simultaneously
Fan Speed	Four Steps: 8 V, 10 V, 11 V, 12 V

Control Matrix

	Boot Command Used	
`env-monitor` Setting[1]	**`boot`**	**`boot -r`[2]**
`enabled-with-fans`	12 V	Fan voltage depends on measured temperature readings:
`enabled`	12 V	8 V
`disabled`	12 V	12 V
`disabled*`	12 V	12 V

Reading of thermistor under CPU module heatsink	Voltage to Front/CPU Fan (J3603)	Voltage to Back Fan (J3602)
0^oC — 27^oC	8 V	8 V
28^oC — 39^oC	10 V	10 V
40^oC — 51^oC	11 V	11 V
52^oC — 111^oC	12 V	12 V

1. Applicable to the Solaris level only for fan speed control. The fans always run at 12 V at the OBP level. Refer to Appendix D.14 “ASM Operation” for the definition of the `env-monitor` settings.
2. The `boot -r` reconfiguration command is required each time the machine is booted to attach the ASM driver.

Monitoring	Individual Fan Fail Warnings (Back Fan Fail), (Front Fan Fail)

Front/CPU Cooling Fan

The CPU fan is required and supplied by Sun for CPU modules with straight fin heatsinks (e.g., 360 MHz, part number 501-5148-xx; 440 MHz, part number 501-5149-xx). Refer to FIGURE C-6 on page C-9 and FIGURE C-7 on page C-10 for configuration information. An OEM-supplied front fan may also be required with CPU modules with pin fin heatsinks depending on system thermal characteristics.

Motherboard Connectors	J3603
Speed Control	8 to 12 VDC from software-controlled digital-to-analog converter
Feedback	TTL level open collector output
Fan Control	Firmware controls fan on-off, software controls fan speed using thermistor input
Recommended Fans	The OEM-supplied fan (when required for CPU modules with pin fin heatsinks in demanding system configurations) must be 12 VDC, variable speed with sensor feedback to detect a failed fan Sanyo Denki: Model 109R0812H4D01 NMB: Model 3110KL-04W-B39

Note – When supplied by Sun for modules with straight fin heatsinks (e.g., 360 MHz, part number 501-5148-xx; 440 MHz, part number 501-5149-xx), this fan is part of the CPU module hold-down bracket (see FIGURE C-6 on page C-9 for an illustration).

Back/Optional Cooling Fan

This OEM-supplied fan may be optional depending upon specific configuration.

Motherboard Connectors	J3602
Speed Control	8 to 12 VDC from software-controlled digital-to-analog converter
Feedback	TTL level open collector output
Fan Control	Firmware controls fan on-off, software controls fan speed using thermistor input
Recommended Fans	The fan must be 12 VDC, variable speed with sensor feedback to detect a failed fan Sanyo Denki: Model 109R0812H4D01 NMB: Model 3110KL-04W-B39

2.1.14.3 Voltage Monitoring

Voltages Monitored	+5VDC at Power Supply DC-to-DC converter core voltage output
Function	POWER_GOOD singal indicates to the Operating System when the voltages are within their ±10% limits
Limits	Power supply: 4.5 VDC to 5.5 VDC DC-to-DC converter: see TABLE 2-2

TABLE 2-2 DC-to-DC Converter Core Voltage Output

DC-to-DC Converter Output (Core Voltage)	Input Range Used for POWER_GOOD Signal	CPU Module	
		Part Number	Speed
2.6 V	2.34 VDC to 2.86 VDC	501-5039-xx	270 MHz
		501-5040-xx	300 MHz
		501-5090-xx	333 MHz
		501-5222-xx	360 MHz
1.9 V	1.71 VDC to 2.09 VDC	501-5148-xx	360 MHz
		501-5149-xx	440 MHz

2.1.15 Default Power On/Off Jumper

This jumper is available on -08 and later versions of Ultra AX*i*.

Motherboard Jumper	J3303
Factory default setting	Default power on (pins 4 and 6 jumpered) System is powered ON when power is connected to the power supply.

Note – If the system is ON when power is disconnected from the power supply, the system always powers ON again when power is reconnected to the power supply no matter how short the power-off time.

If the system is OFF when power is disconnected from the power supply, however, wait at least 10 seconds before reapplying power to the power supply.

Alternate setting	Default power off (pins 2 and 4 jumpered) System is not powered ON when power is connected to the power supply. Must use the front panel switch or keyboard instead to power ON the system.

Note – If the system if OFF when power is disconnected from the power supply, the system always uses the front panel switch or keyboard to power ON no matter how short the power-off time.

If the system is ON when power is disconnected from the power supply, however, wait at least 5 seconds before reapplying power to the power supply.

2.1.16 Power On-Off Switch (front of enclosure)

Motherboard Connector	J3301
Switch Type	2 Contact, momentary contact
Function	Push On, Push Off
Control Circuit	Uses +5V_SB power to control power supply

2.1.17 Speaker (enclosure mounted)

Motherboard Connector	J3201
Type	8 ohm, 0.25W
Function	Functions with PS/2 keyboard only

2.1.18 Reset Switch (front of enclosure)

Motherboard Connector	J1501
Switch Type	Momentary contact, push to reset
Function	Hard reset

2.2 Power Requirements

Motherboard Connector J1901

Supply Voltage +5V, +3.3V, +12V, -12V

Maximum Power (Motherboard only, no CPU installed)

Voltage	+3.3V	+5V	+12V	- 12V	+5V_SB
Maximum Power	1.0A	2.0A	0.5A	.05A	20mA

Power sequencing +5V first, then +3.3V preferred, simultaneous OK.

Power Up Delay < 30ms; Slew rate: < 1V/ms.

Note – The CPU, Memory DIMMs and PCI cards are all powered through the Motherboard. See TABLE C-2 on page C-3 for system power budgeting including peripherals.

Note – The system can use software controlled power down. The system must be powered up using either the front panel switch or keyboard switch. You can change the power on/off default with the J3303 jumper (see Section 2.1.15 “Default Power On/Off Jumper” on page 2-11 for more information).

2.3 Mechanical

Board Dimension 12.0 inches (304.8 mm) x 9.6 inches (243.8 mm)

Height Restrictions 1.65 inches (41.9 mm) at the CPU Module
1.7 inches (43.2 mm) max at the IO connector stack
0.5 inches (12.7 mm) or lower for rest of the board.
The height of the DIMMs will vary with supplier. (Ensure adequate clearance between DIMMs and the hard disk cage)
See FIGURE B-3 on page B-3, FIGURE B-4 on page B-4 and FIGURE B-5 on page B-4.

Mounting Holes 10 holes, ATX recommendation G Profile

2.4 Reliability

MTBF values are calculated.

CPU/Memory/Fan Configuration	Mean Time Between Failure MTBF (Hours)	Annualized Failure Rate (AFR)[1]
No CPU No Memory	267,000	3.28%
CPU Module Installed 32 MB Memory	171,600	5.10%
CPU Module Installed 128 MB Memory	164,300	5.33%

1. Assumes 8,760 power-on hours per year.

When installed, the minimum MTBF of the CPU fan is 75,000 hours.

2.5 Environmental

	Operating	Non-Operating
Temperature (board ambient)	0°C to +55°C	-40°C to +70°C
Air flow requirement	300 lfm at CPU heatsinks	
Humidity	5% to 95% RH non-condensing	5% to 95% RH non-condensing
Shock	6 G peak, 11ms, 10 pulses	15 G peak, 11ms, 3 pulses
Vibration	0.25G, 2 sweeps, 5Hz ~ 500Hz @ 1 Octave / min	1.0 G, 2 sweeps, 5Hz ~ 500Hz @ 1 Octave/min
Altitude	10,000 ft. (3,408 M)	40,000 ft. (12,192 M)
ESD	---	15.0KV 100% Soft, 25% Hard

2.6 EMI Compliance

The Ultra AX*i* has met the FCC requirements for Part 15, subtitle J, Class B in a representative ATX enclosure (Chenming Mold Industrial Corporation, model number ATX601B-P) using 270 MHz and 300 MHz CPU modules. A gasket may be needed between the enclosure sides and the base with the 333MHz CPU module.

Filtered adapters (AMP part no. 842699-3, Connec part no. 243-A-10030-X) and shielded cables may be required for the serial and parallel ports.

2.7 U.L. Recognition

The Ultra AXi is a U.L. recognized component, listing no. E178105.

CHAPTER 3

Functional Description

3.1 General Information

This section describes the functionality of various modules of the SPARCengine UltraAX*i* board. The functionality is explained in the context of UltraAX*i* hardware, OBP firmware and Solaris operating system software. It is possible to use the Ultra AX*i* with other operating systems, with or without OBP. This usage is not discussed in this manual.

3.1.1 Terminology

The terminology used in this manual generally follows industry conventions. The following list defines the specific meanings of words and terms as used in this section.

Boot	The process of initializing the hardware to execute and run an operating environment such as Solaris 2.6.
Device tree	The OBP probing process constructs a hierarchical representation of the hardware devices that are found on the bus, the host-bus being the root. The device tree includes several device nodes, (PCI bus is a device-node).
Firmware	This is software which stays with the hardware usually in a PROM or similar device. Referred to as OBP in IEEE 1275 standards. In the Ultra AX*i* implementation, release version 3.10.x and later are applicable. This version comes with the motherboard. The user may upgrade the OBP to a newer version if needed.
Hardware	The Ultra AX*i* motherboard assembly, CPU module, cables and peripheral devices are typical examples of hardware.
NVRAMRC	Acronym for non-volatile random-access memory run command. This refers to the executable OBP script that is written in the NV-RAM. Other text information or binary data may exist in the NVRAM, but is not referred to as NVRAMRC.
OBP	Acronym for Open Boot PROM. This refers to a memory device which consists of executable code by the UltraSPARC II*i* CPU. The code is responsible for initialization of the hardware and booting the system to bring up the Solaris operating environment.
Probing	A process implemented in the firmware and software to identify onboard hardware devices and add-on cards on the PCI bus. The probing process creates the device-tree.
Software	A collection of machine readable information, instructions, data and procedures that enable the computer to perform specific functions. Typically stored on removable media.
Solaris	The UNIX operating system from Sun. The SPARC V9 architecture version is used with the Ultra AX*i*.

3.1.2 Block Diagram

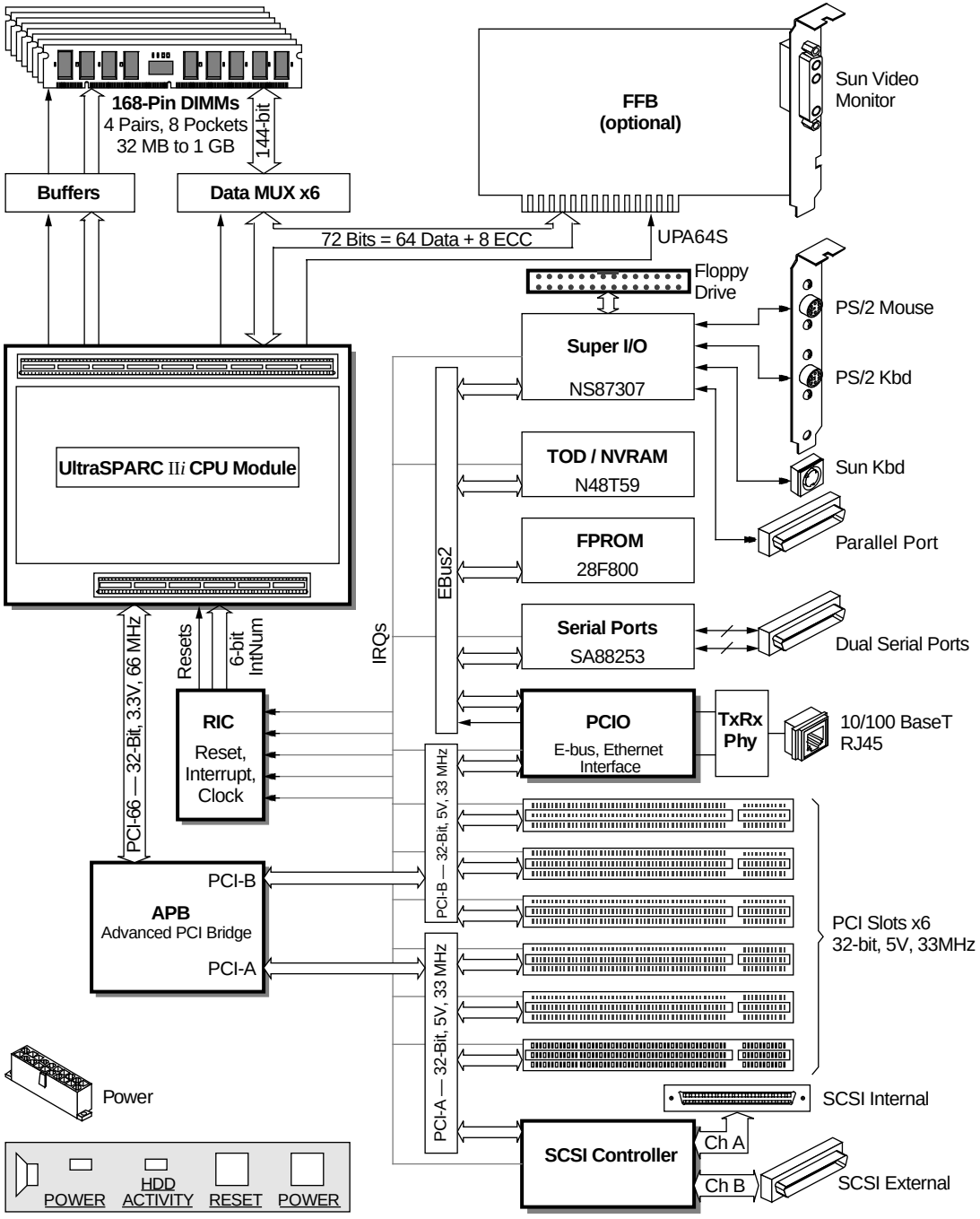


FIGURE 3-1 Ultra AX*i* Motherboard Block Diagram

3.2 Layout Diagram

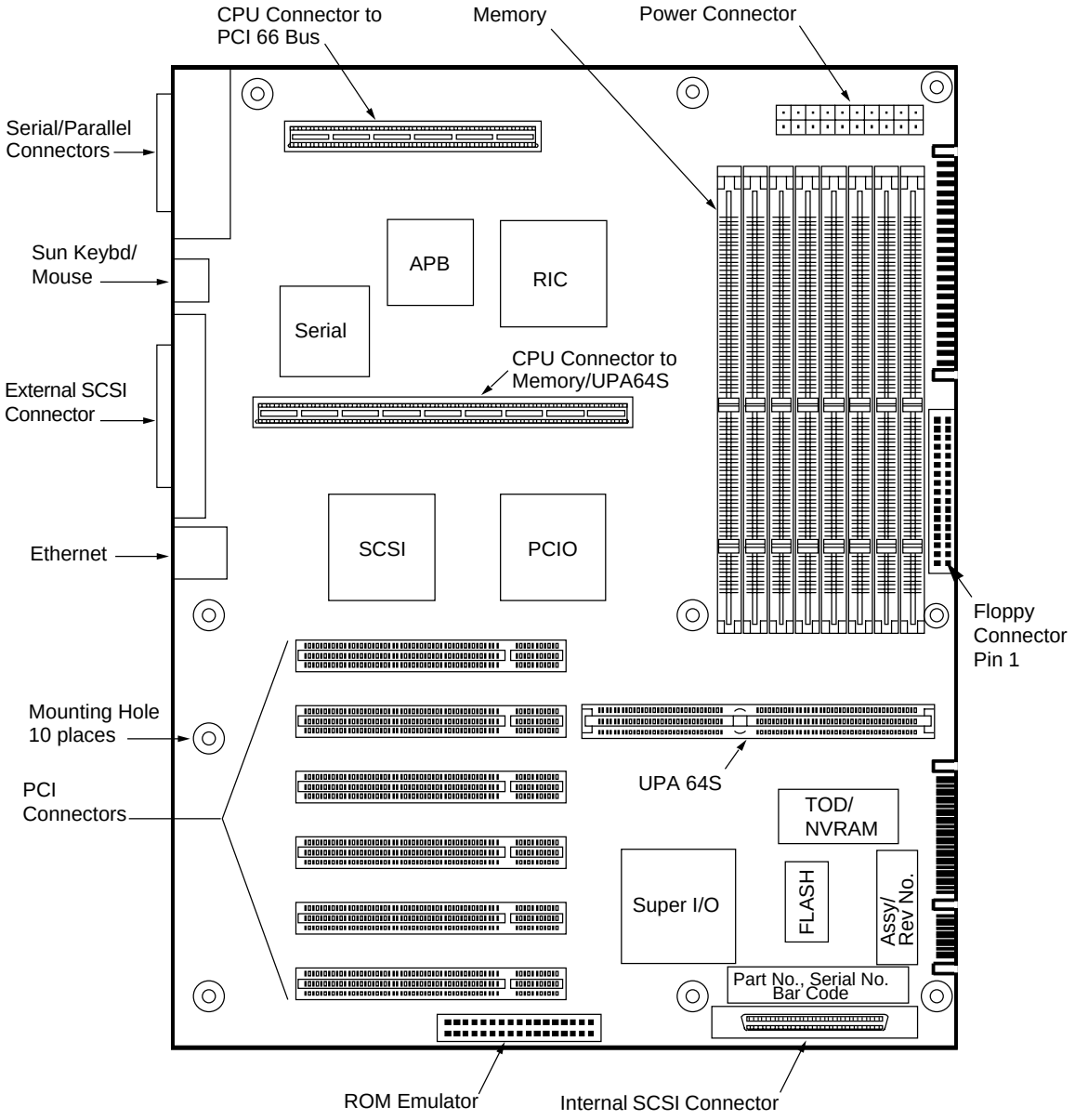


FIGURE 3-2 Ultra AX*i* Layout

Also see FIGURE A-1 on page A-2 for Header, Jumper and Connector information.

3.3 SPARCengine Ultra AX*i* Motherboard

The motherboard implementation details appear in the Block Diagram and the Layout Diagram. It is Fabricated on an 8 layer printed circuit board. Sockets are provided for the CPU module and the memory DIMMs. The motherboard can be equipped with a variety of CPU modules (see TABLE 2-1 on page 2-2). Memory modules are installed in Pairs (two DIMMs at a time) which allow the system to be equipped with 32MB up to 1GB of memory. There are six 32-bit PCI slots available. User configurable jumpers are described in A.1 on page A-3.

3.3.1 CPU Module

The UltraSPARC AX*i* module is a highly integrated CPU with memory controller and PCI interfaces. The module also includes level-2 cache and high-speed UPA64S interface for Fast Frame Buffer video module (FFB2). There are five versions of CPU available at this time: UltraSPARC II*i*-270, UltraSPARC II*i*-300, UltraSPARC II*i*-333, UltraSPARC II*i*-360, UltraSPARC II*i*-360R, and UltraSPARC-II*i*-440R. The architecture complies with SPARC V9 instruction set, which enables the system to use a wide range of peripherals and high performance Solaris 2.6. For further details on the CPU refer to SME1040 Highly Integrated 64-bit RISC Processor, PCI Interface Data Sheet document number 805-0086-02.

3.3.2 Main Memory Modules

The Ultra AX*i* architecture uses 128 data bits + 16 ECC bits in a single memory access. This is achieved by populating 2 memory DIMMs in a Pair. The Ultra AX*i* uses DRAM, EDO, Buffered, 10 or 11-bit Column Address, 3.3V, 60ns, 72-bit, 168-pin DIMMs. The design has 4 DIMM Pairs of 8 sockets. The 144-bit Memory Data bus is routed and multiplexed through BMX devices into the CPU Module as a 72-bit bus. The memory design includes Error Check and Correction (ECC). A single bit error in a 64-bit word is corrected on the fly. Errors of 2-bits or more are detected and flagged to system software for error handling. This assures very high data integrity and a reliable system. The design accommodates different capacity memory modules in 4 Pairs (both DIMMs in a Pair must be the same size). Depending upon the combination of DIMMs used, it is possible to have from 32MB to 1GB populated. (32MB, 48MB, 64MB, 80MB, 96MB, 112MB, 128MB...up to 1GB in 16MB increments). CAS before RAS refresh is used. The memory organization of 10-bit column address is supported in all DIMM Pairs. 11-bit column address is supported in DIMM Pairs 0 and 2 only. See FIGURE C-14 on page C-17, TABLE C-4 on page C-18 and TABLE C-5 on page C-20 for specific DIMM combinations.

Caution – Use 60 ns DIMMs only on the Ultra AX*i* motherboard.

3.3.3 Flash Memory

There is a 1Mx8bit Flash memory device on the EBus2. This is pre-programed with the OBP code. The CPU fetches initial executable codes from Flash memory upon power-on. The Flash memory is field reprogammable.

3.3.4 TOD / NVRAM

The Non-Volatile Memory PROM and a Time of Day (TOD) clock are both contained in a module mounted on the motherboard. This module has its own lithium battery to operate the clock and to keep the contents of the NVRAM during power-off situations. This module is field removable. Module is a SGS Thomson Microelectronics SGS-M48T59Y.

3.3.5 FFB2 Graphics

This is a high speed, high resolution graphics card, made and supported by Sun. It interfaces directly with the CPU over the high performance UPA64S bus. The motherboard accommodates one FFB2 card which is optional for high performance video applications.

Note – The FFB2 card obstructs one PCI slot. When this card is installed, only 5 PCI slots are available

3.3.6 Communication Ports

There are two serial communication ports available to the user, both ports are wired to a single 25-pin connector, J1802, accessible at the rear panel. See A.4.2 on page A-27. Both ports are capable of communicating with an interface at RS-232 level (+12V to -12V swing) and RS-423 level (+5V to Gnd) by jumper settings on J1804 and J1806. See TABLE A-1 on page A-3 and FIGURE A-1 on page A-2. Each channel is progammable to operate in synchronous mode or asynchronous mode. In asynchronous mode each channel is programmable to operate at various baud rates. In synchronous mode, the program selects to the clock, or may be programmed to

use an external clock. To use Channel-A, connect a standard 25 pin terminal cable to the DTE. To use Channel-B, connect the standard 25 pin terminal cable to the “B” end of the “Y” splitter cable, see A.4.2 on page A-27. Using the “Y” splitter cable it is possible to use both channels simultaneously. Implemented using Seimens SAB8223 on the EBus2, with full interrupt support. During system power up, if no keyboard or video interface is found, the system defaults to communicate through TTY-A (Channel-A of the ComPorts).

3.3.7 Printer Port

A parallel interface for printers is provided on this port (J0901) and is compliant with IEEE1284. It is implemented to work in DMA mode for high throughput and works with all standard printers when used with a cable of the recommended type and length. Super IO chip NS87307 provides the interface circuitry.

3.3.8 Sun Keyboard and Mouse

The standard Ultra AX*i* motherboard supports the Sun type 5 keyboard (SunExpress Part No. 320-1234) and mouse (SunExpress Part No. X494A). This keyboard uses the 8 pin DIN connector (J0902) located on the rear panel. See A.3.13 on page A-25. The Sun Keyboard has a speaker for “beep” signals built in. Localization for other language keyboard is supported by Solaris. Consult the Solaris documentation for specific details. Super IO chip NS87307 provides the interface circuitry.

3.3.9 PS/2 Keyboard and Mouse

Most types of PS/2 Keyboards and PS/2 Mouse devices are supported. The interface connectors on the motherboard are J2500 for the PS/2 mouse header and J2501 for the keyboard header. See A.2.3 on page A-5 and A.2.4 on page A-5. The interface signals are brought to the rear panel using a cable adapter detailed in A.4.1 on page A-26. Keyboards of 84 keys, 101 keys, 102 keys and 104 keys layout are supported. For details on keyboard mapping for different languages, consult the Solaris documentation. While a mouse with one, two or three buttons are all supported, most Solaris applications function best with a three button mouse. For details on mouse button mappings, consult the Solaris documentation. Super IO chip NS87307 provides the interface circuitry.

3.3.10 Floppy Drive

One 3.5 inch, 1.44MB floppy drive is supported. Only manual eject is supported. Super IO chip NS87307 provides the interface circuitry.

3.3.11 Ethernet Port

The Ethernet interface is a twisted pair type using an RJ45 connector at the rear panel. The interface incorporates an auto negotiate feature to auto-detect 10Mbits/sec. or 100Mbits/sec. bit rate and will auto-configure itself on the fly. See A.3.12 on page A-24 for pin-out details. Sun ASIC PCIO STP2003QFP provides the circuitry to support this function. A National DP83840A is used as a physical layer device (PHY) for Ethernet 10BASE-T and 100BASE-T using category 5 unshielded, twisted pair cables.

3.3.12 External and Internal SCSI Interface

The Ultra AX*i* fully implements SCSI on an UltraWide 16-bit bus which supports transfer rates up to 40MB/sec. The SCSI connectors are 68-pin Amp type, single-ended signals with an active terminator mounted on the motherboard. See A.3.7 on page A-19 and A.3.8 on page A-20. Each SCSI cable requires a terminator on the last device. SCSI is implemented with Character mode, Block mode DMA and single initiator supports. There is extensive Solaris support for a wide variety of devices such as hard disks, CD-ROMs and tape drives. Symbios chip SYM53C876 provides the dual channel SCSI support.

3.3.13 PCI Bus Connectors

There are six PCI slots provided. All the slots are similar, they are 33 MHz, 32-bit, 5V only. PCI slots 1, 2, 3 are on the internal PCI-A bus segment and PCI slots 4, 5, 6 are on the PCI-B bus segment. See FIGURE A-1 on page A-2. All 6 PCI slots are identical in characteristics. The PCI Bus is compliant with PCI 2.1 specification.

Note – If the FFB2 board is used, it blocks one PCI slot, leaving five usable slots.

3.3.14 Memory Bus

The UltraSPARC II*i* CPU manages all memory control signals and multiplexes the address lines for standard DRAMs. The data bus is 128-bits wide plus-16 bits ECC. This 144-bit wide bus is converted to a 72-bit bus using 6 multiplexer chips to interface with the CPU.

3.3.15 UPA64S Bus

The Sun Creator Graphics card family is supported for 2D and 3D graphics. The card interfaces to the motherboard with a UPA64S connector, and to standard Sun monitors with a 13W3 video connector. This is an internal bus only.

3.3.16 PCI 66 Bus

The UltraSPARC II*i* CPU module has a PCI-66 bus. The bus operates at 66 MHz, 3.3V and has characteristics similar to PCI specifications. The PCI-66 bus is bridged to the PCI-A and PCI-B buses by the Sun ASIC Advanced PCI Bridge (APB) SME2411BGA-66. This is an internal bus.

3.3.17 EBus2

This is a versatile 8-bit data, 24-bit address bus similar to an ISA bus. Components on this bus provide economical interfaces to the Sun keyboard and mouse, PS/2 keyboard, PS/2 mouse, printers, floppy drives, serial ports, flash memory and NVRAM/TOD devices. This is an internal bus only.

3.4 Advanced System Monitoring (ASM)

The ASM features implemented in the Ultra AX*i* monitor critical temperatures, voltages, and the optional cooling fans. The ASM features will issue warnings for high temperatures, low voltage, optional cooling fan failure and will initiate system shutdown due to high temperature. ASM features also control the operation of the two optional cooling fans. These functions and features are implemented internally using dedicated circuitry that operates on the I2C serial-bit-bus. To support these functions and features, OBP 3.10.4 or later and Solaris 2.6 HW: 3/98 or later is required.

Further details regarding ASM can be found in the Sun document *"SPARCengine UltraAXi ASM Utilization and Calibration"* Application Note, Part Number (805-4877-01).

3.4.1 Temperature Monitoring Points

Temperatures are monitored at four thermistors. See FIGURE B-9 on page B-7 and FIGURE B-13 on page B-12.

- On the CPU module under the CPU heatsink (in all versions of CPU)
- On the motherboard, R3407, near the mounting hole between J2002, J2001 PCI connectors
- On the motherboard, R3409, below the CPU module near J0101 CPU connector
- On the motherboard, R3406, in between the CPU and Memory DIMM sockets

3.4.2 Voltage Monitoring Nodes

The ATX power supply generates a signal called Power_OK. This signal is a result of a 'Voltage OK' condition when +3.3V and +5.0V are above 90% of their value. This is one source of the voltage monitoring signal.

An onboard DC to DC converter generates the core voltage for the CPU: 2.6V ±5% or 1.9V ±5%, depending on the CPU module. The motherboard has circuitry to check that this voltage is within ±10%. This is the second source of voltage monitoring signal.

3.4.3 Fan Control and Monitoring

There are connectors to power two fans from the motherboard. The fans must be able to operate with variable power conditions for speed control and must provide a TTL level signal to indicate whether the fan is rotating or not. The 3-pin connectors J3602 and J3603 are used to connect the fans. See A.2.8 on page A-7 and A.2.9 on page A-7.

The CPU fan is required for CPU modules with straight fin heatsinks (e.g., 360 MHz, part number 501-5148-xx; 440 MHz, part number 501-5149-xx)

Note – Connector J3603 powers a Sun-supplied CPU fan for CPU modules with straight fin heatsinks (e.g., 360 MHz, part number 501-5148-xx; 440 MHz, part number 501-5149-xx). An OEM-supplied front fan may also be required for CPU modules with pin fin heatsinks depending on system thermal performance. Connector J3602 powers an optional fan on all versions of CPU modules used with the Ultra AX*i*.

3.4.4 OBP Functions for ASM

Under OBP, the 'env-monitor' variable defines 4 options to perform ASAM functions. In OBP-Ver: 3.10.4, by default ASM is turned off.

Temperature monitoring provides a “Warning” message when the CPU temperature rises out of limits. At extreme temperatures, ASM will initiate a “System ShutDown”.

Voltage Monitoring provides a “Warning” when low voltages are detected.

The fan control function drives the fan at maximum speed. The fan monitor function detects non operational fan(s).

The OBP is also responsible for generating the required 'ASM node' with associated 'property' for Solaris Drivers to implement ASM functions.

Refer to Appendix D for details on how OBP implements the ASM features.

3.4.5 Solaris Driver Functions for ASM

In the add-on package released for Solaris 2.6 HW: 3/98, ASM device drivers are provided to implement ASM functions.

Temperature monitoring provides a “Warning” message if the CPU overheats. At sufficient out of limit temperatures, the ASM driver initiates a “System ShutDown”.

Voltage monitoring provides a “Warning” when low voltages are detected.

The fan control function drives the fan at a defined speed. Internal decision tables determine the speed of the fan to one of the four predefined speeds. The decision is based on the input values of the temperature readings at the four thermistors. The fan monitor function will detect a non-operational fan.

Caution – You must use the `boot -r` reconfiguration command each time the machine is booted to attach the ASM drivers. Otherwise, the system runs without ASM protection at the Solaris level.

3.5 Miscellaneous Information

Either the Sun keyboard and mouse or PS/2 keyboard and PS/2 mouse is supported as the input device, and either TTYA or a video card is supported as the output device. The determination of the input and output devices at power-up by the OBP is shown in TABLE 3-1.

TABLE 3-1 Determining Input and Output Devices at Power-up

Configuration at Power-up			Factory Defaults	
Video Card	**PS/2 Keyboard**	**Sun Keyboard**	**Input Device**	**Output Device**
None	None	None	TTYA	TTYA
None	None	Present	Sun keyboard	TTYA
None	Present	None	PS/2 keyboard	TTYA
None	Present	Present	PS/2 keyboard	TTYA
Present	None	None	TTYA	TTYA
Present	None	Present	Sun keyboard	Video card
Present	Present	None	PS/2 keyboard	Video card
Present	Present	Present	PS/2 keyboard	Video card

There is adequate system level support to configure multiple video devices. At the maximum, FFB2 plus 5 PCI graphics can be supported. If both FFB2 and PCI graphics cards are used the system will default to FFB as console.

No system support is available to boot from floppy.

Volume Manager in Solaris has the capability of electrically ejecting removable media. When using floppy drives, magnetic tape drives or CD-ROMs, the appropriate eject commands should be used. The floppy drive is manual eject only. Refer to the Solaris documentation.

Devices which participate in the Boot Process such as Boot Device, Standard IO, must have OBP support.

The Ultra AX*i* motherboard has built-in OBP support for certain PCI graphics cards from ATI. See Appendix E.

Use of Sun keyboards other than the Type 5 may result in unpredictable operation. For example, the front power switch will not shut down the machine with a Sun Type 4 keyboard attached.

The `boot -r` command must be used to reconfigure the system if any cards are added, removed or moved from one expansion slot to another, or if memory DIMMs are added or removed or any other changes are made to the system configuration.

If the system has a monitor installed, but no keyboard the output will be TTY-A.

The system requires a minimum of 16MB of installed DRAM to operate in OBP, and an additional 16 MB for a total of 32MB to operate Solaris.

CHAPTER 4

Sequence of Events at Power Up

This chapter details the sequence of events that occur at Power Up in the reference configuration described in Appendix C. Interaction with OBP and Solaris is referred to where applicable. This sequence does not address all possible configurations.

4.1 Configuration

A minimum configuration for the Ultra AX*i* motherboard is:

- Ultra AX*i* motherboard with OBP3.10.8 or later
- 32MB Memory
- UltraSPARC II*i* CPU Module
- Console terminal connected to TTYA
- Boot Device - network

The reference configuration for this manual is:

- Ultra AXi motherboard with OBP3.10.8
- 128MB Memory
- UltraSPARC II*i* CPU @270MHz
- ATI graphic card in a PCI slot connected to monitor
- Sun Type 5 keyboard
- Boot Device - Disk
- OBP environment:
  - Boot-device = hard disk
  - Diag-switch? = false
  - Diag-Level = min
  - Auto-boot? = false

TABLE 4-1 Power Up Sequence

Phase	Description	Observation
Power-Connected Rear switch ON	When Power is connected, +5V SB power will be present. This Stand By power is available to the front panel power switch circuitry.	No fan rotation, no LED Illumination.
The Front Panel ON-OFF switch is pressed	Power_On signal is driven to activate the power supply. All the outputs appear. The power supply verifies the outputs have reached the nominal value (output sequence applies) and drives the Power_OK signal.	The fan in the power supply starts. The hard disk and CD-ROM devices self-initialize.
POWER OK signal generates RESET signal. Pressing RESET button generates RESET signal	All chips and the CPU module are brought to an initialized state. The PCI cards also receive this signal to initialize their internal state. The SCSI devices and the floppy drive may also initialize using this signal.	
	The CPU starts executing the instructions from the Flash memory	
	Minimum required hardware registers initialized.	The power LED will illuminate.
	CPU clock speed is also determined and re-initialized.	
	Probe for keyboard entry to skip POST.	
	Execute POST.	POST messages appear on TTYA console
	Probe for amount of installed memory on four banks.	
	Decompress and copy ROM / OBP code into RAM.	
	Probe keyboard.	LED's on keyboard blink. Either keyboard or enclosure speaker will beep.
	Probe for amount of installed memory on four banks.	
	Graphic display device installed.	Banner displayed
	Execute NVRAMRC.	
	Probe FFB.	
	Probe PCIB, Ethernet interface, Ebus	
	Probe PCIB slot J2001.	
	Probe PCIB slot J2002	

TABLE 4-1 Power Up Sequence *(Continued)*

Phase	Description	Observation
	Probe PCIB slot J2003	
	Probe PCIA, SCSI device.	HDD activity light illuminates momentarily.
	Probe PCIA slot J2101	
	Probe PCIA slot J2102	
	Probe PCIA slot J2103	
	Probe floppy disk drive.	FDD activity light illuminates momentarily.
At OBP Prompt	User Control	OBP Prompt appears `ok`
`boot` command entered	PROM loads bootblock (`bootblk`) program	Boot messages appear.
	Bootblook program loads boot (`usfboot`) program	
	The boot (`usfboot`) program loads the kernel	
	The kernel initializes itself, loads all boot device drivers, modules and starts `init` process	
	The `init` process starts the run control scripts	Boot process takes about 3 minute
Console login		

Note – If a system is not working, check the cooling fans first to see if the system shut down is due to a defective fan.

4.2 Reset Cautions

Review these cautions before proceeding.

Caution – Under certain conditions a soft reset (from the command line) may leave the system in an unknown state, indicated by a ”Wait-for-reset-timeout error” message at the “OK” prompt. To correct this condition, power cycle the system.

Caution – At the OS level, the push button reset may leave the system in an unknown state and may corrupt the disk. Only assert the push button reset at the "OK" prompt or if maintaining the state of the disks is not critical. As in any Solaris-based system, the correct shutdown process is to become super-user, sync the file system, then finally halt the system.

APPENDIX **A**

Jumpers, Headers, Connectors, and Adapters

All connectors shown as viewed from mating side.

Appendix A Contents

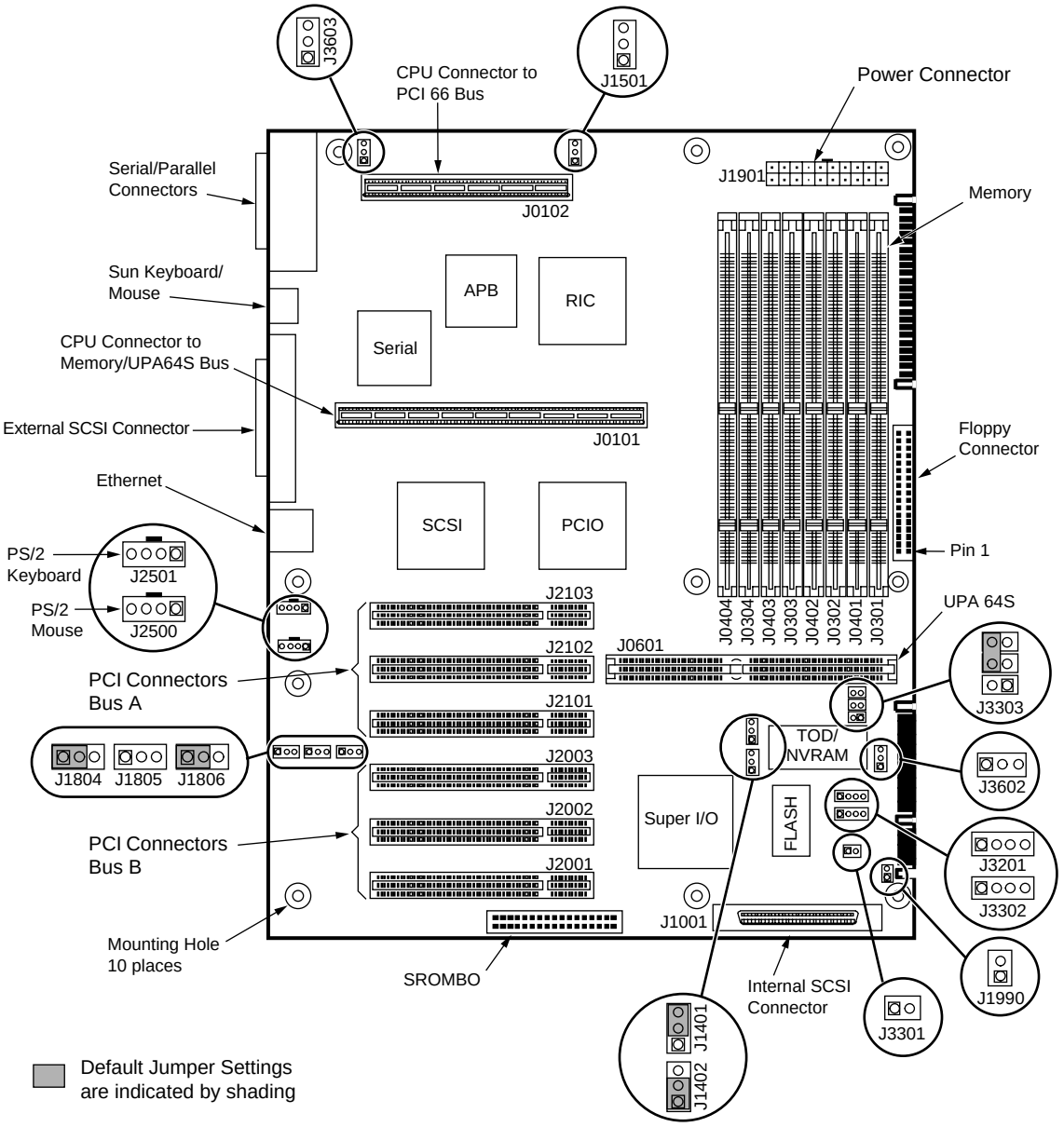


FIGURE A-1 Ultra AXi Jumper, Header, and Connector Layout

A.1 Jumpers

TABLE A-1 shows the default motherboard jumper settings.

TABLE A-1 Motherboard Jumper Settings

Jumper	Settings and Results
J1401	1-2 Flash Memory Write disabled 2-3 Flash Memory Write enabled (default)
J1402	1-2 Flash Memory selected (default) 2-3 ROM Emulator selected (used for system debug only)
J1804	1-2 RS232 (default) 2-3 RS423
J1806	1-2 RS232 (default) 2-3 RS423
J1805	1-2 FAST Serial 2-3 Normal RS232 (default) No Jumper Normal
J3303[1]	2-4 Default power off 4-6 Default power on (default)

1. Available on the -08 and later versions of Ultra AX*i*.

A.2 Headers

TABLE A-2 Header Summary

Header	Function
J1501	Reset Switch (front panel)
J1990	System Power On LED (front panel)
J2500	PS/2 Mouse (rear bracket)
J2501	PS/2 Keyboard (rear bracket)
J3201	Speaker (front panel)
J3301	Power ON-OFF Switch (front panel)
J3302	Reserved (No Jumper)
J3602	Optional/Back Fan
J3603[1]	CPU/Front Fan

1. Required for CPU modules with straight fin heatsinks (e.g., 360 MHz, part number 501-5148-xx; 440 MHz, part number 501-5149-xx)

A.2.1 Reset Switch Header J1501

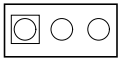


TABLE A-3 Reset Switch Header

Pin #	Description
1	For factory use only.
2	Ground from reset switch.
3	Signal side from reset switch.

A.2.2 Power On LED Header J1990

TABLE A-4 Power-On LED Header

Pin #	Description
1	+LED (Vcc through resistor).
2	-LED (GND through logic).

A.2.3 PS/2 Mouse Header J2500

TABLE A-5 PS/2 Mouse Headers

Pin #	Description
1	Data
2	Gnd
3	Vcc
4	Clk

A.2.4 PS/2 Keyboard Header J2501

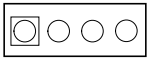


TABLE A-6 PS/2 Keyboard Header

Pin #	Description
1	Data
2	Gnd
3	Vcc
4	Clk

A.2.5 PS/2 Speaker Header J3201

TABLE A-7 PS/2 Speaker Header

Pin #	Description
1	Speaker.
2	N/C.
3	N/C.
4	Speaker.

A.2.6 Power On-Off Switch Header J3301

TABLE A-8 Power Enable Switch Header

Pin #	Description
1	Power On-Off Signal
2	Ground.

A.2.7 Reserved (Do Not Use) J3302

TABLE A-9 Reserved Header

Pin #	Description
1	Reserved
2	Reserved
3	Reserved
4	Reserved

A.2.8 12V Optional/Back Fan Header J3602

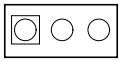


TABLE A-10 12V Back Fan Header

Pin #	Description[1]
1	Back fan fail
2	Power
3	GND

1. Refer to Section 2.1.14.2 “Fan Monitoring and Control” on page 2-9 for more information about these signals.

A.2.9 12V CPU/Front Fan Header J3603

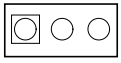


TABLE A-11 12V CPU Fan Header[1]

Pin #	Description[2]
1	Front fan fail
2	Power
3	GND

1. Required for CPU modules with straight fin heat-sinks (e.g., 360 MHz, part number 501-5148-xx; 440 MHz, part number 501-5149-xx)
2. Refer to Section 2.1.14.2 “Fan Monitoring and Control” on page 2-9 for more information about these signals.

A.3 Connectors

A.3.1 ATX Power Connector J1901

Molex Inc. Part No. 39-29-9202

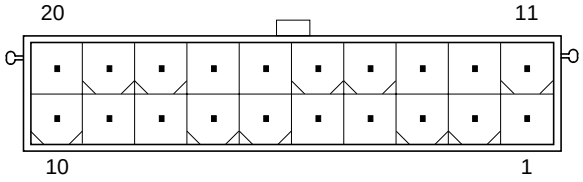


TABLE A-12 ATX Power Connector

Pin	Voltage	Pin	Voltage
1	3.3V	11	3.3V
2	3.3V	12	-12V
3	COM	13	COM
4	5V	14	PS_ON
5	COM	15	COM
6	5V	16	COM
7	COM	17	COM
8	PW_OK	18	-5V
9	5V_SB	19	5V
10	+12V	20	5V

A.3.2 Memory DIMMs J0301, J0302, J0303, J0304 J0401, J0402, J0403, J0404

AMP Inc. Part No. 382826-4
FOXCONN Inc. Part No. AT08403-H6

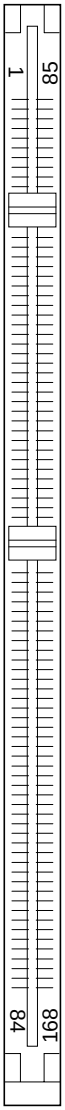


TABLE A-13 Memory DIMMs Pinouts

Pin	Signal	Pin	Signal
1	VCC	85	VSS
2	DQ0	86	DQ36
3	DQ1	87	DQ37
4	DQ2	88	DQ38
5	DQ3	89	DQ39
6	VCC	90	VCC
7	DQ4	91	DQ40
8	DQ5	92	DQ41
9	DQ6	93	DQ42
10	DQ7	94	DQ43
Connector Key			
11	DQ8	95	DQ44
12	VSS	96	VSS
13	DQ9	97	DQ45
14	DQ10	98	DQ46
15	DQ11	99	DQ47
16	DQ12	100	DQ48
17	DQ13	101	DQ49
18	VCC	102	VCC
19	DQ14	103	DQ50
20	DQ15	104	DQ51
21	DQ16	105	DQ52
22	DQ17	106	DQ53
23	VSS	107	VSS
24	NC	108	NC
25	NC	109	NC
26	VCC	110	VCC
27	WE0	111	RFU
28	CAS0	112	NC

Pin	Signal	Pin	Signal
29	RFU	113	RFU
30	RAS0	114	NC
31	OE0	115	RFU
32	VSS	116	VSS
33	A0	117	A1
34	A2	118	A3
35	A4	119	A5
36	A6	120	A7
37	A8	121	A9
38	A10	122	NC
39	NC	123	NC
40	VCC	124	VCC
Connector Key			
41	RFU	125	RFU
42	RFU	126	B0
43	VSS	127	VSS
44	OE2	128	RFU
45	RAS2	129	NC
46	CAS4	130	NC
47	RFU	131	RFU
48	WE2	132	PDE
49	VCC	133	VCC
50	NC	134	NC
51	NC	135	NC
52	DQ18	136	DQ54
53	DQ19	137	DQ55
54	VSS	138	VSS
55	DQ20	139	DQ56
56	DQ21	140	DQ57

Pin	Signal	Pin	Signal
57	DQ22	141	DQ58
58	DQ23	142	DQ59
59	VCC	143	VCC
60	DQ24	144	DQ60
61	RFU	145	RFU
62	RFU	146	RFU
63	RFU	147	RFU
64	RFU	148	RFU
65	DQ25	149	DQ61
66	DQ26	150	DQ62
67	DQ27	151	DQ63
68	VSS	152	VSS
69	DQ28	153	DQ64
70	DQ29	154	DQ65
71	DQ30	155	DQ66
72	DQ31	156	DQ67
73	VCC	157	VCC
74	DQ32	158	DQ68
75	DQ33	159	DQ69
76	DQ34	160	DQ70
77	DQ35	161	DQ71
78	VSS	162	VSS
79	PD1	163	PD2
80	PD3	164	PD4
81	PD5	165	PD6
82	PD7	166	PD8
83	ID0	167	ID1
84	VCC	168	VCC

A.3.3 UltraSPARC Module (Memory and UPA64S) Connector J0101

AMP Inc. Part No. 536279-8

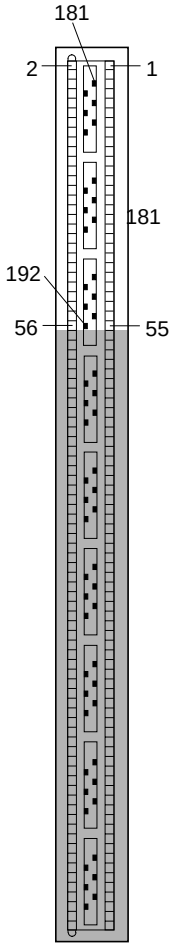
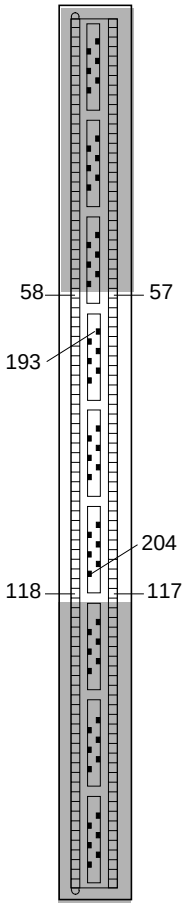


TABLE A-14 UltraSPARC Module (Memory / UPA64S) Connector

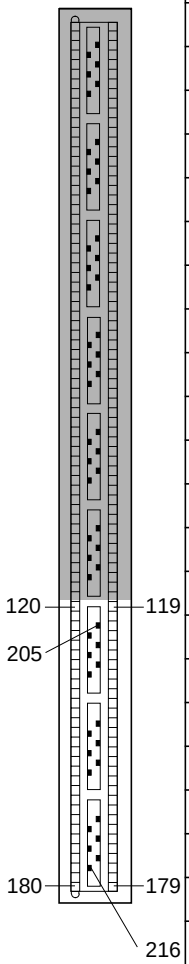
Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
2	VID<1>			1	VID<0>
4	VID<3>			3	VID<2>
6	VID<4>	181	GND	5	NC
8	MFG_L	182	GND	7	GND
10	GND	183	GND	9	XCVR_CLK<0>
12	XCVR_CLK<1>	184	GND	11	GND
14	GND			13	XCVR_CLK<2>
16	XCVR_RD_CNTL<0>			15	GND
18	XCVR_SEL_L			17	XCVR_OEA_L
20	XCVR_RD_CNTL<1>			19	XCVR_OEB_L
22	XCVR_WR_CNTL<1>			21	XCVR_WR_CNTL<0>
24	GND			23	NC
26	RAM_ADR<02>	185	VDD	25	GND
28	RAM_ADR<03>	186	VDD	27	RAM_ADR<00>
30	RAM_ADR<06>	187	VDD	29	RAM_ADR<01>
32	RAM_ADR<08>	188	VDD	31	RAM_ADR<04>
34	RAM_ADR<09>			33	RAM_ADR<05>
36	RAM_ADR<10>			35	RAM_ADR<07>
38	RAM_ADR<12>			37	RAM_ADR<11>
40	GND			39	GND
42	UPA_DATABUS<02>			41	UPA_DATABUS<00>
44	UPA_DATABUS<04>			43	UPA_DATABUS<01>
46	UPA_DATABUS<06>	189	GND	45	UPA_DATABUS<03>
48	UPA_DATABUS<08>	190	GND	47	UPA_DATABUS<05>
50	UPA_DATABUS<10>	191	GND	49	UPA_DATABUS<07>
52	UPA_DATABUS<12>	192	GND	51	UPA_DATABUS<09>
54	UPA_DATABUS<14>			53	UPA_DATABUS<11>
56	UPA_DATABUS<16>			55	UPA_DATABUS<13>

TABLE A-14 UltraSPARC Module (Memory / UPA64S) Connector *(Continued)*



Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
58	UPA_DATABUS<18>			57	UPA_DATABUS<15>
60	UPA_DATABUS<20>			59	UPA_DATABUS<17>
62	UPA_DATABUS<22>			61	UPA_DATABUS<19>
64	UPA_DATABUS<24>			63	UPA_DATABUS<21>
66	UPA_DATABUS<26>	193	VDD	65	UPA_DATABUS<23>
68	UPA_DATABUS<28>	194	VDD	67	UPA_DATABUS<25>
70	UPA_DATABUS<30>	195	VDD	69	UPA_DATABUS<27>
72	UPA_DATABUS<32>	196	VDD	71	UPA_DATABUS<29>
74	UPA_DATABUS<34>			73	UPA_DATABUS<31>
76	UPA_DATABUS<36>			75	UPA_DATABUS<33>
78	UPA_DATABUS<37>			77	UPA_DATABUS<35>
80	NC			79	GND
82	VDD			81	NC
84	MEM_RAST_L<1>			83	MEM_WE_L
86	MEM_CAS_L<1>	197	GND	85	MEM_CAS_L<0>
88	MEM_RAST_L<2>	198	GND	87	MEM_RAST_L<0>
90	MEM_RASB_L<0>	199	GND	89	MEM_RAST_L<3>
92	MEM_RASB_L<2>	200	GND	91	MEM_RASB_L<1>
94	GND			93	MEM_RASB_L<3>
96	UPA_DATABUS<38>			95	VDD
98	UPA_DATABUS<40>			97	UPA_DATABUS<39>
100	UPA_DATABUS<42>			99	UPA_DATABUS<41>
102	UPA_DATABUS<44>			101	UPA_DATABUS<43>
104	UPA_DATABUS<46>			103	GND
106	UPA_DATABUS<48>	201	VDD	105	UPA_DATABUS<45>
108	UPA_DATABUS<50>	202	VDD	107	UPA_DATABUS<47>
110	UPA_DATABUS<52>	203	VDD	109	UPA_DATABUS<114>
112	GND	204	VDD	111	UPA_DATABUS<51>
114	UPA_DATABUS<54>			113	UPA_DATABUS<53>
116	UPA_DATABUS<56>			115	UPA_DATABUS<55>
118	UPA_DATABUS<58>			117	UPA_DATABUS<57>

TABLE A-14 UltraSPARC Module (Memory / UPA64S) Connector *(Continued)*



Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
120	UPA_DATABUS<60>			119	UPA_DATABUS<59>
122	UPA_DATABUS<62>			121	UPA_DATABUS<61>
124	UPA_DATABUS<64>			123	UPA_DATABUS<63>
126	UPA_DATABUS<66>	205	GND	125	UPA_DATABUS<65>
128	UPA_DATABUS<68>	206	GND	127	UPA_DATABUS<67>
130	UPA_DATABUS<70>	207	GND	129	UPA_DATABUS<69>
132	UPA_DATABUS<71>	208	GND	131	NC
134	VDD			133	UPA_ADDRESSBUS<14>
136	UPA_ADDRESSBUS<28>			135	UPA_ADDRESSBUS<13>
138	UPA_ADDRESSBUS<27>			137	UPA_ADDRESSBUS<12>
140	UPA_ADDRESSBUS<26>			139	UPA_ADDRESSBUS<11>
142	UPA_ADDRESSBUS<25>			141	UPA_ADDRESSBUS<10>
144	UPA_ADDRESSBUS<24>			143	UPA_ADDRESSBUS<09>
146	UPA_ADDRESSBUS<23>	209	VDD	145	UPA_ADDRESSBUS<08>
148	UPA_ADDRESSBUS<22>	210	VDD	147	UPA_ADDRESSBUS<07>
150	UPA_ADDRESSBUS<21>	211	VDD	149	UPA_ADDRESSBUS<06>
152	UPA_ADDRESSBUS<20>	212	VDD	151	UPA_ADDRESSBUS<05>
154	UPA_ADDRESSBUS<19>			153	UPA_ADDRESSBUS<04>
156	UPA_ADDRESSBUS<18>			155	UPA_ADDRESSBUS<03>
158	UPA_ADDRESSBUS<17>			157	UPA_ADDRESSBUS<02>
160	UPA_ADDRESSBUS<16>			159	UPA_ADDRESSBUS<01>
162	UPA_ADDRESSBUS<15>			161	UPA_ADDRESSBUS<00>
164	GND			163	VDD
166	NC	213	GND	165	UPA_CLK_POS
168	S_DATA	214	GND	167	UPA_CLK_NEG
170	GND	215	GND	169	GND
172	S_REPLY<2>	216	GND	171	ADR_VLD
174	P_REPLY<0>			173	P_REPLY<1>
176	S_REPLY<1>			175	S_REPLY<0>
178	S_LOAD			177	S_CLK
180	VDD			179	VDD

A.3.4 UltraSPARC Module (PCI-66) Connector J0102

AMP Inc. Part No. 536279-5

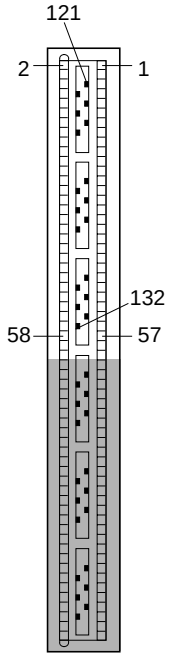
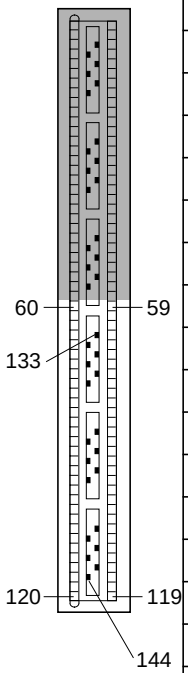


TABLE A-15 PCI 66 Connector Pinouts

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
2	VDD CORE			1	VDD CORE
4	GND			3	GND
6	VDD CORE	121	VDD CORE	5	VDD CORE
8	GND	122	VDD CORE	7	GND
10	GND	123	VDD CORE	9	GND
12	GND	124	VDD CORE	11	GND
14	VDD CORE			13	VDD CORE
16	GND			15	GND
18	GND			17	GND
20	VDD CORE			19	VDD CORE
22	GND			21	GND
24	VDD CORE			23	VDD CORE
26	GND	125	VDD CORE	25	GND
28	GND	126	VDD CORE	27	GND
30	GND	127	VDD CORE	29	GND
32	VDD CORE	128	VDD CORE	31	VDD CORE
34	GND			33	GND
36	VDD CORE			35	VDD CORE
38	GND			37	GND
40	PAD<01>			39	PAD<00>
42	PAD<03>			41	PAD<02>
44	PAD<05>			43	PAD<04>
46	PCBE_L<0>	129	GND	45	PAD<06>
48	PAD<09>	130	GND	47	PAD<07>
50	PAD<10>	131	GND	49	PAD<08>
52	PAD<12>	132	GND	51	PAD<11>
54	PAD<14>			53	PAD<13>
56	PCBE_L<01>			55	PAD<15>
58	PSERR_L			57	PPAR

TABLE A-15 PCI 66 Connector Pinouts *(Continued)*



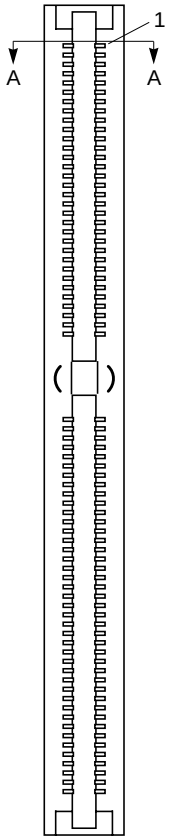
Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
60	PREQ_L<2>			59	NC
62	PDEVSEL_L			61	PPER_L
64	PIRDY_L			63	PREQ_L<3>
66	PCBE_L<02>	133	VDD +3.3V	65	PSTOP_L
68	PAD<17>	134	VDD +3.3V	67	PTRDY_L
70	PAD<19>	135	VDD +3.3V	69	PFRAME_L
72	PAD<21>	136	VDD +3.3V	71	PAD<16>
74	PAD<22>			73	PAD<18>
76	PAD<23>			75	PAD<20>
78	PCBE_L<03>			77	PREQ_L<1>
80	PAD<27>			79	PAD<24>
82	PAD<28>			81	PAD<25>
84	PAD<29>			83	PAD<26>
86	PAD<31>	137	GND	85	PAD<30>
88	PCI_CLK_SEL0	138	GND	87	PGNT_L<0>
90	PREQ_L<0>	139	GND	89	RESET_L
92	GND	140	GND	91	GND
94	PCI_REF_CLK			93	SB_PCI_CLK
96	GND			95	GND
98	PGNT_L<1>			97	PGNT_<2>
100	PGNT_L<3>			99	EMPTY<0>
102	DRAIN			101	EMPTY<1>
104	INT_NM<1>			103	INT_NM<0>
106	INT_NM<3>	141	VDD +3.3V	105	NT_NM<2>
108	INT_NM<5>	142	VDD +3.3V	107	INT_NM<4>
110	PB_RST_L	143	VDD +3.3V	109	SYS_RST_L
112	TCLK	144	VDD +3.3V	111	X_RST_L
114	TMS			113	MODULE_TDO
116	TEMP_SENSE1			115	MODULE_TDI
118	TEMP_SENSE0			117	TRST_L
120	EPD			119	PCI_CLK_SEL1

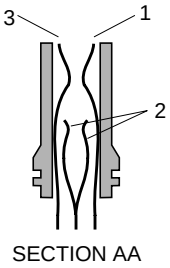
A.3.5 UPA64S (Vertical FFB) Connector J0601

AMP Inc. Part No. 145236-2

This connector uses four contact blades in each cavity. The top pair (furthest from the board) are separately wired and the bottom pair are connected. See Section AA below.

TABLE A-16 UPA64S (Vertical FFB) Connector Pinouts

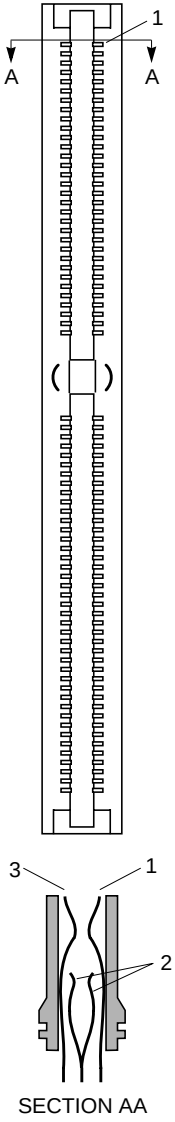




SECTION AA

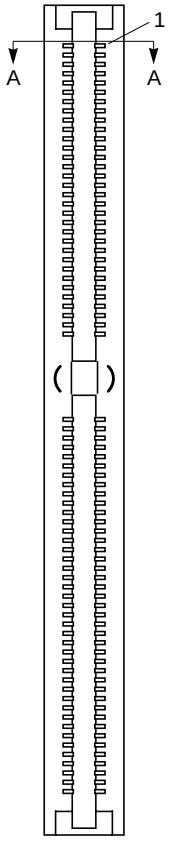
Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
1	VCC	2	VCC	3	VCC
4	VCC	5	GND	6	VCC
7	SPARE0	8	VCC	9	VCC
10	SPARE2	11	GND	12	SPARE1
13	USB_DATA-	14	VCC	15	USB_DATA+
16	SPARE6	17	GND	18	SPARE7
19	-12V	20	VCC	21	+ 12V
22	UPA_DATABUS<61>	23	GND	24	+ 12V
25	UPA_DATABUS<63>	26	VDD	27	UPA_DATABUS<62>
28	UPA_DATABUS<59>	29	GND	30	UPA_DATABUS<60>
31	UPA_DATABUS<57>	32	VDD	33	UPA_DATABUS<58>
34	UPA_DATABUS<55>	35	GND	36	UPA_DATABUS<56>
37	UPA_DATABUS<53>	38	VDD	39	UPA_DATABUS<54>
40	UPA_DATABUS<51>	41	GND	42	UPA_DATABUS<52>
43	UPA_DATABUS<49>	44	VDD	45	UPA_DATABUS<50>
46	UPA_DATABUS<47>	47	GND	48	UPA_DATABUS<48>
49	UPA_DATABUS<45>	50	VDD	51	UPA_DATABUS<46>
52	UPA_DATABUS<43>	53	GND	54	UPA_DATABUS<44>
55	UPA_DATABUS<41>	56	VDD	57	UPA_DATABUS<42>
58	UPA_DATABUS<39>	59	GND	60	UPA_DATABUS<40>
61	UPA_DATABUS<37>	62	VDD	63	UPA_DATABUS<38>
64	UPA_DATABUS<35>	65	GND	66	UPA_DATABUS<36>
67	UPA_DATABUS<33>	68	VDD	69	UPA_DATABUS<34>
70	UPA_DATABUS<31>	71	GND	72	UPA_DATABUS<32>
73	UPA_DATABUS<29>	74	VDD	75	UPA_DATABUS<30>

TABLE A-16 UPA64S (Vertical FFB) Connector Pinouts

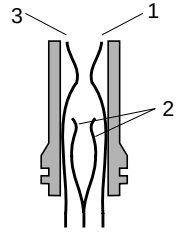


Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
76	UPA_DATABUS<27>	77	GND	78	UPA_DATABUS<28>
79	UPA_DATABUS<25>	80	VDD	81	UPA_DATABUS<26>
82	UPA_DATABUS<23>	83	GND	84	UPA_DATABUS<24>
85	UPA_DATABUS<21>	86	VDD	87	UPA_DATABUS<22>
88	UPA_DATABUS<19>	89	GND	90	UPA_DATABUS<20>
91	UPA_DATABUS<17>	92	VDD	93	UPA_DATABUS<18>
94	UPA_DATABUS<15>	95	GND	96	UPA_DATABUS<16>
Connector Key					
97	UPA_DATABUS<13>	98	VDD	99	UPA_DATABUS<14>
100	UPA_DATABUS<11>	101	GND	102	UPA_DATABUS<12>
103	UPA_DATABUS<09>	104	VDD	105	UPA_DATABUS<10>
106	UPA_DATABUS<07>	107	GND	108	UPA_DATABUS<08>
109	UPA_DATABUS<05>	110	VDD	111	UPA_DATABUS<06>
112	UPA_DATABUS<03>	113	GND	114	UPA_DATABUS<04>
115	UPA_DATABUS<01>	116	VDD	117	UPA_DATABUS<02>
118	VCC	119	GND	120	UPA_DATABUS<00>
121	VCC	122	VDD	123	VCC
124	TCLK2	125	GND	126	GND
127	MOD1_TDI	128	VDD	129	UPA_CLK_POS
130	A_TDI	131	GND	132	UPA_CLK_NEG
133	TRST_L	134	VCC	135	GND
136	MOD_TMS	137	GND	138	VCC
139	VCC	140	VCC	141	UPA_ADDRESSBUS<28>
142	UPA_ADDRESSBUS<27>	143	GND	144	UPA_ADDRESSBUS<26>
145	UPA_ADDRESSBUS<25>	146	VDD	147	UPA_ADDRESSBUS<24>
148	UPA_ADDRESSBUS<23>	149	GND	150	UPA_ADDRESSBUS<22>
151	UPA_ADDRESSBUS<21>	152	VDD	153	UPA_ADDRESSBUS<20>
154	UPA_ADDRESSBUS<19>	155	GND	156	UPA_ADDRESSBUS<18>
157	UPA_ADDRESSBUS<17>	158	VDD	159	UPA_ADDRESSBUS<16>
160	UPA_ADDRESSBUS<15>	161	GND	162	UPA_ADDRESSBUS<14>

TABLE A-16 UPA64S (Vertical FFB) Connector Pinouts



Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
163	UPA_ADDRESSBUS<13>	164	VDD	165	UPA_ADDRESSBUS<12>
166	UPA_ADDRESSBUS<11>	167	GND	168	UPA_ADDRESSBUS<10>
169	UPA_ADDRESSBUS<09>	170	VDD	171	UPA_ADDRESSBUS<08>
172	UPA_ADDRESSBUS<07>	173	GND	174	UPA_ADDRESSBUS<06>
175	UPA_ADDRESSBUS<05>	176	VDD	177	UPA_ADDRESSBUS<04>
178	UPA_ADDRESSBUS<03>	179	GND	180	UPA_ADDRESSBUS<02>
181	UPA_ADDRESSBUS<01>	182	VDD	183	UPA_ADDRESSBUS<00>
184	UPA_P_REPLY<1>	185	GND	186	UPA_ADDRESS_VALID
187	UPA_P_REPLY<0>	188	VDD	189	UPA_P_REPLY<0>
190	UPA_P_REPLY<2>	191	GND	192	UPA_S_REPLY<1>
193	FFB_INT-L	194	VDD	195	UPA_RESET_L
196	SPEED<1>	197	GND	198	SPEED<0>
199	POWER_OK	200	VCC	201	SPEED<2>
202	SPARE8	203	GND	204	SPARE9
205	SPARE10	206	VCC	207	SPARE11
208	SPARE4	209	GND	210	SPARE5
211	VCC	212	VCC	213	SPARE3
214	VCC	215	GND	216	VCC
217	VCC	218	VCC	219	VCC



SECTION AA

A.3.6 PCI 32-Bit Connectors J2001, J2002, J2003 J2101, J2102, J2103

AMP Inc. Part No. 145154-4

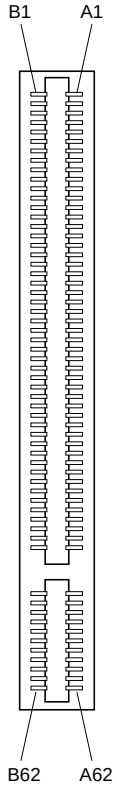


TABLE A-17 32-Bit PCI Connector Pinouts

Pin	Side B	Side A
1	-12V	TRST#
2	TCK	+12V
3	GND	TMS
4	TDO	TDI
5	+5V	+5V
6	+5V	INTA#
7	INTB#	INTC#
8	INTD#	+5V
9	PRSNT1#	Reserved
10	Reserved	+5V (I/O)
11	PRSNT#2	Reserved
12	GND	GND
13	GND	GND
14	Reserved	Reserved
15	GND	RST#
16	CLK	+5V (I/O)
17	GND	GNT#
18	REQ#	GND
19	+5V (I/O)	Reserved
20	AD[31]	AD[30]
21	AD[29]	+3.3V
22	GND	AD[28]
23	AD[27]	AD[26]
24	AD[25]	GND
25	+3.3V	AD[24]
26	C/BE[3]#	IDSEL
27	AD[23]	+3.3V
28	GND	AD[22]
29	AD[21]	AD[20]
30	AD[19]	GND
31	+3.3V	AD[18]

Pin	Side B	Side A
32	AD[17]	AD[16]
33	C/BE[2]#	+3.3V
34	GND	FRAME#
35	IRDY#	GND
36	+3.3V	TRDY#
37	DEVSEL#	GND
38	GND	STOP#
39	LOCK#	+3.3V
40	PERR#	SDONE
41	+3.3V	SBO#
42	SERR#	GND
43	+3.3V	PAR
44	C/BE[1]#	AD[15]
45	AD[14]	+3.3V
46	GND	AD[13]
47	AD[12]	AD[11]
48	AD[10]	GND
49	GND	AD[09]
50	Connector Key	
51	Connector Key	
52	AD[08]	C/BE[0]#
53	AD[07]	3.3V
54	+3.3V	AD[06]
55	AD[05]	AD[04]
56	AD[03]	GND
57	GND	AD[02]
58	AD[01]	AD[00]
59	+5V (I/O)	+5V (I/O)
60	ACK64#	REQ64#
61	+5V	+5V
62	+5V	+5V

A.3.7 Internal SCSI Connector J1001

AMP Inc. Part No. 786555-7

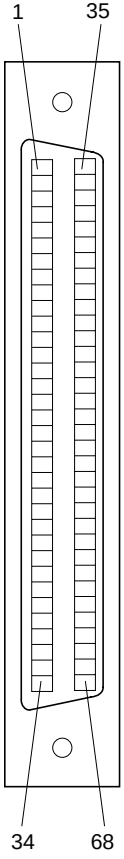


TABLE A-18 SCSI Internal Connector (Channel A) Pinouts

Pin	Signal Name	Pin	Signal Name
1	GND	35	SCSI_AC_DAT<12>
2	GND	36	SCSI_AC_DAT<13>
3	GND	37	SCSI_AC_DAT<14>
4	GND	38	SCSI_AC_DAT<15>
5	GND	39	SCSI_AC_PAR<1>
6	GND	40	SCSI_AC_DAT<0>
7	GND	41	SCSI_AC_DAT<1>
8	GND	42	SCSI_AC_DAT<2>
9	GND	43	SCSI_AC_DAT<3>
10	GND	44	SCSI_AC_DAT<4>
11	GND	45	SCSI_AC_DAT<5>
12	GND	46	SCSI_AC_DAT<6>
13	GND	47	SCSI_AC_DAT<7>
14	GND	48	SCSI_AC_PAR<0>
15	GND	49	GND
16	GND	50	GND
17	TERMPWRA	51	TERMPWRA
18	TERMPWRA	52	TERMPWRA
19	GND	53	GND
20	GND	54	GND
21	GND	55	SCSI_AC_ATN_L
22	GND	56	GND
23	GND	57	SCSI_AC_BSY_L
24	GND	58	SCSI_AC_ACK_L
25	GND	59	SCSI_AC_RST_L
26	GND	60	SCSI_AC_MSG_L
27	GND	61	SCSI_AC_SEL_L
28	GND	62	SCSI_AC_CD_L
29	GND	63	SCSI_AC_REQ_L
30	GND	64	SCSI_AC_IO_L
31	GND	65	SCSI_AC_DAT<8>
32	GND	66	SCSI_AC_DAT<9>
33	GND	67	SCSI_AC_DAT<10>
34	GND	68	SCSI_AC_DAT<11>

A.3.8 External SCSI Connector J1003

AMP Inc. Part No. 749076-7

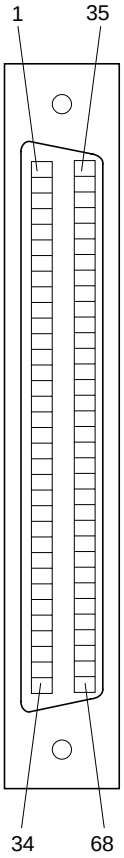


TABLE A-19 SCSI External Connector (Channel B) Pinouts

Pin	Signal Name	Pin	Signal Name
1	GND	35	SCSI_BC_DAT<12>
2	GND	36	SCSI_BC_DAT<13>
3	GND	37	SCSI_BC_DAT<14>
4	GND	38	SCSI_BC_DAT<15>
5	GND	39	SCSI_BC_PAR<1>
6	GND	40	SCSI_BC_DAT<0>
7	GND	41	SCSI_BC_DAT<1>
8	GND	42	SCSI_BC_DAT<2>
9	GND	43	SCSI_BC_DAT<3>
10	GND	44	SCSI_BC_DAT<4>
11	GND	45	SCSI_BC_DAT<5>
12	GND	46	SCSI_BC_DAT<6>
13	GND	47	SCSI_BC_DAT<7>
14	GND	48	SCSI_BC_PAR<0>
15	GND	49	GND
16	GND	50	GND
17	TERMPWRB	51	TERMPWRB
18	TERMPWRB	52	TERMPWRB
19	GND	53	GND
20	GND	54	GND
21	GND	55	SCSI_BC_ATN_L
22	GND	56	GND
23	GND	57	SCSI_BC_BSY_L
24	GND	58	SCSI_BC_ACK_L
25	GND	59	SCSI_BC_RST_L
26	GND	60	SCSI_BC_MSG_L
27	GND	61	SCSI_BC_SEL_L
28	GND	62	SCSI_BC_CD_L
29	GND	63	SCSI_BC_REQ_L
30	GND	64	SCSI_BC_IO_L
31	GND	65	SCSI_BC_DAT<8>
32	GND	66	SCSI_BC_DAT<9>
33	GND	67	SCSI_BC_DAT<10>
34	GND	68	SCSI_BC_DAT<11>

A.3.9 Floppy Disk Drive Connector J1902

AMP Inc. Part No. 104338-7
RNUGENT Part No. IDH-34LP-S3-TR
MOLEX Inc. Part No. 70246-3473

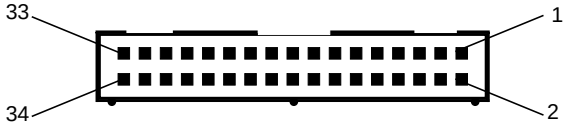
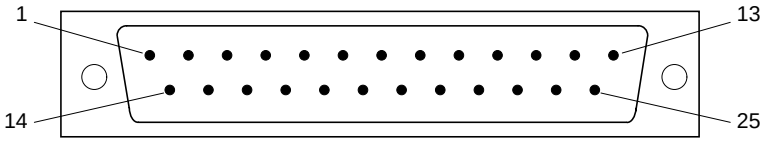


TABLE A-20 Floppy Connector

Pin	Signal Name	Pin	Signal Name
1	GND	2	FD_DENSEL
3	GND	4	33_Ω_to_VCC
5	GND	6	FD_DRATE0_MSEN0
7	N/C	8	FD_INDEX_L
9	GND	10	MTR0_L
11	GND	12	FD_DRV1_SEL_L
13	N/C	14	FD_DRV0_SEL_L
15	GND	16	FD_MTR1_L
17	MSEN1	18	FD_DIR_L
19	GND	20	FD_STEP_L
21	GND	22	FD_WR_DAT_L
23	GND	24	FD_WR_GATE_L
25	GND	26	FD_TRK0_L
27	MSEN0	28	FD_WR_PROT_L
29	GND	30	FD_RD_DAT_L
31	GND	32	FD_HD_SEL_L
33	GND	34	FD_DSK_CHNG_L

A.3.10 Serial Port Male Connector J1802

AMP Inc. Part No. 750601-4



See TABLE A-27 on page A-27 for information and pinouts of “Y” cable serial port adapter

TABLE A-21 DB-25 Serial Port Male Connector Pinouts

Pin	Signal Name	Pin	Signal Name
1	N / C	14	TXD-B
2	TXD-A	15	TRXC-A
3	RXD-A	16	RXD-B
4	RTS-A	17	RXC-A
5	CTS-A	18	TRXC-B
6	SYNC-A	19	RTS-B
7	Ground	20	DTR-A
8	DCD-A	21	NC
9	SYNC-B	22	NC
10	RXC-B	23	NC
11	DTR-B	24	TXC-A
12	DCD-B	25	TXC-B
13	CTS-B	Metal Shell	Chassis Ground

A.3.11 Parallel Port Female Connector J0901

AMP Inc. Part No. 750601-4

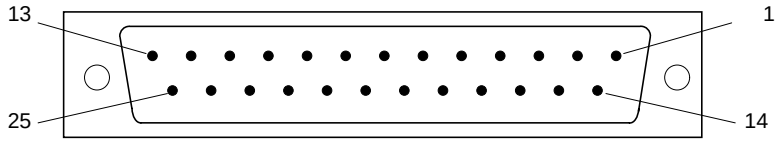
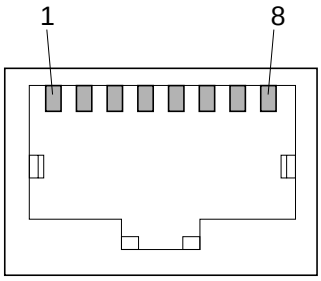


TABLE A-22 Parallel Port Connector Pinouts

Pin #	Signal Name	Pin #	Signal Name
1	Strobe_out_l	14	Auto_feed_out_l
2	Data[0]	15	Errpr_in_l
3	Data[1]	16	Init_out_l
4	Data[2]	17	Select_in_l
5	Data[3]	18	GND
6	Data[4]	19	GND
7	Data[5]	20	GND
8	Data[6]	21	GND
9	Data[7]	22	GND
10	Ack_out_l	23	GND
11	Busy_out_l	24	GND
12	Pe_in	25	GND
13	Select_out		

A.3.12 EtherNet Transceiver Connector TP J2301

Stewart Inc. Part No. SS-6488S-A-NF-SB02
MAXCONN Part No. MJHS-R-88



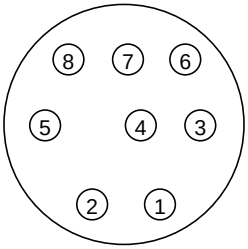
Twisted pair connection. Auto-configuration determines either 10BASE-T or 100BASE-T operation.

TABLE A-23 Type RJ-45 Connector

Pin #	Signal Name
1	Transmit Data +
2	Transmit Data -
3	Receive Data +
4	Presence Detect Tx
5	Presence Detect Tx
6	Receive Data -
7	Presence Detect Rx
8	Presence Detect Rx

A.3.13 Sun Keyboard and Mouse J0902

AMP Inc. Part No. 749179-1
FOXCONN Part No. MH11083-K2-HT



Mini DIN Connector

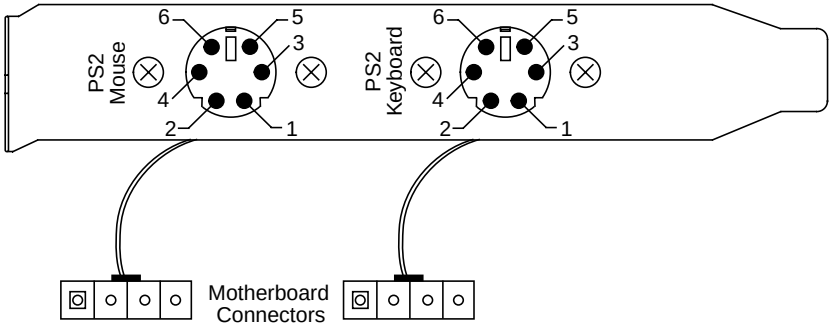
TABLE A-24 Sun Keyboard / Mouse Connector Pinouts

Pin #	Signal
1	GND
2	GND
3	VCC KBD
4	MS in
5	SUN_KBD_OUT
6	VCC KBD
7	POWER_ON_L
8	VCC

A.4 Adapters

A.4.1 (PS/2) Keyboard and Mouse Adapter

J2500 Mouse
J2501 Keyboard



PS/2 Back Panel and Adapter Connectors

TABLE A-25 PS/2 Mouse Connections

Signal	DIN Connector Pin	Motherboard Connector Pin
Data	1	1
NC	2	
Gnd	3	2
Vcc	4	3
Clk	5	4
NC	6	

TABLE A-26 PS/2 Keyboard Connections

Signal	DIN Connector Pin	Motherboard Connector Pin
Data	1	1
NC	2	
Gnd	3	2
Vcc	4	3
Clk	5	4
NC	6	

A.4.2 Serial Port Channels A and B

TABLE A-27 shows the signals on the two 25-pin connectors when using a "Y" cable to separate serial channels A and B. See Appendix A.3.10 for serial connector pinouts.

The splitter cable is available from Y.C. Cable USA, Inc., 4568 Enterprise Street, Fremont, CA 94538, part number DB25F-2M10.

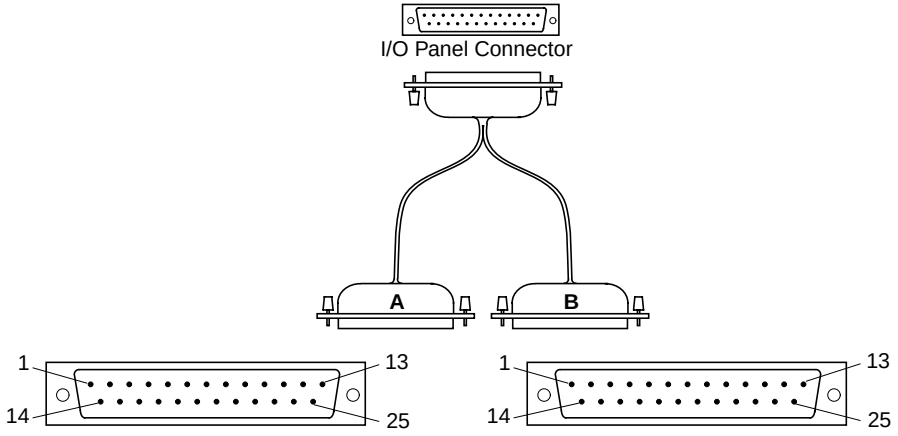


TABLE A-27 25-Pin Serial Channel A and B Connectors (Y Cable)

Pin	A Signal Name	Pin	A Signal Name
1	NC	14	NC
2	TXD-A	15	TRXC-A
3	RXD-A	16	NC
4	RTS-A	17	RXC-A
5	CTS-A	18	NC
6	SYNC-A	19	NC
7	Ground	20	DTR-A
8	DCD-A	21	NC
9	NC	22	NC
10	NC	23	NC
11	NC	24	TXC-A
12	NC	25	NC
13	NC	Metal Shell	Chassis Ground

Pin	B Signal Name	Pin	B Signal Name
1	NC	14	NC
2	TXD-B	15	TRXC-B
3	RXD-B	16	NC
4	RTS-B	17	RXC-B
5	CTS-B	18	NC
6	SYNC-B	19	NC
7	Ground	20	DTR-B
8	DCD-B	21	NC
9	NC	22	NC
10	NC	23	NC
11	NC	24	TXC-B
12	NC	25	NC
13	NC	Metal Shell	Chassis Ground

APPENDIX **B**

Mechanical Drawings

B.1 Ultra AX*i* Motherboard Dimensions

FIGURE B-1 shows a rear view of the Ultra AX*i* motherboard with dimensions to the IO connectors and the IO aperture referenced to the mounting hole (0.000x0.000) used as datum in FIGURE B-2.

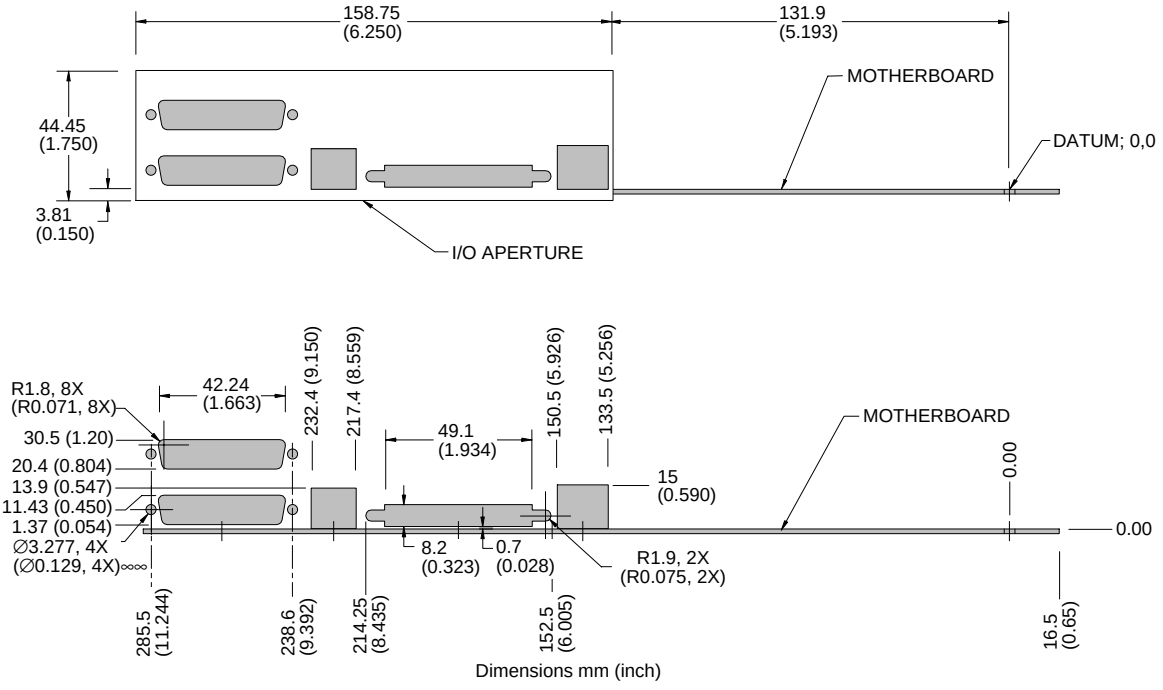


FIGURE B-1 Ultra AX*i* Motherboard IO View

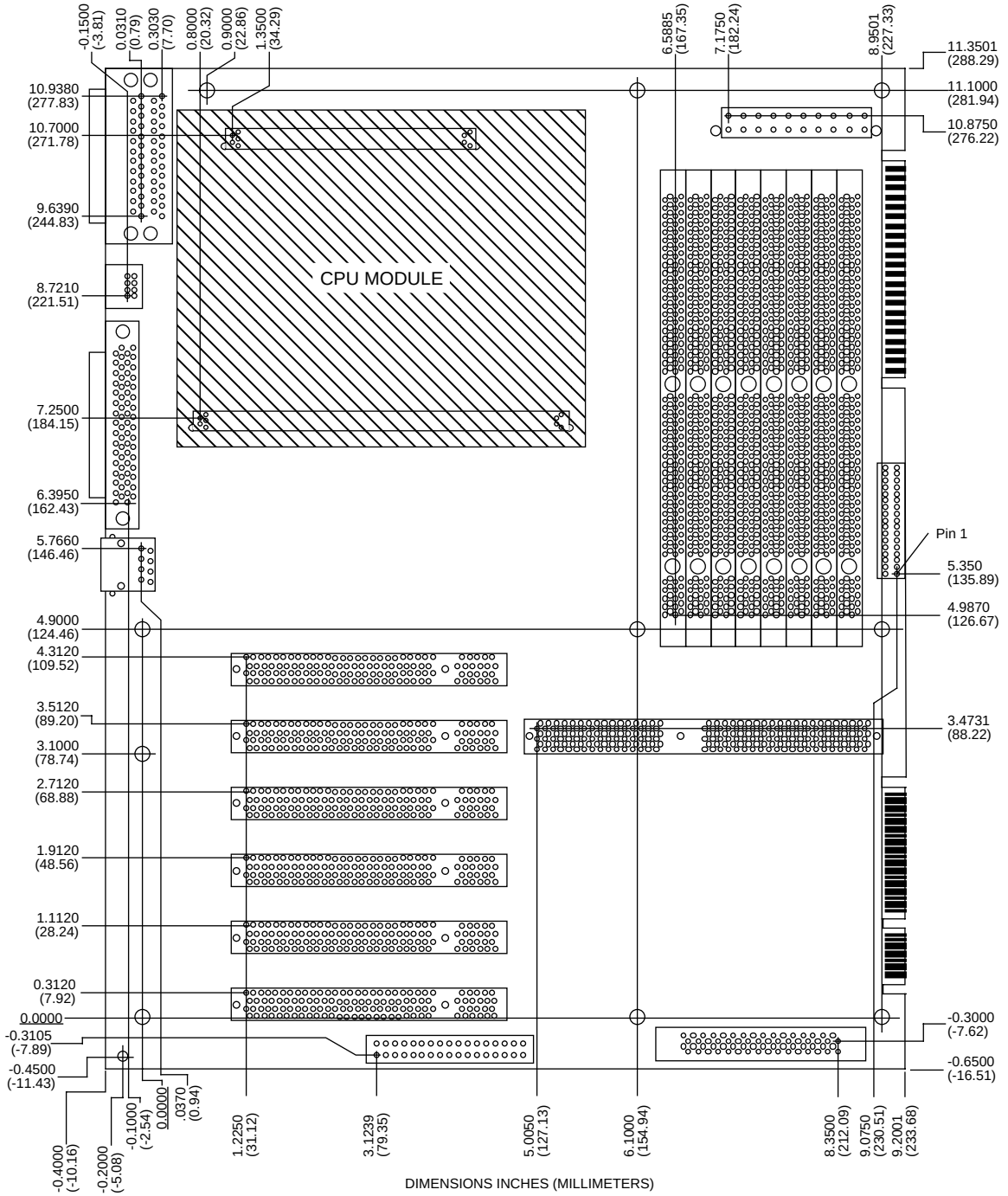


FIGURE B-2 Ultra AX*i* Motherboard Top View

B.2 Height Profiles

All height dimensions are measured from the component side of the Motherboard. The Motherboard thickness 1.57 mm (0.062 inch) must be added to obtain the height form the mounting pads of the enclosure. The Ultra AX*i* conforms to the ATX 2.01 specification height restrictions except in the space indicated by ▨ in the DIMM slot area.

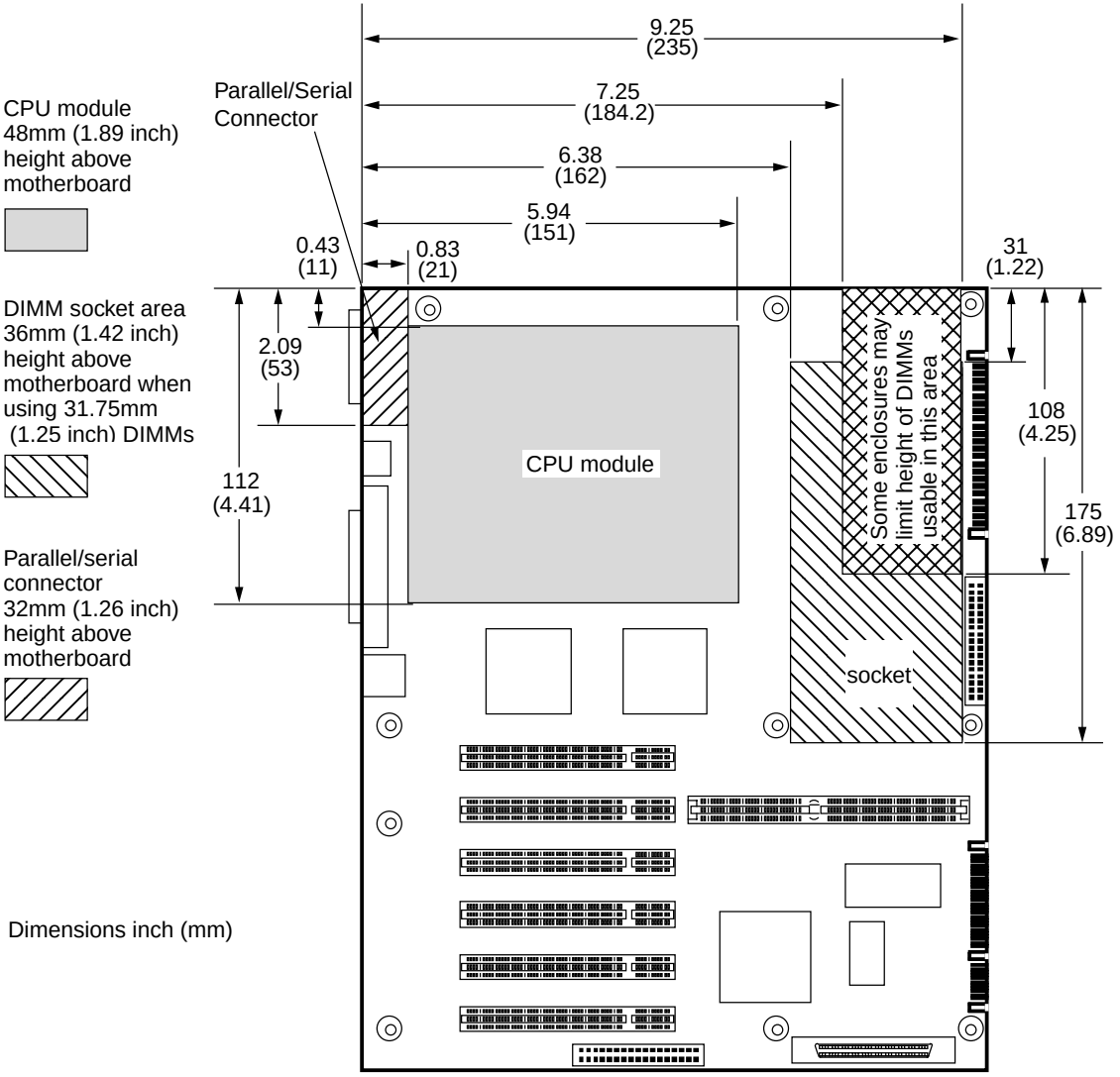


FIGURE B-3 Height Profile Top View

Except as described in the height profiles, no other vertically oriented component exceeds 19mm, (.750 inch) in height. None of the horizontally oriented components exceeds 5.6mm, (0.220 inch) in height.

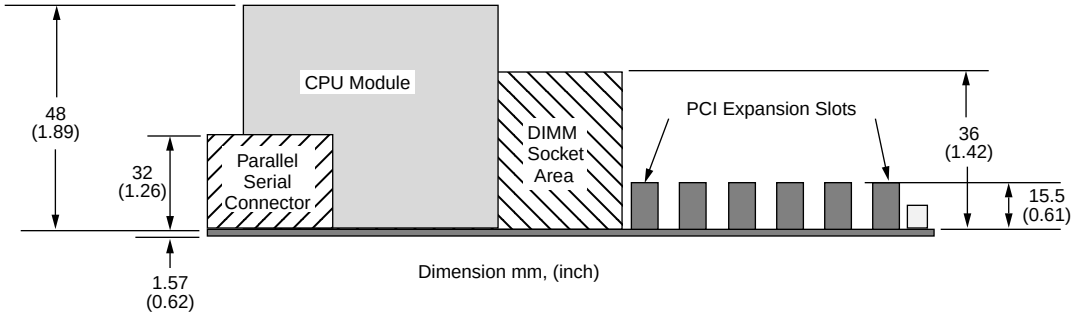


FIGURE B-4 Height Profile IO Side of Board (No CPU Fan)

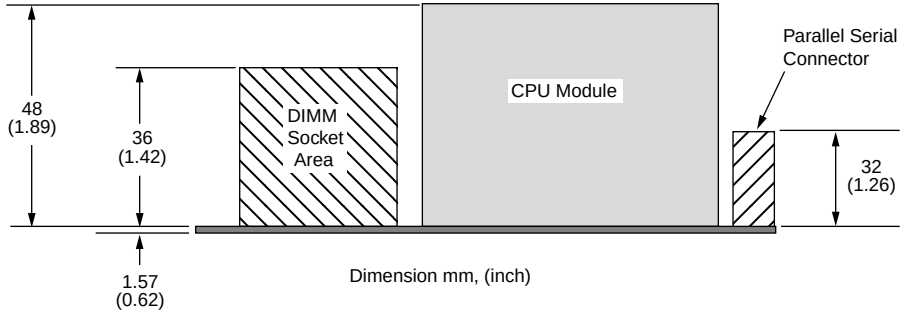


FIGURE B-5 Height Profile from Module End of Board (No CPU Fan)

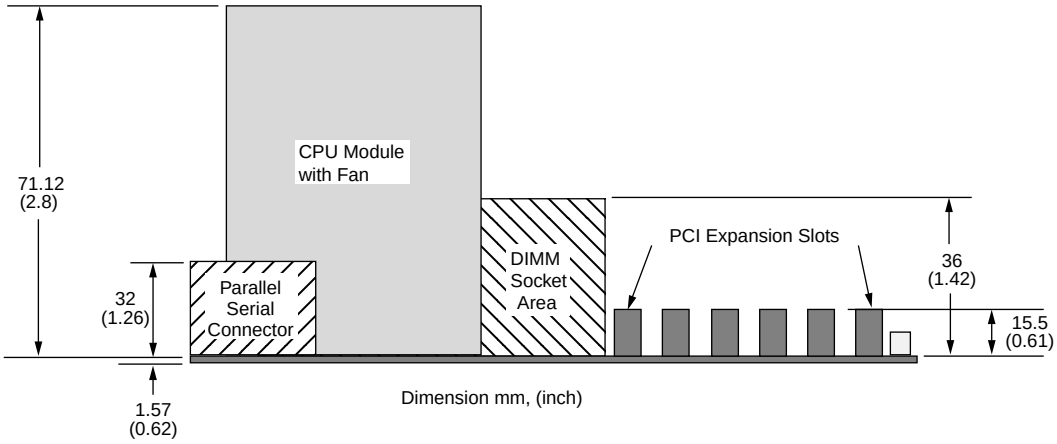


FIGURE B-6 Height Profile IO Side of Board (with CPU Fan)

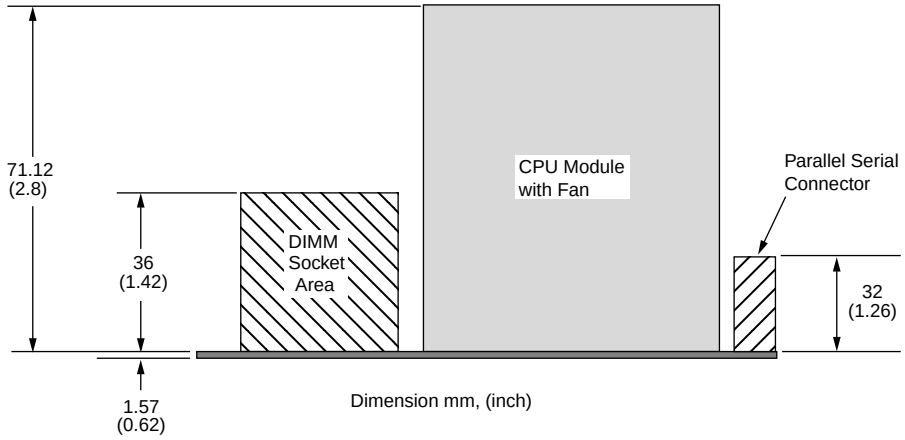


FIGURE B-7 Height Profile from Module End of Board (with CPU Fan)

B.3 Back Panel Connections

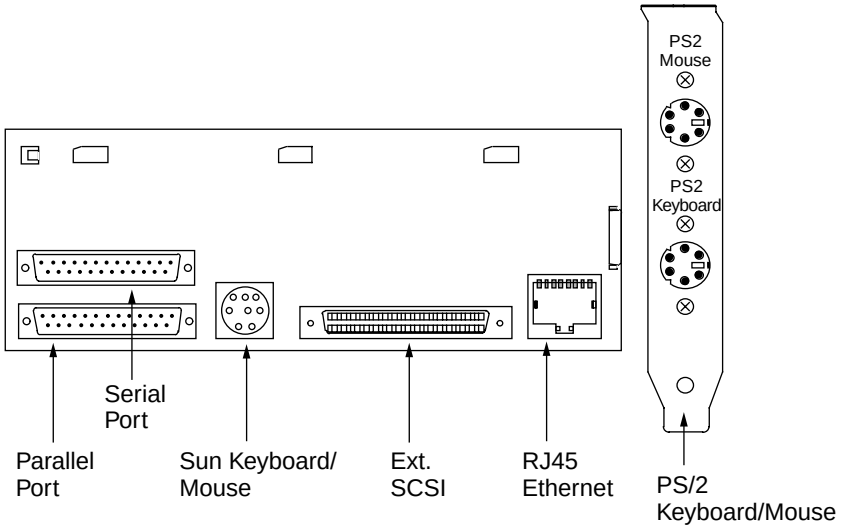


FIGURE B-8 IO Panel of the Ultra AX*i* Motherboard

B.4 Thermal Map

Maximum Case Temperatures Measured Shown as **(XX°C)**.
RAS Thermistors R3406, R3407, R3409 shown as ■

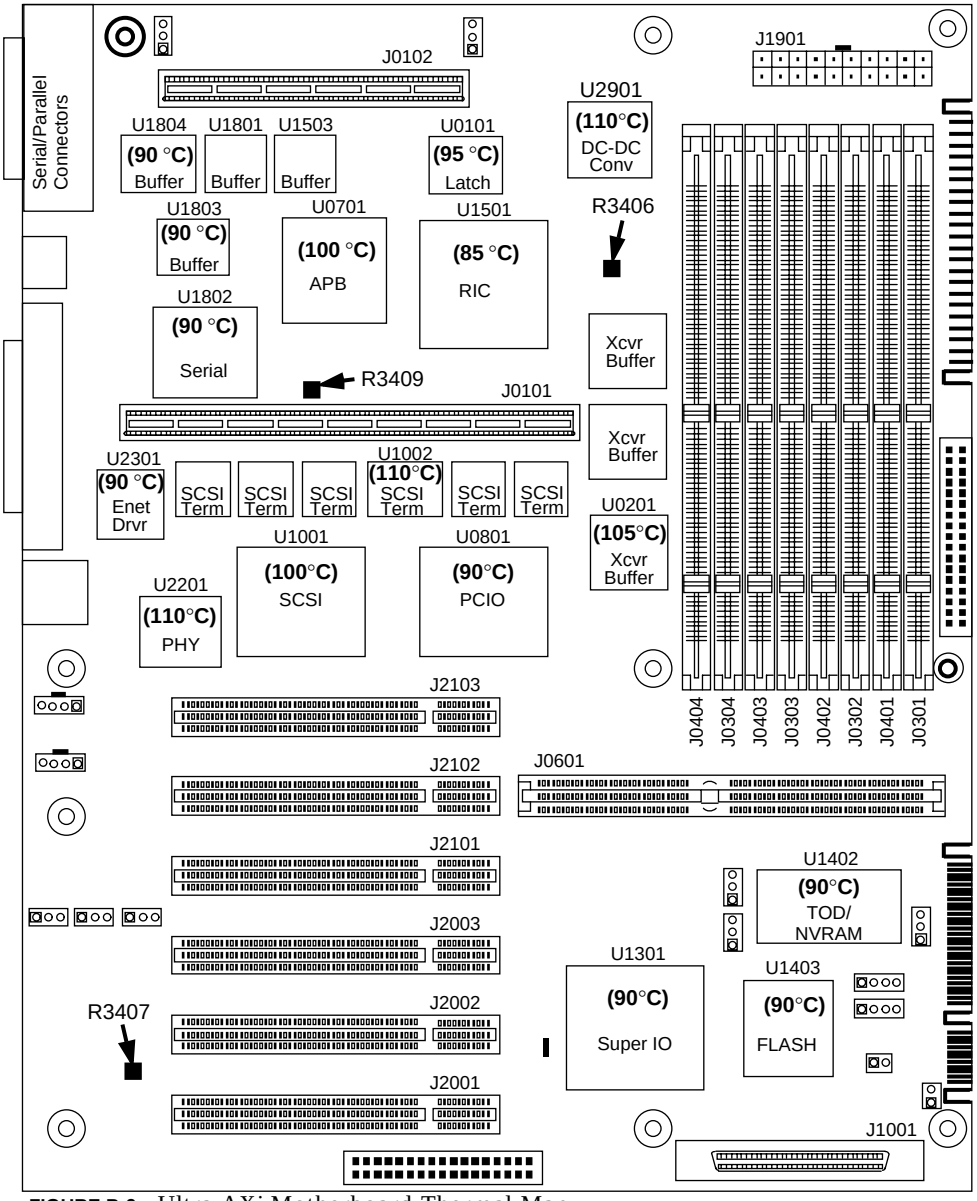


FIGURE B-9 Ultra AX*i* Motherboard Thermal Map

TABLE B-1 Maximum Case Temperatures for Motherboard “Hot Spot” Components

Location	Manufacturer	Part Number	Power (Max)	Ambient Operating Temperature Spec (°C)	Worst Case-Case Temperature (Measured °C)
U0101	Texas Instruments	SN74LVC374A	0.7W	-40, 85	95
U0201	Pericom	PI74LPT16244	1.0W	-40, 85	105
U0701	Sun	SME2411	3.5W	0, 70	100
U0801	Sun	STP2003QFP	2.0W	0, 60	90
U1001	Symbios	SYM53C876	1.0W	0, 70	100
U1002	Unitrode	UC5606	1.0W	-55, 150	110
U1301	National	PC87307VUL	1.0W	0, 70	90
U1402	SGS Thomson	M48T59	1.0W	0, 70	90
U1403	Intel	28F008SA-L	1.0W	-20, 70	90
U1501	Sun	STP2210QFP	0.5W	0, 70	85
U1802	Siemens	SAB80352	0.5W	0, 70	90
U1803	Unitrode	UC5170C	1.25W	0, 70	90
U1804	Unitrode	UC5180C	1.20W	0, 70	90
U2201	National	DP83840A	1.0W	0, 70	110
U2301	National	DP83223	1.575W	0, 70	90
U2901	Raytheon	RC5051	2.0W	0, 70	110

B.5 UltraSPARC II*i* CPU Module Mechanical Drawings

FIGURE B-10, FIGURE B-11, and FIGURE B-12 show the UltraSPARC-II*i* modules.

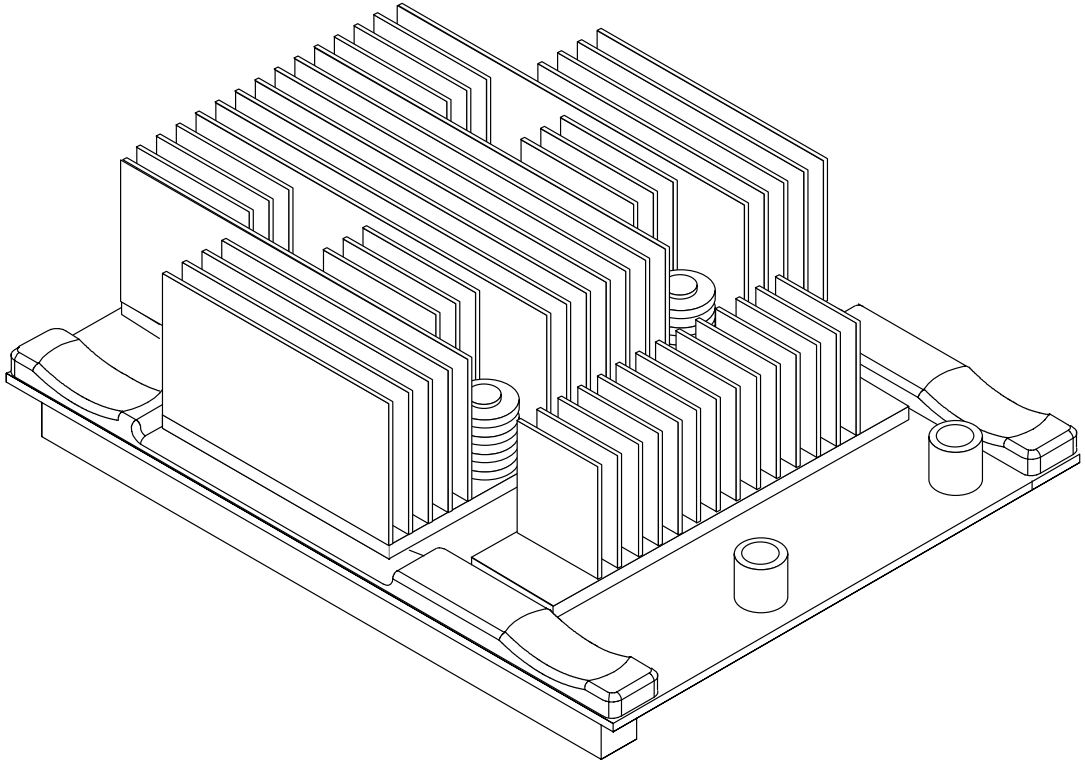


FIGURE B-10 UltraSPARC II*i* Straight Fin Heatsink Module (360 MHz and above)

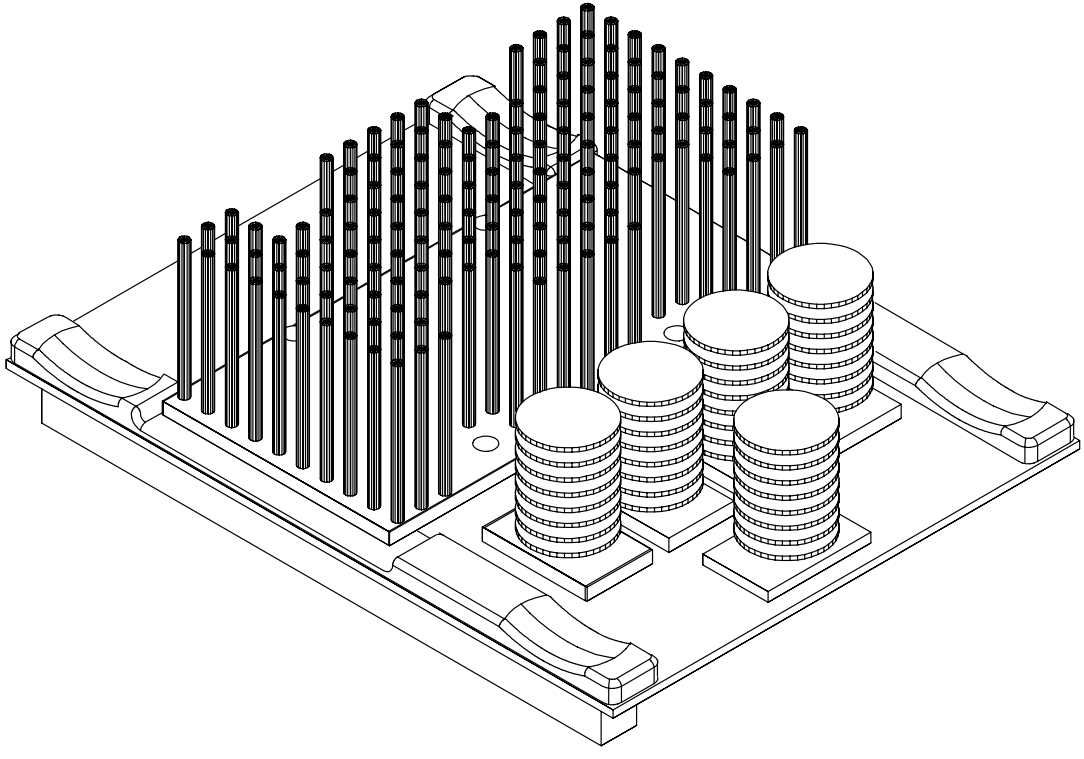


FIGURE B-11 UltraSPARC II*i* Pin Fin Heatsink Module (360 MHz, 333 MHz, and 300 MHz)

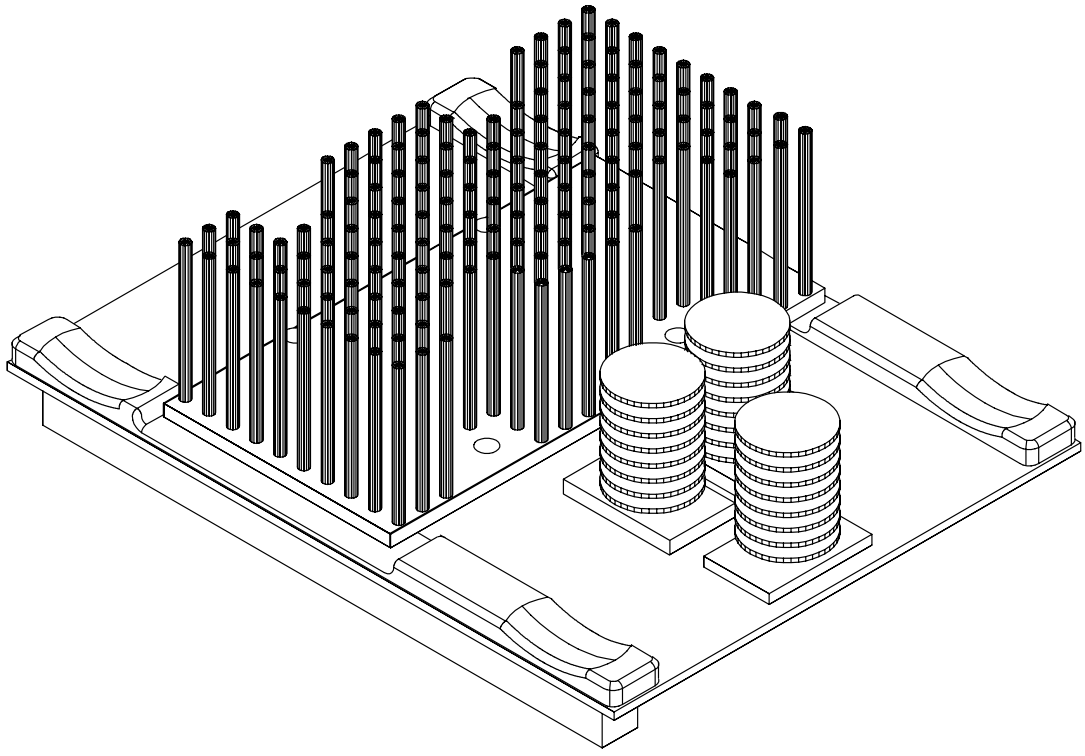


FIGURE B-12 UltraSPARC II*i* Pin Fin Heatsink Module (270 MHz)

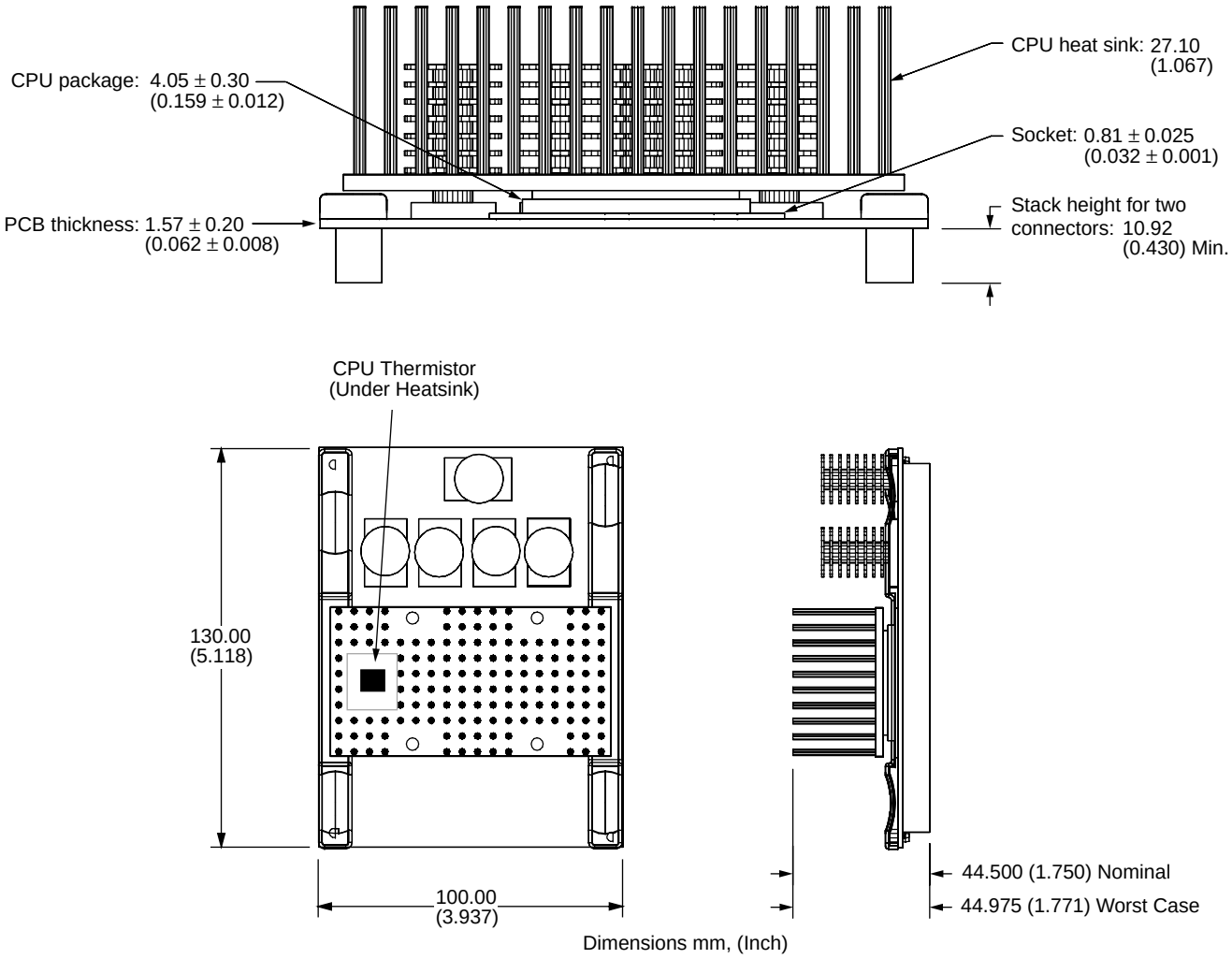


FIGURE B-13 UltraSPARC IIi Module With Pin Fin Heatsink

APPENDIX **C**

Assembly, Installation and Initial Start Up Procedures

This appendix specifically addresses the reference configuration. Many configuration possibilities exist, and the basic installation principles here should be applied.

Reference configuration

- System boxed in a mid tower ATX type enclosure (Chenming Mold Co. Part No. ATX601B-P)
- Ultra AX*i* motherboard with UltraSPARC II*i* CPU module
- 128MB of memory on the motherboard
- 3.5-inch floppy disk drive
- 4GB hard disk drive
- CD-ROM drive 12/20X speed
- ATI Video Boost graphics card
- Sun Type 5 keyboard and mouse
- Solaris 2.6 rev. 3/98 or later

C.1 Before You Start

You may plan your system integration process in advance by using TABLE C-1 on page C-2, TABLE C-2 on page C-3 and TABLE C-3 on page C-4.

Caution – These procedures should be performed only by qualified technicians. Be sure to take appropriate precautions against electrical hazards.

Caution – As with all electronic devices, electronic circuit boards such as the Ultra AX*i* components are extremely sensitive to static electricity. Ordinary amounts of static from your clothes or work environment can destroy some devices. Therefore, follow these guidelines:

- Handle all boards only by the nonconducting edges
- Do not touch the components to any metal parts
- Always wear a grounding wrist strap connected to ground when working on or handling the motherboard

C.1.1 Materials Required

TABLE C-1 Materials Required (May be duplicated and used to record materials used)

ID _____ Ref. No. _____ Date _____			
Item	**Description**	**Quan.**	**Notes**
Obtainable from Sun Microelectronics			
1.	Ultra AX*i* Motherboard Assembly	1	
2.	UltraSPARC-II*i* Module	1	
3.	Solaris 2.6 Desktop Edition	1	
4.	Sun Type 5 Keyboard and Mouse	1	
Obtainable from reputable electronics supplier			
5.	ATX style mid tower enclosure	1	
6.	ATX compliant power supply (250 watts)	1	
7.	12V fan	1	(Optional)
8.	CD-ROM Drive Plextor 12/20X or equivalent	1	5 inch bay
9.			5 inch bay
10.			5 inch bay
11.	Hard drive 4GB, Seagate SCSI or equivalent	1	3 inch bay
12.			3 inch bay
13.	Floppy drive 3.5 inch TEAC or equivalent	1	3 inch bay
14.	50 to 68 pin adapter, SCSI and floppy cables		
15.	32MB Memory DIMMs	4 ea.	
16.	ATI-Video Boost PCI video graphics card	1	PCI Slot
17.			PCI/UPA64S Slot
18.			PCI Slot
19.			PCI Slot
20.			PCI Slot
21.			PCI Slot
22.	SVGA monitor 17" or any other desired screen size	1	
23.			
24.			
25.	Miscellaneous power cables, network cables, etc.		

C.1.2 Power Budgeting

TABLE C-2 System and Peripheral Power Budgeting Requirements Table (Duplicate and use as worksheet to budget for a specific configuration)

ID _____ **Ref. No.** _____ **Date** _____

Device	+3.3V	+5.0V	+12V	-12V	Notes
Motherboard	1.0A	2.0A	0.5A	.05A	
CPU Modules					
270 MHz (501-5039-03)	1.6 A	2.6 A	—	—	1
300 MHz (501-5040-03)	2.2 A	3.8 A	—	—	1
333 MHz (501-5090-01)	4.5 A (typ)	5.1 A (est)	—	—	1
360 MHz (501-5222-01)	4.8 A (typ)	5.4 A (est)	—	—	1
360 MHz (501-5148-02)	2.6 A (typ)	3.0 A (est)	—	—	1
440 MHz (501-5149-04)	2.8 A (typ)	3.5 A (est)	—	—	1
Memory		—	—	—	2
PCI Card	—				2
PCI Card	—				2
PCI Card	—				2
PCI Card	—				2
PCI Card	—				2
PCI Card	—				2
Fan-Sanyo Denki	—	—	0.13A	—	2
Fan-NMB	—	—	0.22A	—	2
Subtotal on Motherboard power connector (J1901)					
Hard Drive	—			—	2
CD ROM Drive	—			—	2
Floppy Drive	—			—	2
Added Device	—			—	2
Added Device	—			—	2
Grand Total in Amps					
Grand Total in Watts (AxV)					
Total all Columns and add appropriate safety margin for Power Supply requirement.			_____ Watt + 25% = _____ Watts		

1. 5.0V is used to supply the 2.6 or 1.9 Vdd core voltage to the CPU. All values are maximum unless otherwise specified.
2. Obtain specific power requirements from your vendors.

C.1.3 Software Installation Information

TABLE C-3 Installation Information Work Sheet
(May be Duplicated and Used to Record Build Data)

ID _____ **Ref. No.** _____ **Date** _____

Host Name		
IP Address		
Name Service (NIS, NIS+, Other		
Domain Name		
Name Server Host Name		
Name Server IP Address		
Connected to Network		
Subnet		
Subnet Mask		
Geographic Location and Time Zone		
Stand-alone or OS Server		
OS Server - # of Diskless Clients		
Configuration Cluster		
System Disk		
File System - root (/)	0	
swap	1	
	3	
	4	
	5	
	6	
	7	
Root Password		

Notes:_____

_____

C.1.4 Tools Required

1. Phillips Screwdriver, #2.
2. Antistatic wrist strap.
3. Socket driver for 5mm. hex head screws.

C.2 Typical Assembly

▼ Procedure

1. **Install power supply (if not already installed, normally supplied with enclosure).**
2. **Install additional fan below power supply (Optional fan).**
3. **Install the rear IO panel.**

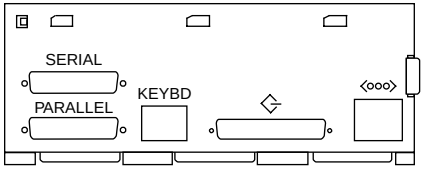


FIGURE C-1 Ultra AX*i* IO Panel

4. **Install the chassis standoffs (i.e., motherboard supports).**

Note – Depending on access and clearances, it may be preferable to install some peripherals and cables before the motherboard is installed.

---

5. **Install the Ultra AX*i* motherboard in the chassis.**

   Generally all ten motherboard mounting screws are used, although some installations delete the screw marked “optional”, between the PCI connectors and the back panel.

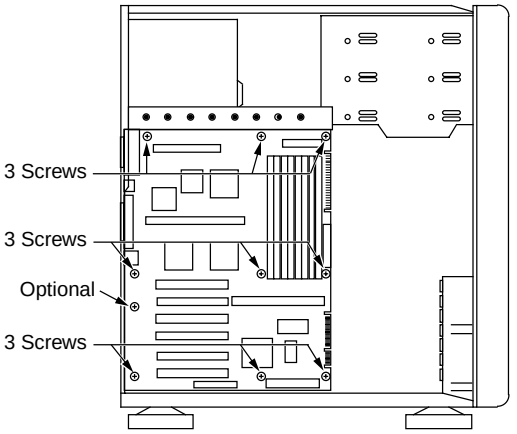


FIGURE C-2 Ultra AX*i* Motherboard Installation

6. **Install CPU Module on motherboard.**

   a. **Position the module over the connectors making sure all pins are aligned with the connectors and press straight down, seating the module (see** FIGURE C-4 **on page C-7).**

   b. **For CPU modules with pin fin heatsinks, install the CPU hold down as shown in** FIGURE C-5 **on page C-8.**

   c. **For CPU modules with straight fin heatsinks, install the CPU hold down with fan as shown in** FIGURE C-6 **on page C-9. Also connect the CPU fan to J3603 (see** FIGURE C-7 **on page C-10).**

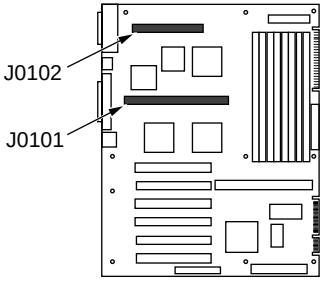


FIGURE C-3 UltraSPARC II*i* Module

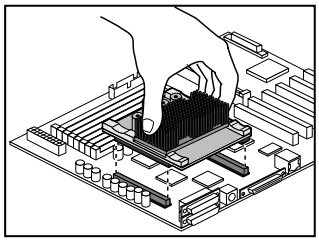
Note – When installed correctly, the CPU fan blows air toward the heatsink.

At the OBP level, the fan operates at full speed all the time.

At the Solaris level, the fan is under ASM software control and may operate at less than full speed depending on system temperature. See Section 2.1.14.2 “Fan Monitoring and Control” on page 2-9 for more information.

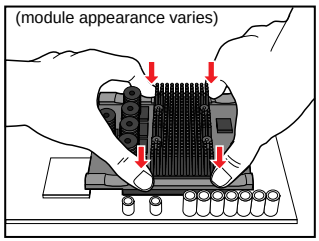
---

1. Place the Ultra AX*i* board on a flat and sturdy grounded surface and follow your company's procedure for preventing static electricity damage to sensitive electronic components.



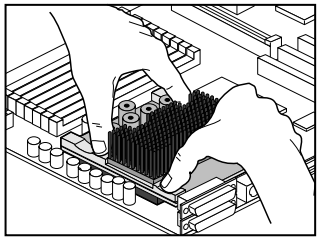
2. Orient the CPU module with respect to the long and short CPU module connectors on the Ultra AX*i* board.

   Be careful to hold the CPU module only by the CPU heatsink.



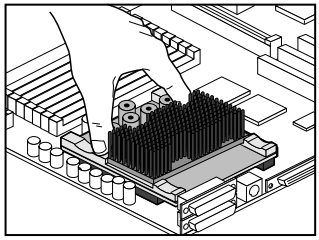
3. Using both hands, press lightly to mate the CPU module with the CPU module connectors on the Ultra AX*i* board.

   Be careful not to bend the ends of the CPU module.

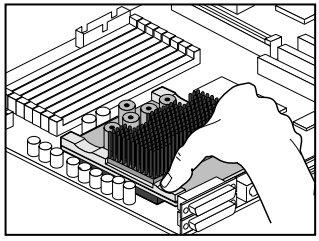


4. Using both hands, press lightly to mate the CPU module with the CPU module connectors on the Ultra AX*i* board.

   Be careful not to bend the ends of the CPU module.



5. Using only two fingers as shown at the base of the CPU heatsink, push one side of the CPU module all the way into the CPU module connectors on the Ultra AX*i* board.



6. Using only two fingers as shown at the base of the CPU heatsink, push the other side of the CPU module all the way into the CPU module connectors on the Ultra AX*i* board.

FIGURE C-4 UltraSPARC-II*i* CPU Module Insertion

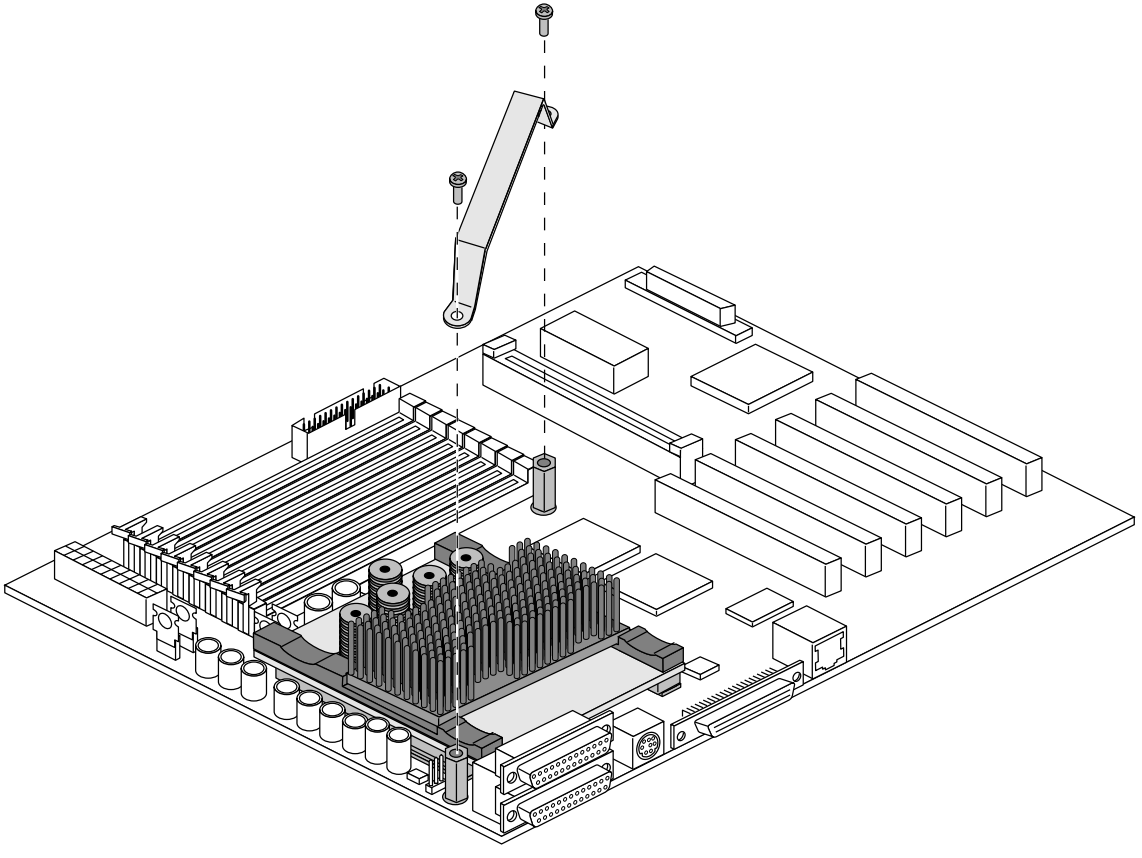


FIGURE C-5 Hold-down Installation for CPU Module with Pin Fin Heatsink

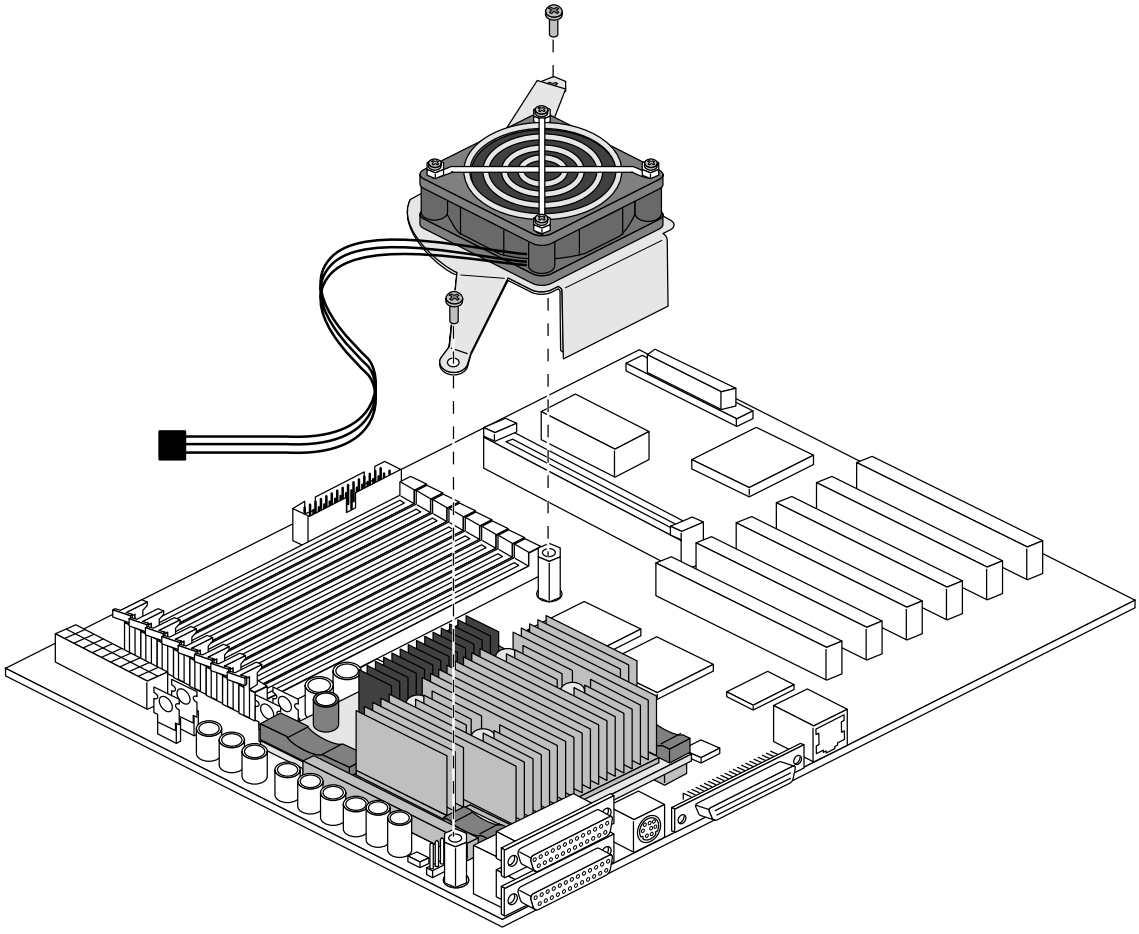


FIGURE C-6 Hold-down Installation for CPU Module with Straight Fin Heat Sink

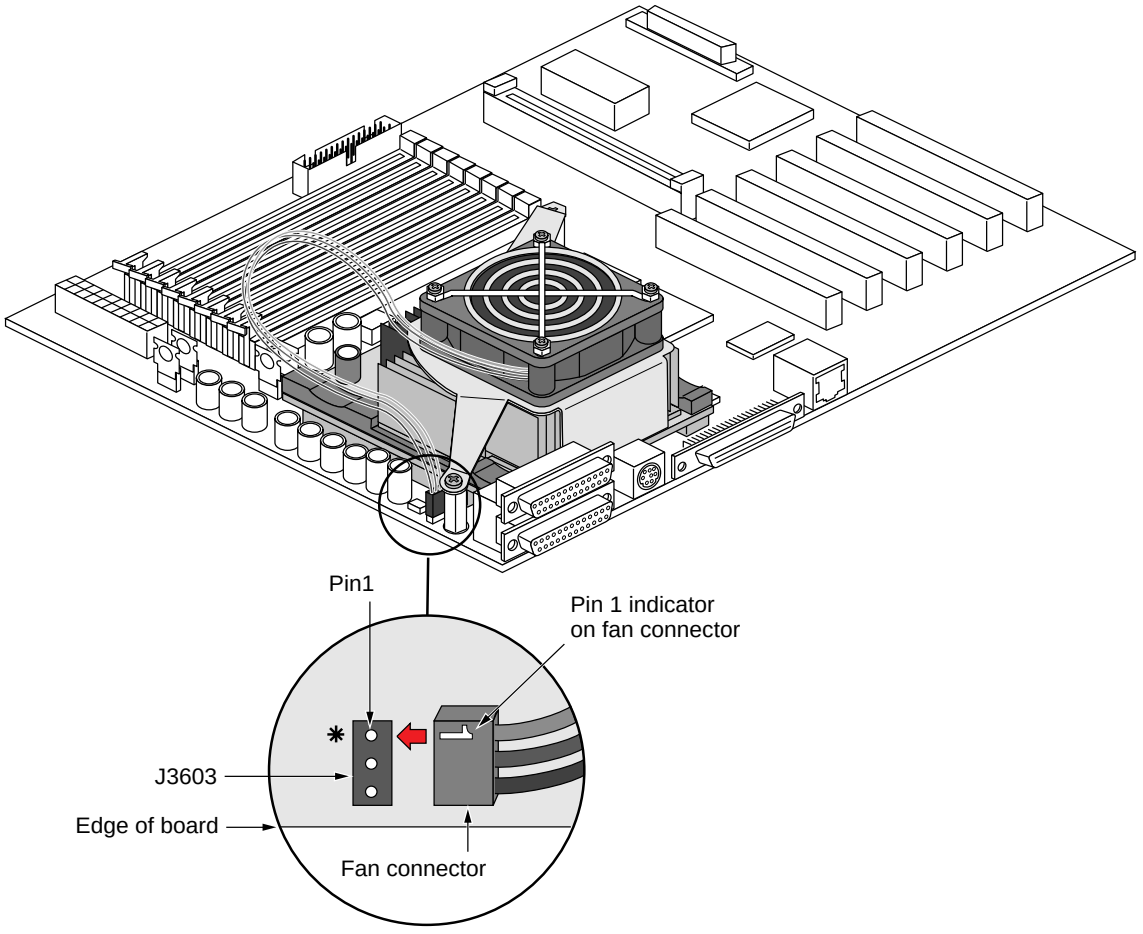


FIGURE C-7 Hooking Up the CPU Fan Power Supply Wires to the J3603 Header

Caution – Be sure pin 1 of the fan connector is connected to pin one of J3603 on the board. Otherwise, the fan will not operate.

7. **Install the PS/2 keyboard and mouse adapter.**

Tip – Due to limited clearance, the adapter cable connectors should be connected to the motherboard before the adapter is installed in the enclosure

---

a. Unscrew the retainer screw and remove the cover from the first expansion slot adjacent to the RJ45 Ethernet connector. This is the preferred location to avoid blocking PCI Expansion slots.

b. Connect the PS/2 mouse adapter cable to the motherboard header J2500.

c. Connect the PS/2 keyboard adapter cable to the motherboard header J2501.

d. Insert the tab of the PS/2 keyboard and mouse adapter in the expansion slot and align the top retaining slot with the retainer screw hole.

e. Retain the PS/2 keyboard and mouse adapter with the screw removed in step a.

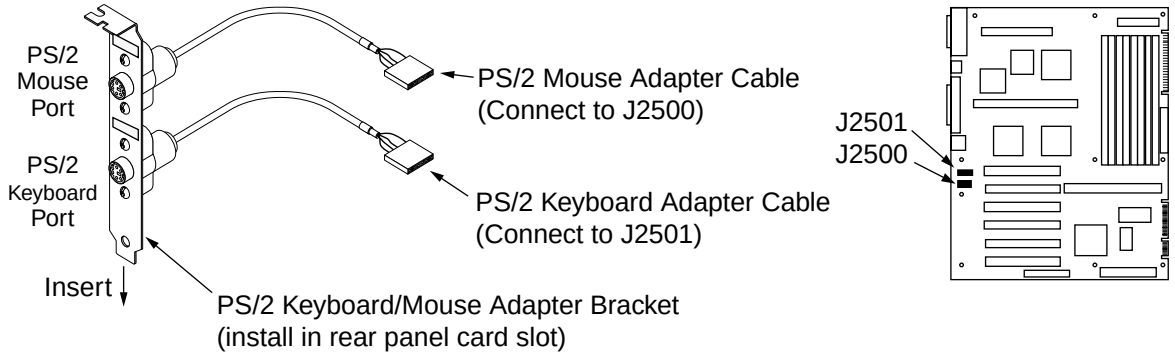


FIGURE C-8 Ultra AX*i* PS/2 Keyboard and Mouse Adapter

8. **Install Serial, Parallel and SCSI connector fasteners through IO panel.**

a. Use four 4-40 x 4-40 female screw locks to fasten the serial and parallel connectors to the IO panel.

b. Use two 4-40 x 2-56 female screw locks to fasten the SCSI connector to the IO panel.

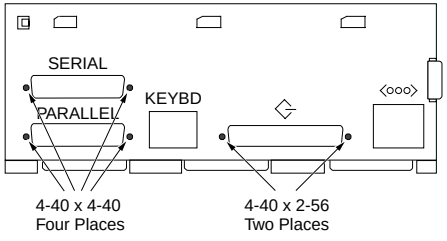


FIGURE C-9 IO Panel Connector Panel Fasteners

9. Install the Hard Disk Drive

Note – If the DIMM slots are obstructed by the drive mount cage, skip to step 11.

---

a. Set the SCSI ID select as applicable. (Solaris default is 0, no jumper.) Consult the drive label and manufacturer documentation for jumper information.

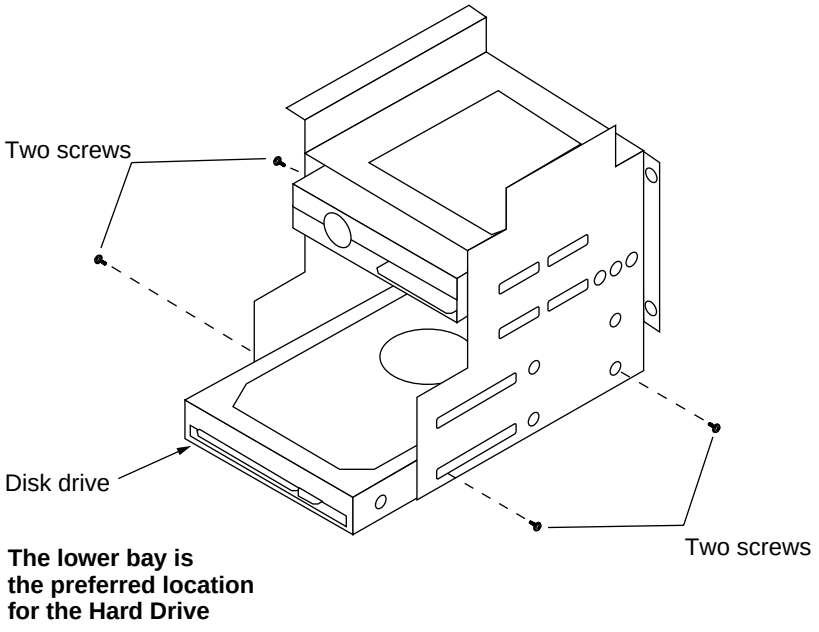


FIGURE C-10 Ultra AX*i* Hard Drive Installation

10. Install the Floppy Drive

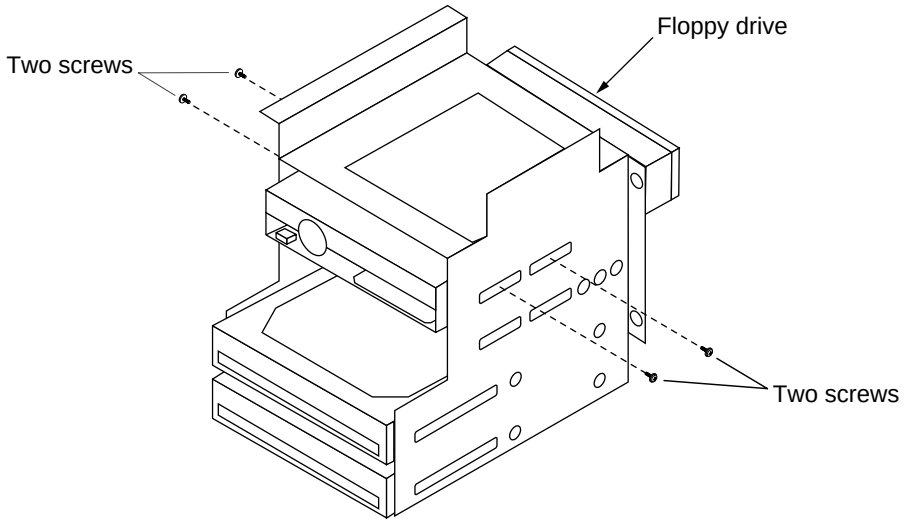


FIGURE C-11 Ultra AX*i* Floppy Drive Installation

11. Install the CD ROM drive

a. Set the SCSI ID select as applicable. (Solaris default is 6.) Refer to the CD ROM drive label and the manufacturers documentation for additional jumper information.

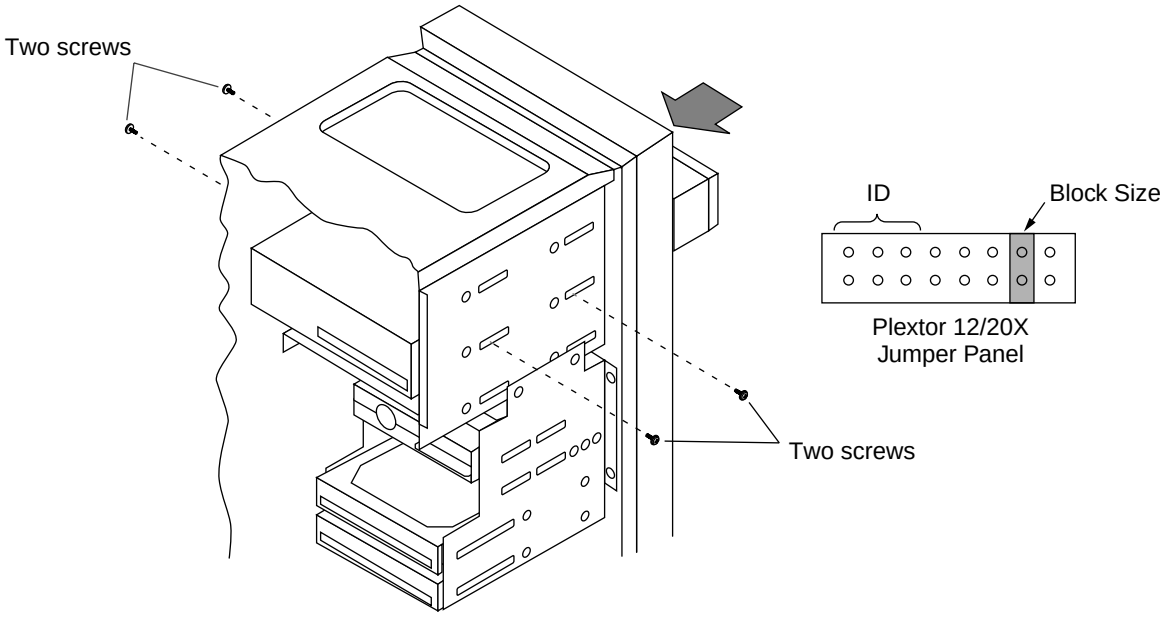


FIGURE C-12 Ultra AX*i* CD ROM Drive Installation

Note – A block size of 512 bytes is selected when the jumper is placed as shown. A 512 byte block size is required by Solaris.

---

12. Install DIMMs

For the reference enclosure, the DIMM modules can not exceed 1.25 inches (31.75 mm) in height.

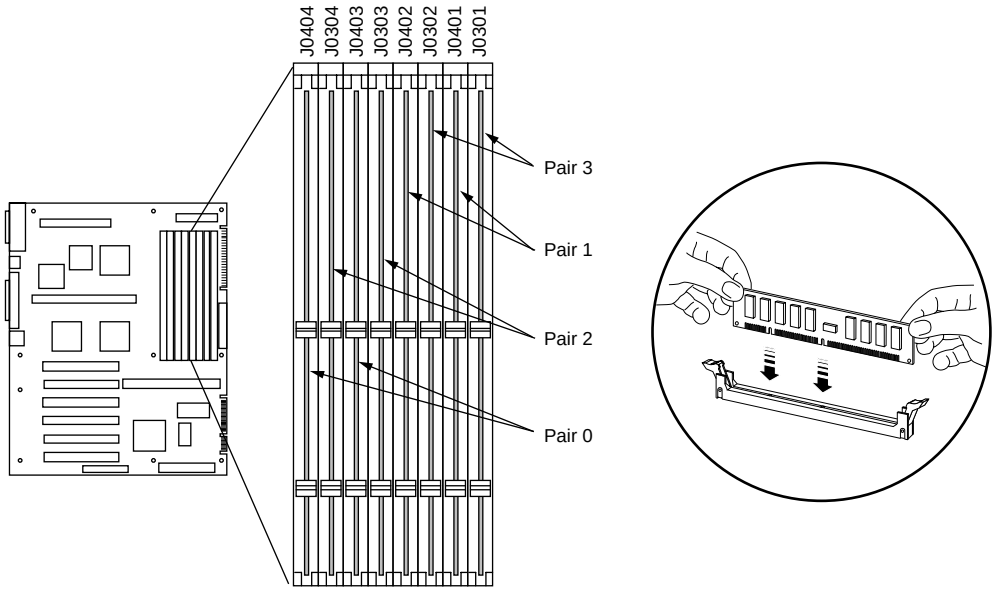


FIGURE C-13 Ultra AX*i* DIMM Installation

To install a DIMM on an Ultra AX*i* motherboard, perform the following steps:

Note – The DIMM slots are configured in 4 pairs of two slots. Slots J0403 and J0404 are Pair 0. Slots J0401 and J0402 are Pair 1. Slots J0303 and J0304 are Pair 2. Slots J0301 and J0302 are Pair 3. See TABLE C-4 on page C-18 for specific configurations.

Caution – Use 60 ns DIMMs only on the Ultra AX*i* motherboard.

---

a. Attach an ESD wrist strap

b. Carefully remove the new DIMM from the protective packaging.

c. Hold the DIMM at the top left and right corners using the thumb and index finger of each hand. Place DIMM in the socket. Be sure you orient the DIMM so that the two notches at the bottom of the DIMM line up with the two tabs in the DIMM connector.

d. Firmly push down simultaneously on both upper corners of the DIMM until the bottom edge of the DIMM (the edge with the gold pads) is firmly seated into the slot. You may hear or feel a "click" when the DIMM is properly seated.

e. Make sure the lever(s) on the end(s) of the connector are in the upright position. Some Motherboards may have DIMM sockets with a lever on one end only.

C.2.1 DIMM Configuration Considerations

1. Each DIMM Pair of 2 sockets must have identical DIMMs installed. The DIMM Pairs may have different memory capacities or bank types as long as the DIMMs within the Pair are identical.
2. DIMMs should be chosen as all 10-bit or all 11-bit column address type.
3. All DIMM sockets (4 Pairs) will support single or dual bank 10-bit column address type DIMMs: 8MB, 16MB, 32MB, 64MB and 128MB.
4. 11-bit column address DIMMs may only be used in Pair 0 (Slots J0404, J0403) and Pair 2 (Slots J0304, J0303). 256MB DIMMs must be 11-bit column address, dual bank.

Caution – Use 60 ns DIMMs only on the Ultra AX*i* motherboard.

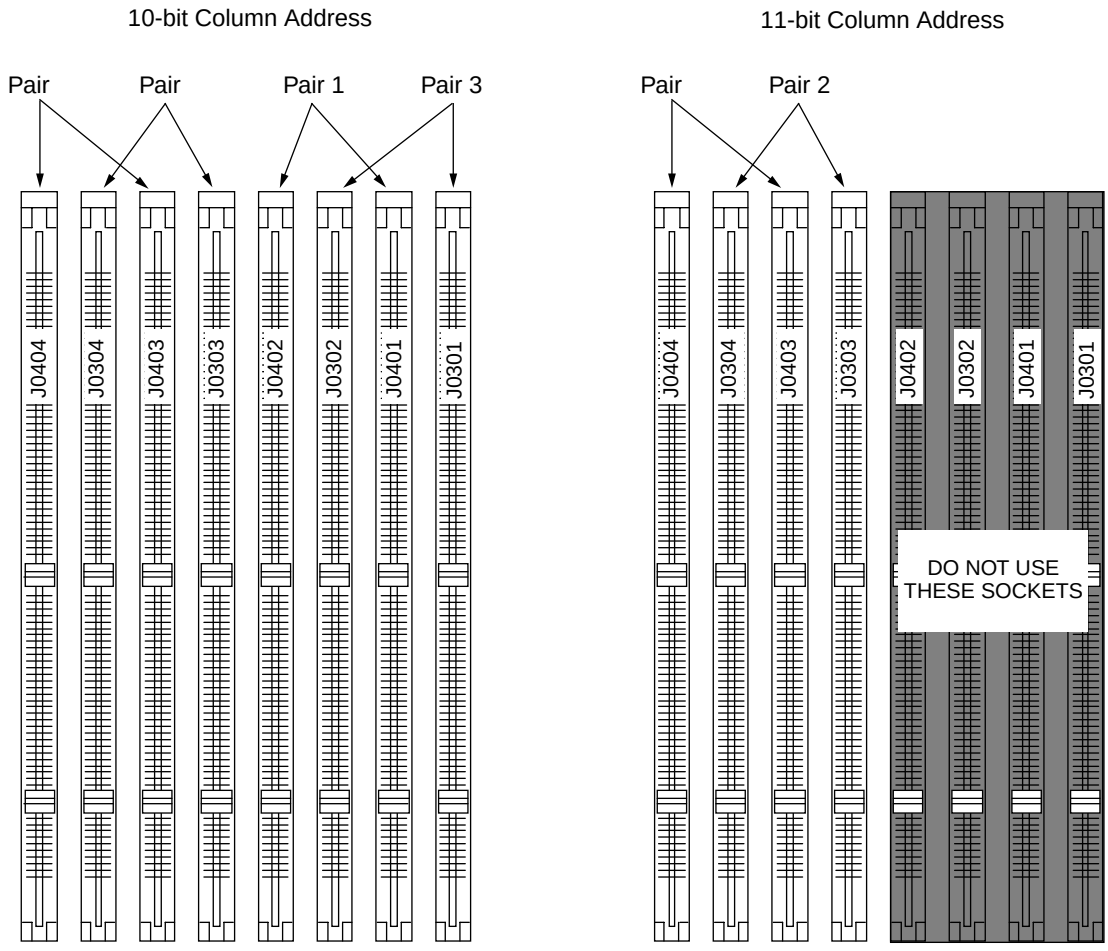


FIGURE C-14 DIMM Sockets Pair Assignments

The machine can be configured in many combinations of DIMMS in 16MB steps. TABLE C-4 on page C-18 shows some of the more common combinations.

TABLE C-4 DIMM Configurations

Total Memory	10-bit Column Address			11-bit Column Address		
	No of DIMMs	DIMM Size	Case from Table C-2	No of DIMMs	DIMM Size	Case from Table C-3
32MB	4	8MB	3, 5, 6, 9, 10, 12	4	8MB	3
48MB	2 2	16MB 8MB	3, 5, 6, 9, 10, 12	2 2	16MB 8MB	3
	6	8MB	7, 11, 13, 14			
64MB	2	32MB	1, 2, 4, 8	2	32MB	1, 2
	4	16MB	3, 5, 6, 9, 10, 12	4	16MB	3
	8	8MB	15			
	4 2	8MB 16MB	7, 11, 13, 14			
96MB	4 4	8MB 16MB	15			
	6	16MB	7, 11, 13, 14			
	4 2	8MB 32MB	7, 11, 13, 14			
	2 2	32MB 16MB	3, 5, 6, 9, 10, 12			
128MB	4	32MB	3, 5, 6, 9, 10, 12	4	32MB	3
	8	16MB	15			
	2 4	32MB 16MB	7, 11, 13, 14			
	2	64MB	1, 2, 4, 8	2	64MB	1, 2
192MB	6	32MB	7, 11, 13, 14			
	4 4	32MB 16MB	15			
	2 4	64MB 16MB	7, 11, 13, 14			
	2 2	64MB 32MB	3, 5, 6, 9, 10, 12	2 2	64MB 32MB	3

TABLE C-4 DIMM Configurations *(Continued)*

Total Memory	10-bit Column Address			11-bit Column Address		
	No of DIMMs	DIMM Size	Case from Table C-2	No of DIMMs	DIMM Size	Case from Table C-3
256MB	8	32MB	15			
	4	64MB	3, 5, 6, 9, 10, 12	4	64MB	3
	4 2	32MB 64MB	7, 11, 13, 14			
	4 2 2	16MB 32MB 64MB	15			
	2	128MB	1, 2, 4, 8	2	128MB	1, 2
384MB	4 4	32MB 64MB	15			
	6	64MB	7, 11, 13, 14			
	2 2	128MB 64MB	3, 5, 6, 9, 10, 12	2 2	128MB 64MB	3
	2 4	128MB 32MB	7, 11, 13, 14			
512MB	8	64MB	15			
	4 2	64MB 128MB	7, 11, 13, 14			
	4	128MB	3, 5, 6, 9, 10, 12	4	128MB	3
				2	256MB	1, 2
768MB	4 4	128MB 64MB	15			
	6	128MB	7, 11, 13, 14			
				2 2	256MB 128MB	3
1024MB	8	128MB	15			
	6	128MB	7, 11, 13, 14			
				4	256MB	3
notes						

TABLE C-5 Acceptable DIMM Locations 10-bit Column Address Mode

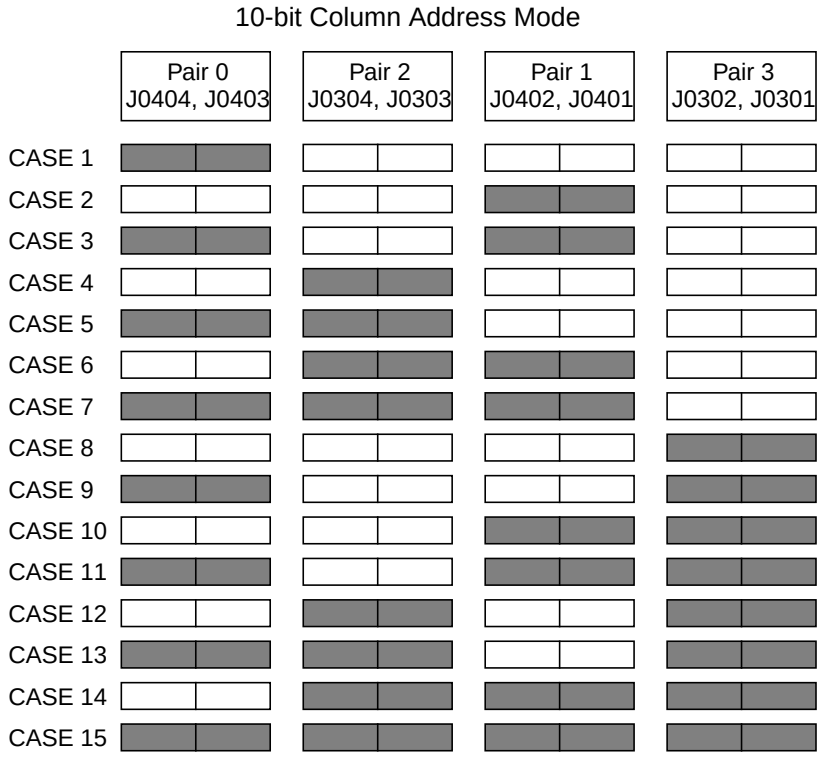
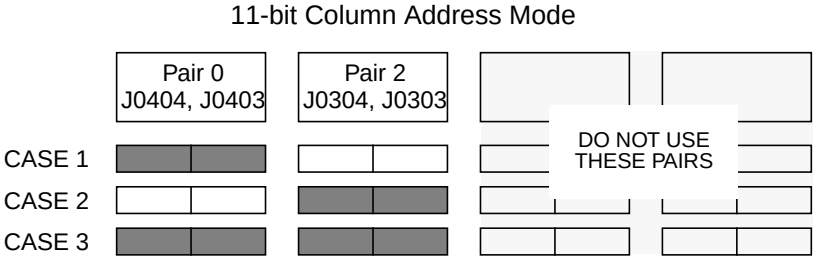


TABLE C-6 Acceptable DIMM Locations 11-bit Column Address Mode



13. Connect internal power cables.

a. Connect ATX power cable to motherboard.

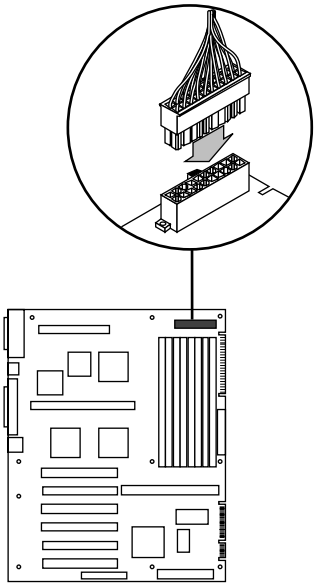


FIGURE C-15 Motherboard Power Connection

b. Connect hard drive power cable.

c. Connect floppy drive power cable.

d. Connect CD ROM power cable.

14. Connect floppy drive signal cable to motherboard connector

a. Connect floppy drive cable between the floppy disk drive and the motherboard connector J1902.

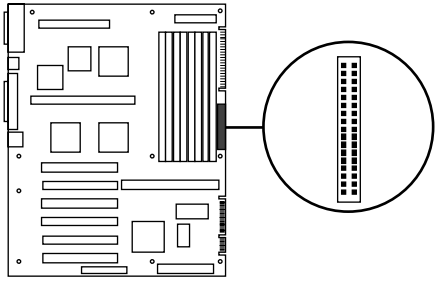
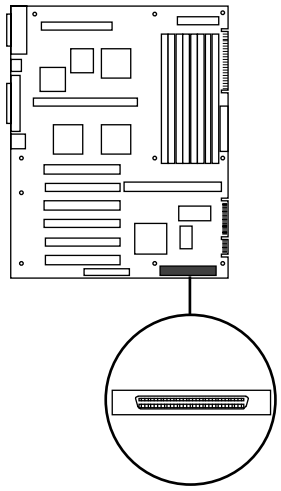


FIGURE C-16 Floppy Drive Motherboard Connection

15. Connect the SCSI cable to the motherboard and the SCSI devices.

Note – There are two SCSI configurations, depending on the hard drive connector. If the hard drive has a standard 68 pin SCSI connector, follow steps a. through c. If the hard drive has an SCA (Single Connector Attachment) connector, follow steps d. through f.



Standard SCSI hard drive connection

a. Connect one end of the SCSI cable to the internal SCSI connector J1001. The SCSI controller on the motherboard has active termination, no settings are needed.

FIGURE C-17 Internal SCSI Connector

b. Connect the second connector of the SCSI cable to the 68 pin end of the 68 pin to 50 pin adapter and connect the 50 pin connector of the adapter to the CD ROM. Set the jumper as shown in FIGURE C-12 **on page C-14 and set the target ID to 6. The terminator must be DISABLED.**

c. Connect the last end of the SCSI cable to the hard disk drive. The terminator must be ENABLED. Set the device ID jumper to 0. Refer to the label on the hard disk drive to identify the jumper locations.

SCA SCSI hard drive connection

d. Connect one end of the SCSI cable to the internal SCSI connector J1001. The SCSI controller on the motherboard has active termination, no settings are needed.

e. Connect the second connector of the SCSI cable to the 68 pin end of the 68 pin to 50 pin adapter and connect the 50 pin connector of the adapter to the CD ROM. Set the jumper as shown in FIGURE C-12 **on page C-14 and set the target ID to 6. The terminator must be DISABLED.**

f. Connect the last end of the SCSI cable to the SCA to SCSI adapter and connect the adapter to the hard disk drive. The terminator on the hard disk drive must be ENABLED. Set the device ID jumper to 0. Refer to the label on the hard disk drive to identify the jumper locations.

16. Connect the front panel cables to the motherboard headers.

a. Connect the front panel Power On-Off switch to motherboard header J3301.

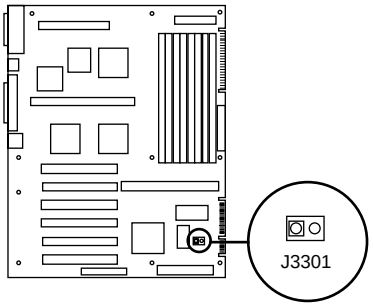


FIGURE C-18 Power On-Off Header

b. Connect Power On LED motherboard header J1990.

Some LED cables have 3-pin connectors. If this is the case the connector may need to be modified to make the LED functional.

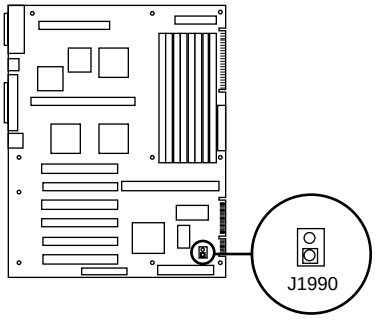


FIGURE C-19 Power On LED Header

c. Connect the speaker wires to motherboard header J3201.

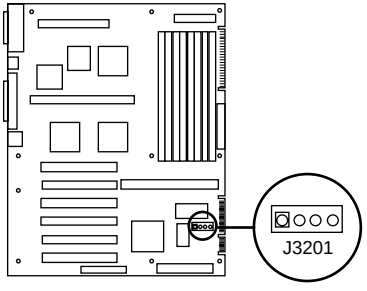


FIGURE C-20 Speaker Header

d. Connect Reset Switch cable to Pins 2 and 3 on motherboard header J1501.

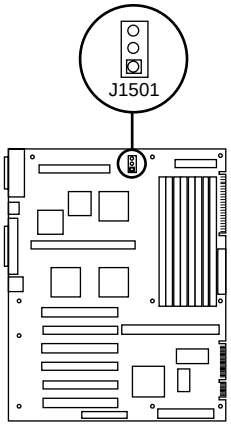


FIGURE C-21 Reset Switch header

e. For CPU modules with pin fin heatsinks, connect optional fan power cable to motherboard header J3603. (The CPU fan is required for CPU modules with straight fin heatsinks (e.g., 360 MHz, part number 501-5148-xx; 440 MHz, part number 501-5149-xx) and would have been connected back in Step 6.)

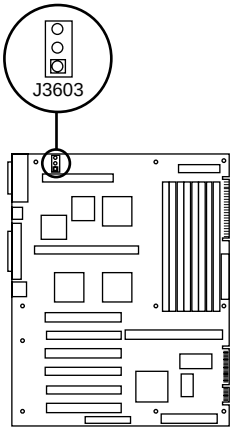


FIGURE C-22 Optional Fan Power Cable Motherboard Header (if available)

17. Connect optional fan power cable to motherboard header J3602.

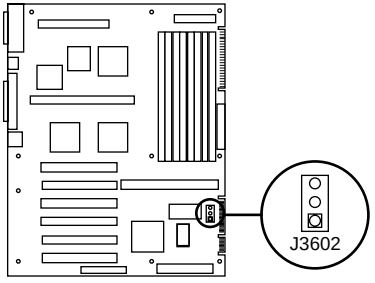


FIGURE C-23 Optional Fan Power Cable Motherboard Header

18. Install ATI Video Card

Note – Be sure to follow instructions from PCI card vendor.

---

a. Carefully remove the new PCI card from the protective packaging.

b. Ensure the jumper on the card is set to Interrupt Enable.

c. Hold the card by its edges, align the contacts on the bottom of the card with the slots in the socket.

d. Apply pressure evenly along the length of the PCI card and push it into its motherboard connector socket. When doing this action and the motherboard is inside a case such as an ATX mini-tower, be sure that the connector bracket is properly seated on the back panel.

e. Use a hex head machine screw and attach the connector bracket to the back panel.

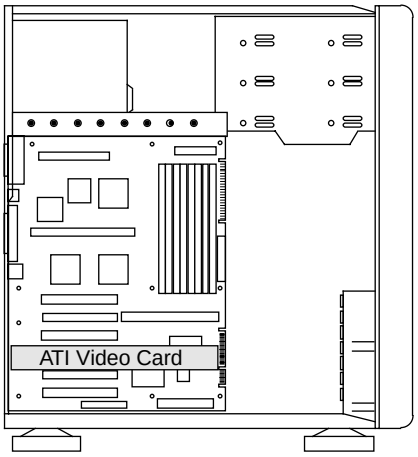


FIGURE C-24 ATI Video Boost PCI Card

19. To Complete Assembly

a. Tie all cables and wires as needed.

b. Apply labels.

c. Install enclosure feet.

d. Install blank plates over unused PCI slots.

e. Install enclosure cover.

20. Make all external connections.

Note – Ensure power supply and monitor power switches are off.

---

a. Connect monitor signal cable from ATI Video Boost connector to monitor.

b. Connect keyboard cable to keyboard connector as applicable.

c. Connect network cable as applicable.

d. Connect power cables to power supply input and monitor.

e. Connect power cables to appropriate power outlets.

C.3 Initial Power-On and Firmware Update

21. Power up the system.

a. Position power supply switch to ON, position monitor power switch to ON then press front panel power switch.

Video should be displayed in 90 seconds.

22. Perform the following diagnostic steps.

a. Verify the following information is correct before continuing to the next step.

Valid memory configuration is displayed on the banner.

Valid ethernet address is displayed on the banner.

b. At the ok **prompt, type**:

ok **probe-scsi-all <cr>**

It may take 5 minutes to complete this probe. Make sure all devices are recognized by the system. Ensure the CD ROM is recognized as target 6.

c. At the ok **prompt, type**:

ok **.version <cr>**

23. Determine if OBP needs to be Updated.

The motherboard was shipped with the latest version of OBP available at the time of manufacture.
The diskette shipped with the motherboard may contain a later version of OBP, which can be used to update.

Information on the latest version of OBP may be found at the URL:
http://www.sun.com/microelectronics/SPARCengineUltraAXi/

Instructions are provided at the Web site to download and update OBP.

24. Update the OBP

a. Insert the diskette into the floppy disk drive.

b. At the ok **prompt, type**:

ok **load floppy:nolabel**<**cr**>

ok **init-program**<**cr**>

Follow the on screen instructions, answer prompts as appropriate.

c. At the ok **prompt, type:**

ok **reset-all**<**cr**>

C.4 Software Installation

The information from TABLE C-3 on page C-4 as appropriate to perform the software installation.

To install the system from the CD ROM, go to Step 25.
To install the system from a network, go to Step 26.

25. To install the system from the CD ROM, at the ok **prompt, type:**

ok **boot cdrom <cr>**

System will boot from the CD ROM and Solaris will install from the CD ROM. Various prompts will be displayed as the system comes up, answer as appropriate.

26. To install the system from a network boot server, the boot client Ethernet address (the system being built) must be obtained.

a. At the ok **prompt (on the system being built) type:**

ok **banner <cr>**

This will display the Ethernet address in the following format:
X.X.XX.X.X.XX

b. Enter the address obtained in step a. in the boot server as a boot client. (See the Solaris documentation to set up an install server).

c. At the ok **prompt on the client (the system being built), type:**

ok **boot net <cr>**

System will boot from the network and Solaris will install from the network. Various prompts will be displayed as the system comes up, answer as appropriate.

27. After Solaris is installed, at the ok prompt, type:

ok **boot disk -rv <cr>**

The system will configure itself after installation.

Caution – You must use the `boot -r` reconfiguration command each time the machine is booted to attach the ASM drivers. Otherwise, the system runs without ASM protection at the Solaris level.

C.5 System Aging Test

28. Obtain SunVTS using the procedures described in Appendix H.

a. Install SunVTS following the procedures shown in Appendix H.

b. Run SUNvts for 24 hours as a stand-alone system. See Appendix H.

The following tests need to be selected and tested in the SunVTS:

KMEM
PMEM
CPU
SYSTEM
SE
ECPP
CDTEST
FDD
DISKTEST

APPENDIX **D**

OpenBoot Firmware

This appendix provides information on the OpenBoot Firmware used in the Ultra AX*i* system. The OpenBoot Firmware is resident on the Ultra AX*i* motherboard and provides hardware testing and initialization prior to booting. The OpenBoot Firmware also enables booting from a wide range of devices. It includes the OpenBoot Program (OBP), Power On Self Test (POST), OpenBoot diagnostic (OBdiag) and Boot loader. More complete information on OBP can be found in the publications referred to in *Related References* on page v of the Preface. This Appendix addresses only enhancements and new Ultra AX*i* specific features found in OBP version 3.10.4 or later.

An in depth knowledge of Forth is required to exploit advanced capabilities of OBP.

Links to the OpenBoot Firmware update site can be found on the Internet at URL:
http://www.sun.com/microelectronics/SPARCengineUltraAXi/

Links to additional OpenBoot Firmware information can be found at URL:
http://www.sun.com/microelectronics/embedded/openboot.html
http://www.firmworks.com/www/traindoc.htm

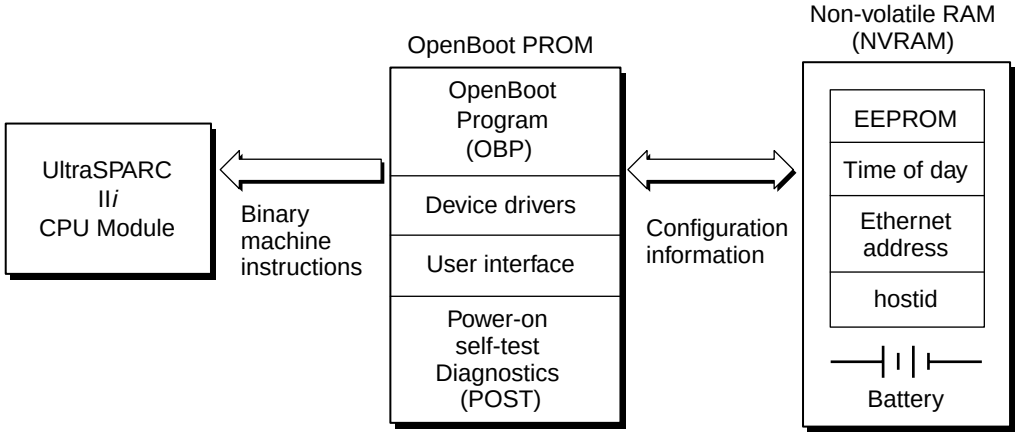


FIGURE D-1 OpenBoot Firmware Block Diagram

D.1 Minimum Requirements

The minimum *system configuration* will have:

- 64 MB of system memory.
- A standard I/O (console device)
- A boot device (storage device or network interface)
- The OpenBoot Firmware uses NVRAM for OBP environment variables.
- A console device can be an external terminal connected as Serial Port A (TTYA)
- A console device can be internal with a keyboard connected to the motherboard assembly and a monitor with a graphics card (ATI PCI).

If a PCI card is active during the boot process it must have built-in IEEE 1275 compliant plug-in FCode. This allows the device controlled by the card to become active during the boot process. PCI Cards that do not have the built-in FCode will allow the system to boot and function normally. For the ATI PCI cards listed on the IHV web site FCode plug in drivers are included in the OBP on the motherboard assembly.

OBP requirements are as follows:

- OBP — 4 MB RAM
- POST — 4 MB RAM
- Input-Output (IO) devices such as TTY

D.2 Additional OBP Features in Ultra AX*i*

- Facility to use drop-in drivers added to OBP
- CD file system support for ISO 9660 Rock Ridge
- DIR command for directory listing. Works with ISO 9660/RockRidge CDROMs, UFS diskettes and disks
- Control-F12 on Sun or PS/2 keyboards for graphics-mode cycling (ATI driver only)
- Control-F11 for PS2 keyboard language cycling
- Advanced System Monitoring (ASM)

D.2.1 Additional Commands

- **show-dropins**
- **add-dropins**
- **delete-dropins**
- **print-dropins**

D.2.2 Additional Environment Variables

- env-monitor
  - enabled-with-fans
  - enabled
  - disabled
  - disabled*
- last-power-off-cause

D.3 Flash Memory and NVRAM Layout

The Ultra AX*i* PROM space is arranged as blocks containing headered segments. The key organizational component is the header. The information content of the PROM and its headers are shown in FIGURE D-2.

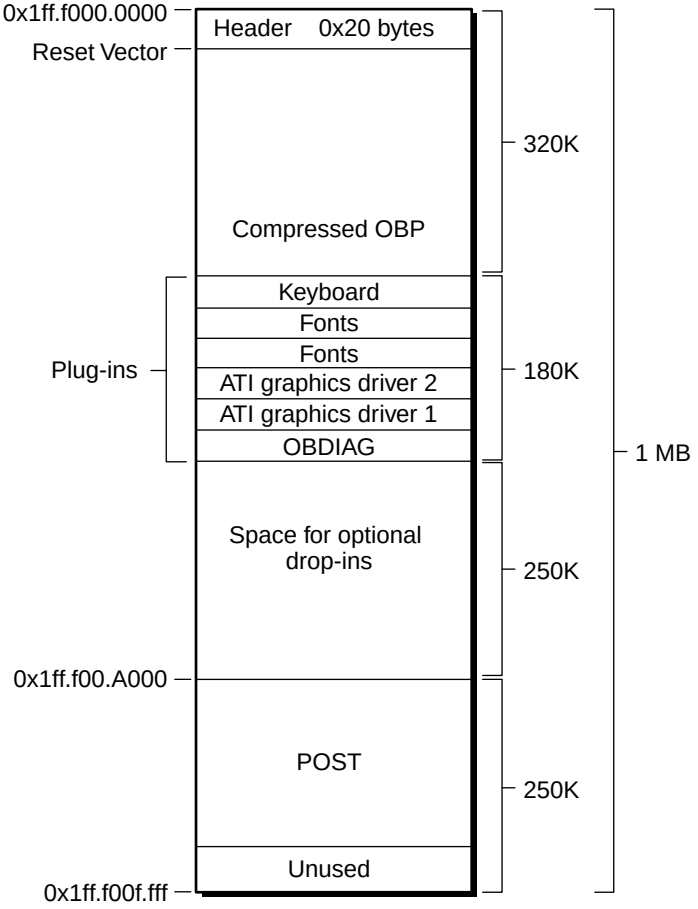


FIGURE D-2 Ultra AX*i* CPU PROM Content Layout

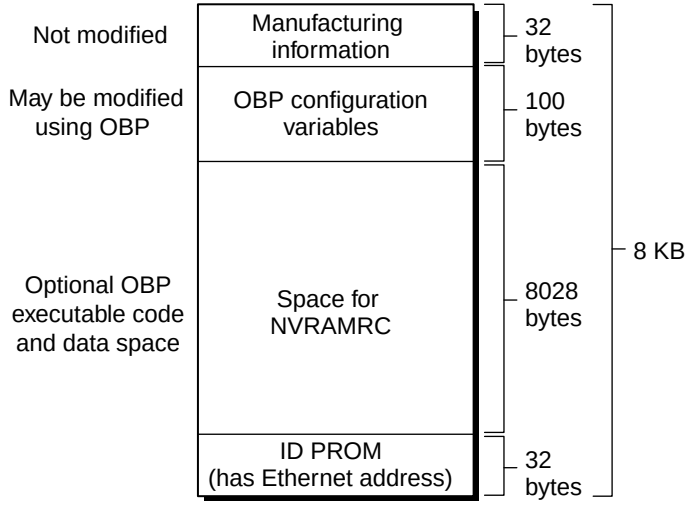


FIGURE D-3 Ultra AX*i* NVRAM Content Layout

D.4 Power on Self-Test (POST)

POST tests onboard system resources that are necessary for OBP to execute and boot Solaris. For Post to run, three hardware requirements must be met:

- The instruction fetch path between the CPU and the OBP PROM must be operating.
- The CPU must have a functioning integer unit to allow proper code execution.
- The serial port A (TTYA) must function to allow POST messages to be displayed.

Post will stop at the first failure and hand over the execution to OBP. In the case of POST failure, OBP will not go through the Auto-Boot process and drops to the `ok` prompt. To check the POST failure, use `show-post-results` command at the `ok` prompt. The system will display the failure message.

D.5 OpenBoot Diagnostics (OB Diag)

OBDIAG diagnoses the various hardware and peripheral devices. Enter **obdiag** at the ok prompt, and the OBDIAG menu will appear. The environment variable **diag-level** can be set to **min** or **max** use in set **env command**. No diagnostics are performed on PS/2 keyboard or mouse.

```
ok obdiag

OBDiag Menu
   0 ..... PCI/Cheerio
   1 ..... EBUS DMA/TCR Registers
   2 ..... Ethernet
   3 ..... Keyboard
   4 ..... Mouse
   5 ..... Floppy
   6 ..... Parallel Port
   7 ..... Serial Port A
   8 ..... Serial Port B
   9 ..... NVRAM
  10 ..... RAS <Inactive>
  11 ..... All Above
  12 ..... Quit
  13 ..... Display this Menu
  14 ..... Toggle script-debug
  15 ..... Enable External Loopback Tests
  16 ..... Disable External Loopback Tests
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===>
```

0, PCIO These tests cover the PCIO circuitry on the motherboard. Installed PCI cards are not tested.

1, Ebus DMA/TCR Registers This test covers motherboard DMA transfer control to the Ebus. Offboard peripherals are not tested.

2, Ethernet Tests 10BaseT / 100BaseT Ethernet interface.

3, Sun Keyboard Tests Sun keyboard controller.

4, Sun Mouse Interface Tests Sun mouse controller.

5, Floppy Requires an installed floppy disk drive with a formatted blank floppy disk.

6, Parallel Port Tests parallel port controller: diag-level must be set to max for test.

7, Serial Port A Runs when serial port A is not connected to a terminal. Runs only when *diag-level* is set to max.

8, Serial Port B This runs only when `diag-level` is set to `max`.

9, NVRAM Simply reads and writes patterns to free space in the NVRAM module.

10, RAS (Referred to as ASM.) Active when `env-monitor` is `enabled` or `enabled-with-fans`.

14, Toggle Script-Debug OBdiag enters verbose or quiet mode.

15, Enable External Loopback Tests Not implemented.

16, Disable External Loopback Tests Not implemented.

D.6 Entering the OBP Environment

You can enter the OpenBoot environment in any of the following ways:

- Halt the operating system by becoming a super user and then enter **`sync<cr>`**
- Execute the following keystroke commands:
  - **`Stop-A`** from a Sun keyboard
  - **`BREAK`** from an ASCII terminal
  - **`~#`** from a tip window
  - **`Control-Break`** from a PS/2 keyboard

D.7 Selected OBP Commands

TABLE D-1 Commonly Used Commands

Emergency Keyboard Commands Hold down keys during power-on sequence.	
Stop	Bypass POST. This command does not depend on security-mode.
Stop-A	Abort (PS/2 Keyboard equivalent **Left Control-Break**)
Stop-D	Enter diagnostic mode (`set diag-switch?` to `true`).
Stop-F	Enter Forth on TTYA instead of probing. Use `fexit` to continue with the initialization sequence. (Useful if hardware is broken.)
Stop-N	Reset NVRAM contents to default values.
Help Command	
help	List main help categories
help category	Show help for all commands in the category. Use only the first word of the category description.
help command	Show help for individual command (where available).
Common Options for The Boot Command	
boot[device-specifier][filename][options]	
[device-specifier]	The name (full path name or alias) of a device. Examples:
cdrom	(CDROM Drive)
disk	(hard disk)
net	(Ethernet)
[filename]	The name of the program to be booted (for example, `stand/diag`). If specified, `filename` is relative to the root of the selected device and partition. If not, the boot program uses the value of the `boot-file` parameter.
[options]	
-r	(Re-configure)
-s	(Single user mode)
-v	(verbose mode)
Diagnostic Test Commands	
probe-scsi	Identify devices attached to the built-in SCSI bus.
Viewing and Changing Parameters	
printenv [parameter]	Display all current parameters and current default values (numbers are usually shown as decimal values). `printenv` parameter shows the current value of the named parameter.
setenv parameter value	Set the parameter to the given decimal or text value

D.8 Configuration Variables

Configuration variables are used by the OBP code and are stored in NVRAM. The following is a sample of the output when the **printenv** command is entered at the ok prompt. The **setenv** command is used to modify the environment variables

TABLE D-2 NVRAM Configuration Variables

Parameter	Default	Description
tpe-link-test?	true	Twisted Pair Ethernet link test
scsi-initiator-id	7	SCSI bus address of host adapter, range 0-f.
keyboard-click?	false	If true, enable keyboard click.
keymap	no default	Keymap for custom keyboard.
ttyb-rts-dtr-off	false	If true, OS does not assert DTR and runs on TTYB.
ttyb-ignore-cd	true	If true, OS ignores TTYB carrier-detect.
ttya-rts-dtr-off	false	If true, OS does not assert DTR and runs on TTYA.
ttya-ignore-cd	true	If true, OS ignores TTYA carrier-detect.
ttyb-mode	9600,8,n,1,-	TTYB (baud, #bits, parity, #stop, handshake).
ttya-mode	9600,8,n,1,-	TTYA (baud, #bits, parity, #stop, handshake).
pcia-probe-list	1,2,3,4	See Para F.12
pcib-probe-list	1,2,3,4	See Para F.12
mfg-mode	off	
diag-level	max	Level of diagnostics to run (min or max).
#power-cycles		
system-board-serial#		
system-board-date	34883686	
last-poweroff-cause	0,1,2,3 etc.	ASM. See Para F.2.3
env-monitor	disabled*	ASM (enabled-with-fans, enabled, disabled, disabled*). See Para F.16
fcode-debug?	false	If true, include name fields for plug-in device FCodes.
output-device	screen	Console output device (usually screen, ttya or ttyb).
input-device	keyboard	Console input device (usually keyboard, ttya or ttyb).
load-base	16384	
boot-command	boot	Command that is executed if auto-boot? is true.
auto-boot?	true	If true, boot automatically after power-on reset.
watchdog-reboot?	false	If true, reboot after watchdog reset.
diag-file	empty string	File from which to boot in diagnostic mode.
diag-device	disk net	Device from which to boot.

TABLE D-2 NVRAM Configuration Variables *(Continued)*

Parameter	Default	Description
boot-file	empty string	File to boot (an empty string lets secondary booter choose default).
boot-device	disk net	Device from which to boot.
local-mac-address?	false	
ansi-terminal?	true	
screen-#columns	80	
screen-#rows	34	
silent-mode?	false	
use-nvramrc?	false	If true, execute commands in NVRAMRC during system start-up
nvramrc	empty string	Contents of NVRAMRC.
security-mode	none	Firmware security level (none, command or full). none: No password required (default). command: All commands except for boot and go require password. full: All commands except for go require the password.
security-password	no default	Firmware security password (never displayed).
security-#badlogins	1073741824	
oem-logo	no default	Byte array custom OEM logo (enabled by oem-logo? true). Displayed in hex.
oem-logo?	false	If true, use custom OEM logo, or use Sun logo.
oem-banner	empty string	Custom OEM banner (enabled by oem-logo? true).
oem-banner?	false	If true, use custom OEM banner.
hardware-revision		
last-hardware-update	00 00 00...	
diag-switch?	false	

D.9 Device Tree

The following is the output from a **show-devs** command at the ok prompt. Device tree nodes representing the hardware and support packages for the PROM are shown.

```
ok show-devs
/SUNW,UltraSPARC-IIi@0,0                          UltraSPARC-IIi CPU
/pci@1f,0                                         CPU-APB PCI-66 Bus
/virtual-memory
/memory@0,0                                       Node representing system memory
/aliases
/options
/openprom
/chosen
/packages
/pci@1f,0/pci@1                                   Advanced PCI bridge Bus A
/pci@1f,0/pci@1/(devid)                           A PCI card on J2001, J2002 or J2003 will appear here
/pci@1f,0/pci@1,1                                 Advanced PCI bridge Bus B
/pci@1f,0/pci@1,1/(devid)                         A PCI card on J2101, J2102 or J2103 will appear here
/pci@1f,0/pci@1/scsi@1,1                          Onboard SCSI External channel
/pci@1f,0/pci@1/scsi@1                            Onboard SCSI Internal channel
/pci@1f,0/pci@1/scsi@1,1/tape
/pci@1f,0/pci@1/scsi@1,1/disk
/pci@1f,0/pci@1/scsi@1/tape
/pci@1f,0/pci@1/scsi@1/disk
/pci@1f,0/pci@1,1/network@1,1                     Onboard network interface
/pci@1f,0/pci@1,1/ebus@1                          Onboard Ebus
/pci@1f,0/pci@1,1/ebus@1/beeper@14,722000
/pci@1f,0/pci@1,1/ebus@1/flashprom@10,0
/pci@1f,0/pci@1,1/ebus@1/eeprom@14,0
/pci@1f,0/pci@1,1/ebus@1/fdthree@14,3203f0        Floppy
/pci@1f,0/pci@1,1/ebus@1/ecpp@14,340278           Parallel Port
/pci@1f,0/pci@1,1/ebus@1/su_pnp@14,3602f8         PS/2 Mouse
/pci@1f,0/pci@1,1/ebus@1/su_pnp@14,3803f8         PS/2 Keyboard
/pci@1f,0/pci@1,1/ebus@1/se@14,400000             TTYA, TTYB
/pci@1f,0/pci@1,1/ebus@1/SUNW,pll@14,504000       Sun Keyboard/Mouse
/pci@1f,0/pci@1,1/ebus@1/power@14,724000
/pci@1f,0/pci@1,1/ebus@1/auxio@14,726000
/openprom/client-services
/packages/sun-keyboard
/packages/SUNW,builtin-drivers                    Built in driver support
/packages/cdfs                                    CD file system package
/packages/ufs-file-system                         UFS file system package
/packages/disk-label
/packages/obp-tftp
/packages/deblocker
/packages/terminal-emulator
```

D.10 PCI Probe Lists

The NVRAM variable maintains the current PCI Probe list. The list can be modified by the user, however, Bus B will always be probed before Bus A.

The default PCI Probe list order is:

1. PCI-BPCIO, onboard
2. PCI-BJ2001 PCI Slot
3. PCI-BJ2002 PCI Slot
4. PCI-BJ2003 PCI Slot
5. PCI-ADual SCSI, onboard
6. PCI-AJ2101 PCI Slot
7. PCI-AJ2102 PCI Slot
8. PCI-AJ2103 PCI Slot

PCI cards added to the system must comply with the PCI 2.1 specification. During the OBP probe process, a node ID is created and added to the device tree.

D.11 Device Aliases

The following is the output from the **devalias** command at the ok prompt which list the default device alias mappings.

```
ok devalias
pcib        /pci@1f,0/pci@1,1
pcia        /pci@1f,0/pci@1
ebus        /pci@1f,0/pci@1,1/ebus@1
i2c         /pci@1f,0/pci@1,1/ebus@1/SUNW,envctrl
net         /pci@1f,0/pci@1,1/network@1,1                          Network Interface
floppy      /pci@1f,0/pci@1,1/ebus@1/fdthree                       Floppy
diskx6      /pci@1f,0/pci@1/scsi@1,1/disk@6,0
diskx5      /pci@1f,0/pci@1/scsi@1,1/disk@5,0
diskx4      /pci@1f,0/pci@1/scsi@1,1/disk@4,0
diskx3      /pci@1f,0/pci@1/scsi@1,1/disk@3,0
diskx2      /pci@1f,0/pci@1/scsi@1,1/disk@2,0
diskx1      /pci@1f,0/pci@1/scsi@1,1/disk@1,0
diskx0      /pci@1f,0/pci@1/scsi@1,1/disk@0,0
scsix       /pci@1f,0/pci@1/scsi@1,1                               External SCSI
disk        /pci@1f,0/pci@1/scsi@1/disk@0,0
cdrom       /pci@1f,0/pci@1/scsi@1/disk@6,0:f
tape        /pci@1f,0/pci@1/scsi@1/tape@4,0
tape1       /pci@1f,0/pci@1/scsi@1/tape@5,0
tape0       /pci@1f,0/pci@1/scsi@1/tape@4,0
disk6       /pci@1f,0/pci@1/scsi@1/disk@6,0
disk5       /pci@1f,0/pci@1/scsi@1/disk@5,0
disk4       /pci@1f,0/pci@1/scsi@1/disk@4,0
disk3       /pci@1f,0/pci@1/scsi@1/disk@3,0
disk2       /pci@1f,0/pci@1/scsi@1/disk@2,0
disk1       /pci@1f,0/pci@1/scsi@1/disk@1,0
disk0       /pci@1f,0/pci@1/scsi@1/disk@0,0
scsi        /pci@1f,0/pci@1/scsi@1                                 Internal SCSI
ttyb        /pci@1f,0/pci@1,1/ebus@1/se:b
tyya        /pci@1f,0/pci@1,1/ebus@1/se:a
keyboard!   /pci@1f,0/pci@1,1/ebus@1/su_pnp@14,3803f8:forcemode
keyboard    /pci@1f,0/pci@1,1/ebus@1/su_pnp@14,3803f8              PS/2 Keyboard
mouse       /pci@1f,0/pci@1,1/ebus@1/su_pnp@14,3602f8              PS/2 Mouse
```

D.12 OBP Video Drivers

This section describes the function of the video drivers in OBP only. For information about the video drivers under system software see Appendix G.

D.12.1 Sun FFB Video Drivers

OBP PROM contains built in support for FFB2 video cards. OBP typically does not use all possible resolutions the card is capable of supporting. The following table shows the video resolution supported when operating in OBP using Sun video cards. These cards may only be used in the UPA64S slot (J0606).

Model	Part Number	Resolution	Vertical Refresh Hz
FFB2, 2D (Creator Series 2)	X3658A	1152x900	66
FFB2+, 2D (Creator Series 3)	X3662A		
FFB2, 3D (Creator3D Series 2)	X3659A		
FFB2+, 3D (Creator 3D Series 3	X3663A		

D.12.2 PCI Video Drivers

The OBP PROM contains built in support for selected PCI video cards. The following table shows the currently approved PCI video cards and the resolution supported when operating in OBP. These cards may be used in any of the PCI slots.

Vendor	Model	Part Number	Resolution	Vertical Refresh Hz
Sun	PGX (ATI Pineapple), 8-bit	X3660A	1152x900	66, 76
ATI	3D Charger, 2MB	100-405059 (Sun:102-38800-00)	800x600 1024x768 1152x900 1280x1024	75 60, 75 66 60
	3D Charger, 4MB	100-405058 (Sun:102-38808-00)	800x600 1024x768 1152x900 1280x1024	75 60, 75 66 60
Tech-Source	Raptor GFX-8M	19-0076-03	1152x900	60, 72, 75, 85
	Raptor GFX-4M	n/a		

The display resolution on ATI cards may be chosen at the `ok` prompt by holding down the **`control`** key and pressing the **`F12`** key until the desired resolution is displayed.

Updates to the built-in video drivers may have to be added as a drop-in. Drivers for third party video cards may be obtained from the vendor of the card.

D.13 PS/2 Keyboard

84, 101, 102, 104 key mappings

D.13.0.1 Non-English PS/2 Keyboards

Press **`Control-F11`** to cycle through keyboard language choices

The default language choices are: English, Spanish, French, Italian and German.

D.14 ASM Operation

A discussion of how ASM features are used by the Ultra AX*i* can be found in Section 3.4 “Advanced System Monitoring (ASM)” on page 3-9.

Supported `env-monitor` values

1. `enabled-with-fans:` If set, OBP monitors and reacts as follows:
   - If the CPU thermistor temperature is above the warning temperature threshold, a warning is issued.
   - If the CPU thermistor reading is above the shutdown temperature threshold, the system will shutdown.
   - If either of the voltages are out of the acceptable range, OBP issues a warning for out of range values.
   - The optional fans are monitored and a warning is issued if the fans are not present or if they fail.
2. `enabled:` same as `enabled-with-fans` without optional fan checking.

Caution – Because the CPU fan is required for CPU modules with straight fin heatsinks (e.g., 360 MHz, part number 501-5148-xx; 440 MHz, part number 501-5149-xx), only use `enabled-with-fans`.

3. `disabled:` Does not monitor any ASM features at OBP level. It creates the device tree node and properties for OS, but OS considers the monitoring disabled.
4. `disabled*:` This value turns off OBP monitoring and does not create the device tree node. (The `*` is part of the setting, not a reference to a footnote).

D.15 Field Upgrade of OBP

OBP can be upgraded in the field.

To determine which version of OBP is installed, perform the following:

If running OBP, at the `OK` prompt type:

```
ok .version<cr>
```

The system will display:

```
OBP 3.10.X <creation date>
POST 2.Y.0 <creation date>
```

If running Solaris, at the <machine_name> prompt type:

```
<machine_name> /usr/bin/prtconf -V
```

The system will display:

```
OBP 3.10.X <creation date>
```

The third character group (X) in OBP is the revision number.

If the installed version is not current, update the OBP before continuing.

D.15.1 Upgrading OBP When Operating in OBP

The latest version of OBP may be obtained from the URL:
http://www.sun.com/microelectronics/SPARCengineUltraAXi/

Note – The alternative method of upgrading the OBP from the OS is much easier. See Section D.15.2, “Upgrading OBP When Operating in OS”.

D.15.1.1 Creating the Update Floppy Diskette

Create the floppy diskette as follows using a Solaris workstation:

1. **Download Update.to.panther.3.10.x@ok from website.**
2. **Place a floppy in the floppy drive.**
3. **From a shell enter: fdformat -U**
4. **Become super user.**
5. **From a shell type: /etc/init.d/volmgt stop**
6. **From a shell type: dd if=<pathname> of=/dev/rdiskette bs=32k**
   Wait for the **DD** command to complete before ejecting the floppy.
7. **From a shell type: eject fd**
8. **From a shell type: /etc/init.d/volmgt start**

D.15.1.2 OpenBoot Program (OBP) Update

Use the created floppy diskette to update the OpenBoot Firmware.

1. **Insert the diskette into floppy disk drive.**
2. **At the `OK` prompt, type:**

   ok **boot floppy:nolabel**<cr>
3. **At the `OK` prompt, type:**

   ok **reset-all**<cr>

D.15.2 Upgrading OBP When Operating in OS

The latest version of OBP may be obtained from the URL:
http://www.sun.com/microelectronics/SPARCengineUltraAXi/

1. **Download Update.to.panther.3.10.x@OS, which is a C shell executable file that includes the OBP 3.10.3 Flash PROM image and the automatic update of the flash content.**

Note – To download this C shell executable file to a directory on your Ultra AX*i*, a server accessible by your Ultra AX*i*, or a floppy diskette, use the SHIFT key on your keyboard when you click on the download link. This forces the Web browser to pop up the "`Save As...`" window.

---

2. **Become super user.**
3. **Change execute permissions of the downloaded file if necessary.**
4. **Execute the downloaded script file, answer prompts as appropriate.**
5. **After completion of script, OBP will be upgraded in Flash.**

   The upgraded OBP will take effect the next time the machine is rebooted, reset or power cycled.

APPENDIX **E**

System Software
Solaris 2.6 Operating Environment

This appendix provides information on the Solaris 2.6 (or later) software used in the Ultra AX*i* system. The Solaris Software is not part of the Ultra AXi motherboard package. It may be purchased from Sun in various packages, either with media or as a Right To Use (RTU) license.

Ultra AX*i* specific Solaris information may be found at the URL:
http://www.sun.com/microelectronics/SPARCengineUltraAXi/software.html

Commonly used Solaris packages are:

- Solaris 2.6 Hardware 3/98 (or later) Desktop (Part # SSOS-260-CDB-DT) Comes licensed for 1-2 users and cannot be used as a server.
- Solaris 2.6 Hardware 3/98 (or later) Server (Part # SSOS-260-CDB-SVR) Operating Environment with a server license and a license for up to 5 Solaris users.

Caution – You must use the `boot -r` reconfiguration command each time the machine is booted to attach the ASM drivers. Otherwise, the system runs without ASM protection at the Solaris level.

E.1 Software Package

The software package contains:

- A CD labeled Solaris 2.6 Software, SPARC Platform
- A CD labeled Solaris 2.6 Documentation, Answer Book, Man Pages, User, Admin, Developer Documentation.
- Hard copy documents, Installation guides.

- A binary licensing agreement
- Release Notes, warranty and other

E.1.1 Publications

Other Solaris publications are available from Sun at the URL's:
http://www.sun.com/solaris/index.html
http://www.sun.com/books/catalog/order_info.html
http://sunexpress.usec.sun.com/
http://www.sun.com/worldwide/
http://docs.sun.com

E.2 Technical Support

SunService, to contact SunService in the U.S., phone (800) USA-4SUN (800-872-4786). To find the SunService Worldwide Solution Center nearest you go to this URL:
http://www.sun.com/service/contacting/solution.html

E.3 Installation

After completing the steps in Appendix C "Assembly, Installation and Initial Start Up Procedures, you can use TABLE C-4 on page C-18 to plan and document your installation of Solaris. Refer to the "Planning Your Installation" Section of the Information Library documentation packaged with your Solaris software.

E.4 System Requirements

- SPARCengine Ultra AX*i* motherboard with UltraSPARC-II*i* CPU module.
- 32MB to 1.0GB DRAM memory (128MB or more provides optimal performance).
- 2GB or more hard disk space
- CD-ROM 24X or faster
- Network Connectivity
- Graphics card and suitable monitor
- Keyboard and Mouse

Refer to Appendix E for information on approved IHV devices.

E.5 Ultra AX*i* Platform Specifics

E.5.1 Advanced System Monitoring (ASM)

Refer to ASM Application Note (805-4877-01)

ASM driver must be downloaded from URL:
http://www.sun.com/microelectronics/SPARCengineUltraAXi/

For details on the features and how various ASM functions are performed, please refer to the OEM Technical Manual, which is available in postscript or pdf from URL:
http://www.sun.com/microelectronics/SPARCengineUltraAXi/

The updated ASM driver needs to be downloaded as a package. This updated driver is not part of the Solaris 2.6 3/98 edition. Solaris 2.6 5/98 edition includes the ASM driver, and is installed and enabled along with Solaris.

Documentation and instructions on how to add ASM features:

- Software and Hardware requirement
- OBP version 3.10.4 SME created 1998/03/04 or later.
- Solaris 2.6 3/98 FCS.
- Ultra AXi motherboard part number: 501-4559-04 or later.
- System setup procedure

1. **Power-On the system. Press `STOP -A` on a Sun keyboard (`cntrl-break` on a PS2 keyboard) after the completion of memory test.**

   (Note: Before the system boot disk). At the `OK` prompt, type:

   `ok>` **`setenv env-monitor enabled`** (default value is `disabled*`)

   `ok>` **`reset-all`** (MUST do!)

   `ok>` **`boot disk -r`** (all releases)

Note – `-r` is a MUST option each time the machine is booted to load the ASM driver. Use `v` option after `-r` to run verbose mode.

---

2. User can download the package from this page.

3. Copy the package into the target system.

```
%  su (become Super User)     <cr>
# pkgrm SUNWglmr                  <cr>
# tar -xvf ASMpkg.tar            <cr>
# pkgadd -d . SUNWglmr.u         <cr>
```

The ASM driver obtains the default values passed from OBP. The default values are:

- shut-down temperature = 58°C
- warning temperature = 55°C
- env-monitor-interval = 60 seconds

E.5.2 Video Drivers

The OBP PROM contains built in support for selected PCI video cards. The following table shows the currently approved PCI video cards and the resolutions supported. These cards may be used in any of the PCI slots.

Vendor	Model	Part Number	Resolution	Vertical Refresh Hz	Mode
Sun	PGX (ATI Pineapple), 8-bit	X3660A	640x480 768x575 800x600 1024x768 1152x900 1280x800 1280x1024 1440x900 1600x1000	60 50 75 60, 70, 75 66, 76 76 60, 67, 75, 76 76 66, 76	NTSC PAL SVGA

ATI	Video Boost, 2MB	100-402031 (Sun:102-34008-XX)	800x600 1024x768 1024x768 1152x900 1280x1024	75 60 75 66 60	
	3D Charger, 2MB	100-405059 (Sun:102-38800-00)	640x480 800x600 1024x768 1152x864 1152x900 1280x1024	72, 75 56, 60, 72, 75 60, 70, 75, 87 75 66, 76 60, 7567, 75, 87	2D 2D 2D 2D 2D 2D
	3D Charger, 4MB	100-405058 (Sun:102-38808-00)	640x480 800x600 1024x768 1152x864 1152x900 1280x1024	72, 75 56, 60, 72, 75 60, 70, 75, 87 75 66, 76 60, 7567, 75, 87	2D 2D 2D 2D 2D 2D
Tech-Source	Raptor GFX-8M Raptor GFX-4M	19-0076-03 n/a	640x480 800x600 1024x768 1152x900 1280x1024 1600x1200 1280x800 1440x900 1600x1000 1920x1080 1920x1200	60, 72, 75, 85 60, 72, 75, 85 60, 70, 75, 85 60, 72, 75, 85 60, 75, 76, 85 60, 65, 70, 75, 80, 85 76 76 66, 76 60, 70 60, 70, 76	VESA VESA VESA VESA VESA VESA HD HD HD HD HD

Drivers for third party video cards may be obtained from the vendor of the card.

E.5.3 Set the Display Mode for OpenWindows or CDE

Note – This applies to PCI display adapter cards; for information on setting display parameters with Sun's Creator Graphics Fast Frame Buffer (FFB) refer to

---

The GUI will use the same display parameters as console mode unless you use the **`m64config`** command at the Solaris prompt. For example, if your monitor supports 1280 pixels by 1024 at 75 Hz, then enter:

```
machine_name% m64config -dev /dev/fb -res 1280x1024x75 <cr>
```

Note – 'x' in 1280x1024x75 is the letter 'x,' not the multiplication symbol.

Once you enter this command, the system will use this display mode when Common Desktop Environment (CDE) comes up on the monitor. If you enter this command within a GUI, you must log out and then log back in before it takes effect.

To check which display modes are currently supported by your graphics controller card, enter:

```
machine_name% m64config -dev /dev/fb -res \?<cr>
```

or

```
machine_name% m64config -dev /dev/fb -prconf \?<cr>
```

Once you enter the above command, a list will appear. Display modes followed by a '[2]' suffix are not currently supported. The '[3]' suffix indicates the current screen resolution.

Note that you can get information on `m64config` by entering:

```
machine_name% man m64config<cr>
```

- To recover when the display becomes unviewable

The display may become unviewable as you move between GUI and console modes:

- If you exit the GUI and the console mode display is unviewable, try entering:

```
machine_name% set-default output-device<cr>
```

- Entering the GUI from console mode is unlikely to be a problem unless **`m64config`** has been used to set a GUI display mode not supported by the current monitor. In this event, you can use **`rlogin`** to access the system over the net, or reboot the system with a terminal or workstation, and then use the **`m64config`** command to set a supported display mode. When you enter CDE again, it will be at the new display mode setting.
- If the screen becomes unviewable and you are unable to perform a remote login:

1. **Reboot the system or if necessary, cycle power on the system.**
2. **Stop the boot process as the boot banner appears by holding down the `Stop` key and then press `A` (use the `Control` and `Break` keys on PS/2 keyboards).**
3. **Type `boot -s`<cr> (for boot into system administration/maintenance mode).**
4. **Use the root password to enter the system administration/maintenance mode.**
5. **Use the `m64config` command to change the display mode setting (see "Set the Display Mode for OpenWindows or CDE" on page G-5).**
6. **Either use `reboot`<cr> to restart the system, or type `exit`<cr> to exit system administration/maintenance mode.**

E.5.4 PS/2 Keyboard Key Mapping

If using a PS/2 keyboard, a PS/2 mouse must also be installed at boot or the system will default to TTYA for console IO. The Function keys (F1 -F12) Insert, Home, Page-up Page-Down, Del and End have the same mapping in both the Sun Type 5 and PS/2 keyboards.

TABLE E-1 Default Sun to PS/2 Equivalent Keystrokes

Sun Type 5	PS/2
Stop-A	**Left Control-Break**
Power-On	No Equivalent
Help	No Equivalent
Stop	No Equivalent
Props	No Equivalent
Front	No Equivalent
Open	No Equivalent
Find	No Equivalent
Again	No Equivalent
Undo	No Equivalent
Copy	No Equivalent
Paste	No Equivalent
Cut	No Equivalent
Meta	No Equivalent
—	**Windows Logo Left**
—	**Windows Logo Right**
—	**Windows List**
Speaker +	—
Speaker -	—
Speaker Off	—
Compose	—
Alt Graph	—
F1 -F12	F1 -F12

TABLE E-1 Default Sun to PS/2 Equivalent Keystrokes

Sun Type 5	PS/2
← ↑ ↓ →	← ↑ ↓ →
PrintScreen / SysRq	**PrintScreen / SysRq**
Scroll Lock	**Scroll Lock**
Pause / Break	**Pause / Break**
Insert	Insert
Home	Home
Page-up	Page-up
Page-Down	Page-Down
Del	Del
End	End

Their is a user assignable keyboard mapping facility under CDE. (OpenWin?). ~/.dt/user.dtwmrc/dtkeybinding. This enables the user to assign equivalent keyboard mapping for PS/2 keyboards

E.5.5 PS/2 Mouse

If using a PS/2 mouse, a PS/2 keyboard must also be installed at boot or the system will default to TTYA for console IO.

Standard three button mouse devices are supported. Consult the vendor to use special pointing devices.

The use of a two button PS/2 mouse is not recommended due to extensive use of middle button by CDE/OpenWindows. However, CDE/OpenWindows can simulate a third button by adding the following to the user's `~/.dt/user.dtwmrc` file.

```
Buttons DtButtonBindings
{
<Btn1Down>            root                f.marquee_selection
<Btn2Click>           root                f.toggle_frontpanel
Ctrl<Btn1Click>       root                f.toggle_frontpanel
<Btn3Down>            root                f.menu  DtRootMenu
Shift<Btn1Click>      frame|icon          f.lower
<Btn1Click>           frame|icon          f.raise
<Btn1Click2>          frame               f.maximize
<Btn1Click2>          icon                f.restore
<Btn2Click>           frame|icon          f.raise_lower
Ctrl<Btn1Click>       frame|icon          f.raise_lower
<Btn3Down>            frame|icon          f.post_wmenu
Alt<Btn1Click>        frame|icon|window   f.raise
Alt<Btn1Click2>       frame|window        f.minimize
Alt<Btn1Click2>       icon                f.restore
```

```
Alt<Btn2Click>          frame|icon|window    f.raise_lower
Ctrl Alt<Btn1Click>     frame|icon|window    f.raise_lower
Alt<Btn1Down>           frame|icon|window    f.move
Alt<Btn3Down>           window               f.minimize
}
```

This file will allow the mouse to be used as shown below:

- Right Control and mouse button 1 anywhere on the background will toggle minimize/maximize of the front panel.
- Right Control and mouse button 1 on a frame or icon will toggle raising/lowering that frame or window. (Raising means exposing a window above other windows and lowering means hiding behind others.
- Alt-Right Control-mouse button 1 within a window will toggle raising/lowering the window.

TABLE E-2 Equivalent Sun and PS/2 Mouse Buttons

Sun	PS/2 Three Button	PS/2 Two Button
left	left	left
right	right	right
middle	middle	

E.5.6 Speaker

There is an integral speaker in the Sun Type 5 keyboard the Sun Keyboard inhibits the enclosure speaker. The PS/2 keyboard uses the enclosure mounted speaker

The speakers are used for error beep signals and the keyboard click feature.

The speaker is enabled in CDE by using the Style Manager Menu, keyboard option. Set volume in CDE. Zero = Off, any other number = On.

E.6 Adding PCI Cards and Drivers

PCI cards must have appropriate Solaris drivers to function with the Ultra AXi system. These drivers are provided by the vendor. A list of PCI cards that have been tested and found to work with the AXi system can bee found at the URL: *http://www.sun.com/microelectronics/ihv*

Refer to the documentation provided with the PCI card. Usually software drivers and related documentation are provided on CD-ROM or floppy diskettes. Read all documentation furnished with the package. The manufacturers Web Site may also be referred to for the latest product and driver information.

E.6.1 To Install a PCI Card

1. **Shut down the system**
2. **Install the PCI card**
3. **Make necessary connections**
4. **Power up the system**
5. **Boot with -rv options**
6. **at system prompt, become super user**
7. **Add package using pkgadd command**
8. **Reboot if necessary**

E.6.2 To Verify the Board is Seen by the System

1. **Use the prtconf -D command to print the device tree.**

   It should show the PCI bus instances #0 and #1 for the two PCI buses on Photon. There will be instances of various PCI cards connected to each one. A PCI card will show up as pciVVVV,DDDD, where VVVV is the vendor id, e.g. 1011 and DDDD is the device id, e.g. 008e. If the driver for the card is already loaded, then you may see the device name supplied by the driver in the device tree.

2. **Use the modinfo command to see if the driver for the card is loaded or not.**

   Typically the description of the driver will contain name of the product or the vendor.

3. **At the OBP prompt the PCI board should be visible in the device tree even if the driver is not installed.**

E.6.3 To Obtain Additional Assistance

1. **Run the following commands and record the output.**

prtconf

modinfo

dmesg

cat /etc/driver_aliases

cat /etc/path_to_inst

2. **Contact the vendor of the PCI card.**

E.7 Language Versions

All European languages (including English) are consolidated into a single product with the software in all 6 languages on the Solaris 2.6 Software CD. User documentation is included and translated on the European language version of the Solaris 2.6 Documentation CD. The European language version includes:

English
French
German
Italian
Spanish
Swedish

Solaris 2.6 is also available in oriental and Asian languages. These are available on a separate CD for each language.

Simplified Chinese
Traditional Chinese
Japanese
Korean

APPENDIX **F**

System Software
SunVTS Validation Test Suite

This Appendix provides information on the SunVTS suitable for the Ultra AX*i* system. The applicable version is based on SunVTS 2.1 Ultra AX*i* version.

F.1 Distribution

SunVTS may be downloaded at no cost to the user from the following URL:
http://www.sun.com/microelectronics/SPARCengineUltraAXi/

Ensure the SunVTS version matches the Solaris version (see TABLE F-1).

TABLE F-1 SunVTS Release Summary

SunVTS Version	Solaris Version
SunVTS 3.2	Solaris 7 5/99
SunVTS 3.1	Solaris 7 3/99
SunVTS 3.0	Solaris 7
SunVTS 2.1.3	Solaris 2.6 - 5/98
SunVTS 2.1.2	Solaris 2.6 - 3/98
SunVTS 2.1.1	Solaris 2.5.1 - 11/97

Information on the version of SunVTS installed can be found in the file:
`/opt/SUNWvts/bin/.version`

Installation of SunVTS automatically adds applicable Man pages. These Man pages can be used as online documentation.

F.1.1 Obtaining Documentation from the Web

Documentation links to SunVTS 2.1 SunVTS User's Guide Part No. 802-7299 August 1997, Rev. A, SunVTS Quick Reference Card, Part No. 802-7301 August 1997, Rev. A SunVTS Test Reference Manual Part No. 802-7300-10, August 1997, Rev. A may be found at the following URL:
http://docs.sun.com:80

F.2 System Requirements

- Solaris 2.6 version 3/98 uses SunVTS 2.1.2 with afbtest patch 106140-01.
- Solaris 2.6 version 5/98 uses SunVTS 2.1.3.
- SPARCengine Ultra AX*i* motherboard with UltraSPARC-II*i* CPU module.
- 32MB to 1.0GB DRAM memory.
- 2GB or more hard disk space.
- CD-ROM 24X or faster.
- Network Connectivity.
- Graphics card and suitable monitor.
- Keyboard and Mouse.

Independent Hardware Vendors generally supply non-Sun parts, components and peripherals such as PCI and graphics cards, enclosures, power supplies, memory, hard disk drives, floppy disk drives, CD-ROM drives, monitors, keyboards, mouse devices, cables and adapters.

A list of these IHVs can be found on the Internet at:
http://www.sun.com/microelectronics/ihv

F.3 Installing SunVTS

Installation instructions will accompany the software when it is downloaded.

The installation instructions are:

1. **Create a temp directory on the Panther system: (eg. `mkdir /tmp/vts`)**

2. **Download the image to that directory. Currently the image is a bit over 17 MB using the Solaris compress utility. gzip brings the image size down to 12 MB but the utility is not part of Solaris.**

3. **Uncompress the image. (eg. `cd /tmp/vts; uncompress vts.tar.Z`)**

4. **Untar the image. (eg. `tar -xvf vts.tar`)**

5. **Install the SunVTS packages (`SUNWvts SUNWvtsmn`) (eg. `pkgadd -d .`) Answer the questions pkgadd asks accordingly. When the four packages are installed SunVTS will reside in `/opt/SUNWvts/bin`. At this point, apply afbtest patch 106140-01 as applicable.**

F.4 Configuring and Running SunVTS

There are three types of user interface:

- GUI Graphical User Interface on-screen menu options.
- TTY Using terminal interface or remote access modem.
- Command Line.

There are three modes of testing possible:

- Connectivity mode: A low stress, quick testing of the availability/connectivity of the tested device is run.
- On-line mode: A mode thorough but non-intrusive test is invoked, which does not affect other applications running at the same time.
- Stand alone mode: This test uses all necessary system resources and performs a thorough system test.

There is no support for third party PCI adapters (including PCI-ATI Graphics cards) and devices in SunVTS.

Loopback connectors are required for Ethernet connection, parallel port, serial ports, mouse and keyboard.

F.5 Error Messages

The memory test may report errors on IC's which are not part of the Ultra AX*i*.

The memory test will report errors with addresses.

The CDROM test will detect bad media or no media in the CDROM drive.

The hard disk test can be used to analyze media. Test errors are reported with block size. The sense key error can be used with the block number to repair a partially defective area using the format command.

F.6 Ultra AXi Specific Implementation

SunVTS does not test the ASM features on the Ultra AX*i*.

The SCSI tape test for low density tapes is not reliable and should not be used. The test option short block count tests reliably. The test option long block count is not reliable and should not be used.

The ATI graphics card has been tested and found to work with the Ultra AX*i*, but is not formally supported by Sun.

F.7 SunVTS Test Reference Manual Table of Contents

This section shows which chapters of the SunVTS Test Reference Manual are applicable to the Ultra AX*i* system.

TABLE F-2 SunVTS Test Reference Manual Chapter Applicability

Chap	Title	Remarks
1	Introduction	
2	Advanced Frame Buffer Test(afbtest)	
3	SunATM Adapter Test(atmtest)	Not Applicable
4	Audio Test (audio)	
5	Bidirectional Parallel Port Printer Test (bpptest)	
6	Compact Disc Test (cdtest)	
7	Color Graphics Frame Buffer Test (cg14test)	
8	Frame Buffer, GX, GX+ and TGX Options Test (cg6)	
9	Disk and Floppy Drives Test (disktest)	
10	ECP 1284 Parallel Port Printer Test (ecpptest)	

TABLE F-2 SunVTS Test Reference Manual Chapter Applicability *(Continued)*

Chap	Title	Remarks
11	Sun Enterprise Network Array Test(enatest)	Not Applicable
12	Environmental Test (envtest)	Not Applicable
13	Frame Buffer Test (fbtest)	Not Applicable
14	Fast Frame Buffer Test(ffbtest)	OK
15	Floating Point Unit Test (fputest)	
16	Dual Basic Rate ISDN (DBRI) Chip (isdntest)	
17	ZX and TZX Graphics Accelerator Test (leotest)	Not Applicable
18	SPARCprinter Ports Test (lpvitest)	Not Applicable
19	M64 Video Board Test(m64test)	Not Applicable
20	Multiprocessor Test (mptest)	Not Applicable
21	Network Hardware Test (nettest)	OK
22	PCMCIA Modem Card Test (pcsertest)	
23	SPARCstorage Array Controller Test (plntest)	Not Applicable
24	Physical Memory Test(pmem)	OK
25	Prestoserve Test (pstest)	Not Applicable
26	SunVideo Test (rtvctest)	Not Applicable
27	Serial Asynchronous Interface (PCI)	Not Applicable
28	Environmental Sensing Card Test (sentest)	Not Applicable
29	Soc+ Host Adapter Card Test(socaltest)	Not Applicable
30	NeWSprinter Test (spdtest)	
31	Serial Parallel Controller Test (spif)	
32	Serial Ports Test (sptest) 287	
33	SunButtons Test (sunbuttons)	
34	SunDials Test (sundials)	
35	HSI/S Boards Test (sunlink)	
36	Pixel Processor Test (sxtest)	
37	System Test (systest)	
38	Tape Drive Test (tapetest)	
40	Virtual Memory Test (vmem)	OK
41	SBus Expansion Subsystem Test (xbtest)	Not Applicable

F.8 Loopback Connectors

Appendix A of the *SunVTS 2.1 Test Reference Manua*l (Part No. 802-7300-10 August 1997, Revision A) contains complete loopback connector information. This should be used any time loopback connector use is contemplated.

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