

Sun™ Enterprise™ 6500/5500/4500 Systems Reference Manual



THE NETWORK IS THE COMPUTER™

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Part No.: 805-2632-10
RevisionA, April 1998

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Preface

The *Sun™ Enterprise™ 6500/5500/4500 Systems Reference Manual* is for the qualified service-trained maintenance provider.

Using UNIX Commands

This document may not contain information on basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following for this information:

- *Solaris 2.x Handbook for SMCC Peripherals*, which contains Solaris™ 2.x software commands
- AnswerBook™ online documentation for the Solaris 2.x software environment
- Other software documentation that you received with your system

Typographic Conventions

TABLE P-1 Typographic Conventions

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

Shell Prompts

TABLE P-2 Shell Prompts

Shell	Prompt
C shell	<i>machine_name%</i>
C shell superuser	<i>machine_name#</i>
Bourne shell and Korn shell	\$
Bourne shell and Korn shell superuser	#

Related Documentation

The following documents contain topics that relate to the information in the *Sun Enterprise 6500/5500/4500 Systems Reference Manual*.

TABLE P-3 Related Documentation

Application	Title	Part Number
Installation	<i>Sun Enterprise 6500/5500/4500 Systems Installation Guide</i>	805-2631
Software	<i>SMCC SPARC Hardware Platform Guide</i>	802-5341
	<i>Solstice SyMON User's Guide</i>	802-5355
	<i>Dynamic Reconfiguration User's Guide for Sun Enterprise 6x00/5x00/4x00/3x00 Systems</i>	805-3530
Options	<i>Sun Enterprise Expansion Cabinet Installation and Service Manual</i>	805-4009
	<i>Sun Enterprise 6/5/4/3x00 Systems Board Installation Guide</i>	805-4007
	<i>4 Mbyte UltraSPARC II Installation Guide</i>	805-1150
	<i>Sun Enterprise 6/5/4/3x00 Systems SIMM Installation Guide</i>	802-5032
	<i>SBus+ and Graphics+ I/O Boards (100 MB/sec Fibre Channels) for Sun Enterprise 6/5/4/3x00 Systems</i>	805-2704
	<i>PCI+ I/O Board Installation and Component Replacement for Sun Enterprise 6/5/4/3x00 Systems</i>	805-1372
	<i>Sun Enterprise 6x00/5x00/4x00 Disk Board Installation Guide</i>	802-6740
	<i>Sun Enterprise Systems Peripheral Power Supply Installation Guide</i>	802-5033
	<i>Sun Enterprise Systems Power/Cooling Module Installation Guide</i>	802-6244
	<i>Rackmount Placement Matrix</i>	802-6945
<i>Sun Enterprise Cabinet Floor Brackets Mounting Guide</i>	802-7543	
<i>Sun Enterprise Caster Base Installation Guide</i>	802-5034	

Sun Documentation on the Web

The `docs.sun.com` web site enables you to access Sun technical documentation on the World Wide Web. You can browse the `docs.sun.com` archive or search for a specific book title or subject at `http://docs.sun.com`.

Sun Welcomes Your Comments

We are interested in improving our documentation and welcome your comments and suggestions. You can email your comments to us at smcc-docs@sun.com. Please include the part number of your document in the subject line of your email.

Notes, Cautions, and Warnings

Read the safety agency compliance statements in Appendix H, “Compliance Statements,” before performing installation or service procedures on any Sun Microsystems products.



Caution – This equipment contains lethal voltage. Accidental contact with centerplane, card cage, and drive areas can result in serious injury or death.



Caution – Improper handling by unqualified personnel can cause serious damage to this equipment. Unqualified personnel who tamper with this equipment may be held liable for any resultant damage to the equipment.

Individuals who remove any outer panels or open covers to access this equipment must observe all safety precautions and ensure compliance with skill level requirements, certification, and all applicable local and national laws.

Procedures contained in this document must be performed by qualified service-trained maintenance providers.

Note – Before you begin, carefully read each of the procedures in this manual. If you have not performed similar operations on comparable equipment, *do not attempt* to perform these procedures.

For system compliance class and conformity information, refer to Appendix A, “Regulatory Agency Compliance Statements,” in the system installation guide that came with your Enterprise system.

Product Overview

1.1 Standard Features

The Sun™ Enterprise™ 6500/5500/4500 systems are available in three styles of enclosures. This manual has specific details for two styles used for the Sun Enterprise 6500, 5500, and 4500 servers (FIGURE 1-1).

Many boards and modules are used in all three enclosures, including the CPU/Memory+ board, various types of I/O+ boards, the Disk board, processor modules, memory modules, most power supplies, and the CD-ROM drive.

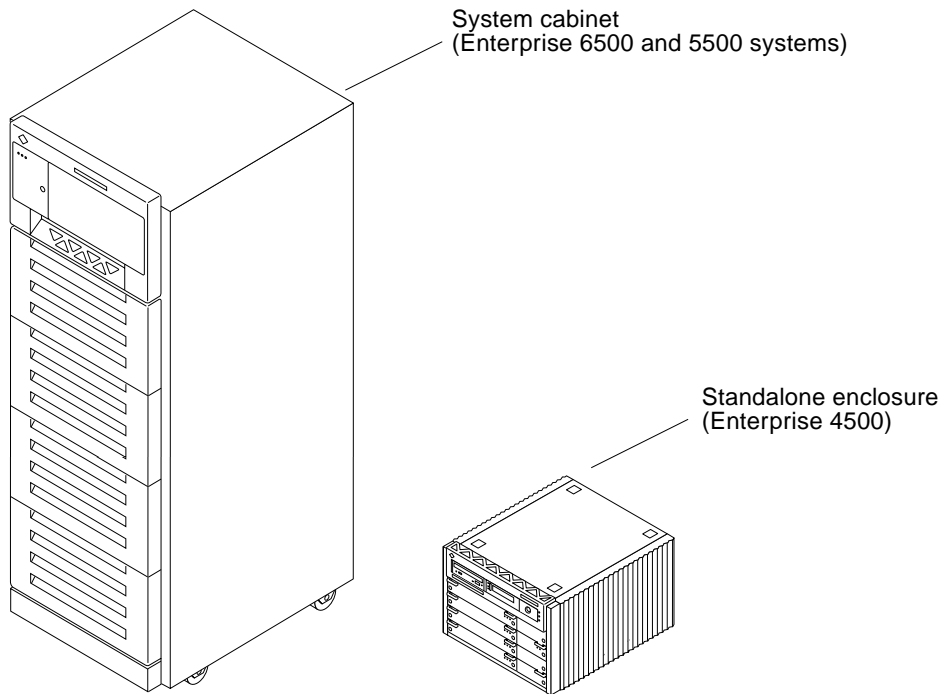


FIGURE 1-1 Front Views of the Sun Enterprise 6500/5500 and 4500 Servers

1.2 Enterprise 6500 and 5500 Systems

The minimum configuration for the Enterprise 6500/5500 systems is:

- Data center system cabinet (system cabinet)
- 16-slot (6500) or 8-slot (5500) card cage
- Power/cooling modules (2)
- Quad fan tray
- Clock+ board
- CPU/Memory+ board
- UltraSPARC™ II module
- Main memory
- I/O+ board
- Peripheral power supply
- AC power sequencer
- Media tray for removable SCSI media drives, such as the SunCD™ drive

FIGURE 1-2 shows the front view of the Enterprise 5500 system. The Enterprise 6500 system is similar, but has a larger card cage.

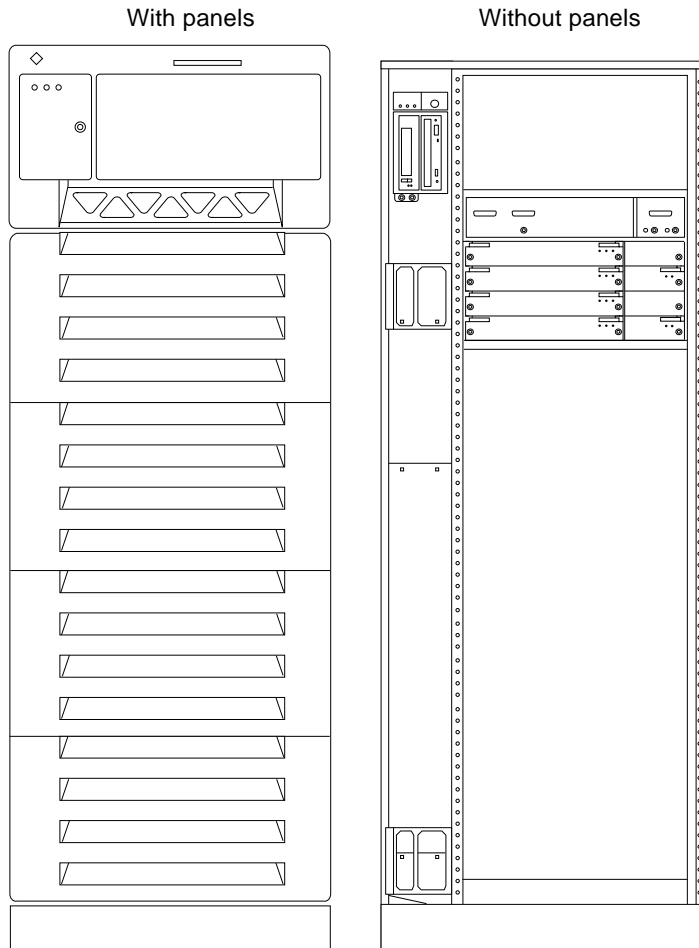


FIGURE 1-2 Front View of the Enterprise 5500 System Cabinet

FIGURE 1-3 shows the rear view of the Enterprise 6500 system. The Enterprise 5500 system is similar.

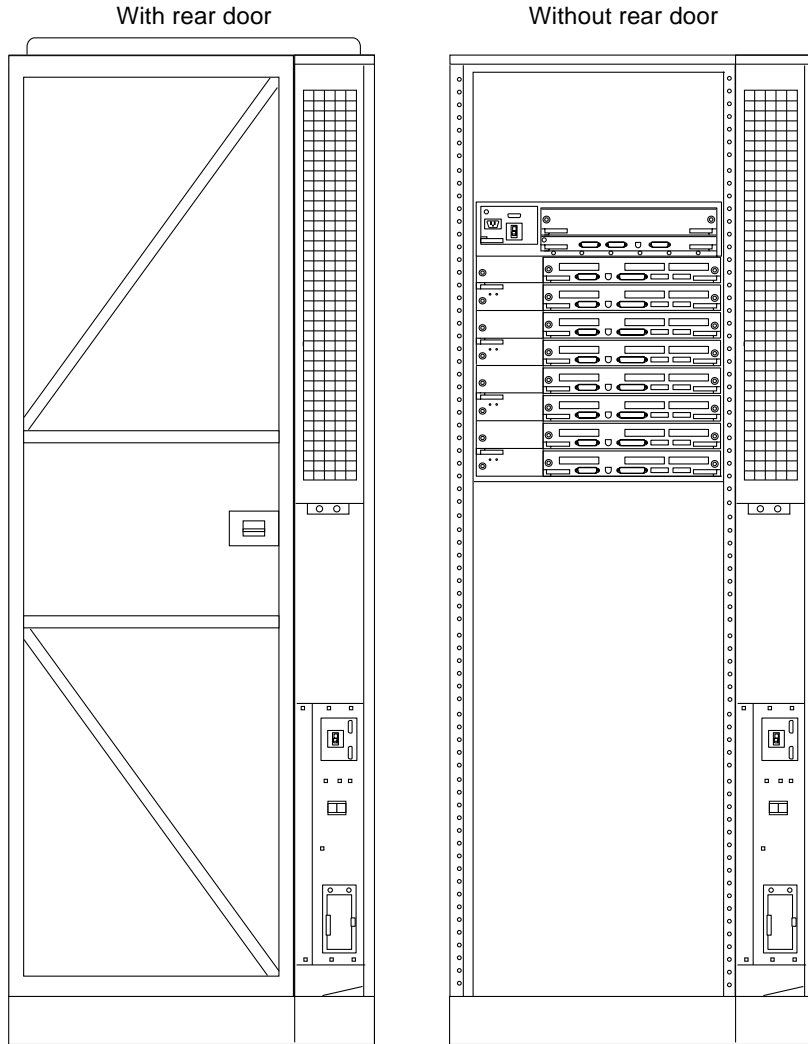


FIGURE 1-3 Rear View of the Enterprise 6500 System Cabinet

The top front panel varies with the number and type of options in the upper part of the Enterprise 6500/5500 system. FIGURE 1-4 shows two types of panels.

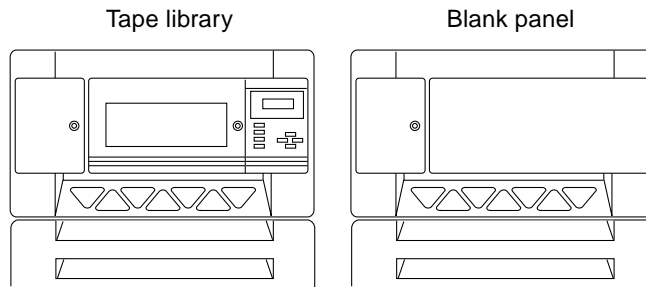


FIGURE 1-4 Bezels for Enterprise 6500/5500 System - Two Examples

1.3 Enterprise 4500 System

The minimum configuration for the Enterprise 4500 system is:

- 8-slot card cage
- Power/cooling modules (2)
- Fan box
- Clock+ board
- CPU/Memory+ board
- UltraSPARC II module
- Main memory
- SBus+ I/O board
- Peripheral power supply
- AC power sequencer
- Media tray for removable SCSI media drives, such as the SunCD drive

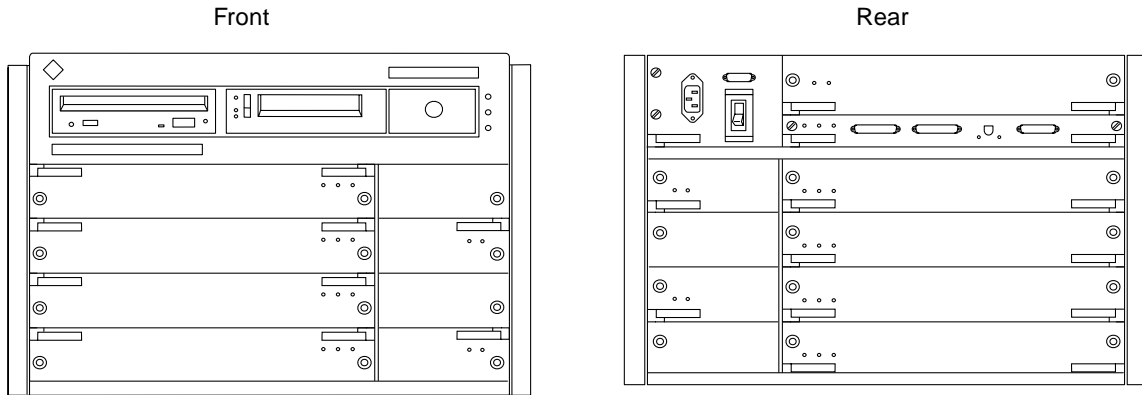


FIGURE 1-5 Enterprise 4500 System

1.4 Definitions of Terms

Centerplane — all Sun Enterprise X500 server systems use a centerplane. The orientation of the sockets on the rear of the centerplane is opposite the orientation of sockets on the front of the centerplane.

Board orientation — Boards in the front of the card cage are installed component side down, and boards in the rear of the card cage are installed component side up. Similarly, the orientation of the power/cooling modules installed in the rear of the system chassis is opposite the orientation of power/cooling modules in the front of the system chassis.

Viewer orientation — Since boards, modules, and power/cooling modules may be located on either side of the Enterprise server chassis centerplane, the terms “front,” “rear,” “right,” and “left” are defined in TABLE 1-1.

TABLE 1-1 Definitions of Terms

Orientation of the Server	
Front	The key switch is located here.
Rear	The AC power switch and cable are located here.

TABLE 1-1 Definitions of Terms (*Continued*)

Orientation of Power/Cooling Module, Board, and UltraSPARC II Module	
Front	Edge nearest you as you face the unit installed in a system
Right	Side to your right as you face the front of the installed unit
Left	Side to your left as you face the front of the installed unit

1.5 Internal Options

TABLE 1-2 Internal Options for the Sun Enterprise Server Systems

Option	Enterprise 6500	Enterprise 5500/4500	Comments
CPU/Memory+ boards, SBus+ I/O boards, Graphics+ I/O boards, and PCI+ I/O boards	16, maximum	8, maximum	Each slot can accept any of these four types of boards: CPU/Memory+ board, SBus+ I/O board, Graphics+ I/O board, and PCI+ I/O board. Combinations can vary. One CPU/Memory+ board becomes the system master automatically. Jumper changes are not needed to select the system master. For easy cable connections, I/O+ boards should be installed at the rear of the card cage, although CPU/Memory+ boards and I/O+ boards will work in either the front or rear of the card cage.
Disk boards	2 per system (<i>must</i> use slot 15 if only 1 is installed)	4 per system	Can be installed <i>only</i> in slot 14 and slot 15 in the Enterprise 6500 system. For easier Disk boards cabling, CPU/Memory+ boards can be installed in the front and Disk boards in the rear of the Enterprise system.
UltraSPARC II modules	30	14	0-2 modules on each CPU/Memory+ board.
Memory modules	0, 8, or 16 SIMMs per CPU/Memory+ board	0, 8, or 16 SIMMs per CPU/Memory+ board	SIMM sizes are 8, 32, or 128 Mbyte DRAM. Do not mix sizes within the same bank. Add 8 SIMMs at a time. Install SIMMs in all bank 0 sockets first on each CPU/Memory+ board, from the lowest slot to the highest. Once bank 0 is full, install remaining SIMMs in bank 1 sockets in the same order.
SBus cards	15 per system	7 per system	0-3 cards per SBus+ I/O board, 0-2 cards per Graphics+ I/O board.
Graphics (UPA) cards	4 per system	4 per system	0-1 card per Graphics+ I/O board.

TABLE 1-2 Internal Options for the Sun Enterprise Server Systems *(Continued)*

Option	Enterprise 6500	Enterprise 5500/4500	Comments
PCI cards	Dependent upon the type of PCI card, consult your customer representative		0-2 cards per PCI+ I/O board.
Media tray	CD-ROM and tape drive	CD-ROM and tape drive	Media tray takes removable-media drives only. One SunCD 32 is standard equipment per system. One optional tape drive is supported in the media tray.
StorEdge™ Disk Array A5000	The Enterprise 6500 and 5500 system cabinets support Sun StorEdge™ A5000 disk arrays. The expansion cabinet also supports A5000 disk arrays. Refer to documentation that comes with the disk arrays and the expansion cabinet.		
StorEdge Flexipack or L400	The Enterprise 6500 and 5500 system cabinets support the StorEdge Flexipack or L400 tape unit. The expansion cabinet also supports the StorEdge Flexipack or L400 tape units. Refer to documentation that comes with the tape unit and the expansion cabinet.		

Safety Precautions and Tools Requirements

2.1 Safety Precautions

For your protection, observe the following safety precautions when setting up your equipment:

- Follow all cautions, warnings, and instructions marked on the equipment.
- Never push objects of any kind through openings in the equipment as they may touch dangerous voltage points or short out components that could result in fire or electric shock.
- Refer servicing of equipment to qualified personnel.

To protect both yourself and the equipment, observe the following precautions:

TABLE 2-1 Safety Precautions

Item	Problem	Precaution
Wrist or foot strap	ESD	Wear a conductive wrist strap or foot strap when handling printed circuit boards.
ESD mat	ESD	An approved ESD mat provides protection from static damage when used with a wrist strap or foot strap. The mat also cushions and protects small parts that are attached to printed circuit boards.
Cover panels	System damage and overheating	Re-install all cabinet cover panels after performing any service work on the system.
Card cage slot filler panels and load boards	System damage and overheating	Make sure all empty board slots have a filler panel installed. NOTE: You must use load boards instead of filler panels in the 16-slot Enterprise 6500 system card cage.

2.2 Symbols

The following symbols mean:



HAZARDOUS VOLTAGES — To reduce the risk of electrical shock and danger, follow the instructions accompanying this symbol.



RISK OF INJURY OR EQUIPMENT DAMAGE — To reduce the risk, follow the instructions accompanying this symbol.



HOT SURFACE — Avoid contact. Surface may cause injury if touched.



ALTERNATING CURRENT OR VOLTAGE



ON



OFF



STAND-BY — The system is in standby mode and the operating system is halted. The circuit breaker can be turned off.



DIAGNOSTICS — System is powered on. If system is rebooted, POST will display extended diagnostic messages.



RUNNING (on a board or control panel) — System board is operating normally.



LOCKED — On a board, this means the captive screw is in the locked position. On a system panel, this means the system is running in secure mode and will not respond to commands from the console. The key can be removed.

FIGURE 2-1 Symbols, Part 1







	UNLOCKED — On a board, the 1/4-turn access screw is in the unlocked position.
	COMPONENT POWER — The board is receiving DC power.
	SERVICE NEEDED — The system has detected a hardware failure.
	PROTECTIVE EARTH — Earth ground
	CHASSIS GROUND — Frame or chassis ground.
	FUSE — Replace ONLY with fuse of the same type and rating.

FIGURE 2-2 Symbols, Part 2

2.3 System Precautions

Ensure that the voltage and frequency of the power outlet to be used matches the electrical rating labels on the equipment.

Wear antistatic wrist straps when handling any magnetic storage devices, CPU/Memory+ boards, or other printed circuit boards.

Use only properly grounded power outlets as described in Section 1.2, “Preparing the Electrical Circuits,” in the *Sun Enterprise 6500/5500/4500 Systems Installation Guide*, part number 805-2631.



Caution – DO NOT make mechanical or electrical modifications to the cabinet. Sun Microsystems™ is not responsible for regulatory compliance of modified cabinets.



Caution – The chassis AC power cord must remain plugged in to ensure a proper ground.

2.4 Tools Required

For the procedures in this book, you will need some or all of these tools:

- Screwdriver, slotted, 3/16 inch
- Screwdriver, Phillips #2
- Screwdriver, Phillips #1
- Hex driver, M-4
- Hex driver, 3/16 inch
- Hex driver, 9 mm
- Wrench, 13 mm (supplied with the system)
- DIP/IC extraction tool
- ESD mat
- Grounding wrist strap
- Needlenose pliers
- Hex driver, 3/32
- Torque screwdriver (supplied with the system), preset to 6 inch-pounds

CPU/Memory+ Boards and Components

To protect both yourself and the equipment, make sure you follow the precautions in Chapter 2 “Safety Precautions and Tools Requirements.”

- Safety Precautions—page 2-1
- Handling Boards and Assemblies—page 3-2
- Filler Panels and Load Boards—page 3-3
- Hot-Plug Feature—page 3-4
- CPU/Memory+ Boards—page 3-5
- UltraSPARC II Modules—page 3-11
- Memory Modules (SIMMs)—page 3-16
- Connectors—page G-2

For your protection, also observe the following safety precautions when setting up your equipment:

- Follow all cautions, warnings, and instructions marked on the equipment.
- Never push objects of any kind through openings in the equipment as they may touch dangerous voltage points or short out components that could result in fire or electric shock.
- Refer servicing of equipment to qualified personnel.

3.1 Handling Boards and Assemblies



Caution – The chassis AC power cord must remain connected to ensure a proper ground.



Caution – The CPU/Memory+ boards, modules, and cards have surface-mount components that can be broken by flexing the boards.

To minimize the amount of board flexing, observe the following precautions:

- Hold the board only by the edges near the middle of the board, where the board stiffener is located. Do not hold the board *only* at the ends.
- When removing the board from an antistatic bag, keep the board vertical until you lay it on the Sun ESD mat.
- Do not place the board on a hard surface. Use a cushioned antistatic mat. The board connectors and components have very thin pins that bend easily.
- Do not use an oscilloscope probe on the components. The soldered pins are easily damaged or shorted by the probe point.
- Transport the board in an antistatic bag.
- Be careful of small parts located on the component side of the board.
- Be careful not to drag boards across surfaces as board components are easily damaged.



Caution – The heatsinks on the board can be damaged by incorrect handling. Do not touch the heatsinks while installing or removing the board. Hold the board only by the edges. If a heatsink is loose or broken, obtain a replacement board.



Caution – When inserting a board into slot 4 or slot 10 of a 16-slot card cage, lift the board slightly to avoid damage to the centerplane connectors.



Caution – The heatsinks on the board can be damaged by improper packaging. When storing or shipping the board, ensure that the heatsinks have sufficient protection.

3.2 Filler Panels and Load Boards

All empty board slots in Enterprise systems must have either a filler panel or a load board installed. (A load board is distinguished by the presence of centerplane connectors. A filler panel has no centerplane connectors.)

- Empty slots in Enterprise 5500 and 4500 systems must have a filler panel installed (FIGURE 3-1).
- Empty slots in Enterprise 6500 systems must have a load board installed (FIGURE 3-2).

Load boards and filler panels are inserted into a board slot with the springfingers facing down if inserted in the front of the system; the springfingers face up if inserted in the rear of the system.

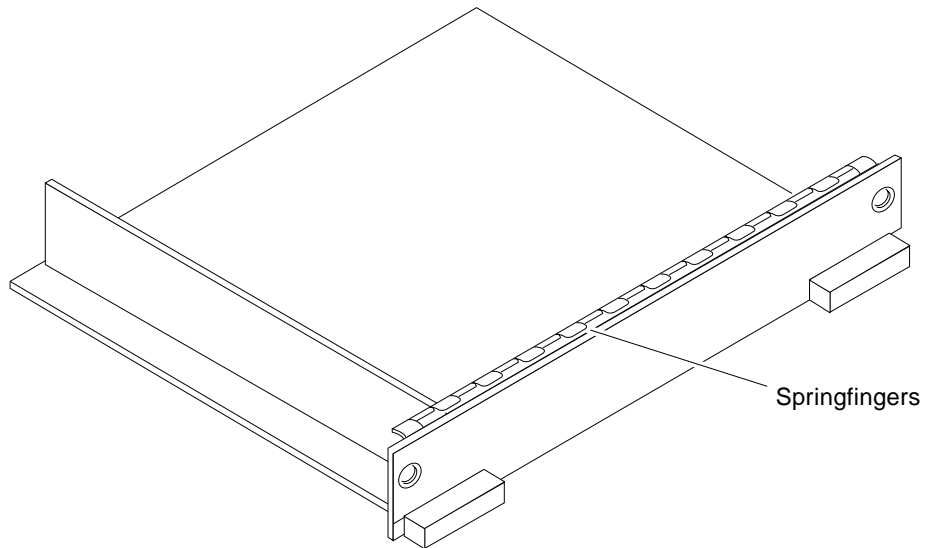


FIGURE 3-1 Filler Panel (Enterprise 5500/4500 Only)

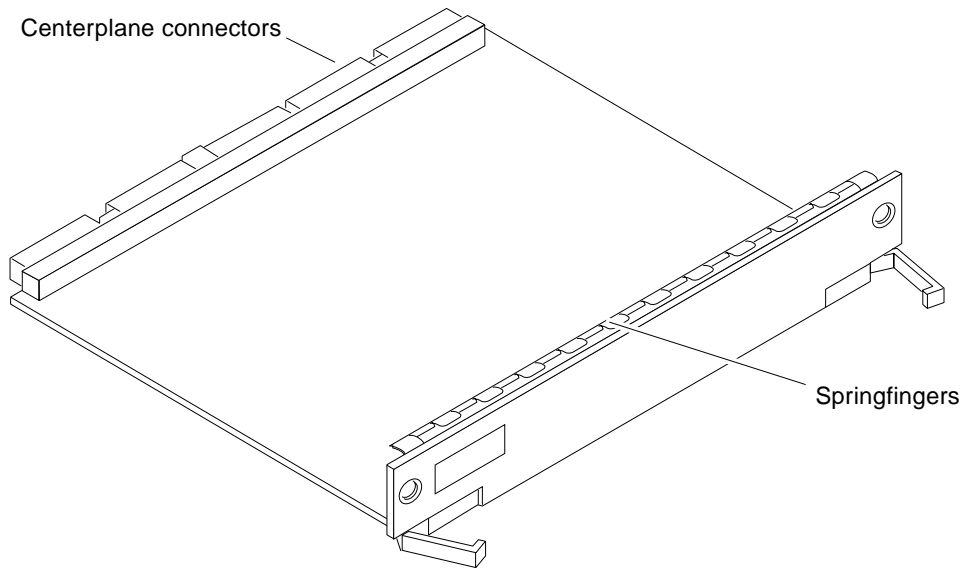


FIGURE 3-2 Load Board (Enterprise 6500 Systems Only)

3.3 Hot-Plug Feature

Enterprise systems have extensive error detection mechanisms, and an Automatic System Reconfiguration (ASR) feature that enables the system to be rebooted with failed components (such as CPUs, memory, or I/O) disabled. When an error is detected, the system can be reconfigured so that the board containing the failed components is placed in low power mode and is no longer accessible.



Caution – The peripheral power supply provides the precharge voltages required for hot-plug. Do not attempt hot-plug of a system component if the power supply is missing or inoperative. Use `prtdiag(1M)` to determine the status of the peripheral power supply.



Caution – If the message: `NOTICE: Hot Plug not supported in this system` is displayed during boot, do NOT attempt hot-plug in this system or damage to the hardware will occur.

The hot-plug feature enables you to insert a new board into a powered-on system, despite the system being “live,” or being supplied with electrical power. When the hot-plug feature is used to add a board to a powered-on system, the system will not use the new board until the system is rebooted.

3.4 CPU/Memory+ Boards

Each CPU/Memory+ board supports up to two UltraSPARC II modules and 16 SIMM slots for memory.

The CPU/Memory+ board includes an Address Controller (AC+), 8 bit-sliced Data Controllers (DC+s), a Bootbus Controller, onboard devices (including a Flash PROM, and SRAM), two CPU processor slots, and slots for two memory banks of 8 SIMMs each.

3.4.1 Removing a Board

3.4.1.1 Removing a Board from a Powered-On System



Caution – Remove a board from a powered-on system only after the ASR software has disabled the board. If a board has not been disabled by the ASR software, then the operating system should be halted and the system powered off prior to board removal. See Chapter 11 “Powering Off and On” and then see Section 3.4.1.2 “Removing a Board From a Powered-Off System.”

1. **Ensure that the board has been disabled by the ASR software. See Section 3.3 “Hot-Plug Feature.”**

There are two possible results:

- The three LEDs on the board are not lit (board has no power).
- The outer two green LEDs are not lit and the middle yellow LED is lit (board in low power mode).

2. **Use a Phillips #1 screwdriver to unlock the board.**

Insert the screwdriver into each quarter-turn access slot (the slots are on the left and right sides of the board) and turn the arrow to the unlocked position (FIGURE 3-3).

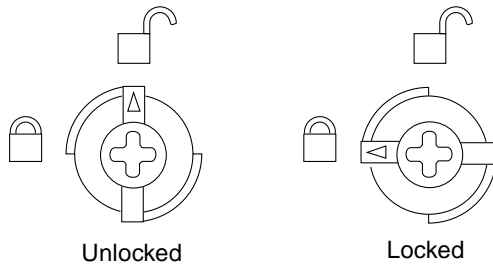


FIGURE 3-3 Unlocking and Locking Quarter-Turn Access Slots

- 3. Pull the ends of both extraction levers outward simultaneously to unseat the board centerplane connector from the centerplane receptacles (FIGURE 3-4).**

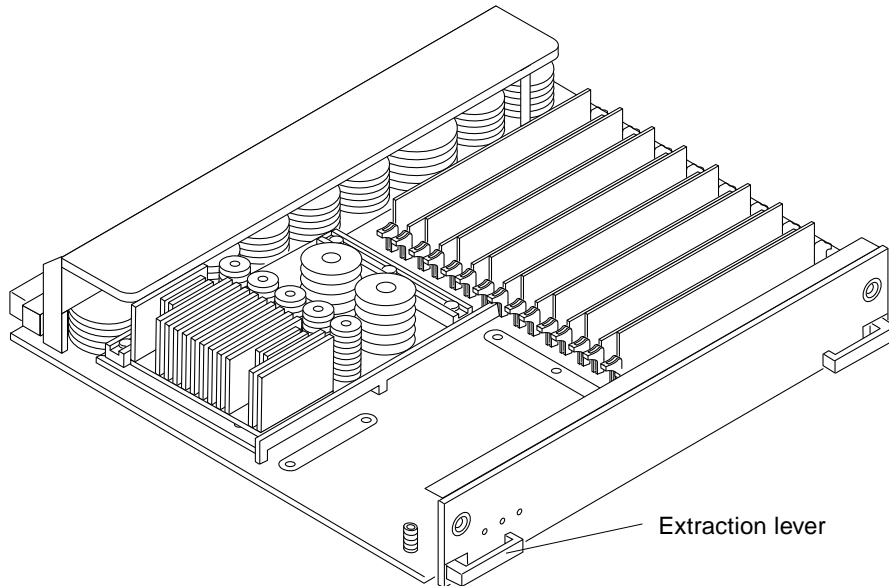


FIGURE 3-4 CPU/Memory+ Board

- 4. If a board is not immediately replaced, a load board (Enterprise 6500 systems only) or a filler panel (Enterprise 4500 and 5500 systems only) must be installed in its place.**
See Section 3.2 “Filler Panels and Load Boards.”

3.4.1.2 Removing a Board From a Powered-Off System

1. **Use a Phillips #1 screwdriver to mechanically release the board from the system card cage.**
Insert the screwdriver into each quarter-turn access slot (the slots are located on the left and right sides of the board front panel) and then turn a quarter turn so that the arrow points to the unlocked position (FIGURE 3-3).
2. **Pull the ends of both extraction levers outward simultaneously to release the board from the centerplane receptacles (FIGURE 3-4).**
3. **If a board is not immediately replaced, a load board (Enterprise 6500 systems only) or a filler panel (Enterprise 4500 and 5500 systems only) must be installed in its place.**
See Section 3.2 “Filler Panels and Load Boards.”

3.4.2 Installing a Board

3.4.2.1 Board Slot Selection

Note – It is suggested that CPU/Memory+ boards be installed in the front slots, and I/O+ and Disk boards be installed in the rear slots because of cabling. Should the need arise, however, any of these three board types can be placed in any board slot, with the exception of slot 1. Slot 1 should be used for an I/O+ board because it is the only slot connected to the onboard SCSI devices.

The first CPU/Memory+ board is placed in slot 0, followed sequentially by all remaining even numbered slots. If there are boards remaining, they can be installed sequentially in odd numbered slots, if available, in the system rear (with the exception of slot 1 as noted above). See FIGURE 3-5 and FIGURE 3-6 for board slot locations.

For CPU/Memory+ boards being placed in the rear of the system, ensure that the component side is up. If the boards are placed in the front of the system, ensure that the component side is down (FIGURE 3-7).

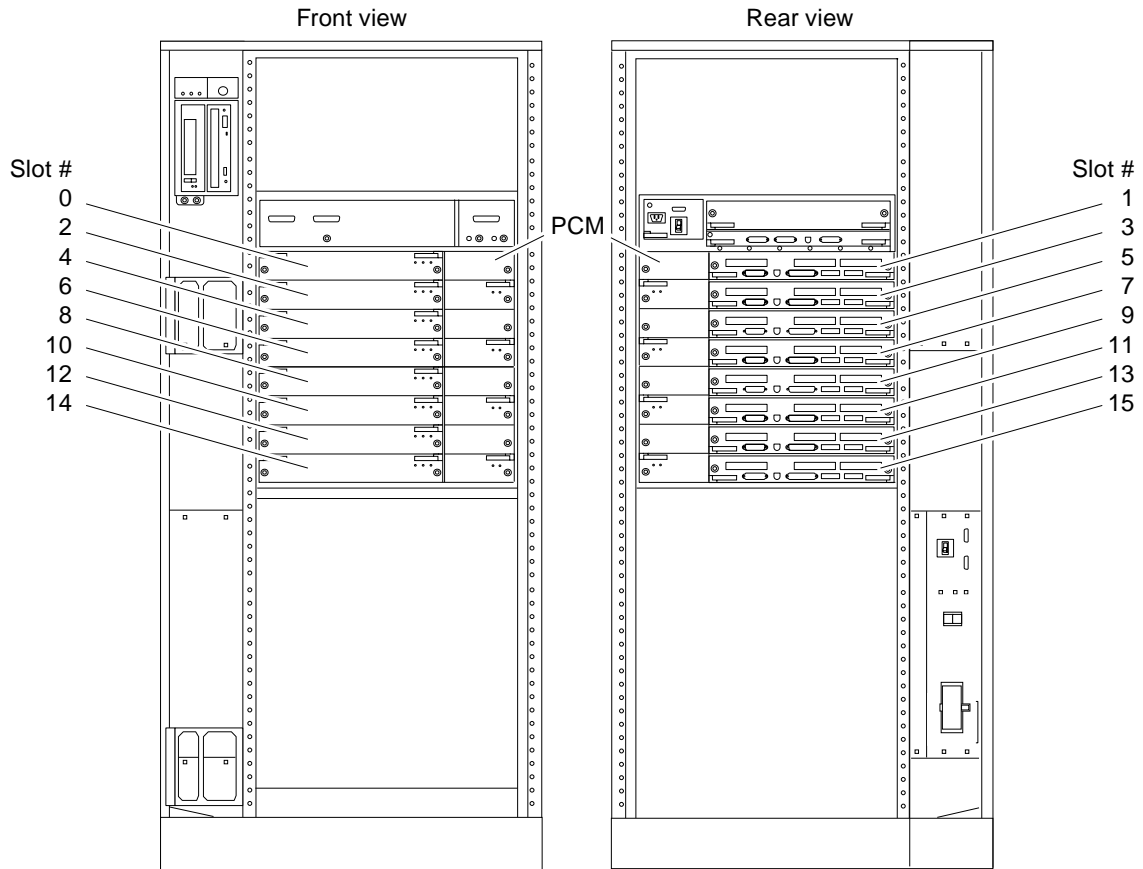


FIGURE 3-5 Enterprise 6500 Board Locations

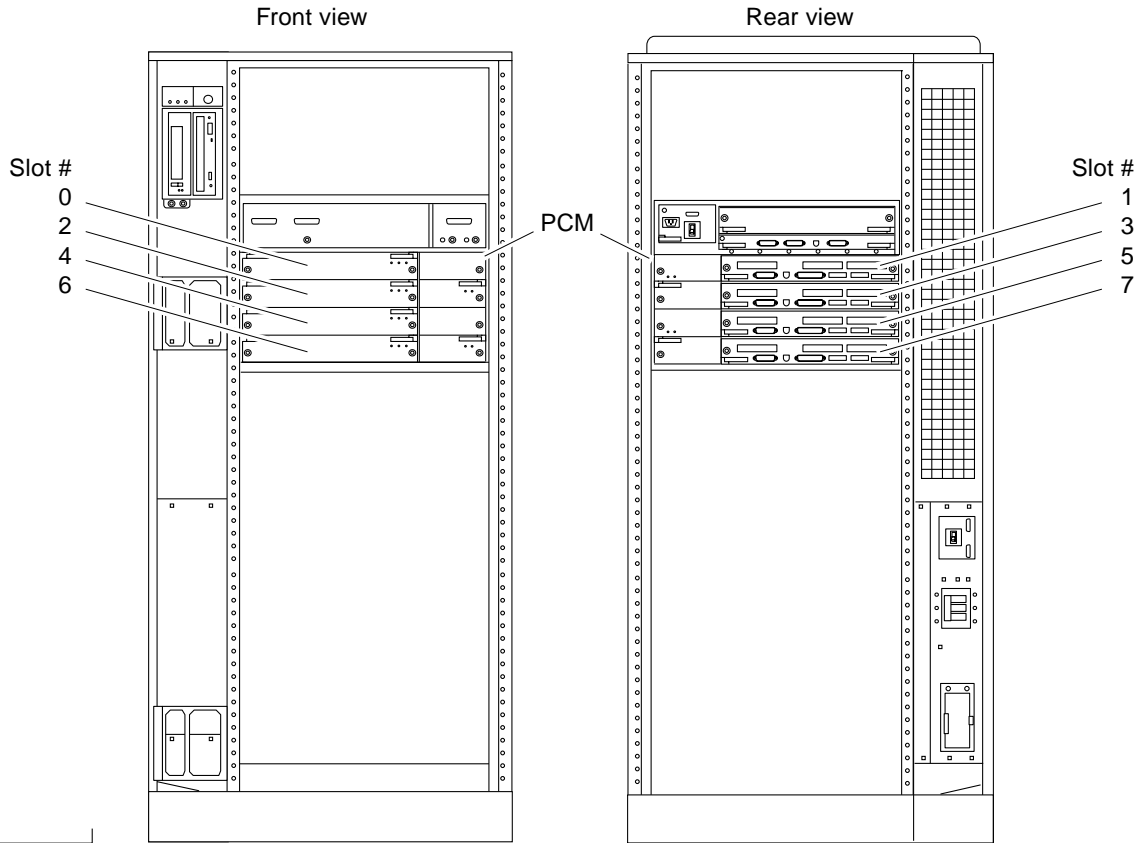


FIGURE 3-6 Enterprise 5500/4500 Board Locations

3.4.2.2 Cooling and Power Issues

There should be one power/cooling module (PCM) for every two boards to adhere to cooling and power requirements. The PCMs must be installed adjacent to populated board slots to ensure the fan in the PCM can cool the respective boards.

Note – All empty board slots in Enterprise 4500 or 5500 systems must have a filler panel installed to ensure proper cooling and for EMI protection. All empty slots in Enterprise 6500 systems must have load boards installed.

3.4.2.3 Inserting a System Board

1. Carefully insert the board (component side down if in front; component side up if in the rear) in the proper slot in the card cage, ensuring that the board does not slip out of the left and right card guide (FIGURE 3-7).

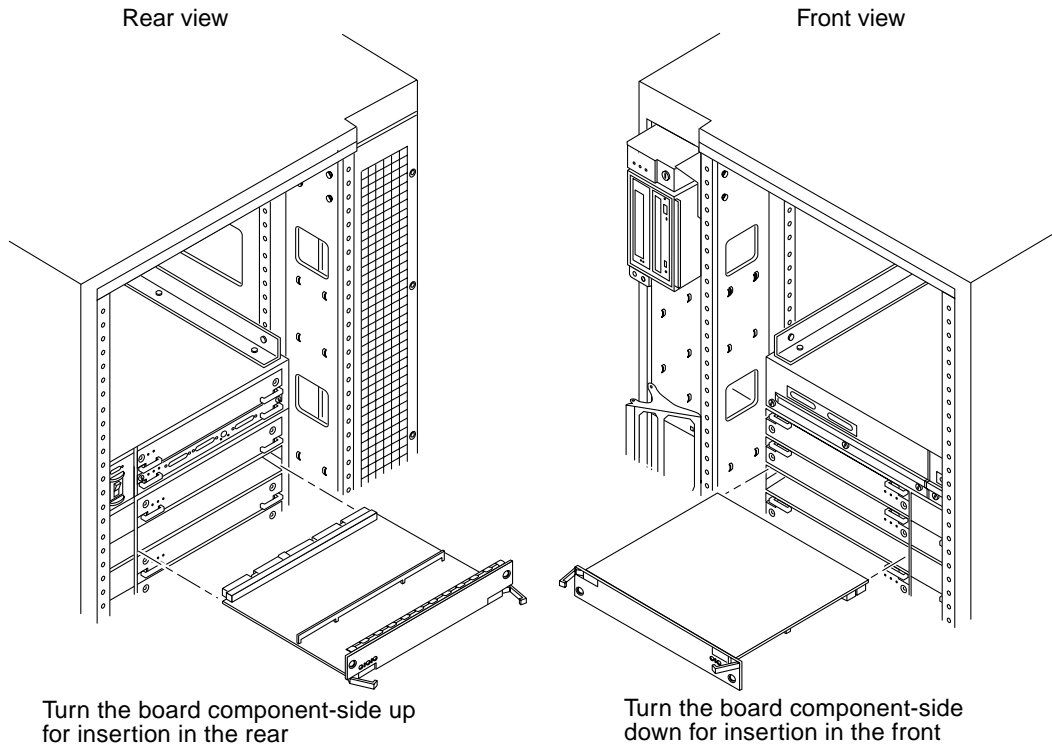


FIGURE 3-7 Board Replacement

2. Ensure that both extraction levers are in the insert position (arrow pointing outward), and that the quarter-turn access slots are unlocked (arrow indicates unlocked position) as you slide the board toward the centerplane receptacles (FIGURE 3-3 and FIGURE 3-4).

The board will not seat fully unless the levers are in this starting position and both quarter-turn access slots are unlocked.



Caution – DO NOT FORCE any board into a slot; it can cause damage to the board and system. The board should insert and seat smoothly. If it binds, remove the board and inspect the card cage slot for any obvious obstructions. Also inspect both the board and the centerplane for bent pins or other damage.

- 3. Push the board into the card cage, then simultaneously press both extraction levers to seat the board on the centerplane.**

Pushing both levers simultaneously avoids twisting the board and bending the connector pins, and mates the board centerplane connector to the matching receptacle on the centerplane. Do not press on board front panel to seat it—doing so will damage the connector pins.

- 4. Mechanically lock the board to the system chassis by inserting a Phillips #1 screwdriver into each quarter-turn access slot and then turning to the locked position (FIGURE 3-3).**
- 5. Once the board has been installed, a message similar to the following will be displayed on the monitor (if the system is powered on):**

Example depicts screen output when a new CPU/Memory+ board has been hot-plugged into slot 6 of an operating Enterprise system:

```
NOTICE: CPU Board Hotplugged into Slot 6
NOTICE: Board 6 is ready to remove
```

This screen output indicates that the board has been detected by the system and is in the low power mode. Additionally, any subsequent `prtdiag(1M)` output would include information for board slot 6. Again, note that the system will not use the new board until the system is rebooted.

- 6. Reboot the system now or schedule a later time to reboot when system disruption will be minimized.**

3.4.3 UltraSPARC II Modules

Each CPU/Memory+ board has four connectors for UltraSPARC II modules (up to two modules per board, two connectors per module). For each module, there is a connector with 144 pins and a connector with 288 pins (FIGURE 3-8).

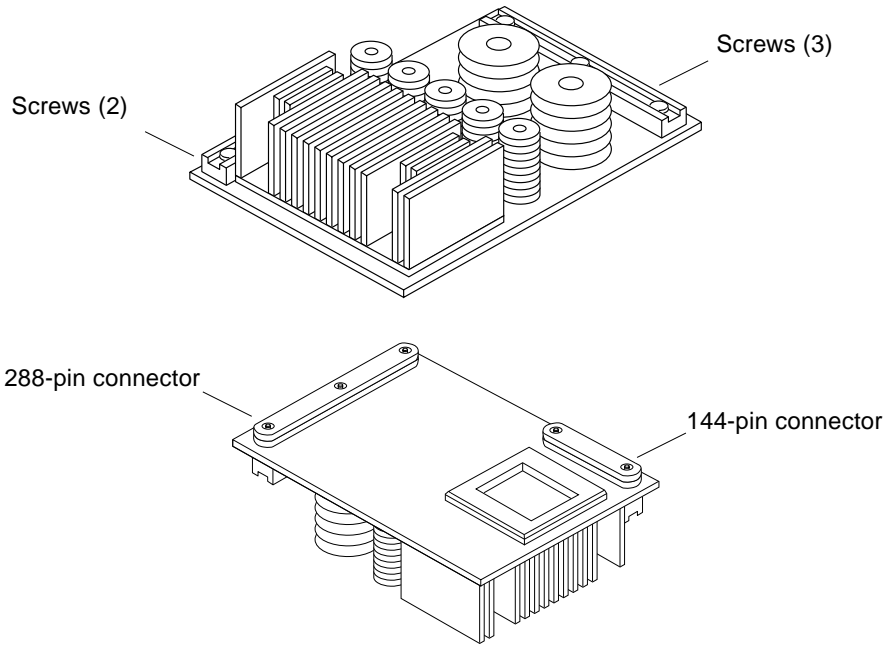


FIGURE 3-8 UltraSPARC II Module Connectors

3.4.4 Handling Precautions

The following precautions should be exercised when handling UltraSPARC II modules:

- UltraSPARC II modules are static-sensitive and a grounding wrist strap field kit must be used when handling the modules.
- Always handle the modules by the edges and not by the smaller black heat sinks that break easily if handled improperly.
- Do not handle the modules by touching the gold pins on the compression connectors. Natural oils on the hands cause these connectors to oxidize and corrode over a period of time, resulting in the need for module cleaning or replacement.

3.4.4.1 Removing a Module

Each module is locked to the main board with a single standoff and is connected to the main board by two connectors. The pins within the connectors are compressed to the corresponding board mating surfaces by a metal compression bar which, when secured with screws, compresses the module connector pins to the board mating surfaces (FIGURE 3-9).

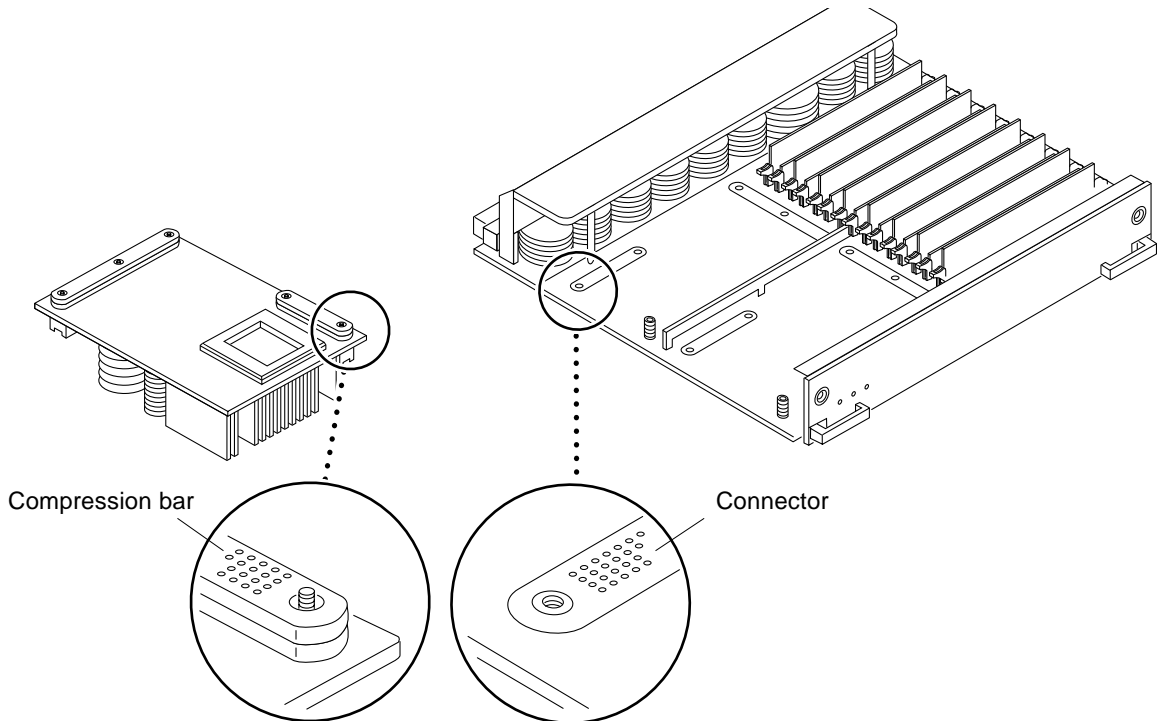


FIGURE 3-9 Ultra SPARC Module Connector Detail

1. Use the procedures in Section 3.4.1 “Removing a Board,” to remove the applicable CPU/Memory+ board.



Hot Surface – The heatsinks on the UltraSPARC II modules may be hot. Use caution when removing or installing UltraSPARC II modules and avoid contact.

2. Use a 3/32 Hex driver to loosen all screws on each of the compression connectors on the module to be removed (three screws for the 288-pin connector, two screws for the 144-pin connector) (FIGURE 3-8).

- 3. Lift the module straight up, off the board mating surface and the single standoff that locks the module to the board.**

Use pressure applied with fingers to assist in removing module from standoff (FIGURE 3-10).

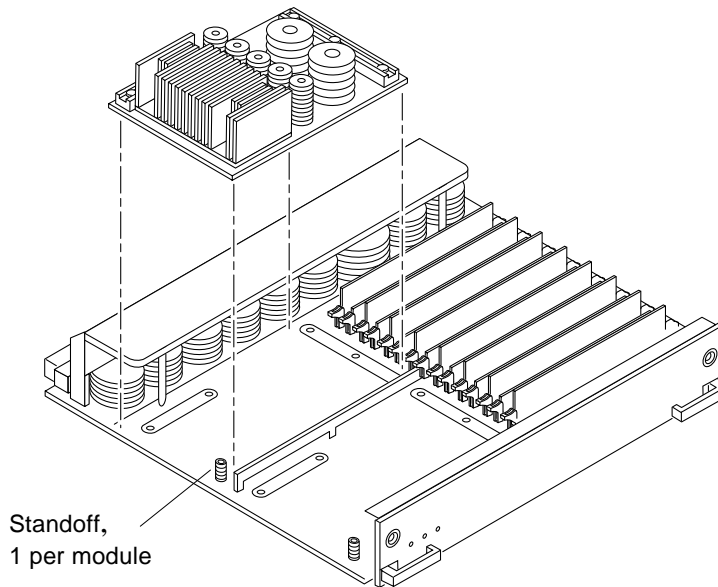


FIGURE 3-10 UltraSPARC II Module Removal and Replacement

- 4. Place the module in an antistatic bag.**

3.4.4.2 Installing a Module

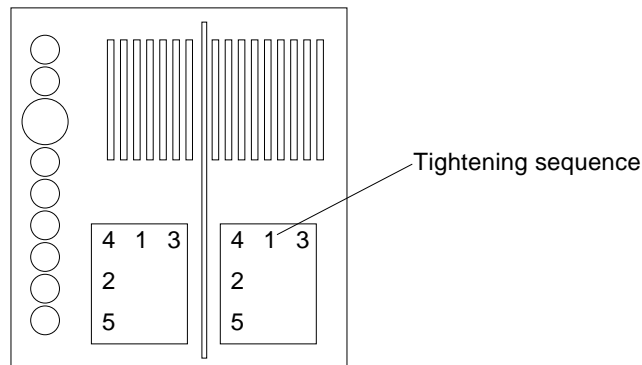
To maximize performance when installing UltraSPARC II modules on a CPU/Memory+ board, use all CPU 0 connectors on the lowest numbered slot to the highest numbered slot. If there are modules remaining, use the CPU 1 connectors in the same order.

Note – Screws on the UltraSPARC II modules must be tightened to 6 inch-pounds. The torque screwdriver that came with your system is set to this specification.

1. **Take the UltraSPARC II module out of the protective packaging and inspect for dust on the connectors.**
If necessary, clean the connectors with a dry, stiff toothbrush.
2. **Remove the applicable CPU/Memory+ board as indicated in Section 3.4.1 “Removing a Board.”**
3. **Inspect the board module mating surface and connectors. If they require cleaning, use a dry, stiff toothbrush to remove debris.**

Note – There are miniature silver alignment pins on the compression connectors which, when the module is properly seated, align with related receptacles on the mating surfaces of the CPU/Memory+ board. In addition, there is a gold standoff mounted on the CPU/Memory+ board opposite the module’s smaller board connector. This acts as a standoff for the module as well as an alignment pin.

4. **Holding the module by the edges, align the module over the two board receptacles (use the single standoff and the alignment pins on the module compression connector as a guide). See FIGURE 3-9 and FIGURE 3-10.**
5. **Rest the module on the board standoff, aligning the compression connectors with the screws.**
Firmly but gently press the module straight down until the standoff post snaps into place and the module connectors are fully seated.
6. **Using the torque screwdriver provided with your system, *partially tighten* the five 3/32 hex screws:**
 - a. ***Partially tighten* the screws just until they touch the compression connectors in order, beginning with screw 1.**



- b. **Tighten the five screws an additional one-half turn in the same tightening sequence.**

- c. **Finish the module installation by tightening *all* the screws to 6 inch-pounds in the same tightening sequence. See FIGURE 3-11.**



Caution – Do not over torque or under torque the screws. Excessive force can warp the connector. Insufficient force can cause an incomplete electrical connection.

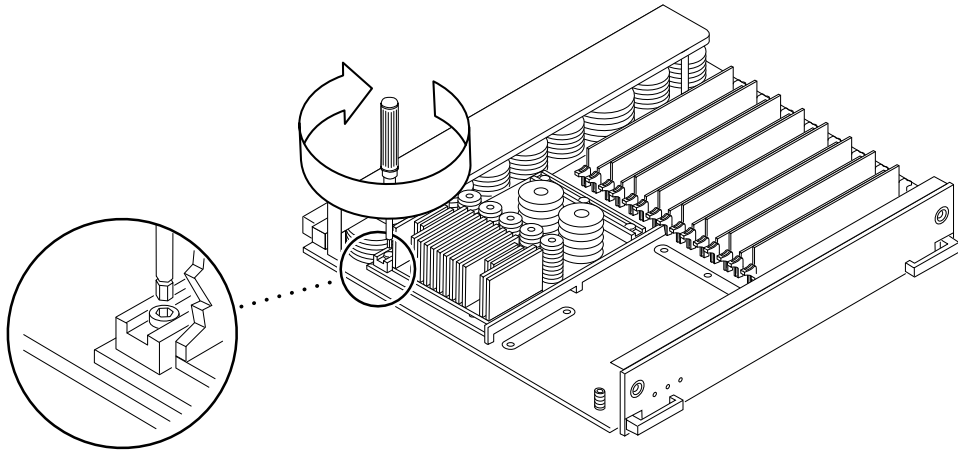


FIGURE 3-11 Tightening Compression Connector Screws

7. Use the procedures in Section 3.4.2 “Installing a Board,” to replace the applicable CPU/Memory+ board.

3.4.5 Memory Modules (SIMMs)

The CPU/Memory+ board has 16 SIMM sockets, which are divided into two banks of 8 SIMMs each, Bank 0 and Bank 1. Bank 0 and Bank 1 SIMMs occupy alternate slot locations; Bank 0 SIMMs are in the even numbered slots, and Bank 1 SIMMs are in odd numbered slots (FIGURE 3-12).

Three types of SIMMs (TABLE 3-1) can be used in Bank 0 and Bank 1.

TABLE 3-1 SIMM vs. DRAM

SIMM	DRAM
8 Mbyte	1 Mbyte x4
32 Mbyte	4 Mbyte x4
128 Mbyte	16 Mbyte x4

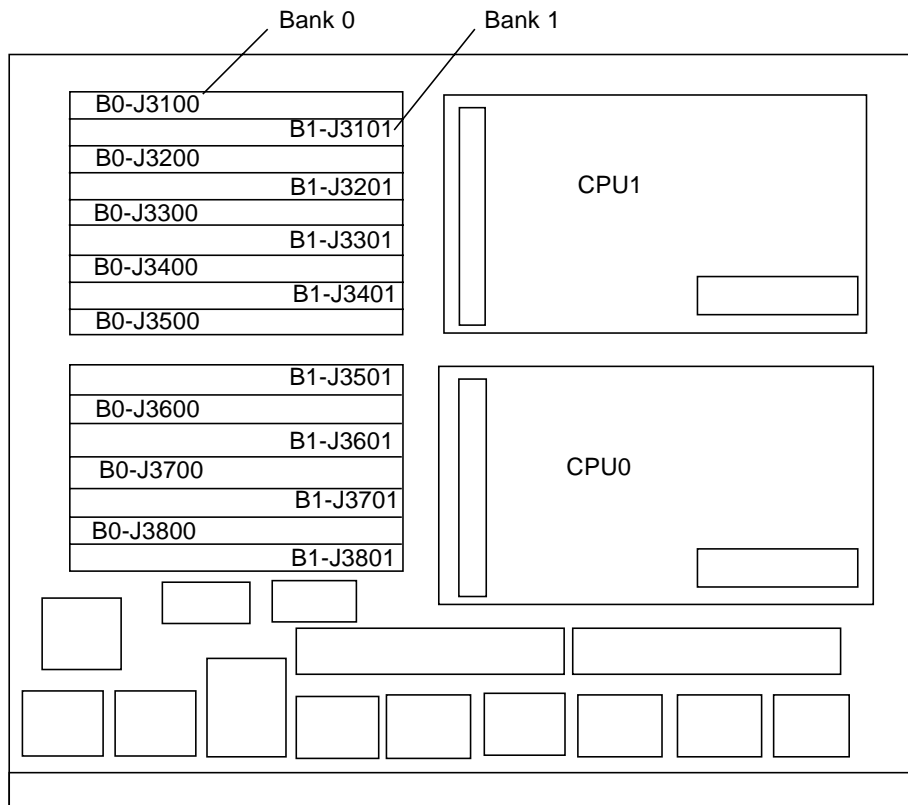


FIGURE 3-12 SIMM Slot Numbers

3.4.5.1 Removing a Memory Module

1. Remove the CPU/Memory+ board from which the SIMM is to be removed. See Section 3.4.1 “Removing a Board.”
2. Attach a wrist strap and place an antistatic surface next to the system.

3. Use the system error messages to locate the slot (FIGURE 3-12) for the SIMM you need to replace.
4. Eject the faulty SIMM by pressing down on the ejection levers on both sides of the SIMM connector (FIGURE 3-13).

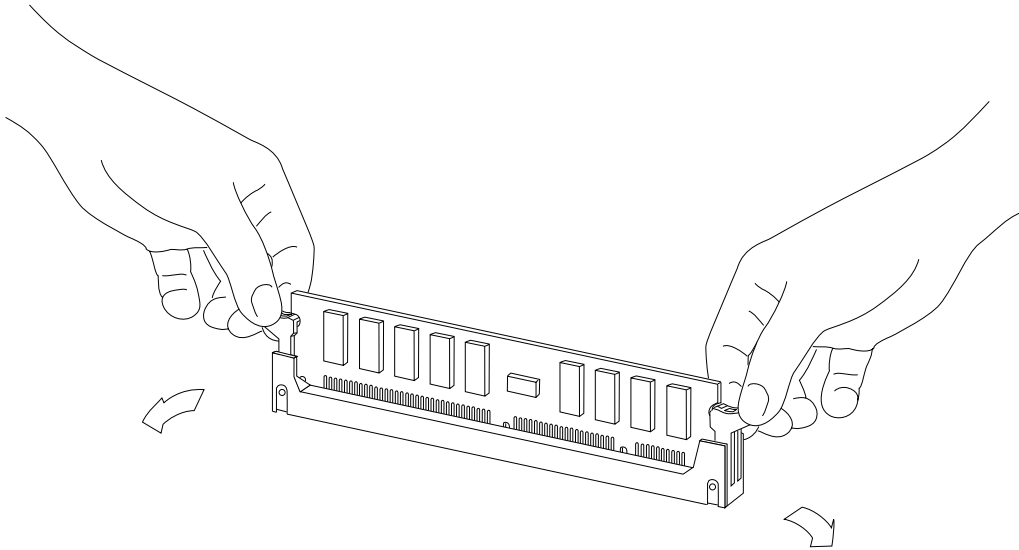


FIGURE 3-13 Ejecting a SIMM

5. Holding the SIMM by its edges, remove it from the slot and place it on an antistatic surface.

3.4.5.2 Installing a Memory Module

Requirements

All banks must have the same size SIMMs, however, SIMMs from different manufacturers are interchangeable in a single bank if the SIMMs all have the same capacity and speed. Sort the SIMMs into banks of eight using the same size SIMMs.

Maximizing Performance

The following guidelines will result in optimal memory interleaving across boards for performance. These guidelines are for optimal performance and are not requirements for a functional system. The guidelines apply to systems with no SIMMs installed and when adding SIMMs to a system; if you are adding SIMMs, you may need to move some SIMMs to meet the guidelines.

- 1. Install one bank on each board before installing the second bank on any board.**
It does not matter whether the first bank is bank 0 or bank 1.
- 2. Begin with the largest density banks first (128 Mbyte SIMMs), continue with medium sized banks (32 Mbyte SIMMs), and finish with the smallest banks (8 Mbyte SIMMs).**
- 3. If there is remaining memory, start filling the second banks on the boards in the same order as the first banks.**

Installation

- 1. Place the CPU/Memory+ board on which the SIMM is to be installed on an antistatic mat.**
- 2. Carefully remove the new SIMM from its protective packaging and place it on an antistatic surface.**
The bag that the SIMM is packed in makes a good antistatic surface.
- 3. Press down on the ejector levers at both ends of the SIMM connector slot that will receive the new SIMM.**
The connector slot will not accept the SIMM unless the levers are in the insert position (FIGURE 3-14).
- 4. Align the SIMM with the slot.**
Hold the SIMM by its edges and orient it so that the two notches at the bottom of the SIMM line up with the two tabs in the SIMM connector (FIGURE 3-14).
- 5. Place your thumbs on the top edge of the SIMM and push the SIMM firmly into its connector (FIGURE 3-15).**
- 6. Lock the SIMM in place by pushing both ejector levers into the upright position (FIGURE 3-15).**
- 7. Install the CPU/Memory+ board and detach the wrist strap.**
See Section 3.4.2 “Installing a Board.”
- 8. As you reboot the system, watch for the system banner to verify that the new memory is recognized by the system.**

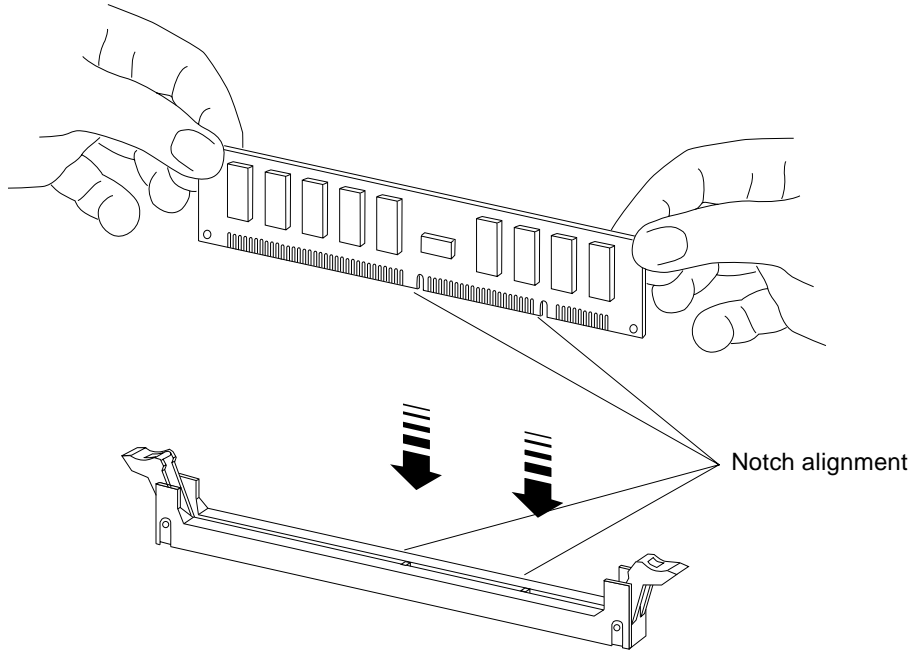


FIGURE 3-14 Orienting a SIMM

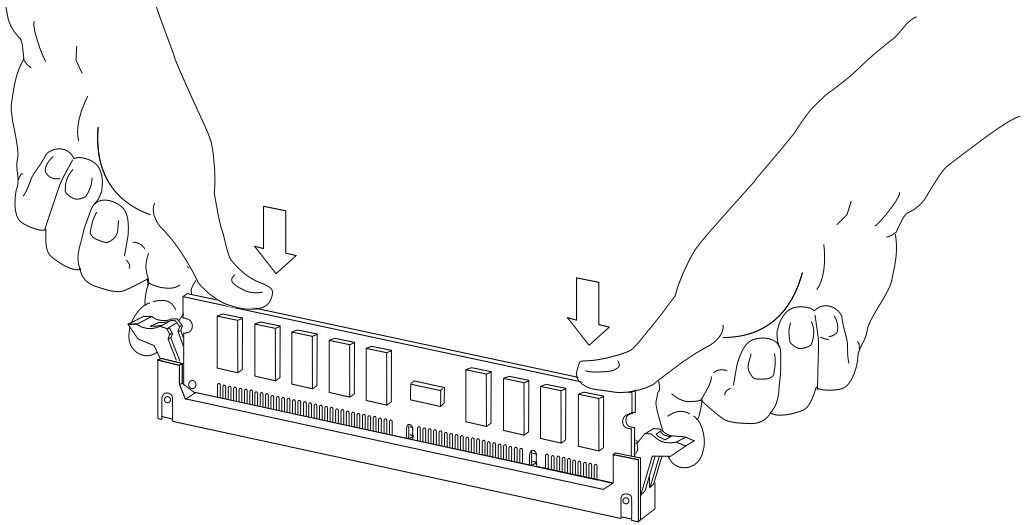


FIGURE 3-15 Installing a SIMM

I/O+ Boards and Components

To protect both yourself and the equipment, make sure you follow the precautions in Chapter 2 “Safety Precautions and Tools Requirements.”

- Handling Boards and Assemblies—page 4-2
- Filler Panels and Load Boards—page 4-3
- SCSI Termination—page 4-4
- Hot-Plug Feature—page 4-5
- I/O+ Boards—page 4-6
- SBus Cards—page 4-16
- Graphics (UPA) Cards—page 4-23
- GBICs—page 4-26
- PCI Cards—page 4-29
- Connectors—page G-5

For your protection, also observe the following safety precautions when setting up your equipment:

- Follow all cautions, warnings, and instructions marked on the equipment.
- Never push objects of any kind through openings in the equipment as they may touch dangerous voltage points or short out components that could result in fire or electric shock.
- Refer servicing of equipment to qualified personnel.

4.1 Handling Boards and Assemblies



Caution – The chassis AC power cord must remain connected to ensure a proper ground.



Caution – The I/O+ boards, their modules, and cards have surface-mount components that can be broken by flexing the boards.

To minimize the amount of board flexing, observe the following precautions:

- Hold the board only by the edges near the middle of the board, where the board stiffener is located. Do not hold the board *only* at the ends.
- When removing the board from an antistatic bag, keep the board vertical until you lay it on the Sun ESD mat.
- Do not place the board on a hard surface. Use a cushioned antistatic mat. The board connectors and components have very thin pins that bend easily.
- Do not use an oscilloscope probe on the components. The soldered pins are easily damaged or shorted by the probe point.
- Transport the board in an antistatic bag.
- Be careful of small parts located on the component side of the board.
- Be careful not to drag boards across surfaces as board components are easily damaged.



Caution – The heatsinks on the board can be damaged by incorrect handling. Do not touch the heatsinks while installing or removing the board. Hold the board only by the edges. If a heatsink is loose or broken, obtain a replacement board.



Caution – When inserting the board into slot 4 or slot 10 of a 16-slot card cage, lift the board slightly to avoid damage to the centerplane connectors.



Caution – The heatsinks on the board can be damaged by improper packaging. When storing or shipping the board, ensure that the heatsinks have sufficient protection.

4.2 Filler Panels and Load Boards

All empty board slots in Enterprise systems must have either a filler panel or a load board installed. (A load board is distinguished by the presence of centerplane connectors. A filler panel has no centerplane connectors.)

- Empty slots in Enterprise 5500 and 4500 systems must have a filler panel installed (FIGURE 4-1).
- Empty slots in Enterprise 6500 systems must have a load board installed (FIGURE 4-2).

Load boards and filler panels are inserted into a board slot with the springfingers facing down if inserted in the front of the system; the springfingers face up if inserted in the rear of the system.

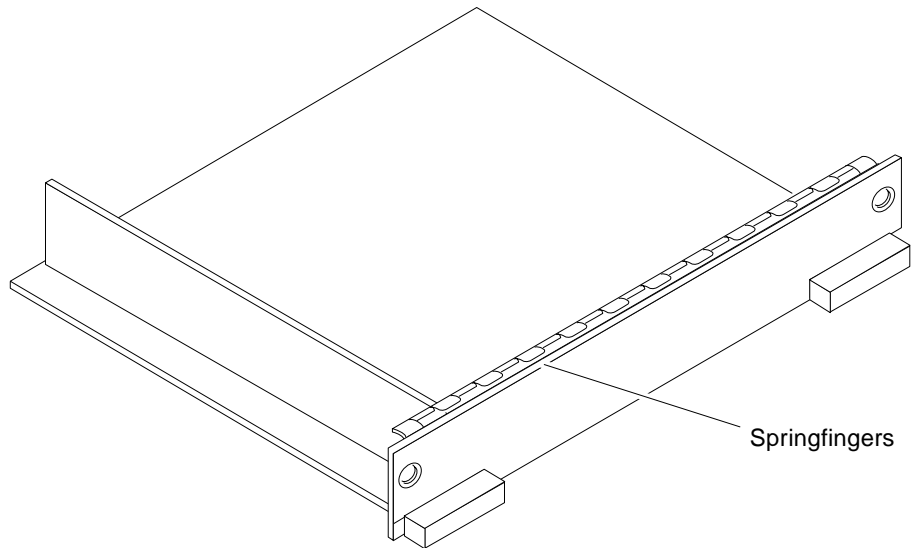


FIGURE 4-1 Filler Panel (Enterprise 5500/4500 Only)

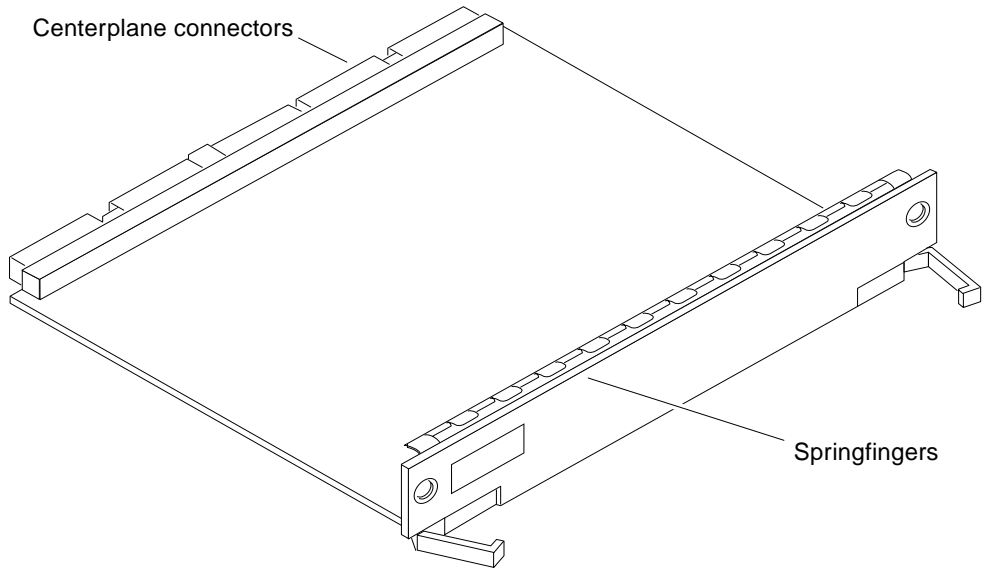


FIGURE 4-2 Load Board (Enterprise 6500 System Only)

4.3 SCSI Termination

The I/O+ board in slot 1 controls the internal media tray devices. Therefore, the external SCSI connector on the I/O+ board in slot 1 of a system must be terminated with a SCSI terminator (FIGURE 4-3).

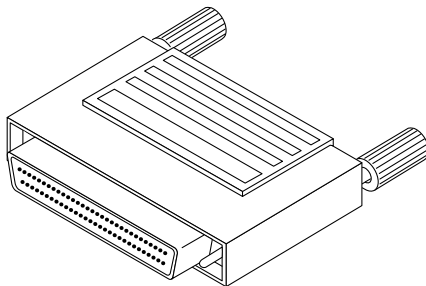


FIGURE 4-3 SCSI Terminator

4.4 Hot-Plug Feature

Enterprise systems have extensive error detection mechanisms, and an Automatic System Reconfiguration (ASR) feature that enables the system to be rebooted with failed components (such as CPUs, memory, or I/O) disabled. When an error is detected, the system can be reconfigured so that the board containing the failed components is placed in low power mode and is no longer accessible.



Caution – The peripheral power supply provides the precharge voltages required for hot-plug. Do not attempt hot-plug of a system component if the power supply is missing or inoperative. Use `prtdiag(1M)` to determine the status of the peripheral power supply.



Caution – If the message: `NOTICE: Hot Plug not supported in this system` is displayed during boot, do NOT attempt hot-plug in this system or damage to the hardware will occur.

The hot-plug feature enables you to insert a new board into a powered-on system, despite the system being “live,” or being supplied with electrical power. When the hot-plug feature is used to add a board to a powered-on system, the system will not use the new board until the system is rebooted.

4.5 I/O+ Boards

Enterprise 6500/5500/4500 systems support three types of I/O+ boards: SBus+ I/O board with 100 MB/sec Fibre Channel, Graphics+ I/O board with 100 MB/sec Fibre Channel, and PCI+ I/O board. Each board has three LEDs that provide board status codes (FIGURE 4-4 through FIGURE 4-6).

4.5.1 GBIC

Each SBus+ and Graphics+ I/O board provides mounting for two GBIC interfaces. A GBIC (Gigabit Interface Converter) is a hot-pluggable unit that converts any of the standard Fibre Channel connectors and signaling technologies. The GBIC Fibre Channel referred to in this manual is 100 Mbytes/second.

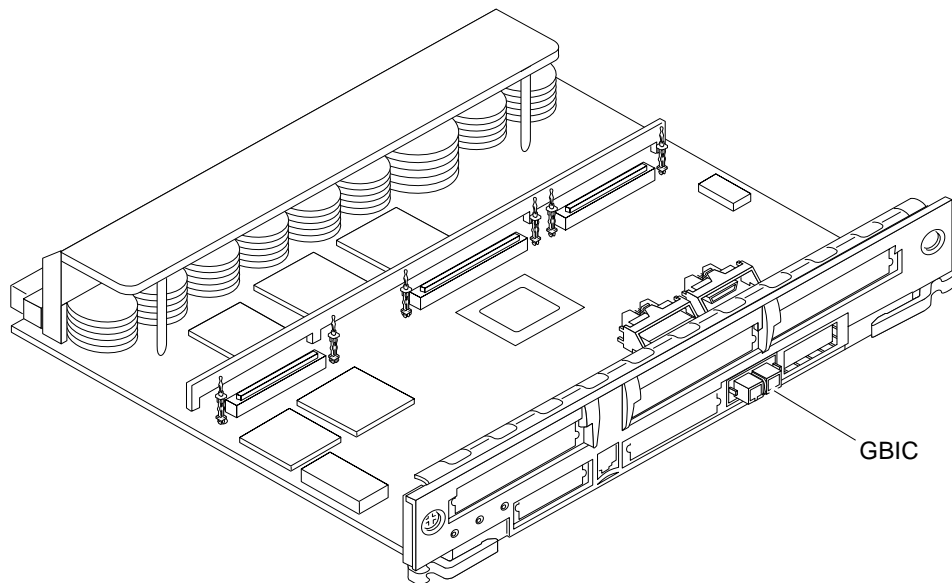


FIGURE 4-4 SBus+ I/O Board with 100 MB/sec Fibre Channel

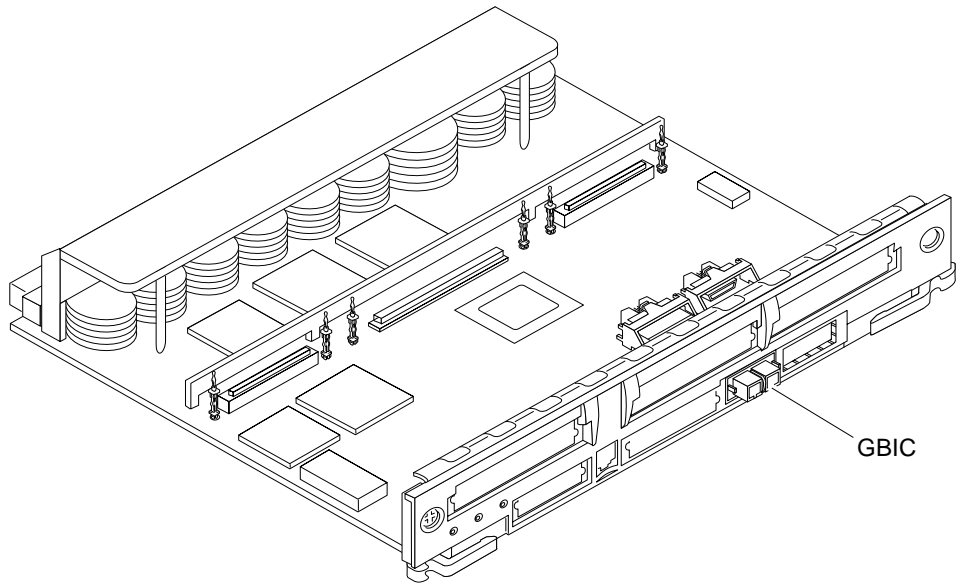


FIGURE 4-5 Graphics+ I/O Board with 100 MB/sec Fibre Channel

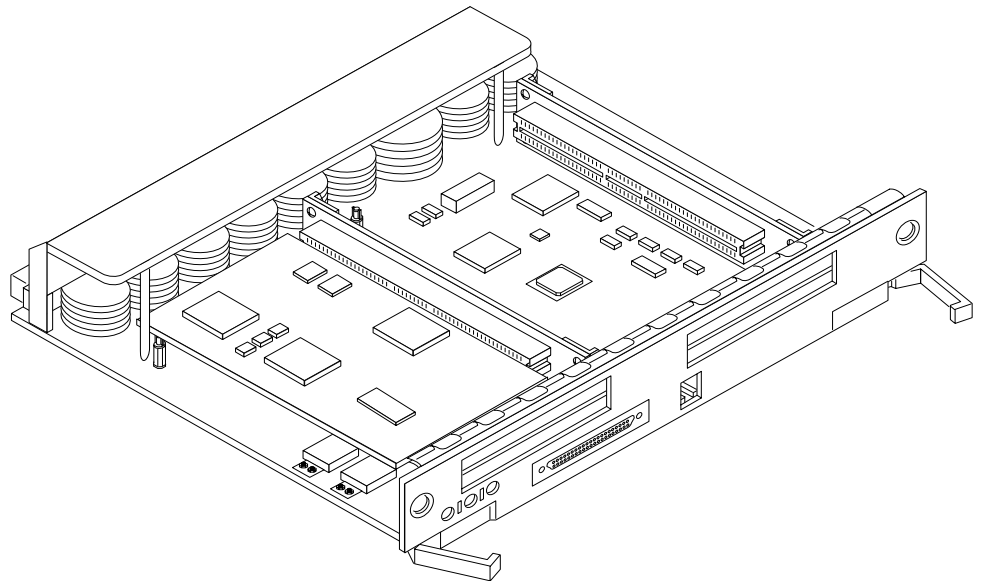


FIGURE 4-6 PCI+ I/O Board

The *SBus+ I/O board with 100 MB/sec Fibre Channel* includes two SYSIO ASICs that provide two SBuses:

- One for two plug-in SBus cards and two GBIC interfaces
- One for one plug-in SBus card and the onboard devices (10/100 Mbit TPE and Single-ended Fast/Wide SCSI).

Note – SBus connector slots 1 and 2 on the SBus+ I/O board can accommodate a double-wide SBus card.

The *Graphics+ I/O board with 100 MB/sec Fibre Channel* includes one SYSIO ASIC that provides a single SBus for two plug-in SBus cards, two GBIC interfaces, and the onboard devices (10/100 Mbit TPE and Single-ended Fast/Wide SCSI).

The *PCI+ I/O board* has two PCI bus connectors:

- Each connector can accommodate a PCI riser card
- Each riser card accommodates one PCI short card

In addition, onboard devices on the PCI+ I/O board provide Fast Ethernet (10/100 Mbit) and Fast Wide SCSI interfacing.

4.5.2 Removing a Board

Note – It is not necessary to remove an I/O+ board from the card cage to remove and replace GBICs. A GBIC may be removed and replaced “live” (without removing power from the system or board). However, the necessary software precautions must be taken whenever the I/O path to a particular disk is to be interrupted; halt all I/O activity to the disk affected by the replacement of a GBIC. To replace a GBIC or fiber optic cable, proceed to Section 4.5.6 “GBICs.”

4.5.2.1 Removing a Board from a Powered-On System



Caution – Remove a board from a powered-on system only after the ASR software has disabled the board. If a board has not been disabled by the ASR software, then the operating system should be halted and the system powered off prior to board removal. See Chapter 11 “Powering Off and On” and then Section 4.5.2.2 “Removing a Board from a Powered-Off System.”

1. Ensure that the board has been disabled by the ASR software. See Section 4.4 “Hot-Plug Feature.”

Once disabled by ASR, one of two results occurs:

- The three LEDs on the board are not lit (board has no power).
- The outer two green LEDs are not lit and the middle yellow LED is lit (board is in low power mode).

Note – System software operates such that the LED pattern described is the same for a board that is component side down (installed in front of card cage) or component side up (installed in rear of card cage).

2. Unfasten any cable connectors from the front panel and set them aside.

Label cables to identify them for reconnection later.

3. Use a Phillips #1 screwdriver to mechanically release the board from the system card cage.

Insert the screwdriver into each quarter-turn access slot (the slots are located on the left and right sides of the board front panel) and then turn a quarter turn so that the arrow points to the unlocked position (FIGURE 4-7).

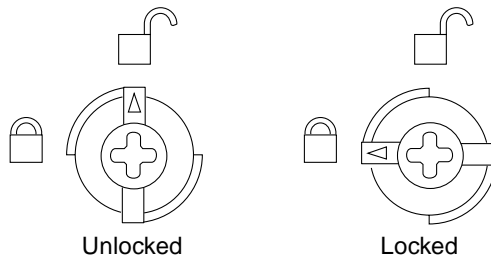


FIGURE 4-7 Unlocking and Locking Quarter-Turn Access Slots

4. Pull the ends of both extraction levers outward simultaneously to unseat the board centerplane connector from the centerplane receptacles (FIGURE 4-8).

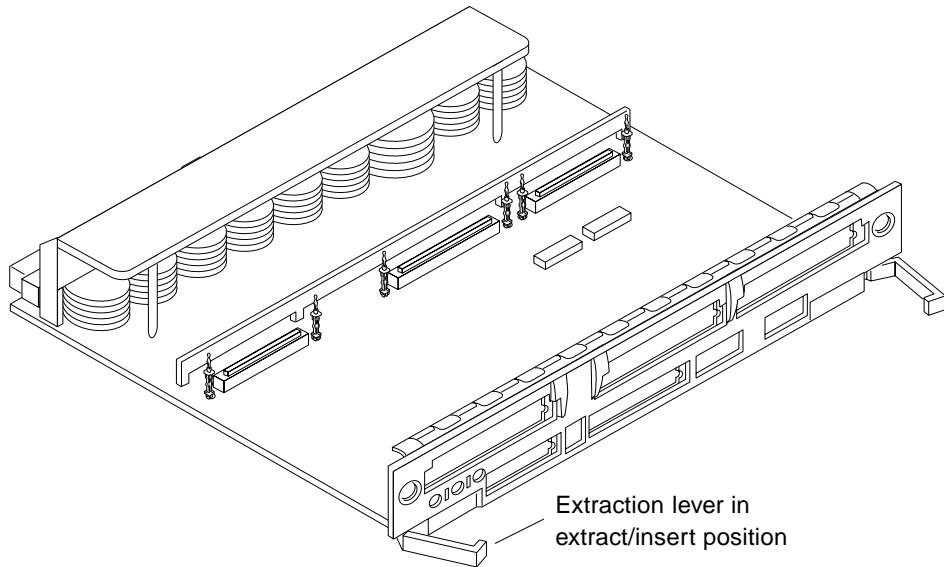


FIGURE 4-8 Extraction Lever in Extract Position

5. **If a board is not immediately replaced, a load board (Enterprise 6500 systems only) or a filler panel (Enterprise 4500 and 5500 systems only) must be installed in its place.**

See Section 4.2 “Filler Panels and Load Boards.”

4.5.2.2 Removing a Board from a Powered-Off System

1. **Use a Phillips #1 screwdriver to mechanically release the board from the system card cage.**
 Insert the screwdriver into each quarter-turn access slot (the slots are located on the left and right sides of the board front panel) and then turn a quarter turn so that the arrow points to the unlocked position (FIGURE 4-7).
2. **Unfasten any cable connectors from the front panel and set them aside.**
 Label cables to identify them for reconnection later.
3. **Pull the ends of both extraction levers outward simultaneously to unseat the board from the centerplane receptacles (FIGURE 4-8).**

4. If a board is not immediately replaced, a load board (Enterprise 6500 systems only) or a filler panel (Enterprise 4500 and 5500 systems only) must be installed in its place before powering on the system.

See Section 4.2 “Filler Panels and Load Boards.”

4.5.3 Installing a Board

4.5.3.1 Board Slot Selection

Note – Logically there is no difference between the board slots in the front or rear of the card cage, and each slot can accept any board type. It is suggested that CPU/Memory+ boards be installed in the front slots, and I/O+ and Disk boards be installed in the rear slots because of cabling. Should the need arise, however, any of these three board types can be placed in any of the numbered board slots, with the exception of slot 1. Slot 1 should be used by the first I/O+ board because it is the only slot connected to the onboard SCSI devices.

The first CPU/Memory+ board is placed in slot 0, followed sequentially by all remaining even numbered slots. If there are boards remaining, they can be installed sequentially in odd numbered slots, if available, in the system rear (with the exception of slot 1 as noted above) (FIGURE 4-9 and FIGURE 4-10).

For I/O+ boards being placed in the rear of the system, ensure that the component side is up. If the boards are placed in the front of the system, ensure that the component side is down (FIGURE 4-11).

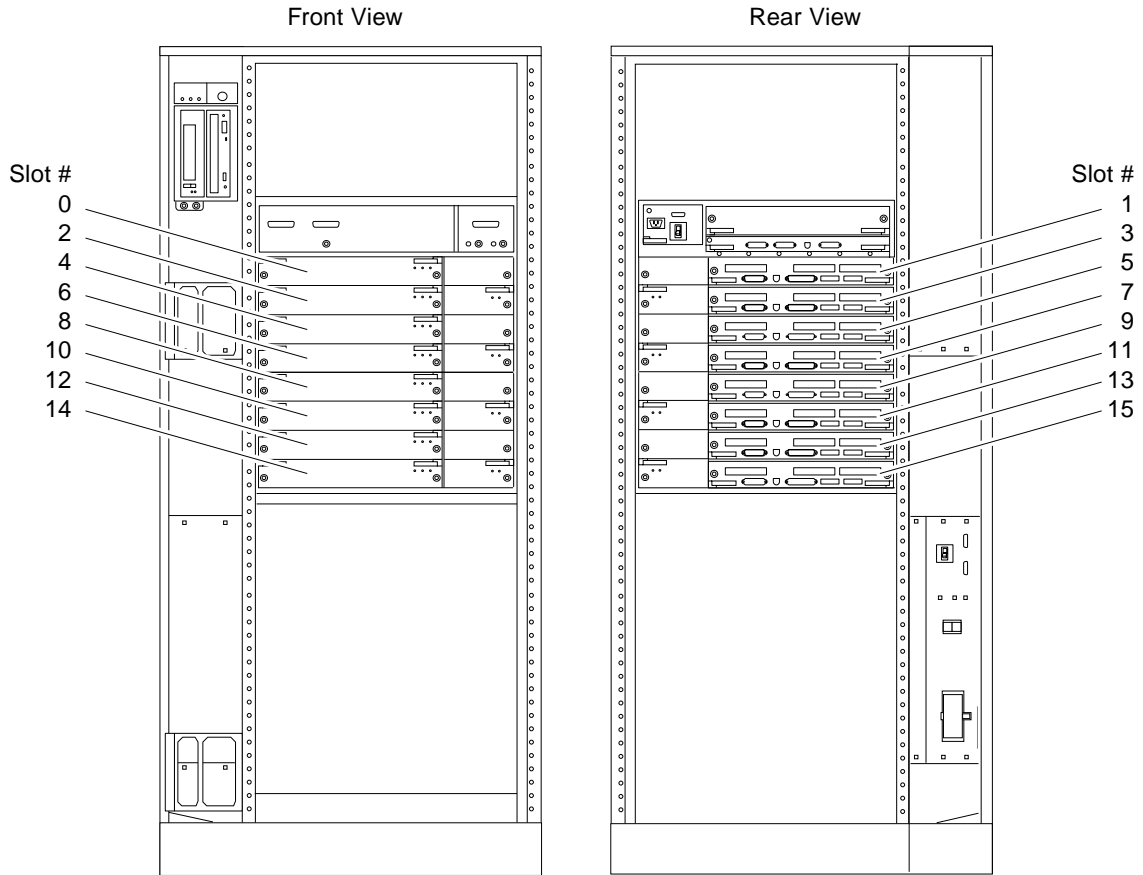


FIGURE 4-9 Enterprise 6500 Board Locations

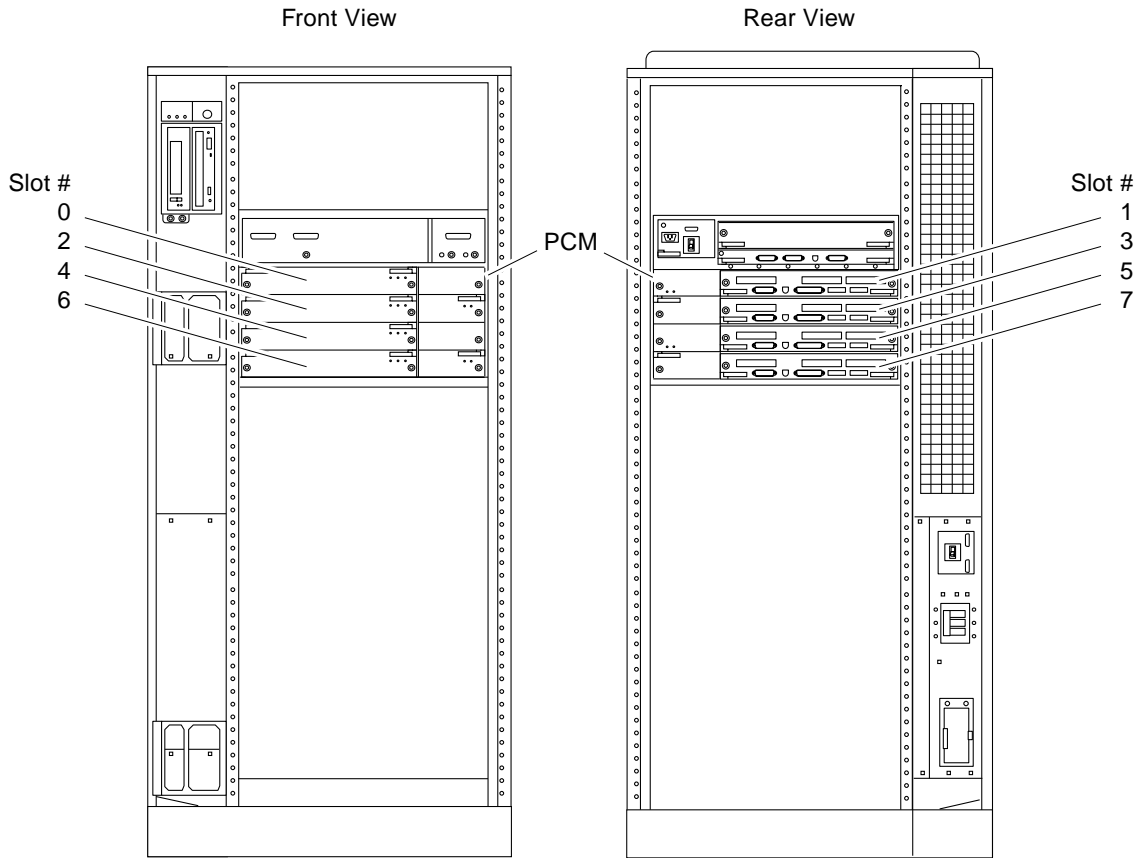


FIGURE 4-10 Enterprise 5500/4500 Board Locations

4.5.3.2 Cooling and Power Issues

There should be one power/cooling module (PCM) for every two boards to adhere to cooling and power requirements. The PCMs must be installed adjacent to populated board slots to ensure the fan in the PCM can cool the respective boards.

Note – All empty board slots in Enterprise 6500 systems must have a load board installed to ensure proper cooling and for EMI protection. All empty board slots in Enterprise 5500 or 4500 systems must have a filler panel installed.

4.5.3.3 Inserting a System Board

1. Carefully insert the board (component side down if in front; component side up if in the rear) in the proper slot in the card cage, ensuring that the board does not slip out of the left and right card guides (FIGURE 4-11).

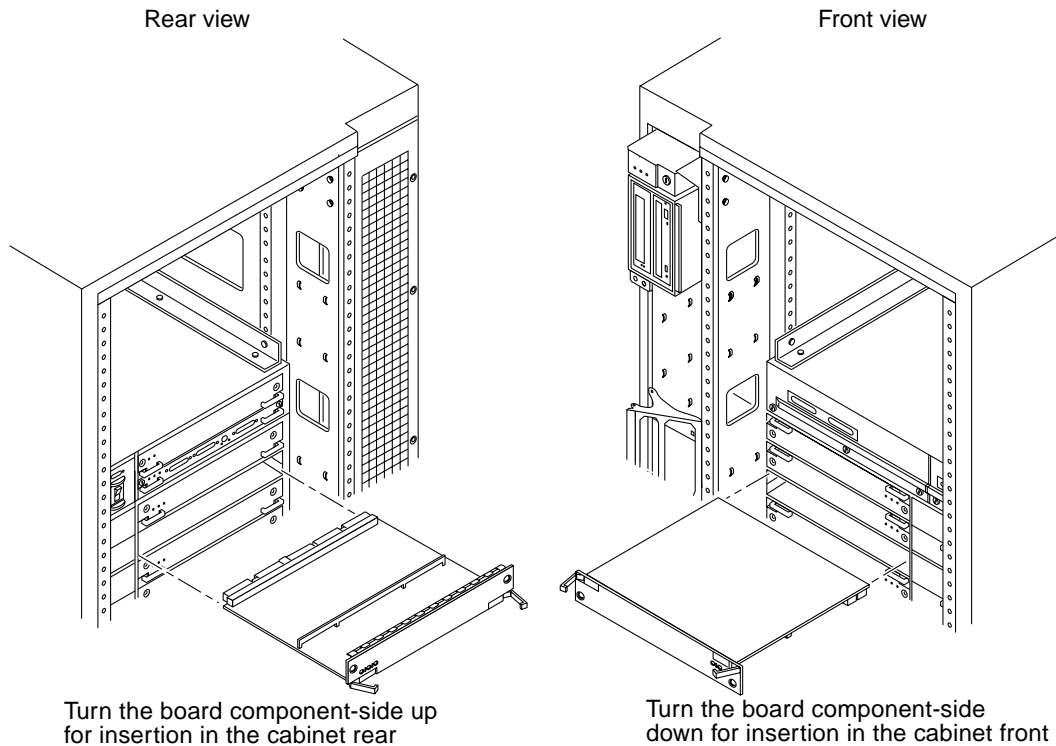


FIGURE 4-11 Board Replacement

2. Ensure that both extraction levers are in the insert position (arrow pointing outward), and that the quarter-turn access slots are unlocked (arrow indicates unlocked position) as you slide the board toward the centerplane receptacles.

The board will not seat fully unless the levers are in this starting position and the access slots are unlocked. See FIGURE 4-7, and FIGURE 4-8 on page 4-10.



Caution – DO NOT FORCE any board into a slot; this can cause damage to the board and system. The board should insert and seat smoothly. If it binds, remove the board and inspect the card cage slot for any obvious obstructions. Also inspect both the board and the centerplane for bent pins or other damage.

- 3. Push the board into the card cage, then simultaneously press both extraction levers to seat the board on the centerplane.**

Pushing both levers simultaneously avoids twisting the board and bending the connector pins, and mates the board centerplane connector to the matching receptacle on the centerplane. Do not press on board front panel to seat it—doing so will damage the connector pins.

- 4. Mechanically lock the board to the system chassis by inserting a Phillips #1 screwdriver into each quarter-turn access slot and then turning to the locked position (FIGURE 4-7).**

- 5. Replace or connect all necessary cables to the front of the board.**

Note – The I/O+ board in slot 1 controls the internal media tray devices. Therefore, the external SCSI connector on the I/O+ board in slot 1 of a system must be terminated with a SCSI terminator (FIGURE 4-3).

- 6. Terminate the board SCSI connector if required, see above note.**
- 7. Once the board has been installed, a message similar to the following will be displayed on the monitor (if the system is powered on):**

The example depicts screen output when a new I/O+ board has been hot-plugged into slot 6 of an operating Enterprise system:

```
NOTICE: I/O Board Hotplugged into Slot 6
NOTICE: Board 6 is ready to remove
```

This screen output indicates that the board has been detected by the system and is in the low power mode. Additionally, any subsequent `prtdiag(1M)` output would include information for board slot 6. Again, note that the system will not use the new board until the system is rebooted.

- 8. Reboot the system now or schedule a later time to reboot when system disruption will be minimized.**

4.5.4 SBus Cards

There are three SBus card locations on the SBus+ I/O board; the Graphics+ I/O board has two.

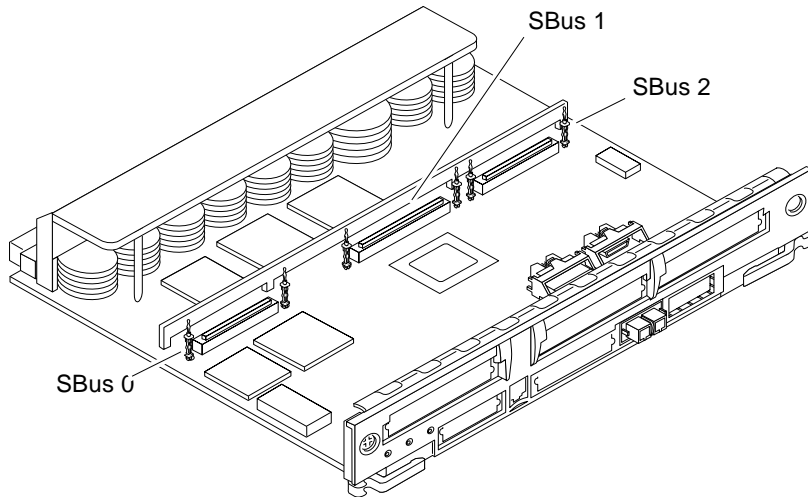


FIGURE 4-12 SBus+ I/O Board SBus Card Connectors

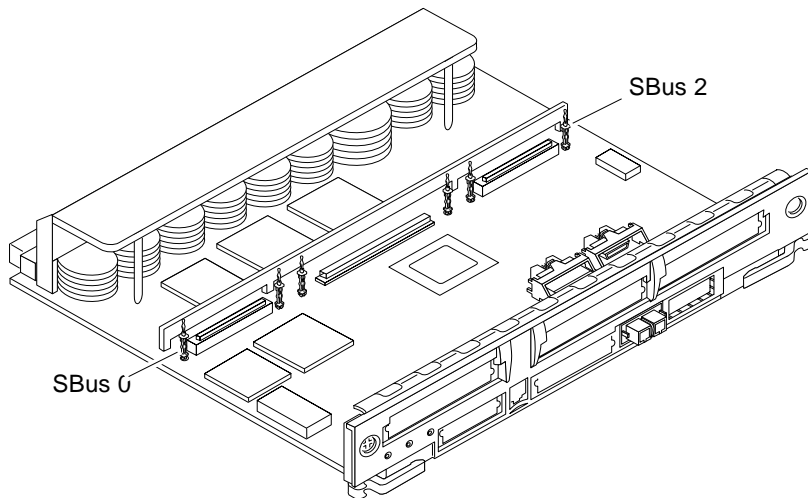


FIGURE 4-13 Graphics+ I/O Board SBus Card Connectors

4.5.4.1 Nylon Standoffs

Nylon standoffs lock the SBus and graphics (UPA) cards to the I/O+ boards (FIGURE 4-14).

- To unlock a standoff, pull up the tip insert.
- To lock a standoff, first ensure that the module or card rests on the standoff flange, then press down the tip insert.

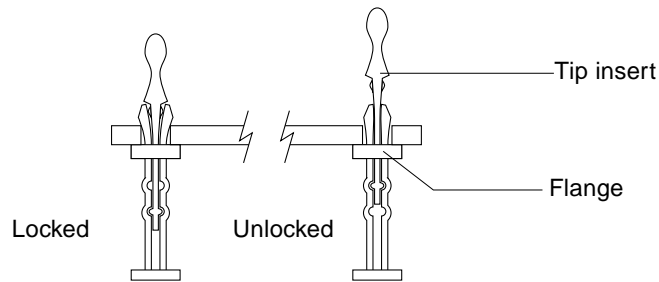


FIGURE 4-14 Locking and Unlocking Standoffs

4.5.4.2 Removing an SBus Card

1. Use the procedures in Section 4.5.2 “Removing a Board,” to remove the applicable I/O+ board.
2. Use FIGURE 4-12 to locate the card to be removed.
3. Remove the two screws that secure the SBus card to the back panel.
Save the screws for installation of a replacement SBus card or a filler panel.
4. Unlock the SBus card by pulling up the tips of the two standoff (FIGURE 4-14).
5. Hold the card by the edges near the connector and gently rock the card back and forth to loosen it from the socket.

You may have to remove the SBus cards or the FFB card next to this card in order to have enough room to hold onto the SBus card being removed.



Caution – The connector housing may break if the SBus card is tilted too far.

6. Lift the SBus card from the socket at an angle while guiding the face plate out from the back panel opening (FIGURE 4-15).

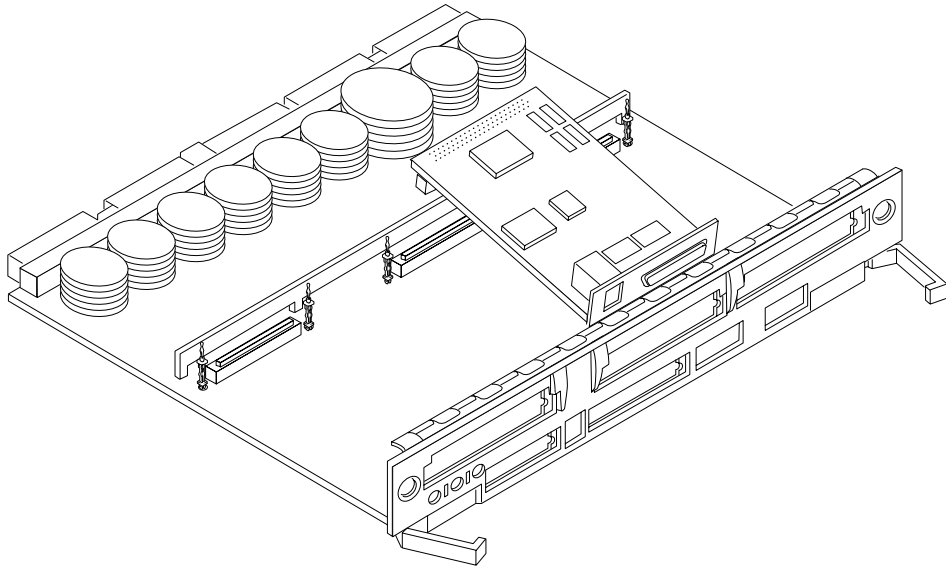


FIGURE 4-15 Removing or Installing an SBus Card

7. Place the SBus card in an antistatic bag for protection.
8. If the SBus card is not immediately replaced, install a filler panel (part number 340-2305) on the I/O+ board back panel opening. To secure the filler panel, use the screws that were removed in Step 3.



Caution – Be sure to install the filler panel right-side up. Installing it upside down creates a gap at the top edge of the SBus slot opening that can impair system cooling and FCC regulatory compliance.

9. Replace the I/O+ board. Use the procedures in Section 4.5.3 “Installing a Board” on page 4-11.”

4.5.4.3 Installing an SBus Card

▼ Removing Adapter and Card Retainer

Note – If the new SBus card does not have an adapter plate or card retainer, proceed to Section t “Installation” on page 4-22.

1. **Attach a wrist strap and take the SBus card out of the protective packaging and place the SBus card on an antistatic mat.**
2. **Remove the adapter bracket from the SBus card rear panel (FIGURE 4-16).**
Remove the two screws securing the adapter to the card rear panel (the adapter bracket and the screws are not needed for this installation).

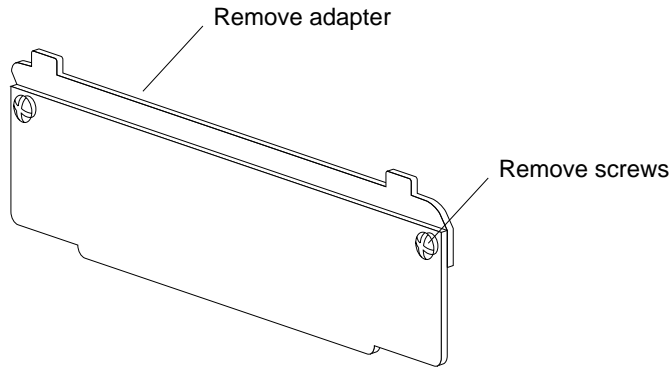


FIGURE 4-16 SBus Card Rear Panel with Adapter

3. **Remove the black plastic card retainer shipped with the card (FIGURE 4-17).**
Spread the ends of the retainer apart to remove it from the card (the retainer is not needed for this installation).

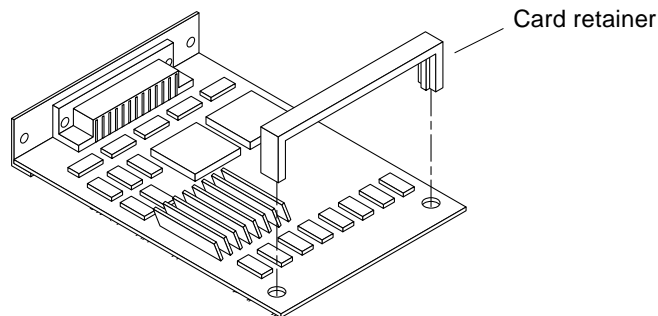


FIGURE 4-17 Card Retainer

▼ Link Integrity Test

Note – If the new SBus card does not have a link integrity test proceed to Section t “Installation” on page 4-22.

For the system to communicate with a network, the `tpe-link-test?` settings for the onboard Ethernet ports must be compatible with the setting at the network hub. The `tpe-link-test?` variable is set separately for the onboard Ethernet port on each I/O+ board. The variable is also set for any SBus Ethernet cards in the system.

If you have problems verifying connection between Sun equipment and your hub, verify that your hub also has the link test function enabled. Also, refer to the manual provided with your hub.

1. **Place the SBus card on an antistatic mat.**
2. **For DSBE/S and FSBE/S cards: remove the two outer retaining screws (FIGURE 4-18), but do NOT remove the middle screw or the springfinger.**
Use a #0 Phillips screwdriver and a 3/16 nut driver or socket wrench.
3. **For DSBE/S and FSBE/S cards, configure jumper J0302 for Link Integrity Test functionality. See FIGURE 4-18 (DSBE/S) or FIGURE 4-19 (FSBE/S).**
 - a. **Put the shunt over both pins to *disable* the Link Integrity Test (FIGURE 4-20 “Disabled”)**
 - b. **Put the shunt in one pin to *enable* the Link Integrity Test (FIGURE 4-20 “Enabled”).**



Caution – If you choose to disable the test, it must be disabled both at the hub and at the SBus card. In the event of “loss of carrier” or “not responding” errors, check the status of the link enable on both the SBus card and the hub.

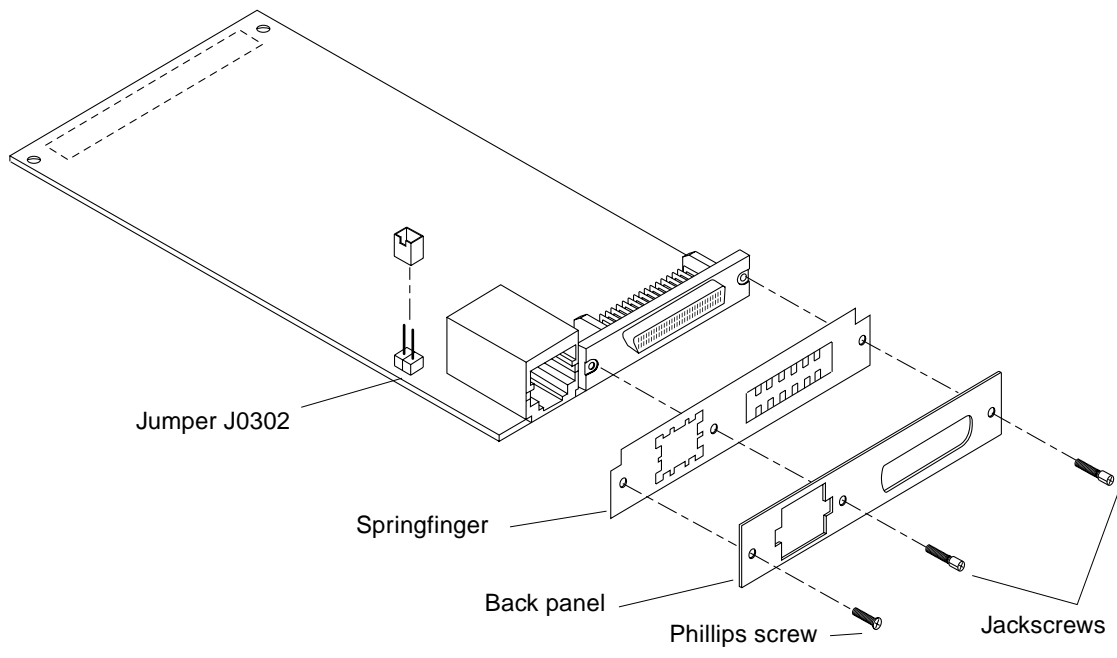


FIGURE 4-18 DSBE/S SBus Card

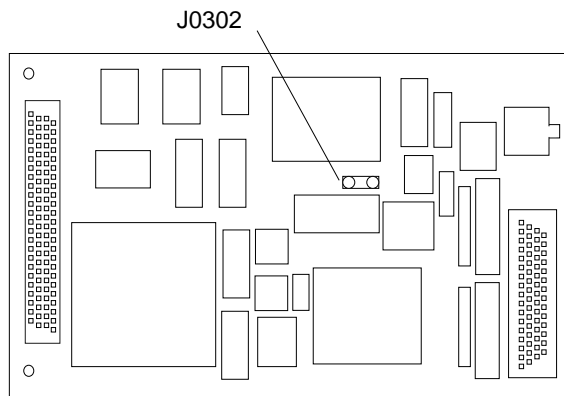


FIGURE 4-19 FSBE/S SBus Card



FIGURE 4-20 Disabling and Enabling the Link Integrity Test

▼ Installation

1. Use the procedures in Section 4.5.2 “Removing a Board,” to remove the applicable I/O+ board.
2. Use FIGURE 4-12 to locate the SBus connector for the card that is to be installed.
3. If a filler panel covers the back panel SBus slot, remove the two screws and detach the filler panel.

Retain the screws to attach the SBus card to the back panel, unless the card has a wide connector, or set of connectors.

4. Unlock the tip insert of the two standoffs for the SBus slot (FIGURE 4-14).
5. Attach a wrist strap and take the SBus card out of the protective packaging. Inspect the pins in the connector to make sure they are not bent.
6. Hold the SBus card at an angle and guide the SBus card face plate under the springfingers and against the rear face of the I/O+ board front panel.
See FIGURE 4-15 on page 4-18. The I/O connectors of the SBus card should be visible through the opening in the back panel.
7. Hold the card by the edges nearest the SBus connector and place the card over the two standoffs.

8. Hold the SBus card by the edges near the connector and firmly but gently press the card down until the connector is fully seated.

To align the connector and socket, push the card toward the I/O+ board back panel.



Caution – Do not rock the card onto the socket; the plastic connector housing may break.

9. Press each corner of the SBus card to ensure that it rests on the collar of the standoff.
10. Press down on the tip insert of each standoff to lock the card in place.

11. Replace and tighten the back panel screws to secure the SBus card to the I/O+ board back panel.
12. Replace the I/O+ board using the procedures described in Section 4.5.3 “Installing a Board.”

4.5.5 Graphics (UPA) Cards

The Graphics+ I/O board contains a single connector that accommodates graphics (UPA) cards (FIGURE 4-21).

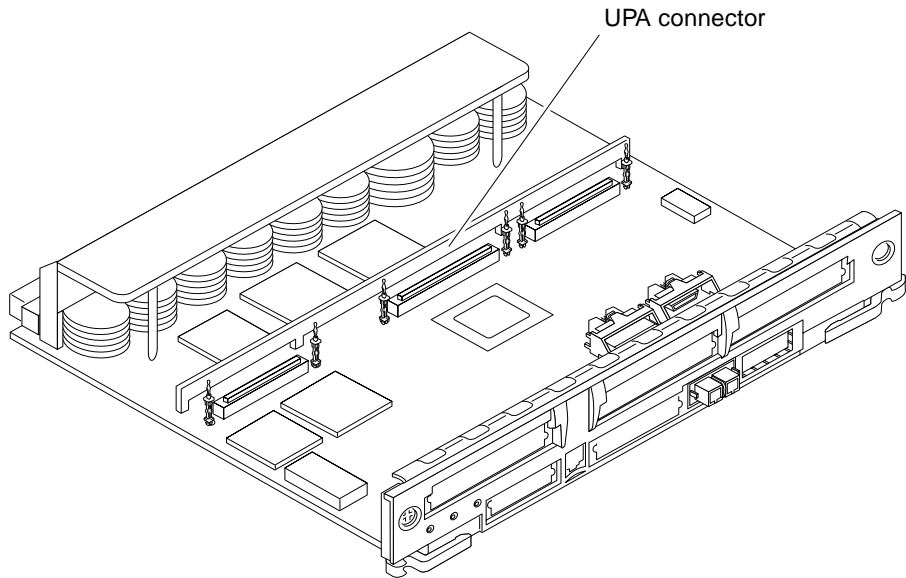


FIGURE 4-21 Graphics (UPA) Card Connector Location

4.5.5.1 Removing a Graphics (UPA) Card

1. Use the procedures in Section 4.5.2 “Removing a Board,” to remove the applicable Graphics+ I/O board.
2. Locate the card (FIGURE 4-22).
3. Remove the two screws that secure the card to the Graphics+ I/O board front panel.
Save the screws for installation of a replacement card or a filler panel.
4. Unlock the card by pulling up the tips of the two standoffs (FIGURE 4-14).

5. Hold the card by the edges near the connector and gently rock the card back and forth to loosen it from the socket.

You may have to remove the SBus cards next to this card in order to have enough room to hold onto the graphics (UPA) card being removed.



Caution – The connector housing may break if the card is tilted too far.

6. Lift the card from the socket at an angle while guiding the face plate out from the back panel opening (FIGURE 4-22).

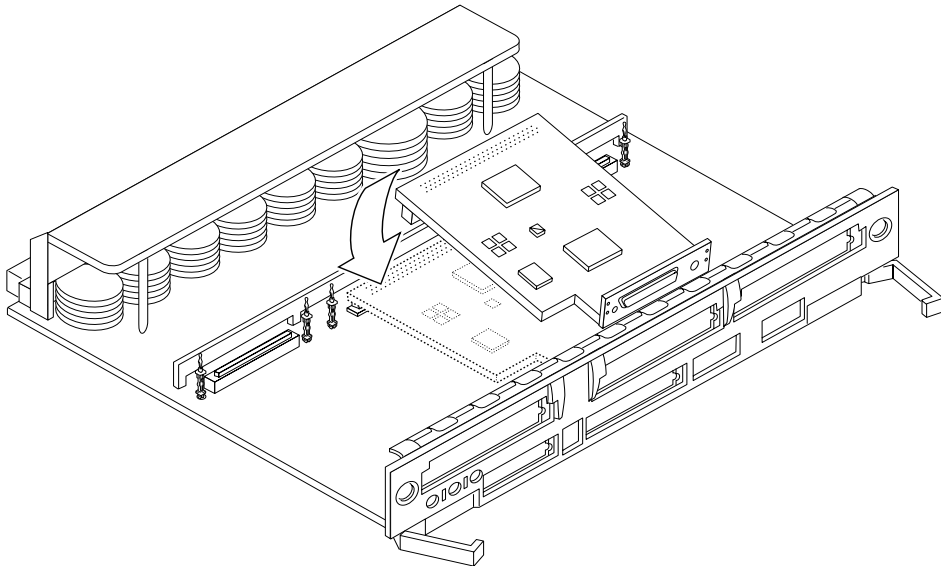


FIGURE 4-22 Removing or Installing a Graphics (UPA) Card

7. Place the card in an antistatic bag.
8. If the graphics (UPA) card is not immediately replaced, install a filler panel (part number 340-2305) on the Graphics+ I/O board back panel opening. To secure the filler panel, use the screws that were removed in Step 3.



Caution – Be sure to install the filler panel right-side up. Installing it upside down creates a gap at the top edge of the card slot opening that can impair system cooling and regulatory compliance.

9. Use the procedures in Section 4.5.3 “Installing a Board,” to replace the Graphics+ I/O board.

4.5.5.2 Installing a Graphics (UPA) Card

1. Use the procedures described in Section 4.5.2 “Removing a Board,” to remove the applicable Graphics+ I/O board.

Note – The connector pins on graphics (UPA) cards are extremely delicate, use care when handling.

2. **Attach a wrist strap and take the graphics (UPA) card out of the protective packaging and place the card on an antistatic mat.**

Inspect the pins in the connector to make sure they are not bent.

3. **Remove the adapter bracket from the rear panel of the card** (FIGURE 4-16).

Remove the two screws securing the adapter to the card rear panel (the adapter bracket and the screws are not needed for this installation).

4. **Locate the UPA connector for the card** (FIGURE 4-21).

5. **If a filler panel covers the back panel slot for the graphics (UPA) card, remove the two screws and detach the filler panel.**

Retain the screws to attach the graphics (UPA) card to the back panel, unless the card has a wide connector, or set of connectors.

6. **Unlock the two standoffs for the UPA connector slot** (FIGURE 4-14).

7. **Hold the card at an angle and guide the card face plate under the springfingers and against the rear face of the Graphics+ I/O board front panel.**

The I/O connectors of the card should be visible through the opening in the Graphics+ I/O board front panel.

8. **Hold the card by the edges nearest the UPA connector and position the card over the two standoffs.**

9. **Hold the card by the edges near the connector and firmly but gently press the card down until the connector is fully seated.**

To align the connector and socket, push the card toward the Graphics+ I/O board front panel.



Caution – Graphics (UPA) cards have very fragile connectors. Press gently to ensure pins do not break or bend.



Caution – Do not rock the card onto the socket; the plastic connector housing may break.

10. Press each corner of the card to ensure that it rests on the collar of the standoff.
11. Press down on the tip insert of each standoff to lock the card in place.
12. Replace and tighten the back panel screws to secure the card to the Graphics+ I/O board front panel (FIGURE 4-15).
13. Use the procedures in Section 4.5.3 “Installing a Board,” to replace the Graphics+ I/O board.

4.5.6 GBICs

Each SBus+ and Graphics+ I/O board has two onboard connectors; each connector accommodates one GBIC (100 MB/sec Fibre Channel).

4.5.6.1 Removing a GBIC

1. Locate the GBIC to be removed (FIGURE 4-23 or FIGURE 4-24).

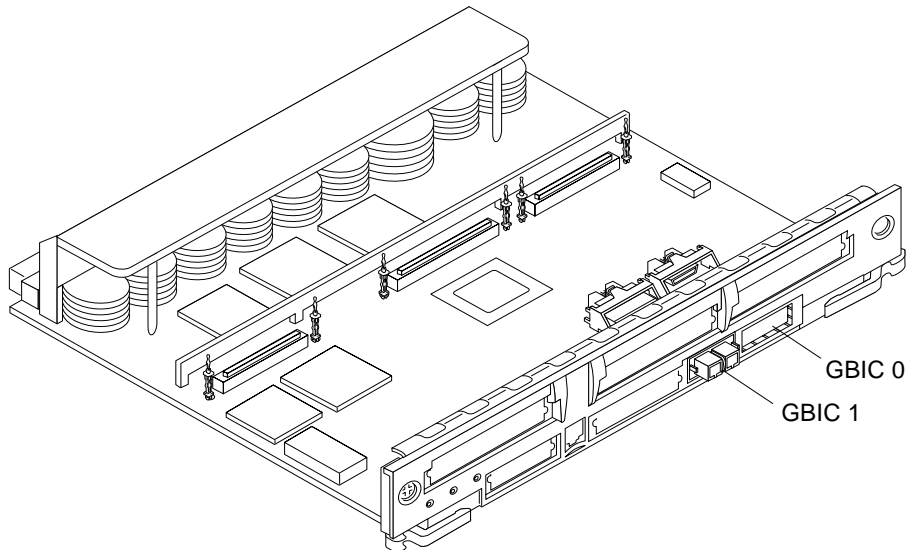


FIGURE 4-23 SBus+ I/O Board GBIC Connector Locations

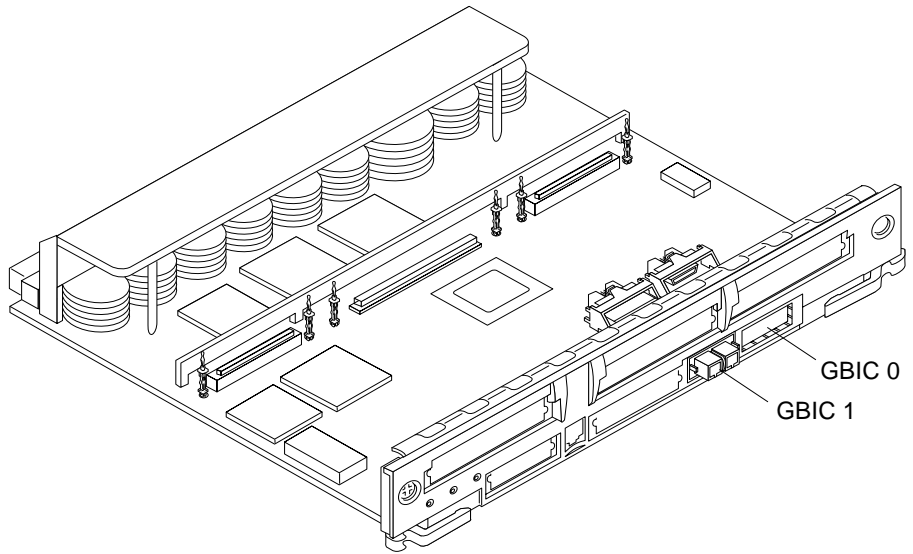


FIGURE 4-24 Graphics+ I/O Board GBIC Connector Locations

2. Remove the GBIC from the I/O+ board by compressing the locking tabs located on either side of the card and pulling straight out from the opening in the I/O+ board panel (FIGURE 4-25).

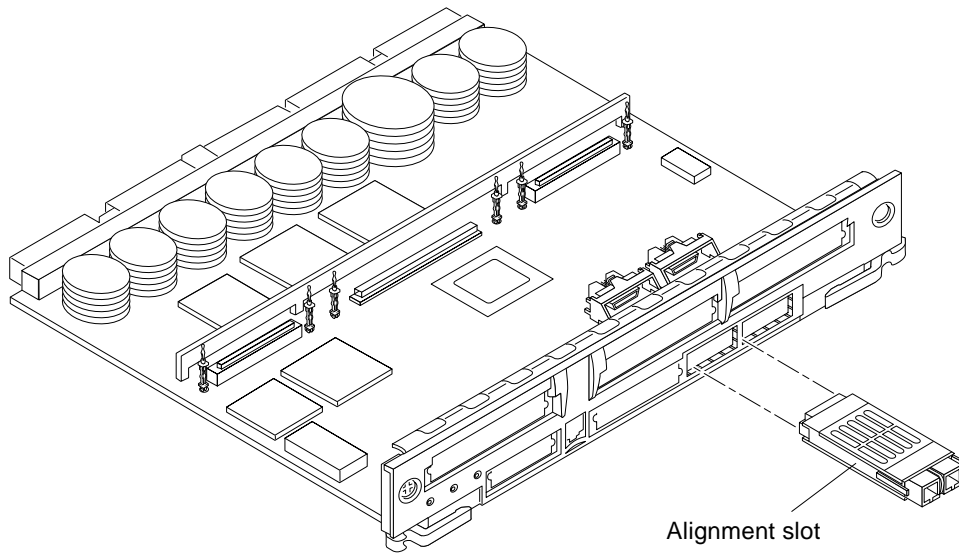


FIGURE 4-25 Removing or Installing a GBIC

4.5.6.2 Installing a GBIC

1. Locate the GBIC slot for installation (FIGURE 4-24).
2. Ensure correct orientation for insertion.
The alignment slots should be on the bottom of the GBIC (FIGURE 4-25).
3. Insert the GBIC into the I/O+ board panel slot and then push in to firmly seat the card.
An audible click indicates the GBIC is properly seated to the onboard connector.

4.5.7 PCI Cards

Each PCI+ I/O board can accommodate two PCI (short) cards. The PCI cards are plugged into receptacles on corresponding riser cards that are mounted on the PCI+ I/O board. The riser cards can be one of two voltage types, either 5.0V or 3.3V.

The voltage rating of a PCI card must be matched to the rating of the riser card and connector on the motherboard. The PCI bus connectors of PCI cards can be one of three possible types, those that can be used with 5.0V or 3.3V connector receptacles only, and those that can be used with either voltage type.

Sun PCI+ I/O boards are shipped with two 5.0V riser cards (installed) and two 3.3V riser cards (not installed). If you are switching to a 3.3V PCI card, you must replace the existing 5.0V riser card with the 3.3V riser card. See Section 4.5.7.3 “Replacing Riser Cards” on page 4-33.

4.5.7.1 Removing a PCI Card

1. Use the procedures in Section 4.5.2 “Removing a Board,” to remove the applicable I/O+ board.

Note – Some PCI cards may not utilize the standoffs provided for mounting.

2. On the noncomponent side of the I/O+ board, loosen the locking standoff for the corresponding PCI card that is to be removed (FIGURE 4-26).

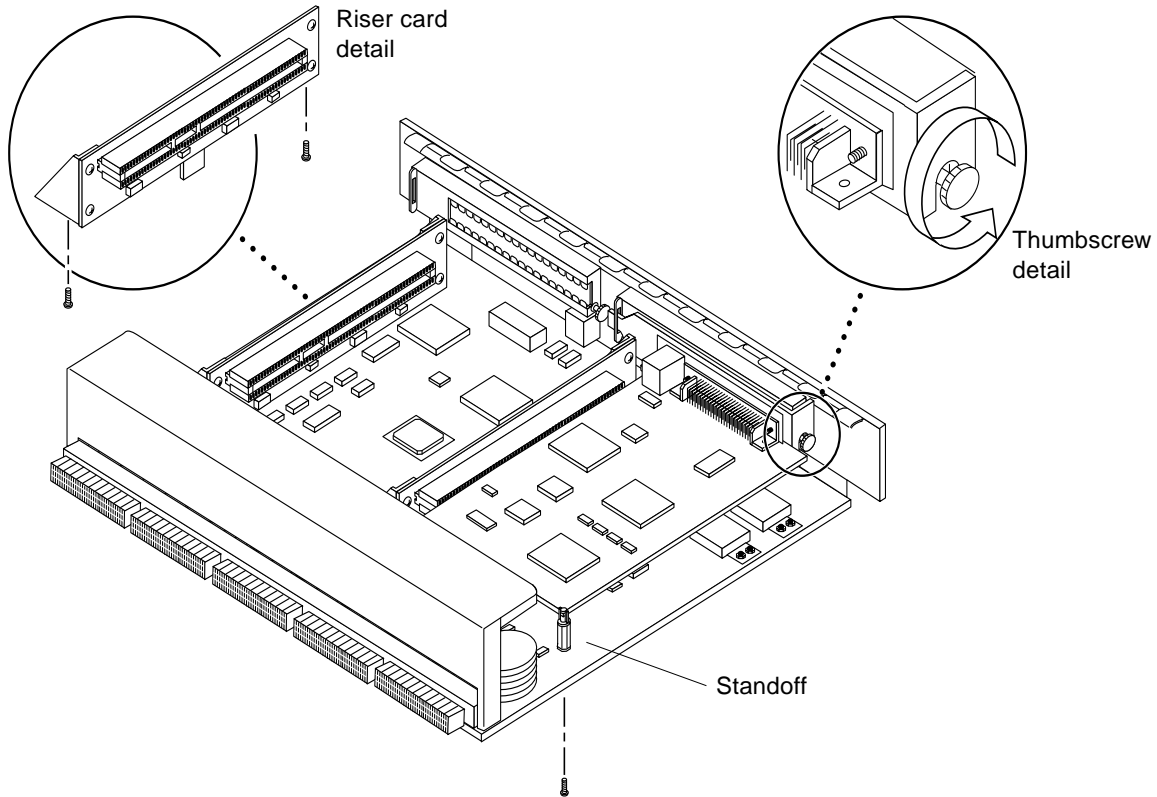


FIGURE 4-26 PCI and Riser Card Removal

3. Loosen and then remove the thumbscrew on the component side of the I/O+ board next to the external PCI card connector (FIGURE 4-26).
4. Refer to FIGURE 4-27 while removing the card as follows:
 - a. Grasp the card to be removed with your index fingers on either side of the card where it mates with the connector on the riser card (thumbs against the connector).
 - b. Loosen the card from the PCI bus connector and the catch mechanism by firmly pushing with your thumbs against the PCI bus connector, while grasping the card edge with the index fingers of both hands.
5. Once the card is free of the PCI bus connector and the metal catch mechanism, remove the card from the I/O+ board (FIGURE 4-27).

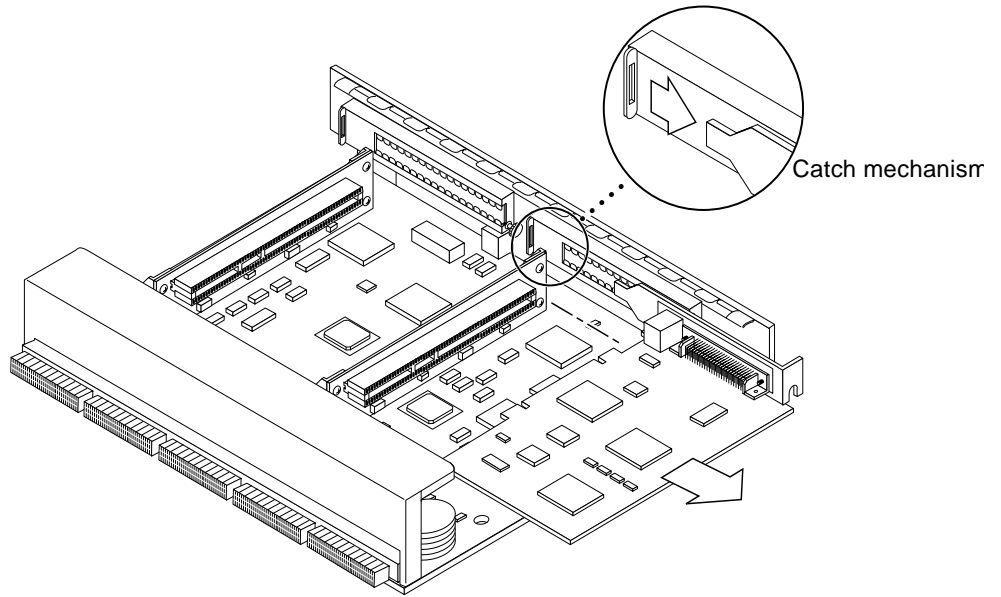


FIGURE 4-27 PCI Card Removal

4.5.7.2 Replacing or Installing a PCI Card

1. Ensure that the voltage type of the PCI card you are replacing or installing matches the voltage type of the riser card, either 5.0V or 3.3V.
2. Verify that the JTAG Test Jumper is removed/disabled (FIGURE 4-28).

Note – PCI+ I/O boards purchased from Sun Microsystems are shipped with the JTAG Test Jumper disabled or removed on both of the 5.0V riser cards installed on the board.

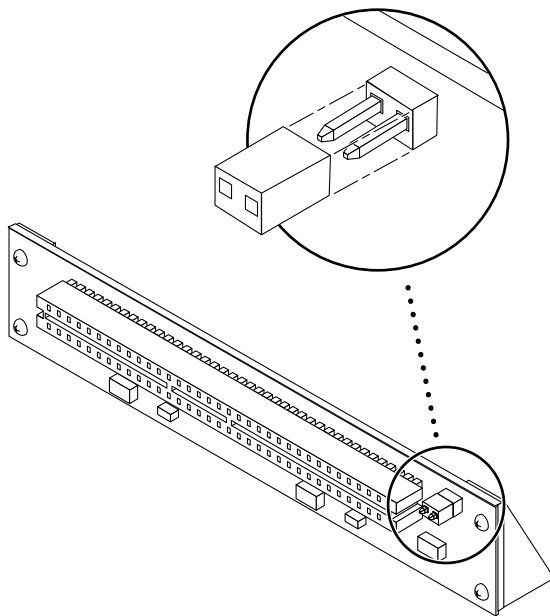


FIGURE 4-28 JTAG Test Jumper

3. Align the PCI card so that the PCI bus connector mates with the PCI+ I/O board PCI bus connector, making sure that the external connector end of the card is retained on one side by the opening in the metal catch mechanism and the opposite end is properly aligned to accept the locking thumbscrew (FIGURE 4-29).

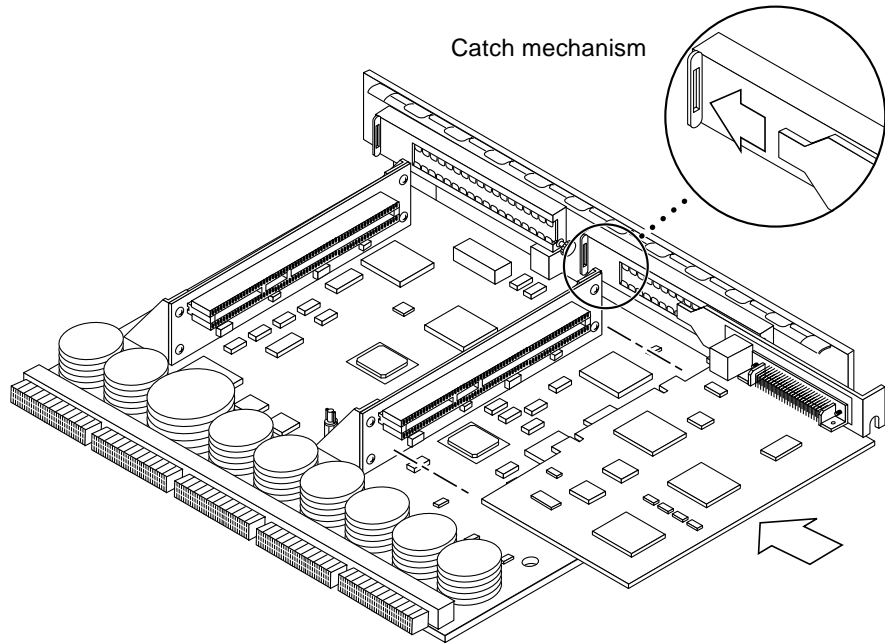


FIGURE 4-29 PCI Card Installation/Replacement

4. Once the card is properly positioned as described above and seated properly to the PCI board PCI Bus connector, tighten the locking thumbscrew.

Note – Some PCI cards may not require the standoffs provided for mounting.

5. Ensure that the standoff is positioned to capture the edge of the PCI card, and then tighten the screw securing the standoff.
6. Use the procedures in the Section 4.5.3 “Installing a Board” on page 4-11, to replace the I/O+ board.

4.5.7.3 Replacing Riser Cards

1. Use the procedures in Section 4.5.2 “Removing a Board” on page 4-8, to remove the applicable I/O+ board.
2. If a PCI card is already installed in the slot designated for replacement of the riser card, remove the card as indicated in Section 4.5.7.1 “Removing a PCI Card” on page 4-29.

If there is no PCI card presently installed, proceed to Step 3.

3. Remove two screws securing the existing riser card to the PCI+ I/O board (FIGURE 4-26 on page 4-30) and remove the riser card.
4. Secure the new riser card onto the PCI+ I/O board using the two screws removed in Step 3.
5. If a PCI card was removed in Step 2, replace the card as indicated in the Section 4.5.7.2 “Replacing or Installing a PCI Card” on page 4-32.

4.5.7.4 Verifying Installation

After the PCI+ I/O board and any PCI cards are installed, *and before booting the system*, verify installation by performing the following tasks. Refer to the *Solaris 2.x Handbook for SMCC Peripherals* manual or your Solaris documentation for detailed instructions.

1. Power on the system, and when the banner appears, press the Stop-A keys to interrupt the boot process and get the `ok` prompt.
2. Use the `show-devs` command to list the system devices.

You should see entries (similar to the entries in the example below) for the PCI+ I/O board that you installed:

```
ok show-devs
.
.
.
/pci@3,2000/pci@2
/pci@3,2000/pci@2/SUNW,isptwo@4 (identifies adapter SCSI interface)
/pci@3,2000/pci@2/SUNW,hme@0,1 (identifies adapter Ethernet interface)
/pci@3,2000/pci@2/pci108e,1000@0
/pci@3,2000/pci@2/SUNW,isptwo@4/st
/pci@3,2000/pci@2/SUNW,isptwo@4/sd
/pci@3,4500/SUNW,isptwo@3 (identifies motherboard SCSI interface)
.
.
.
/pci@2,2000/pci@2
/pci@2,2000/pci@2/SUNW,isptwo@4 (identifies adapter SCSI interface)
/pci@2,2000/pci@2/SUNW,hme@0,1 (identifies adapter Ethernet interface)
/pci@2,2000/pci@2/pci108e,1000@0
/pci@2,2000/pci@2/SUNW,isptwo@4/st
/pci@2,2000/pci@2/SUNW,isptwo@4/sd
/pci@2,4500/SUNW,hme@1,1 (identifies motherboard Ethernet interface)
```

In this example, a PCI+ I/O board with two SunSwift™ PCI adapter cards has been installed in I/O+ board slot 1 of an Sun Enterprise 4500 system. To find the device path for your specific device, refer to the documentation that came with your PCI card.

If you do not see your new device(s) listed, make sure the PCI+ I/O board and any PCI cards are properly seated, and reinstall the board or cards, if necessary.

Also verify that the JTAG Test Jumper on the PCI card is disabled or removed.

See Section 4.5.7.2 “Replacing or Installing a PCI Card.”

4.5.7.5 Flash PROM

The Sun Enterprise 6500/5500/4500 system I/O+ boards use flash PROMs. Flash PROMs may be reprogrammed and can be updated to the latest firmware code. Refer to the *Sun Enterprise 6x00/5x00/4x00/3x00 System Flash PROM Programming Guide* for this procedure.

4.5.7.6 Diagnostics Testing

For PCI+ I/O board PCI card diagnostics testing refer to the *SunVTS 2.1 User's Guide*. Also, refer to the documentation that came with your PCI card for further diagnostic testing.

Disk Boards and Components

To protect both yourself and the equipment, make sure you follow the precautions in Chapter 2 “Safety Precautions and Tools Requirements.”

- Safety Precautions—page 2-1
- Handling Boards and Assemblies—page 5-2
- Filler Panels and Load Boards—page 5-3
- SCSI Termination—page 5-4
- Hot-Plug Feature—page 5-5
- Disk Boards—page 5-6
- Disk Drives—page 5-12
- Connectors—page G-12

For your protection, also observe the following safety precautions when setting up your equipment:

- Follow all cautions, warnings, and instructions marked on the equipment.
- Never push objects of any kind through openings in the equipment as they may touch dangerous voltage points or short out components that could result in fire or electric shock.
- Refer servicing of equipment to qualified personnel.

5.1 Handling Boards and Assemblies



Caution – The chassis AC power cord must remain connected to ensure a proper ground.



Caution – The Disk boards, their modules, and cards have surface-mount components that can be broken by flexing the boards.

To minimize the amount of board flexing, observe the following precautions:

- Hold the board only by the edges near the middle of the board, where the board stiffener is located. Do not hold the board *only* at the ends.
- When removing the board from an antistatic bag, keep the board vertical until you lay it on the Sun ESD mat.
- Do not place the board on a hard surface. Use a cushioned antistatic mat. The board connectors and components have very thin pins that bend easily.
- Do not use an oscilloscope probe on the components. The soldered pins are easily damaged or shorted by the probe point.
- Transport the board in an antistatic bag.
- Be careful of small parts located on the component side of the board.
- Be careful not to drag boards across surfaces as board components are easily damaged.



Caution – The heatsinks on the board can be damaged by incorrect handling. Do not touch the heatsinks while installing or removing the board. Hold the board only by the edges. If a heatsink is loose or broken, obtain a replacement board.



Caution – The heatsinks on the board can be damaged by improper packaging. When storing or shipping the board, ensure that the heatsinks have sufficient protection.

5.2 Filler Panels and Load Boards

All empty board slots in Enterprise systems must have either a filler panel or a load board installed. (A load board is distinguished by the presence of centerplane connectors. A filler panel has no centerplane connectors.)

- Empty slots in Enterprise 5500 and 4500 systems must have a filler panel installed (FIGURE 5-1).
- Empty slots in Enterprise 6500 systems must have a load board installed (FIGURE 5-2).

Load boards and filler panels are inserted into a board slot with the springfingers facing down if inserted in the front of the system; the springfingers face up if inserted in the rear of the system.

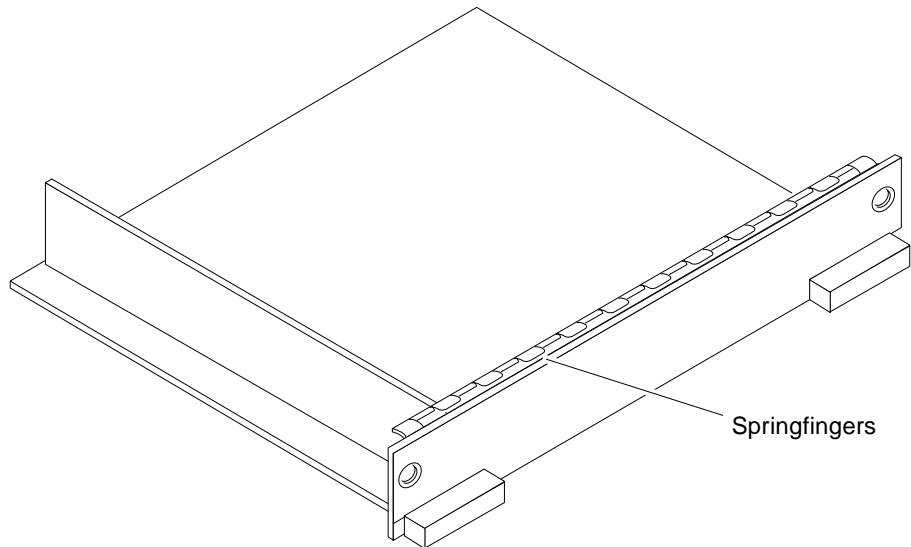


FIGURE 5-1 Filler Panel (Enterprise 5500/4500 Only)

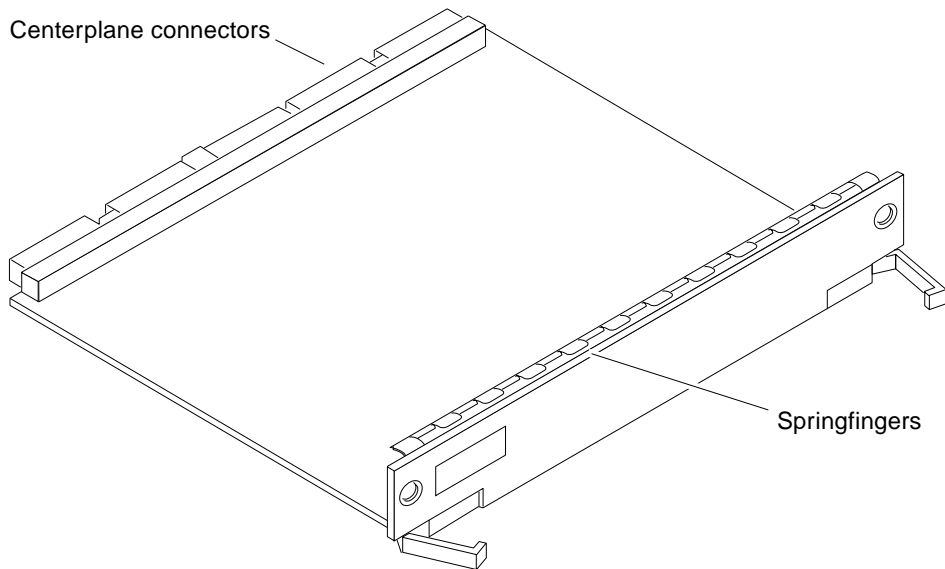


FIGURE 5-2 Load Board (Enterprise 6500 Systems Only)

5.3 SCSI Termination

The last or only Disk board in a system must have the SCSI-out connector terminated with a SCSI terminator (FIGURE 5-3).

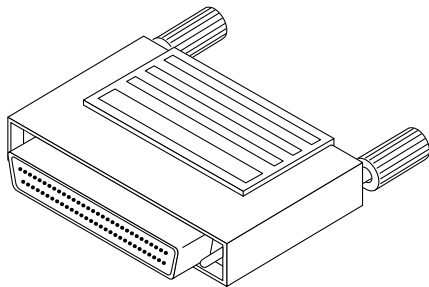


FIGURE 5-3 SCSI Terminator

5.4 Hot-Plug Feature

Enterprise systems have extensive error detection mechanisms, and an Automatic System Reconfiguration (ASR) feature that enables the system to be rebooted with failed components (such as CPUs, memory, or I/O) disabled. When an error is detected, the system can be reconfigured so that the board containing the failed components is placed in low power mode and is no longer accessible.



Caution – The peripheral power supply provides the precharge voltages required for hot-plug. Do not attempt hot-plug of a system component if the peripheral power supply is missing or inoperative. Use `prtdiag (1M)` to determine the status of the peripheral power supply.



Caution – If the message: `NOTICE: Hot Plug not supported in this system` is displayed during boot, do NOT attempt hot-plug in this system or damage to the hardware will occur.

The hot-plug feature enables you to insert a new board into a powered-on system, despite the system being “live,” or being supplied with electrical power. When the hot-plug feature is used to add a board to a powered-on system, the system will not use the new board until the system is rebooted.

5.5 Disk Boards

A maximum of two Disk boards can be installed in Enterprise 6500 systems; four Disk boards can be installed in Enterprise 5500/4500 systems.

Note – Disk boards can be installed only in slots 14 and 15 in Enterprise 6500 systems, and *slot 15 must be used* when installing only one Disk board.

Each Disk board contains a fast and wide single-ended SCSI chain with sockets for two disks. There are three status and two activity LEDs; each activity LED is driven directly by a disk drive.

5.5.1 Removing a Board

5.5.1.1 Removing a Board from a Powered-On System



Caution – Remove a board from a powered-on system only after the ASR software has disabled the board. If a board has not been disabled by the ASR software, then the operating system should be halted and the system powered off prior to board removal. See Chapter 11 “Powering Off and On” and then Section 5.5.1.2 “Removing a Board from a Powered-Off System.”

1. **Ensure that the board has been disabled by the ASR software. See Section 5.4 “Hot-Plug Feature.”**

Once disabled by ASR, one of two results occur:

- The three LEDs on the board are not lit (board has no power)
- The outer two green LEDs are not lit and the middle yellow LED is lit (board in low power mode).

Note – System software operates such that the LED pattern described is the same for a board that is component side-down (installed in front of card cage) or component-side up (installed in rear of card cage).

2. **Unfasten any cable connectors from the front panel and set them aside.**

Label cables to identify them for reconnection later.

3. Use a Phillips #1 screwdriver to mechanically release the board from the system card cage.

Insert the screwdriver into each quarter-turn access slot (the slots are located on the left and right sides of the board's front panel) and then turn a quarter turn so that the arrow points to the unlocked position (FIGURE 5-4).

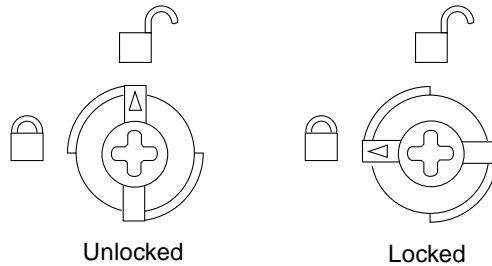


FIGURE 5-4 Unlocking and Locking Quarter-Turn Access Slots

4. Pull the ends of both extraction levers outward simultaneously to unseat the board centerplane connector from the centerplane receptacles (FIGURE 5-5).

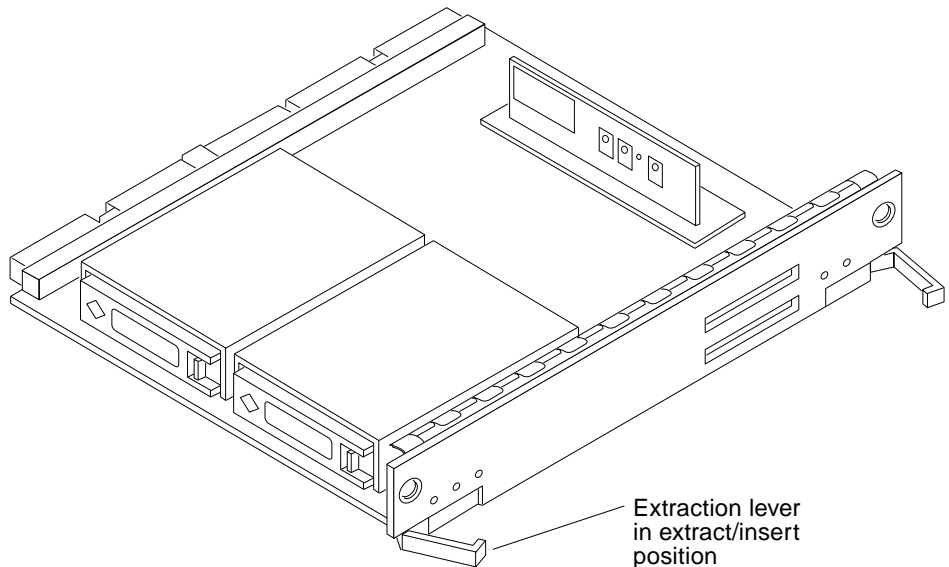


FIGURE 5-5 Disk Board

5. If a board is not immediately replaced, a filler panel or a load board (for Enterprise 6500 systems only) must be installed in its place.

See Section 5.2 “Filler Panels and Load Boards.”

5.5.1.2 Removing a Board from a Powered-Off System

1. **Use a Phillips #1 screwdriver to mechanically release the board from the system card cage.**

Insert the screwdriver into each quarter-turn access slot (the slots are located on the left and right sides of the board's front panel) and then turn a quarter turn so that the arrow points to the unlocked position (FIGURE 5-4 on page 5-7).

2. **Unfasten any cable connectors from the front panel and set them aside.**

Label cables to identify them for reconnection later.

3. **Pull the ends of both extraction levers outward simultaneously to unseat the board from the centerplane receptacles.**

See FIGURE 5-5 on page 5-7.

5.5.2 Installing a Board

5.5.2.1 Board Slot Selection

Note – Logically there is no difference between the board slots in the front or rear of the card cage, and each slot can accept any board type. It is suggested that CPU/Memory+ boards be installed in the front slots, and I/O+ and Disk boards be installed in the rear slots because of cabling. Should the need arise, however, any of these three board types can be placed in any of the numbered board slots, with these exceptions:

Slot 1: Slot 1 should be used by the first I/O+ board because it is the only slot connected to the onboard SCSI devices.

Slots 14 and 15: In Enterprise 6500 systems, Disk boards are supported only in these two slots.

The first CPU/Memory+ board is placed in slot 0, followed sequentially by all remaining even numbered slots. If there are boards remaining, they can be installed sequentially in odd numbered slots, if available, in the system rear (with the exception of slot 1 as noted above). See FIGURE 5-6 on page 5-9.

Other than the slot 1 exception, a Disk board can be placed in any of the numbered board slots in Enterprise 5500/4500 systems. Use only slot 14 and slot 15 in Enterprise 6500 systems, and *you must use slot 15 if only one* Disk board is installed.

For boards being placed in the rear of the system, ensure that the component side is up. If the boards are placed in the front of the system, ensure that the component side is down (FIGURE 5-7).

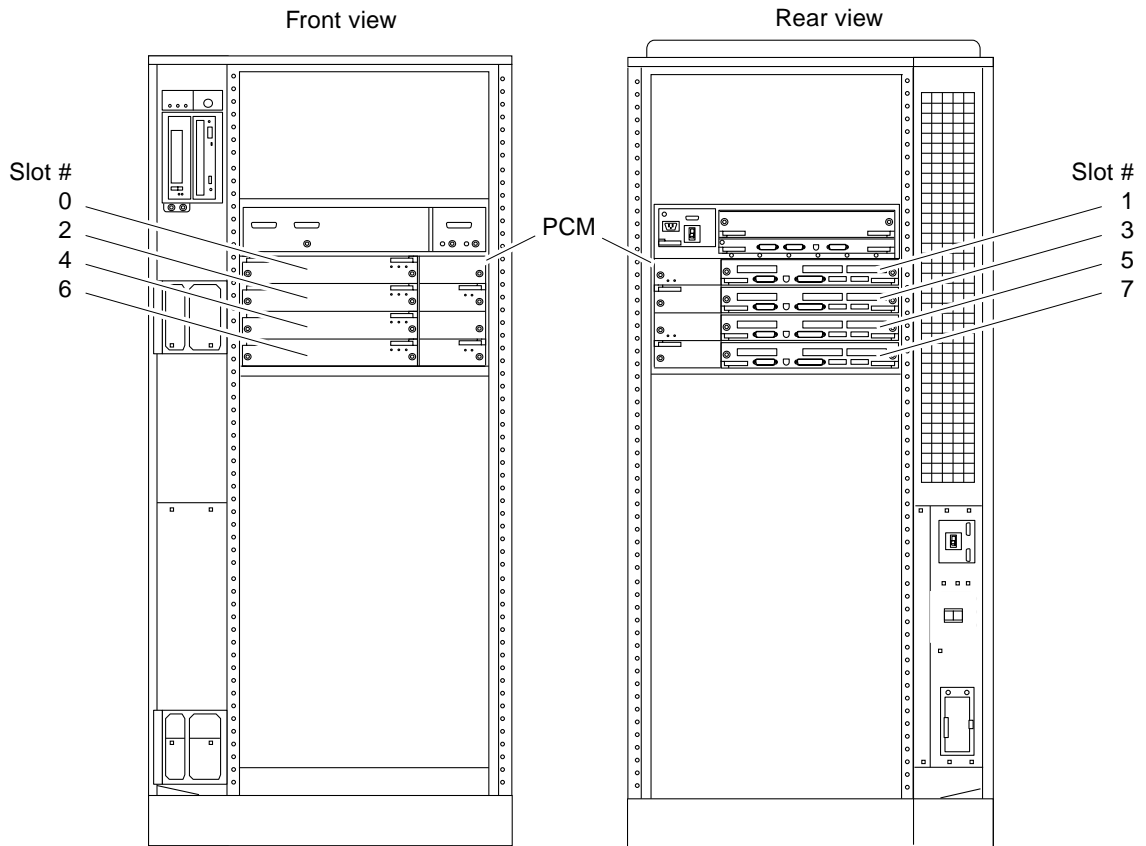


FIGURE 5-6 Enterprise 5500/4500 Board Locations

5.5.2.2 Cooling and Power Issues

There should be one power/cooling module (PCM) for every two boards to adhere to cooling and power requirements. The PCMs must be installed adjacent to populated board slots to ensure the fan in the PCM can cool the respective boards.

Note – All empty board slots in Enterprise 4500 or 5500 systems must have a filler panel installed to ensure proper cooling. All empty slots in Enterprise 6500 systems must have load boards installed.

5.5.2.3 Inserting a System Board

1. Carefully insert the board (component side down if in front; component side up if in the rear) in the proper slot in the card cage, ensuring that the board does not slip out of the left and right card guides (FIGURE 5-7).

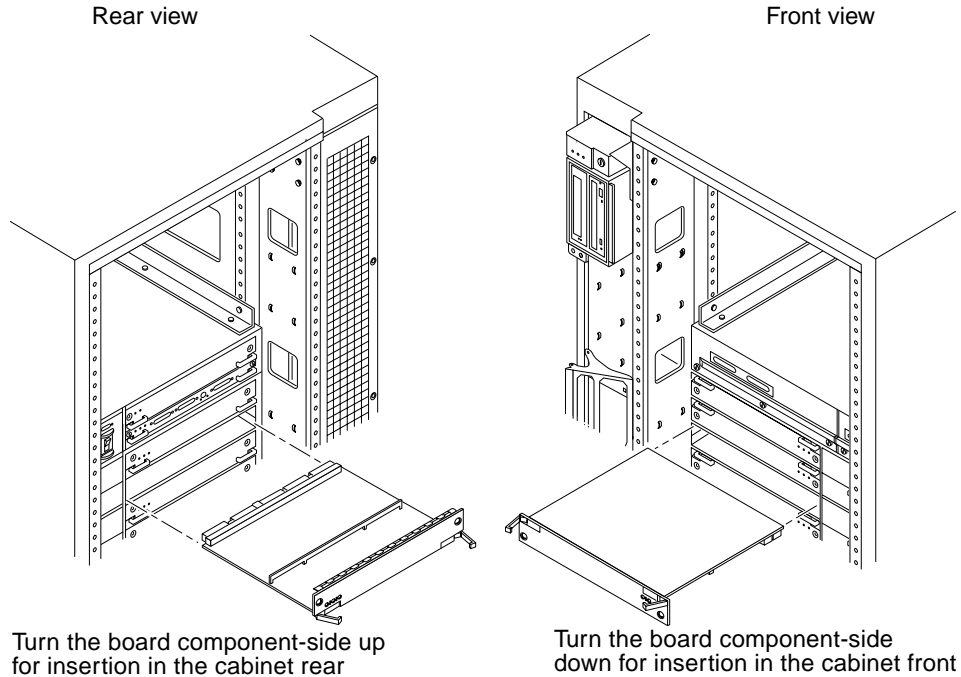


FIGURE 5-7 Board Replacement

2. Ensure that both extraction levers are in the insert position (arrow pointing outward) and that the quarter-turn access slots are unlocked (arrow indicates unlocked position) as you slide the board toward the centerplane receptacles.

See FIGURE 5-4 on page 5-7 and FIGURE 5-5 on page 5-7. The board will not seat fully unless the levers are in this starting position and both quarter-turn access slots are unlocked.



Caution – DO NOT FORCE any board into a slot; this can cause damage to the board and system. The board should insert and seat smoothly. If it binds, remove the board and inspect the card cage slot for any obvious obstructions. Also inspect both the board and the centerplane for bent pins or other damage.

- 3. Push the board into the card cage, then simultaneously press both extraction levers to seat the board on the centerplane.**

Pushing both levers simultaneously avoids twisting the board and bending the connector pins, and mates the board centerplane connector to the matching receptacle on the centerplane. Do not press on board front panel to seat it—doing so will damage the connector pins.

- 4. Mechanically lock the board to the system chassis by inserting a Phillips #1 screwdriver into each quarter-turn access slot and then turning to the locked position.**

See FIGURE 5-4 on page 5-7.

- 5. Connect the Disk board to a SCSI Host Adapter (on-board or SBus card).**

The Disk board kit includes an 80-cm fast-wide SCSI cable. If the Disk board is installed on the opposite side of the card cage from the SCSI Host Adapter, you must use a 2-meter cable, part number 530-1885 (sold separately).

- 6. If the Disk board is the last (or only) board in the SCSI chain, terminate the SCSI out connector on the disk board.**

The Disk board kit includes a fast-wide SCSI terminator, part number 150-2267.

- 7. Replace or connect all other necessary cables to the fronts of the boards.**

- 8. Once the Disk board has been installed, a message similar to the following will be displayed on the monitor (if the system is powered on):**

Example depicts screen output when a new Disk board has been hot-plugged into slot 6 of an operating Enterprise system:

```
NOTICE: Disk Board Hotplugged into Slot 6
NOTICE: Board 6 is ready to remove
```

This screen output indicates that the board has been detected by the system and is in the low power mode. Additionally, any subsequent `prtdiag(1M)` output would include information for board slot 6. Again, note that the system will not use the new board until the system is rebooted.

- 9. Reboot the system now or schedule a later time to reboot when system disruption will be minimized.**

5.5.2.4 Cabling Issues for Enterprise 6500 Systems

▼ Slot 15 installation

1. Use an 80-cm SCSI cable to connect the Disk board to the SCSI Host Adapter (onboard or SBus card).
2. Install a SCSI terminator on the disk board if it is the last (or only) board in the SCSI chain.

▼ Slot 14 installation

1. Connect the Disk board to the SCSI Host Adapter (onboard or SBus card):
 - If an I/O+ board is installed in the front, use an 80-cm SCSI cable to connect the Disk board to the SCSI Host Adapter.
 - If all I/O+ boards are installed in the rear, use a 2-meter SCSI cable (sold separately) to connect the Disk board to the SCSI Host Adapter. Route the cable down the side of the card cage, through the cable pass in the cabinet.
2. Install a SCSI terminator on the disk board if it is the last (or only) board in the SCSI chain.

5.5.3 Disk Drives

5.5.3.1 Removing a Disk Drive

1. Use the procedures described in, Section 5.5.1 “Removing a Board,” To remove the applicable Disk board.
2. Unlatch and open the ejector drive retainer on the drive to be replaced (FIGURE 5-8).

Using the extended drive retainer as a handle pull the drive straight out to disengage it from the board mating receptacle and the drive mounting bracket.

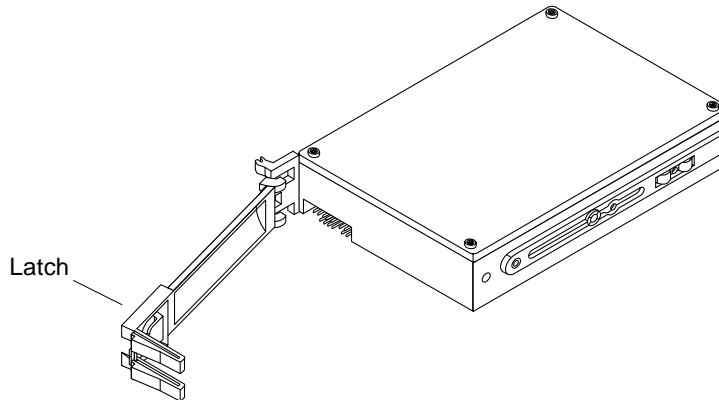


FIGURE 5-8 Disk Drive with Ejector Drive Retainer Open

3. If a new drive is to be installed, proceed to the next section.

If the drive is not to be replaced, replace the Disk board as described in Section 5.5.2 “Installing a Board”.

5.5.3.2 Installing a Disk Drive

1. Inspect the shipping container upon receipt of your drive, and look for evidence of damage.

If the carrier’s agent is not present when the container is opened, and the contents are damaged, keep all contents and packing materials for the agent’s inspection.

2. If there is no evidence of damage, carefully remove the drive from the shipping container.

Save the carton and the packing material for possible later use.

3. Place the antistatic mat on a table or work surface.

4. Attach a grounding wrist strap.

Refer to the documentation that came with your ESD kit.

5. Remove the disk drive from its protective packaging.

Hold the disk drive by the edges, near the middle of the drive. Keep the drive vertical until you lay it on the ESD mat.

6. Place it on the antistatic mat with the component side of the disk drive controller cards facing up.

7. Unlatch and then open the ejector drive retainer for the drive being replaced or installed (FIGURE 5-8).

- 8. Using the drive retainer as a handle, slide the drive in and then seat it to the board connector receptacle.**

Close and latch the ejector drive retainer.

- 9. SCSI IDs for disk drives on Disk boards are selected on the Disk board.**

See Appendix C “SCSI Devices” to select the SCSI ID for the disk drive.

- 10. Check that the ejector drive retainers on both disk drives are closed, latched in place, and do not extend past the edge of the board.**

If an ejector drive retainer extends past the edge of the Disk board or is not fully closed, the disk drive connector is not joined with the Disk board connector. Do the following:

- a. Use the unlatched drive retainer to unseat the drive from the board connector receptacle and slide it out an inch or two.**
- b. Check that the connectors are not broken and that nothing blocks the joining of these two connectors.**

If there is a problem, put the disk drive back into its protective packaging, and contact your service representative.

Note – Save the antistatic shipping bag and other original packing. You will need these materials when transporting the disk drive.

- 11. Terminate the SCSI-out connector, if necessary.**

The SCSI-out connector on Disk boards that are not daisy chained to an additional device must be terminated with a SCSI terminator. See FIGURE 5-3 on page 5-4.

Note – The last or only disk board in a system must have the SCSI out connector terminated with a fast-wide SCSI terminator, part number 150-2267.

- 12. Replace the Disk board as described in Section 5.5.2 “Installing a Board.”**

Clock+ Board

To protect both yourself and the equipment, make sure you follow the precautions in Chapter 2 “Safety Precautions and Tools Requirements.”

- Safety Precautions—page 2-1
- Handling Boards and Assemblies—page 6-1
- Clock+ Board—page 6-2
- Connectors—page G-14

For your protection, also observe the following safety precautions when setting up your equipment:

- Follow all cautions, warnings, and instructions marked on the equipment.
- Never push objects of any kind through openings in the equipment as they may touch dangerous voltage points or short out components that could result in fire or electric shock.
- Refer servicing of equipment to qualified personnel.

6.1 Handling Boards and Assemblies



Caution – The chassis AC power cord must remain connected to ensure a proper ground.



Caution – The clock+ board and its modules have surface-mount components that can be broken by flexing the board.

To minimize the amount of board flexing, observe the following precautions:

- Hold the board only by the edges near the middle of the board, where the board stiffener is located. Do not hold the board *only* at the ends.
- When removing the board from an antistatic bag, keep the board vertical until you lay it on the Sun ESD mat.
- Do not place the board on a hard surface. Use a cushioned antistatic mat. The board connectors and components have very thin pins that bend easily.
- Do not use an oscilloscope probe on the components. The soldered pins are easily damaged or shorted by the probe point.
- Transport the board in an antistatic bag.
- Be careful not to drag boards across surfaces as board components are easily damaged.

6.2 Clock+ Board

There is one clock+ board to a system. The clock+ board provides:

- Programmable system and processor clock
- Serial, keyboard, and mouse ports for the console
- Centralized Time-of-day (TOD) chip that includes NVRAM
- Centralized reset logic
- Status and control of power supplies

The clock+ board consists of the following subsystems:

- Console Bus
- Clocks
- Reset logic
- JTAG
- Centerplane connector signals

FIGURE 6-1 depicts a block diagram of the subsystems and centerplane connector.

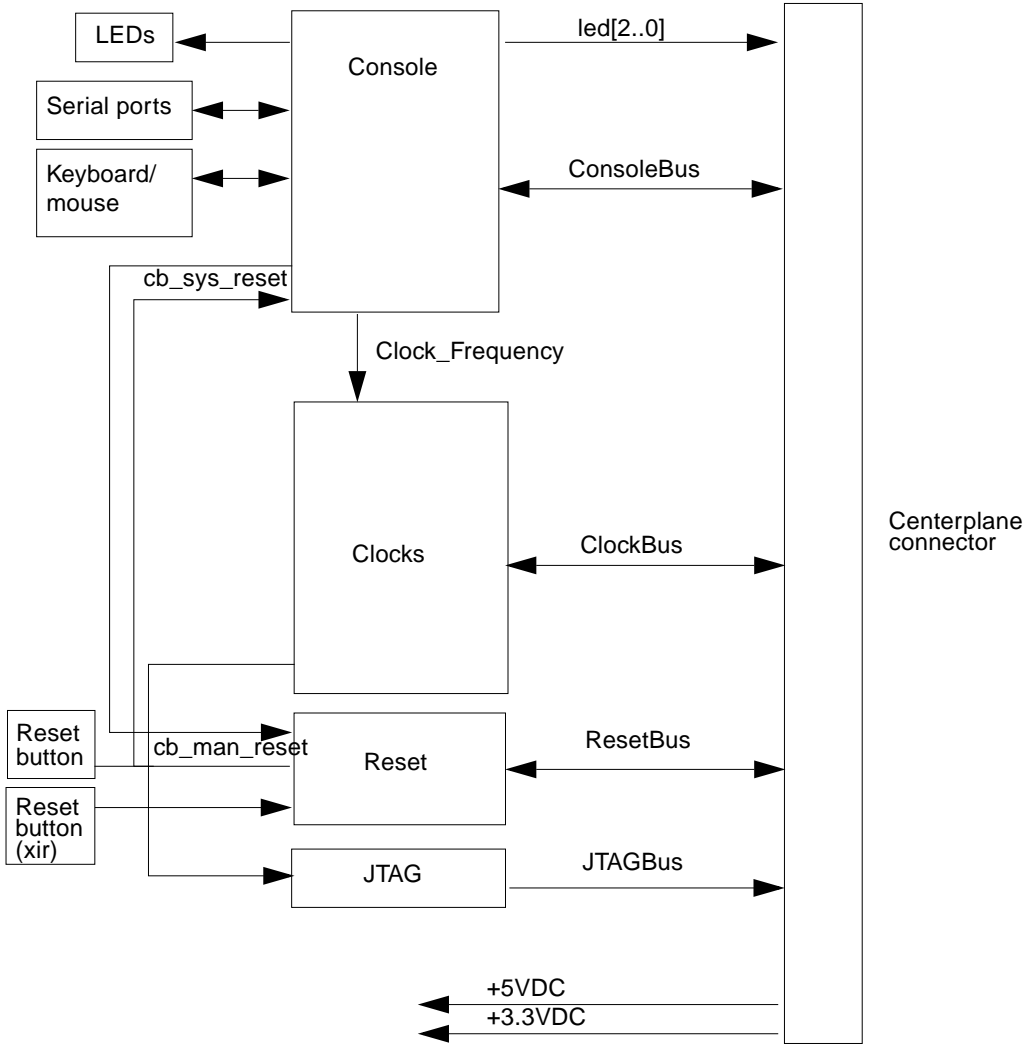


FIGURE 6-1 Clock+ Board Block Diagram

6.2.1 ConsoleBus

The ConsoleBus provides system boards access to global system control and status as well as to the keyboard, mouse, and serial ports. In addition, there is a NVRAM/TOD chip that maintains the date and time and 8 Kbytes worth of data when the power to the system is shut off.

The state of physical hardware conditions is maintained in registers on the clock+ board. Each of these registers has inputs generated from other subsystems on the clock+ board, from other boards, or from the power supplies in the system. Some clock+ board registers are reserved for controlling various states of the machine.

The ConsoleBus also provides a serial port interface and a keyboard/mouse interface. The primary purpose of the serial port interface is to provide POST messages during power-on. The serial port can be used as a console for systems without a keyboard and display, and for standard serial peripheral hook-ups such as modems and printers.

6.2.2 Clocks

The clock subsystem generates the clocks for the entire system. The base clock is synthesized, then divided into various frequencies. The base clocks are then “fanned-out” and driven to the centerplane by an array of driver chips. Two processor clocks and one system clock go to each board slot on the centerplane.

6.2.3 Reset logic

The reset logic consists of four subcircuits for controlling the system reset and error state:

- Manual reset
- System reset
- XIR
- System error

6.2.4 Removing a Clock+ Board

The clock+ board slot (FIGURE 6-2) is located near the top of the system, immediately below the peripheral power supply. The illustration shows an Enterprise 4500 server, but the location is similar for the Enterprise 5500 and 6500 servers.



Caution – The clock+ board is not hot-pluggable. Do not remove the clock+ board until the system has been halted and powered off.



Caution – To avoid damaging internal circuits, do not disconnect or connect any cable while power is applied to the system.

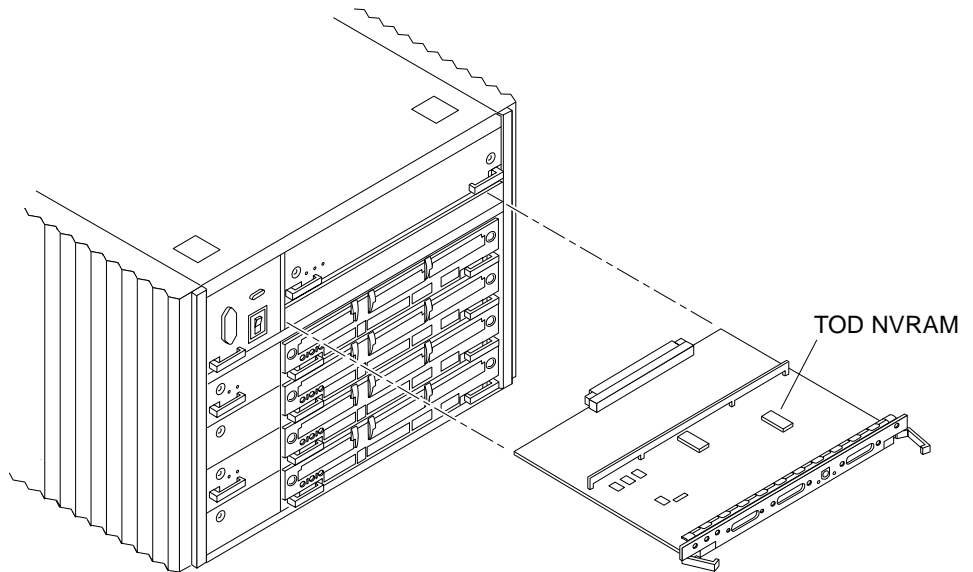


FIGURE 6-2 Clock+ Board

1. **You must halt the operating system before turning off the system power.** See Chapter 11 “Powering Off and On,” for this procedure.
2. **Unfasten cable connectors from the clock+ board front panel and set them aside.** Label cables as you disconnect them, to help identify them for reconnection later.
3. **Loosen the two captive screws securing the board to the system chassis.**
4. **Pull the ends of both extraction levers outward simultaneously to release the board from the centerplane receptacles (FIGURE 6-2).**

5. **If you are replacing the clock+ board, remove the TOD NVRAM from the old board and place it on the new board.**

This is necessary to match the host ID with the Ethernet ID.

Note – If a entire system is replaced, the TOD NVRAM on the clock+ board must also be changed to maintain the same host ID.

6.2.5 Installing a Clock+ Board

Note – If you are replacing the clock+ board, then the TOD NVRAM from the old board must be removed and placed on the new board. Note also that if a system is replaced, then the TOD NVRAM on the clock+ board must also be changed.

1. **Carefully insert the board in the proper slot in the card cage, ensuring that the board does not slip out of the left and right card guides.**

The component side of the board must face up.

2. **Ensure that both extraction levers are in the outward position as you slide the board toward the backplane connectors** (FIGURE 6-2).

The board will not seat fully unless the levers are in this starting position.



Caution – DO NOT FORCE any board into a slot; this can cause damage to the board and system. The board should insert and seat smoothly. If it binds, remove the board and inspect the card cage slot for any obvious obstructions. Also inspect both the board and the backplane for bent pins or other damage.

3. **Use the extraction levers to seat the board.**

Simultaneously swing both levers into the locked position. Do not press on board front panel to seat it—doing so will damage the connector pins.

4. **Secure the board to the chassis using the two captive screws, one on each side.**
5. **Connect any applicable interface cables to the front panel of the board.**
6. **Turn on system power. See Chapter 11 “Powering Off and On,” for this procedure.**
7. **Boot the system.**

Power Supplies

This chapter describes the power supplies and environmental sensing and reporting in Sun Enterprise systems.

- Safety Precautions—page 7-2
- Power Distribution—page 7-3
- Peripheral Power Supply—page 7-3
- Troubleshooting a Peripheral Power Supply—page 7-4
- Replacing a Peripheral Power Supply—page 7-4
- Power/Cooling Module (PCM)—page 7-8
- Troubleshooting a PCM—page 7-10
- Replacing a PCM—page 7-10

There are two types of power supplies: a power/cooling module (PCM) and a peripheral power supply (PPS). Both types of power supplies are hot-pluggable. This feature allows you to physically remove the failed component from a running system. A new hot-pluggable component can be inserted into a running system.

Note – The hot-plug feature requires a functioning peripheral power supply to provide electrical precharge current. Use the `prtdiag (1M)` command to determine if precharge current is available.

TABLE 7-1 lists the sources of power supply voltages.

TABLE 7-1 Power Supply Summary

Voltage	Source	Where Used
2.0V	PCM	GTL centerplane termination
3.3V	PCM	CPU/Memory+ Board (AC+, DC+s, FHC, SIMMs) UltraSPARC II Module (SRAMs, SDBs, CPU I/O)
5V	PCM, PPS	SBus, Clock+ Board UltraSPARC II Module power (via DC/DC converter)
12V	PPS	Peripherals (CD drive, tape drive)

7.1 Safety Precautions

Any servicing of equipment should be performed by qualified personnel.

Observe the precautions in TABLE 7-2.

TABLE 7-2 Safety Precautions

Item	Problem	Precaution
Wrist or foot strap	ESD	Wear a conductive wrist strap or foot strap when handling power supplies.
ESD mat	ESD	An approved ESD mat provides protection from static damage when used with a wrist strap or foot strap.
Cover panels	System damage and overheating	Re-install all cabinet cover panels after performing any service work on the system.
SBus slot covers	System damage and overheating	Install SBus slot covers in all unused SBus slots.

7.2 Power Distribution

The system has a single peripheral power supply, and each pair of board slots has a slot for a PCM. AC is distributed to each of the PCMs within the chassis. The software monitors the status of the AC power source. Current-sharing between power supplies provides redundant power.

7.3 Peripheral Power Supply

The peripheral power supply (FIGURE 7-1) provides power to the peripheral subsystems, the drives, the fans in the AC box, and the fan in the key switch box. The PPS provides auxiliary 5V output to power an optional remote console.

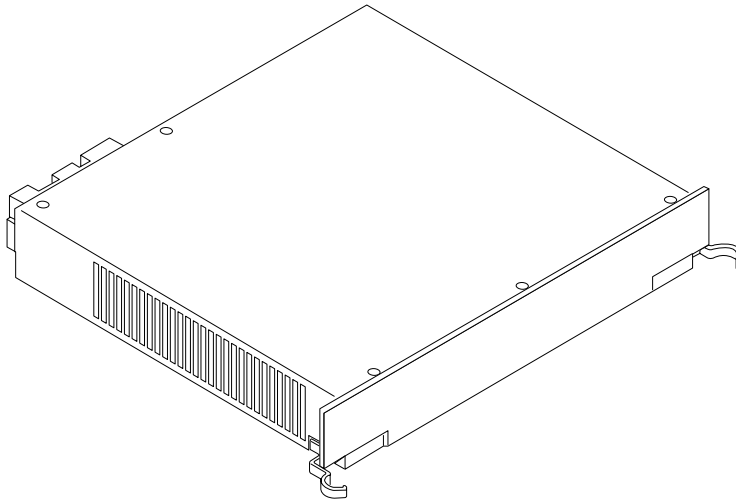


FIGURE 7-1 Peripheral Power Supply

The peripheral power supply provides three precharge outputs (3.3V, 5V, and 12V) to enable hot plug-in of system boards, PCMs, or drives into an active centerplane.

The PPS shares current with PCMs on the 5V output at the centerplane. In this way the PPS helps to reduce the possibility of a system failure if a PCM fails.

7.3.1 Troubleshooting a Peripheral Power Supply

A green LED is lit on the power supply when it is operational. When a peripheral power supply fails, a yellow LED is lit on the power supply.

See Chapter 10 “Flow Diagrams for Troubleshooting,” for more information.

7.3.2 Replacing a Peripheral Power Supply



Caution – Remove and replace the peripheral power supply in a running system. Do not replace the PPS when the system is in the low power mode.

1. Verify that the system is running and is not in the low power mode.

If you replace the PPS in low power mode, the system will power on unexpectedly. Note that when the system is in low power mode, the front panel and board LEDs are all off, and the yellow power supply LEDs are on.

2. Verify that onboard peripheral devices are not in use, or data may be lost.

Note that while the PPS is removed:

- There is no peripheral power, and onboard peripheral devices will not operate.
- There is no precharge current. Do not attempt to replace hot-pluggable devices except for the PPS itself.

3. Use a Phillips #1 screwdriver to unlock the quarter-turn access slots (FIGURE 7-2) on the power supply.

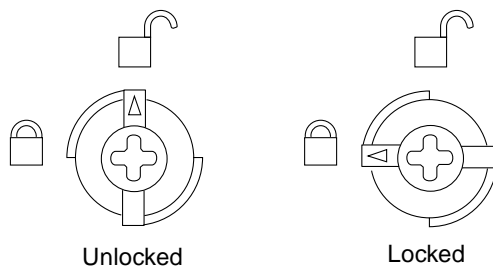


FIGURE 7-2 Quarter-Turn Access Slot

4. Pull the ends of the extraction levers outward to release the power supply from the centerplane (FIGURE 7-3 for Enterprise 6500 or 5500 system, FIGURE 7-4 for Enterprise 4500 system).

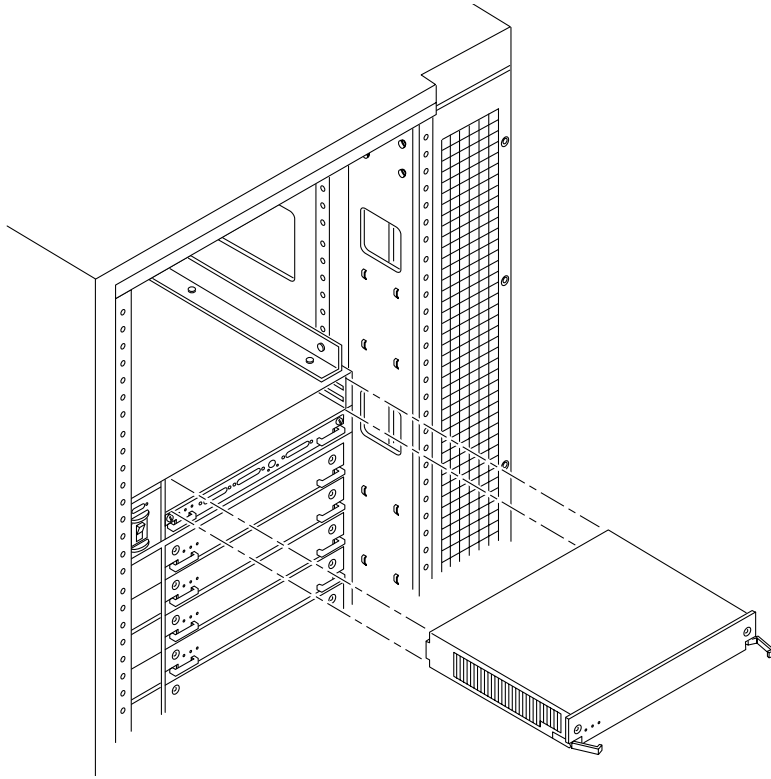


FIGURE 7-3 Replacing the Enterprise 6500/5500 PPS

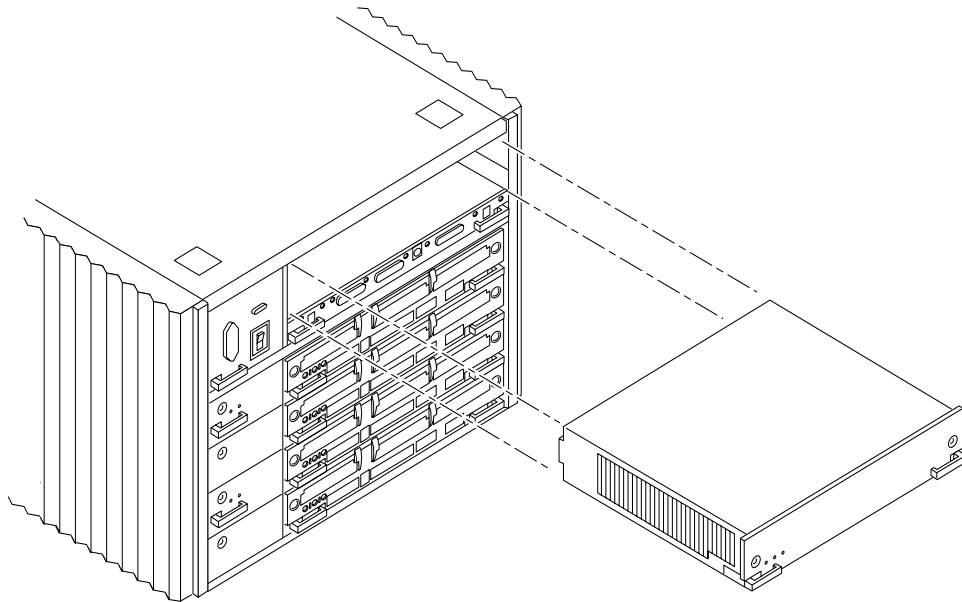


FIGURE 7-4 Replacing the Enterprise 4500 PPS

5. Pull out the power supply.

You will see a message similar to the following example on your system console:

```
WARNING: Peripheral 5.0 Volt Power Failing
WARNING: AC Power failure detected
WARNING: Peripheral 12 Volt Power Failing
WARNING: Auxiliary 5.0 Volt Power Failing
WARNING: Keyswitch fan failure detected
NOTICE: Peripheral Power Supply 0 Removed
WARNING: AC Box fan failure detected
```

6. Place the replacement PPS halfway into the slot, and:

a. Pull out both extraction levers to the unlocked position

b. Verify that the quarter-turn access slots are also in the unlocked position.

7. Slide the PPS to the centerplane, then use the extraction levers to seat the PPS.

Simultaneously swing both levers inward to the locked position. Do not press on the front panel of the power supply to seat it; doing so will damage the connector pins.



Caution – DO NOT FORCE the power supply into a slot; this can damage the power supply and the centerplane.

The power supply should insert and seat smoothly. If it binds, remove it, and inspect the slot for any obstructions. Do not damage the springfingers at the bottom of the power supply.

8. Use a Phillips #1 screwdriver to turn quarter-turn access slots to the locked position (FIGURE 7-2).

9. Be sure the green LED is lit.

If the green LED is not lit, the power supply may not be seated properly. Check to see if it is seated properly by repeating Step 4 to Step 9. If the green LED is still not lit, see Chapter 10 “Flow Diagrams for Troubleshooting,” for more information.

You will see a message similar to the following example on your system console:

```
NOTICE: Peripheral Power Supply 0 Installed
NOTICE: AC Power failure no longer detected
NOTICE: Peripheral Power Supply OK
NOTICE: Peripheral 5.0 Volt Power OK
NOTICE: Peripheral 12 Volt Power OK
NOTICE: Auxiliary 5.0 Volt Power OK
NOTICE: Peripheral 5.0 Volt Precharge OK
NOTICE: Peripheral 12 Volt Precharge OK
NOTICE: System 3.3 Volt Precharge OK
NOTICE: System 5.0 Volt Precharge OK
NOTICE: AC Box fans OK
NOTICE: Keyswitch fans OK
```

7.4 Power/Cooling Module (PCM)

The power/cooling module (PCM) provides power for two boards. The PCM also supplies cooling air to the board slots, so in normal operation each board must be next to a working PCM.

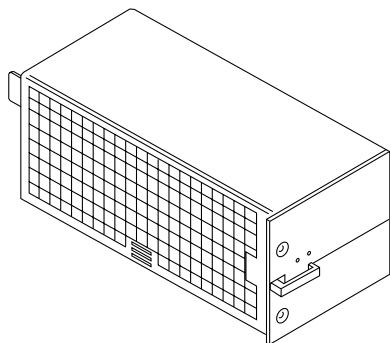


FIGURE 7-5 PCM

The PCM incorporates an AC inrush limit circuit and two precharge inputs (3.3V and 5V) that enable it to be hot-pluggable into a live centerplane.

Within a system all PCMs operate in a parallel redundant mode, sharing 2.0V, 3.3V, and 5V output currents. The shared 5V output also includes the 5V output of a peripheral power supply.

7.4.1 Requirements for Redundant Power

If a DC supply in a PCM fails, the system boards will continue to be powered and cooled by the other power supplies if sufficient redundancy (an additional power supply) is present.

For example, if an Enterprise system needs a minimum of three power supplies and four are present, then the system has redundancy. However, fully configured Enterprise systems represent a different situation and are always hot-pluggable. That is, an Enterprise 5500 or 4500 system with seven or eight boards and four PCMs is hot-pluggable. (The peripheral power supply acts as the “extra” power supply.) Similarly, an Enterprise 6500 system with fifteen or sixteen boards and eight power supplies is also hot-pluggable. (Seven PCMs are sufficient to power sixteen active boards; the eighth PCM is “extra.” However, the eighth PCM is required for cooling purposes.) See TABLE 7-3.

Note – The presence of an additional (extra) PCM in the system provides redundancy and allows hot-plug of PCMs.

TABLE 7-3 Minimum and Redundant Working Power Supplies Required to Power Active Boards

Number of Boards	Enterprise 5500/4500 Systems		Enterprise 6500 System	
	Minimum Working Power Supplies	Redundant Working Power Supplies (Hot-pluggable)	Minimum Working Power Supplies	Redundant Working Power Supplies (Hot-pluggable)
1-2	1	2	1	2
3-4	2	3	2	3
5-6	3	4	3	4
7-8	3 + peripheral supply ¹	4 + peripheral supply	4	5
9-10			5	6
11-12			6	7
13-14			7	8
15-16			7 ²	8

1. System needs a fourth PCM for cooling purposes.

2. System needs an eighth PCM for cooling purposes.

Failed power supplies must be replaced as soon as practical. Operating an Enterprise system without a redundant power supply will result in an outage at the next PCM failure.

7.4.2 Cooling Requirements

Note – In the Enterprise system, all boards must be adjacent to a PCM. The fans in the PCM cool the boards. The minimum configuration is one PCM for every two adjacent boards.

The power supplies incorporate redundant bulk fan electrical power so that the fans continue to operate in a failed power supply with the redundant fan power from the peripheral power supply.

7.4.3 Troubleshooting a PCM

A green LED is lit on the power supply when it is operational. When a PCM fails, a yellow LED is lit on the power supply.

You will see a message similar to the following example on your system console when a PCM fails:

```
WARNING: Core Power Supply 2 Failing
WARNING: Redundant power lost
```

See Chapter 10 “Flow Diagrams for Troubleshooting,” for more information.

7.4.4 Replacing a PCM



Caution – *Do not replace a PCM while the system is in the low power mode.* Remove and replace the PCM only in a running system. Replacing a PCM during low power mode will cause the system to power up immediately and result in a severe overload condition for that PCM (the other PCMs will remain in the low power mode).

The system is in the low power mode if the front panel and board LEDs are all off while the yellow LEDs are lit on the power supplies.



Caution – Replace the PCM within several minutes or risk overheating the board(s) cooled by the fans in that power supply.

Remember the following rules for hot-plug replacement of a PCM:

- The peripheral power supply must be fully operational (to provide precharge current.)
- There must be a redundancy of electrical power (TABLE 7-3) in the system.

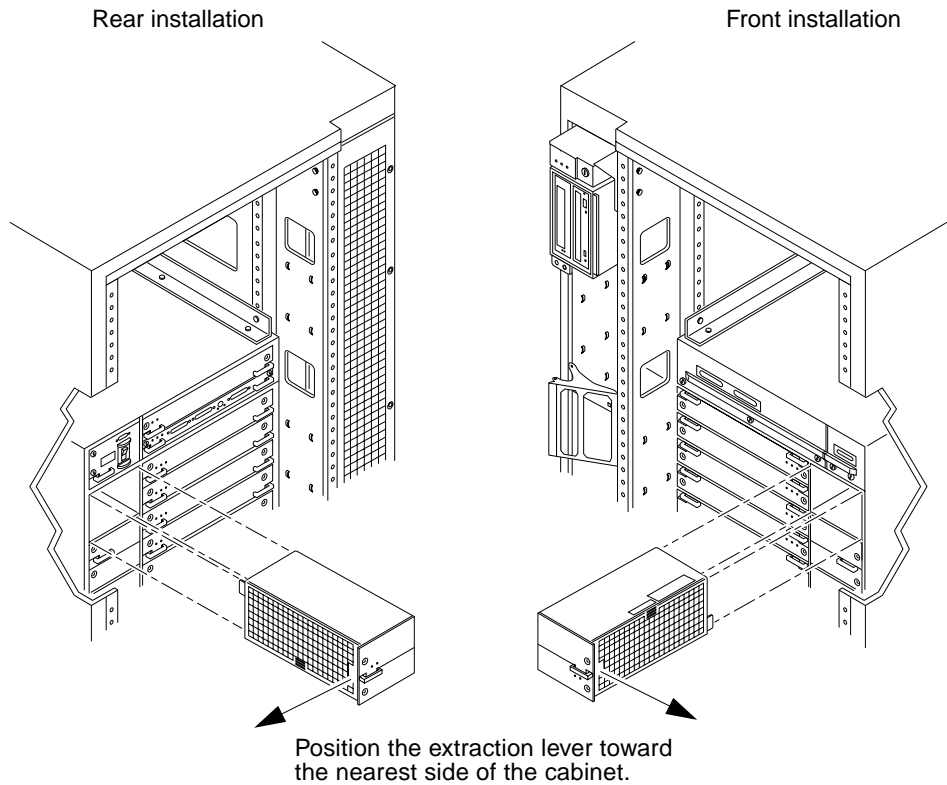


FIGURE 7-6 PCM — Front and Rear Installation

1. Use the `printdiag (1M)` command to determine if precharge current is present.
2. Use a Phillips #1 screwdriver to turn each quarter-turn access slot on the power supply to the unlocked position (FIGURE 7-7).

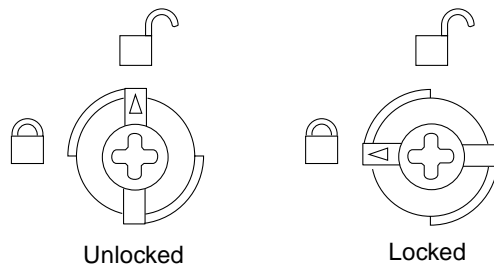


FIGURE 7-7 Quarter-Turn Access Slots

3. **Pull the end of the extraction lever outward to release the power supply from the centerplane.**
4. **Pull out the power supply.**

You will see a message similar to the following example on your system console:

```
NOTICE: Core Power Supply 2 Removed
```

5. **Insert the replacement power supply halfway into the guide slots, then:**
 - a. **Verify that power supply is oriented so that the extraction lever is toward the outside edge of the system (FIGURE 7-6).**
 - b. **Verify that the arrows in the quarter-turn access slots are turned to the unlocked position.**
 - c. **Open the extraction lever to the unlocked position.**

The power supply will not seat fully unless the extraction lever is in the unlocked position.



Caution – DO NOT FORCE the power supply into a slot; this can cause damage to the power supply and system.

The power supply should insert and seat smoothly. If it binds, remove it, and inspect the slot for obstructions. Take care to avoid damaging the springfingers at the bottom of the power supply.

6. **Slide the power supply to the centerplane, then use the extraction lever to seat the power supply.**

Swing the lever inward to the locked position. Do not press on the front panel of the power supply to seat it; doing so will damage the connector pins.
7. **Use a Phillips #1 screwdriver to turn each quarter-turn access slot to the locked position (FIGURE 7-7).**

8. Check to be sure the green LED is lit.

If the green LED is not lit, the power supply is not seated properly. Repeat Step 5 to Step 8. If the green LED is still not lit, see Chapter 10 “Flow Diagrams for Troubleshooting” for more information.

When the power supply is correctly installed, you will see a message similar to the following example on your system console:

```
NOTICE: Core Power Supply 2 Installed
NOTICE: Core Power Supply 2 OK
NOTICE: Redundant power available
```


Internal SCSI and Storage Devices

- Tape and CD-ROM Drives—page 8-4
- Sun StorEdge FlexiPack Tray—page 8-10
- Disk Drives—page 8-10

8.1 Device Locations

FIGURE 8-1 through FIGURE 8-3 show the general location of devices in each Enterprise system.

Individual removable-media devices (tape and CD-ROM) are supported in the removable-media tray in all cabinets.

The Enterprise 4500 cabinet supports internal FC-AL disk drives.

The Enterprise 6500 and 5500 cabinets support internal Sun StorEdge A5000 disk arrays. For hole numbers for mounting screws for Sun disk arrays and other storage trays and devices, refer to the *Rackmount Placement Matrix*, Sun part number 802-6945. Unless otherwise specified in the *Rackmount Placement Matrix*, mount the heaviest subassemblies at the bottom of the racks to minimize the effects of earthquakes.

Refer to the installation guide for the storage device for additional instructions.

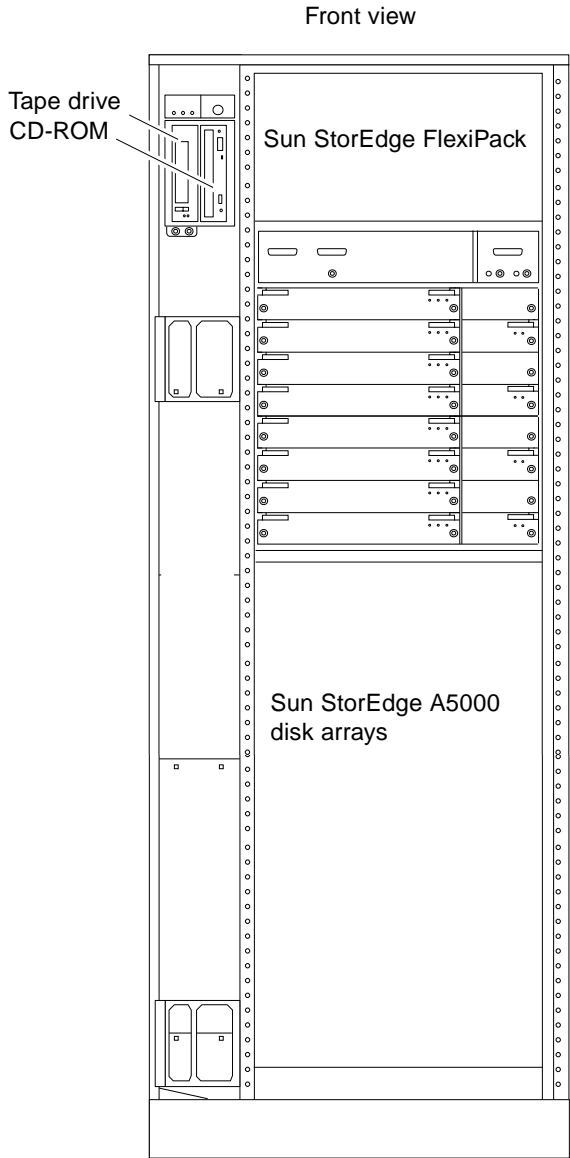


FIGURE 8-1 Enterprise 6500 System Storage Device Locations

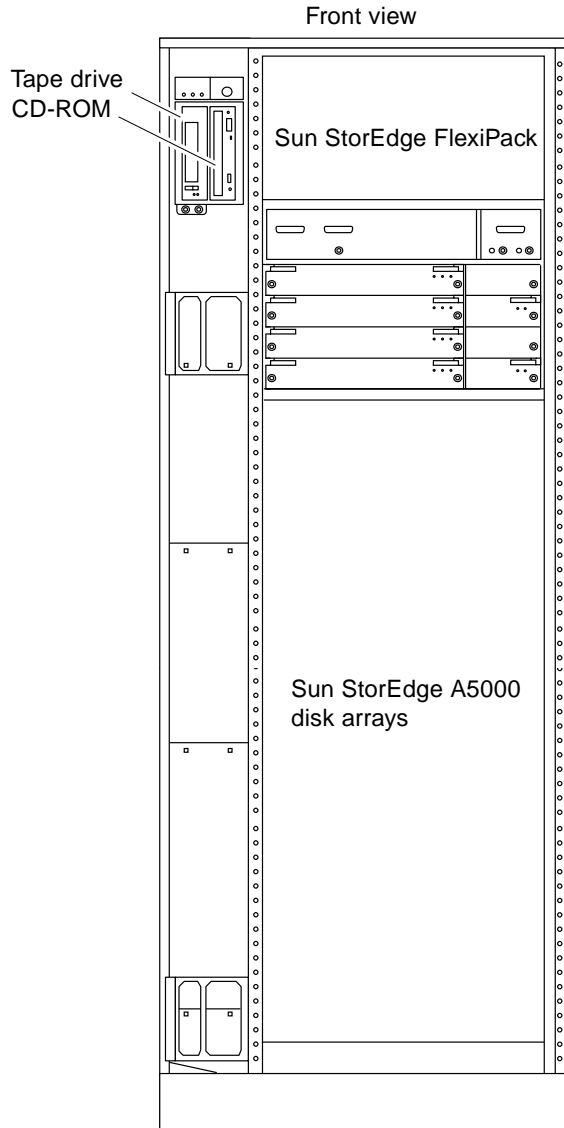


FIGURE 8-2 Enterprise 5500 System Storage Device Locations

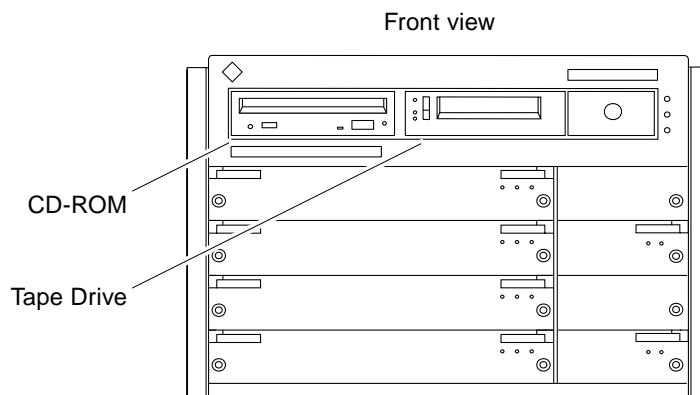


FIGURE 8-3 Enterprise 4500 System CD-ROM and Tape Drive Locations

Note – For cooling purposes, the tape drive in Enterprise 4500 configurations should be installed in the right bay, closest to the key switch and fan.

8.2 Tape and CD-ROM Drives

8.2.1 Use and Maintenance

Refer to the documentation that came with your device for information on use and maintenance. The procedures for the use and maintenance of these devices are the same for the different Enterprise systems, whether the devices are mounted horizontally (as in the Enterprise 4500 system) or vertically (as in the Enterprise 5500 and 6500 systems).

8.2.2 Enterprise 6500/5500 Tape or CD-ROM Drive

To remove and replace an existing device, perform steps 1 through 5. To install a tape device for the first time, proceed to step 6.



Caution – To prevent breakage, do not grasp the panel by the bottom edge.

1. **Remove the key from the key switch.**
2. **Remove the top panel.**

Grasp the panel on both sides at the top and pull to disengage the ball studs (FIGURE 8-4).

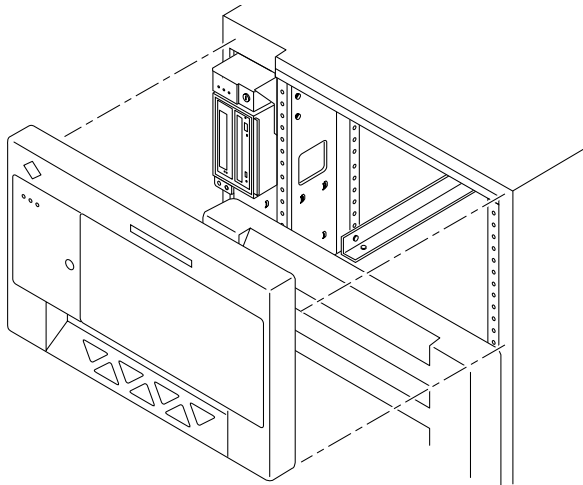


FIGURE 8-4 Removing the Top Front Panel

Note – It is not necessary to remove the media tray to replace a device; it is only necessary to remove the device enclosure from the media tray.

3. **Remove the left side panel.**
See Section 12.3.6 “Side Panels” for removal instructions.
4. **Release the device enclosure from the media tray by removing three screws on the left side of the media tray (FIGURE 8-5).**
5. **Pull the device enclosure forward and disconnect the data and power cables from the rear of each device.**

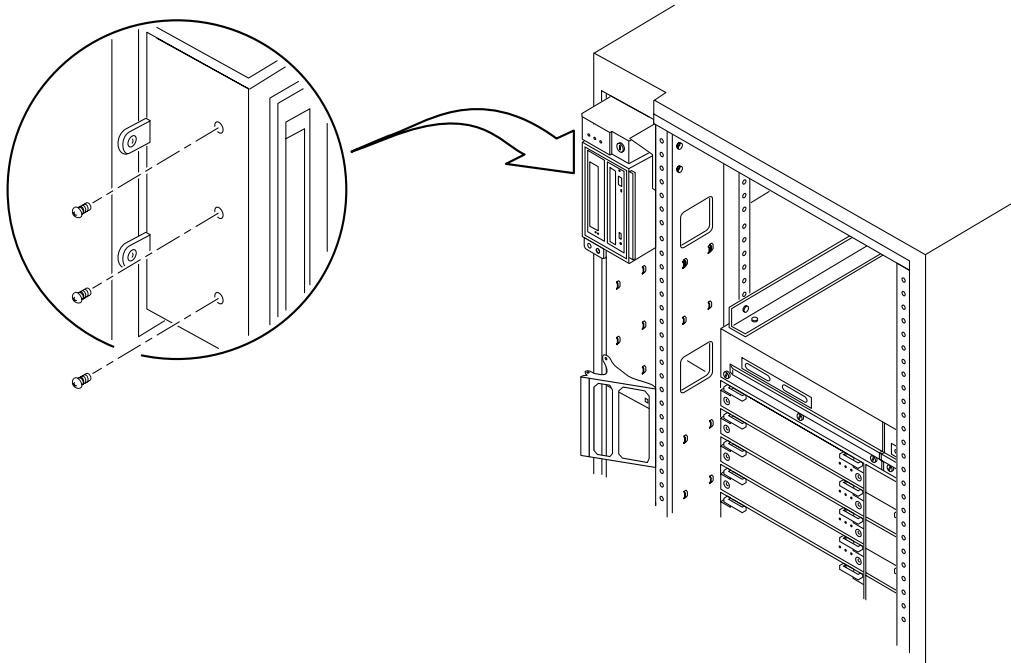


FIGURE 8-5 CD-ROM/Tape Drive Removal and Replacement

6. After the cabling is removed, remove the device enclosure from the media tray.
7. To remove a drive:
 - **CD-ROM drive:** remove two screws from each side where the device is secured to the device enclosure. Proceed to Step 9.
 - **Tape drive:** remove 2 screws from each side where the tape is fastened to the device enclosure, and then remove 4 screws securing the device to the enclosure side plate. Proceed to Step 9.
8. To install a tape drive in an unused slot:
 - a. Remove the filler panel from the device enclosure by loosening and removing 4 screws.
 - b. Use the 4 screws to secure the tape drive to the device enclosure.
9. On the replacement device set the SCSI ID address to 6 (for a CD-ROM drive) or 5 (for a tape drive).
10. To complete installation of a CD-ROM or tape drive, reverse Step 2 through Step 5.

8.2.3 Enterprise 4500 Tape or CD-ROM Drive

To remove and replace an existing device, perform steps 1 through 5. To install a tape drive for the first time, proceed to step 6.

Note – For cooling purposes, the tape drive must be installed on the side nearest the key switch.

1. **Unlock and remove the front panel bezel.**
 - a. **To unlock the bezel, press inward on the serrated edges at the lower left and right sides.**
 - b. **Tilt the bezel up 45 degrees to remove it (FIGURE 8-6).**
2. **Loosen the bottom three captive screws that hold the media tray to the chassis tray (FIGURE 8-7).**
3. **Insert a screwdriver in the notch (FIGURE 8-7) at the top center of the media tray to pull out the tray and separate it from the rear slip connectors.**
4. **Remove the seven screws on top of the media tray to lift off the tray cover to access CD-ROM and tape drives.**

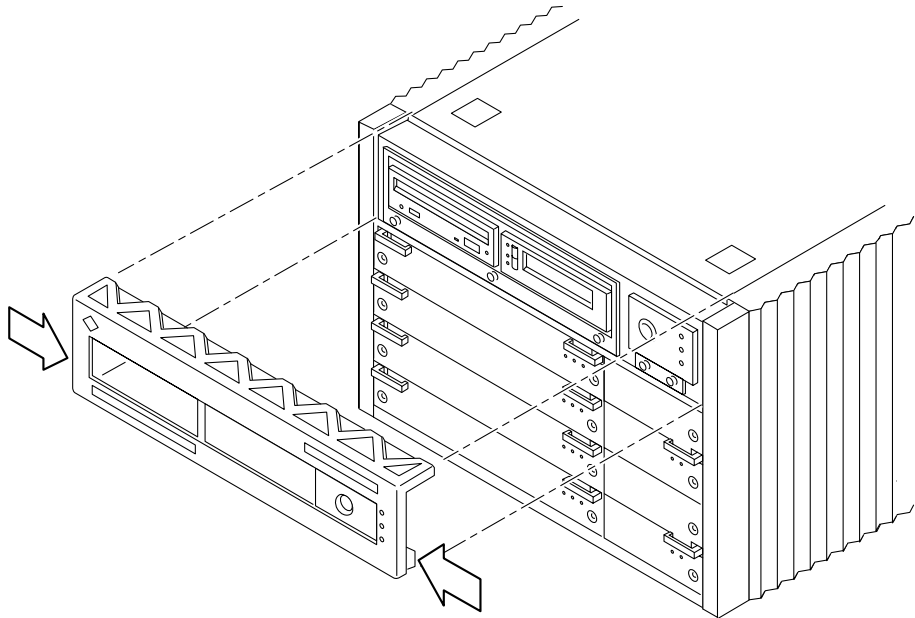


FIGURE 8-6 Removing the Front Panel Bezel

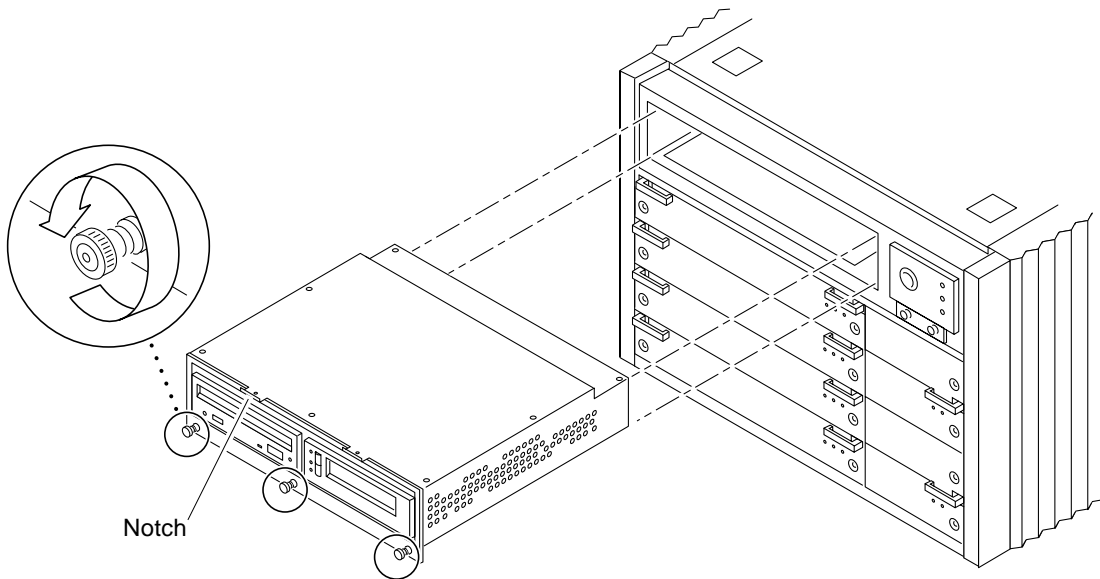


FIGURE 8-7 Removing and Replacing the media tray

5. To remove and replace a CD-ROM or a tape drive:

- a. Loosen the three captive screws securing the device to the tray.**
- b. Remove the mounting plate of the device being replaced and attach it to the replacement device using the same screws.**
- c. Set the replacement device SCSI address to 6 for a CD-ROM drive, or 5 for a tape drive.**
- d. Secure the replacement device to the caddy by tightening the three captive screws on the mounting plate.**
- e. To complete the replacement, reverse Step 1 and Step 2.**

Note – The tape drive must be installed on the side nearest the key switch for cooling purposes.

6. To install a tape drive for the first time:

- a. Remove the filler panel by loosening the three captive screws and then removing the panel.**

- b. Separate the filler panel plate from the device mounting bracket by loosening and removing the four screws; discard the filler panel plate.**
- c. Secure the mounting bracket to the new device.**
- d. Set the SCSI address to 5.**
- e. Secure the device and the mounting bracket to the media tray using the three captive screws.**
- f. To complete the install, reverse Step 1 through Step 3 of this procedure.**

8.3 Sun StorEdge FlexiPack Tray

For use and maintenance of the Sun StorEdge FlexiPack tray, refer to the documentation that came with the device.

8.4 Disk Drives

The Enterprise systems support Sun StorEdge A5000 disk arrays. For use and maintenance of these devices, refer to the documentation that came with the unit.

Troubleshooting Overview

This chapter contains these topics:

- Using a Terminal—page 9-1
- Hardware Indicator LEDs—page 9-3
- Diagnosing Problems—page 9-8
- Specific Problems and Solutions—page 9-11

9.1 Using a Terminal

If the system does not have a console, you can log in remotely or attach a terminal directly to the system.

To attach a terminal to the system:

- 1. Halt the system and turn off power.**
- 2. Connect the terminal to serial port A on the clock+ board.**

The clock+ board is located at the back of system, near the top of the card cage. FIGURE 9-1 shows the Enterprise 6500/5500 cabinet server. In the 8-slot Enterprise 4500 standalone server, the clock+ board is also near the top of the card cage.

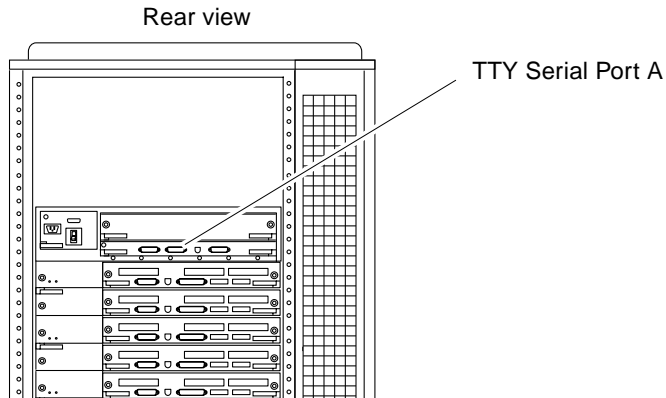


FIGURE 9-1 TTY Serial Port A on the Clock+ Board

3. Power on the terminal.

4. Set up the terminal.

Refer to the *OpenBoot Command Reference* for instructions for using the `set-defaults` and `printenv` commands.

The settings will vary with the terminal type, but these settings are often used:

- 9600 bps
- 8 data bits
- 1 stop bit
- Even parity
- Full duplex

5. Turn the key switch to the diagnostic position ().

The system will turn on. The diagnostic position puts POST in interactive mode and enables extensive POST tests.

9.2 Hardware Indicator LEDs

LEDs indicate system status. The front panel and the boards have three LEDs (FIGURE 9-2). Power supply modules have two LEDs.








	Power	Hardware failure	Cycling or running normally
System (3 LEDs):			
Board (3 LEDs):			
PCM (2 LEDs):			

FIGURE 9-2 LED Symbols

The LEDs on the system front panel or the clock+ board indicate the status of the system as a whole. The LEDs on individual boards and power supplies indicate the status of the individual board or power supply. Many of the LED codes (TABLE 9-1) are common to the system front panel and various types of boards. TABLE 9-2 lists specific exceptions for LED codes for system boards.

9.2.1 System Front Panel LEDs

TABLE 9-1 lists the LED codes for system operations.

TABLE 9-1 System Status Codes

Power	Service	Cycling	Condition
Off	Off	Off	No power or the key switch is in the Off position.
Off	On	Off	Failure mode. System has electrical power.
Off	Off	On	Failure mode. System has electrical power.
Off	On	On	Failure mode. System has electrical power.
On	Off	Off	System is hung, either in POST/OBP or in the operating system.
On	Off	On	Hung in OS.
On	On	Off	(Hung in POST/OBP) or (hung in OS and failed component in system).
On	On	On	(Hung in POST/OBP) or (hung in OS and failed component in system).
On	Off	Flashing	OS running. System is operating normally.
On	On	Flashing	OS running and failed component in system.
On	Flashing	Off	Slow flash = POST. Fast flash = OBP.
On	Flashing	On	OS or OBP error.

LEDs in the system are controlled by OpenBoot™ PROM programming (OBP).

9.2.2 Clock+ Board LEDs

The clock+ board also displays system status. The LED codes are the same as for the front panel (TABLE 9-1).

9.2.3 CPU/Memory+ and I/O+ Board LEDs

TABLE 9-2 summarizes LED codes for boards. The Power, Service, and Cycling symbols are marked on the card cage frame above the respective LEDs. Note that many but not all of the LED codes are the same as the system codes (TABLE 9-1).

TABLE 9-2 Board Status LED Codes

Power	Service	Cycling	Condition
Off	Off	Off	Board has no electrical power.
Off	On	Off	Board is in low-power mode, can be unplugged.
Off	Off	Flashing	Undefined.
Off	On	Flashing	Undefined.
On	Off	Off	System is hanging, either in POST/OBP or OS.
On	Off	On	Hung in OS.
On	On	Off	(Hung in POST/OBP) or (hung in OS and failed component on board).
On	On	On	(Hung in POST/OBP) or (hung in OS and failed component on board).
On	Off	Flashing	OS running. System is operating normally.
On	On	Flashing	OS running and failed component on board.
On	Flash	Off	Slow flash = POST. Fast flash = OBP.
On	Flash	On	OS or OBP error.

Note – For boards, Off-On-Off indicates that the board is in low-power mode and is ready for removal. (For the system, Off-On-Off indicates a failure.)



Caution – If the Power LED is lit, do not remove the board. Removing a board that is not in low-power mode will damage the board and the system.

9.2.4 Basic Troubleshooting for Boards

- If the yellow LED (middle LED) is continuously lit (not flashing) the board requires service.
- If the left and right green LEDs are off, the board is ready for removal.
- If no LEDs are flashing, the system is hung.
- If no LEDs are lit, there is no electrical power to the board.

9.2.5 Disk Board LEDs

The board status LED codes correspond to those shown in TABLE 9-2 for the CPU/Memory+ and I/O+ boards. The Disk board has two additional LEDs on the opposite side of the board to show the status of the two onboard disk drives. The LED for disk drive 1 is nearer to the side of the Disk board, and the LED for disk drive 0 is closer to the center of the board.

9.2.6 Power Supplies

A system has one peripheral power supply and up to four or eight CPU/IO modular power supplies. All the power supplies have one green LED and one yellow LED.

The control and status signals of all power supply modules connect to the clock+ board. If the clock+ board LEDs indicate a problem, inspect the LEDs on the power supplies to locate a faulty module, if any.

9.2.6.1 Peripheral Power Supply (PPS)

The green LED is to the right of the yellow LED on the peripheral power supply. The green LED indicates that the peripheral power supply is operating, but does not necessarily indicate that the DC outputs are within specification.

When the peripheral power supply module yellow LED is lit, a DC power output has malfunctioned or the voltage level is out of specification.

The peripheral power supply produces +5 VDC and +12 VDC current. The current is available for peripherals such as a tape drive and/or CD-ROM drive. In addition, the +5 VDC output of the peripheral power supply is available at the center plane for current sharing with the +5 VDC outputs of the power supply modules.

9.2.6.2 Power/Cooling Modules (PCMs)

For a PCM at the front of the card cage, the green LED is to the *left* of the yellow LED. At the back of the card cage, the LED positions are reversed and the green LED is to the *right* of the yellow LED. See TABLE 9-3.

When the yellow LED is lit, a fan or a DC output has malfunctioned. Each modular power supply contains two fans and three DC supplies (+3.3 VDC, +5 VDC, and +2 VDC).

The green LED indicates that the DC supplies are operating, but does not guarantee that the DC outputs are within specification.

TABLE 9-3 Modular Power Supply LED Codes

Green	Yellow	Condition
Off	Off	No AC input or key switch is turned off.
On	Off	Normal operation.
On	On	A fan has failed or one or more voltages are out of specification.
Off	On	One or more DC outputs have failed, or the voltages are out of specification, or the system is in the low power state.

The PCMs operate in redundant current share mode. If a module fails, the remaining modules may or may not provide enough current to continue system operation. The system's ability to continue operations depends on the total demand for current.

9.2.7 Disk Tray Indicators

The availability and type of status information varies with the disk tray type used in a system. Refer to the disk tray user manual for specific status information.

9.3 Diagnosing Problems

When LED codes (TABLE 9-1, TABLE 9-2, TABLE 9-3) indicate a hardware problem, several types of software programs are available to supply information about the problem.

9.3.1 Error Messages

Error messages and other system messages are saved in the `/var/adm/messages` file.

9.3.2 SunVTS

The latest version of SunVTS™ (online validation test suite) has several modes of testing, including low-impact testing, which can run with minimum affect on customer applications.

The SunVTS can also be used to stress-test Sun hardware, either in or out of the Solaris operating environment. By running multiple and multithreaded diagnostic hardware tests, the SunVTS software verifies the system configuration and functionality of most hardware controllers and devices.

SunVTS tests many board and system functions, as well as interfaces for Fibre Channel, SCSI, and SBus interfaces. SunVTS accepts user-written scripts for automated testing.

Refer to the *SunVTS User's Guide* for starting and operating instructions.

9.3.3 `prtdiag(1M)`

You can use the `prtdiag` command to display:

- System configuration, including information about clock frequencies, CPUs, memory, and I/O card types.
- Diagnostic information
- Failed field replaceable units (FRUs)

Refer to the `prtdiag` man page for instructions.

9.3.3.1 History Log Option

To isolate an intermittent failure, it may be helpful to maintain a `prtdiag` history log. Use the `prtdiag` command with the `-l (log)` option to send output to a log file in the `/var/adm` directory.

9.3.3.2 Running `prtdiag`

To run `prtdiag`, type:

```
% /usr/platform/sun4u/sbin/prtdiag
```

9.3.4 POST and OpenBoot

POST and OpenBoot work together in the system to test and manage system hardware.

POST resides in the OpenBoot PROM on each CPU/Memory+ board, I/O+ board, and Disk board. When the system is turned on, or if a system reset is issued, POST detects and tests buses, power supplies, boards, CPUs, SIMMs, and many board functions. POST controls the status LEDs on the system front panel and all boards. POST displays diagnostic and error messages on a console terminal, if available.

Only POST can configure the system hardware, and only POST can enable hot-pluggable boards. If a new unit (board or modular power supply) is added to the card cage after the system has booted, the new unit will not work until the system is rebooted, at which time POST reconfigures the system, using the units that are found in the system at that time.

Note – POST does not test drives or internal parts of SBus cards. To test these devices, run OBP diagnostics manually after the system has booted. Refer to the *OpenBoot Command Reference* manual for instructions.

OpenBoot provides basic environmental monitoring, including detection of overheating conditions and out-of-tolerance voltages. For example, if an overheated board is found, OpenBoot issues a warning message. If the temperature passes the danger level, POST will put the overheated board(s) in low power mode.

OpenBoot also provides a set of commands and diagnostics at the `ok` prompt. For example, you can use OpenBoot to set NVRAM variables that reserve a board or a set of SIMMs for hot-sparing.

The following OpenBoot commands may be useful for diagnosing problems:

9.3.4.1 `show-devs` Command

Use the `show-devs` command to list the devices that are included in the system configuration.

9.3.4.2 `printenv` Command

Use the `printenv` command to display the system configuration variables stored in the system NVRAM. The display includes the current values for these variables, as well as the default values.

If the system cannot communicate with a 10BASE-T network, the Ethernet link test setting for the port may be incompatible with the setting at the network hub. See Section 9.4.1 “Failure of Network Communications,” for further details.

9.3.4.3 `probe-scsi` Command

The `probe-scsi` command locates and tests SCSI devices attached to the system. `probe-scsi` is run from the OpenBoot prompt.

When it is not practical to halt the system, you can use SunVTS as an alternate method of testing the SCSI interfaces.

9.3.4.4 Reference Documents for POST/OpenBoot

For more information, refer to:

- *OpenBoot 3.x Command Reference*, part number 802-3242
- *Writing FCode 3.x Programs*, part number 802-3230

9.3.5 Solstice SyMON

The Solstice™ SyMON™ program monitors system functioning and features a graphical user interface (GUI) to continuously display system status. Solstice SyMON is intended to complement system management tools such as SunVTS.

Solstice SyMON is accessible through an SNMP interface from network tools such as Solstice™ SunNet Manager™.

Refer to the *Solstice SyMON User's Guide*, part number 802-5355, for starting and operating instructions.

9.4 Specific Problems and Solutions

9.4.1 Failure of Network Communications

Description of the Problem

The system cannot communicate with a network if the system and the network hub are not set in the same way for the Ethernet Link Integrity Test. This problem particularly applies to 10BASE-T network hubs, where the Ethernet Link Integrity Test is optional. This is not a problem for 100BASE-T networks, where the test is enabled by default.

If you connect the system to a network and the network does not respond, use the OpenBoot command `watch-net-all` to display conditions for all network connections:

```
ok watch-net-all
```

For SBus Ethernet cards, the test can be enabled or disabled with a hardware jumper, which you must set manually. For the TPE and MII onboard ports on the I/O+ board, the link test is enabled or disabled through software, as shown below.

Note – The TPE and MII ports share some circuitry so do not try to use the two ports at the same time.

Note – Some hub designs do not use a software command to enable/disable the test, but instead permanently enable (or disable) the test through a hardware jumper. Refer to the hub installation or user manual for details of how the test is implemented.

Determining the Device Names of the I/O+ Boards

To enable or disable the link test for an on-board TPE (hme) port, you must first know the device name for the I/O+ board. To list the device names:

1. **Shut down the system and take the system into OpenBoot.**
2. **Determine the device names of the I/O+ boards:**
 - a. **Type:**

```
ok show-devs
```

- b. **In the `show-devs` listing, find the node names.**

Node names take the general form `/sbus@3,0/SUNW,hme@3,8c00000`.

Solution 1

Use this method while the operating system is running:

1. **Become superuser.**
2. **Type:**

```
# eeprom nvramrc="probe-all install-console banner apply disable-link-pulse  
device-name "  
  (Repeat for any additional device names.)  
# eeprom "use-nvramrc?"=true
```

3. **Reboot the system (when convenient) to make the changes effective.**

Solution 2

Use this alternate method when the system is already in OpenBoot:

1. At the monitor OpenBoot prompt, type:

```
ok nvedit
0: probe-all install-console banner
1: apply disable-link-pulse device-name
  (Repeat this step for other device names as needed.)
  (Press CONTROL-C to exit nvedit.)
ok nvstore
ok setenv use-nvramrc? true
```

2. Reboot to make the changes effective.

9.4.2 Resetting and Power Cycling the System from a Remote Console

It is possible to reset the system or cycle power from the remote console under these conditions:

- The console must be connected to port A on the clock+ board.
- The key switch must be in either the On or Diagnostic setting. If the key switch is in the Secure or Off position, the remote key sequences and button resets are ignored.
- Security features permit the use of the remote console.
- You must use a slow typing speed, not less than 0.5 seconds and not more than 5 seconds between characters.

TABLE 9-4 Remote Console Commands

Command	Enter this sequence
Remote power off/on	<CR> <CR> <-> <Control-Shift-p>
Remote system reset	<CR> <CR> <-> <Control-Shift-r>
Remote XIR (CPU) reset	<CR> <CR> <-> <Control-Shift-x>

Key:
<CR> = ASCII 0d hexadecimal,
<-> = ASCII 7e hexadecimal,
<Control-Shift-p> = 10 hexadecimal,
<Control-Shift-r> = 12 hexadecimal,
<Control-Shift-x> = 18 hexadecimal.

Note – The remote console logic circuit continues to receive power even if you have commanded system power off.

The remote system reset command is useful for resetting the system under general conditions. The remote XIR reset command is used for software development and debugging.

Flow Diagrams for Troubleshooting

This chapter lists solutions to these problems:

- No AC or DC Power—page 10-2
- System Cannot Boot—page 10-3
- Defective CPU/Memory+ Board—page 10-4
- Defective I/O+ Interface Board—page 10-5
- Defective Disk Board—page 10-6
- Defective Disk Drive—page 10-7
- Defective Power Supplies—page 10-8
- Defective Clock+ Board—page 10-9
- Network Does Not Respond—page 10-10

10.1 No AC or DC Power

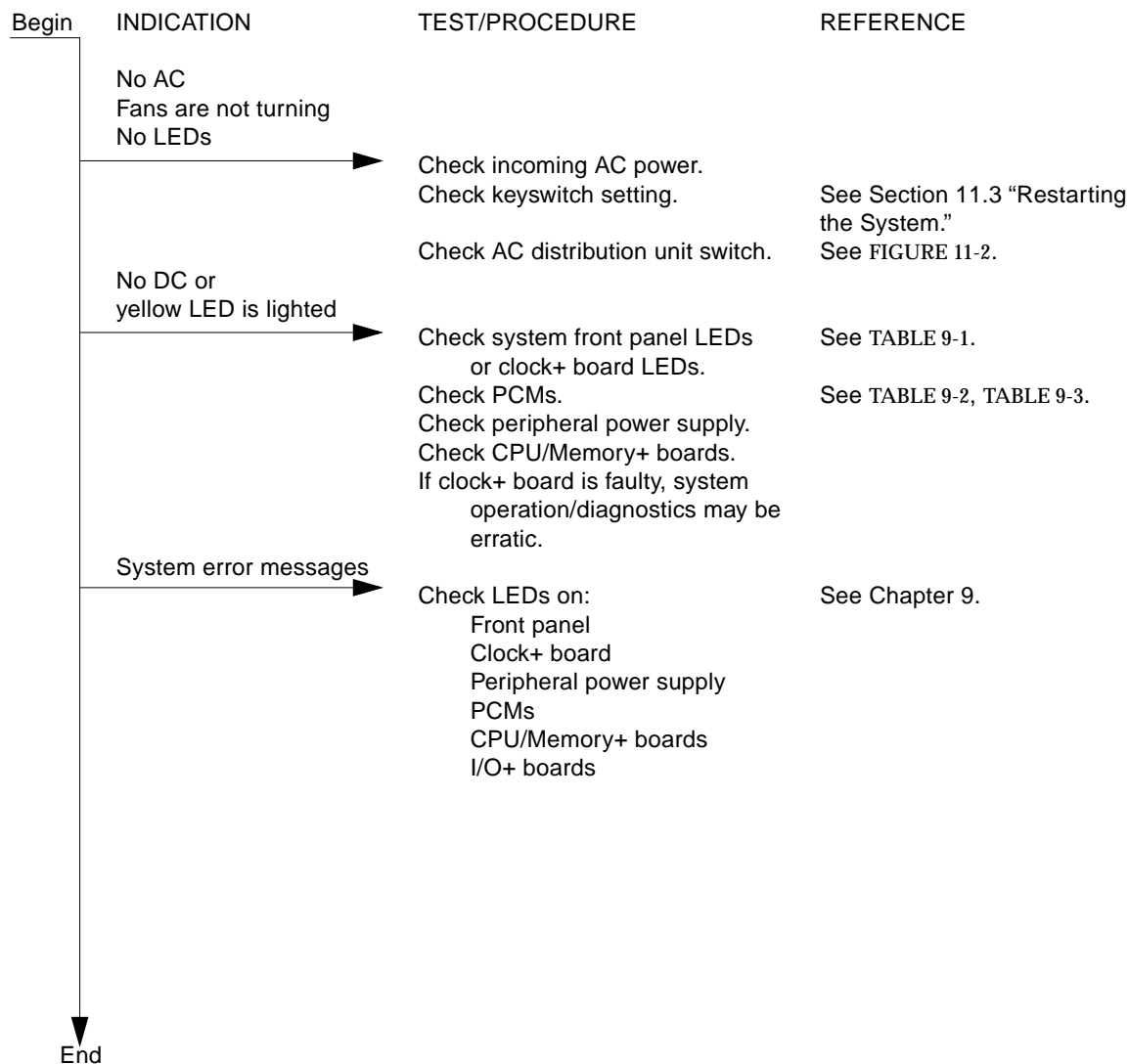


FIGURE 10-1 Diagnosing AC/DC Power Problems

10.2 System Cannot Boot

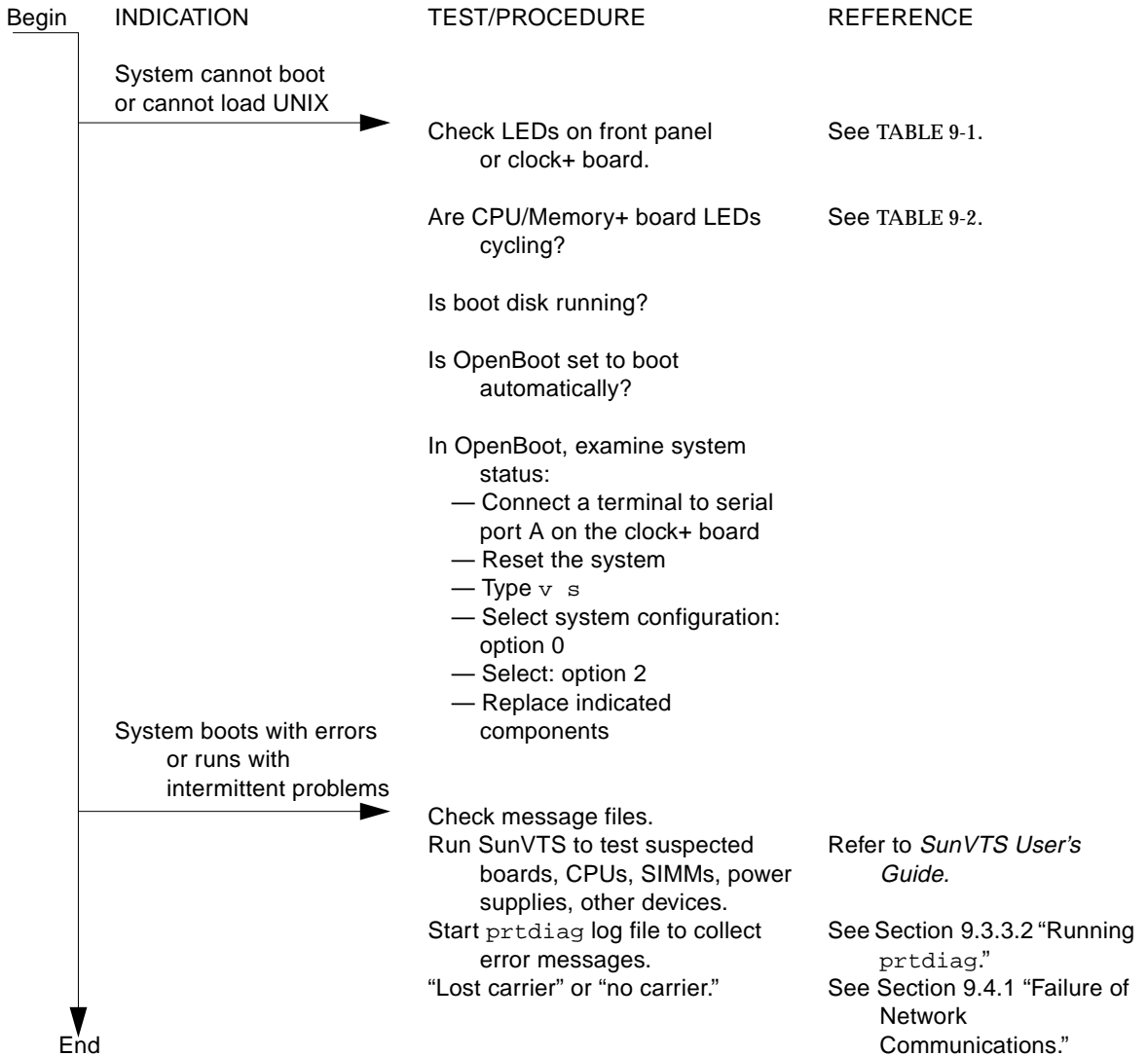


FIGURE 10-2 Diagnosing Operating System Problems

10.3 Defective CPU/Memory+ Board

CPU/Memory+ boards are hot-pluggable.

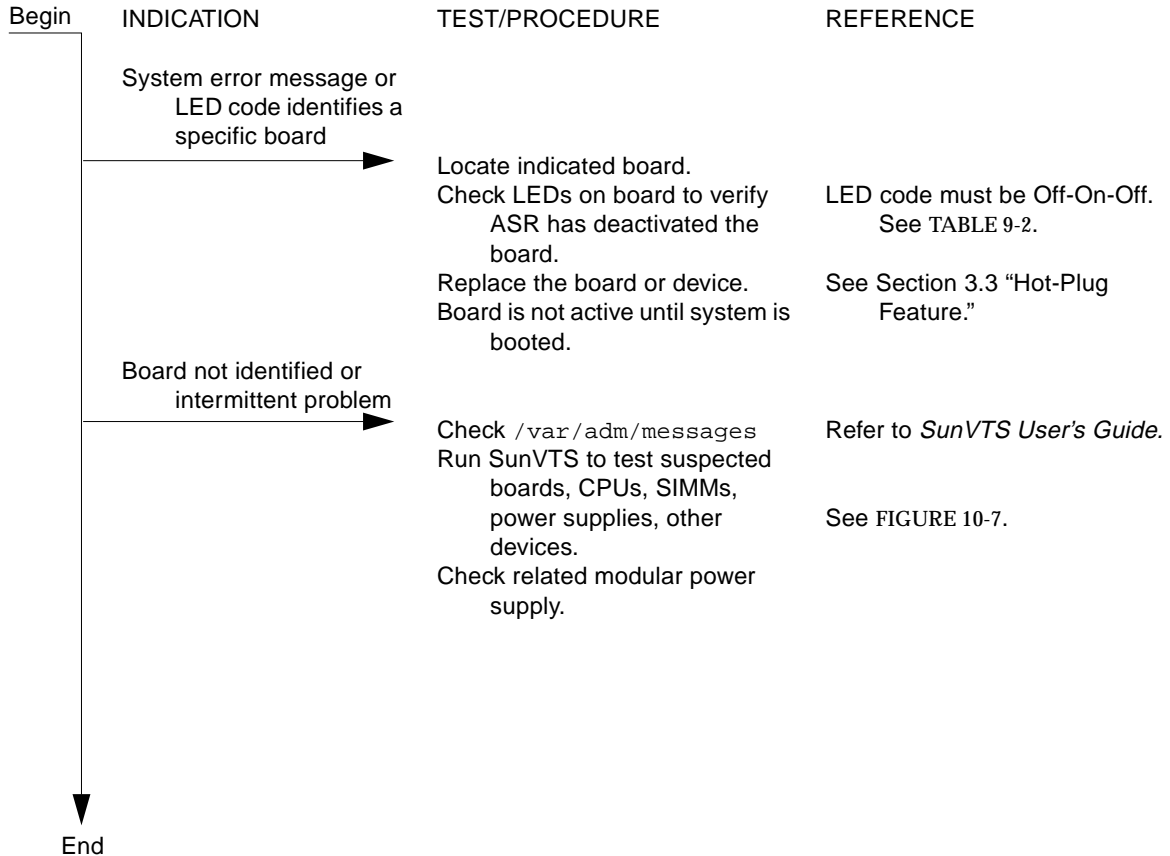


FIGURE 10-3 Diagnosing CPU/Memory+ Board Problems

10.4 Defective I/O+ Interface Board

Interface boards are hot-pluggable in many instances.

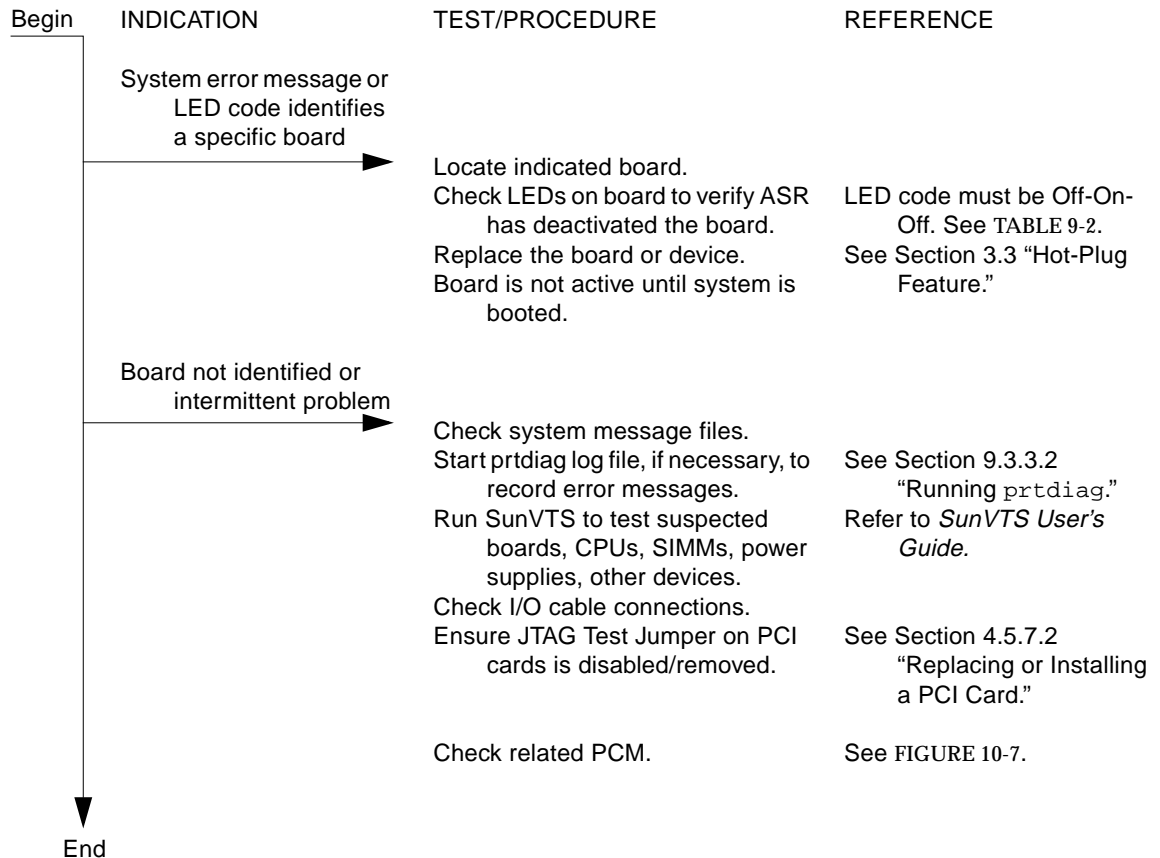


FIGURE 10-4 Replacing I/O Interface

10.5 Defective Disk Board

The disk board is hot-pluggable.

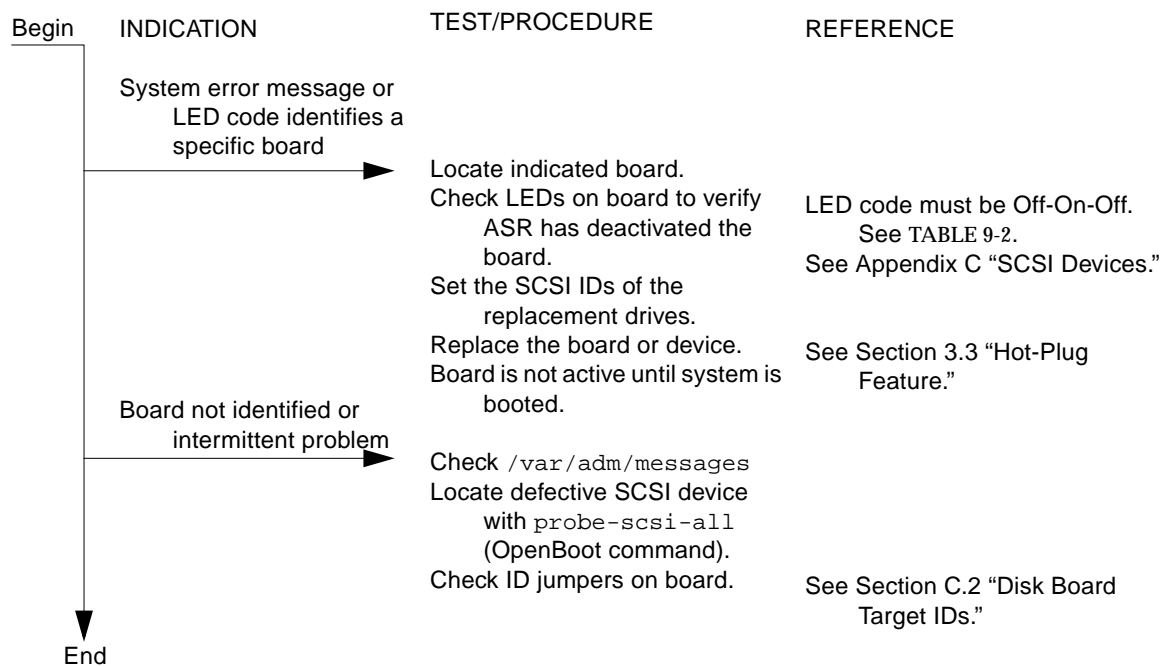


FIGURE 10-5 Diagnosing Disk Board Problems

10.6 Defective Disk Drive

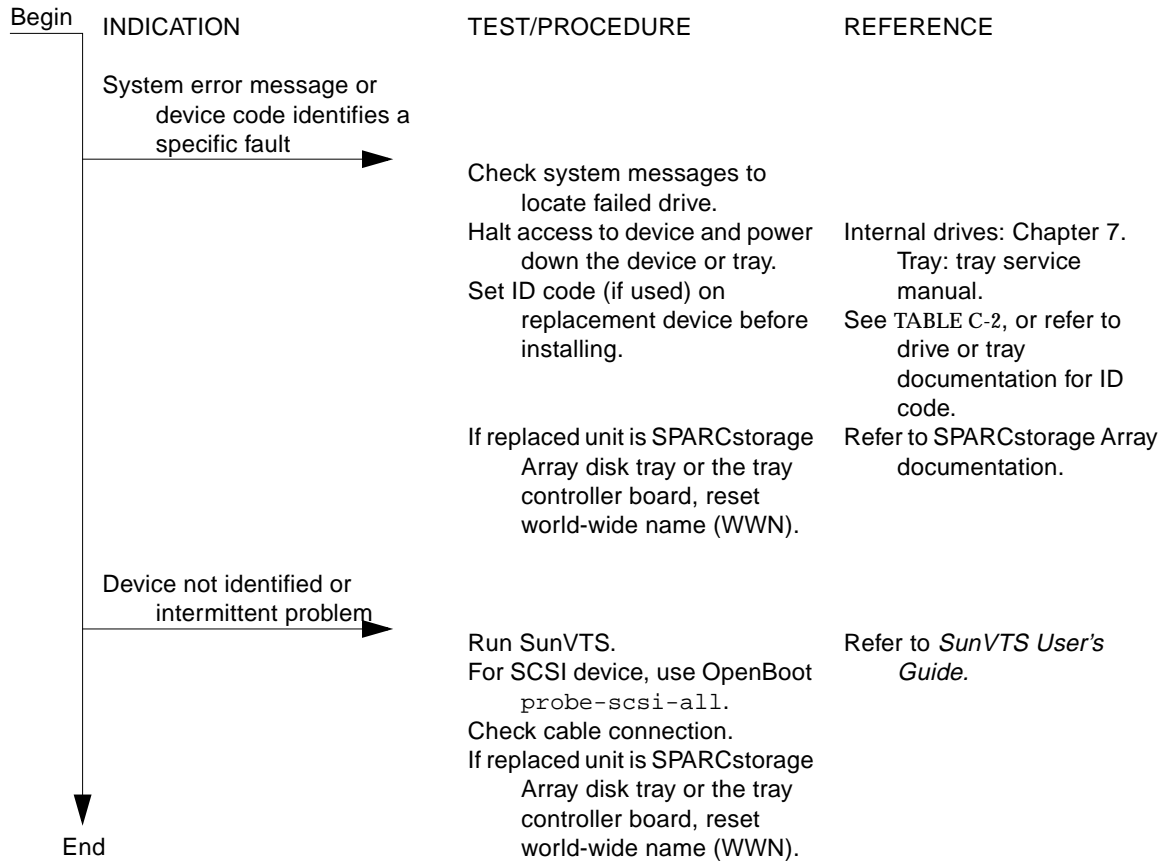


FIGURE 10-6 Diagnosing Disk Drive Problems

10.7 Defective Power Supplies

The peripheral power supply and power/cooling modules are hot-pluggable.



Caution – Boards in slots adjacent to a modular power supply may overheat if the supply is removed and not replaced. The modular power supply provides cooling air to two board slots.



Caution – Do not hot-plug boards or modules if the peripheral power supply is defective. The hot-plug feature requires a working peripheral power supply for precharge current.

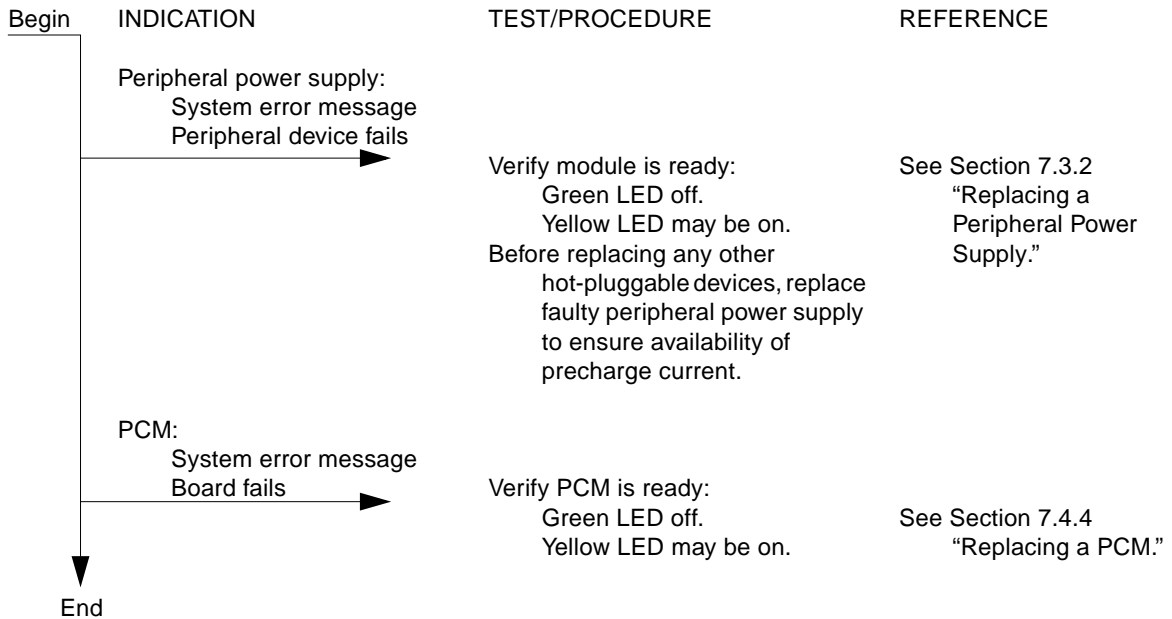


FIGURE 10-7 Diagnosing Power Supply Problems

10.8 Defective Clock+ Board

There is one clock+ board in the system.



Caution – The clock+ board is not hot-pluggable. You must halt the operating system and turn off AC power before replacing the clock+ board.

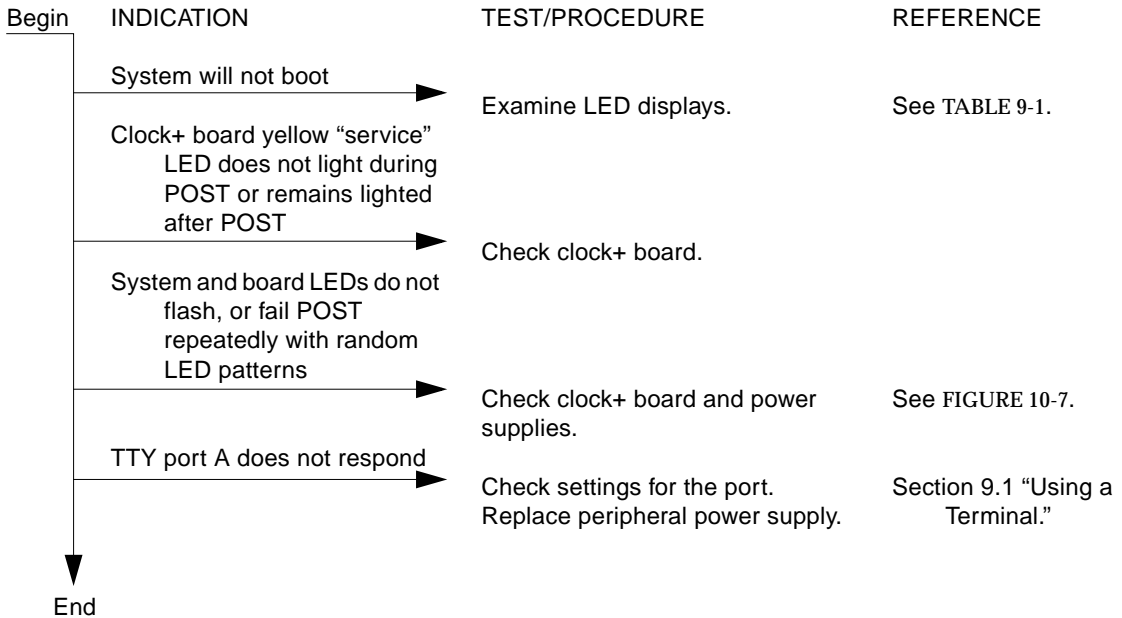


FIGURE 10-8 Diagnosing a Defective Clock+ Board

10.9 Network Does Not Respond

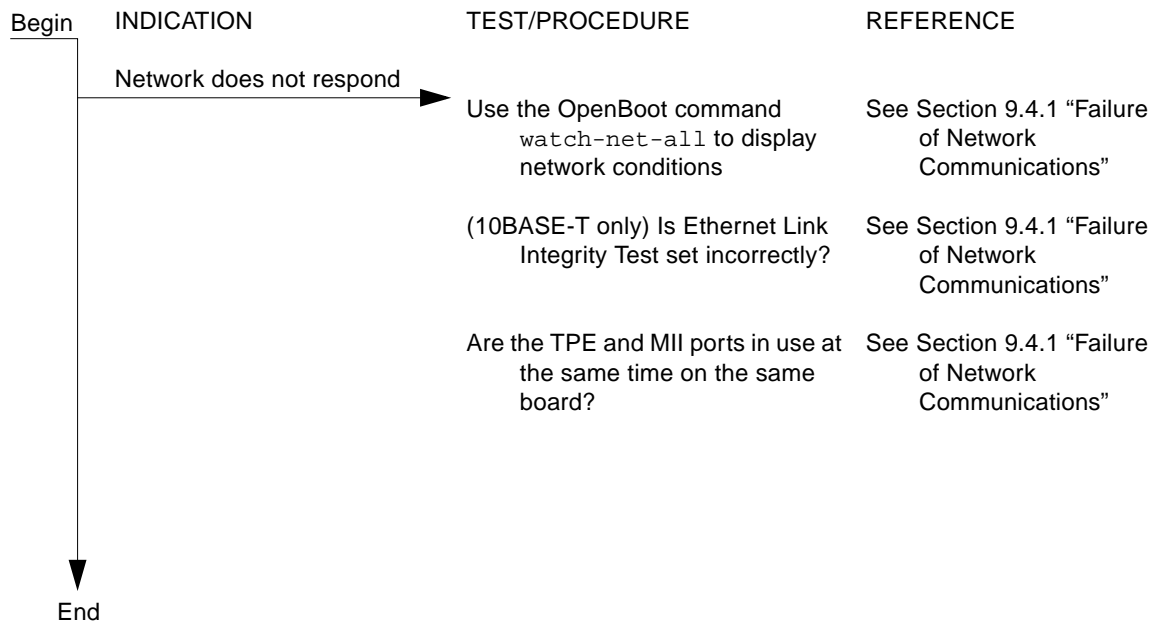


FIGURE 10-9 Diagnosing Network Problems

Powering Off and On

This chapter contains these topics:

- Powering Off the System—page 11-1
- Removing the External Cables—page 11-5
- Restarting the System—page 11-6
- Reading Boot Messages—page 11-8

11.1 Powering Off the System

Before turning off system power, halt the operating system as shown below. Failure to halt the operating system properly can cause the loss of disk drive data.

If you are troubleshooting system problems, you may find it convenient to reset the system or even cycle system power from the console. See Section 9.4.2 “Resetting and Power Cycling the System from a Remote Console” on page 9-13.

11.1.1 Enterprise 6500/5500 Cabinet Systems

1. **Notify users that the system is going down.**
2. **Back up the system files and data to tape, if necessary.**
3. **Halt the system using the appropriate commands.**

Refer to the *Solaris Handbook for SMCC Peripherals* that corresponds to your operating system.

4. **Wait for the system-halted message and the boot monitor prompt.**

5. **Turn off the system power in this order:**
 - a. External drives and expansion cabinets (if any)
 - b. System cabinet
 - c. Terminal
6. **Turn the front panel key switch to the Standby position (FIGURE 11-1).**

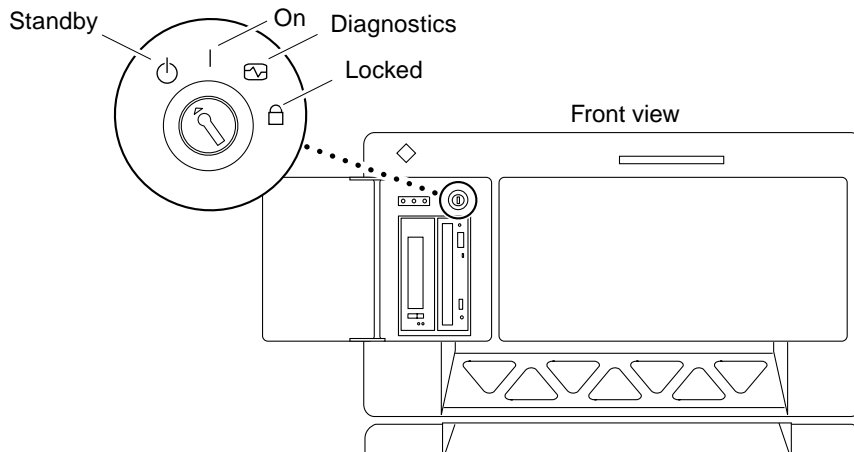


FIGURE 11-1 Key Switch (Enterprise 6500 and 5500)

7. **Turn the main power switch (FIGURE 11-2) to Off.**



Caution – Before attempting to service the system cabinet, turn off the AC power.

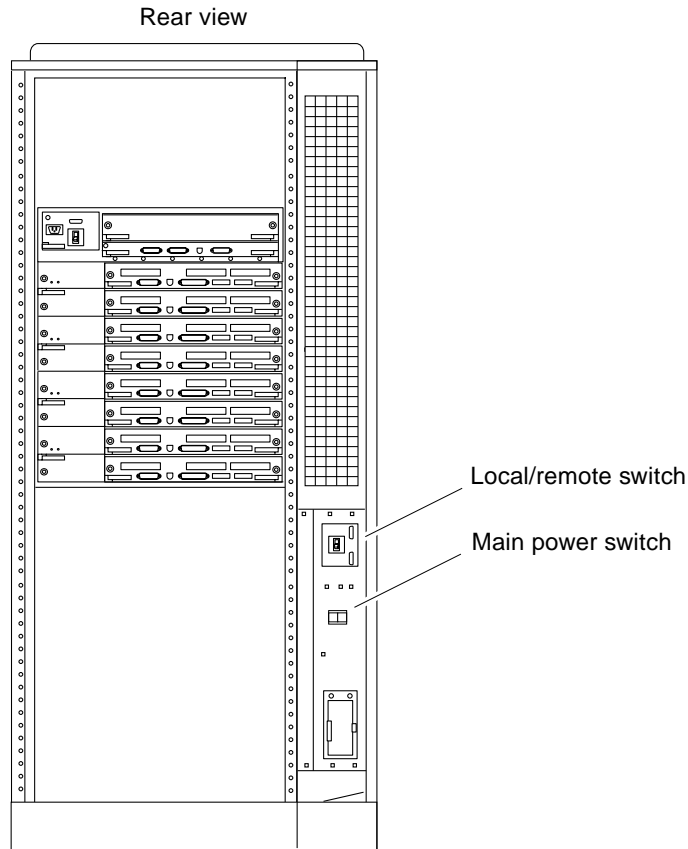


FIGURE 11-2 AC Power Switch (Enterprise 6500 and 5500)

11.1.2 Enterprise 4500 System

1. Notify users that the system is going down.
2. Back up the system files and data to tape, if necessary.
3. Halt the system using the appropriate commands.
Refer to the *Solaris Handbook for SMCC Peripherals* that corresponds to your operating system.
4. Wait for the system-halted message and the boot monitor prompt.
5. Turn the key switch on the front panel of the server to the Standby position (fully counterclockwise) (FIGURE 11-3).

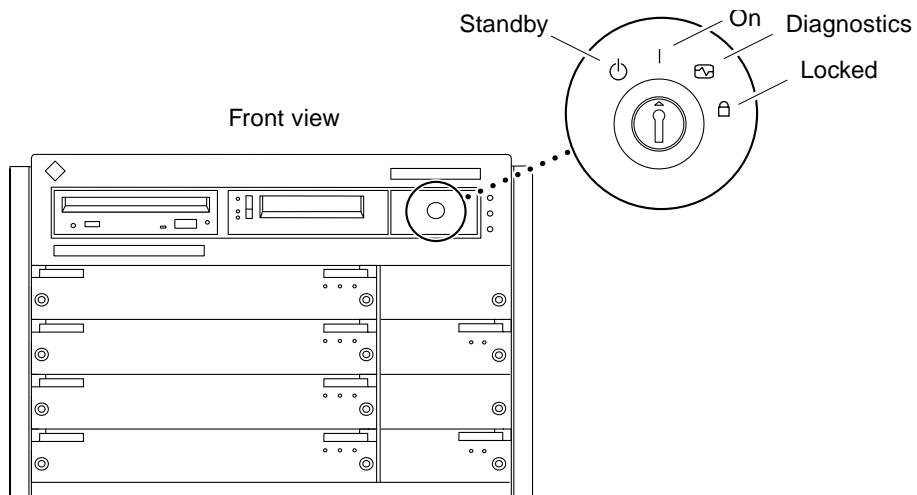


FIGURE 11-3 Key switch (Enterprise 4500)

6. Turn the AC power switch on the system rear off (FIGURE 11-4).

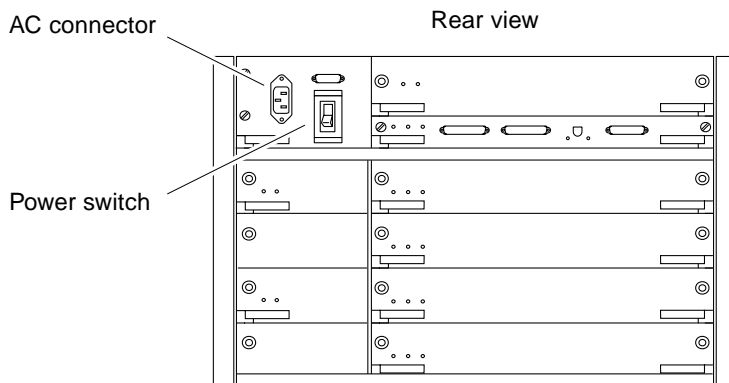


FIGURE 11-4 AC Power Switch (Enterprise 4500)

11.2 Removing the External Cables

1. Position the server for easy access to the rear.
2. For Enterprise 6500 and 5500 systems only:
 - a. Open the door or pull out the hinge pins (FIGURE 11-5) and lift the door off.
 - b. Remove the kick panel by loosening two screws.

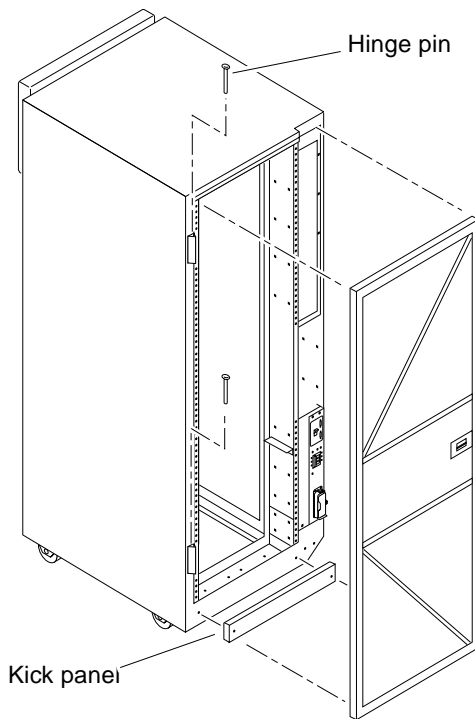



FIGURE 11-5 Rear Screen and Kick Panel

3. Disconnect each cable from the I/O+ boards carefully.

Squeeze the locking tabs on the sides of the connector body, or loosen any retaining screws (if provided), and pull the connectors out.
4. Mark each cable for identification as you remove it.
5. Remove any cable restraints.
6. Clear the cables away from the server.

11.3 Restarting the System

Note – As the system starts up, watch for error messages from the POST diagnostic program. If a terminal is not already part of the system, you can install a TTY terminal before continuing the startup. See Section 9.1 “Using a Terminal” on page 9-1 for terminal settings.

1. **The system key switch must be turned to  (the standby position) (FIGURE 11-1 or FIGURE 11-3).**



Caution – The outlet must be a 120-240 VAC 30-ampere circuit, intended solely for use by the server cabinet, as described in the site preparation instructions in the *Sun Enterprise 6500/5500/4500 Systems Installation Guide*. The electrical receptacle must be grounded, and the grounding conductor serving this receptacle must be connected to the earth ground at the service equipment.

2. **Enterprise 6500/5500 systems only: turn the Local/Remote switch down, to Local (FIGURE 11-2).**
3. **Turn on the AC main power switch (FIGURE 11-2 or FIGURE 11-4).**
4. **Turn on power to the terminal.**

A terminal is optional for viewing system messages. For setup instructions, see Section 9.1 “Using a Terminal” on page 9-1.

5. **Turn the front panel key switch to | (the power on position) (FIGURE 11-1 or FIGURE 11-3).**

Several things will happen:

- The left front panel LED (green) turns on immediately to indicate the DC power supply is functioning.
- The middle front panel LED (yellow) lights immediately and should turn off after approximately 60 seconds.
- The right front panel LED (green) flashes after POST has ended to show that booting is successful and the operating system is running.
- The terminal screen lights up upon completion of the internal self-test.



Caution – Never move the server or the expansion cabinets when system power is on. Excessive movement can cause catastrophic disk drive failure. Always power the system OFF before moving cabinets.

6. Watch the terminal screen for POST error messages.

At the conclusion of testing, POST automatically configures the system, omitting any devices that have failed diagnostics. After POST ends, the system will boot using the new configuration.

Note – If the middle front panel LED (yellow) remains lit after the system has booted, the system has failed POST.

Note – POST does not test drives or internal parts of SBus cards. To test these devices, run OBP diagnostics manually after the system has booted. Refer to the *OpenBoot Command Reference* manual for instructions.

7. To start POST again, or if the system hangs, press the CPU reset switch on the clock+ board (FIGURE 11-6).

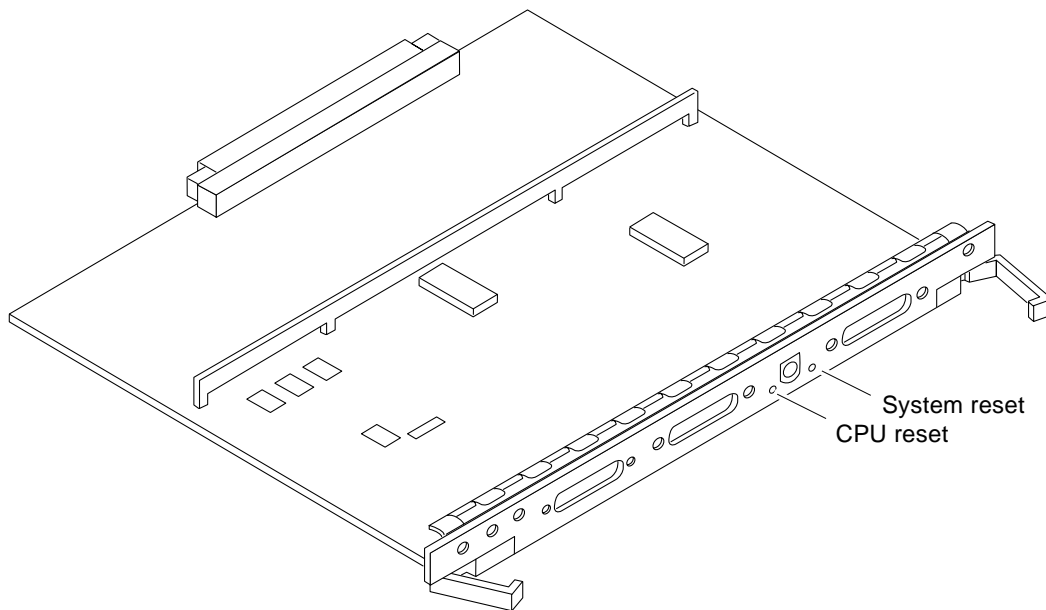


FIGURE 11-6 CPU Reset Switch on Clock+ Board

8. If the system displays “not responding” or “no carrier” messages, the Link Integrity Test may be set incorrectly. See “Link Integrity Test” on page 4-19.

11.4 Reading Boot Messages

- Use the boot software messages to verify the presence of options in the system.

After POST completes the system self-test, a message similar to the following will appear on your screen. The message lists hardware detected in the system.

Note – The following screen display is only an example. The actual message displayed on the screen will vary with the software running on the system.

```
16-slot Ultra Enterprise 6000, Keyboard Present
OpenBoot -.- FCS, --- MB memory installed, Serial #---.
Ethernet address -:-:---:---:---:---, Host ID: -----.
```

If there is no terminal on this system, check the system status by inspecting LEDs on the front panel. (FIGURE 11-7 and FIGURE 11-8).

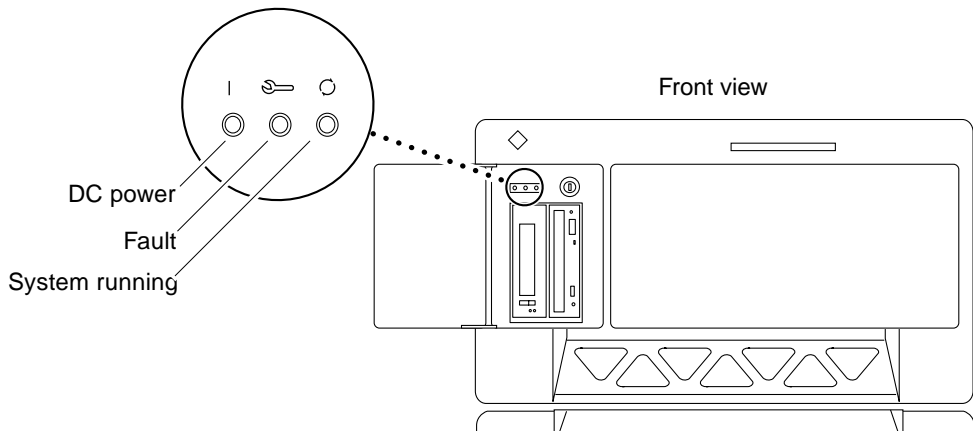


FIGURE 11-7 System Status LEDs on the Enterprise 6500/5500 Front Panel

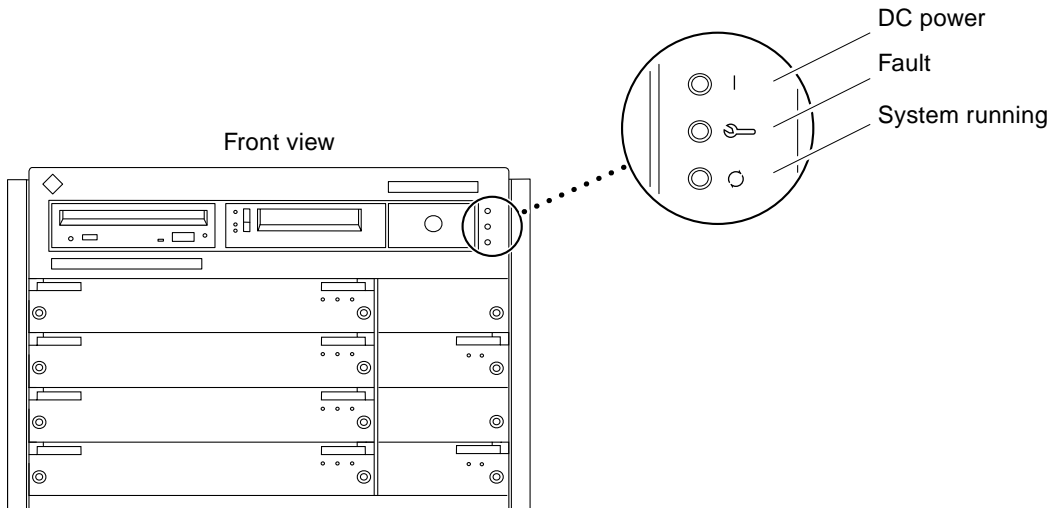


FIGURE 11-8 Status LEDs on the Enterprise 4500 Front Panel

TABLE 11-1 summarizes the front panel LED status conditions during and after POST.

TABLE 11-1 LED Status Indicators

Location	LED	Condition
Front panel	Left or Top LED (green)	On — DC power supply is receiving AC current. Off — There is no DC power.
	Middle LED (yellow)	On flashing— (first 60 seconds) self-tests are running. Off — (after self-tests end) No hardware failures. On — (after self-tests end) Hardware failure was detected.
	Right or Bottom LED (green)	Off — (first 60 seconds) self-tests are running. On flashing— (after self-tests end) System is running. Off — (after self-tests end) System cannot run; repair is needed.

Preparing for Service

This chapter contains information about preparing the system for service after the system has been powered off.

- Servicing Hot-Pluggable Components—page 12-1
- Powering Off the System—page 11-1
- Internal Access–Enterprise 6500/5500 Systems—page 12-2
- Internal Access - Enterprise 4500 System—page 12-10
- Powering On the System—page 11-6

12.1 Servicing Hot-Pluggable Components

Hot-pluggable components can be removed and replaced without powering off the system. For information about disconnecting and connecting hot-pluggable components that require service, see Section 3.3 “Hot-Plug Feature” on page 3-4.

12.2 Powering Off the System

See Section 11.1 “Powering Off the System” on page 11-1.

12.3 Internal Access—Enterprise 6500/5500 Systems

The Enterprise 6500/5500 system cabinet panels, shown in FIGURE 12-1 through FIGURE 12-6, consist of the following:

- CD/Tape device door
- Top bezel
- Front panels—hinged door consisting of three vented panels
- Rear screen panel
- Two side panels
- Fan tray screen cover
- Kick panel
- Stabilizer bar

12.3.1 Outer Cover Reference Guide

Use TABLE 12-1 as a guide to determine which panels to remove to access replaceable parts for the Enterprise cabinet systems.

TABLE 12-1 Cover Removal by Assembly

	CD/Tape Device Door	Top Bezel	Front Door (3 Vented Panels)	Rear Screen	Left Side Panel	Right Side Panel	Kick Panel	Fan Tray Screen Cover
SCSI Compartment	X							
Tape Tray or Tape Library		X						
Fan Tray								X
Control Board			X					
Centerplane		X	X	X				
AC power sequencer							X	
External Cables				X			X	
CPU/Memory+ Board (Front load)			X					
I/O+ or Disk Boards (Rear load)				X				
Differential media trays			X	X				

12.3.2 CD-ROM/Tape Device Door

The small door to the left of the top panel can contain a CD-ROM drive and/or a tape drive.

To open the door:

- **Push on the top right corner of the door. The clasp will release and the door will spring open.**

To close the door:

- **Press gently to engage the clasp.**

12.3.3 Top Front Bezel

The top front bezel is retained by chassis-mounted ball studs.



Caution – To avoid breaking the plastic bezel, do not grasp the bezel by the bottom edge.

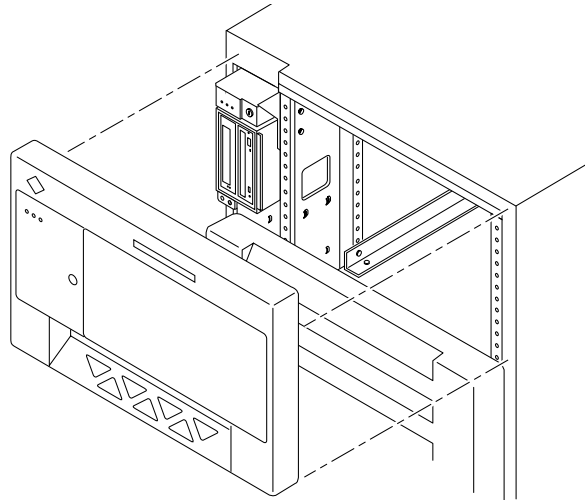


FIGURE 12-1 Removing the Front Bezel

12.3.3.1 Removing the Top Front Bezel

1. Remove the key from the key switch.
2. Grasp the bezel on both sides at the top and pull the bezel away from the ball studs (FIGURE 12-1).
3. Set the bezel aside.

12.3.3.2 Replacing the Top Front Bezel

1. Place the bezel against the chassis with ball studs aligned with the catches on the bezel, and tap or press both sides of the bezel into place.
2. Insert the key into the key switch.

12.3.4 Front Door

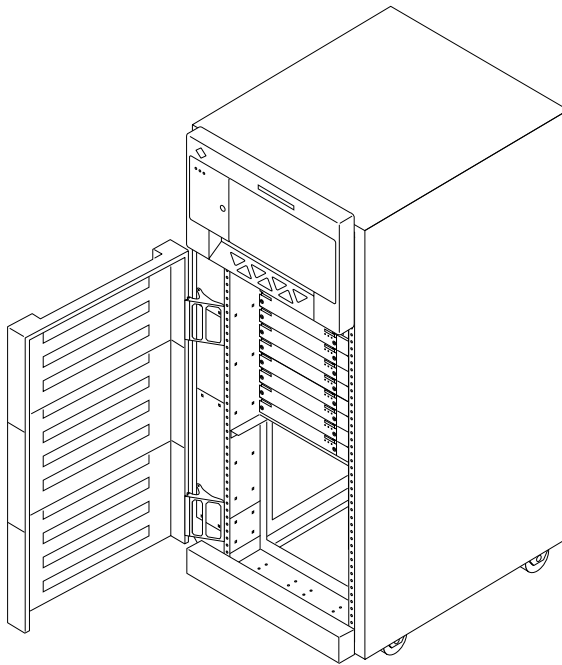


FIGURE 12-2 Opening the Front Door

12.3.4.1 Opening the Front Door

The door is hinged on the left side. The door swings open if pulled firmly on the right side of the top panel.

12.3.4.2 Removing the Front Door

- 1. Remove the top bezel. See Section 12.3.3 “Top Front Bezel.”**
- 2. Open the hinged door fully (past the bracket), and lift the door free of the bracket.**

12.3.5 Rear Door and Kick Panel

If it is necessary to remove the rear door, pull out the two hinge pins (FIGURE 12-3) and lift the rear door away from the cabinet.

Interface cables should be placed behind the kick panel. To remove the kick panel, loosen the two captive screws.

To replace the rear hinged door and kick panel, reverse these instructions.

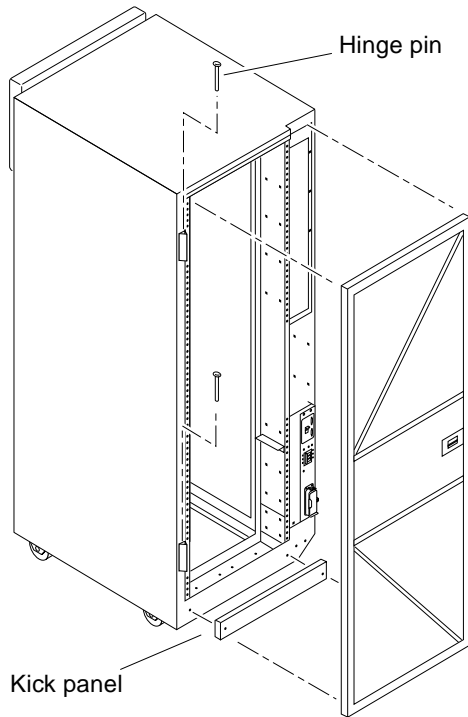


FIGURE 12-3 Removing the Rear Door

12.3.6 Side Panels

To remove the side panels:

1. Loosen two slotted-head captive screws near the panel base.
2. Tilt the panel bottom out.
3. Lift the panel up until free of the tabs at the top of the chassis.

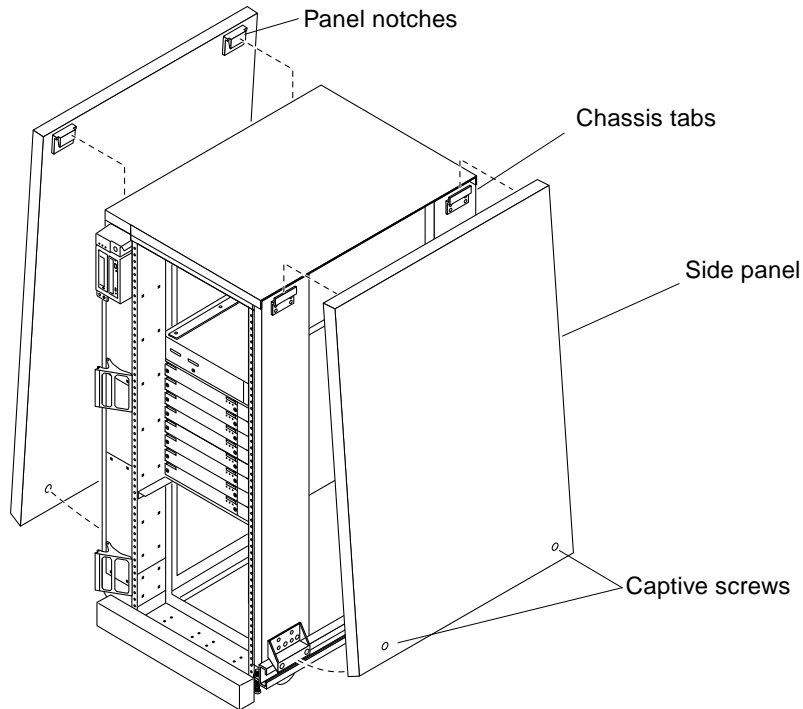


FIGURE 12-4 Removing the Side Panels

To replace the side panels:

1. Place the panel against the cabinet so the notches on the panel inside align with tabs at the chassis top.
2. Lower the panel into place and allow it to hang flush against the chassis.
3. Tighten the two captive screws at the panel base.

12.3.7 Fan Tray and Screen

12.3.7.1 Fan Tray Screen

1. **Loosen the four screws on the left and the four screws on the right of the fan tray screen (FIGURE 12-5).**

It is not necessary to completely remove the screws.

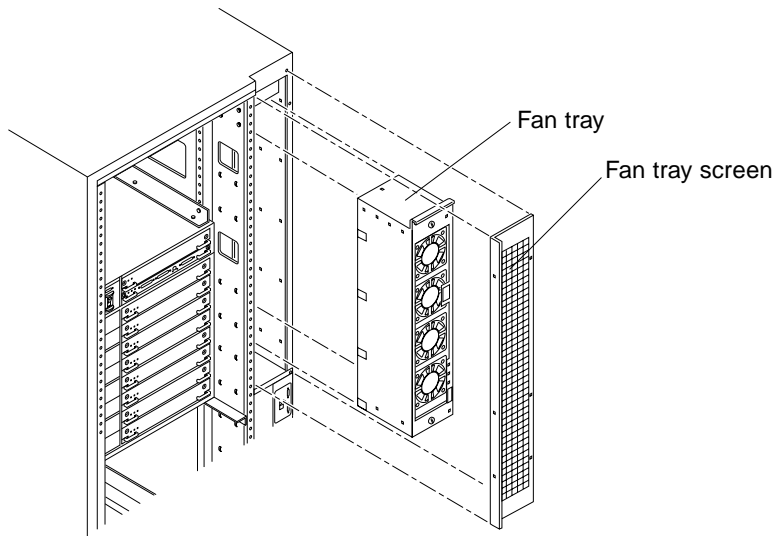


FIGURE 12-5 Removing the Fan Tray Screen and Fan Tray

2. **Lift the screen up until the slotted screw holes clear the screw heads.**

To replace the fan tray screen, reverse these instructions.

12.3.7.2 Fan Tray

1. **Loosen the two captive fasteners on the fan tray.**

2. **Remove the power cable and fan fail cable.**

To keep the cables out of the way, feed them down through the opening below the fan tray area.

3. **Pull the fan tray back, tilting the top out so that it clears the chassis.**

To replace the fan tray, reverse these instructions.

12.3.8 Stabilizer Bar

The cabinet has six levelling pads. Four pads on the cabinet frame are lowered to touch the floor and prevent the cabinet from rocking. Two levelling pads are part of the stabilizer bar and should not touch the floor.

1. **Extend the stabilizer bar fully from the bottom of the cabinet (FIGURE 12-6).**

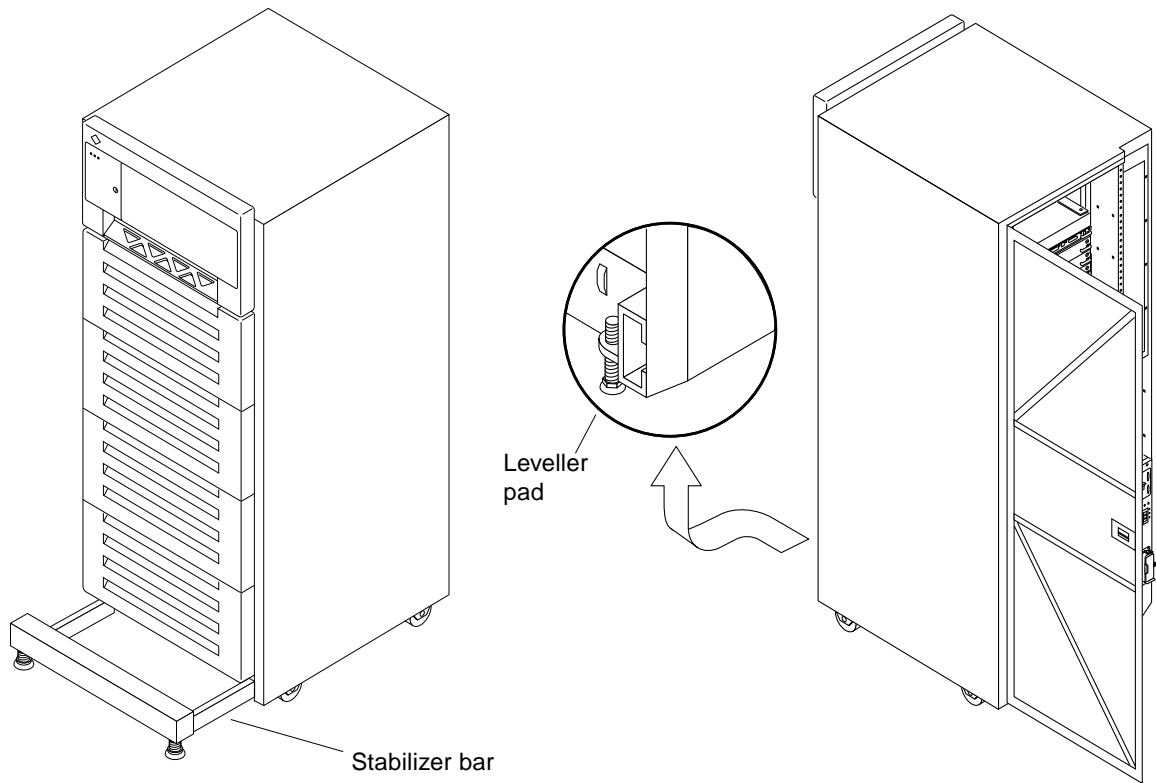


FIGURE 12-6 Stabilizer Bar and Levelling Pads

2. **Screw the two stabilizer bar levelling pads down until they are $\frac{1}{8}$ - to $\frac{1}{4}$ -inch (3 to 6 mm) above the floor.**

Ensure both pads are at equal heights above the floor. This clearance allows the stabilizer bar to slide in and out easily, yet catch the cabinet if it should begin to tilt.



Caution – Always extend the stabilizer bar before pulling the disk drive trays out for servicing.

12.4 Internal Access - Enterprise 4500 System

The top bezel must be removed to access the media tray and the key switch tray.

12.4.1 Top Bezel

To remove the top bezel:

1. **Remove the key from the key switch.**
2. **Grasp the bottom corners of both sides of the top bezel and pull it toward you.**
Apply inward pressure (FIGURE 12-7) to release the snap locks on each side.

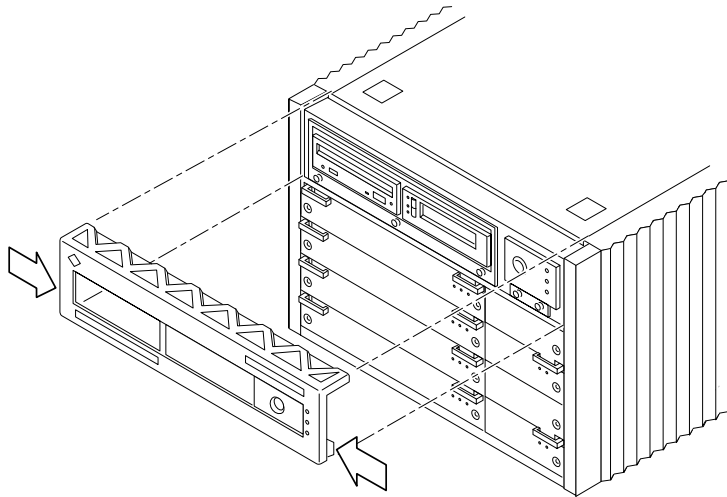


FIGURE 12-7 Removing the Top Bezel/Panel

3. **Tilt the top bezel upward to a 45° angle and remove the bezel.**

To replace the top bezel, reverse these instructions.

12.4.2 Media Tray

To remove the media tray:

1. Remove the top bezel.

2. Loosen the three captive screws that hold the tray in place.

Insert a screwdriver in the notch at the top center of the media tray to pull out the media tray. (FIGURE 12-8).

3. Remove the seven screws on top of the media tray to lift off the tray cover to access CD and tape drives (FIGURE 12-8).

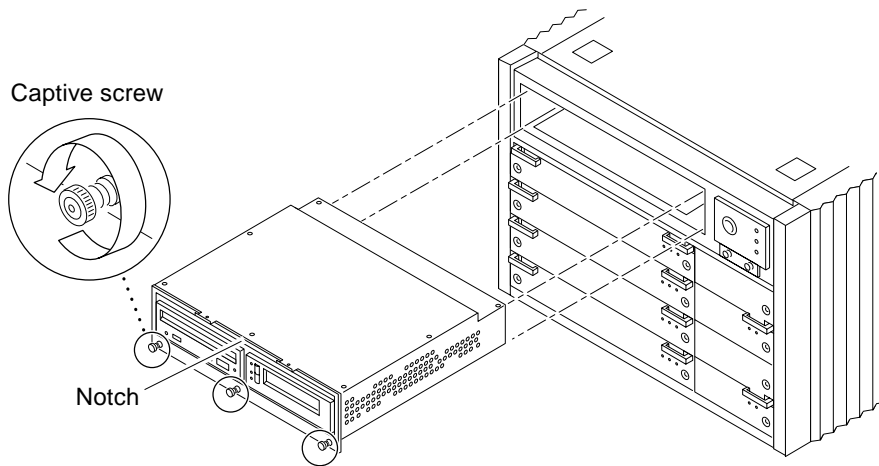


FIGURE 12-8 Removing the Media Tray

To replace the media tray, reverse these procedures.

12.5 Powering On the System

All of the panels should be in place before you turn on the electrical power. See Section 11.3 “Restarting the System,” to power-on.

Specifications

A.1 Physical Specifications

TABLE A-1 Enterprise 6500/5500 Physical Specifications

	U.S.	Metric
Height	68.3 in	173 cm
Width	30 in	77 cm
Depth	39 in	99 cm
Weight	835 lb, approx	375 kg, approx
Power cord	15 ft	4.6 m

TABLE A-2 Enterprise 6500/5500 Clearance and Service Access

	U.S.	Metric
Front	4 ft	122 cm
Rear	3 ft	92 cm
Left	1 ft*	31 cm
Right	1 ft *	31 cm

*** Access only. There are no side clearance requirements during operation.**

TABLE A-3 Enterprise 6500/5500 Shipping Specifications

	U.S.	Metric
Height	75.3 in	188 cm
Width	39 in	99 cm
Depth	44.5 in	113 cm
Weight	910 lb, approx	415 kg, approx

TABLE A-4 Enterprise 4500 Physical Specifications

	U.S.	Metric
Height	13.5 in	34 cm
Width	19.7 in	50 cm
Depth	22 in	56 cm
Weight	150 lb, approx	68 kg, approx
Power cord	6 ft	1.8 m

TABLE A-5 Enterprise 4500 Clearance and Service Access

	U.S.	Metric
Front	18 in	47 cm
Rear	18 in	47 cm
Left	6 in*	16 cm*
Right	6 in*	16 cm*

*Although 6 in (16 cm) clearance is sufficient to prevent blocking the in and out airflow of a single system, to avoid exhaust air recirculation, a minimum space of 36 in (92 cm) is recommended between systems sitting side by side.

TABLE A-6 Enterprise 4500 Shipping Specifications

	U.S.	Metric
Height	19.0 in	48 cm
Width	23.8 in	60 cm
Depth	26.8 in	68 cm
Weight	160 lb, approx	72 kg, approx

A.2 Electrical Specifications

TABLE A-7 Enterprise 6500/5500 Electrical Specifications

Parameter		Value
Input current	Voltage range	200-240 Vac
	Current, maximum	24A
	Current frequency range	47-63 Hz
Input power rating	Total continuous power	3500W (with 3 drive trays)
Volt-Ampere rating		3700 VA
BTU rating		12,000 BTU
Power factor		0.92 - 0.96
Plug type	U.S.	NEMA L6-30P for 200-240 Vac
	International	32A, single phase IEC 309, connected for 220-240 Vac

TABLE A-8 Enterprise 4500 Electrical Specifications

Parameter		Value
Input current	Voltage range	100-120 Vac or 200-240 Vac
	Current, maximum	12A
	Current frequency range	47-63 Hz
Input power rating	Total continuous power	1370W
Volt-Ampere rating		1440 VA
BTU rating		4680 BTU
Power factor		0.92 - 0.96
Plug type	U.S.	NEMA 5-15P
	International	10A, single phase IEC 320, connected for 220-240 Vac

A.3 Environmental Requirements

TABLE A-9 Enterprise 6500/5500 Temperature, Humidity, and Altitude Limits

	Operating	Nonoperating
Temperature	41 ^o F to 95 ^o F (5 ^o C to 35 ^o C)*	-4 ^o F to 140 ^o F (-20 ^o C to 60 ^o C)
Humidity	20% to 80% RH noncondensing, 27C max wb	93% RH
Altitude	9,843 ft (3 km)	39,370 ft (12 km)
*Maximum operating temperature is 95 ^o F (35 ^o C) when using tape media.		

TABLE A-10 Enterprise 4500 Temperature, Humidity, and Altitude Limits

	Operating	Nonoperating
Temperature	41 ^o F to 104 ^o F (5 ^o C to 40 ^o C)*	-4 ^o F to 140 ^o F (-20 ^o C to 60 ^o C)
Humidity	20% to 80% RH noncondensing, 27C max wb	93% RH
Altitude	9,843 ft (3 km)	39,370 ft (12 km)
*Maximum operating temperature is 95 ^o F (35 ^o C) when using tape media.		

Functional Description

B.1 System Overview

The Enterprise 6500, 5500, and 4500 servers all use variations of the same general card cage design. All systems feature shared-memory multiprocessors and use the same boards, power/cooling modules (PCMs), and operating software.

B.1.1 Board Types

All systems use the same board types, with the exception of load boards and filler panels.

1. The CPU/Memory+ board supports up to two UltraSPARC II modules and 16 SIMM slots.
2. The SBus+ I/O board includes two SYSIO ASICs that provide two SBuses: one for two plug-in SBus cards and two GBIC (100 MB/sec Fibre Channel) interfaces, and one for one plug-in SBus card and the onboard devices (10/100 Mbit TPE and Single-ended Fast/Wide SCSI).
3. The Graphics+ I/O board includes one SYSIO ASIC that provides a single SBus for two plug-in SBus cards, two GBIC (100 MB/sec Fibre Channel) interfaces, and the onboard devices (10/100 Mbit TPE and Single-ended Fast/Wide SCSI).
4. The PCI+ I/O board has two PCI bus connectors, each of which can accommodate a PCI riser card. Each riser card accommodates one PCI short card. In addition, onboard devices provide Fast Ethernet (10/100 Mbit) and Fast/Wide SCSI interfacing.

5. In the Enterprise 6500 system, empty board slots require load boards (part number 501-3142) to reduce the possibility of RFI generation. The Enterprise 5500 and 4500 systems use filler panels (part number 540-2592).

B.1.2 Basic Definitions for the Card Cage

When locating a board slot in the 8-slot and 16-slot card cages, remember:

Slot numbers	<p>Even-numbered slots are at the front of the card cage. Odd-numbered slots are at the back.</p> <p>In the front of the card cage, slot 0 is at the top. At the rear of the card cage, slot 1 is at the top.</p> <p>The component side of a board is <i>down</i> in the front slots. The component side is <i>up</i> in the rear slots.</p> <p>For specific slot numbers, see Appendix B, Section B.2.3 “Enterprise 4500 Standalone Server” on page B-6.”</p>
Slot functions	<p>All card cage slots are equivalent in the Enterprise 6500, 5500, and 4500 systems. However, it is suggested that you install I/O+ boards at the back of the cage to simplify the installation of interface cables. Install CPU/Memory+ boards at the front of the cage to leave the rear slots for I/O+ boards. If all slots are filled on one side of the cage, you can use the other side.</p> <p>Slot 1 should contain an I/O+ board connected to the boot disk. (This is a suggestion, and not a requirement.)</p> <p>Slot 0 should contain a CPU/master board with at least one CPU. The POST diagnostics display more messages if slot 0 contains a CPU/Memory+ board and a CPU. For an explanation, see the next item, “Master board.”</p>
Master board	<p>The first CPU/Memory+ board (in slot 0) functions temporarily as a master board during some POST tests. There is no master board during normal system operations after the POST tests have finished.</p>

Enterprise card cages feature a centerplane bus. Boards at the front of the centerplane must be installed component side down, while boards at the back must be installed component side up. The boards are oriented this way to allow for minimum signal trace lengths and optimum system performance.

FIGURE B-1 illustrates the logical organization of Enterprise systems.

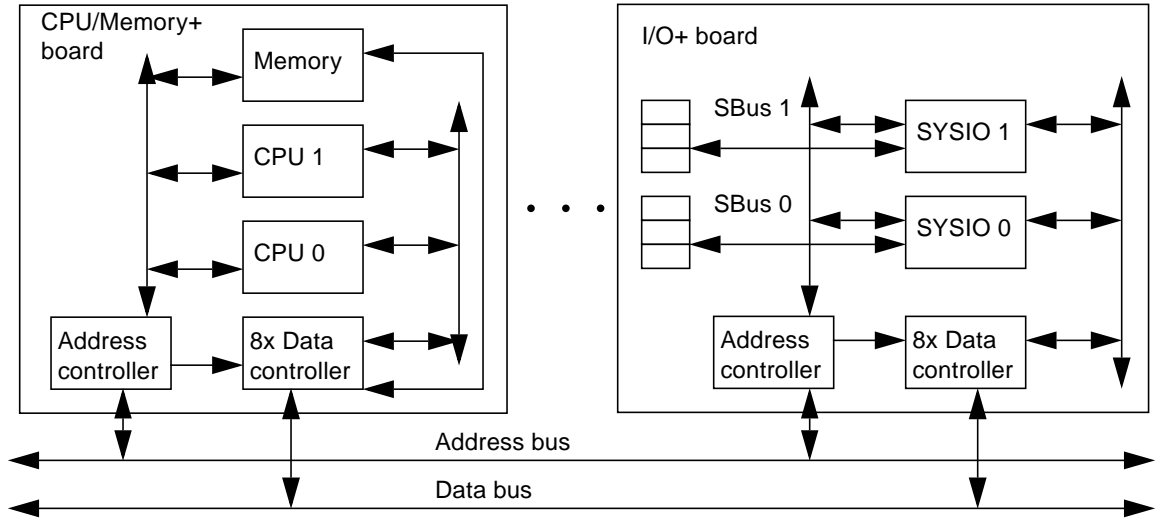


FIGURE B-1 Enterprise System Logical Organization

There are few differences between board slots and each slot can accept any board type. However, an I/O+ board should be installed in slot 1 since this slot connects directly to the internal media tray through the centerplane and related cables. The internal tape and/or CD-ROM or other optional internal SCSI drives cannot be used unless an I/O+ board is present in slot 1.

Although the remaining slots are equivalent, I/O+ boards should be located on the back side of the centerplane for easy access to interface cables at the rear of the cabinet.

B.2 System Packaging

This section describes the features of the system enclosures.

B.2.1 Enterprise 6500 Server

The Enterprise 6500 server features a 16-slot card cage in a 68-inch data center system cabinet (FIGURE B-2).

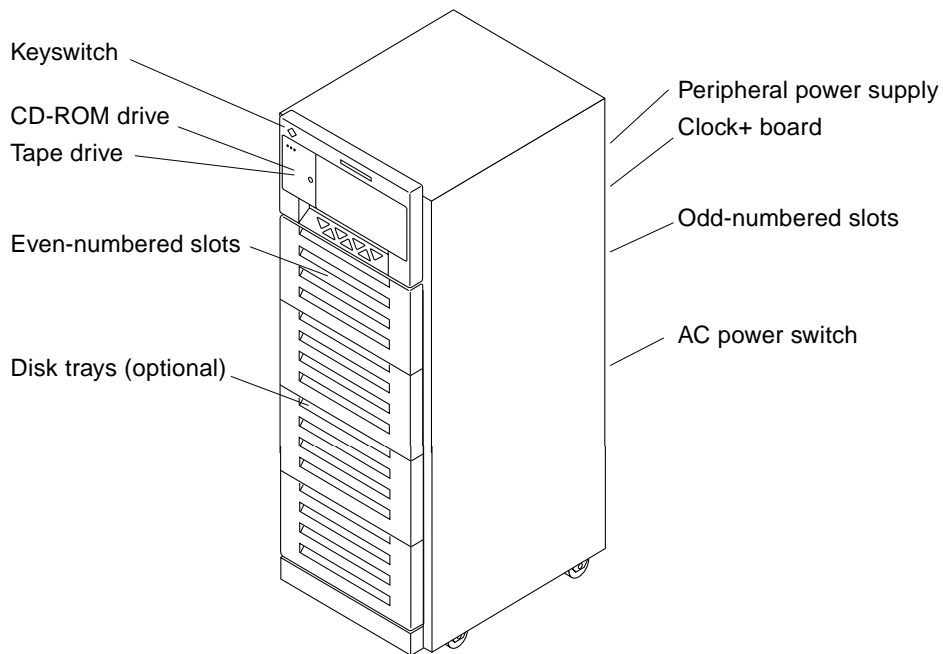


FIGURE B-2 Sun Enterprise System Cabinet

The front of the cabinet contains the CD-ROM/tape tray, the keyswitch, the even-numbered board slots, and the even-numbered power/cooling module (PCM) slots.

The rear of the cabinet contains the AC power switch, the peripheral power supply, the clock+ board, the odd-numbered board slots, and the odd-numbered PCM slots.

For slot numbers in the 16-slot card cage, see FIGURE 3-5.

Air circulation for the system boards is provided by the power/cooling modules. The PCMs (PCM 0 through PCM 7) have two fans each. The fans provide cooling for the PCM, plus two adjacent board slots. There are also a fan tray in the card cage (item 11 in FIGURE F-2). A second fan tray is located at the side of the rack (FIGURE F-7), The rear of the media tray also has a fan.

All empty board slots must be blocked by load boards for proper airflow, cooling, and EMI protection. Other types of empty slots must be blocked by filler panels.

B.2.2 Enterprise 5500 Server

The Enterprise 5500 server is similar to the Enterprise 6500 system but features a shorter, 8-slot, card cage. See FIGURE B-2 on page B-4.

For slot numbers in the 8-slot card cage, see FIGURE B-3.

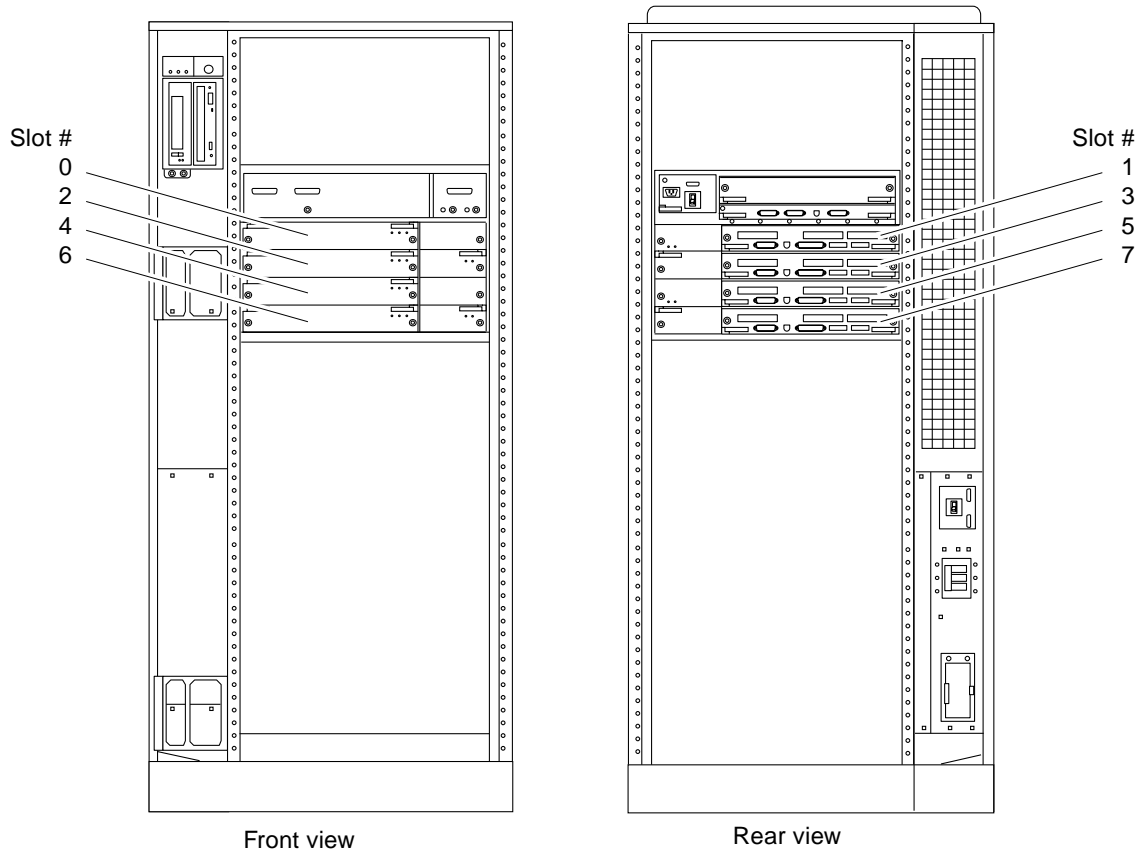


FIGURE B-3 Enterprise 5500 Server

Functionally, the 16-slot and 8-slot cabinet servers are the same, with the only difference being the board capacity and amount of internal space available below the card cage. All boards are interchangeable between the two versions.

All empty slots must be blocked by filler panels for proper airflow, cooling, and EMI protection.

Note – The load board that is required for the 16-slot Enterprise 6500 server is not required for the Enterprise 5500.

B.2.3 Enterprise 4500 Standalone Server

The Enterprise 4500 server uses the 8-slot card cage that is used for the Enterprise 5500, but the card cage is in a standalone cabinet (FIGURE B-4).

Also note that several areas of the card cage that are covered by filler panels in the cabinet version are used in the standalone version. These areas include the SCSI CD-ROM/tape tray, keyswitch, and AC switch (FIGURE B-4).

The power/cooling modules (PCM 0 through PCM 3) each have two fans. The fans provide cooling for the PCM and the two adjacent board slots. Air circulation for the system boards is provided by the power/cooling modules. In addition, the Enterprise 4500 has a combined AC input box and fan tray.

All empty slots must be blocked by filler panels for proper airflow, cooling, and EMI protection.

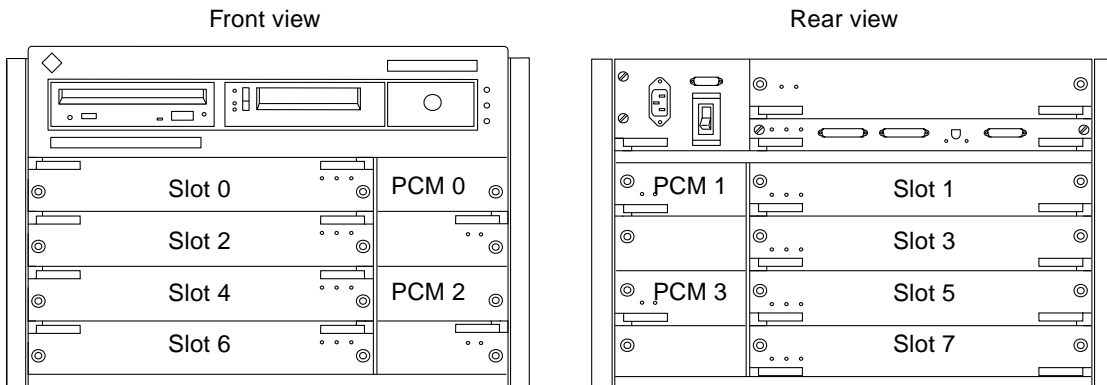


FIGURE B-4 Enterprise 4500 Standalone Server

B.3 Software

The Enterprise software includes two diagnostic packages, Solstice SyMON and SunVTS. Refer to the online manuals for operating instructions.

B.4 Board Hot-Plug Procedures

The CPU/Memory+ board and the I/O+ board are hot-pluggable under certain conditions. If the operating system detects a hardware failure in the board, the system powers down the corresponding board slot and turns off the left green status LED on the board. (See TABLE 9-2 for LED codes.)

When the left green LED is off, it is safe to remove the board even though the system continues running.

B.5 CPU/Memory+ Board

The CPU/Memory+ board supports up to 2 CPU modules and 16 SIMMs. The CPU/Memory+ board is shown in FIGURE B-5.

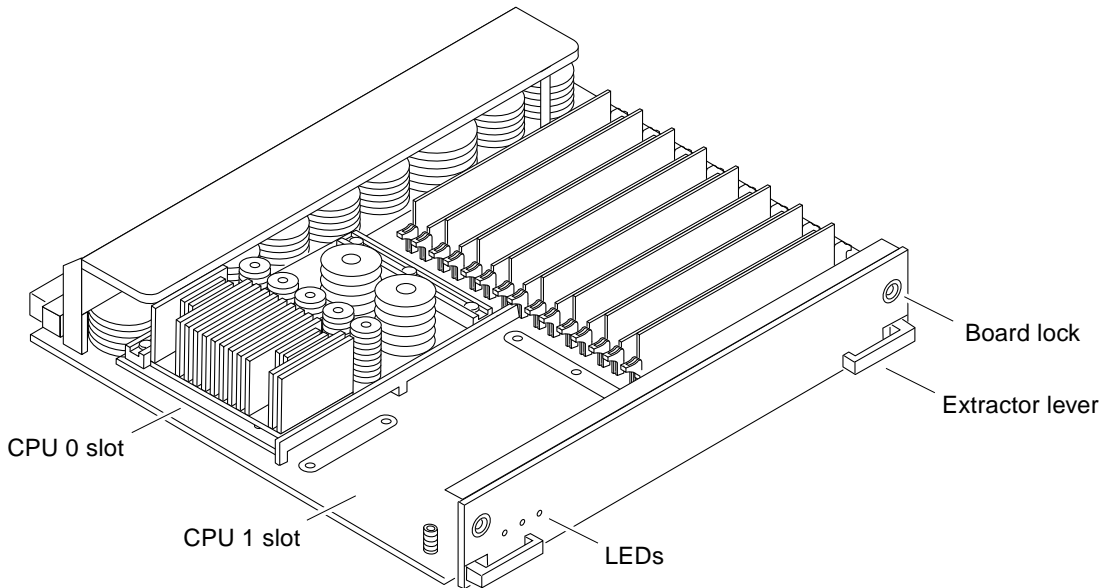


FIGURE B-5 CPU/Memory+ Board

The CPU/Memory+ board should be installed from the smallest even-numbered slot (0) to the largest even-numbered slot (14). The even-numbered slots are located at the front of the cabinet. When located in these slots, the component side of the board is down. If the front slots are filled, you can use slots at the rear of the cabinet, with the exception of slot 1. Slot 1 requires an I/O+ board because the slot connects to the media tray in the front of the cabinet.

All empty slots must have a filler panel or load board installed.

Note – The 16-slot Enterprise 6500 card cage requires load boards to reduce the potential for RFI generation. The 8-slot Enterprise 5500 and 4500 card cages use filler panels, which do not have load circuits.

B.5.1 CPU Modules

Each CPU/Memory+ board has two sets of CPU connectors, marked PROC 0 and PROC 1.

The order in which you fill CPU slots is not critical. However, to optimize heat dissipation in the system:

- Fill all PROC 0 locations on all CPU/Memory+ boards before filling any PROC 1 locations. To receive the maximum quantity of diagnostic information, fill PROC 0 on board 0.
- After all PROC 0 locations are filled, you may begin filling the PROC 1 locations, again starting from the lowest slot number to the highest.

B.5.2 System Master Board

The board slots are interchangeable. A system master board is selected for the duration of POST and OBP testing, to control the testing processes. The system master is normally the lowest-numbered slot containing a board with a functional CPU. After the tests are finished, the board slots are again fully equivalent.

B.5.3 SIMMs

The CPU/Memory+ board has 16 slots for SIMMs, organized as two banks of eight SIMMs.

B.5.3.1 Slot Locations

SIMMs must be installed in full banks of eight. FIGURE B-6 shows the slot numbers for bank 0 and bank 1.

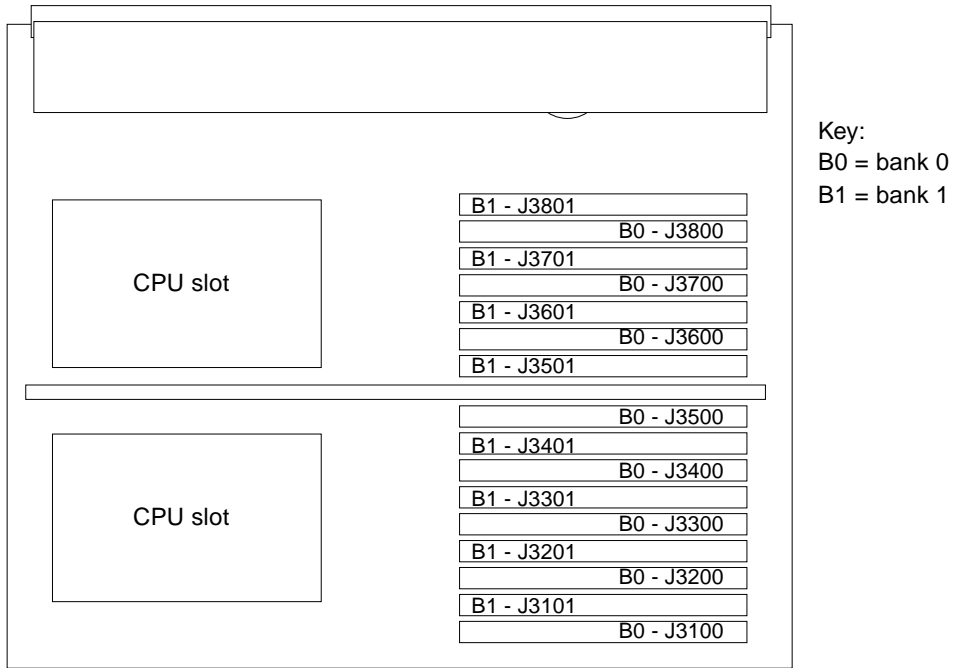


FIGURE B-6 SIMM Slot Locations

B.5.3.2 SIMM Selection

The JEDEC standard 3.3 volt SIMMs are available in 8, 32, or 128 Mbyte capacities. All are 168-pin SIMMs.

Do not mix different capacities in a bank.



Caution – The Enterprise systems SIMMs operate at 3.3V — do not substitute other voltage ratings.

B.6 I/O+ Boards

Several types of I/O+ boards are available: SBus+ I/O board, Graphics+ I/O board, and PCI+ I/O board.

For easy access to I/O cables, I/O+ boards should be installed in the rear of the cabinet, with CPU/Memory+ boards in the front of the cabinet. I/O+ boards should be installed from the smallest odd-numbered slot (1) to the largest odd-numbered slot (7 or 15). The odd-numbered slots are located at the rear of the cabinet. When located in these slots, the board is oriented so that the component side is up.

Note – Board slot 1 requires an SBus+ or Graphics+ I/O board because this is the only slot that connects with the internal media tray. If slot 1 does not contain an I/O+ board, the drives in the media tray will not function.

If the rear slots are filled, you can use slots at the front of the cabinet. When located in a front slot, the board is oriented so that the component side is down.

Note – All empty card cage slots must contain a load board (Enterprise 6500 server) or filler panel (Enterprise 5500 or 4500 servers).

B.6.1 SBus+ I/O Board

The *SBus+ I/O board with 100 MB/sec Fibre Channel* (FIGURE B-7) includes two SYSIO ASICs that provide two SBuses:

- One for two plug-in SBus cards and two GBIC (100 MB/sec Fibre Channel) interfaces
- One for one plug-in SBus card and the onboard devices (10/100 Mbit TPE and Single-ended Fast/Wide SCSI)

Note – SBus connector slots 1 and 2 on the SBus+ I/O board can accommodate a double-wide SBus card.

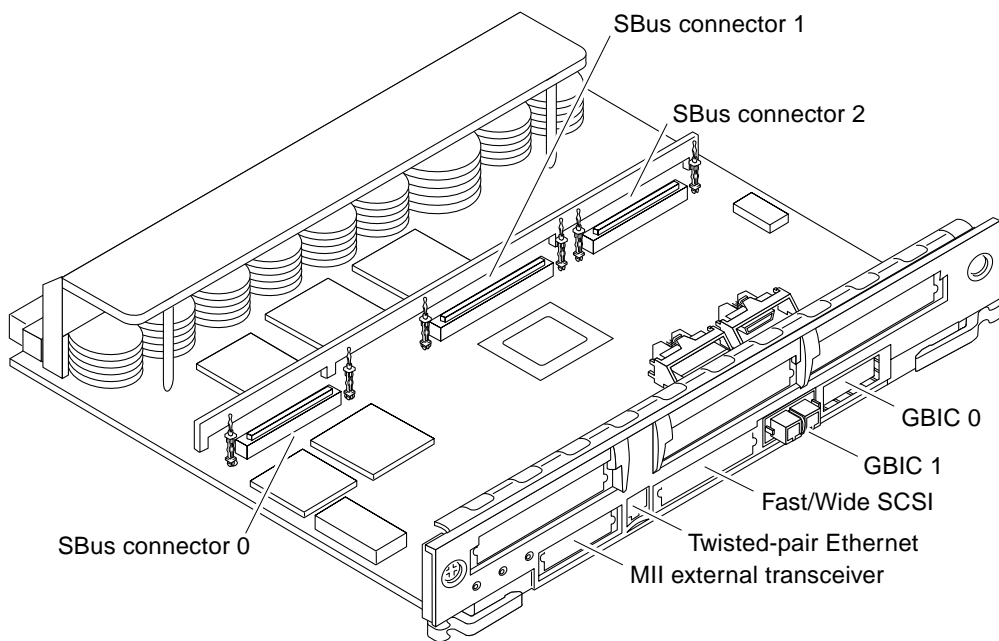


FIGURE B-7 SBus+ I/O Board

B.6.2 Graphics+ I/O Board

The *Graphics+ I/O board with 100 MB/sec Fibre Channel* (FIGURE B-8) includes one SYSIO ASIC that provides a single SBus for two plug-in SBus cards, two GBIC (100 MB/sec Fibre Channel) interfaces, and the onboard devices (10/100 Mbit TPE and Single-ended Fast/Wide SCSI).

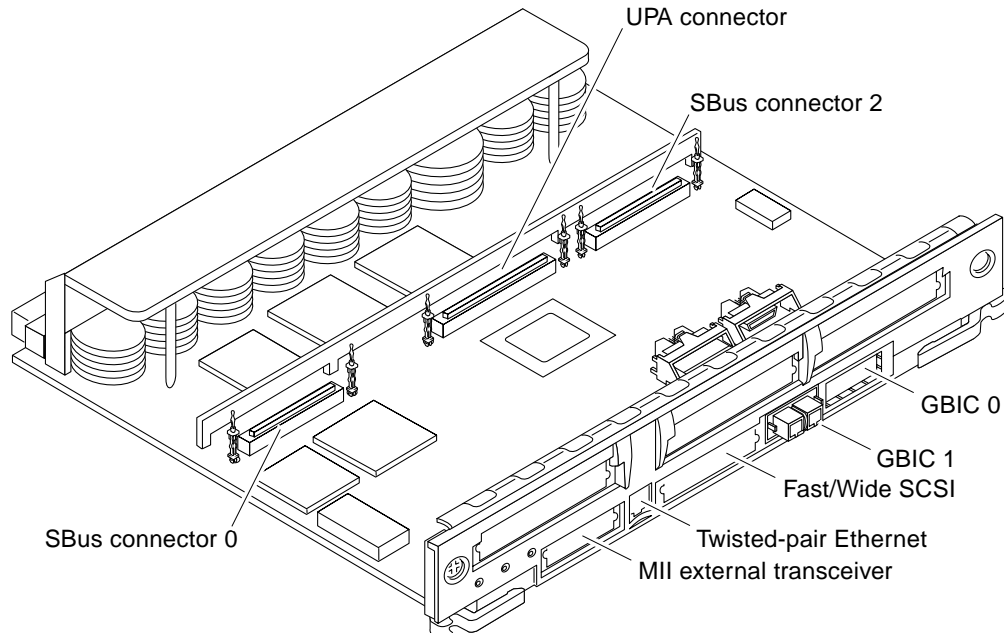


FIGURE B-8 Graphics+ I/O Board

B.6.3 PCI+ I/O Board

The *PCI+ I/O board* (FIGURE B-9) has two PCI bus connectors:

- Each connector can accommodate a PCI riser card
- Each riser card accommodates one PCI short card

In addition, onboard devices on the PCI+ I/O board provide Fast Ethernet (10/100 Mbit) and Fast/Wide SCSI interfacing.

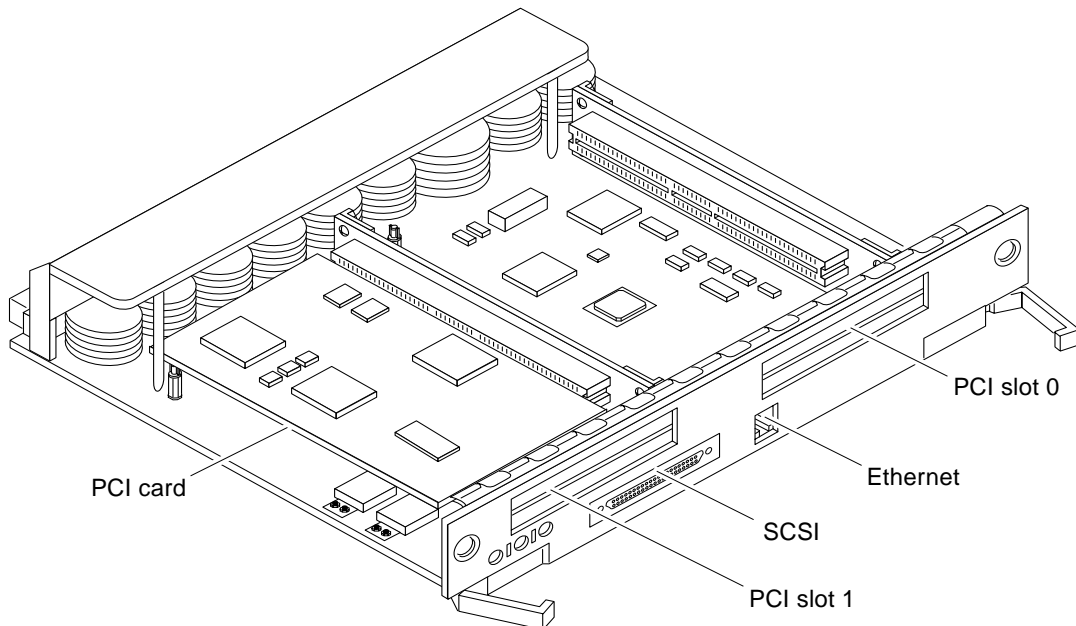


FIGURE B-9 PCI+ I/O Board

The board contains five subsystems: I/O (PCI Bus), Memory, Bus Interface, FireHose Interface, and Clock Generation. Four of these subsystems: the I/O (PCI Bus), Memory, Bus Interface and internal board interface subsystems include ASICs. The Clock subsystem distributes and generate clocks for the ASICs and PCI Bus Interfaces on the board

B.7 Network Interfaces

Each SBus+ I/O board and Graphics+ I/O board has onboard connectors for 10BASE-T or 100BASE-T Ethernet. The two sockets (RJ-45 and 40-pin MII) connect to the same interface circuit, so that only one socket is active at any time.

Additional network interfaces can be added in the form of SBus cards. The SBus+ I/O board will support up to three SBus interface cards. The Graphics+ I/O board will support up to two SBus interface cards.

B.8 Disk Board

The Disk board (with two SCSI disks) is an available option for the Enterprise systems. The Enterprise 6500 system supports two Disk boards (*only* in slots 14 and 15); the Enterprise 5500 and 4500 systems support four Disk boards.

The ID settings of the two disks on the Disk board vary according to the card cage slot location. See Appendix C “SCSI Devices.”

B.9 Power Supplies

There are two types of power supplies: power/cooling modules (PCMs) and peripheral power supplies. PCMs provide DC current and cooling air to boards in the card cage. The peripheral power supply provides current for peripheral devices (such as a tape or CD-ROM drive) in the media tray.

B.9.1 Power/Cooling Modules (PCMs)

The DC power to the centerplane is supplied by one or more PCMs. Each PCM also provides cooling air for two board slots. If a slot contains a board, the adjacent PCM slot must contain a PCM to supply cooling air.

Current from individual PCMs is shared on the centerplane.

With automatic system reconfiguration (ASR), a PCM can be taken offline and replaced without halting the system. There are two restrictions:

1. The remaining power/cooling modules must provide sufficient electrical power. As a general rule, the number of boards must be less than half the number of PCMs.
2. The PCM should be replaced quickly so that any adjacent boards will not overheat from lack of fan cooling.

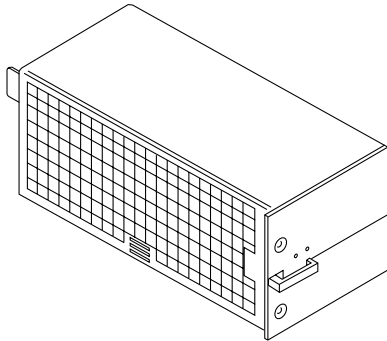


FIGURE B-10 PCM

B.9.2 Peripheral Power Supply

A system has one peripheral power supply. This power supply provides DC power for the CD-ROM/tape tray and precharge power for hot-plugging boards and power/cooling modules. The +5 VDC output of the peripheral power supply is current shared with the +5 VDC outputs of the power/cooling modules.

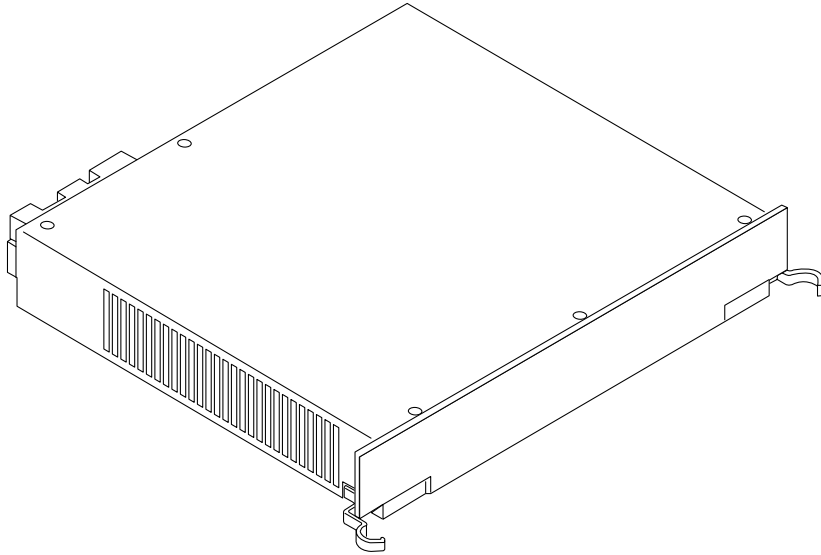


FIGURE B-11 Peripheral Power Supply

B.10 Clock+ Board

The clock+ board is located at the rear of the system, directly below the peripheral power supply. When replacing the clock+ board, orient the board with the component side up (FIGURE B-12).

The clock+ board provides 16 pairs of system clocks, 32 pairs of processor clocks.

All processors run at the same clock speed. The system clock and the processor clocks are derived from a single clock source. The frequency of the clock source as well as the processor and system clocks are programmable and set by firmware. The processor clock frequency is set to match the lowest-frequency processor in the system.

The clock+ board also includes central devices including serial ports, keyboard and mouse, and a time-of-day (TOD) chip.

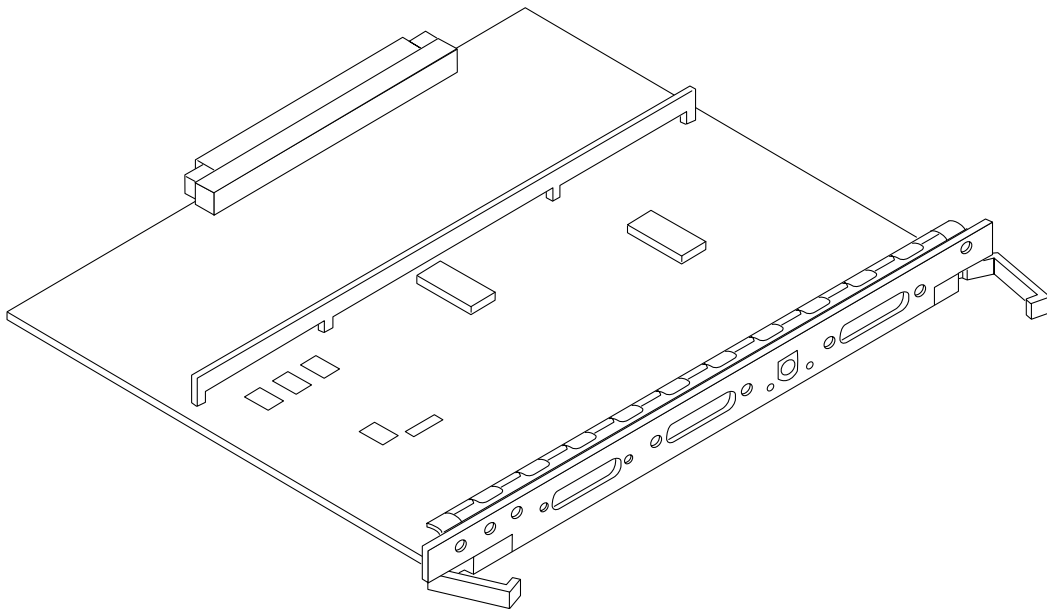


FIGURE B-12 Clock+ Board

B.11 Disk Trays

Enterprise systems support Fibre Channel and/or SCSI disk trays.

- The 16-slot Enterprise 6500 cabinet server has a capacity of three internal trays.
- The 8-slot Enterprise 5500 cabinet server has a capacity of four internal trays.
- The 8-slot Enterprise 4500 standalone server does not have a capacity for internal trays.

B.12 CD-ROM/Tape Tray

All Enterprise servers include a tray for one CD-ROM drive and one tape drive. The drives connect to the wide SCSI connector of the first I/O+ board (in card cage slot 1).

- Enterprise 6500/5500
Cabinet servers: The tray is located in the front upper left part of the rack, and the drives are mounted vertically.

Up to four additional SCSI drives may be mounted in the area to the right of the CD-ROM/tape tray.

- Enterprise 4500
Standalone server: The tray is located in the front, immediately above the card cage, and the drives are mounted horizontally.

The standalone server does not have space for additional internal drives.

SCSI Devices

C.1 Media Tray Target IDs

The default SCSI ID numbers for devices in the media tray are:

TABLE C-1 Media Tray Default SCSI ID Numbers

Device	ID
CD-ROM	6
Tape drive	5

C.2 Disk Board Target IDs

C.2.1 Default SCSI ID Numbers

The default SCSI ID numbers for disk drives on the Disk boards are listed by server type in TABLE C-2.

TABLE C-2 Disk Board Default SCSI Disk Drive ID Numbers

	Board Slot	Disk 0,1	Board Slot	Disk 0,1
Enterprise 4500 or 5500				
	0	4, 5	1	6, 7
	2	0, 1	3	10, 11
	4	2, 3	5	12, 13
	6	8, 9	7	14, 15
Enterprise 6500 only				
	14*	0, 1	15*	10, 11
*Enterprise 6500 systems: Disk boards can only be installed in slots 14 and 15.				

C.2.2 Overriding A Default Disk Board Target ID

You can override the default IDs by jumpers on each disk board. Each disk has an ID_ENABLE jumper and four ID jumpers. If the ID_ENABLE jumper is not installed, the disk drive uses the default SCSI ID. If the ID_ENABLE jumper is installed, the disk drive uses the ID specified by the four ID jumpers located on the disk board (an installed jumper indicates a logical 1).

Note – For Enterprise 4500 and 5500 servers, default disk drive ID numbers are chosen so that IDs 4, 5, 6, and 7 are unlikely to be assigned to disk drives. These IDs are in slots 0 and 1, which are normally taken by a CPU/Memory+ board (slot 0) and an I/O board (slot 1).

C.3 SCSI Cable Length

The maximum combined length for a string of SCSI cables is 6 meters for non-differential cables. For differential SCSI cables, the maximum is 25 meters. To calculate the total length of a SCSI string, include external cables, internal cables, and printed traces. TABLE C-3 lists measurements for Enterprise servers.

TABLE C-3 Internal SCSI Lengths (Approximate)

Location	Internal Length	Comments
Enterprise 6500 slot 1	3.7 meters	Includes I/O+ board traces and cables to media tray
Enterprise 5500 slot 1	3.7 meters	Includes I/O+ board traces and cables to media tray
Enterprise 4500 slot 1	1.4 meters	Includes I/O+ board traces and cables to media tray
SBus+ I/O board	0.43 meter	Includes board traces only
Graphics+ I/O board	0.43 meter	Includes board traces only
Disk board	0.64 meter	Includes board traces only

C.4 SCSI Termination

The I/O+ board in slot 1 of any Enterprise server must be terminated. This slot connects to the media tray through cables and a connector on the centerplane.

I/O+ boards in other slots do not require termination if no devices connect to the SCSI bus on those boards.

Rules for System Configuration

Some of the following rules are suggestions for optimizing your system. Other rules are strictly required and are marked with the notation **Requirement** or **Maximum**.

D.1 Card Cage

As a general rule, all board slots in the card cage are interchangeable. However, the requirements and limitations in the following sections apply when you install boards.

D.1.1 CPU/Memory+ Boards

1. Install CPU/Memory+ boards at the front of the system, starting with the top slot (slot 0). If you reserve the rear slots for I/O+ boards, I/O cable attachments will be made easier.
2. After the front slots are filled, you may add CPU/Memory+ boards at the rear of the system, below the I/O+ boards.

D.1.2 I/O+ Boards

1. **Requirement** — An I/O+ board must always be in slot 1. This is the only slot that allows access internally to the internal SCSI devices (tape and CD-ROM drives.)
2. Install I/O+ boards at the rear of the system to facilitate I/O cable attachments.
3. If you require additional slots, you may use those at the front of the card cage, preferably below the CPU/Memory+ boards.
4. **Maximum** — Up to four graphics (UPA) cards are supported in a system.
5. **Requirement** — The I/O+ board in slot 1 of any Enterprise server must be terminated because it connects to the media tray.
6. An I/O+ board in a slot other than slot 1 does not require termination if no devices connect to the SCSI bus on that board.

D.1.3 Disk Board

1. **Maximum** — The Enterprise 6500 system supports up to two Disk boards.
 - a. Disk boards are supported only in slots 14 and 15.
 - b. Slot 15 must be used when installing only one Disk board.
2. **Maximum** — The Enterprise 5500 and 4500 systems support up to four disk boards.
3. The disk board has a capacity of two disk drives. In addition to the three status LEDs found on other types of boards, the disk board has two LEDs to show the status of the individual disk drives. LEDs 1 and 2 represent drives 0 and 1, respectively.

D.1.4 Power Supplies and Fan Cooling

1. **Requirement** — The fans in the power/cooling modules (PCMs) provide cooling air only for the two adjacent board slots. Do not install a board in a slot that is not cooled by a PCM.
2. **Requirement** — You must fill all empty slots (board slots and power supply slots) to avoid loss of cooling air to the active boards. For further information on this subject, see Section D.1.5 “Filler Panels and Load Boards.”
3. Under some circumstances, you may remove a power/cooling module from an active system for a short time. However, if the boards in the adjacent slots create large quantities of heat, it is safer to halt and power off the system first.

D.1.5 Filler Panels and Load Boards

1. **Requirement** — All empty board slots must be filled with filler panels or load boards.
2. **Requirement** — For Enterprise 6500 systems, use load boards. A load board (part number 501-3142) is identified by the presence of connector sockets and passive circuitry, which reduces electrical noise at the center plane. *Do not substitute filler panels, which do not have load circuits.*
3. **Requirement** — For Enterprise 5500 and 4500 systems, use filler panels (part number 540-2592).
4. **Requirement** — Filler panels are required for all unused PCM bays.

D.2 SBus Modules

1. Install double-wide SBus cards only on the SBus+ I/O board, at SBus slots 1 and 2. The location of SBus slot 0 prevents its use with double-wide cards.
2. Double-wide SBus cards cannot be used with the Graphics+ I/O board. The middle card connector does not fit SBus cards.

D.3 CPU Modules

1. Each CPU/Memory+ board has two sets of CPU connectors, marked “PROC 0” and “PROC 1”.
2. Do not mix CPU speeds.
3. **Requirement** — To run 250 MHz CPU modules:
 - a. Use only clock+ board part number 501-4286.
 - b. Do not mix 250 MHz CPU modules with CPU modules of a different speed.
4. The order in which CPU slots are filled is not critical. However, to optimize heat dissipation in the system:
 - Fill all “PROC 0” locations on all CPU/Memory+ boards before filling any “PROC 1” locations. To receive the maximum quantity of diagnostic information, fill “PROC 0” on board 0.
 - After all “PROC 0” locations are filled, you can begin filling the “PROC 1” locations, again starting from the lowest slot number to the highest.

TABLE D-1 shows slot locations for an example of five CPUs on three CPU/Memory+ boards.

TABLE D-1 Example of CPU Placement

Slot Number	“PROC 0”	“PROC 1”
0	in	in
2	in	in
4	in	—

D.4 Memory Modules

1. The SIMMs are 168-pin, JEDEC-standard devices. Do not use other types of memory modules.
2. **Requirement** — All SIMMs in a bank (eight SIMMs) must have the same capacity. Do not mix 8, 32, or 128 Mbyte SIMMs in the same bank.
3. All SIMMs in a bank should have the same speed rating. If SIMMs of different speeds are mixed in a bank, the bank will function, but at the lowest speed.

D.5 Power Supplies

Requirement — Only the peripheral power supply provides precharge current to the system. The peripheral power supply must be fully functional if you replace a hot-pluggable board or PCM. If the peripheral power supply cannot supply precharge current, the hot-pluggable unit will be damaged.

D.6 Disk Drives

1. The disk array containing the boot disk should be connected to the I/O+ board in card cage slot 1.
2. Additional drive arrays may be attached to I/O+ boards in any other card cage slot.
3. In the Enterprise 6500 and 5500 systems, optional disk arrays can be mounted under the card cage. The maximum number of arrays supported by Sun varies with the server type and the physical size of the trays.

D.7 CD-ROM/Tape Drive Media Tray

1. For the 8-slot Enterprise 4500 system, the optional CD-ROM and tape drives are mounted horizontally in a media tray that is attached to the card cage.

2. For the 16-slot Enterprise 6500 and 8-slot Enterprise 5500 cabinets, the optional CD-ROM and tape drives are mounted vertically in a media tray that is attached to the rack. Note that the 8-slot card cage is the same unit as is used in the 8-slot stand-alone unit, but with filler panels in the unused card cage media tray and key switch compartments.
3. The Enterprise 6500 and 5500 systems have space above the card cage for an optional multi-tape backup tray or tape library unit.

D.8 Connecting Cables

D.8.1 SCSI

1. **Maximum** — The maximum length for a chain of non-differential SCSI cables is 6.0 meters (20 feet).
2. **Maximum** — The maximum length for a chain of differential SCSI cables is 25 meters (82 feet).

D.8.2 Ethernet

1. The main Ethernet should be connected to the I/O+ board in slot 1.
2. Additional Ethernet connections may be made to I/O+ boards in any other card cage slot.

D.8.3 Video Interface

1. A system that is operated with a monitor may use a graphics adapter mounted on either a Graphics+ I/O board or an SBus+ I/O board.
2. Up to four Graphics+ I/O boards are supported in a system.

Non-Chassis Field Replaceable Units (FRUs)

E.1 FRU List

Refer to the following pages to remove and replace system subassemblies:

TABLE E-1 List of Field Replaceable Units

FRU List Items	Part Number	Page Number
Assembly, data cable, media tray, 6500/5500	530-2528	page E-6
Assembly, power cable, media tray, 6500/5500	530-2655	page E-6
Assembly, system cabinet AC input, domestic	530-2265	page E-3
Assembly, system cabinet AC input, international	530-2266	page E-3
Centerplane, Enterprise 6500	501-5010	page E-20
Centerplane, Enterprise 5500	501-4944	page E-20
Centerplane, Enterprise 4500	501-4944	page E-28
Fan tray assembly, 100/240V	370-1811	page E-23
Fan tray assembly, 200/240V	370-1812	page E-19
Fan tray assembly, system cabinet	540-2709	page E-2
Key switch adapter assembly	370-2073	page E-18
Key switch tray, Enterprise 6500/5500	370-2161	page E-10
Key switch tray, Enterprise 4500	370-1810	page E-25
Power sequencer, universal, system cabinet	300-1290	page E-5
SCSI tape adapter PCS assembly	540-2713	page E-16

E.2 Enterprise 6500/5500 Systems

E.2.1 System Cabinet Fan Tray Assembly

You must remove the fan tray screen (FIGURE E-1) to reach the assembly.

Note – There is also a fan tray in the card cage (Section E.2.8 “Fan Tray Assembly, 200/240V) and one fan in the media tray.

E.2.1.1 Removing the Fan Tray Screen

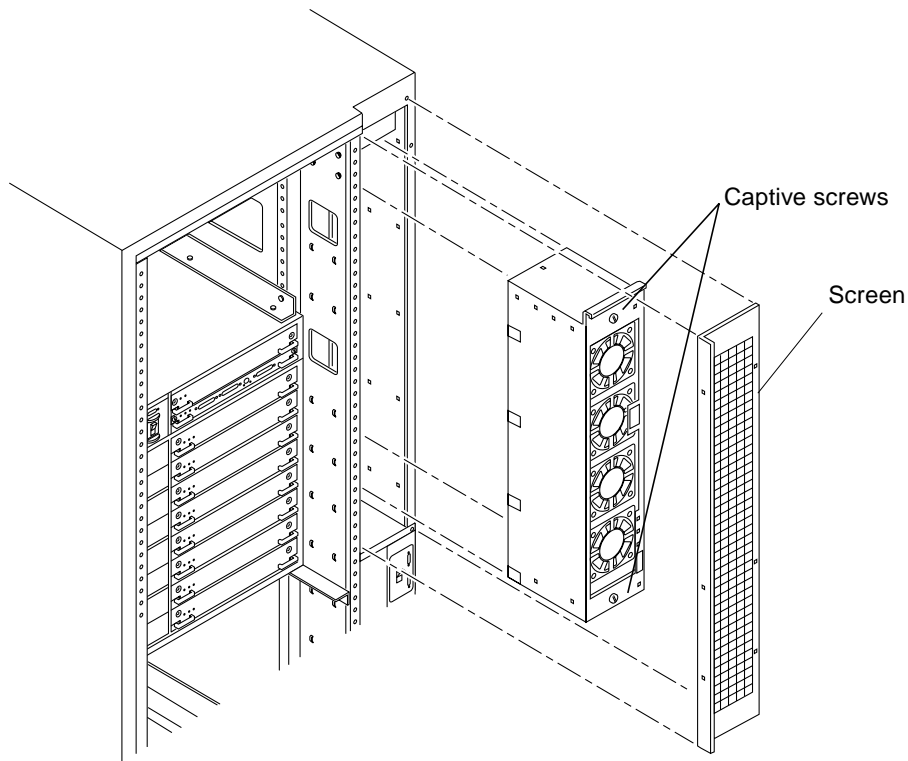


FIGURE E-1 Replacing the Fan Tray Assembly in the Enterprise 6500/5500 Systems

1. **Loosen the four screws on the left and the four screws on the right of the fan tray screen.**

It is not necessary to completely remove these four screws.

2. **Lift the screen up until the slotted screw holes clear the screw heads, and set it aside.**

E.2.1.2 Removing the Fan Tray Assembly

1. **Disconnect the power cable and fan cable assembly.**
2. **Loosen the two captive screws on the fan tray assembly (FIGURE E-1).**
3. **Tilt the fan tray assembly back slightly so that it clears the top of the cabinet.**
4. **Remove the fan tray assembly.**

E.2.1.3 Replacing the Fan Tray Assembly

1. **Tilt the fan tray assembly inward and lower it behind the upper sequencer bracket.**
2. **Push the fan tray into the cabinet until the fan tray cannot be inserted any further.**
3. **Tighten the two captive screws at the top and bottom of the fan tray (FIGURE E-1).**
4. **Replace the power cable and fan fail cable.**

E.2.1.4 Replacing the Fan Tray Screen

1. **Replace the screen so that the slotted screw holes clear the screw heads.**
2. **Tighten the four screws on the left and the four screws on the right.**

E.2.2 AC Power Cable

E.2.2.1 Removing the AC Power Cable

1. **Power off the system.**
See the power off instructions in Chapter 11 “Powering Off and On.”
2. **Disconnect the AC power cable from the power connector.**

- 3. Push back and release the latch (FIGURE E-2) attaching the power cable to the power connector .**

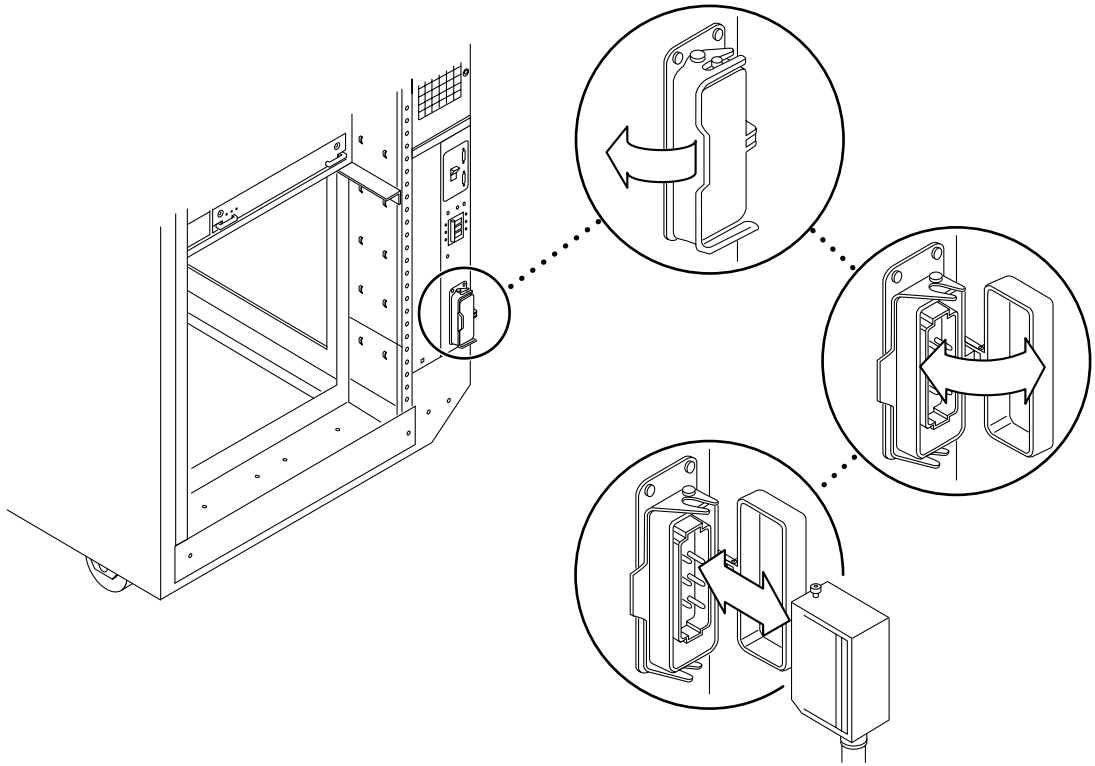


FIGURE E-2 Opening the Power Connector Cover

- 4. Unplug the AC power cable.**
Close the power connector cover.

E.2.2.2 Replacing the AC Cable Assembly

- 1. Pull back the power connector cover (FIGURE E-2) to expose the power connector.**
- 2. Connect the AC power cable into the power connector.**
- 3. Pull the latch over the AC power cable.**
- 4. Connect the AC power cable to the wall socket.**

5. Power on the Enterprise system.

See the power on instructions in Chapter 11 “Powering Off and On.”

E.2.3 Universal System Cabinet Power Sequencer

E.2.3.1 Removing the Power Sequencer

1. Completely power off the Enterprise system.

See the power off instructions in Chapter 11 “Powering Off and On.”

2. Remove the power cord assembly from the back of the power sequencer.

See Section E.2.2 “AC Power Cable,” for information on removing the power cord.

3. Remove the side panel closest to the power sequencer.

See Chapter 12 “Preparing for Service,” for information on removing the side panel.

4. Disconnect all the cable assemblies from the front of the power sequencer.

Reach through the space uncovered by the side panel to disconnect these cable assemblies.

5. Remove the two screws at the top of the power sequencer (FIGURE E-3).

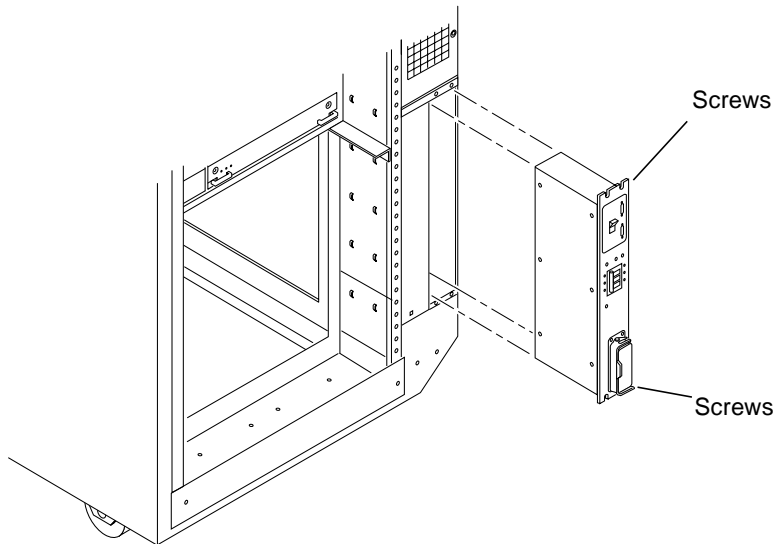


FIGURE E-3 Replacing the Power Sequencer

6. Remove the two screws at the bottom of the power sequencer.

7. **Tilt the power sequencer slightly so that it clears the top and lift it up and out of the cabinet.**

You may use the power inlet to obtain a grip on the power sequencer.

E.2.3.2 Replacing the Power Sequencer

1. **Tilt the power sequencer inward and seat the bottom in the cabinet opening.**

There are two retainers at the bottom of the power sequencer which rest on the sheet metal at the bottom of the cabinet opening.

2. **Tilt the power sequencer so that it is flush against the cabinet.**
3. **Replace the two screws at the bottom of the power sequencer (FIGURE E-3).**
4. **Replace the two screws at the top of the power sequencer.**
5. **Connect all the cable assemblies to the front of the power sequencer.**

Reach through the space uncovered by the side panel to replace these cable assemblies.

6. **Replace the side panel closest to the power sequencer.**

See Chapter 12 “Preparing for Service,” for information on replacing the side panel.

7. **Replace the power cord assembly at the back of the power sequencer.**

See Section E.2.2 “AC Power Cable,” for information on replacing the power cord.

8. **Power on the Enterprise system.**

See the power on instructions in Chapter 11 “Powering Off and On.”

E.2.4 Media Tray

E.2.4.1 Replacing the Media Tray Fan

The media tray contains one fan. To replace this fan:

1. **Remove the left side panel.**
See Chapter 12 “Preparing for Service,” for instructions.
2. **Remove the side cover (FIGURE E-4) from the media tray.**

Remove seven screws from the cover to reach the fan.

Note – It is not necessary to remove the media tray from the cabinet.

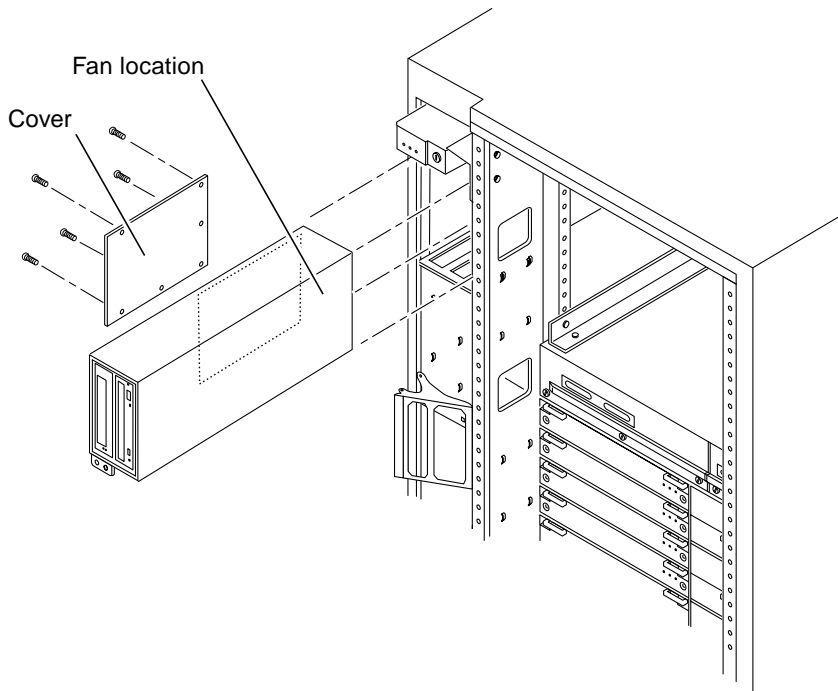


FIGURE E-4 Replacing the Fan in the Media Tray in the Enterprise 6500/5500 Systems

3. Pull the power cable off the fan.
4. Remove the four screws from the fan and replace the fan.
5. Reverse steps 1 through 3 to complete the procedure.

E.2.4.2 Removing the Cable Assemblies

1. Completely power off the Enterprise system.
See the power off instructions in Chapter 11 “Powering Off and On.”
2. Remove the key from the key switch.
3. Grasp the front bezel on both sides at the top and pull it out far enough to disengage the ball studs (FIGURE E-5).



Caution – To prevent breakage, do not grasp the bezel by the bottom edge.

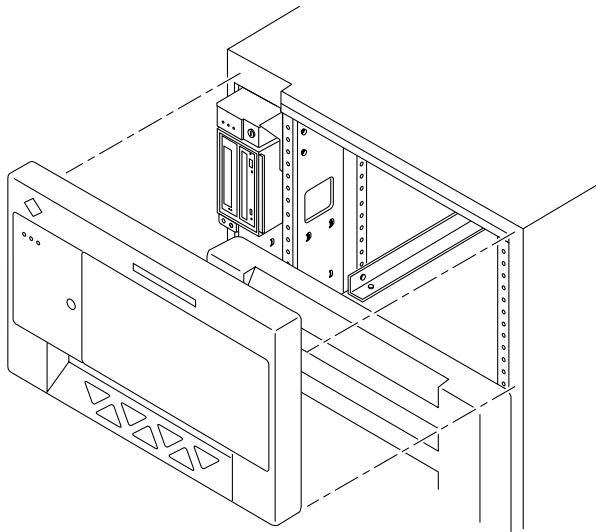


FIGURE E-5 Removing the Front Bezel

- 4. Remove the bezel and set it aside.**
- 5. Open the hinged door on the front panel by pulling the right side of the upper door panel.**

The door is hinged on the left side and swings open if pulled firmly.
- 6. Remove the side panel closest to the key switch assembly.**

See Chapter 12 “Preparing for Service,” for information on removing the side panel.
- 7. Disconnect the media tray power assembly and/or data cable assembly from the back of the media tray.**
- 8. Pull the cable assembly through the opening in the cabinet to the front of the card cage.**

The cable assembly runs through the front of the fan tray shelf and the system cabinet pillar to the SCSI adapter assembly.
- 9. Disconnect the cable assembly from the front of the SCSI adapter assembly and remove the cable assembly (FIGURE E-6).**

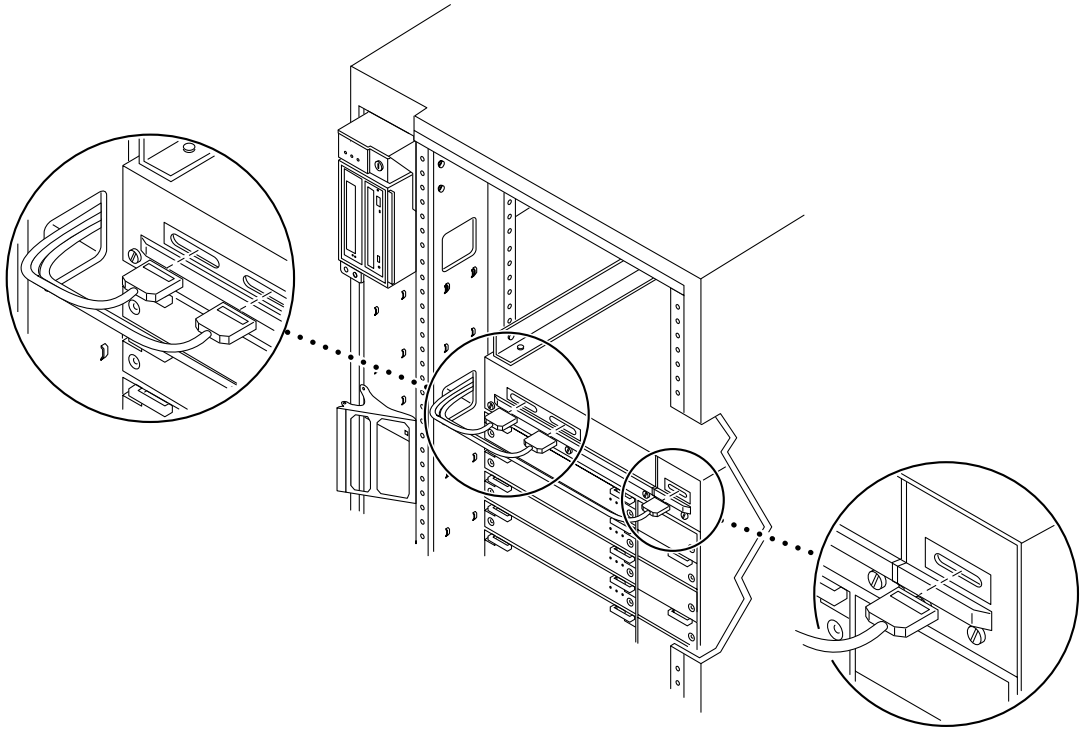


FIGURE E-6 Removing the Cable Assemblies From the Front of the SCSI Adapter Tray

E.2.4.3 Replacing the Cable Assembly

- 1. Connect the media tray power and data cable assembly to the back of the media tray.**
- 2. Pull the cable assembly through the opening in the cabinet to the front of the card cage.**

The cable assembly runs through the front of the fan tray shelf and the system cabinet pillar to the SCSI adapter assembly.
- 3. Connect the cable assembly into the front of the SCSI adapter assembly (FIGURE E-6).**
- 4. Replace the side panel.**

See Chapter 12 “Preparing for Service,” for information on replacing the side panel.
- 5. Close the front door.**

- 6. Place the front bezel against the cabinet with the ball studs aligned with the catches on the bezel.**

Tap or press both sides of the bezel into place (FIGURE E-5).

- 7. Power on the Enterprise system.**

See the power on instructions in Chapter 11 “Powering Off and On.”

E.2.5 Key Switch Assembly

E.2.5.1 Removing the Key Switch Assembly

- 1. Power off the Enterprise system.**

See the power off instructions in Chapter 11 “Powering Off and On.”

- 2. Remove the key from the key switch.**

- 3. Remove the top front panel by grasping the bezel on both sides and pulling the bezel away from the ball studs (FIGURE 12-1).**

- 4. Remove the left side panel.**

See Chapter 12 “Preparing for Service,” for instructions.

- 5. Disconnect the power and data cable assemblies from the back of the media tray.**

- 6. Remove the two screws that attach the media tray to the flange on the side of the fan tray shelf (FIGURE E-7).**

- 7. Disconnect the power cable from the fan in the media tray.**

- 8. Disconnect the keyswitch cable.**

- 9. Loosen and remove the tie wrap from fan cable.**

- 10. Remove the two screws (FIGURE E-8) that hold the media tray.**

- 11. Remove the media tray and set it aside.**

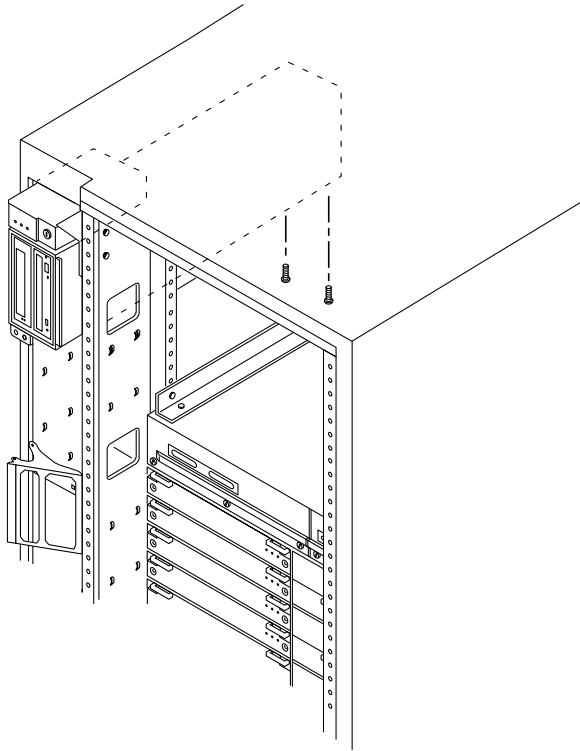


FIGURE E-7 Removing the Two Screws that Attach the media tray to the Flange

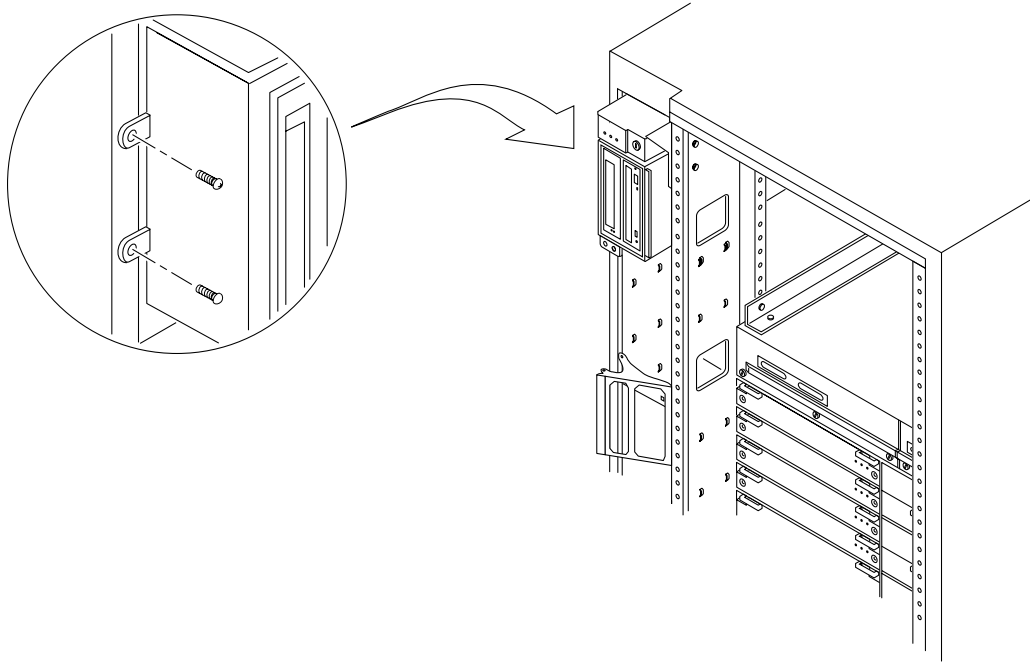


FIGURE E-8 Removing the Two Screws that Attach the media tray to the Cabinet Pillar

- 12. Disconnect the cable from the back of the key switch assembly.**
- 13. Remove the screw on the left side that attaches the key switch assembly to the cabinet pillar (FIGURE E-9).**

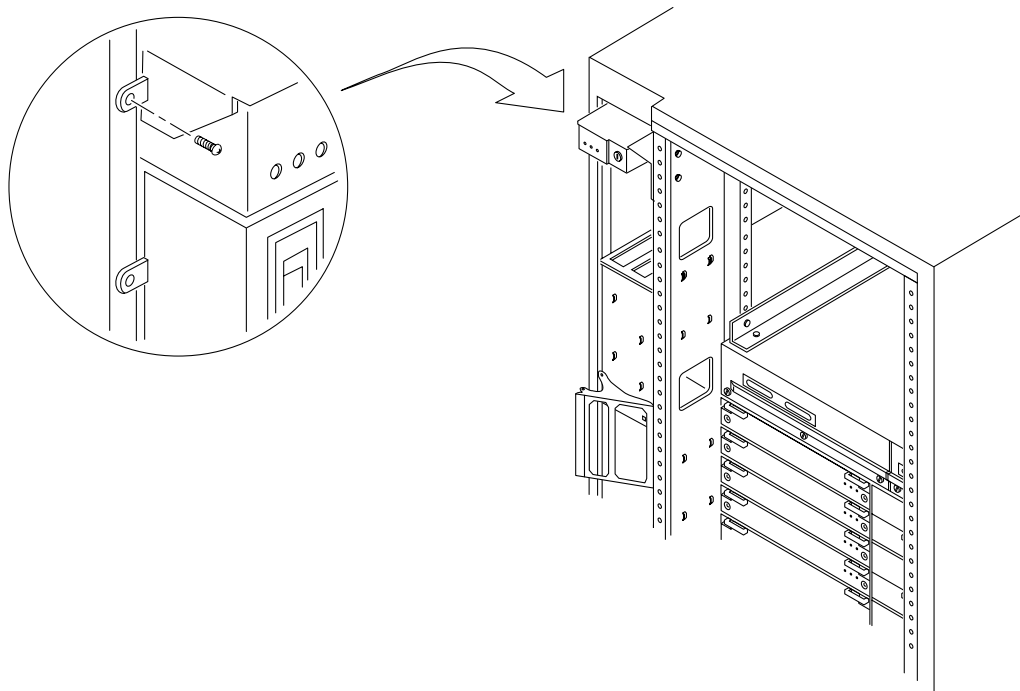


FIGURE E-9 Removing the Screw from the Left Pillar

- 14. Remove the two screws on the right side that attach the key switch assembly to the cabinet pillar.**

You can access the two screws through the space previously occupied by the media tray (FIGURE E-10).

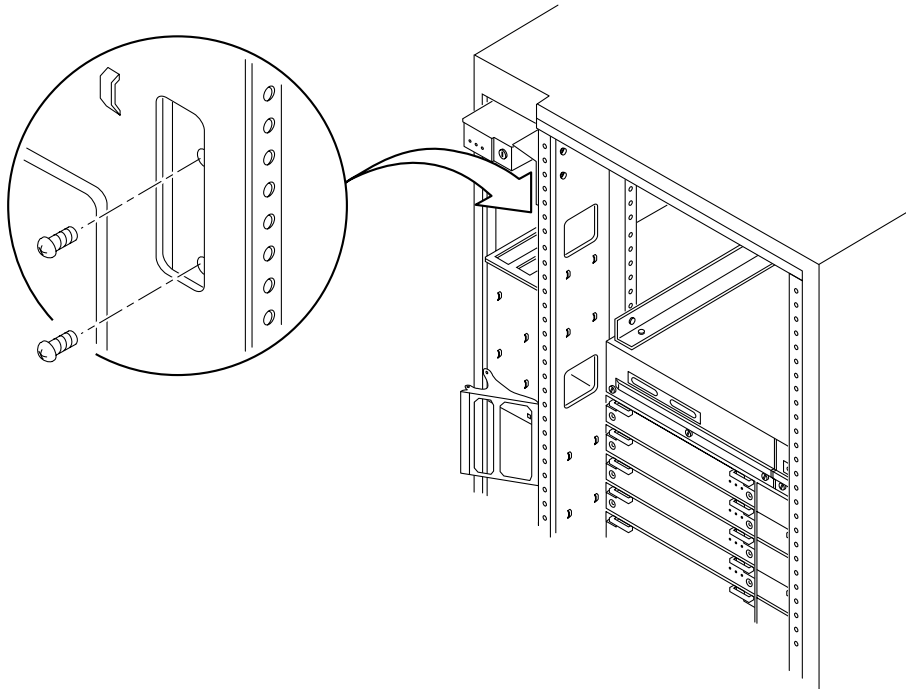


FIGURE E-10 Removing the Two Screws from the Right Pillar

15. Carefully remove the key switch assembly from the cabinet.

Pull out the right side first and gently rock the assembly until the left flange clears the cabinet (FIGURE E-11).

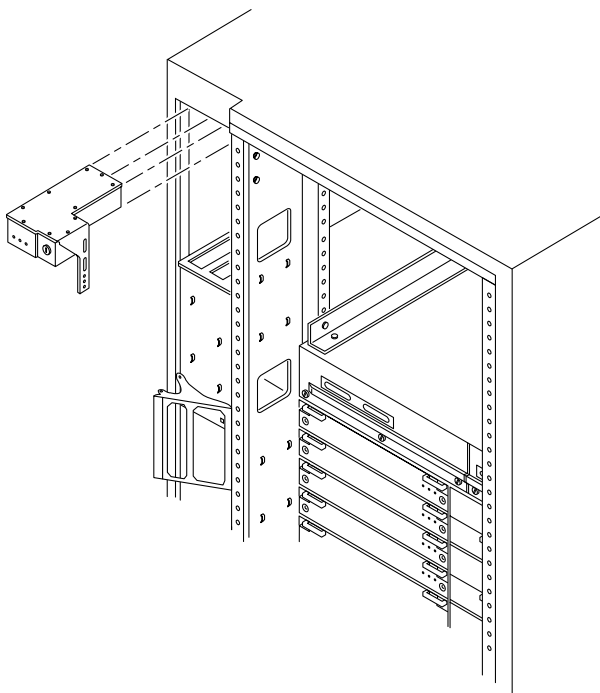


FIGURE E-11 Replacing the Key Switch Assembly in the Enterprise 6500/5500 Systems

E.2.5.2 Replacing the Key Switch Assembly

- 1. Insert the key switch assembly into the cabinet until it is seated properly.**

The key switch assembly is seated properly when the screw holes align with the cabinet pillar (FIGURE E-11).
- 2. Replace the two screws on the right side that attach the key switch assembly to the cabinet pillar.**

You can access the two screws through the space previously occupied by the media tray (FIGURE E-10).
- 3. Replace the screw on the left side that attaches the key switch assembly to the cabinet pillar (FIGURE E-9).**
- 4. Connect the key switch cable assembly into the back of the key switch assembly.**
- 5. Replace the media tray into the cabinet using the support system cabinet CD shelf as a guide.**

When seated properly, the media tray is flush with the key switch assembly in the cabinet.

- 6. Replace the two screws that attach the media tray to the cabinet pillar (FIGURE E-8).**
- 7. Replace the two screws that attach the media tray to the flange on the bottom of the fan tray shelf (FIGURE E-7).**
- 8. Connect the media tray power and data cable assemblies into the back of the media tray.**
- 9. Replace the fan tray shelf cover.**

Replace the 10 screws and attach the cover to the cabinet.
- 10. Replace the side panel closest to the key switch assembly.**

See Chapter 12 “Preparing for Service,” for information on replacing the side panel.
- 11. Power on the Enterprise system.**

See the power on instructions in Chapter 11 “Powering Off and On.”

E.2.6 SCSI Tape Adapter PCS Assembly

E.2.6.1 Removing the SCSI Adapter Assembly

- 1. Completely power off the Enterprise system.**

See the power off instructions in Chapter 11 “Powering Off and On.”
- 2. Disconnect the two cable assemblies from the front of the SCSI adapter assembly (FIGURE E-6).**
- 3. Loosen the three captive screws on the bottom that secure the SCSI adapter assembly to the cabinet (FIGURE E-12).**

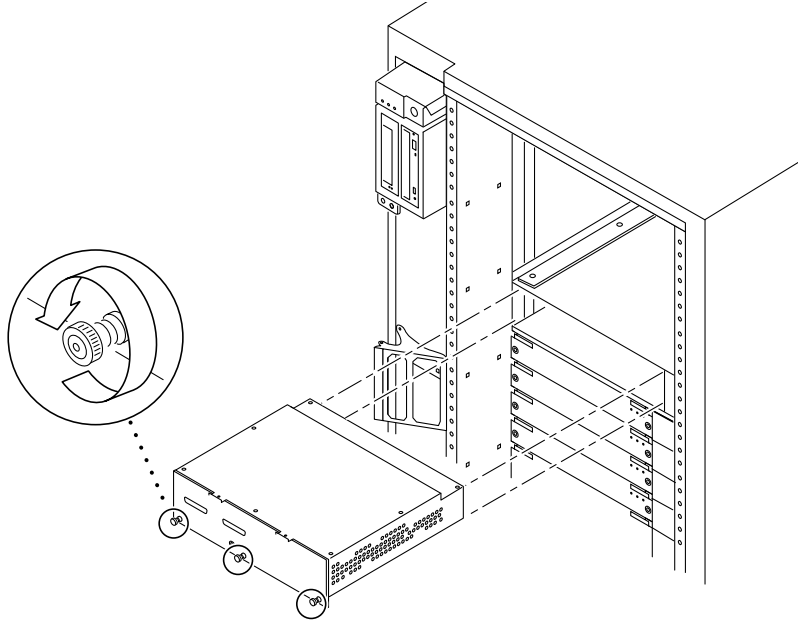


FIGURE E-12 Removing the SCSI Tape Adapter PCS Assembly in the Enterprise 6500/5500 Systems

- 4. Pull and slowly remove the SCSI adapter assembly from the cabinet.**

E.2.6.2 Replacing the SCSI Adapter Assembly

- 1. Carefully insert the SCSI adapter assembly into the front of the Enterprise system.**



Caution – DO NOT FORCE the SCSI adapter assembly into the slot; this can cause damage to the assembly and system.

The SCSI adapter assembly should insert and seat smoothly. If it binds, remove it, and inspect the slot for any obvious obstructions. Do not damage the springfingers at the bottom of the assembly.

- 2. Tighten the three captive screws on the bottom that secure the SCSI adapter assembly to the cabinet (FIGURE E-12).**
- 3. Connect the two cable assemblies to the front of the SCSI adapter assembly (FIGURE E-6).**

4. Power on the Enterprise system.

See the power on instructions in Chapter 11 “Powering Off and On.”

E.2.7 Key Switch Adapter Assembly

E.2.7.1 Removing the Key Switch Adapter Assembly

1. Completely power off the Enterprise 6500 system.

See the power off instructions in Chapter 11 “Powering Off and On.”

2. Disconnect the cable assembly from the front of the key switch adapter assembly.

3. Loosen the two captive screws on the bottom that secure the key switch adapter assembly to the cabinet.

4. Pull and slowly remove the key switch adapter assembly from the cabinet.

E.2.7.2 Replacing the Key Switch Adapter Assembly

1. Carefully insert the key switch adapter assembly into the front of the Enterprise 6500 system.



Caution – DO NOT FORCE the key switch adapter assembly into the slot; this can cause damage to the assembly and system.

The key switch adapter assembly should insert and seat smoothly. If it binds, remove it, and inspect the slot for any obvious obstructions. Do not damage the springfingers at the bottom of the assembly.

2. Tighten the two captive screws on the bottom that secure the key switch adapter assembly to the cabinet.

3. Connect the cable assembly to the front of the key switch adapter assembly.

4. Power on the Enterprise 6500 system.

See the power on instructions in Chapter 11 “Powering Off and On.”

E.2.8 Fan Tray Assembly, 200/240V

E.2.8.1 Removing the Fan Tray Assembly

1. Power off the system.

See the power off instructions in Chapter 11 “Powering Off and On.”

2. Locate the fan tray assembly (FIGURE E-13) at the back of the card cage.

The fan tray includes two connectors and a switch.

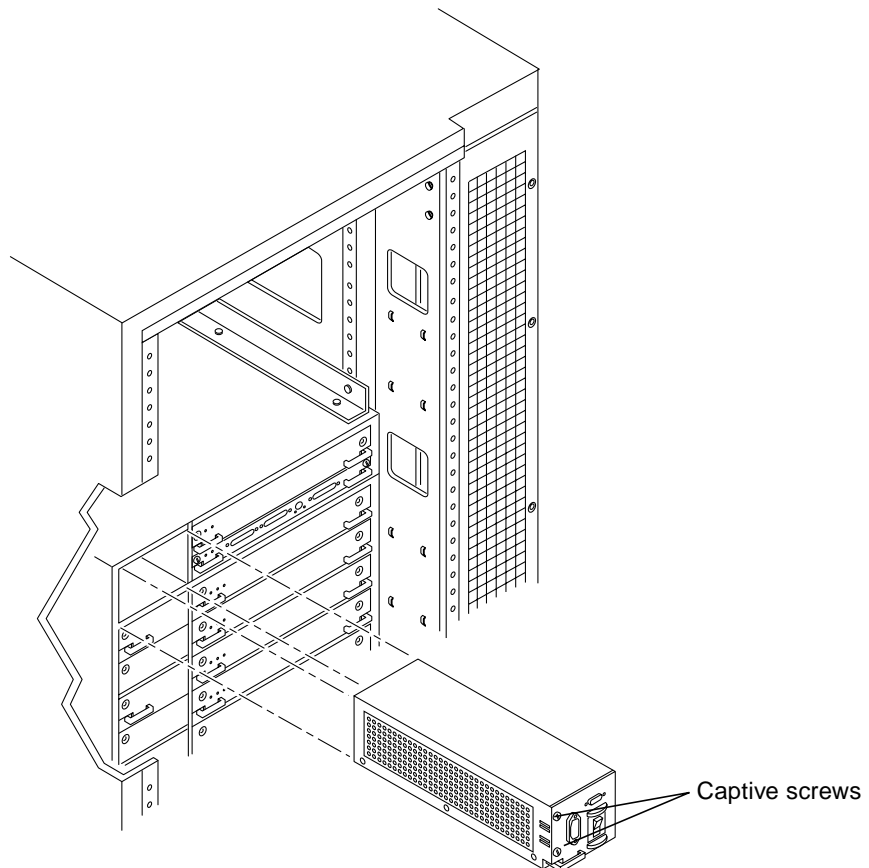


FIGURE E-13 Removing the 200/240V Fan Tray Assembly

3. Disconnect the cables from the fan tray assembly.

4. Loosen the two captive screws on the left side that secure the fan tray assembly to the cabinet.
5. Pull and slowly remove the fan tray assembly from the cabinet.

E.2.8.2 Replacing the Fan Tray Assembly

1. Carefully insert the fan tray assembly into the cabinet.

Viewed from the rear of the system, the fan tray is on the left side of the cabinet (FIGURE E-13).



Caution – DO NOT FORCE the fan tray assembly into the slot; this can cause damage to the fan tray assembly and system.

The fan tray assembly should insert and seat smoothly. If it binds, remove it, and inspect the slot for any obvious obstructions. Do not damage the springfingers at the bottom of the fan tray assembly.

2. Tighten the two captive screws to secure the fan tray in place.
3. Reconnect the cables.
4. Power on the Enterprise system.
See the power on instructions in Chapter 11 “Powering Off and On.”

E.2.9 Centerplane

E.2.9.1 Removing the Centerplane

1. Completely power off the Enterprise system.
See the power off instructions in Chapter 11 “Powering Off and On.”
2. Remove the front bezel, front door and rear screen panel.
See Chapter 12 “Preparing for Service,” for information on removing these assemblies.
3. Remove any assemblies above and below the Enterprise system.
Refer to the respective service manuals for further information.

4. Remove all the boards and power supplies.

See Chapters 3-6 for information on removing the boards and Chapter 7 “Power Supplies,” for information on removing power supplies.

5. Remove the SCSI adapter assembly, the key switch adapter assembly, and the 200/240V fan tray assembly.

See Section E.2.6 “SCSI Tape Adapter PCS Assembly,” Section E.2.7 “Key Switch Adapter Assembly, and Section E.2.8 “Fan Tray Assembly, 200/240V” for information on removing these assemblies.

6. Disconnect any remaining cables from the Enterprise system main cabinet.

7. Remove the two screws on each side of the system cabinet that attach the top rails to the system cabinet.

8. Loosen the four screws on each side of the system cabinet that attach the top rails to the main chassis.

9. Remove the top rails and set them aside.

Guide the four screws through the key slots in each top rail.

10. Remove the four screws on each side of the system cabinet that attach the bottom rails to the main chassis.



Caution – Use care when removing the Enterprise system chassis. It weighs approximately 100 pounds.

11. Carefully slide the Enterprise system chassis out toward the front and place it front side down onto a surface.

12. Remove the screws around the center of the main chassis.

- For the Enterprise 6500 system, there are a total of 32 screws, 8 per side.
- For the Enterprise 5500 system, there are a total of 26 screws.

13. Lift and remove the rear chassis and set it aside.

14. Remove the screws that hold the centerplane to the front chassis.

- For the Enterprise 6500 system, there are a total of 27 screws, 20 screws around the side and 7 in the interior section.
- For the Enterprise 5500 system, there are a total of 20 screws.

Note – Remember the proper orientation of the centerplane when removing it from the front chassis.

15. Lift the centerplane out and set it aside.

E.2.9.2 Replacing the Centerplane

1. Place the centerplane in the front chassis.

Be sure the centerplane has the proper orientation when placed in the front chassis.

2. Replace the screws that hold the centerplane to the front chassis.

- For the Enterprise 6500 system, there are a total of 27 screws, 20 screws around the side and 7 in the interior section.
- For the Enterprise 5500 system, there are a total of 20 screws.

3. Place the rear chassis on the front chassis.

4. Replace the screws around the center of the main chassis.

- For the Enterprise 6500 system, there are a total of 32 screws, 8 per side.
- For the Enterprise 5500 system, there are a total of 26 screws.



Caution – Use care when lifting the Enterprise system chassis. It weighs approximately 100 pounds.

5. Slide the main chassis into the system cabinet.

Use the bottom rails as a guide.

6. Replace the four screws on each side of the system cabinet that attach the bottom rails to the main chassis.

7. Replace the top rails.

- a. Tighten the four screws on each side attaching the top rail to the main chassis.
- b. Replace the two screws on each side attaching the top rail to the system cabinet.

8. Replace the SCSI adapter assembly, the key switch adapter assembly, and the 200/240V fan tray assembly.

See Section E.2.6 “SCSI Tape Adapter PCS Assembly,” Section E.2.7 “Key Switch Adapter Assembly, and Section E.2.8 “Fan Tray Assembly, 200/240V” for information on replacing these assemblies.

9. Replace all the boards and power supplies.

See Chapters 3-6 for information on replacing the boards and Chapter 7 “Power Supplies,” for information on replacing power supplies.

10. Connect any remaining cables to the Enterprise system main cabinet.

11. Replace any assemblies above and below the Enterprise system.

Refer to the respective service manuals for further information.

12. Replace the front bezel, front door and rear screen panel.

See Chapter 12 “Preparing for Service,” for information on replacing these assemblies.

13. Power on the Enterprise system.

See the power on instructions in Chapter 11 “Powering Off and On.”

E.3 Enterprise 4500 System

E.3.1 Fan Tray Assembly, 100V/240V

E.3.1.1 Removing the Fan Tray Assembly

1. Power off the Enterprise system.

See the power off instructions in Chapter 11 “Powering Off and On.”

2. Locate the fan tray assembly (FIGURE E-14) at the rear of the system.

The fan tray is on the left side of the enclosure. It includes the power cord connector and the AC power switch.

3. Loosen the cable restrainer and disconnect the power cable from the fan tray assembly.

4. Loosen the two captive screws on the left side that secure the fan tray assembly to the enclosure.

5. Pull the end of the extraction lever outward to release the fan tray assembly from the centerplane.

6. Slowly remove the fan tray assembly from the enclosure.

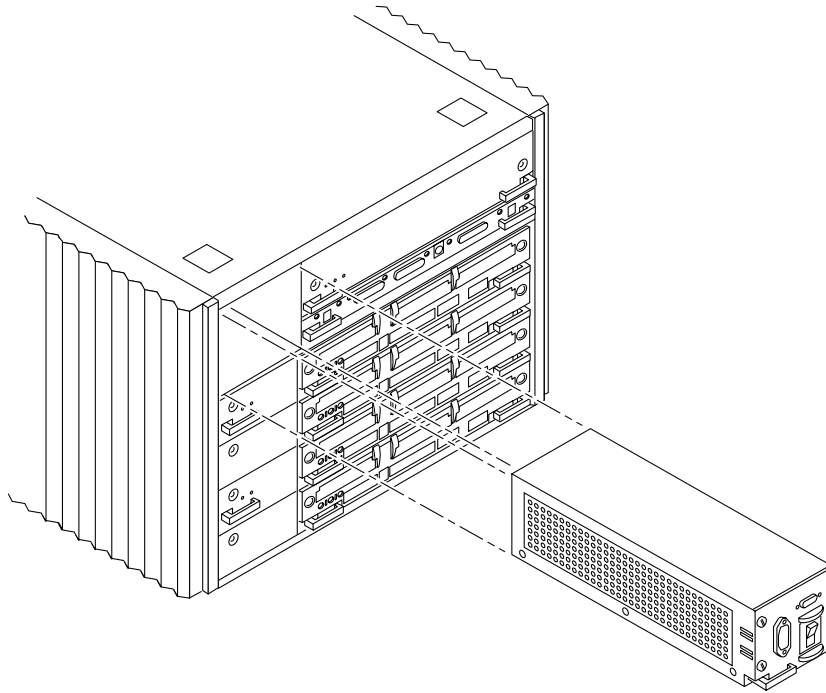


FIGURE E-14 Removing the Fan Tray from the Enterprise 4500 System

E.3.1.2 Replacing the Fan Tray Assembly

1. **Carefully insert the fan tray assembly into the slot on the left side of the Enterprise system.**

Viewed from the rear of the system, the fan tray is on the left side of the enclosure. See FIGURE E-14.

2. **Ensure that the extraction lever is in the outward position as you slide the fan tray assembly toward the centerplane.**

The fan tray assembly will not seat fully unless the lever is in this starting position.



Caution – DO NOT FORCE the fan tray assembly into the slot; this can cause damage to the fan tray assembly and system.

The fan tray assembly should insert and seat smoothly. If it binds, remove it, and inspect the slot for any obvious obstructions. Do not damage the springfingers at the bottom of the fan tray assembly.

3. Use the extraction lever to seat the fan tray assembly.

Swing the lever inwards to the locked position. Do not press on the fan tray assembly to seat it; doing so will damage the connector pins.

4. Tighten the two captive screws to secure the fan tray in place.

5. Connect the power cord and tighten the cable restrainer.

6. Power on the Enterprise system.

See the power on instructions in Chapter 11 “Powering Off and On.”

E.3.2 Key Switch Assembly

E.3.2.1 Removing the Key Switch Assembly

1. Completely power off the Enterprise system.

See the power off instructions in Chapter 11 “Powering Off and On.”

2. Remove the system key.

3. Grasp the bottom corners of both sides of the top bezel and pull it toward you.

4. Tilt the top bezel upward to a 45° angle and remove the bezel.

Set the bezel aside (FIGURE E-15).

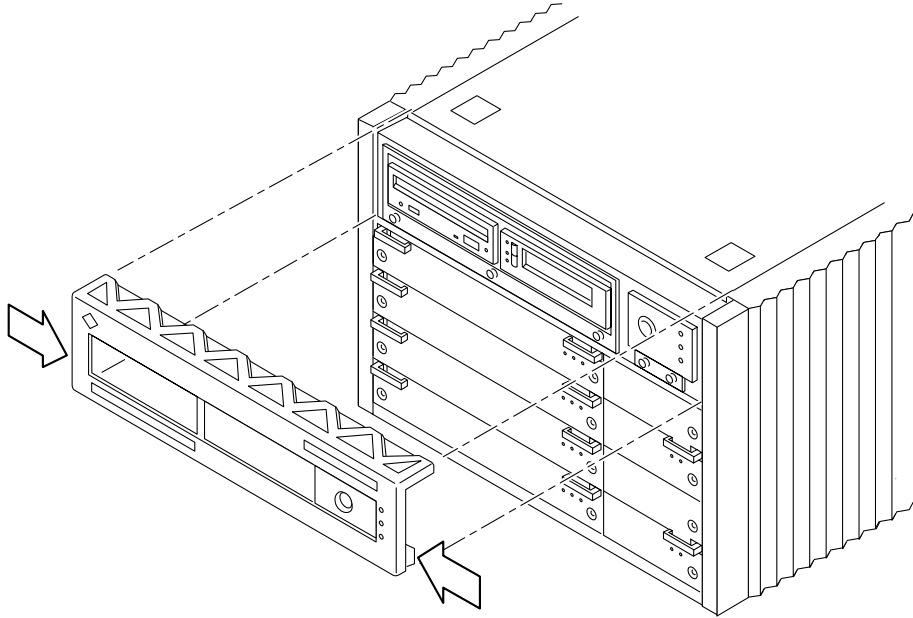


FIGURE E-15 Removing the Top Bezel

- 5. Loosen the two captive screws securing the key switch assembly to the enclosure.**
Viewed from the front of the system, the key switch assembly is on the right side of the enclosure.
- 6. Gently pull the key switch assembly from the enclosure (FIGURE E-16).**

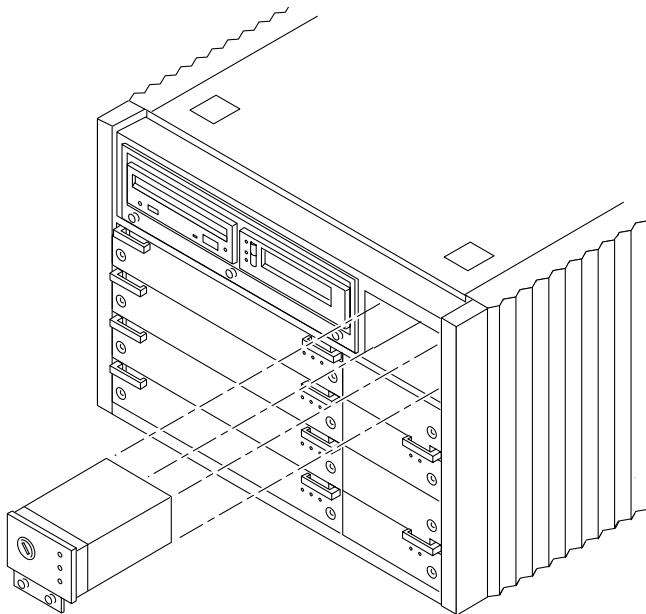


FIGURE E-16 Replacing the Key Switch/LED Tray Assembly in the Enterprise 4500 System

E.3.2.2 Replacing the Key Switch Assembly

1. Gently insert the key switch assembly in the enclosure.

Viewed from the front of the system, the key switch assembly is on the right side of the enclosure (FIGURE E-16).



Caution – DO NOT FORCE the key switch assembly into the slot; this can cause damage to the key switch assembly and system.

The key switch assembly should insert and seat smoothly. If it binds, remove it, and inspect the slot for any obvious obstructions. Do not damage the springfingers at the bottom of the key switch assembly.

2. Tighten the two captive screws securing the key switch assembly to the enclosure.
3. Tilt the top bezel at a 45° angle and insert the lip of the bezel under the top of the enclosure (FIGURE E-15).
4. Lower the top bezel.
The top bezel should snap into place.
5. Replace the system key.

6. Power on the Enterprise system.

See the power on instructions in Chapter 11 “Powering Off and On.”

E.3.3 Centerplane

E.3.3.1 Removing the Centerplane

1. Completely power off the Enterprise system.

See the power off instructions in Chapter 11 “Powering Off and On.”

2. Remove the top bezel.

See Chapter 12 “Preparing for Service,” for information on removing this assembly.

3. Remove the side vents. Push each side vent backwards until it stops. Then lift the vent off the Enterprise system and set it aside.

4. Remove the top cover.

a. Locate the four plugs in each corner of the enclosure.

b. Lift each plug by pushing down in the dotted area.

This action causes the plug to pop up.

c. Remove each plug.

d. Lift up the front of the top cover and slide it backwards approximately 6-10 millimeters. Remove the top cover and set it aside.

5. Remove all the boards and power supplies.

See Chapters 3-6 for information on removing the boards and Chapter 7 “Power Supplies,” for information on removing power supplies.

6. Loosen the bottom three captive screws securing the media tray to the enclosure.

Insert a screwdriver in the notch at the top center of the media tray to pull out the tray and separate it from the rear slip connectors (FIGURE E-17).

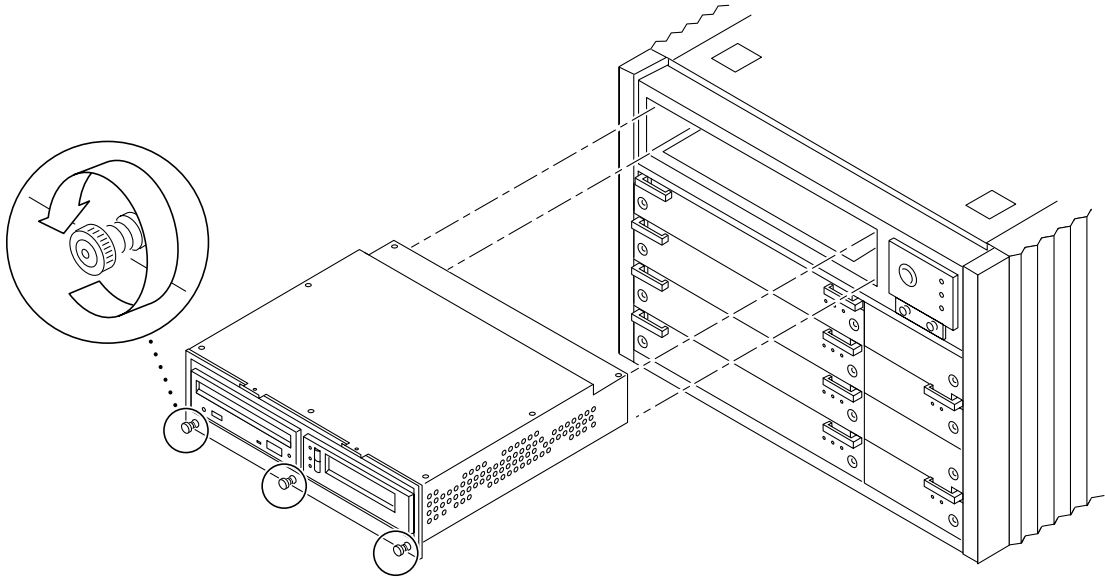


FIGURE E-17 Removing the media tray

7. Remove the key switch assembly and the 100/240V fan tray assembly.

See Section E.3.2 “Key Switch Assembly and Section E.3.1 “Fan Tray Assembly, 100V/240V” for information on removing these assemblies.

8. Turn over the enclosure and remove the feet on the bottom.

- a. Locate the four feet in each corner of the enclosure.
- b. Unscrew and remove each foot.

9. Turn the enclosure front side down onto a surface.

10. Remove the 26 screws around the center of the main chassis.

11. Lift and remove the rear chassis and set it aside.

12. Remove the 20 screws that hold the centerplane to the front chassis.

Note – Remember the proper orientation of the centerplane when removing it from the front chassis.

13. Lift the centerplane out and set it aside.

E.3.3.2 Replacing the Centerplane

1. Place the centerplane in the front chassis.

Be sure the centerplane has the proper orientation when placed in the front chassis.

2. Replace the 20 screws that hold the centerplane to the front chassis.

3. Place the rear chassis on the front chassis.

4. Replace the 26 screws around the center of the main chassis.

5. Replace the feet on the bottom of the enclosure.

Screw in one foot in each corner.

6. Turn the enclosure over so that the feet are supporting the chassis.

7. Replace all boards and power supplies.

See Chapters 3-6 for information on replacing the boards and Chapter 7 “Power Supplies,” for information on replacing power supplies.

8. Replace the media tray.

Tighten the bottom three captive screws and secure the media tray to the enclosure (FIGURE E-17).

9. Replace the key switch assembly and the 100/240V fan tray assembly.

See Section E.3.2 “Key Switch Assembly and Section E.3.1 “Fan Tray Assembly, 100V/240V” for information on replacing these assemblies.

10. Replace the top cover.

a. Slide the top cover over the key slots until it fits securely on the main chassis.

b. Replace each plug.

11. Replace the side vents. Place each vent alongside the main chassis and push the vent forward until it stops.

12. Replace the top bezel.

See Chapter 12 “Preparing for Service,” for information on replacing this assembly.

13. Power on the Enterprise system.

See the power on instructions in Chapter 11 “Powering Off and On.

Illustrated Parts Breakdown (IPB)

The illustrations and tables in this appendix are intended to supplement the removal and replacement procedures described in previous chapters and appendixes.

F.1 Finding Part Numbers

Note – Part numbers in this section may differ from those found in your system. Before ordering replacement parts, find the label on the part to be replaced and place your order using that number. Be sure to use the right part number (for the entire assembly instead of the individual components) as shown in TABLE F-1.

For example, the part number for the fan tray assembly in the data center system cabinet is 540-2709. Although the individual fans in the assembly may have a separate part number, the part number you should use when placing your order is 540-2709 for the entire assembly.

Note – For information about additional capacity drives and other replacement options, contact your sales representative.

F.2 List of Illustrations

TABLE F-1 List of Replaceable Components (1 of 3)

General Category	Description	Part Number	Page
Enterprise 6500/5500 Systems			
Fan tray	Fan tray assembly, 200/240V	370-1812	page F-10
	Fan tray assembly, system cabinet	540-2709	page F-10
Centerplane	Centerplane assembly (Enterprise 6500)	501-5010	page F-11
	Centerplane assembly (Enterprise 5500)	501-4944	page F-22
SCSI devices	Assembly, cable, media tray, data	530-2528	
	Assembly, cable, mediatray, power	530-2655	
	Assembly, cable, media tray, fan	530-2587	
	Terminator, 68-pin	150-2267	page F-23
	SCSI tape adapter PCS assembly	540-2713	page F-7
	SunCD	370-3416	page F-7
	Key switch tray	370-2161	page F-7
	Key switch adapter tray	370-2073	
	Cable, key switch adapter to remote key switch	530-2225	
	Power, Enterprise 6500, 5500	Power supply, peripheral	300-1301
Power/cooling module (PCM)		300-1260	page F-11
PCM filler panel		540-2593	
Cable, system cabinet AC input, domestic		530-2265	page F-9
Cable, system cabinet AC input, international		530-2266	page F-9
Cable, universal power cord, internal		530-2197	page F-10
Assembly, power cable, sequencer to AC input box		530-2213	
Assembly, power cable, sequencer to AC input box		530-2645	
Assembly, AC input/sequencer fan fail cable		530-2235	
Power sequencer, universal, system cabinet		300-1290	page F-9

TABLE F-1 List of Replaceable Components (2 of 3)

General Category	Description	Part Number	Page
Boards, Enterprise 6500, 5500	CPU/Memory+ board assembly	501-4882	page F-13
	4 Mbyte, 336 MHz CPU module	501-4363	
	4 Mbyte, 250MHz CPU module	501-2976	
	Assembly, DRAM, 1MX72, JEDEC, SIMM, 60 ns	501-2652	page F-13
	Assembly, DRAM, 4MX72, JEDEC, SIMM, 60 ns	501-2653	page F-13
	Assembly, DRAM, 16MX72, JEDEC, SIMM, 60 ns	501-2654	page F-13
	SBus+ I/O board assembly	501-4883	page F-14
	Graphics+ I/O board assembly	501-4884	page F-15
	PCI+ I/O board assembly	501-4962	page F-16
	Optical link card (GBIC)	370-2303	
	Clock+ board assembly	501-4946	page F-17
	Disk board assembly (Enterprise 5500)	501-3113	page F-18
	Load board assembly (Enterprise 6500)	501-3142	page F-18
	Board, filler panel	540-2592	
	Enterprise 4500 System	Fan tray assembly, 100/240V	370-1811
Centerplane assembly, 8-slot		501-4944	page F-22
Terminator, 68-pin		150-2267	page F-23
Assembly, media tray CD/tape drive		540-2587	page F-23
SunCD		370-3416	page F-23
Key switch tray, standalone, 8-slot		370-1810	page F-21
Power, Enterprise 4500		Power supply, peripheral	300-1301
	Power/cooling module (PCM)	300-1260	page F-11
	PCM filler panel	540-2593	

TABLE F-1 List of Replaceable Components *(3 of 3)*

General Category	Description	Part Number	Page
Boards, Enterprise 4500	CPU/Memory+ board assembly	501-4882	page F-13
	4 Mbyte, 336 MHz CPU module	501-4363	
	Assembly, DRAM, 1MX72, JEDEC, SIMM, 60 ns	501-2652	page F-13
	Assembly, DRAM, 4MX72, JEDEC, SIMM, 60 ns	501-2653	page F-13
	Assembly, DRAM, 16MX72, JEDEC, SIMM, 60 ns	501-2654	page F-13
	SBus+ I/O board assembly	501-4883	page F-14
	Graphics+ I/O board assembly	501-4884	page F-15
	PCI+ I/O board assembly	501-4926	page F-16
	Optical link card (GBIC)	370-2303	
	Clock+ board assembly	501-4946	page F-17
	Disk board assembly	501-3113	page F-18
	Board, filler panel	540-2592	

F.3 Enterprise 6500/5500 Systems

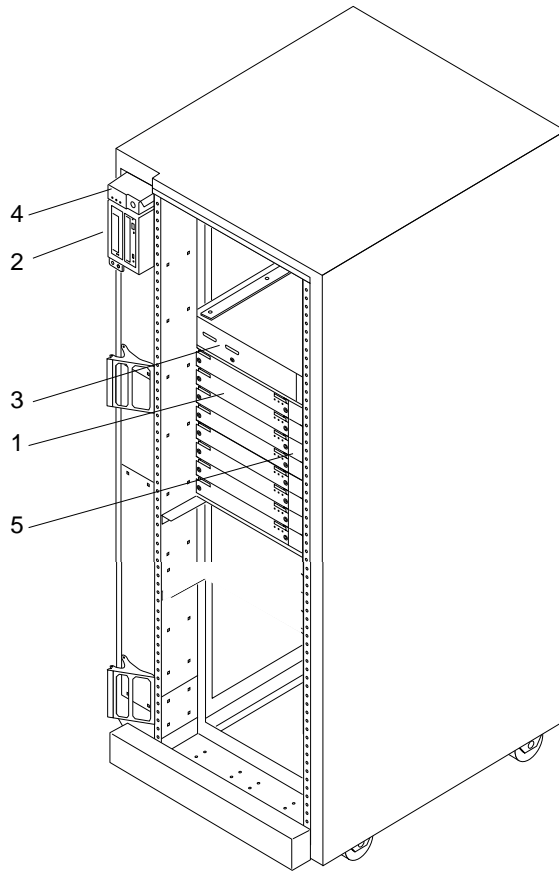


FIGURE F-1 Enterprise 6500 System, Front View

Key	Description	Part Number
1	CPU/Memory+ board	501-4882
2	SunCD	370-3416
3	SCSI tape adapter PCS assembly	540-2713
4	Key switch tray, cabinet, 8-slot/16-slot	370-2161
5	PCM	300-1260

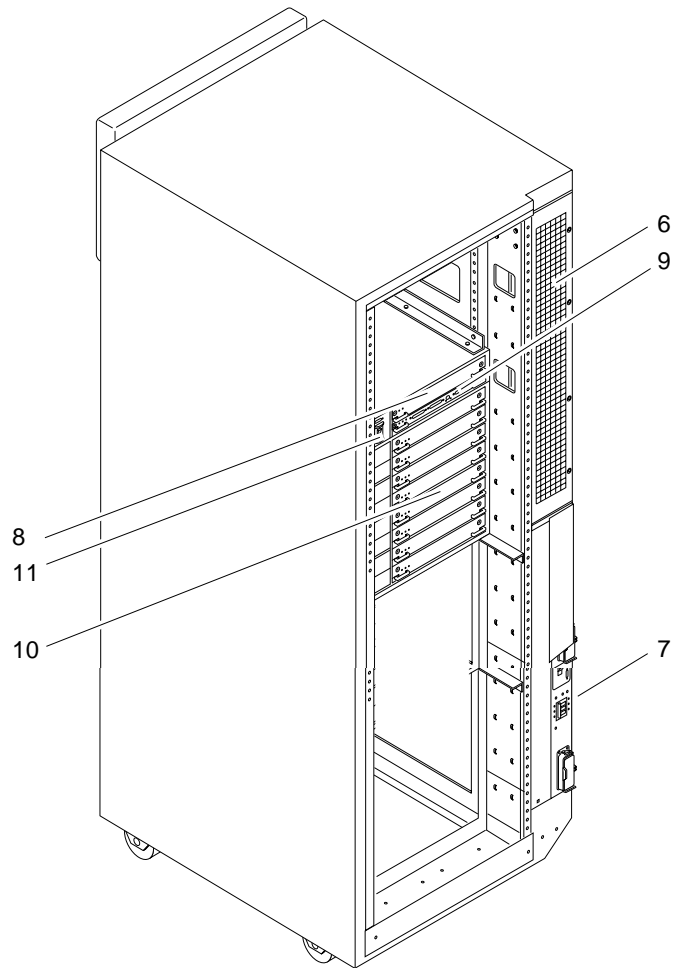


FIGURE F-2 Enterprise 6500 System, Rear View

Key	Description	Part Number
6	Fan tray assembly, system cabinet	540-2709
7	Power sequencer, universal, system cabinet	300-1290
8	Power supply, peripheral	300-1301
9	Clock+ board assembly	501-4946
10	SBus+ I/O board assembly	501-4883
11	Fan tray assembly, 200/240V	370-1812

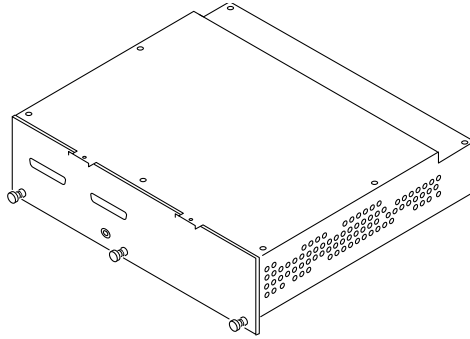


FIGURE F-3 SCSI Tape Adapter PCS Assembly

Description	Part Number
SCSI tape adapter PCS assembly	540-2713

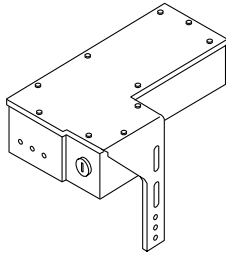


FIGURE F-4 Key Switch Tray

Description	Part Number
Key switch tray, cabinet, 16-slot or 8-slot	370-2161

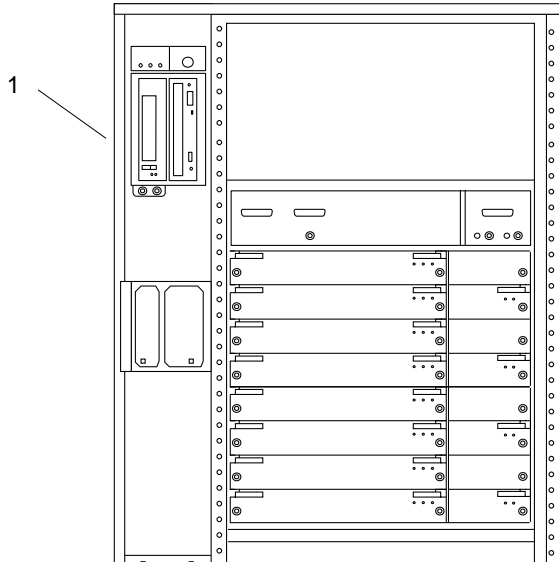


FIGURE F-5 SunCD

Key	Description	Part Number
1	SunCD	370-3416

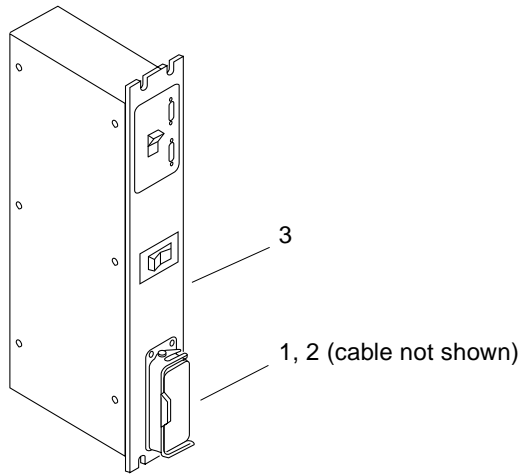


FIGURE F-6 Power Sequencer

Key	Description	Part Number
1	Cable, system cabinet AC input, domestic	530-2265
2	Cable, system cabinet AC input, international	530-2266
3	Power sequencer, universal, system cabinet	300-1290

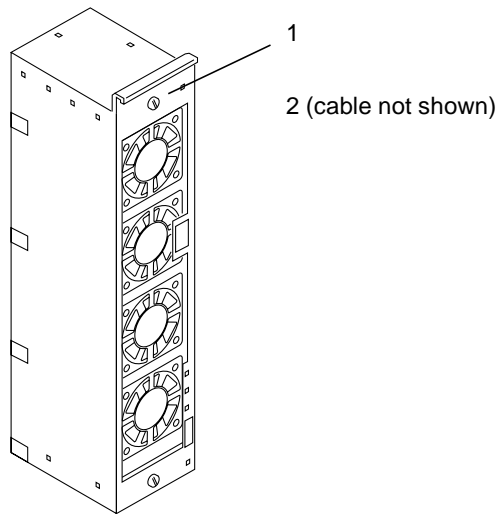


FIGURE F-7 Fan Tray Assembly

Key	Description	Part Number
1	Fan tray assembly, system cabinet	540-2709
2	Assembly, cable, universal power cord, internal	530-2197

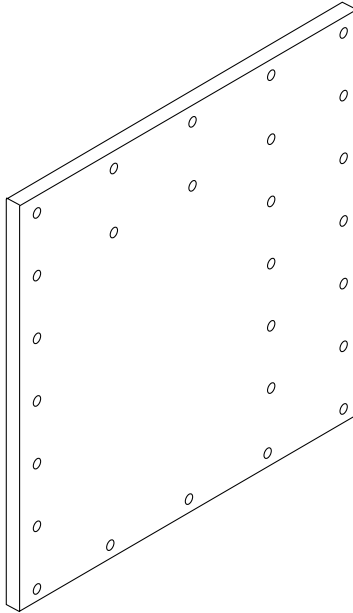


FIGURE F-8 Centerplane Assembly

Description	Part Number
Centerplane assembly, 16-slot	501-5010

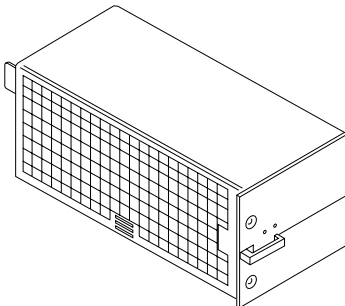


FIGURE F-9 Power/Cooling Module (PCM)

Description	Part Number
PCM	300-1260

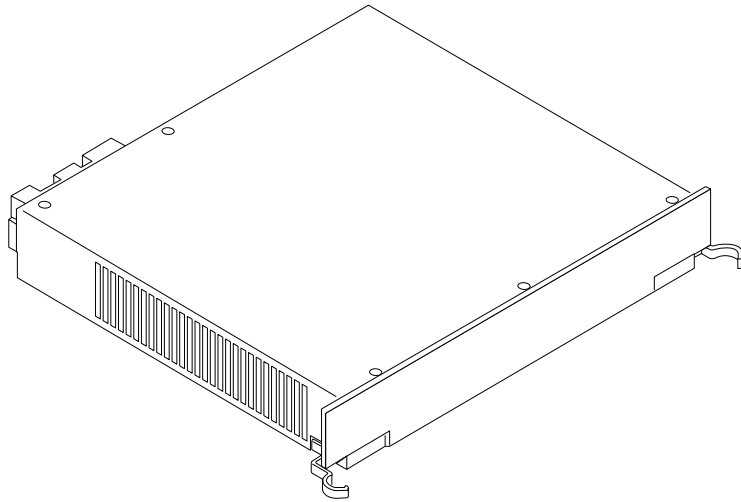


FIGURE F-10 Peripheral Power Supply

Description	Part Number
Power supply, peripheral	300-1301

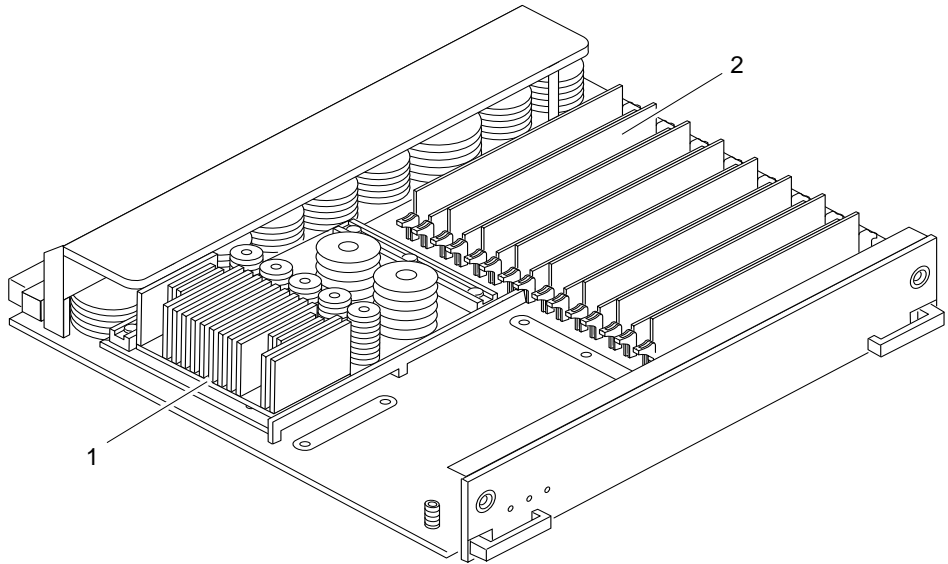


FIGURE F-11 CPU/Memory+ Board

Key	Description	Part Number
	CPU/Memory+ board assembly	501-4882
1	4 Mbyte, 336 MHz CPU module	501-4363
	4 Mbyte, 250MHz CPU module	501-2976
2	Assembly, DRAM, 1MX72, JEDEC, SIMM, 60 ns	501-2652
	Assembly, DRAM, 4MX72, JEDEC, SIMM, 60 ns	501-2653
	Assembly, DRAM, 16MX72, JEDEC, SIMM, 60 ns	501-2654

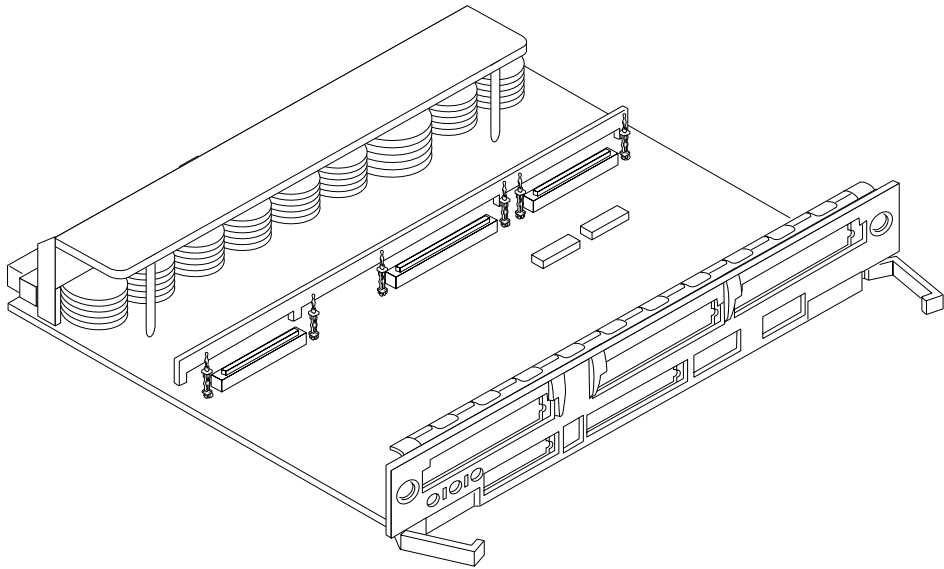


FIGURE F-12 SBus+ I/O Board Assembly

Description	Part Number
SBus+ I/O board assembly	501-4883

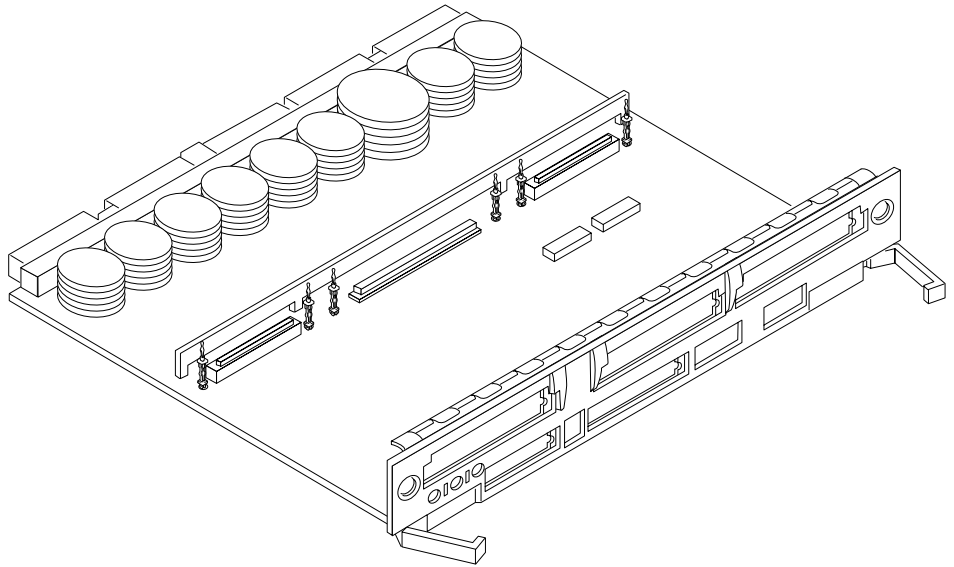


FIGURE F-13 Graphics+ I/O Board Assembly

Description	Part Number
Graphics+ I/O board assembly	501-4884

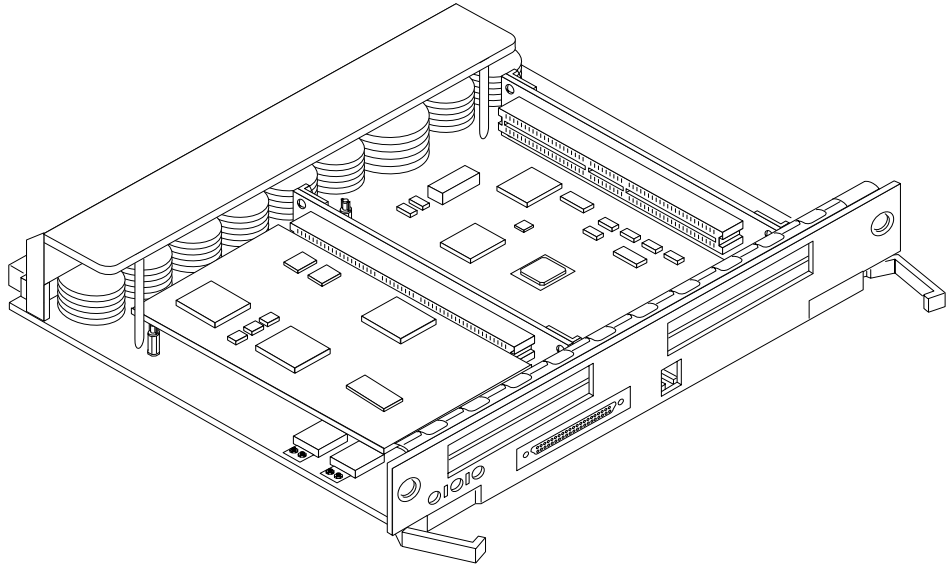


FIGURE F-14 PCI+ I/O Board Assembly

Description	Part Number
PCI+ I/O board assembly	501-4962

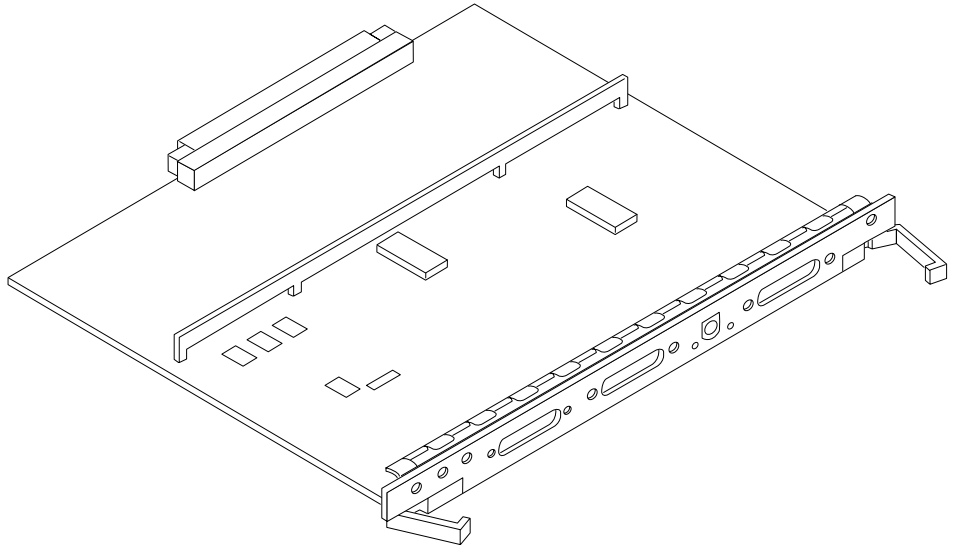


FIGURE F-15 Clock+ Board Assembly

Description	Part Number
Clock+ board assembly	501-4946

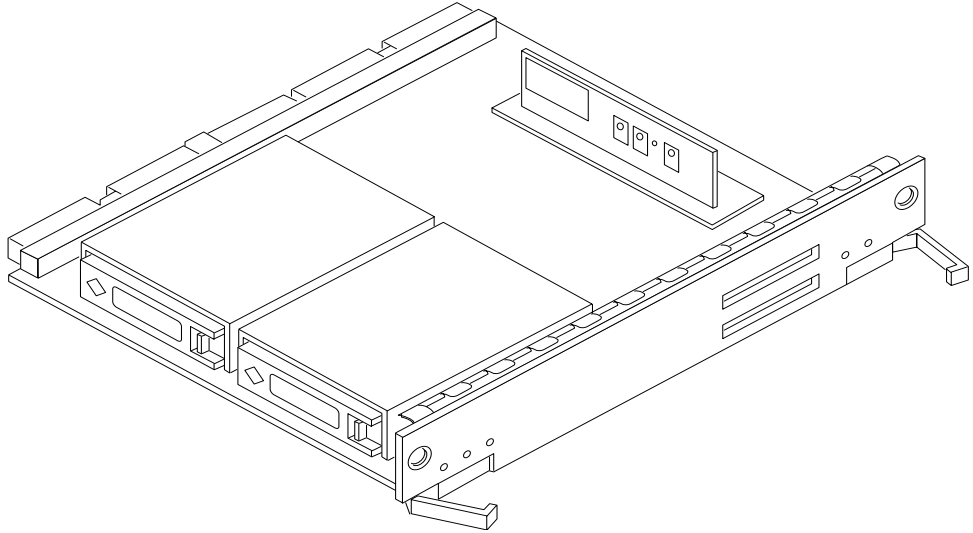


FIGURE F-16 Disk Board Assembly

Description	Part Number
Disk board assembly	501-3113

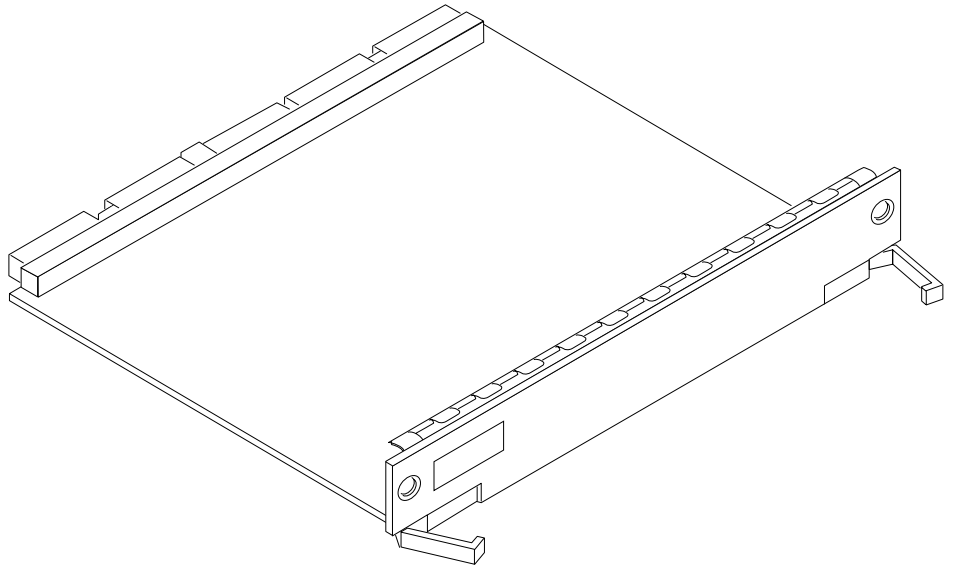


FIGURE F-17 Load Board Assembly

Description	Part Number
Load board assembly	501-3142

F.4 Enterprise 4500 System

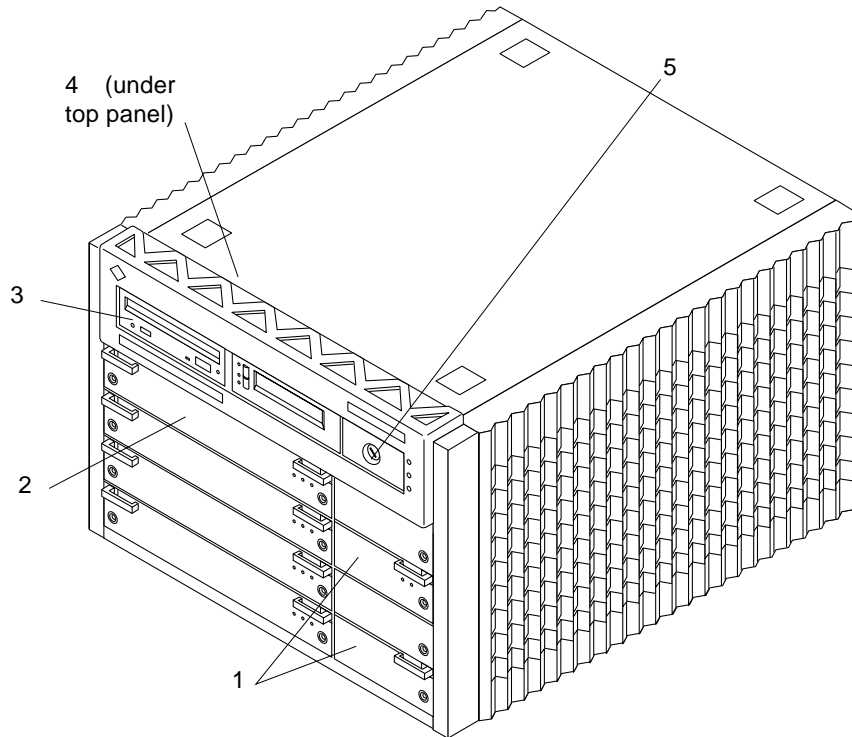


FIGURE F-18 Enterprise 4500 System, Front View

Key	Description	Part Number
1	PCM	300-1260
2	CPU/Memory+ board	501-4882
3	SunCD	370-3416
4	Assembly, media tray, CD/tape drive	540-2587
5	Key switch tray, 8-slot standalone	370-1810

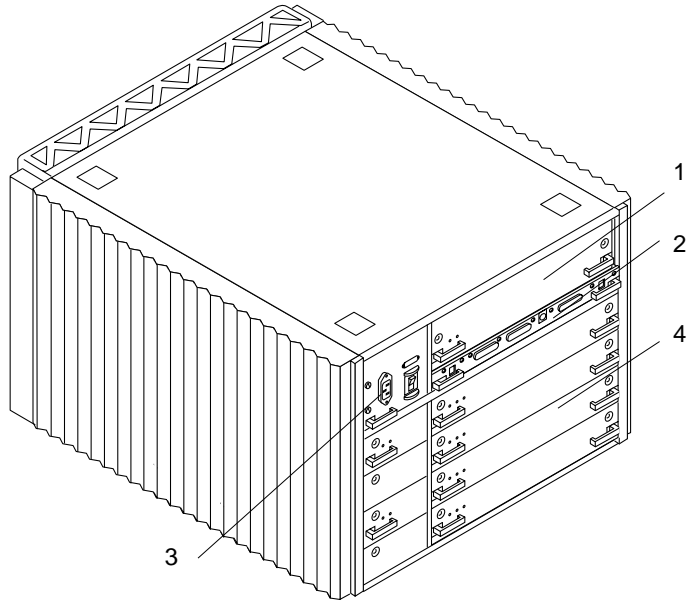


FIGURE F-19 Enterprise 4500 System, Rear View

Key	Description	Part Number
1	Power supply, peripheral	300-1301
2	Clock+ board assembly	501-2975
3	Fan tray assembly, 100/240V	370-1811
4	Graphics+ I/O board assembly	501-2749

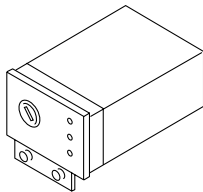


FIGURE F-20 Key Switch Tray

Description	Part Number
Key switch tray, 8-slot standalone	370-1810

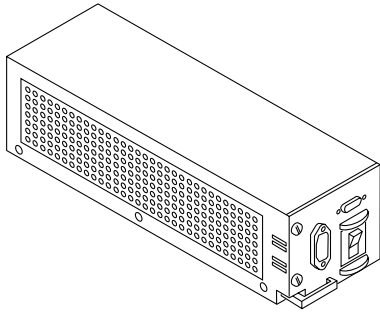


FIGURE F-21 Fan Tray Assembly

Description	Part Number
Fan tray assembly, 100/240V	370-1811

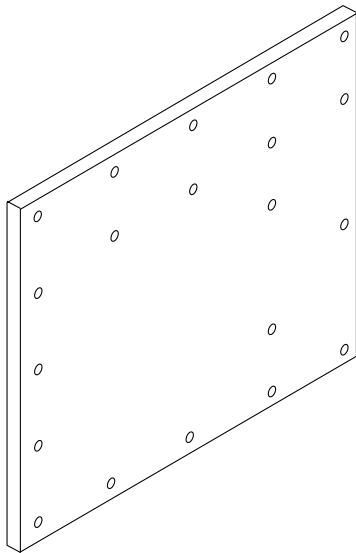


FIGURE F-22 Centerplane Assembly

Description	Part Number
Centerplane, 8-slot	501-4944

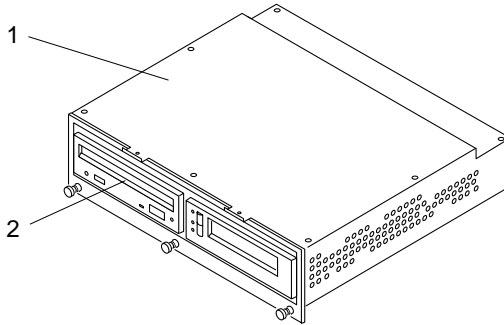


FIGURE F-23 CD-ROM and Tape Devices

Key	Description	Part Number
1	Assembly, media tray, CD/tape drive	540-2587
2	SunCD	370-3416

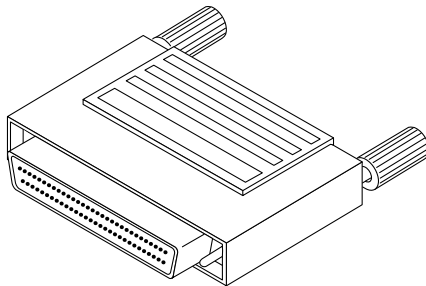


FIGURE F-24 68-Pin Terminator

Description	Part Number
68-pin terminator	150-2267

Connectors

- CPU/Memory+ Board—page G-2
 - Centerplane Connector—page G-2
 - CPU Module Connectors—page G-4
- I/O+ Boards—page G-5
 - Centerplane Connector—page G-6
 - SBus Connectors—page G-7
 - UPA Connector Location—page G-8
 - Ethernet Connector (TPE)—page G-9
 - MII Connector—page G-9
 - GBIC Connectors—page G-10
 - SCSI Connector—page G-11
 - PCI Connectors—page G-11
- Disk Board—page G-12
 - Centerplane Connector—page G-12
 - SCSI In Connector—page G-13
 - SCSI Out Connector—page G-13
- Clock+ Board—page G-14
 - Centerplane Connector—page G-15
 - Serial Port Connectors—page G-16
 - Keyboard and Mouse Connector—page G-17

G.1 CPU/Memory+ Board

FIGURE G-1 shows the locations of the centerplane and CPU module connectors for the CPU/Memory+ board.

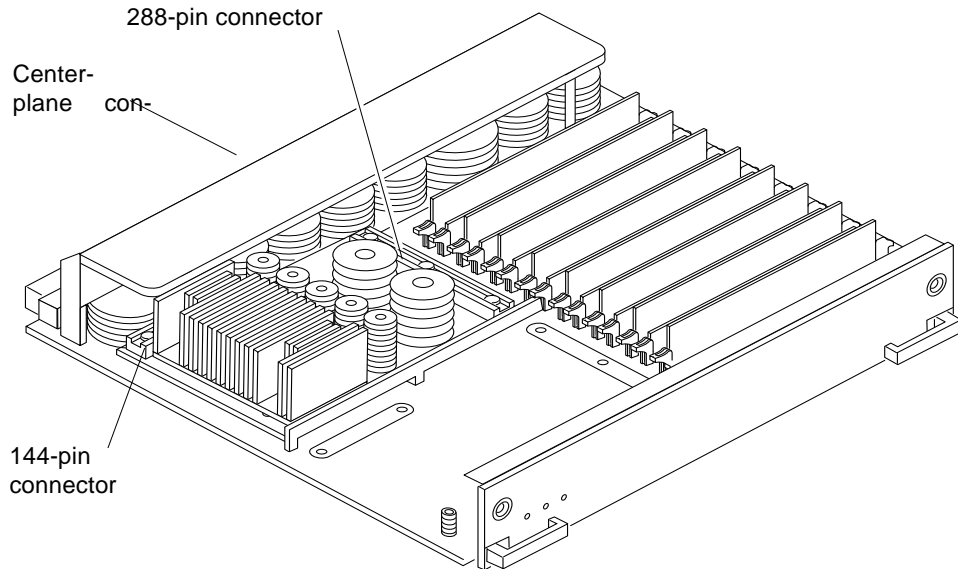


FIGURE G-1 CPU/Memory+ Board Connector Locations

G.1.1 Centerplane Connector

Note – Information for the CPU/Memory+ board centerplane connector also applies to the I/O+ and Disk board centerplane connectors.

The CPU/Memory+ board centerplane connector is mounted on the rear of the board, opposite the side of the board with the LED display and extraction levers. See FIGURE G-2. The connector is comprised of modular sections, each with its own set of receptacle pins. See FIGURE G-3.

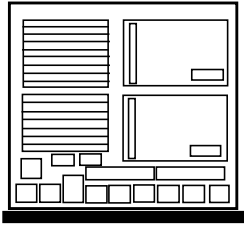


FIGURE G-2 CPU/Memory+ Board Centerplane Connector Location

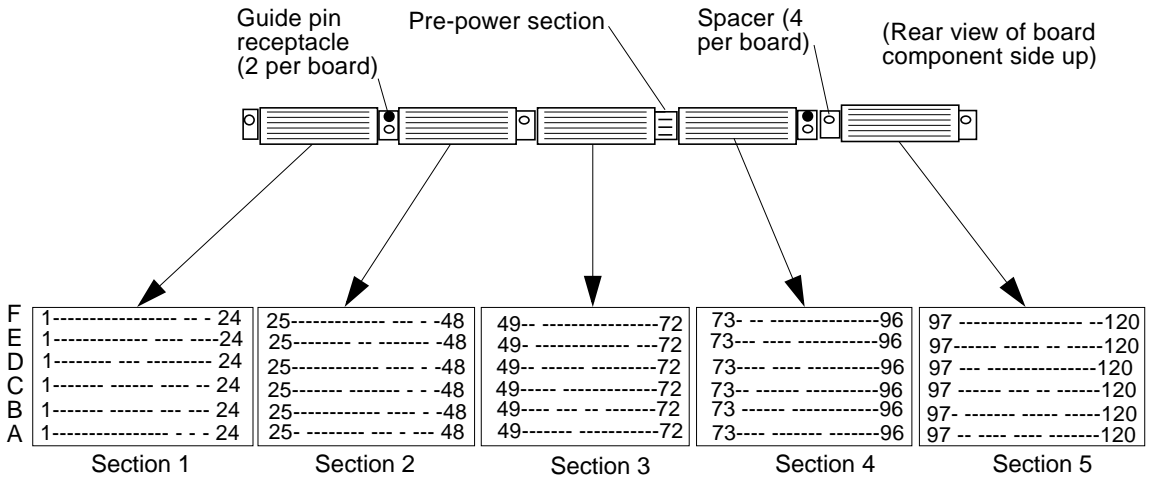


FIGURE G-3 Centerplane Connector Detail

A three-bladed power section results in 12 pins on the board. There are six, 120-pin rows, labeled A through F, spread across the remaining five sections; each section has 24 pins of each 120-pin row.

G.1.2 CPU Module Connectors

There are two connectors for each CPU module, one with 144 pins and the other with 288 pins. See FIGURE G-4 through FIGURE G-6.

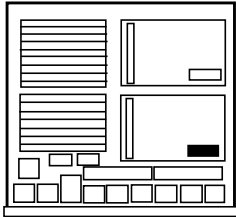


FIGURE G-4 CPU Module 0 Connector (144 Pin) Location

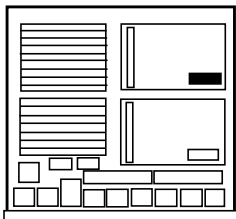


FIGURE G-5 CPU Module 1 Connector (144 Pin) Location

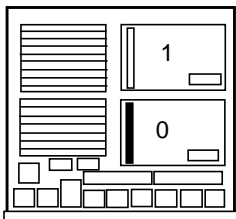


FIGURE G-6 CPU Module 0 Connector (288 Pin) Location

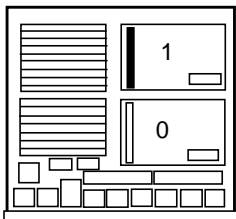


FIGURE G-7 CPU Module 1 Connector (288 Pin) Location

G.2 I/O+ Boards

FIGURE G-8, FIGURE G-9, and FIGURE G-10 show the locations of the connectors on the I/O+ boards.

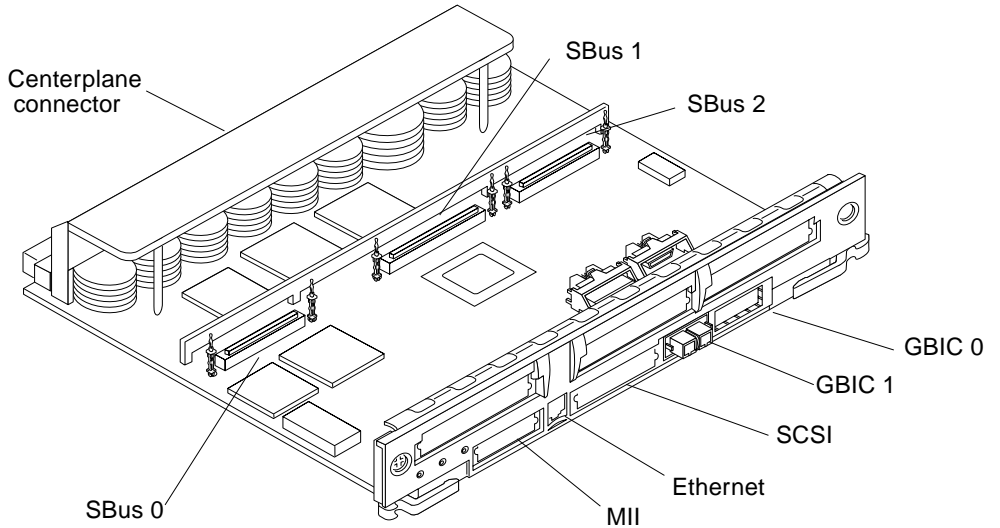


FIGURE G-8 SBus+ I/O Board Connector Locations

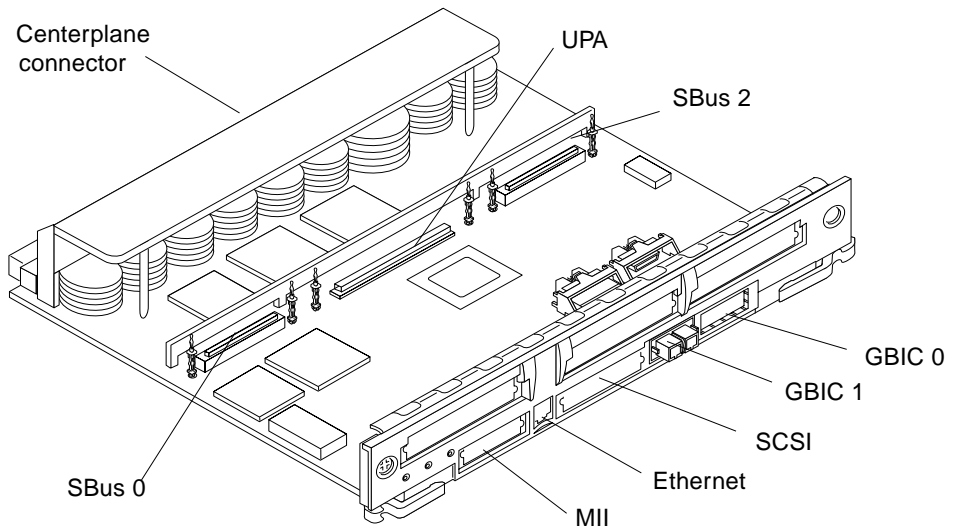


FIGURE G-9 Graphics+ I/O Board Connector Location

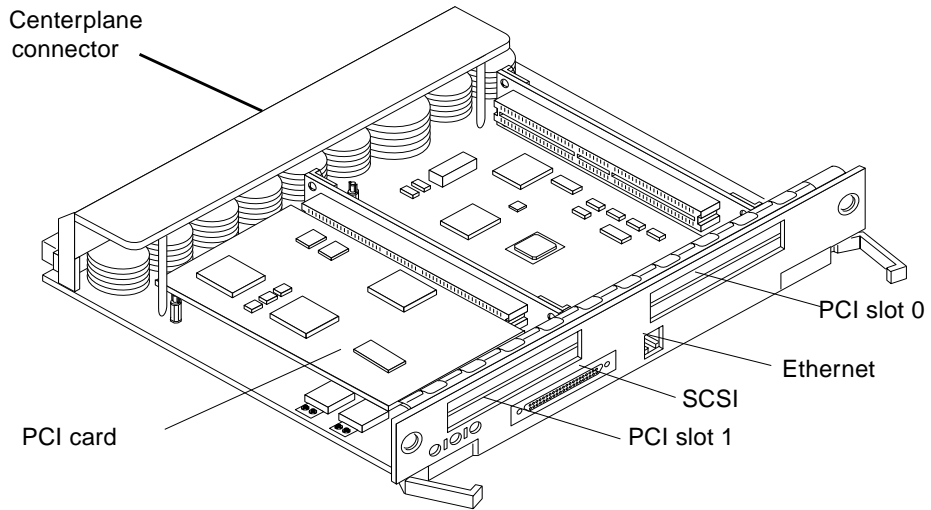


FIGURE G-10 PCI+ I/O Board Connector Location

G.2.1 Centerplane Connector

Information for the I/O+ boards centerplane is the same as for the CPU/Memory+ board centerplane. See Section G.1.1 “Centerplane Connector” on page G-2.

G.2.2 SBus Connectors

The SBus+ I/O board has three SBus connectors (SBus 0, 1, and 2). The Graphics+ I/O board has two (SBus 0 and 2). See FIGURE G-11, FIGURE G-12, and FIGURE G-13.

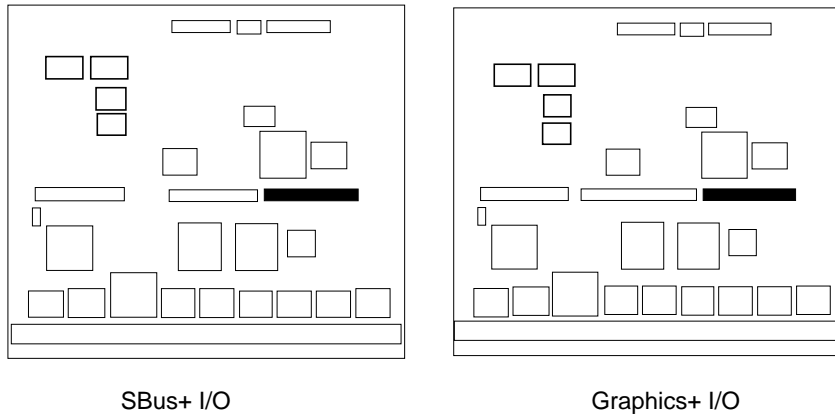


FIGURE G-11 I/O+ Board SBus 0 Connector Locations

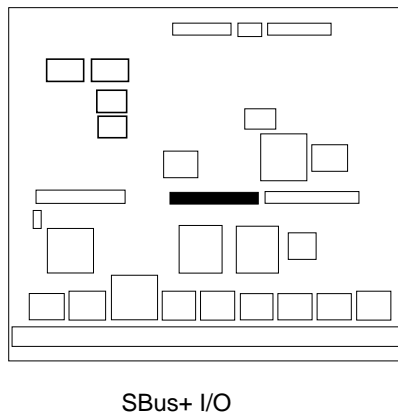
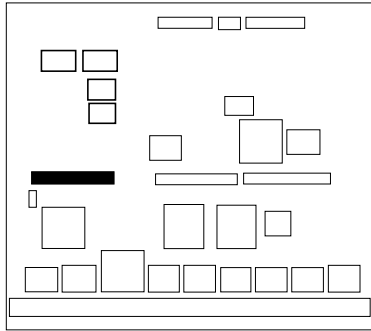
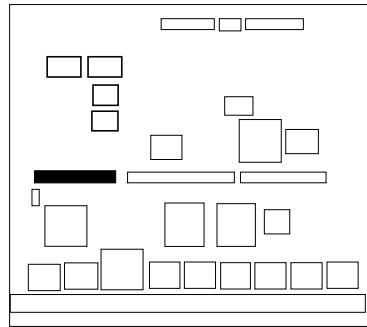


FIGURE G-12 I/O+ Board SBus 1 Connector Location



SBus+ I/O

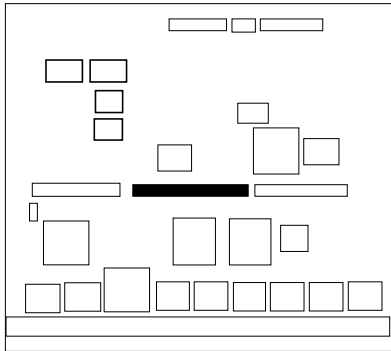


Graphics+ I/O

FIGURE G-13 I/O+ Board SBus 2 Connector Locations

G.2.3 UPA Connector Location

The Graphics+ I/O board has one UPA connector.



Graphics+ I/O

FIGURE G-14 Graphics+ I/O Board UPA Connector Location

G.2.4 Ethernet Connector (TPE)

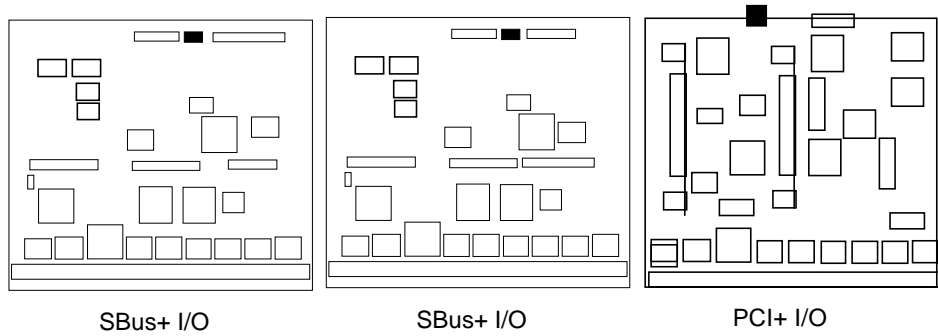


FIGURE G-15 I/O+ Board Ethernet Connector Locations

G.2.5 MII Connector

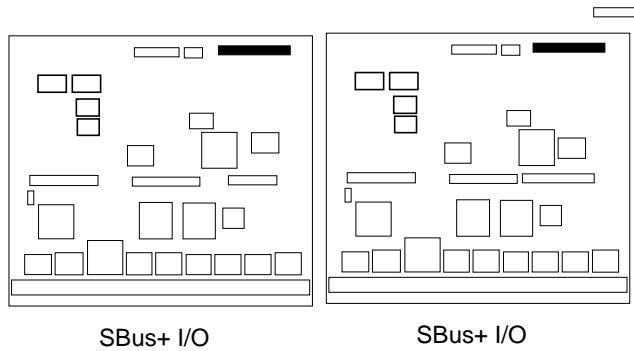


FIGURE G-16 I/O+ Board MII Connector Locations

G.2.6 GBIC Connectors

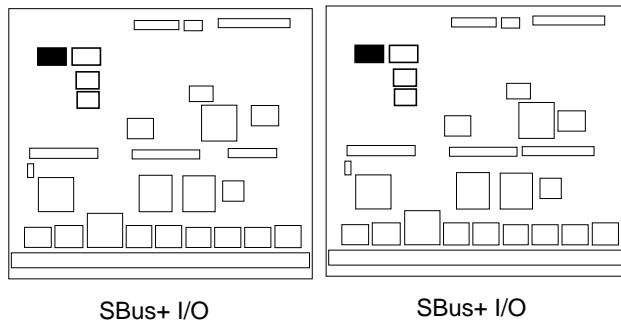


FIGURE G-17 I/O+ Board GBIC 0 Connector Locations

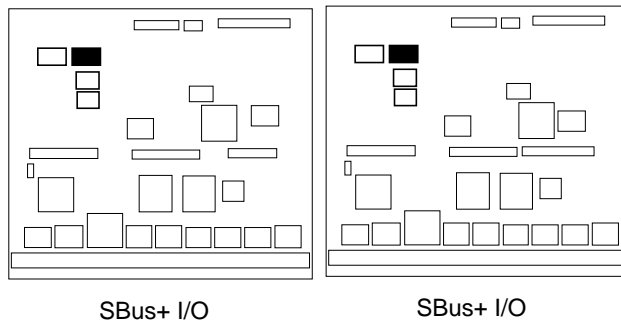


FIGURE G-18 I/O+ Board GBIC 1 Connector Locations

G.2.7 SCSI Connector

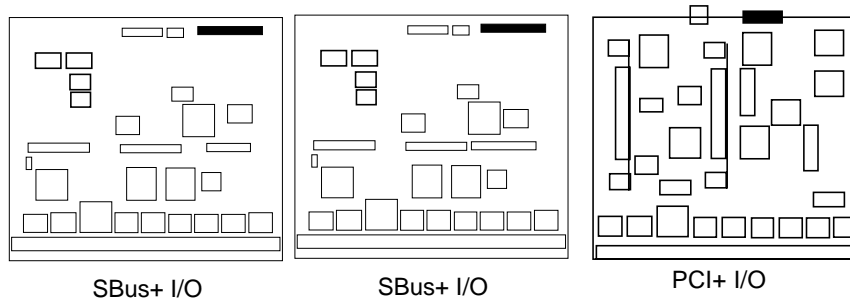


FIGURE G-19 I/O+ Board SCSI Connector Locations

G.2.8 PCI Connectors

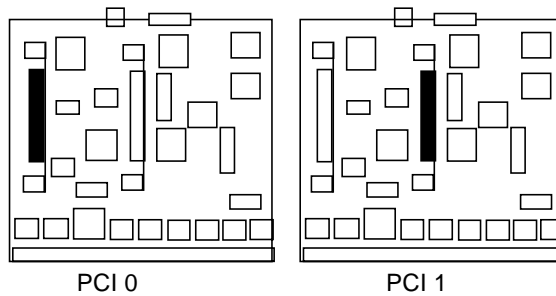


FIGURE G-20 PCI 0 and 1 Connectors

G.3 Disk Board

FIGURE G-21 shows the locations of the connectors on the Disk board.

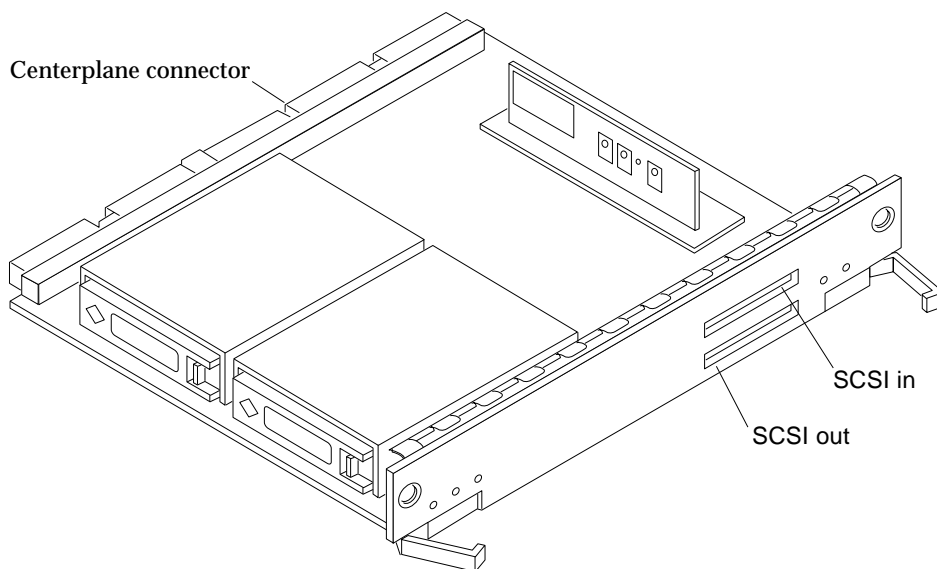


FIGURE G-21 Disk Board Connector Locations

G.3.1 Centerplane Connector

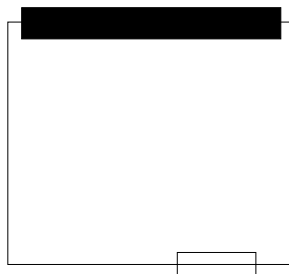


FIGURE G-22 Disk Board Centerplane Connector Location

G.3.2 SCSI In Connector

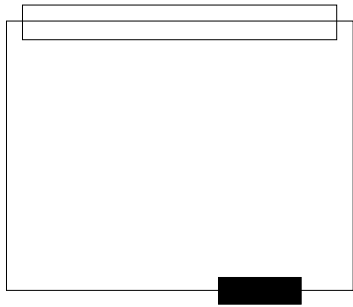


FIGURE G-23 Disk Board SCSI In Connector Location (Upper)

G.3.3 SCSI Out Connector

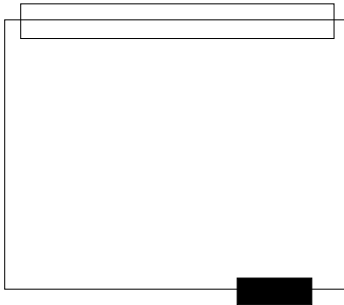


FIGURE G-24 Disk Board SCSI Out Connector Location (Lower)

G.4 Clock+ Board

FIGURE G-25 shows the clock+ board connector locations.

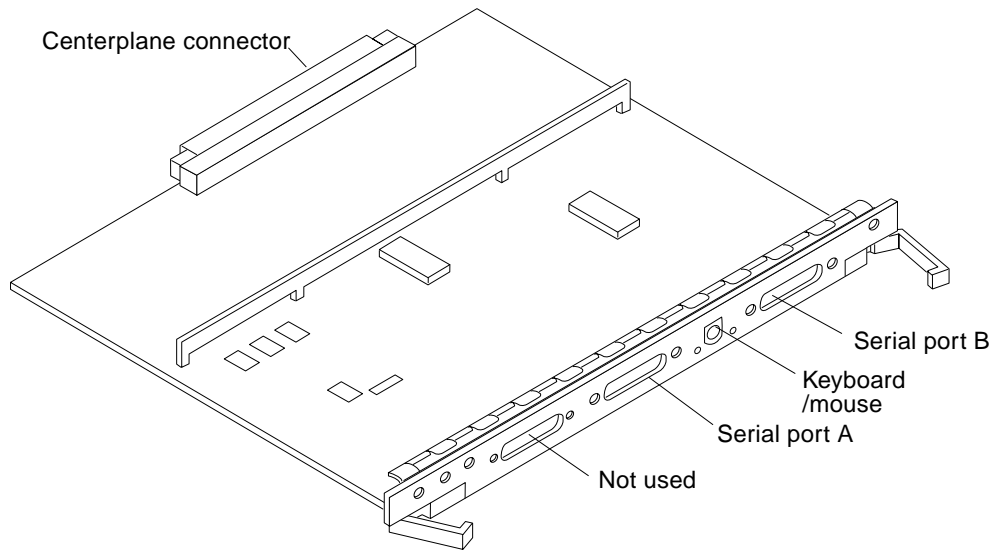


FIGURE G-25 Clock+ Board Connector Locations

G.4.1 Centerplane Connector

The clock+ board centerplane connector interfaces the board to the system. The connector is divided into six rows of pins labeled A through F; each row has 72 pins.



FIGURE G-26 Clock+ Board Centerplane Connector Location

G.4.2 Serial Port Connectors

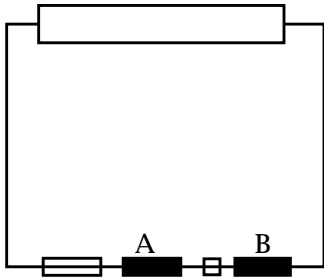


FIGURE G-27 Clock+ Board Serial Port Connectors Locations

		1			1	
	14	2	TXDA		2	TXDB
DBA	15	3	RXDA	DBB	3	RXDB
	16	4	RTSA		4	RTSB
DDA	17	5	CTSA	DDB	5	CTSB
	18	6	DSRA		6	DSRB
	19	7	GND		7	GND
DTRA	20	8	DCDA	DTRB	8	DCDB
	21	9			9	
	22	10			10	
	23	11			11	
DAA	24	12		DAB	12	
	25	13			13	

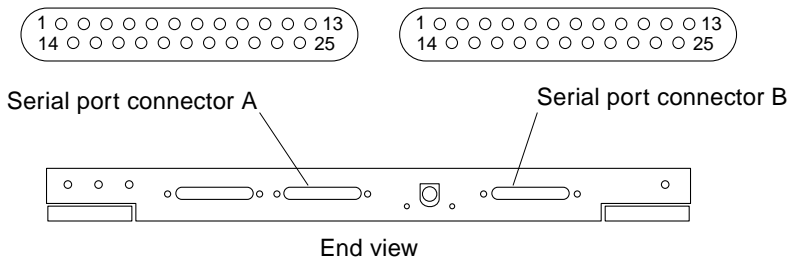


FIGURE G-28 Serial Port A and B Connector Pinouts

G.4.3 Keyboard and Mouse Connector

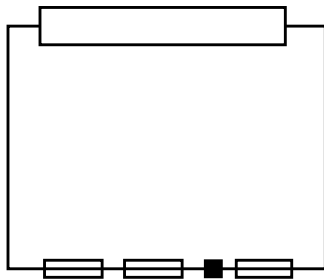


FIGURE G-29 Clock+ Board Keyboard/Mouse Connector Location

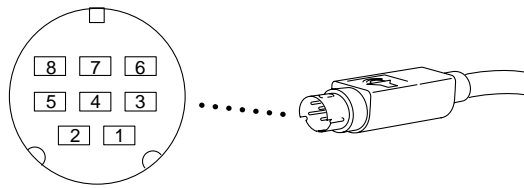


FIGURE G-30 Keyboard and Mouse Connector Pinouts

Compliance Statements

Safety Agency Compliance Statements

Read this section before beginning any procedure. The following text provides safety precautions to follow when installing a Sun Microsystems product.

Safety Precautions

For your protection, observe the following safety precautions when setting up your equipment:

- Follow all cautions and instructions marked on the equipment.
- Ensure that the voltage and frequency of your power source match the voltage and frequency inscribed on the equipment's electrical rating label.
- Never push objects of any kind through openings in the equipment. Dangerous voltages may be present. Conductive foreign objects could produce a short circuit that could cause fire, electric shock, or damage to your equipment.

Symbols

The following symbols may appear in this book:



Caution – There is risk of personal injury and equipment damage. Follow the instructions.



Caution – Hot surface. Avoid contact. Surfaces are hot and may cause personal injury if touched.



Caution – Hazardous voltages are present. To reduce the risk of electric shock and danger to personal health, follow the instructions.

On – Applies AC power to the system.

Depending on the type of power switch your device has, one of the following symbols may be used:



Off – Removes AC power from the system.



Standby – The On/Standby switch is in the *standby* position.

Modifications to Equipment

Do not make mechanical or electrical modifications to the equipment. Sun Microsystems is not responsible for regulatory compliance of a modified Sun product.

Placement of a Sun Product



Caution – Do not block or cover the openings of your Sun product. Never place a Sun product near a radiator or heat register. Failure to follow these guidelines can cause overheating and affect the reliability of your Sun product.



Caution – The workplace-dependent noise level defined in DIN 45 635 Part 1000 must be 70Db(A) or less.

SELV Compliance

Safety status of I/O connections comply to SELV requirements.

Power Cord Connection



Caution – Sun products are designed to work with single-phase power systems having a grounded neutral conductor. To reduce the risk of electric shock, do not plug Sun products into any other type of power system. Contact your facilities manager or a qualified electrician if you are not sure what type of power is supplied to your building.



Caution – Not all power cords have the same current ratings. Household extension cords do not have overload protection and are not meant for use with computer systems. Do not use household extension cords with your Sun product.



Caution – Your Sun product is shipped with a grounding type (three-wire) power cord. To reduce the risk of electric shock, always plug the cord into a grounded power outlet.

The following caution applies only to devices with a **Standby** power switch:



Caution – The power switch of this product functions as a standby type device only. The power cord serves as the primary disconnect device for the system. Be sure to plug the power cord into a grounded power outlet that is nearby the system and is readily accessible. Do not connect the power cord when the power supply has been removed from the system chassis.

Lithium Battery



Caution – On Sun CPU boards, there is a lithium battery molded into the real-time clock, SGS No. MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, or MK48T08. Batteries are not customer replaceable parts. They may explode if mishandled. Do not dispose of the battery in fire. Do not disassemble it or attempt to recharge it.

System Unit Cover

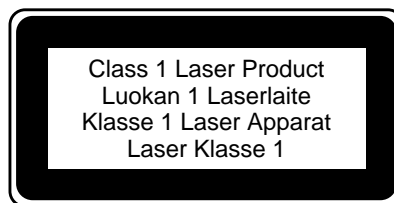
If you must remove the cover of your Sun computer system unit in order to add cards, memory, or internal storage devices, be sure to replace the top cover before powering up your computer system.



Caution – Do not operate Sun products without the top cover in place. Failure to take this precaution may result in personal injury and system damage.

Laser Compliance Notice

Sun products that use laser technology comply with Class 1 laser requirements.



CD-ROM



Caution – Use of controls, adjustments, or the performance of procedures other than those specified herein may result in hazardous radiation exposure.

Einhaltung sicherheitsbehördlicher Vorschriften

Auf dieser Seite werden Sicherheitsrichtlinien beschrieben, die bei der Installation von Sun-Produkten zu beachten sind.

Sicherheitsvorkehrungen

Treffen Sie zu Ihrem eigenen Schutz die folgenden Sicherheitsvorkehrungen, wenn Sie Ihr Gerät installieren:

- Beachten Sie alle auf den Geräten angebrachten Warnhinweise und Anweisungen.
- Vergewissern Sie sich, daß Spannung und Frequenz Ihrer Stromquelle mit der Spannung und Frequenz übereinstimmen, die auf dem Etikett mit den elektrischen Nennwerten des Geräts angegeben sind.
- Stecken Sie auf keinen Fall irgendwelche Gegenstände in Öffnungen in den Geräten. Leitfähige Gegenstände könnten aufgrund der möglicherweise vorliegenden

gefährlichen Spannungen einen Kurzschluß verursachen, der einen Brand, Stromschlag oder Geräteschaden herbeiführen kann.

Symbole

Die Symbole in diesem Handbuch haben folgende Bedeutung:



Achtung – Gefahr von Verletzung und Geräteschaden. Befolgen Sie die Anweisungen.



Achtung – Hohe Temperatur. Nicht berühren, da Verletzungsgefahr durch heiße Oberfläche besteht.



Achtung – Gefährliche Spannungen. Anweisungen befolgen, um Stromschläge und Verletzungen zu vermeiden.



Ein – Setzt das System unter Wechselstrom.

Je nach Netzschaltertyp an Ihrem Gerät kann eines der folgenden Symbole benutzt werden:



Aus – Unterbricht die Wechselstromzufuhr zum Gerät.



Wartezustand (Stand-by-Position) - Der Ein-/Wartezustand-Schalter steht auf Wartezustand. Änderungen an Sun-Geräten.

Nehmen Sie keine mechanischen oder elektrischen Änderungen an den Geräten vor. Sun Microsystems, übernimmt bei einem Sun-Produkt, das geändert wurde, keine Verantwortung für die Einhaltung behördlicher Vorschriften

Aufstellung von Sun-Geräten



Achtung – Um den zuverlässigen Betrieb Ihres Sun-Geräts zu gewährleisten und es vor Überhitzung zu schützen, dürfen die Öffnungen im Gerät nicht blockiert oder verdeckt werden. Sun-Produkte sollten niemals in der Nähe von Heizkörpern oder Heizluftklappen aufgestellt werden.



Achtung – Der arbeitsplatzbezogene Schalldruckpegel nach DIN 45 635 Teil 1000 beträgt 70Db(A) oder weniger.

Einhaltung der SELV-Richtlinien

Die Sicherung der I/O-Verbindungen entspricht den Anforderungen der SELV-Spezifikation.

Anschluß des Netzkabels



Achtung – Sun-Produkte sind für den Betrieb an Einphasen-Stromnetzen mit geerdetem Nulleiter vorgesehen. Um die Stromschlaggefahr zu reduzieren, schließen Sie Sun-Produkte nicht an andere Stromquellen an. Ihr Betriebsleiter oder ein qualifizierter Elektriker kann Ihnen die Daten zur Stromversorgung in Ihrem Gebäude geben.



Achtung – Nicht alle Netzkabel haben die gleichen Nennwerte. Herkömmliche, im Haushalt verwendete Verlängerungskabel besitzen keinen Überlastungsschutz und sind daher für Computersysteme nicht geeignet.



Achtung – Ihr Sun-Gerät wird mit einem dreiadrigen Netzkabel für geerdete Netzsteckdosen geliefert. Um die Gefahr eines Stromschlags zu reduzieren, schließen Sie das Kabel nur an eine fachgerecht verlegte, geerdete Steckdose an.

Die folgende Warnung gilt nur für Geräte mit Wartezustand-Netzschalter:



Achtung – Der Ein/Aus-Schalter dieses Geräts schaltet nur auf Wartezustand (Stand-By-Modus). Um die Stromzufuhr zum Gerät vollständig zu unterbrechen, müssen Sie das Netzkabel von der Steckdose abziehen. Schließen Sie den Stecker des Netzkabels an eine in der Nähe befindliche, frei zugängliche, geerdete Netzsteckdose an. Schließen Sie das Netzkabel nicht an, wenn das Netzteil aus der Systemeinheit entfernt wurde.

Lithiumbatterie



Achtung – CPU-Karten von Sun verfügen über eine Echtzeituhr mit integrierter Lithiumbatterie (Teile-Nr. MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, oder MK48T08). Diese Batterie darf nur von einem qualifizierten Servicetechniker ausgewechselt werden, da sie bei falscher Handhabung explodieren kann. Werfen Sie die Batterie nicht ins Feuer. Versuchen Sie auf keinen Fall, die Batterie auszubauen oder wiederaufzuladen.

Gehäuseabdeckung

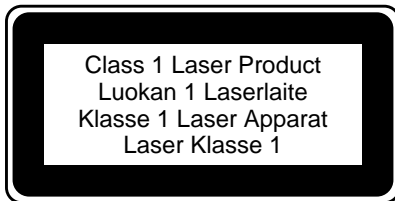
Sie müssen die obere Abdeckung Ihres Sun-Systems entfernen, um interne Komponenten wie Karten, Speicherchips oder Massenspeicher hinzuzufügen. Bringen Sie die obere Gehäuseabdeckung wieder an, bevor Sie Ihr System einschalten.



Achtung – Bei Betrieb des Systems ohne obere Abdeckung besteht die Gefahr von Stromschlag und Systemschäden.

Einhaltung der Richtlinien für Laser

Sun-Produkte, die mit Laser-Technologie arbeiten, entsprechen den Anforderungen der Laser Klasse 1.



CD-ROM



Warnung – Die Verwendung von anderen Steuerungen und Einstellungen oder die Durchführung von Prozeduren, die von den hier beschriebenen abweichen, können gefährliche Strahlungen zur Folge haben.

Conformité aux normes de sécurité

Ce texte traite des mesures de sécurité qu'il convient de prendre pour l'installation d'un produit Sun Microsystems.

Mesures de sécurité

Pour votre protection, veuillez prendre les précautions suivantes pendant l'installation du matériel :

- Suivre tous les avertissements et toutes les instructions inscrites sur le matériel.
- Vérifier que la tension et la fréquence de la source d'alimentation électrique correspondent à la tension et à la fréquence indiquées sur l'étiquette de classification de l'appareil.
- Ne jamais introduire d'objets quels qu'ils soient dans une des ouvertures de l'appareil. Vous pourriez vous trouver en présence de hautes tensions dangereuses. Tout objet conducteur introduit de la sorte pourrait produire un court-circuit qui entraînerait des flammes, des risques d'électrocution ou des dégâts matériels.

Symboles

Vous trouverez ci-dessous la signification des différents symboles utilisés :



Attention : risques de blessures corporelles et de dégâts matériels. Veuillez suivre les instructions.



Attention : surface à température élevée. Evitez le contact. La température des surfaces est élevée et leur contact peut provoquer des blessures corporelles.



Attention : présence de tensions dangereuses. Pour éviter les risques d'électrocution et de danger pour la santé physique, veuillez suivre les instructions.

MARCHE – Votre système est sous tension (courant alternatif).

Un des symboles suivants sera peut-être utilisé en fonction du type d'interrupteur de votre système:



ARRET – Votre système est hors tension (courant alternatif).



VEILLEUSE – L'interrupteur Marche/Veilleuse est en position « Veilleuse ».

Modification du matériel

Ne pas apporter de modification mécanique ou électrique au matériel. Sun Microsystems n'est pas responsable de la conformité réglementaire d'un produit Sun qui a été modifié.

Positionnement d'un produit Sun



Attention : pour assurer le bon fonctionnement de votre produit Sun et pour l'empêcher de surchauffer, il convient de ne pas obstruer ni recouvrir les ouvertures prévues dans l'appareil. Un produit Sun ne doit jamais être placé à proximité d'un radiateur ou d'une source de chaleur.



Attention : Le niveau de pression acoustique au poste de travail s'élève selon la norme DIN 45 635 section 1000, à 70 dB (A) ou moins.

Conformité SELV

Sécurité : les raccordements E/S sont conformes aux normes SELV.

Connexion du cordon d'alimentation



Attention : les produits Sun sont conçus pour fonctionner avec des alimentations monophasées munies d'un conducteur neutre mis à la terre. Pour écarter les risques d'électrocution, ne pas brancher de produit Sun dans un autre type d'alimentation secteur. En cas de doute quant au type d'alimentation électrique du local, veuillez vous adresser au directeur de l'exploitation ou à un électricien qualifié.



Attention : tous les cordons d'alimentation n'ont pas forcément la même puissance nominale en matière de courant. Les rallonges d'usage domestique n'offrent pas de protection contre les surcharges et ne sont pas prévues pour les systèmes d'ordinateurs. Ne pas utiliser de rallonge d'usage domestique avec votre produit Sun.



Attention : votre produit Sun a été livré équipé d'un cordon d'alimentation à trois fils (avec prise de terre). Pour écarter tout risque d'électrocution, branchez toujours ce cordon dans une prise mise à la terre.

L'avertissement suivant s'applique uniquement aux systèmes équipés d'un interrupteur VILLEUSE:



Attention : le commutateur d'alimentation de ce produit fonctionne comme un dispositif de mise en veille uniquement. C'est la prise d'alimentation qui sert à mettre le produit hors tension. Veillez donc à installer le produit à proximité d'une prise murale facilement accessible. Ne connectez pas la prise d'alimentation lorsque le châssis du système n'est plus alimenté.

Batterie au lithium



Attention : sur les cartes CPU Sun, une batterie au lithium (référence MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, ou MK48T08.) a été moulée dans l'horloge temps réel SGS. Les batteries ne sont pas des pièces remplaçables par le client. Elles risquent d'exploser en cas de mauvais traitement. Ne pas jeter la batterie au feu. Ne pas la démonter ni tenter de la recharger.

Couvercle

Pour ajouter des cartes, de la mémoire, ou des unités de stockage internes, vous devrez démonter le couvercle de l'unité système Sun. Ne pas oublier de remettre ce couvercle en place avant de mettre le système sous tension.

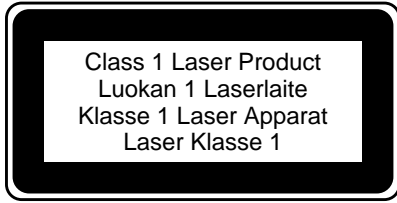


Attention : il est dangereux de faire fonctionner un produit Sun sans le couvercle en place. Si l'on néglige cette précaution, on encourt des risques de blessures corporelles et de dégâts matériels.

Conformité aux certifications Laser

Les produits Sun qui font appel aux technologies lasers

sont conformes aux normes de la classe 1 en la matière.



CD-ROM



Attention – L'utilisation de contrôles, de réglages ou de performances de procédures autre que celle spécifiée dans le présent document peut provoquer une exposition à des radiations dangereuses.

Normativas de seguridad

El siguiente texto incluye las medidas de seguridad que se deben seguir cuando se instale algún producto de Sun Microsystems.

Precauciones de seguridad

Para su protección observe las siguientes medidas de seguridad cuando manipule su equipo:

- Siga todas las avisos e instrucciones marcados en el equipo.
- Asegúrese de que el voltaje y la frecuencia de la red eléctrica concuerdan con las descritas en las etiquetas de especificaciones eléctricas del equipo.
- No introduzca nunca objetos de ningún tipo a través de los orificios del equipo. Pueden haber voltajes peligrosos.
Los objetos extraños conductores de la electricidad pueden producir cortocircuitos que provoquen un incendio, descargas eléctricas o daños en el equipo.

Símbolos

En este libro aparecen los siguientes símbolos:



Precaución – Existe el riesgo de lesiones personales y daños al equipo. Siga las instrucciones.



Precaución – Superficie caliente. Evite el contacto. Las superficies están calientes y pueden causar daños personales si se tocan.



Precaución – Voltaje peligroso presente. Para reducir el riesgo de descarga y daños para la salud siga las instrucciones.

Encendido – Aplica la alimentación de CA al sistema.

Según el tipo de interruptor de encendido que su equipo tenga, es posible que se utilice uno de los siguientes símbolos:



Apagado – Elimina la alimentación de CA del sistema.



En espera – El interruptor de Encendido/En espera se ha colocado en la posición de *En espera*.

Modificaciones en el equipo

No realice modificaciones de tipo mecánico o eléctrico en el equipo. Sun Microsystems no se hace responsable del cumplimiento de las normativas de seguridad en los equipos Sun modificados.

Ubicación de un producto Sun



Precaución – Para asegurar la fiabilidad de funcionamiento de su producto Sun y para protegerlo de sobrecalentamientos no deben obstruirse o taparse las rejillas del equipo. Los productos Sun nunca deben situarse cerca de radiadores o de fuentes de calor.



Precaución – De acuerdo con la norma DIN 45 635, Parte 1000, se admite un nivel de presión acústica para puestos de trabajo máximo de 70Db(A).

Cumplimiento de la normativa SELV

El estado de la seguridad de las conexiones de entrada/salida cumple los requisitos de la normativa SELV.

Conexión del cable de alimentación eléctrica



Precaución – Los productos Sun están diseñados para trabajar en una red eléctrica monofásica con toma de tierra. Para reducir el riesgo de descarga eléctrica, no conecte los productos Sun a otro tipo de sistema de alimentación eléctrica. Póngase en contacto con el responsable de mantenimiento o con un electricista cualificado si no está seguro del sistema de alimentación eléctrica del que se dispone en su edificio.



Precaución – No todos los cables de alimentación eléctrica tienen la misma capacidad. Los cables de tipo doméstico no están provistos de protecciones contra sobrecargas y por tanto no son apropiados para su uso con computadores. No utilice alargadores de tipo doméstico para conectar sus productos Sun.



Precaución – Con el producto Sun se proporciona un cable de alimentación con toma de tierra. Para reducir el riesgo de descargas eléctricas conéctelo siempre a un enchufe con toma de tierra.

La siguiente advertencia se aplica solamente a equipos con un interruptor de encendido que tenga una posición "En espera":



Precaución – El interruptor de encendido de este producto funciona exclusivamente como un dispositivo de puesta en espera. El enchufe de la fuente de alimentación está diseñado para ser el elemento primario de desconexión del equipo. El equipo debe instalarse cerca del enchufe de forma que este último pueda ser fácil y rápidamente accesible. No conecte el cable de alimentación cuando se ha retirado la fuente de alimentación del chasis del sistema.

Batería de litio



Precaución – En las placas de CPU Sun hay una batería de litio insertada en el reloj de tiempo real, tipo SGS Núm. MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, o MK48T08. Las baterías no son elementos reemplazables por el propio cliente. Pueden explotar si se manipulan de forma errónea. No arroje las baterías al fuego. No las abra o intente recargarlas.

Tapa de la unidad del sistema

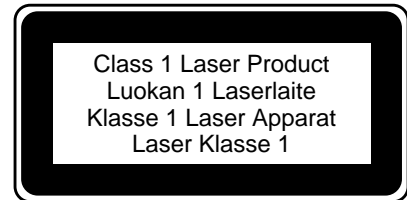
Debe quitar la tapa del sistema cuando sea necesario añadir tarjetas, memoria o dispositivos de almacenamiento internos. Asegúrese de cerrar la tapa superior antes de volver a encender el equipo.



Precaución – Es peligroso hacer funcionar los productos Sun sin la tapa superior colocada. El hecho de no tener en cuenta esta precaución puede ocasionar daños personales o perjudicar el funcionamiento del equipo.

Aviso de cumplimiento con requisitos de láser

Los productos Sun que utilizan la tecnología de láser cumplen con los requisitos de láser de Clase 1.

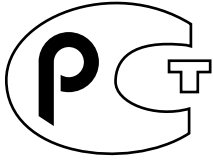


CD-ROM



Precaución – El manejo de los controles, los ajustes o la ejecución de procedimientos distintos a los aquí especificados pueden exponer al usuario a radiaciones peligrosas.

GOST-R Certification Mark



Nordic Lithium Battery Cautions

Norge



A D V A R S E L – Litiumbatteri —

Ekspløsjonsfare.

Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.

Sverige



WARNING – Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

Danmark



ADVARSEL! – Litiumbatteri — Ekspløsjonsfare ved fejlagtig håndtering. Udsiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.

Suomi



VAROITUS – Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

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