

UltraTM EnterpriseTM 3000 System Manual



The Network Is the ComputerTM

Sun Microsystems Computer Company

2550 Garcia Avenue
Mountain View, CA 94043 USA
415 960-1300 fax 415 969-9131

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Preface

The Sun™ Ultra™ Enterprise™ 3000 System Manual is for the qualified service-trained maintenance provider.

How This Book Is Organized

Information in this manual is organized in five parts:

Part 1 - "Product Description," provides an overview of the system, safety precautions, and tools information.

Part 2 - "System Components," provides descriptions, and installation and removal instructions for boards and components, power supplies, and internal storage devices.

Part 3 - "Troubleshooting," contains fault isolation information and flow charts to help locate system hardware problems.

Part 4 - "Service Information," explains how to prepare the system for service and how to access subassemblies.

Part 5 - "Appendixes," provides additional reference information such as product specifications, illustrated parts breakdown, connector pinouts, and other material of interest to qualified service-trained maintenance providers.

UNIX Commands

This document may not include specific software commands or procedures. Instead, it may name software tasks and refer you to operating system documentation or the handbook that was shipped with your new hardware.

The types of tasks that you might need to use references for includes:

- Shutting down the system
- Booting the system
- Configuring devices
- Other basic software procedures

The references you can use include:

- *Solaris 2.x Handbook for SMCC Peripherals* contains Solaris™ 2.x software commands.
- On-line AnswerBook™ for the complete set of documentation supporting the Solaris 2.x software environment.
- Other software documentation that you received with your system.

Typographic Conventions

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

Typeface or Symbol	Meaning	Example
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. machine_name% You have mail.
AaBbCc123	What you type, contrasted with on-screen computer output	<div>machine_name% su Password:</div>
<i>AaBbCc123</i>	Command-line placeholder: replace with a real name or value	To delete a file, type <code>rm filename</code> .
<i>AaBbCc123</i>	Book titles, new words or terms, or words to be emphasized	Read Chapter 6 in the <i>User's Guide</i> . These are called <i>class</i> options. You <i>must</i> be root to do this.

Shell Prompts

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

Shell	Prompt
C shell	machine_name%
C shell superuser	machine_name#
Bourne shell and Korn shell	\$
Bourne shell and Korn shell superuser	#

Related Documents

The following documents contain topics that relate to the information in the *Ultra Enterprise 3000 System Manual*.

Application	Title	Part Number
Installation	<i>Ultra Enterprise 3000 System Installation Guide</i>	802-6050
Safety/EMI	<i>Ultra Enterprise System Cabinet Regulatory Compliance Manual</i>	802-3846
Software	<i>SMCC SPARC Hardware Platform Guide</i>	802-5341
	<i>Solstice SyMON User's Guide</i>	802-5355
Options	<i>Ultra Enterprise Expansion Cabinet Installation and Service Manual</i>	802-6084
	<i>Ultra Enterprise Board Installation Guide</i>	802-5030
	<i>Ultra Enterprise CPU Installation Guide</i>	802-5031
	<i>Ultra Enterprise SIMM Installation Guide</i>	802-5032
	<i>Ultra Enterprise Peripheral Power Supply Installation Guide</i>	802-5033
	<i>Ultra Enterprise Power/Cooling Module (PCM) Installation Guide</i>	802-6244
	<i>Ultra Enterprise Disk Board Installation Guide</i>	802-6740

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Germany	01-30-81-61-91	01-30-81-61-92
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Notes, Cautions, and Warnings



Warning – 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.

Product Overview



1.1 Standard Features

The Ultra Enterprise 3000 system enclosure contains a 4-slot chassis and two built-in disk bays that hold up to 10 disk drives.

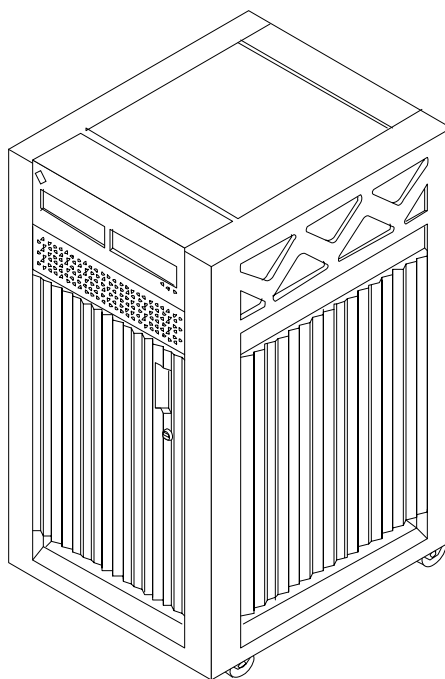


Figure 1-1 Ultra Enterprise 3000 System

The minimum configuration for the server is:

- Power/cooling modules
- Fan tray
- Clock board
- CPU/Memory board
- UltraSPARC™ module
- Main memory
- I/O board
- Peripheral power supply w/AC power sequencer
- SCSI receptacle for removable media, including CD-ROM drive
- Disk

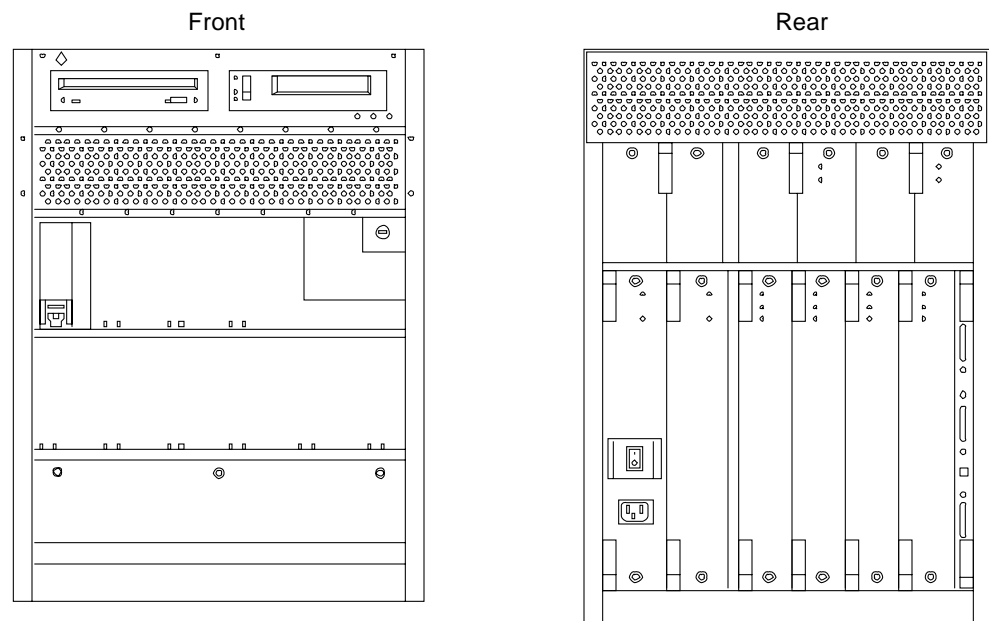


Figure 1-2 Ultra Enterprise 3000 Components

1.2 Internal Options

Table 1-1 Internal Options for the Ultra Enterprise 3000 System

Option	Quantity	Comments
CPU/Memory boards, SBus I/O boards, and Graphics I/O boards	4 <i>total</i> per system	Each slot can accept three types of boards: CPU/Memory board, SBus I/O board, and Graphics I/O board. Combinations can vary. One system board becomes the system master automatically. Jumper changes are not needed.
UltraSPARC modules	6 per system	0-2 modules on each CPU/Memory board.
Memory modules	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	9 per system	0-3 cards per SBus I/O board, 0-2 cards per Graphics I/O board.
Graphics (UPA) cards	3 per system	1 card per Graphics I/O board.
SCSI tray	CD-ROM drive and tape drive	SCSI tray takes removable-media drives only. One SunCD 4 is standard equipment per system. One optional tape drive is supported in the SCSI tray.
Disk drives	2 internal disk bays	Top bay can hold 4 disk drives; bottom bay can hold 6 disk drives. Install disks in top bay first, from left to right, starting with slot 0 (the farthest slot to the left as you face the front of the system is slot 0). Also install disks in the bottom bay from left to right.

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.

Table 2-1 Safety Precautions (Continued)

Item	Problem	Precaution
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	System damage and overheating	Make sure all empty board slots have a filler panel installed.

2.2 Symbols

The following symbols mean:



WARNING

Hazardous voltages are present. To reduce the risk of electrical shock and danger to personal health, follow the instructions.



WARNING

Risk of personal injury. To reduce the risk, follow the instructions.



CAUTION

Risk of equipment damage. To reduce the risk, follow the instructions.



SURFACE

CAUTION: Hot surfaces. Avoid contact. Surfaces are hot and may cause personal injury if touched.













AC

A terminal to which alternating current or voltage may be applied.



ON

The principal and stand-by switches are in the ON position; the system is powered on.

	OFF	The principal switch is in the OFF position.
	STAND-BY	The system is in standby mode and the operating system is halted. The circuit breaker can be turned off.
	DIAGNOSTICS	System is running. If system is rebooted, POST will display extended diagnostic messages.
	CYCLING	System or board is operating normally.
	LOCKED	Board: 1/4-turn access slot is locked. System: running in secure mode and will not respond to commands from the console. The key can be removed.
	UNLOCKED	Board 1/4-turn access slot is unlocked.
	POWER	Board is receiving DC power.
	SERVICE	System has detected a hardware failure.
	PROTECTIVE EARTH	Earth ground.
	CHASSIS	Frame or chassis ground.



FUSE REPLACEMENT MARKING

For continued protection against risk of fire and electric shock, replace **ONLY** with fuse of the same type and rating.

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 1.3, “Locating the Electrical Circuits,” in the *Ultra Enterprise 3000 System Installation Guide*, part number 802-6050.



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.

2.3 Tools Required

This list represents the minimum of tools and test equipment you will need:

- Screwdriver, Phillips #2
- Screwdriver, Phillips #1
- DIP/IC extraction tool
- ESD mat
- Grounding wrist strap
- Needlenose pliers
- Hex driver, 3/32

CPU/Memory Boards and Components



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

<i>Handling Boards and Assemblies</i>	<i>page 3-2</i>
<i>Safety Precautions</i>	<i>page 2-1</i>
<i>Hot-Plug Feature</i>	<i>page 3-3</i>
<i>CPU/Memory Boards</i>	<i>page 3-4</i>
<i>UltraSPARC Modules</i>	<i>page 3-10</i>
<i>Memory Modules (SIMMs)</i>	<i>page 3-15</i>
<i>Connectors</i>	<i>page G-1</i>

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, 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.

3.2 Filler Panels

All empty board slots in Enterprise 3000 systems must have a filler panel installed for cooling purposes. Filler panels are inserted into a board slot with the springfingers facing to the right. See Figure 3-1.

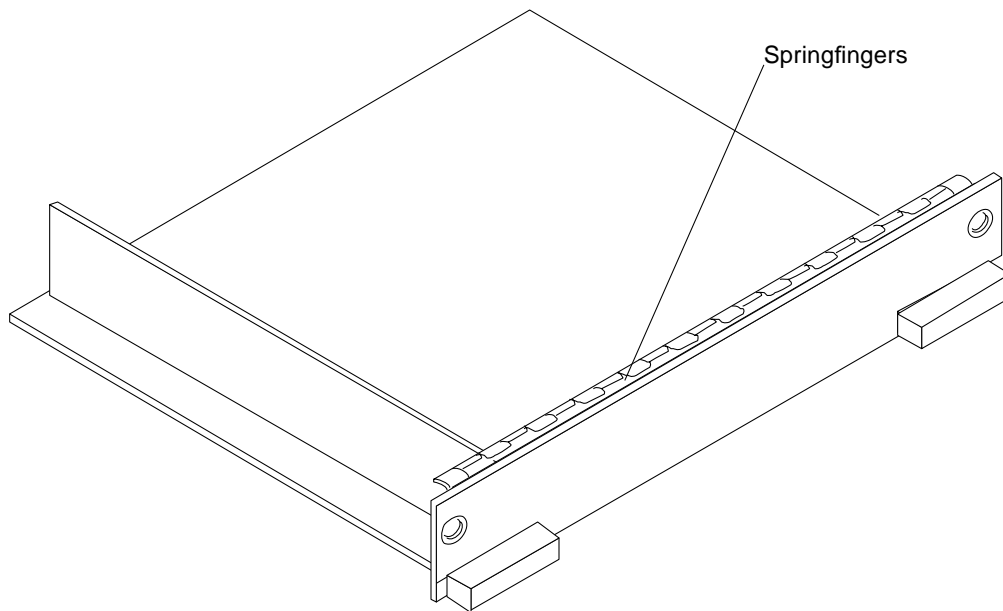


Figure 3-1 Filler Panel

3.3 Hot-Plug Feature

Enterprise 3000 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 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 being “live,” or being supplied with electrical power. Once a working board is added to a powered-on system with the hot-plug feature, 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 modules and 16 SIMM slots for memory.

Figure 3-2 is a simplified block diagram of the CPU/Memory board. It includes an Address Controller (AC), 8 bit-sliced Data Controllers (DCs), a Bootbus Controller (BC), on-board devices (including a Flash PROM, and SRAM), two CPU processor slots, and slots for two memory banks of 8 SIMMs each.

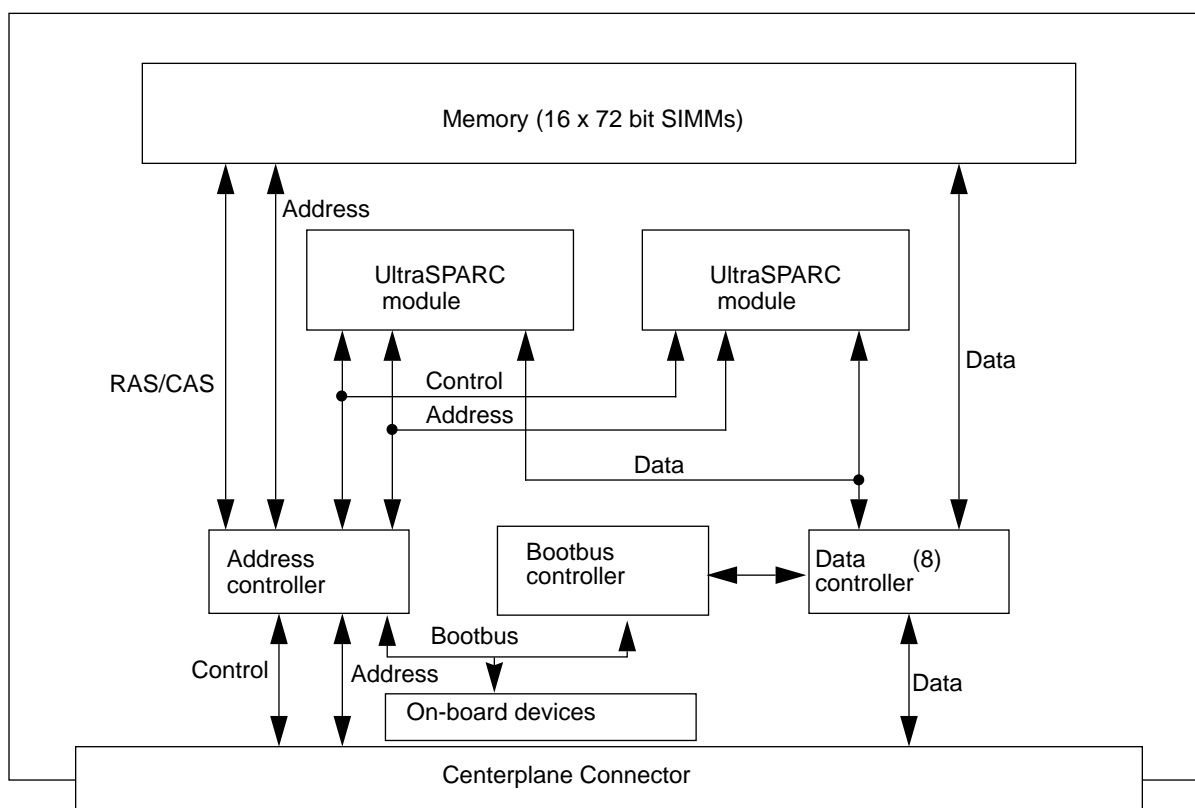


Figure 3-2 CPU/Memory Board Simplified Block Diagram

3.4.1 Removing a Board



Caution – A board should be removed from a powered-on system only after the ASR software has disabled that board, otherwise, 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 3.4.1.2, “Removing a Board from a Nonpowered-On System.”

3.4.1.1 Removing a Board from a Powered-On System

1. **Ensure that the board has been disabled by the ASR software. See Section 3.3, “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 in low power mode).

2. **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. See Figure 3-3.

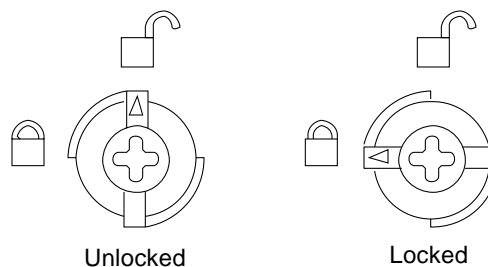


Figure 3-3 Unlocking and Locking Quarter-Turn Access Slots

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

See Figure 3-4 for positioning of the extraction levers.

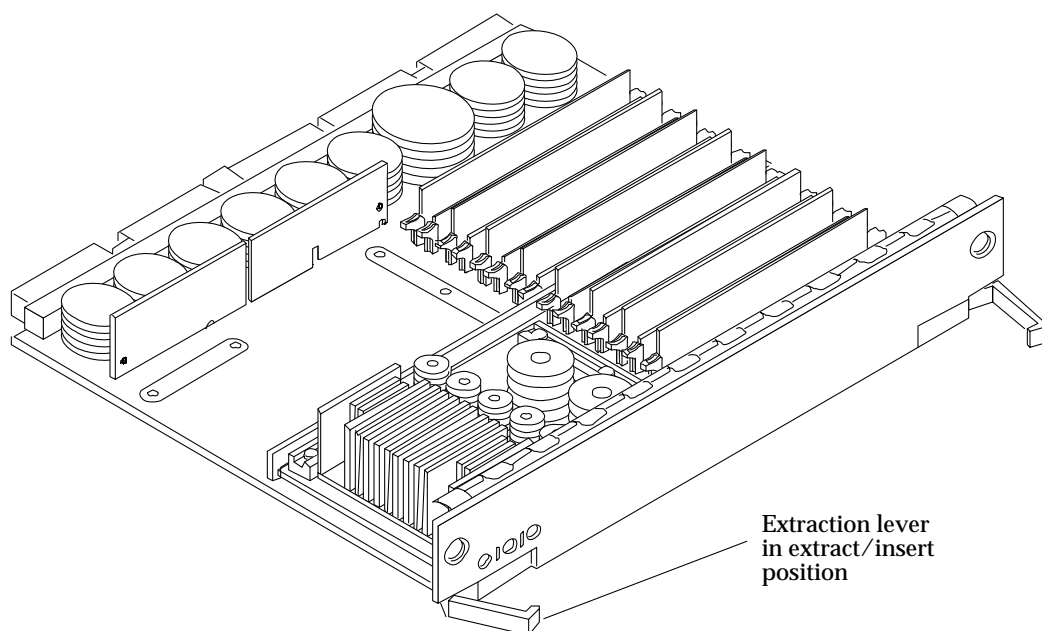


Figure 3-4 CPU/Memory Board

- 4. If a board is not immediately replaced, a filler panel must be installed in its place.**

See Section 3.2, "Filler Panels."

3.4.1.2 Removing a Board from a Nonpowered-On 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. See Figure 3-3 on page 3-6.
- 2. Pull the ends of both extraction levers outward simultaneously to unseat the board from the centerplane receptacles.**
See Figure 3-4 for positioning of the levers.

3. If a board is not immediately replaced, a filler panel must be installed in its place.

See Section 3.2, "Filler Panels."

3.4.2 Installing a Board

3.4.2.1 Board Slot Selection

Logically there is no difference between the board slots, and each slot can accept any board type. However, since the lowest numbered board slot (slot 1) is the only slot connected to the onboard SCSI devices, this slot is usually reserved for the first I/O board. See Figure 3-5.

Note – Board slot numbers are marked on the chassis.

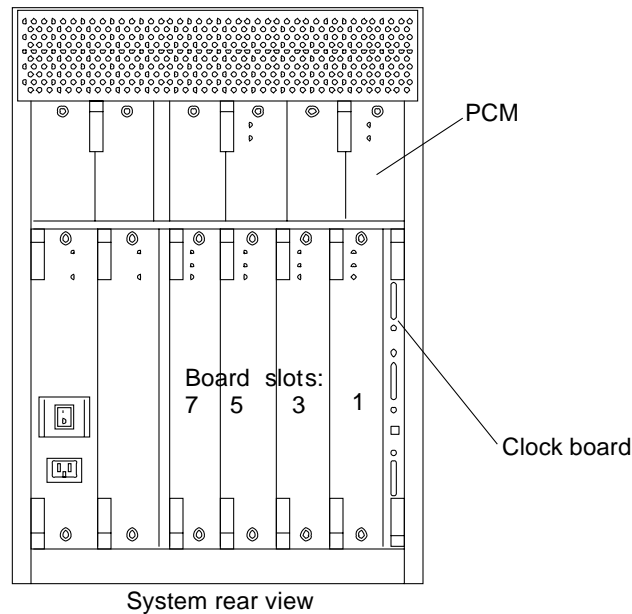


Figure 3-5 Board Slot Locations

3.4.2.2 Cooling and Power Issues

To adhere to cooling and power requirements, there should be one power/cooling module (PCM) for every two boards. 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 slots must have a filler panel installed to ensure proper cooling. See Section 3.2, “Filler Panels.”

3.4.2.3 Powered-On or Nonpowered-On System

1. **Carefully insert the board in the proper slot in the card cage, component side to the right, ensuring that the board does not slip out of the top and bottom card guides.**

All empty slots must have a filler panel installed.

2. **Ensure that both extraction levers are in the outward position as you slide the board toward the centerplane receptacles.**

The board will not seat fully unless the levers are in this starting position. See Figure 3-4 on page 3-7 for positioning of the levers.



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

Simultaneously swing both levers inward to the locked position, mating 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 3-3 on page 3-6.

5. **Once the board is installed, when the system is powered on, a message similar to the following will be displayed on the monitor:**

Example depicts screen output when a new CPU/Memory board has been hot-plugged into slot 5 of an operating Enterprise system:

```
NOTICE: CPU Board Hotplugged into Slot 5
NOTICE: Board 5 is ready to remove
```

Additionally, any subsequent `prtdiag(1M)` output would include information for board slot 5. 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 Modules*

Each CPU/Memory board has four connectors for UltraSPARC 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. See Figure 3-6.

3.4.4 *Handling Precautions*

The following precautions should be exercised when handling UltraSPARC modules:

- UltraSPARC 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.

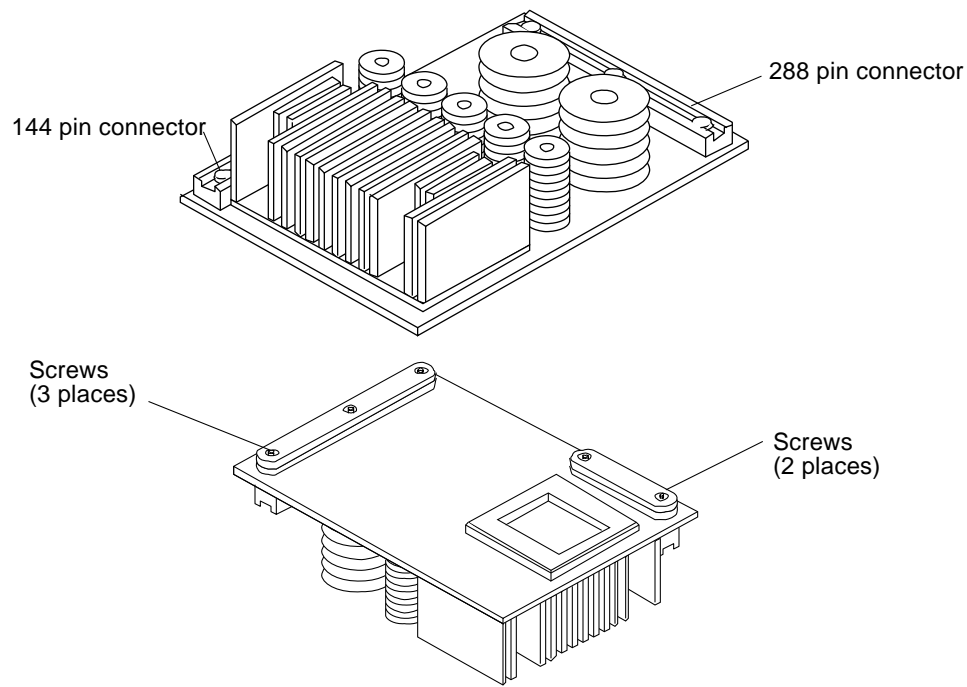


Figure 3-6 UltraSPARC Module Connector Detail

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 pin receptacles by a metal compression bar which, when secured with screws, compresses the module connector pins to the board receptacle pins. See Figure 3-7.

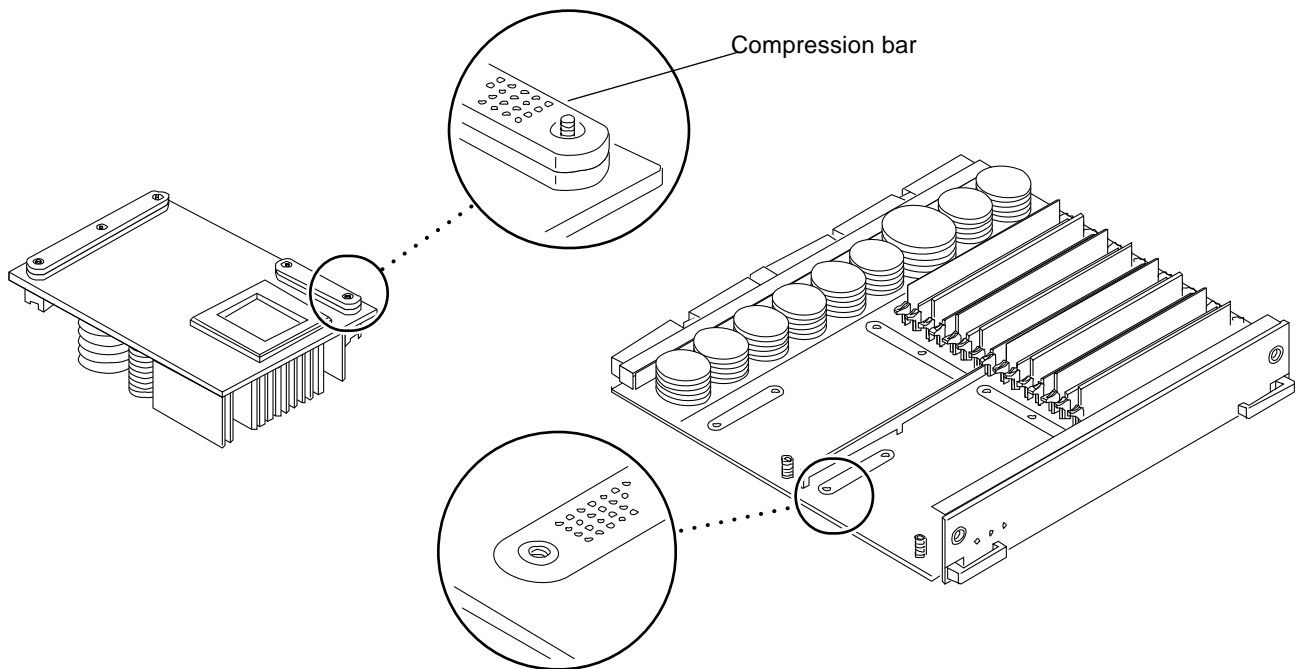


Figure 3-7 UltraSPARC Module Connector Detail

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



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

2. Use a 3/32 Hex driver to loosen all screws from each of the compression bars. Two screws for the 144 pin connector, three screws for the 288 pin connector.
See Figure 3-6.
3. Lift the module straight up off the board mating surface and the single standoff that locks the module to the board.
See Figure 3-8.

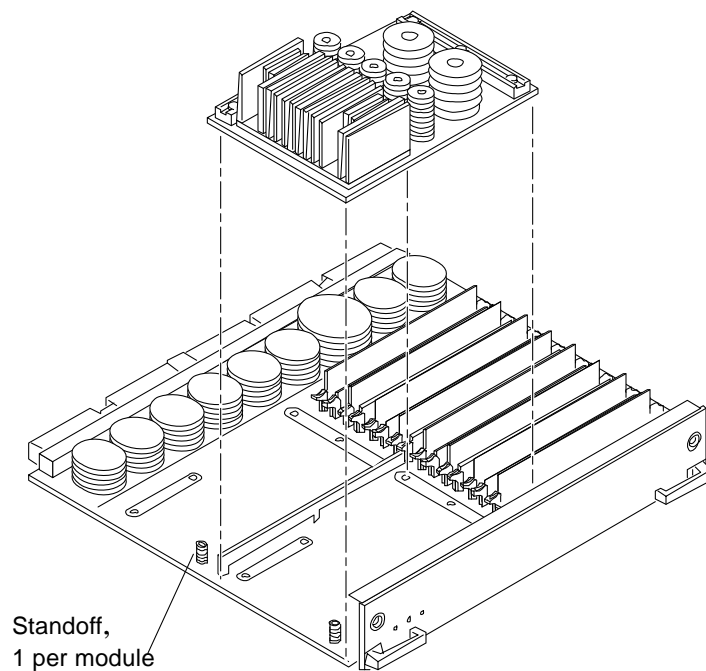


Figure 3-8 UltraSPARC Module Removal and Replacement

4. Place the module in an antistatic bag.

3.4.4.2 Installing a Module

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

- 1. Take the UltraSPARC module out of the protective packaging and inspect for dust on the connectors.**
- 2. Remove the applicable CPU/Memory board as indicated in Section 3.4.1, “Removing a Board.”**
- 3. Inspect the board module mating surface. If the surface requires cleaning, use a cotton swab to clean debris from the mating surfaces.**

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. **Align the module over the two board receptacles using the single standoff as well as the alignment pins located on the module compression connector as a guide.**

See Figure 3-7 and Figure 3-8.

5. **Holding the module by the edges, rest it on the board standoff, aligning the compression connectors with the screws.**

Firmly but gently press the module straight down until the standoff snaps into place and the module connectors are fully seated.

6. **Finger tighten the screws of each compression connector to the board mating surfaces.**

Use an alternate tightening pattern as follows:

- a. **Finger tighten the middle screw on the three screw connector.**
- b. **Finger tighten either one of the outside screws.**
- c. **Finger tighten the remaining screw.**

7. **Tighten the screws using a 3/32 Hex driver (three screws for the 288 pin connector, two for the 144 pin connector).**

Use an alternate tightening sequence as follows:



Caution – Do not over- or under-torque the module screws; over-torque can cause the connector to warp and under-torque can result in other problems.

- a. **Tighten the three screws on the 288 pin connector *almost all the way*; begin with the middle screw, followed by either of the outside two screws.**
- b. **Do the same for the two screws on the 144 pin connector.**
- c. **Using the same sequence described initially, tighten each screw until medium resistance is met.**

- d. Using the same sequence, tighten each screw an additional 3/4 turn.

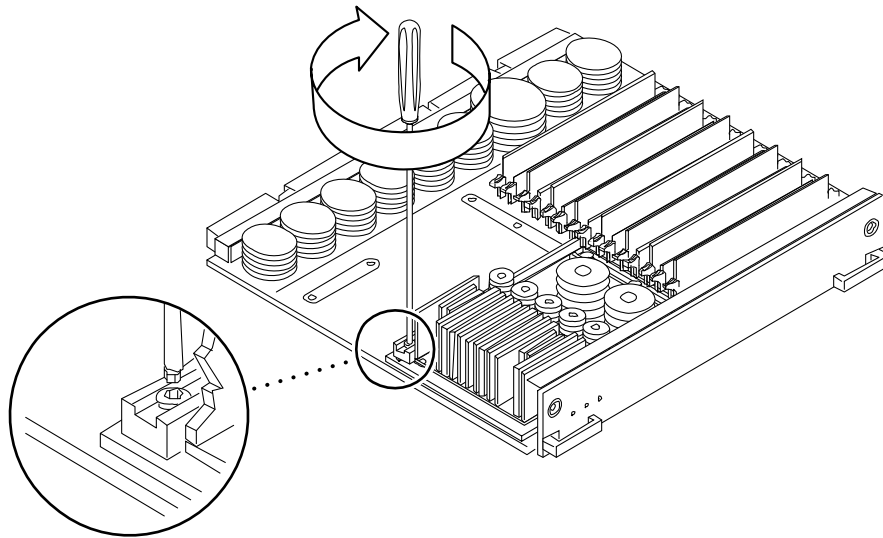


Figure 3-9 Tightening Compression Bar Screws

8. 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. See Figure 3-10.

There are three types of SIMMs that can be used in both Bank 0 and Bank 1 SIMMs. Each type is listed in Table 3-1 together with the DRAMs used.

Table 3-1 SIMM/DRAM

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

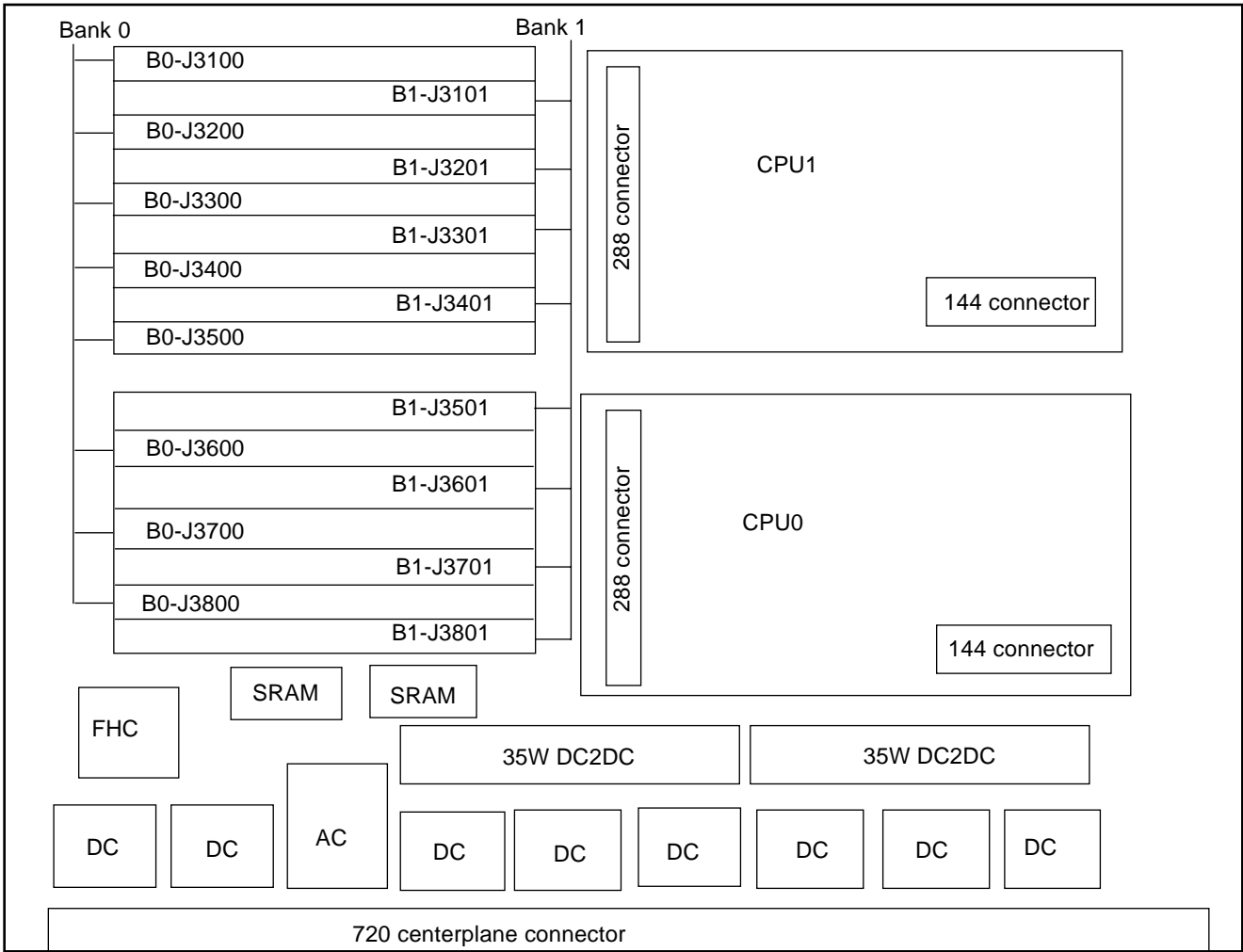


Figure 3-10 Layout of CPU/Memory Board

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. **Locate the slot for the SIMM you need to replace.**
See Figure 3-10.
4. **Eject the faulty SIMM by pressing down on the ejaction levers on both sides of the SIMM connector.**
See Figure 3-11.

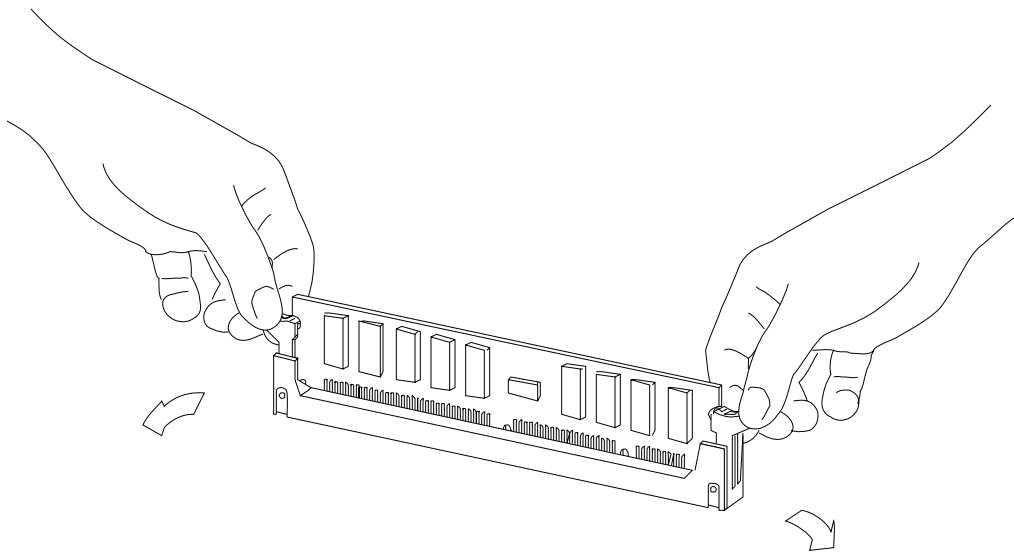


Figure 3-11 Ejecting a SIMM

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 manufactures 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. See Figure 3-12.

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. See Figure 3-12.

5. Place your thumbs on the top edge of the SIMM and push the SIMM firmly into its connector.

6. Lock the SIMM in place by pushing both ejector levers into the upright position.

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.

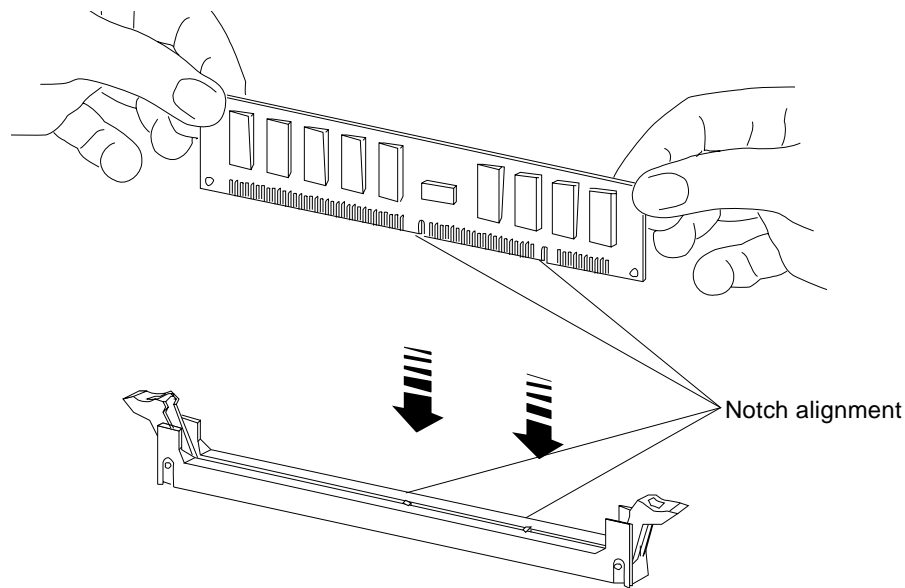


Figure 3-12 Orienting and Installing a SIMM

I/O Boards and Components



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

<i>Handling Boards and Assemblies</i>	<i>page 4-2</i>
<i>Safety Precautions</i>	<i>page 2-1</i>
<i>Hot-Plug Feature</i>	<i>page 4-4</i>
<i>I/O Boards</i>	<i>page 4-4</i>
<i>SBus Cards</i>	<i>page 4-15</i>
<i>Graphics (UPA) Cards</i>	<i>page 4-23</i>
<i>Fibre Cards</i>	<i>page 4-27</i>
<i>Connectors</i>	<i>page G-5</i>

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.

4.2 Filler Panels

All empty board slots in Enterprise 3000 systems must have a filler panel installed for cooling purposes. Filler panels are inserted into a board slot with the springfingers facing to the right. See Figure 4-1.

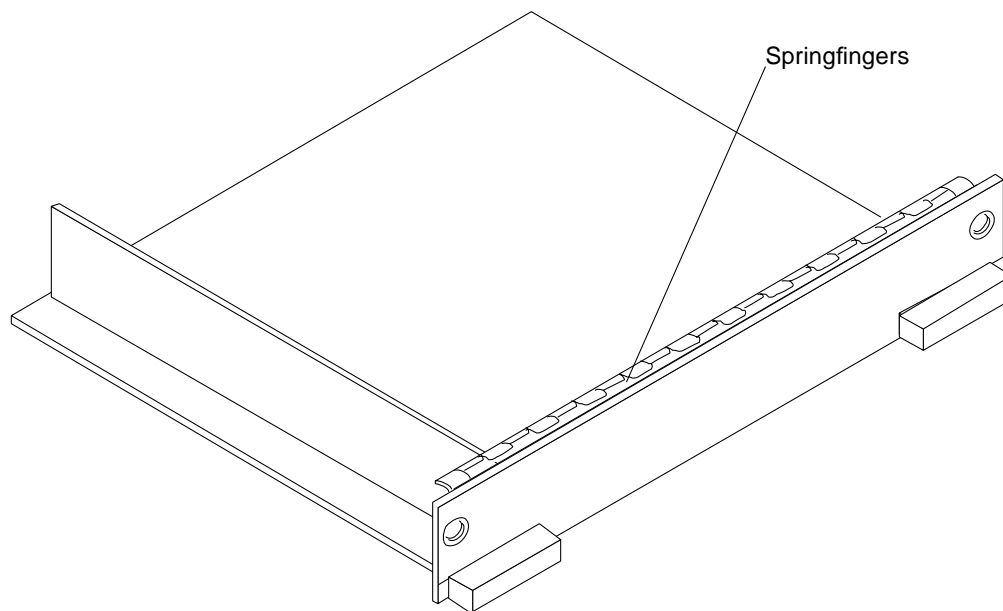


Figure 4-1 Filler Panel

4.3 SCSI Termination

The I/O board in slot 1 controls the internal SCSI 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. See Figure 4-2.

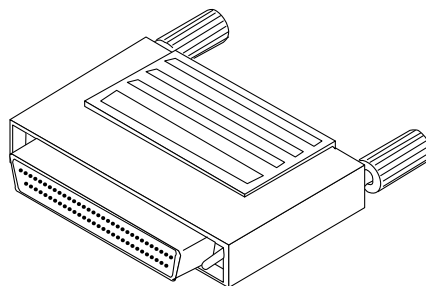


Figure 4-2 SCSI Terminator

4.4 Hot-Plug Feature

Enterprise 3000 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 – 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 is the ability to insert a new board into a powered-on system, despite being “live,” or being supplied with electrical power. Once a working board is added to a powered-on system with the hot-plug feature, the system will not use the new board until the system is rebooted.

4.5 I/O Boards

Enterprise 3000 systems support two types of I/O boards: SBus and Graphics. See Figure 4-3 through Figure 4-6.

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

The SBus I/O board includes two SYSIO ASICs that provide two SBuses:

- One for two plug-in SBus cards and two fiber interfaces
- One for one plug-in SBus card and the on-board devices (10/100Mbyte TPE and Fast/Wide SCSI)

The Graphics I/O board includes one SYSIO ASIC that provides a single SBus for two plug-in SBus cards, as well as the same on-board devices described for the SBus I/O board (10/100Mbyte TPE and Fast/Wide SCSI). See Figure 4-5 and Figure 4-6 for simplified block diagrams of each board.

4.5.1 `tpe-link-test?` *Variable*

If the system cannot communicate with a network, the `tpe-link-test?` settings for the on-board Ethernet ports may be incompatible with the setting at the network hub. The `tpe-link-test?` variable is set separately for the on-board 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.

See Section 8.5.3.2, “`printenv` Command,” for information about displaying configuration variables and Section 8.6.1, “Failure of Network Communications,” for additional `tpe-link-test?` information. Also, refer to the manual provided with your hub.

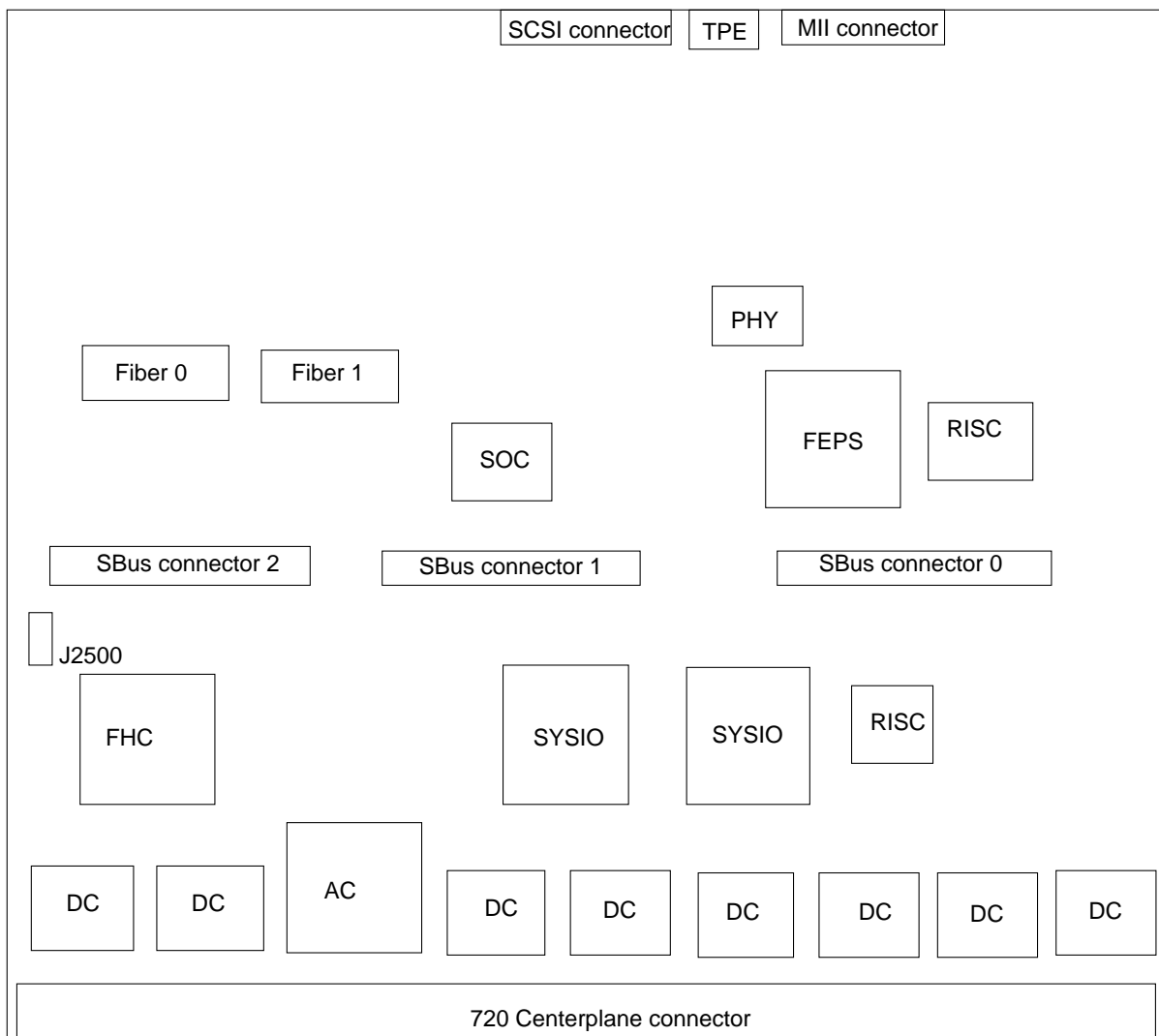


Figure 4-3 SBus I/O Board Components Locations

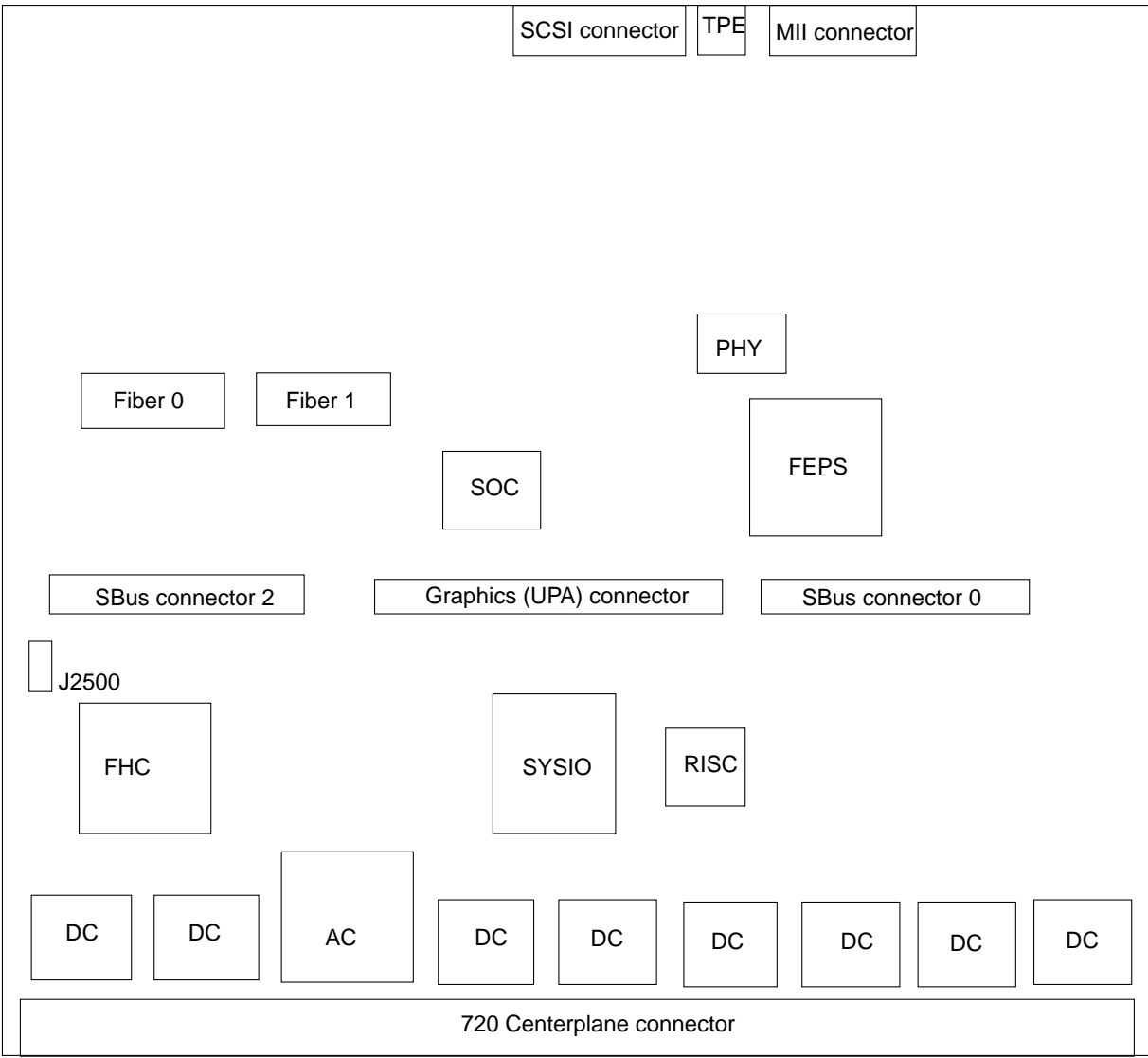


Figure 4-4 Graphics I/O Board Components Locations

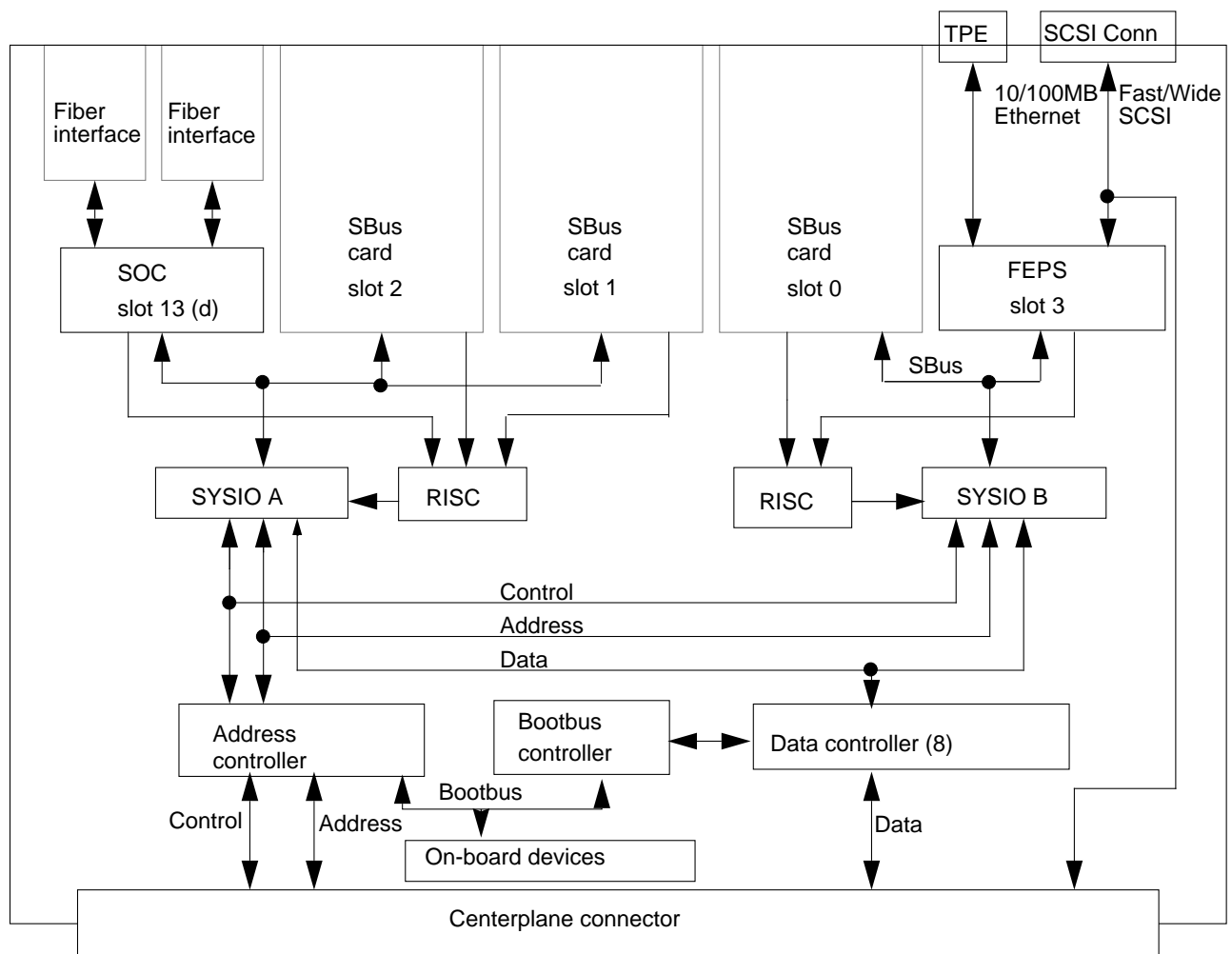


Figure 4-5 SBus I/O Board Simplified Block Diagram

4.5.2 Removing a Board

4.5.2.1 Removing a Board from a Powered-On System



Caution – A board should be removed from a powered-on system only after the ASR software has disabled that board, otherwise, 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 Nonpowered-On 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 in low power mode).

2. **Unfasten any cable connectors from the front panel and set them aside.**
Label cables to identify them for reconnection later.
3. **Mechanically release the board from the system cabinet by inserting a Phillips #1 screwdriver into each quarter-turn access slot and then turning to the unlocked position.**

See Figure 4-7.

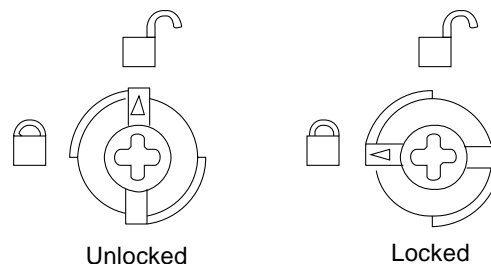


Figure 4-7 Unlocking and Locking Quarter-Turn Access Slots

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

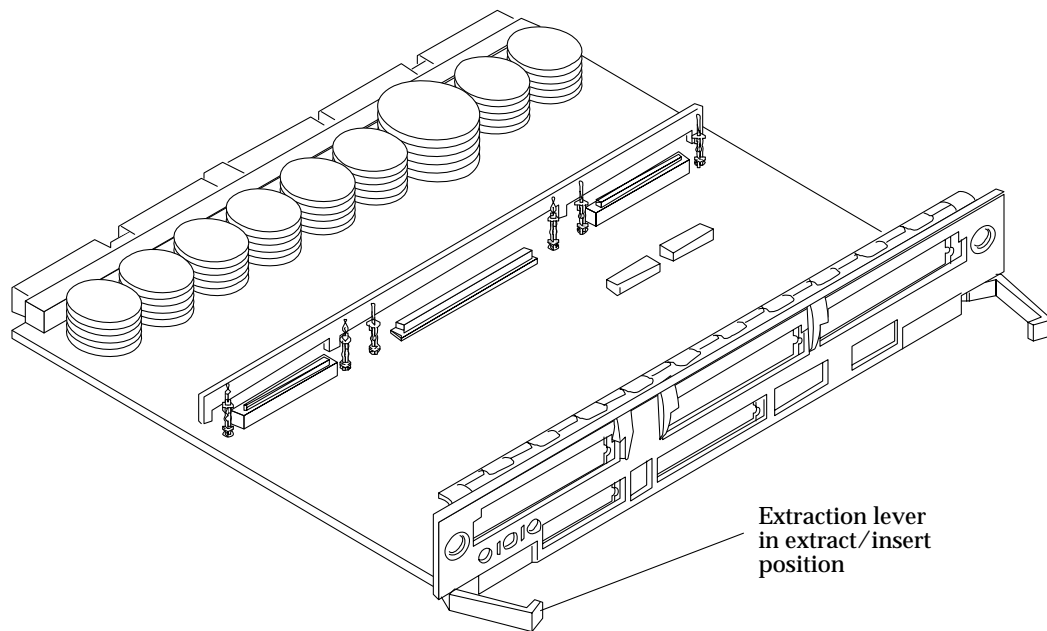


Figure 4-8 I/O Board (Graphics)

5. If a board is not immediately replaced, a filler panel must be installed in its place. See Section 4.2, “Filler Panels.”

4.5.2.2 Removing a Board from a Nonpowered-On System

1. Mechanically release the board from the system chassis by inserting a Phillips # 1 screwdriver into each quarter-turn access slot and then turning to the unlocked position. See Figure 4-7 on page 4-10.

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 4-8 on page 4-11.
4. **If a board is not immediately replaced, a filler panel must be installed in its place.**
See Section 4.2, “Filler Panels.”

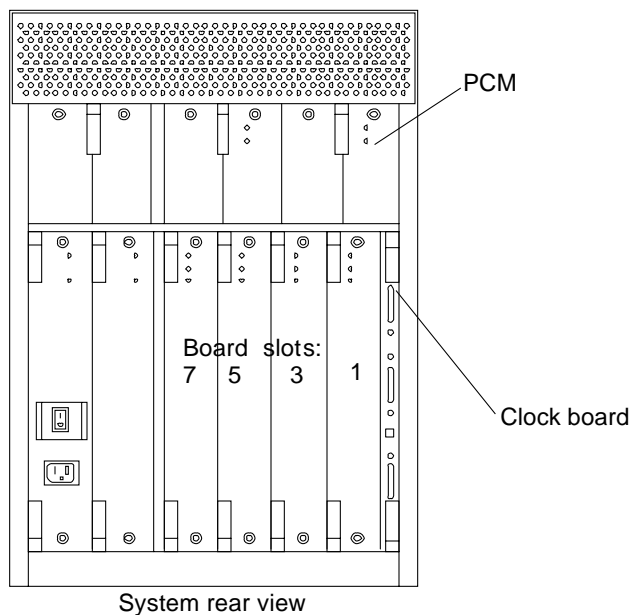


Figure 4-9 Board Removal and Replacement

4.5.3 Installing a Board

4.5.3.1 Board Slot Selection

Logically there is no difference between the board slots, and each slot can accept any board type. However, since the lowest numbered board slot (slot 1) is the only slot connected to the onboard SCSI devices, this slot is usually reserved for the first I/O board. Board slot numbers are marked on the chassis. See Figure 4-9.

4.5.3.2 Cooling and Power Issues

To adhere to cooling and power requirements, there should be one power/cooling module (PCM) for every two boards. 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 slots must have a filler panel installed to ensure proper cooling.

4.5.3.3 Powered-On or Nonpowered-On System

- 1. Carefully insert the board (component side to the right) in the proper slot in the card cage, ensuring that the board does not slip out of the top and bottom card guides.**
All empty slots must have a filler panel installed.
- 2. Ensure that both extraction levers are in the outward position as you slide the board toward the centerplane receptacles.**
The board will not seat fully unless the levers are in this starting position. See Figure 4-8 on page 4-11 for lever positioning.
- 3. Slowly insert the board until the board centerplane connector is just touching the centerplane receptacle.**



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.

4. Use the extraction levers to seat the board.

Simultaneously swing both levers inward to the locked position, mating 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.

5. 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 4-7 on page 4-10.

6. Replace or connect all necessary cables to the front of the board.

Note – The I/O board in slot 1 controls the internal SCSI 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. See Figure 4-2 on page 4-3.

7. Terminate the board SCSI out connector if required. See “Note” above.

8. Once the board is installed, when the system is powered on, a message similar to the following will be displayed on the monitor:

Example depicts screen output when a new I/O board has been hot-plugged into slot 3 of an operating Enterprise 3000 system:

```
NOTICE: I/O Board Hotplugged into Slot 3
NOTICE: Board 3 is ready to remove
```

Additionally, any subsequent `prtdiag(1M)` output would include information for board slot 3. 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.

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 4-10 shows the SBus card locations for both types of boards.

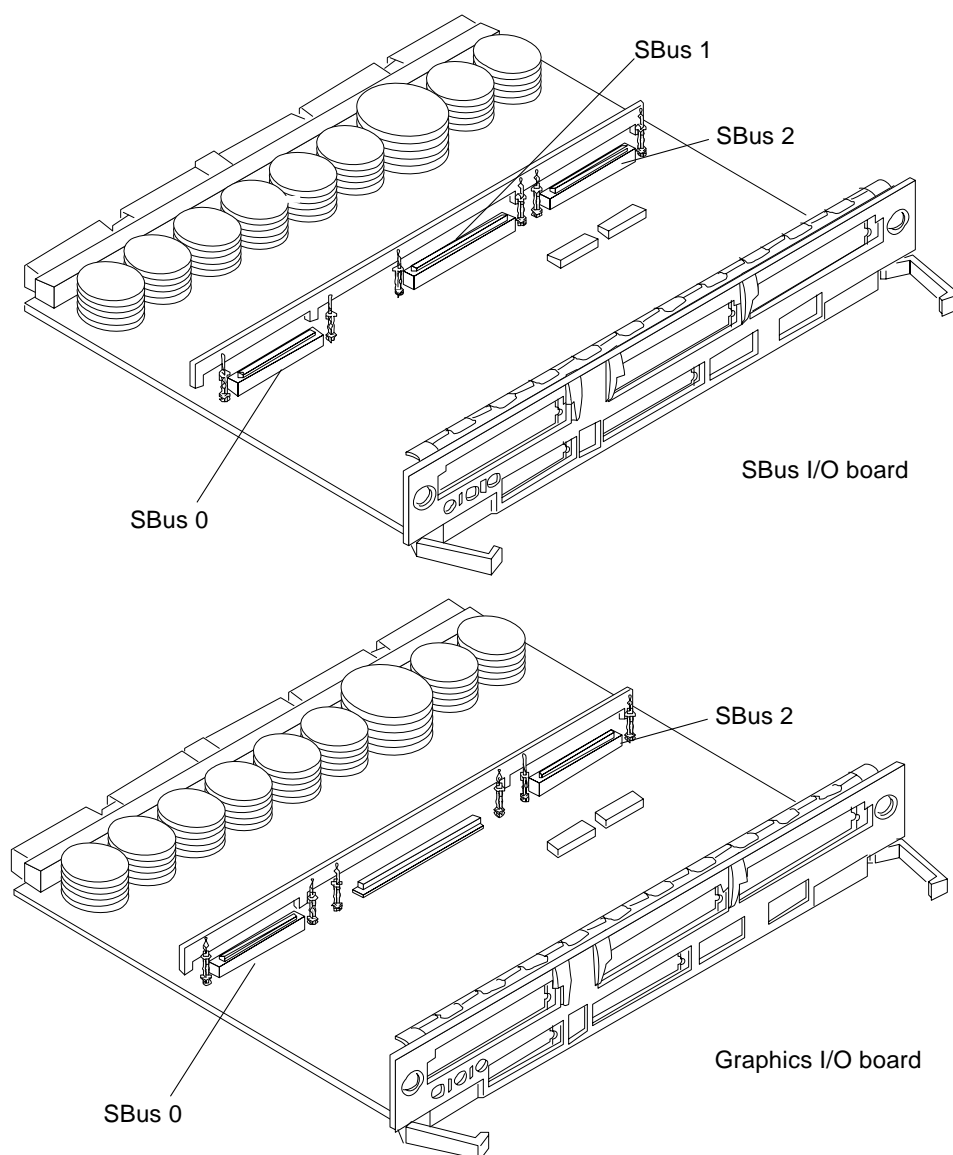


Figure 4-10 I/O Board SBus Card Locations

4.5.4.1 Plastic Standoffs

Plastic standoffs lock the SBus cards to the I/O boards. See Figure 4-11.

- 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.

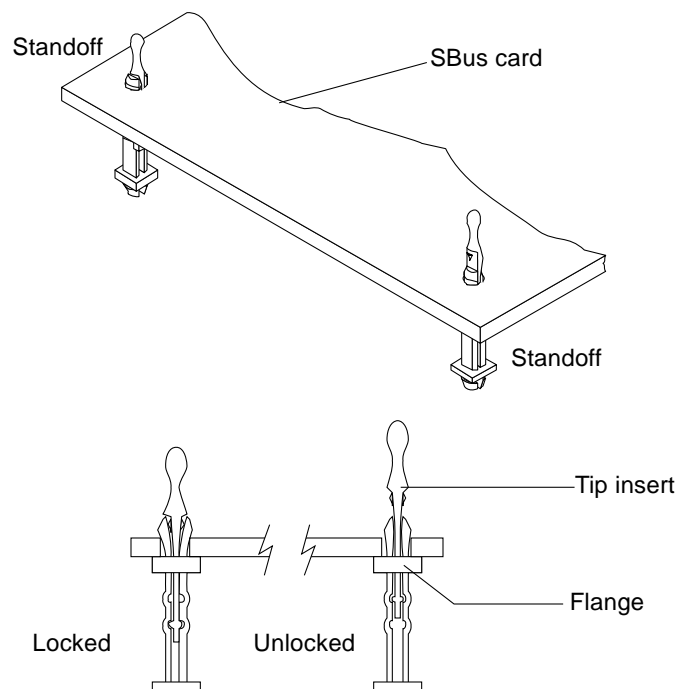


Figure 4-11 Locking and Unlocking Standoffs

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. **Locate the card to be removed.**
See Figure 4-10 on page 4-16.

3. **Remove the two screws that secure the SBus card to the I/O board front 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 standoffs.**
See Figure 4-11 on page 4-17.
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 graphics (UPA) 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.**
See Figure 4-12.

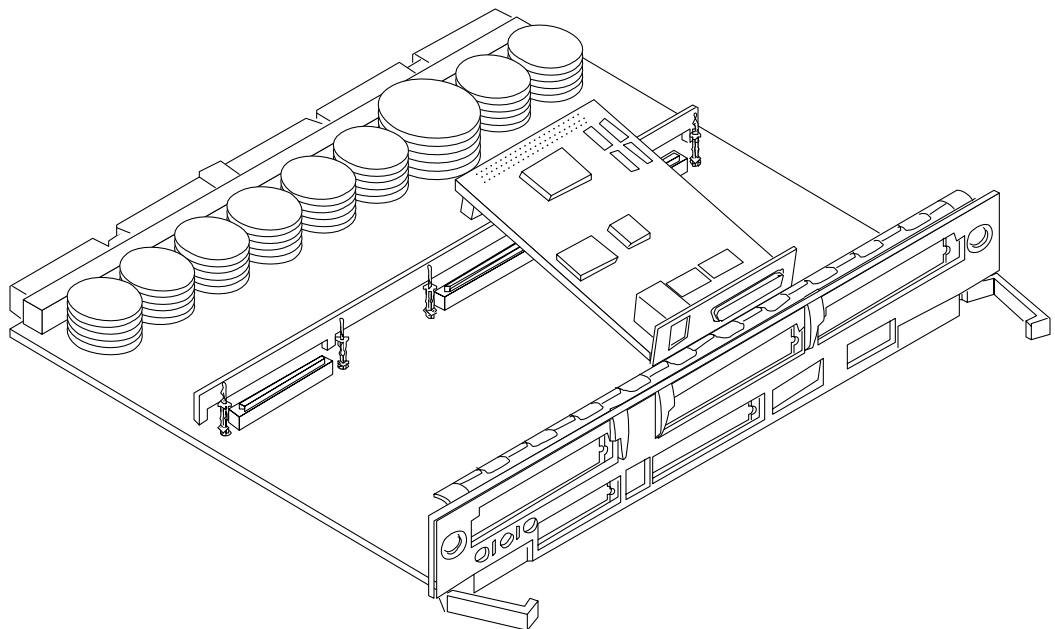


Figure 4-12 Removing or Installing an SBus Card

7. Place the SBus card in an antistatic bag.
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 regulatory compliance.

9. Replace the I/O board. Use the procedures in Section 4.5.3, “Installing a Board.”

4.5.4.3 *Installing an SBus Card*

Note – If the new SBus card does not have an adapter plate or the Link Integrity Test feature, proceed to “Installing an SBus Card” on page 4-22.

Preparing to Install

1. Attach a wrist strap and take the SBus card out of the protective packaging. Place the SBus card on an antistatic mat.
2. Remove the adapter bracket from the SBus card rear panel.
See Figure 4-13. Remove the two screws securing the adapter to the card rear panel (the adapter bracket and the screws are not needed for this installation).

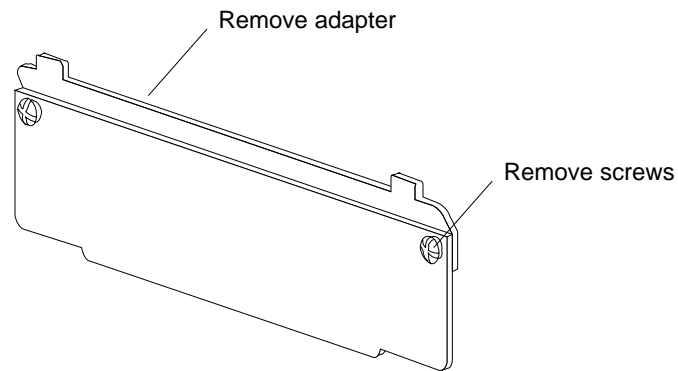


Figure 4-13 SBus Card Rear Panel with Adapter

3. Remove the black plastic card retainer shipped with the card.

See Figure 4-14. Spread the ends of the retainer apart to remove it from the card (the retainer is not needed for this installation).

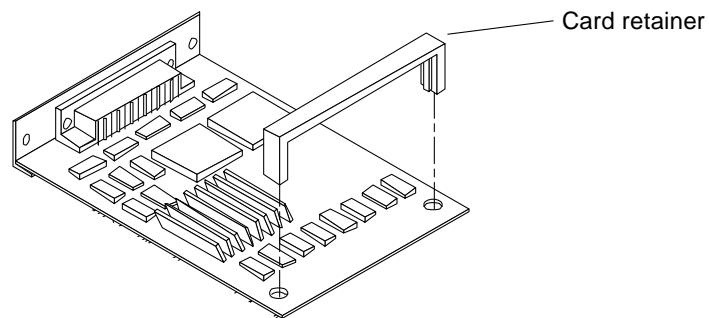


Figure 4-14 Card Retainer

Link Integrity Test

1. Ensure that the SBus card is on an antistatic mat.
2. For DSBE/S and FSBE/S cards: remove the two outer retaining screws (see Figure 4-15), but do NOT remove the middle screw or the springfinger. Use a Phillips #0 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 4-15 (DSBE/S) or Figure 4-16 (FSBE/S).

- a. Put the shunt over both pins to *disable* the Link Integrity Test. See Figure 4-17 “Disabled.”
- b. Put the shunt in one pin to *enable* the Link Integrity Test. See Figure 4-17 “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” problems, check the status of the link enable on both the SBus card and the hub.

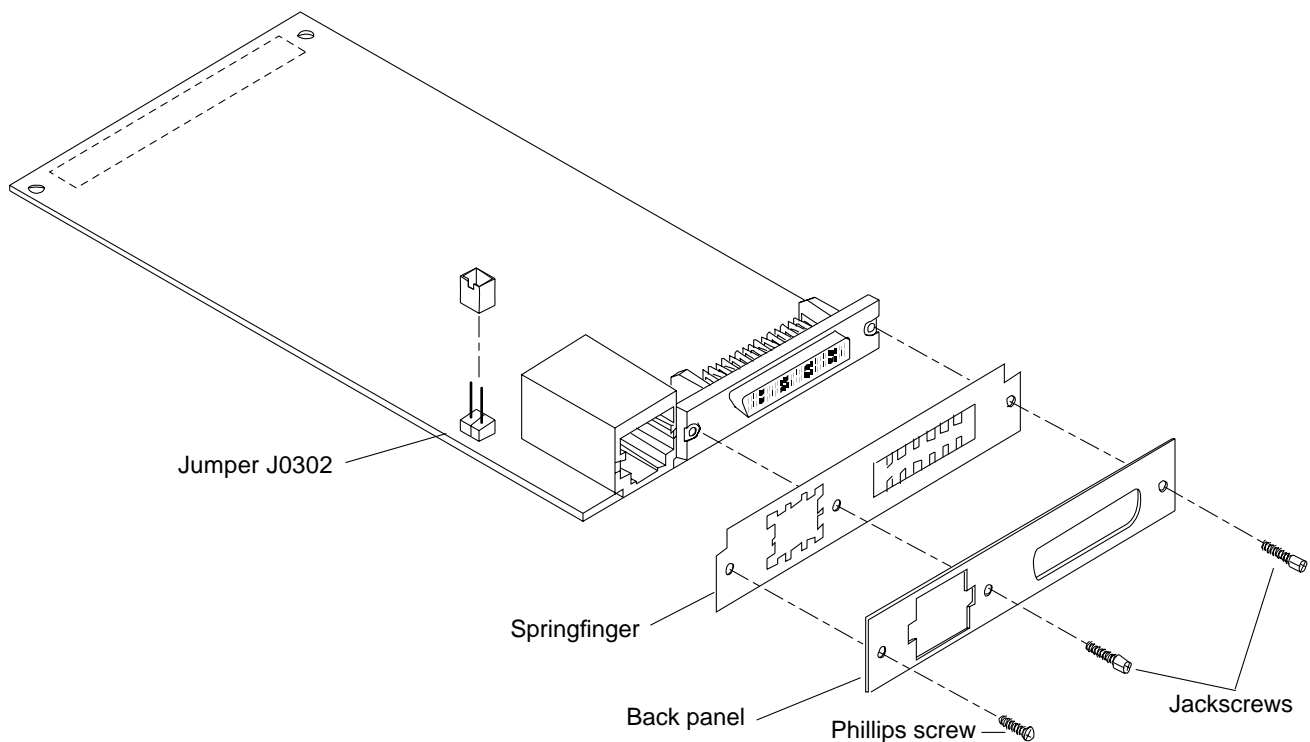


Figure 4-15 DSBE/S SBus Card

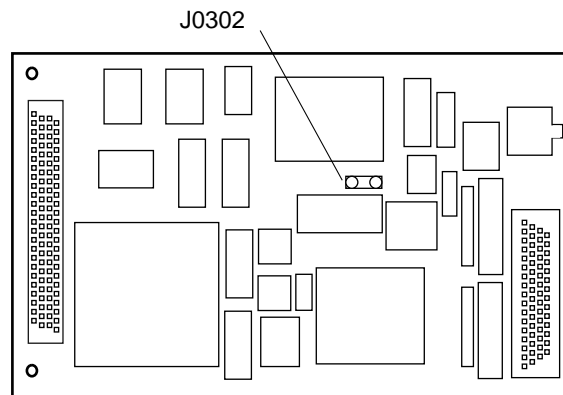


Figure 4-16 FSBE/S SBus Card



Figure 4-17 Disabling and Enabling the Link Integrity Test

Installing an SBus Card

1. Use the procedures in Section 4.5.2, “Removing a Board,” to remove the applicable SBus I/O or Graphics I/O board.
2. Locate the SBus connector that the card is to be installed in.
See Figure 4-10 on page 4-16.
3. If a filler panel covers the front 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 inserts of the two standoffs for the SBus slot.
See Figure 4-11 on page 4-17.

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. **Guide the SBus card face plate under the springfinger and against the rear face of the I/O board front panel.**
The I/O connectors of the SBus card should be visible through the opening in the I/O board front 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 front 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 front 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. See Figure 4-18.

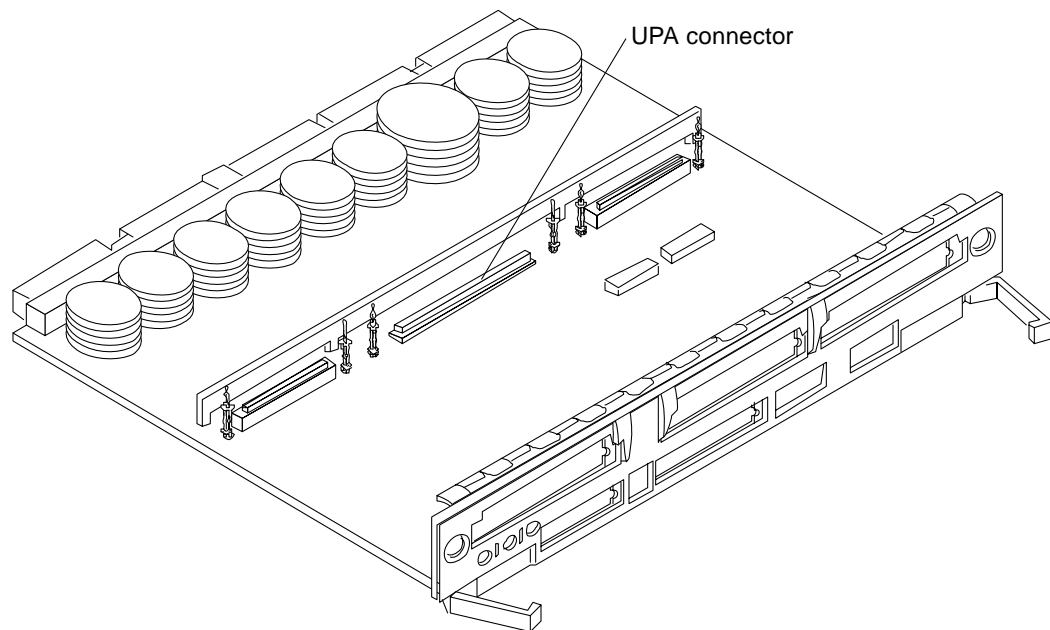


Figure 4-18 Graphics (UPA) Card Connector Location

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.**
See Figure 4-19.
3. **Remove the two screws that secure the card to the 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.**
See Figure 4-11 on page 4-17.
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 front panel opening.**
See Figure 4-19.

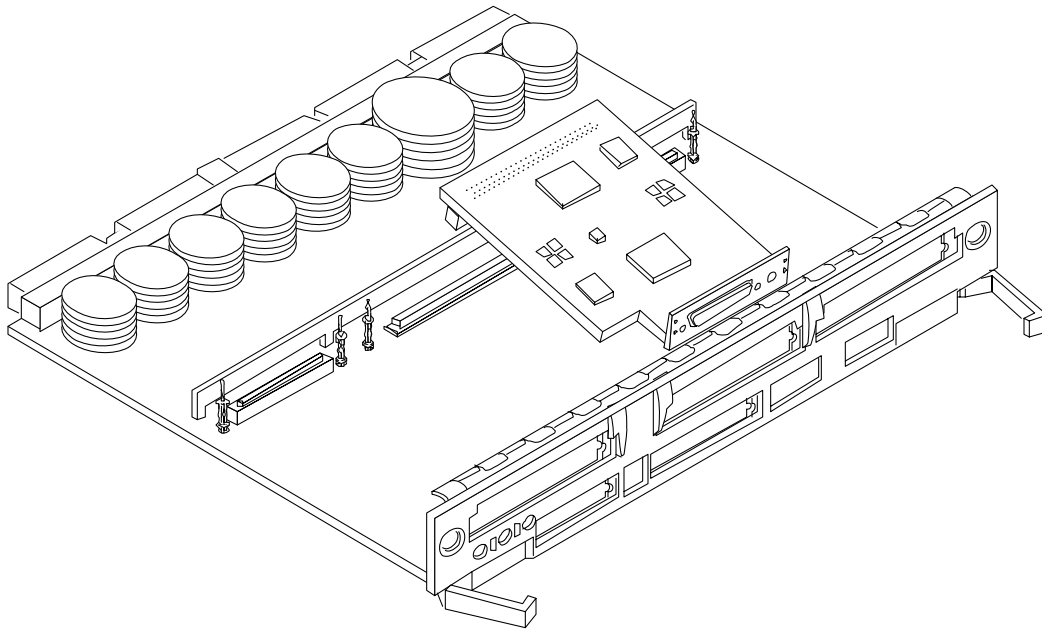


Figure 4-19 Removing or Installing a Graphics (UPA) Card

- 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 front 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 FCC 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.**
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.**
See Figure 4-13 on page 4-20. 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. **Remove the black plastic card retainer shipped with the card.**
See Figure 4-14 on page 4-20. Spread the ends of the retainer apart to remove it from the card (the retainer is not needed for this installation).
5. **Locate the graphics (UPA) connector for the card.**
See Figure 4-18 on page 4-24.
6. **If a filler panel covers the I/O board front 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 front panel, unless the card has a wide connector, or set of connectors.
7. **Unlock the tip inserts for the two standoffs for the graphics (UPA) connector slot.**
See Figure 4-11 on page 4-17.

8. **Hold the card at an angle as depicted in Figure 4-19 on page 4-25. Guide the card face plate under the springfingers and against the rear face of the I/O board front panel.**

The I/O connectors of the card should be visible through the opening in the I/O board front panel once the card is properly positioned.

9. **Hold the card by the edges nearest the graphics (UPA) connector and place the card over the two standoffs.**
10. **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 – Do not rock the card onto the socket; the plastic connector housing may break.

11. **Press each corner of the card to ensure that it rests on the collar of the standoff.**
12. **Press down on the tip insert of each standoff to lock the card in place.**
13. **Replace and tighten the front panel screws to secure the card to the Graphics I/O board front panel.**
See Figure 4-12 on page 4-18
14. **Use the procedures in Section 4.5.3, “Installing a Board,” to replace the Graphics I/O board.**

4.5.6 Fibre Cards

4.5.6.1 Removing a Fibre Card

1. **Use the procedures in Section 4.5.2, “Removing a Board,” to remove the applicable I/O board.**
2. **Locate the card to be removed. See Figure 4-20.**
You may have to remove the SBus cards over or next to this card in order to have enough room to hold onto the fibre card being removed. See Figure 4-21.

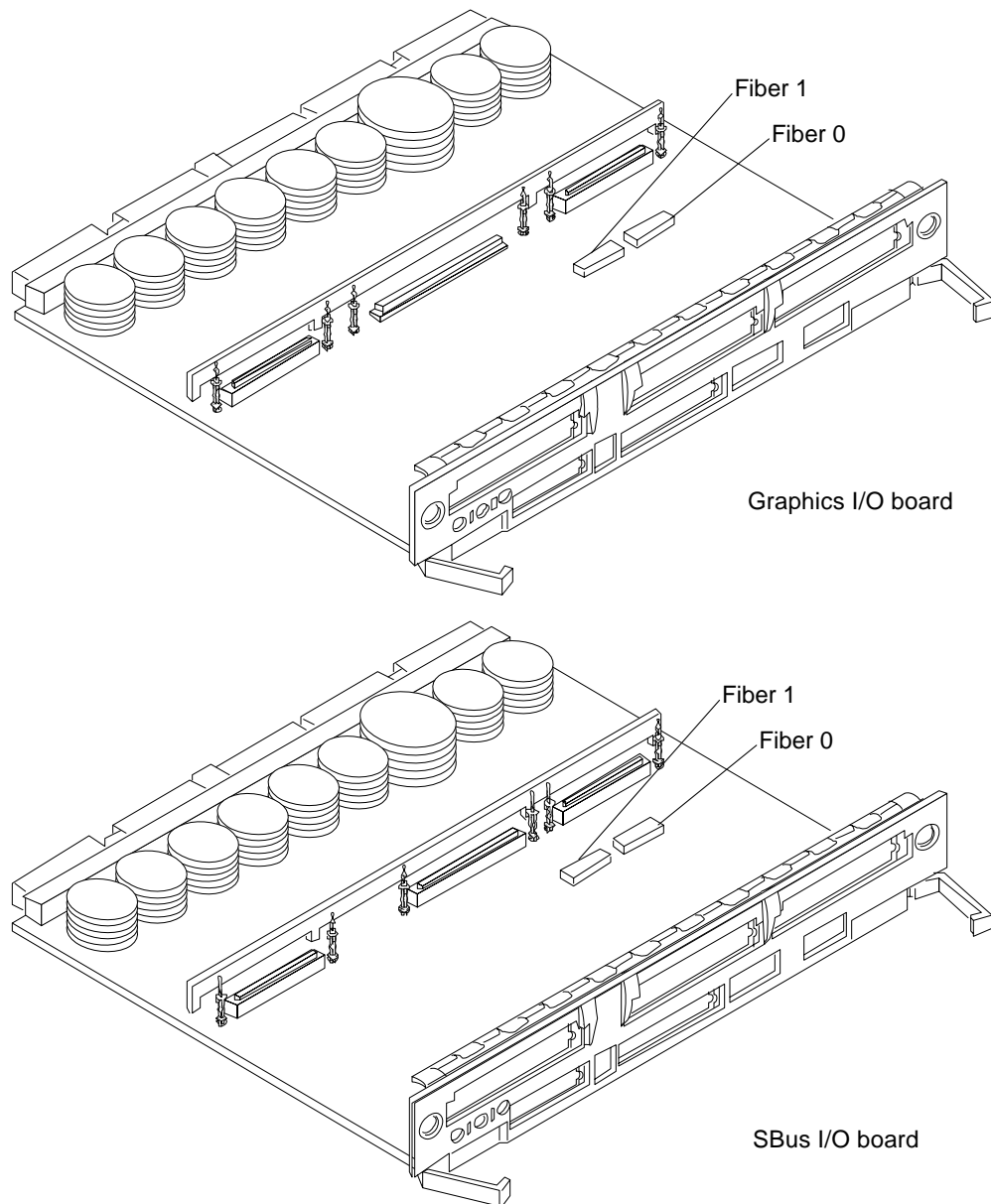


Figure 4-20 I/O Board Fibre Card Connector Locations

Note – There are four plastic standoffs located on the bottom of each card, two on each end. These secure the card once they are inserted into corresponding openings on the I/O board. See detail in Figure 4-21.

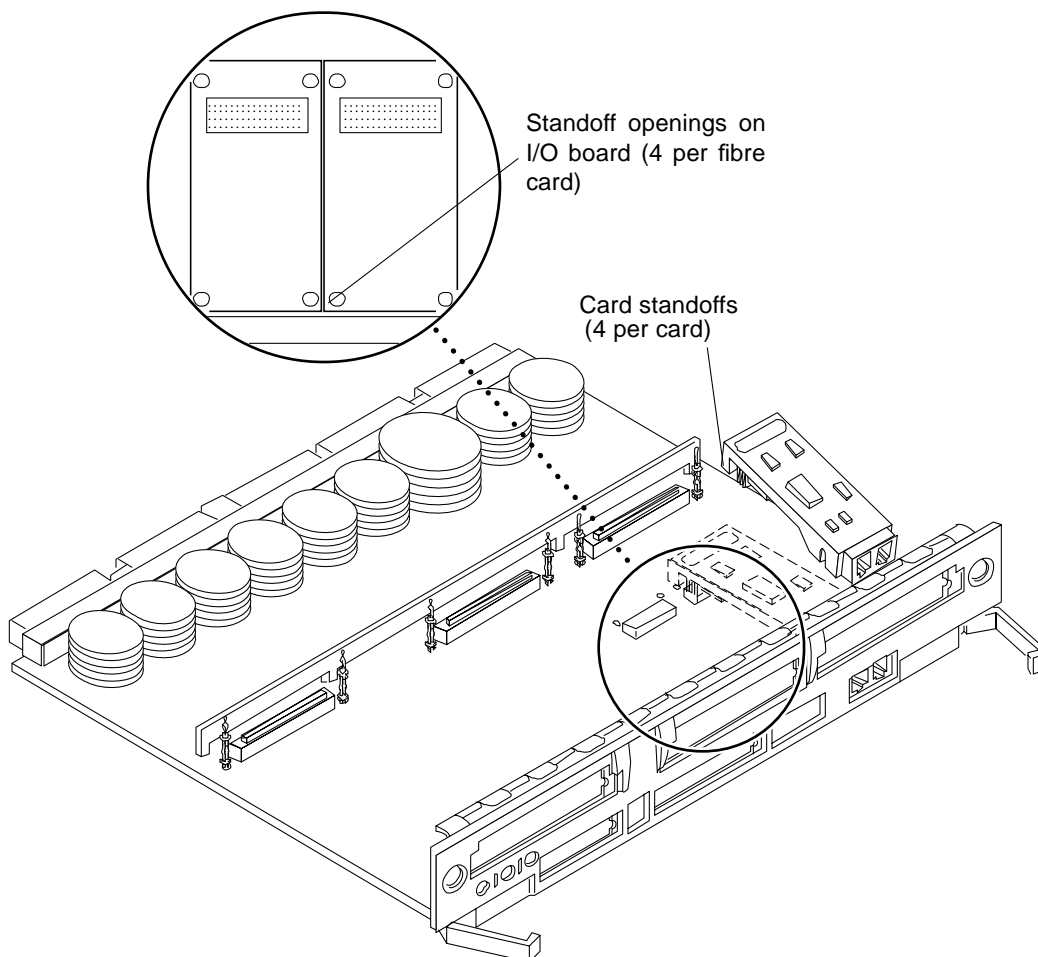


Figure 4-21 Removing or Installing A Fibre Card

3. Unseat the card from the I/O board:
 - a. Grasp the card underneath each corner on the end of the card that connects to the I/O board receptacle (opposite the I/O board front panel end), then firmly unseat the two standoffs as well as the card connector.
 - b. Grasp the card underneath each corner near the I/O board front panel, and then firmly unseat the remaining two standoffs from the I/O board.
4. Once the card standoffs and connector are unseated, hold the card at a slight angle as depicted in Figure 4-21 on page 4-29. Guide the card fiber connector end from the front panel opening on the I/O board.
5. If the fibre card is not immediately replaced, install an OLC plug on the I/O board front panel opening.
6. Use the procedures in Section 4.5.3, “Installing a Board,” to replace the I/O board.

4.5.6.2 *Installing a Fibre Card*

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

Note – If required, remove the OLC plug that protects the fiber optic connector opening on the front panel of the I/O board. These OLC plugs are installed in factory shipped systems without fibre cards installed.

2. **Locate the card slot for installation.**

See Figure 4-20 on page 4-28. You may need to remove the SBus cards over (or next to) this card to have enough room to hold onto the fibre card being installed.

Note – There are four plastic standoffs located on the bottom of each card, two on each end of the card. These secure the card once they are inserted into corresponding openings on the I/O board. See detail in Figure 4-21 on page 4-29.

3. **Hold the card at a slight angle and position it so the fiber connector end is loosely inserted into the I/O board front panel opening.**
4. **Align the card over the I/O board fiber connector receptacle and over the four standoff holes on the I/O board.**
See Figure 4-21 on page 4-29.
5. **Seat the card:**
 - a. **Grasp the card underneath each corner near where the card connects to the I/O board fiber connector receptacle. Firmly seat the card on the connector and on the two adjacent standoffs.**
 - b. **On the end of the card near the I/O board front panel, grasp the card underneath each side and firmly seat the remaining two standoffs.**
6. **Use the procedures in Section 4.5.3, “Installing a Board,” to replace the I/O board.**

Clock Board



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

<i>Safety Precautions</i>	<i>page 2-1</i>
<i>Clock Board</i>	<i>page 5-2</i>
<i>Connectors</i>	<i>page G-11</i>

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 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.

5.2 Clock Board

There is one clock board for each Enterprise 3000 system. See Figure 5-1. 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:

- ConsoleBus
- Clocks
- Reset logic
- JTAG
- Centerplane connector signals

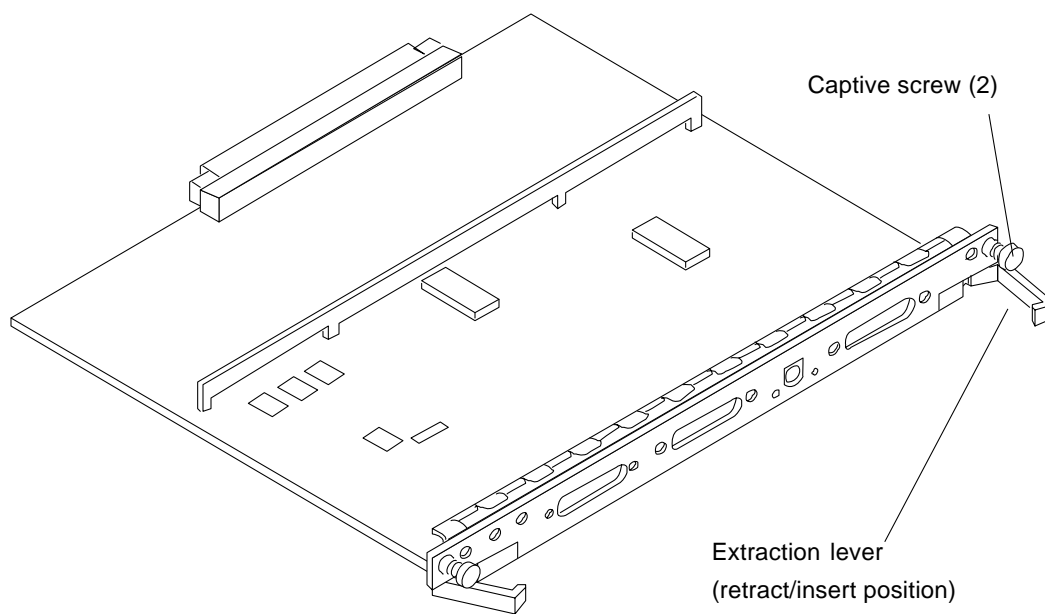


Figure 5-1 Clock Board

Figure 5-2 depicts a block diagram of the subsystems and centerplane connector.

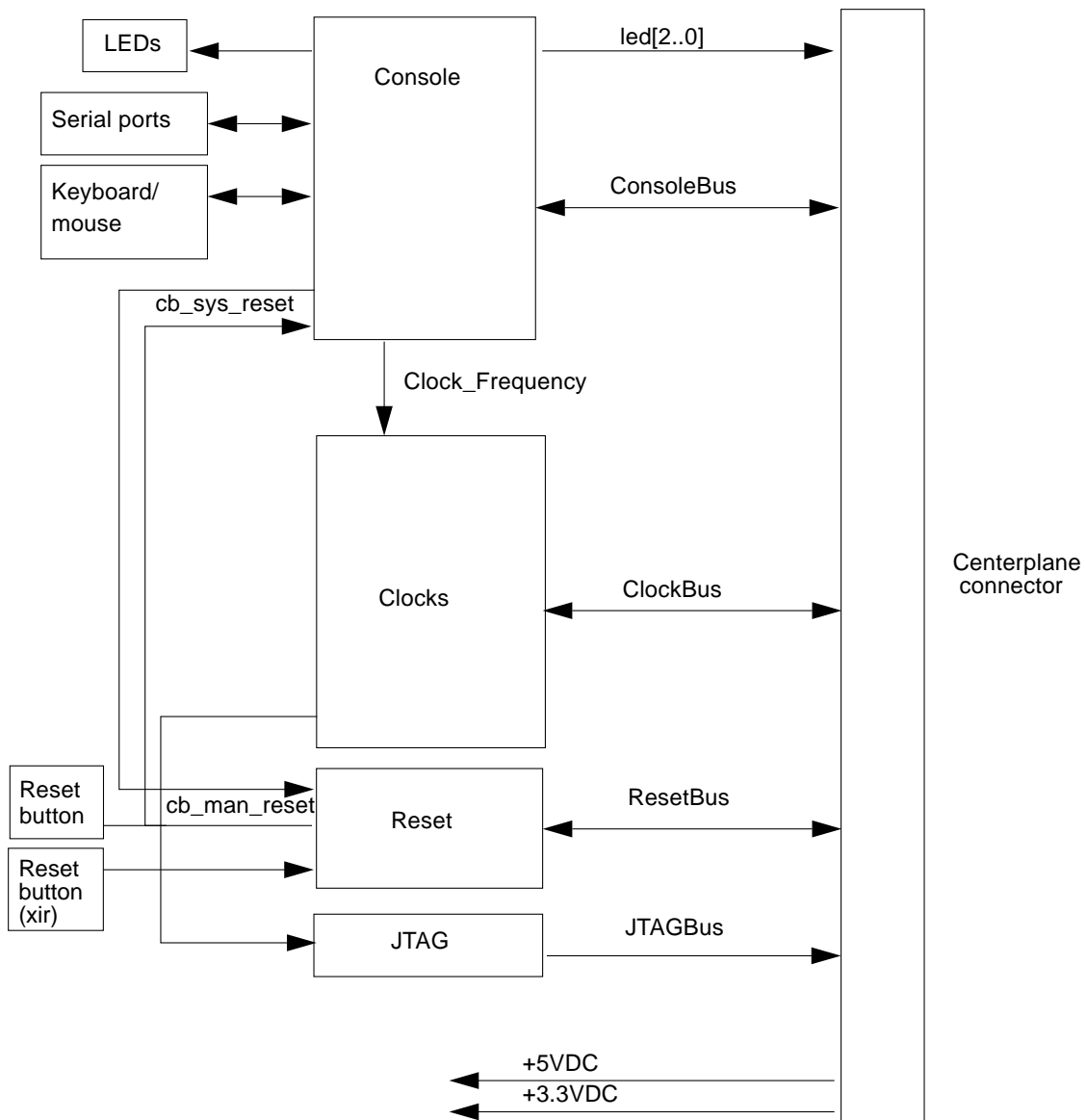


Figure 5-2 Clock Board Simplified Block Diagram

5.2.1 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 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.

5.2.2 Clocks

The clock subsystem generates the clocks for the entire system. The base clock is synthesized and 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 of the board slots on the centerplane.

5.2.3 Reset logic

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

- Manual reset
- System reset
- XIR
- System error

5.2.4 Removing a Clock Board

The clock board slot is located in the system rear, to the right of the board slots. See Figure 5-3.



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

You must halt the operating system before turning off the system power. See Chapter 11, “Powering Off and On” for this procedure.



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

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 board front panel and set them aside.** Label cables to identify them for reconnection later.
3. **Loosen the two captive screws securing the board to the system card cage.**
4. **Pull the ends of both extraction levers outward simultaneously to unseat the board from the centerplane receptacles.**
See Figure 5-1 on page 5-3 to position of the extraction levers.

5.2.5 Installing a Clock Board

The clock board slot is located in the system rear, to the right of the board slots. See Figure 5-3.

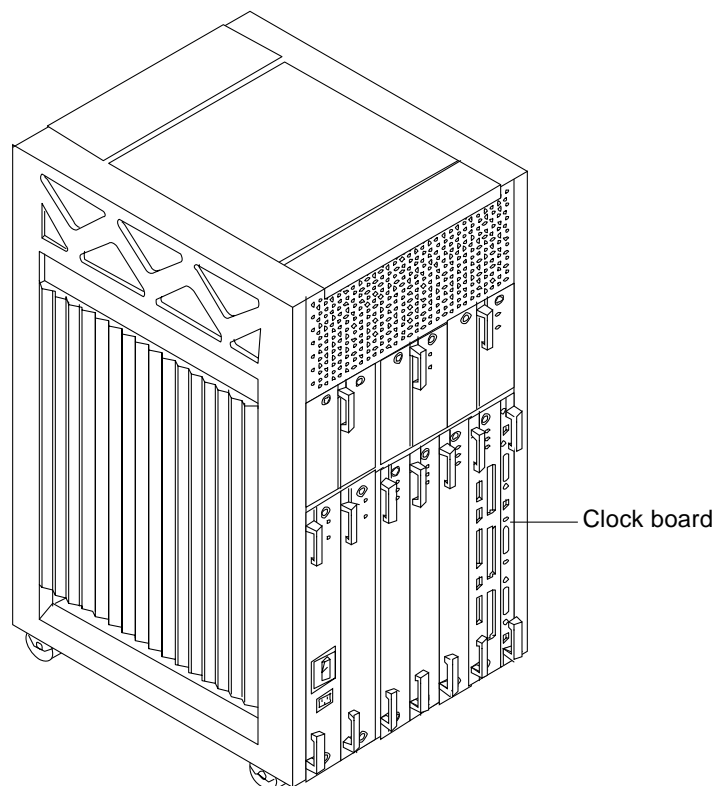


Figure 5-3 Clock Board Location

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 to the right.
- 2. Ensure that both extraction levers are in the outward position as you slide the board toward the backplane connectors.**
See Figure 5-1 on page 5-3 to position the extraction levers. 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 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.**
See Figure 5-1 on page 5-3.
- 5. Connect any applicable interface cables to the system board back panel.**
- 6. Turn on system power.** See Chapter 11, “Powering Off and On,” for this procedure.
- 7. Boot the system.**

Power Supplies



<i>Safety Precautions</i>	<i>page 6-3</i>
<i>Distribution</i>	<i>page 6-3</i>
<i>Peripheral Power Supply</i>	<i>page 6-3</i>
<i>Troubleshooting a Peripheral Power Supply</i>	<i>page 6-4</i>
<i>Replacing a Peripheral Power Supply</i>	<i>page 6-5</i>
<i>Power/Cooling Module (PCM)</i>	<i>page 6-8</i>
<i>Troubleshooting a PCM</i>	<i>page 6-9</i>
<i>Replacing a PCM</i>	<i>page 6-10</i>

This chapter describes the power supplies and environmental sensing and reporting in Enterprise 3000 systems.

There are three types of power supplies:

- a power/cooling module (PCM)
- a peripheral power supply/AC input (PPS/AC [PPS 0])
- an optional peripheral power supply (PPS [PPS 1])

Both the PCM and the peripheral power supply (PPS 1) are hot-pluggable. This feature allows you to physically remove the failed component, despite its being “live,” or being supplied with electrical power. In addition, both may be inserted into a running system.

The PPS/AC (PPS 0) is not hot-pluggable as it incorporates an AC cord and circuit breaker for system input power.

Note – A functioning PPS/AC (PPS 0) provides electrical precharge that is required for the hot-plug of PCMs. The hot-plug replacement of the PPS (PPS 1) does not require electrical precharge. Use the `prtdiag (1M)` command to determine if electrical precharge is available.

Table 6-1 lists the power supply voltages, their uses, and the power supplies that generate them.

Table 6-1 Power Supply Summary

Voltage	Supply	Use
2.0V	PCM	Centerplane termination
3.3V	PCM	CPU/Memory Board, I/O Board, Clock Board UltraSPARC Module (SRAMs, SDBs, CPU I/O)
5V	PCM	SBus Card, Clock Board UltraSPARC Module power (via DC/DC converter)
5V	PPS/AC, PPS	Peripherals (CD drive, tape drive)
12V	PPS/AC, PPS	Peripherals (CD drive, tape drive)

6.1 Safety Precautions

To protect both yourself and the equipment, any servicing of equipment should be performed by qualified personnel. Observe the precautions in Table 6-2.

Table 6-2 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.

6.2 Distribution

In the Enterprise 3000 system, there is at least one peripheral power supply and a PCM slot for each pair of board slots. There is a single alternating current (AC) power cord for the whole system. AC is then 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.

6.3 Peripheral Power Supply

The PPS/AC (PPS 0) in Figure 6-1 and the PPS (PPS 1) in Figure 6-2 provide power to the peripheral subsystems, the remote console, and the drives. Both the PPS/AC (PPS 0) and PPS (PPS 1) incorporate current sharing to operate in redundant and parallel operations. The peripheral power supply/AC input provides three precharge outputs (3.3V, 5V, and 12V) to enable hot plug-in of system boards or PCMs into an active centerplane.

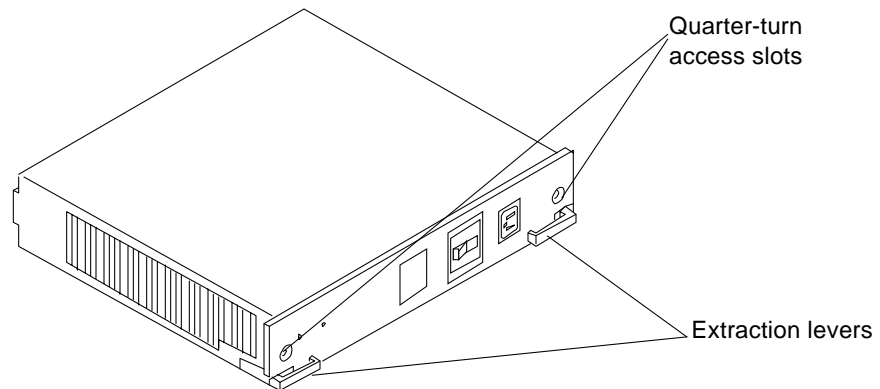


Figure 6-1 Peripheral Power Supply/AC Input

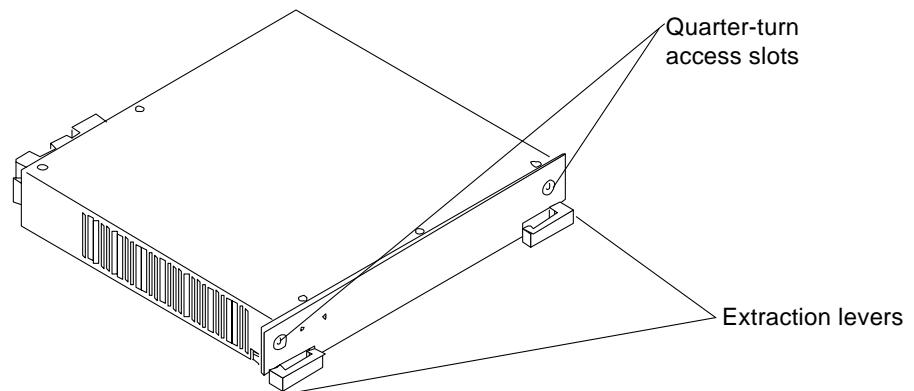


Figure 6-2 Peripheral Power Supply

6.3.1 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 9, “Flow Diagrams for Troubleshooting,” for more information.

6.3.2 Replacing a Peripheral Power Supply



Caution – Remove and replace the peripheral power supply (PPS 1) in a running system (and not in the low power mode). In the low power mode, the front panel and board LEDs are all off, while the yellow LEDs are lit on the power supplies.

Replacing the PPS (PPS 1) during low power mode will cause the system to power on immediately.

1. **If you are replacing the peripheral power supply (PPS 1), skip to Step 3. If you are replacing the PPS/AC (PPS 0), completely power off the Enterprise 3000 system.**

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

2. **Disconnect the AC power cord from the power inlet.**

3. **Mechanically release the power supply from the system chassis by inserting a Phillips #1 screwdriver into each quarter-turn access slot and then turning to the unlocked position.**

See Figure 6-3.

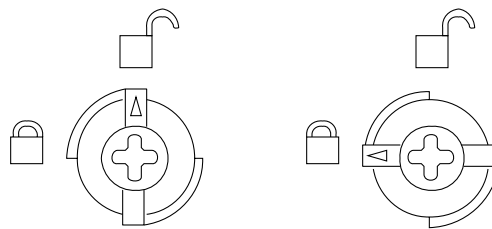


Figure 6-3 Unlocking and Locking Quarter-turn Access Slots

4. **Pull the ends of the extraction levers outward to release the power supply from the centerplane.**

5. Pull out the power supply.

If you are replacing the PPS (PPS 1), you will see a message similar to the following example on your system console:

```
NOTICE: Peripheral Power Supply 1 Removed
```

See Figure 6-4.

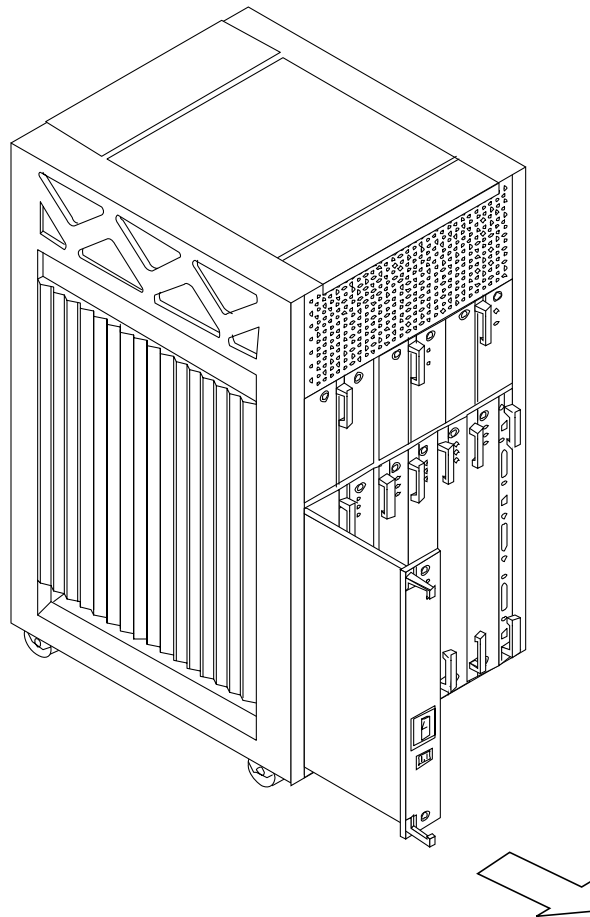


Figure 6-4 Replacing the Peripheral Power Supply/AC Input

6. Carefully insert the replacement power supply in the proper slot using the guide slots.

Ensure that both extraction levers are in the outward position. The power supply will not seat fully unless the levers are in this starting position.

7. Slide the power supply toward the centerplane.

Ensure that the arrows in the quarter-turn access slots point to the unlocked position. See Figure 6-4.



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 any obvious obstructions. Do not damage the springfingers at the bottom of the power supply.

8. Use the extraction levers to seat the power supply.

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.

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

10. If you replaced the PPS/AC (PPS 0), connect the AC cord and power on the Enterprise 3000 system.

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

11. 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 6 to Step 11. If the green LED is still not lit, see Chapter 9, “Flow Diagrams for Troubleshooting” for more information.

If you replaced the PPS (PPS 1), you will see a message similar to the following example on your system console:

```
NOTICE: Peripheral Power Supply 1 Installed
NOTICE: Peripheral Power Supply 1 OK
```

6.4 Power/Cooling Module (PCM)

The PCM in Figure 6-5 provides sufficient power to the system for two boards. In addition, it provides power to two fans that cool the two boards.

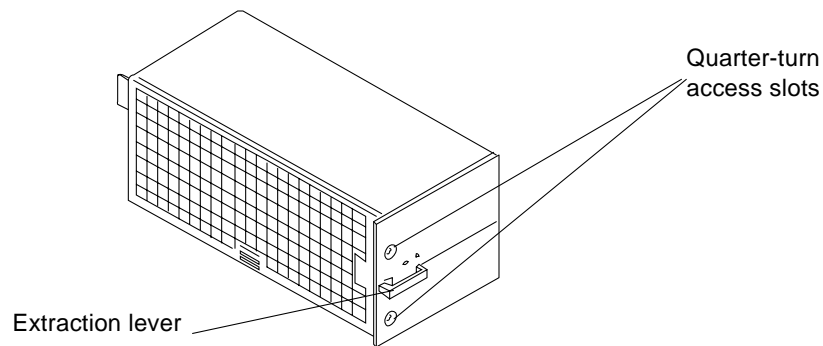


Figure 6-5 PCM

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. A current sharing scheme on the 2.0V, 3.3V, and 5V outputs enable the PCM to operate in a parallel redundant mode. A maximum of three PCMs are used together in the redundant current sharing.

6.4.1 Power Requirements

If a PCM fails, the system boards will continue to be powered and cooled by the other power supplies, provided redundancy (an additional power supply) is present. For example, if an Enterprise 3000 System needs a minimum of two PCMs and three are present, then the system has redundancy. See Table 6-3.

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

Table 6-3 Minimum and Redundant Power Supply Requirements

Number of Boards	Enterprise 3000 System	
	Minimum Number of Working PCMs	Redundant Working PCMs (Hot-pluggable)
1-2	1	2
3-4	2	3

Failed power supplies must be replaced as soon as practical. Otherwise, the Enterprise 3000 system will lose its redundancy and result in an outage at the next PCM failure.

6.4.2 Cooling Requirements

Note – In the Enterprise 3000 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 PCMs incorporate redundant bulk fan power so that the fans continue to operate in a failed power supply via the redundant fan power from the peripheral power supply.

Note – A PCM or an auxiliary fan tray must be working in PCM slot 5. The fans cool the peripheral power supply/AC input.

6.4.3 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 PCM.

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

```
WARNING: Core Power Supply 3 Failing
WARNING: Redundant power lost
```

See Chapter 9, “Flow Diagrams for Troubleshooting,” for more information.

6.4.4 Replacing a PCM



Caution – Remove and replace a PCM in a running system. Do not replace a PCM while the system is in the low power mode. In the low power mode, the front panel and board LEDs are all off while the yellow LEDs are lit on the power supplies.

Replacing a PCM during low power mode causes the PCM to power on immediately and result in a severe overload condition for that PCM (the other PCMs remain in the low power mode).



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

Note – Remember the following when attempting the hot-plug replacement of a PCM:

- The peripheral power supply/AC input (PPS 0) is providing precharge.
- There is (power) redundancy in the system.

Use the `printdiag (1M)` command to determine if precharge current is present.

1. **Mechanically release the power supply from the system chassis by inserting a Phillips #1 screwdriver into each quarter-turn access slot and then turning to the unlocked position.**
See Figure 6-6.

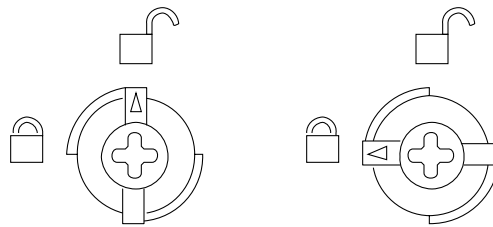


Figure 6-6 Unlocking and Locking Quarter-turn Access Slots

2. **Pull the end of the extraction lever outward to release the power supply from the centerplane.**
3. **Pull out the power supply.**
You will see a message similar to the following example on your system console:

NOTICE: Core Power Supply 5 Removed

See Figure 6-7.

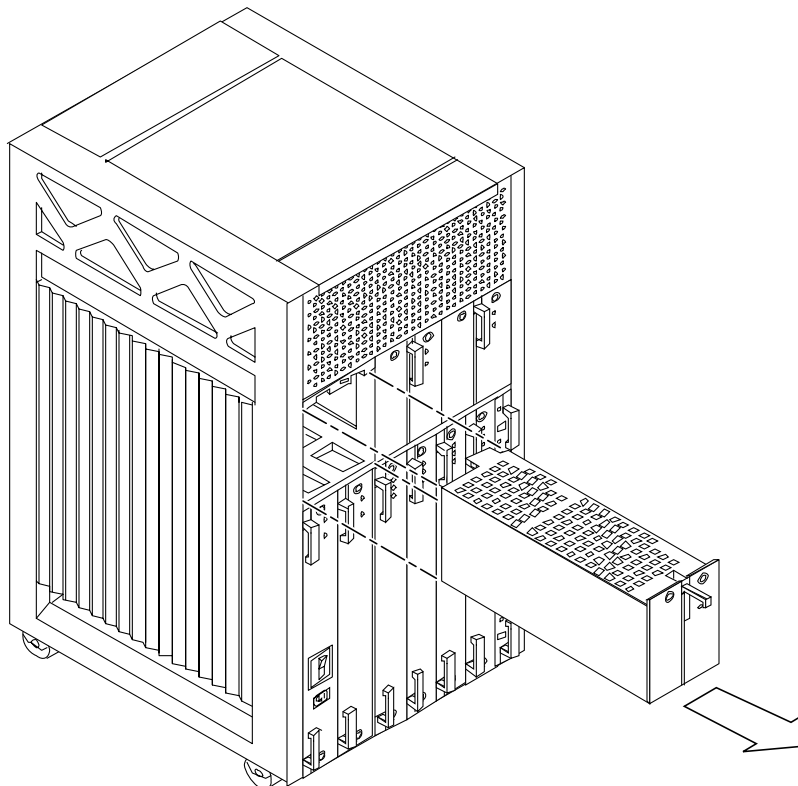


Figure 6-7 Replacing a PCM in the Enterprise 3000 System

4. Carefully insert the replacement power supply in the proper slot.

- Orient the PCM with the extraction lever on the outside edge of the Enterprise 3000 system.
- Ensure that the extraction lever is in the outward position. The power supply will not seat fully unless the lever is in this starting position.

5. Slide the power supply toward the centerplane.

Ensure that the arrows in the quarter-turn access slots point to the unlocked position. See Figure 6-7.



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 any obvious obstructions. Do not damage the springfingers at the bottom of the power supply.

6. 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. Mechanically lock the power supply 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 6-6.

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 4 to Step 8. If the green LED is still not lit, see Chapter 9, “Flow Diagrams for Troubleshooting” for more information.

If the green LED is lit, you will see a message similar to the following example on your system console:

```
NOTICE: Core Power Supply 5 Installed
NOTICE: Core Power Supply 5 OK
NOTICE: Redundant power available
```


Internal SCSI and Storage Devices



<i>Tape and CD-ROM Drive</i>	<i>page 7-2</i>
<i>Disk Drives</i>	<i>page 7-5</i>

The following SCSI and storage devices are supported in an Enterprise 3000 system:

- CD-ROM Drive
- Tape Drive
- Internal SCSI Disks

Figure 7-1 shows the location of the system internal SCSI and storage devices.

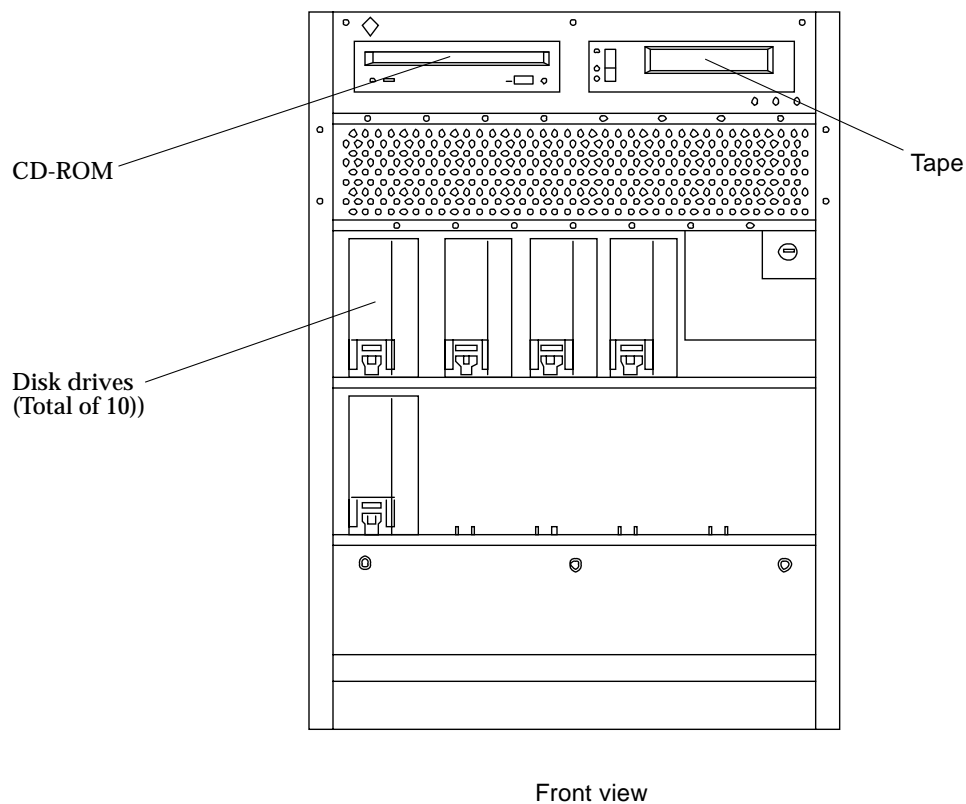


Figure 7-1 Internal SCSI and Storage Device Locations

7.1 Tape and CD-ROM Drive

7.1.1 Use and Maintenance

Refer to the documentation that came with your device for information on use and maintenance.

7.1.2 Removing/Replacing a Tape or CD-ROM Drive

1. Remove the front bezel.

a. Grasp the front bezel on both sides near the center.

Place your thumbs on top of the front bezel and place your other fingers at the slight indentations under the front bezel for leverage.

b. Pull the front bezel straight out toward you and set it aside.

See Figure 7-2

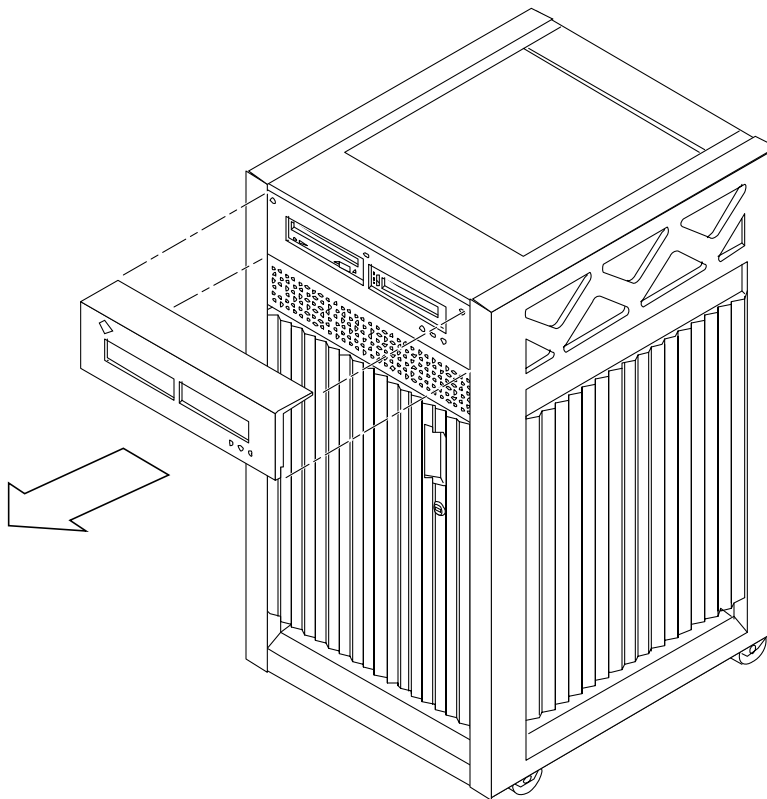


Figure 7-2 Front Bezel

2. Loosen the bottom two captive screws that secure the SCSI tray to the chassis tray.
See Figure 7-3.
3. Use a screwdriver in the notch at the bottom center of the tray to assist in separating the SCSI tray from the rear slip connectors. Remove the devices with the tray.

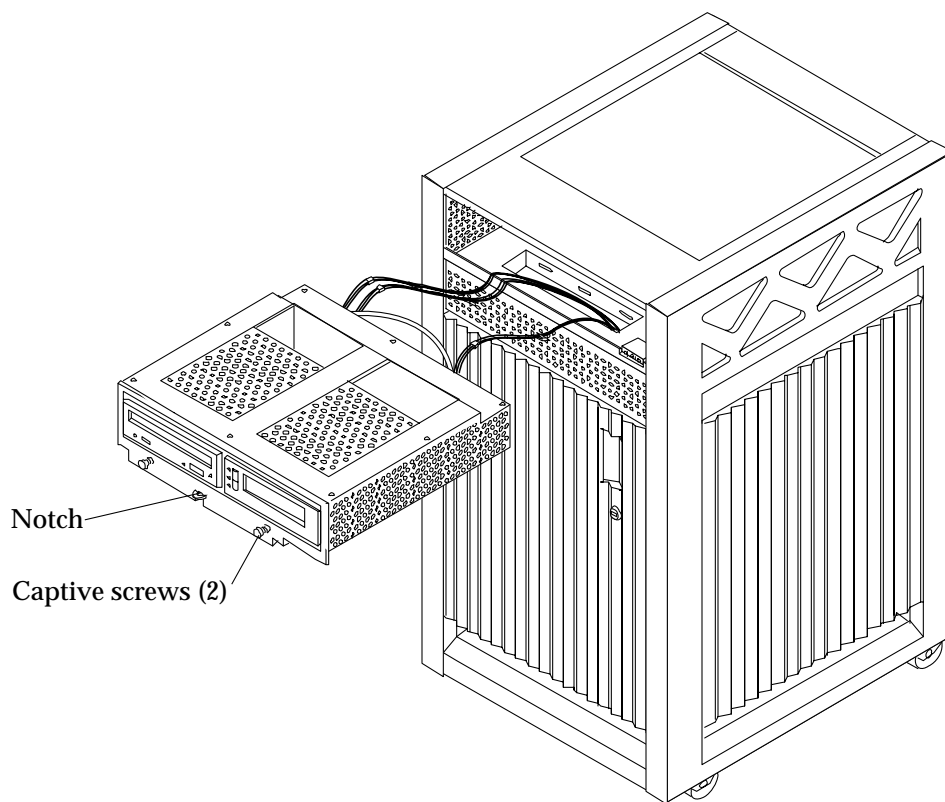


Figure 7-3 SCSI Tray Removal and Replacement

4. To access the devices in the SCSI tray, remove the seven screws on top of the tray and remove the top panel.
To remove and replace an existing device, perform Step 5. To install a tape drive for the first time, proceed to Step 6.

5. To 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, 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 through Step 4.

Note – For cooling purposes the tape must be installed on the side nearest the keyswitch.

6. To install a tape for the first time, remove the filler mechanism:

- a. Remove the filler mechanism by loosening the three captive screws and then removing the unit.
- b. Separate the filler from what will become the device mounting plate by loosening and then removing the four screws; discard the remaining filler portion.
- c. Secure the mounting bracket to the new device.
- d. Set the SCSI address to 5.
- e. Secure the device with the mounting bracket to the SCSI tray using the three captive screws.
- f. To complete the install, reverse Step 1 through Step 4.

7.2 Disk Drives

An Enterprise 3000 system supports up to 10 single connector 3.5" hard disk drives of the 1.0" form factor or 10 drives of the 1.6" form factor.

7.2.1 Use and Maintenance

Refer to the documentation that came with your device for instructions on use and maintenance.

7.2.2 Removing a Disk Drive



Caution – Prior to performing the following procedure, ensure that you perform any necessary software tasks. Failure to perform any necessary software tasks prior to removing or replacing a disk drive may result in loss of data.

Note – Disk drives used in Enterprise 3000 systems have a retainer mechanism that doubles as an extraction handle.

1. To access the disk drives, open the system front door.
See Figure 7-4.

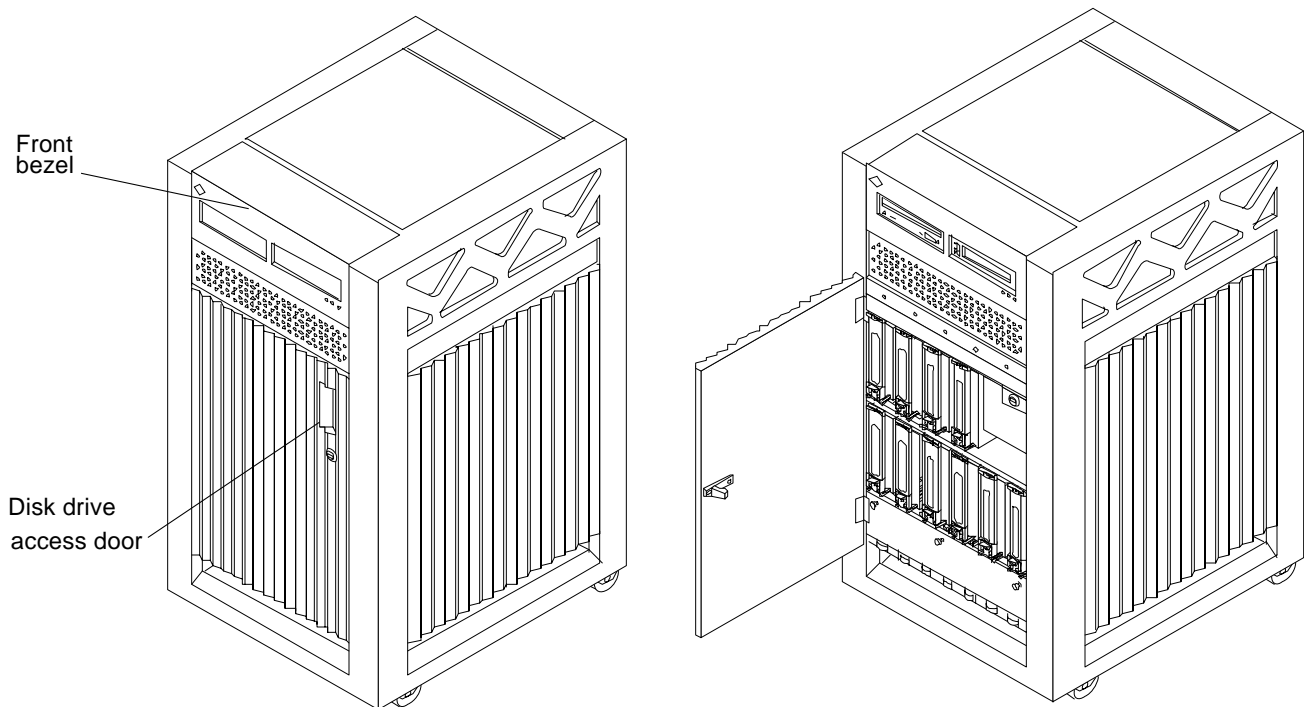


Figure 7-4 Disk Drive Access

2. Locate the drive to be replaced.

See Figure 7-5.



Caution – You must wear a wrist strap when handling disk drives to prevent harmful electrical discharge that can damage the system components.

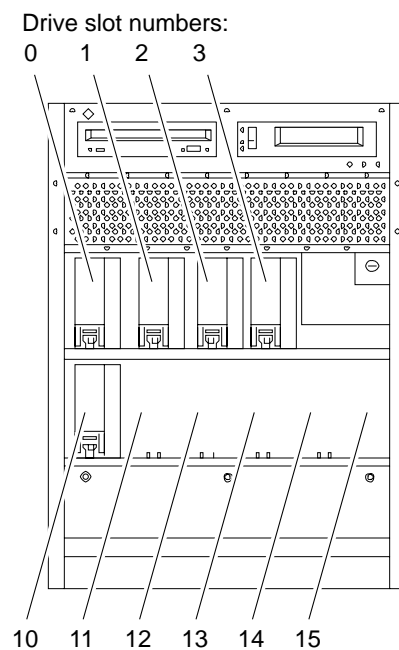


Figure 7-5 Disk Drive Slot Locations

Note – The disk drive retainer must be unlatched and then extended 90 degrees, to a horizontal position, for a drive to be removed or replaced in the system chassis.

3. **Unlatch the drive retainer and extend it 90 degrees to a horizontal position.**
See Figure 7-6.

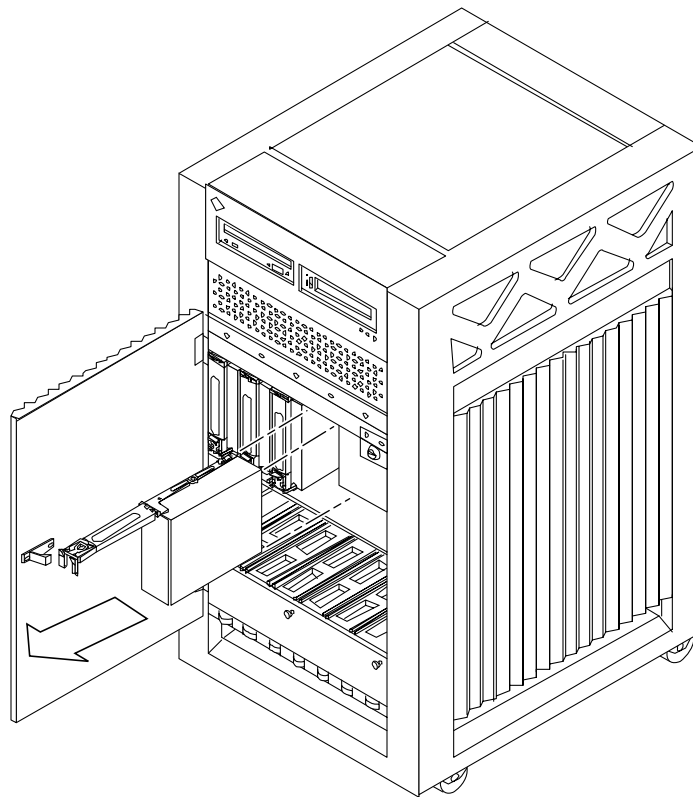


Figure 7-6 Disk Drive with Retainer Unlatched and Extended

4. **Using the extended retainer as a handle, gently but forcefully pull outward to disengage the drive connections at the rear of the drive.**
Once the drive is partially removed from the mounting rails, grasp the bottom of the drive to aid in removal.
5. **If the drive is to be replaced, proceed to the next section.**

7.2.3 Installing a Disk Drive

- 1. Attach a grounding wrist strap.**

Refer to the documentation that came with your ESD kit.



Caution – You must wear a wrist strap when handling disk drives to prevent harmful electrical discharge that can damage the system components.

- 2. Remove the disk drive from its protective packaging and place it on an ESD mat.**

Note – The drive retainer must be unlatched and extended to the horizontal position in order for the drive to be inserted into the system chassis guide rails.

- 3. Unlatch and then extend the drive retainer to a horizontal position as shown in Figure 7-6.**

Use the extended retainer as a handle to gently guide the drive so that the plastic rails on the top and bottom of the drive slide in to the drive mounting rails in the system chassis.

- 4. Once the connector on the rear of the drive is positioned against the centerplane connector, gently compress the face of the drive and force the connectors together.**

You should hear a click as the connectors come together.

Note – Disk drive SCSI IDs are automatically selected when a drive is placed in a disk drive slot. The disk drive ID for the corresponding slot is marked on the system chassis.

- 5. Latch the drive retainer into place.**

Check that the retainer on the disk drive is latched into place when closed, and does not extend past the edge of the chassis.

If the retainer extends past the edge of the chassis or will not fully latch, the disk drive connector is not joined with the centerplane connector. Do the following:

- a. Unlatch the drive retainer and extend it to a horizontal position.**

- b. Do not remove the drive; instead, use the retainer as a handle to slide it out an inch or two.**
- c. Check that the connectors are not broken and that nothing blocks the joining of the two connectors.**

Put the disk drive back into its protective packaging and contact your service representative if there is still a problem.

Troubleshooting Overview



8.1 Using a Terminal

If your system does not normally have a terminal, you may find it useful to attach a console terminal directly to the system for troubleshooting.

Note – Alternatively, you can log in remotely through a network. You can also control the system remotely through a modem and a system serial port.

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. See Figure 8-1.
- 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. Power on the system and reboot.

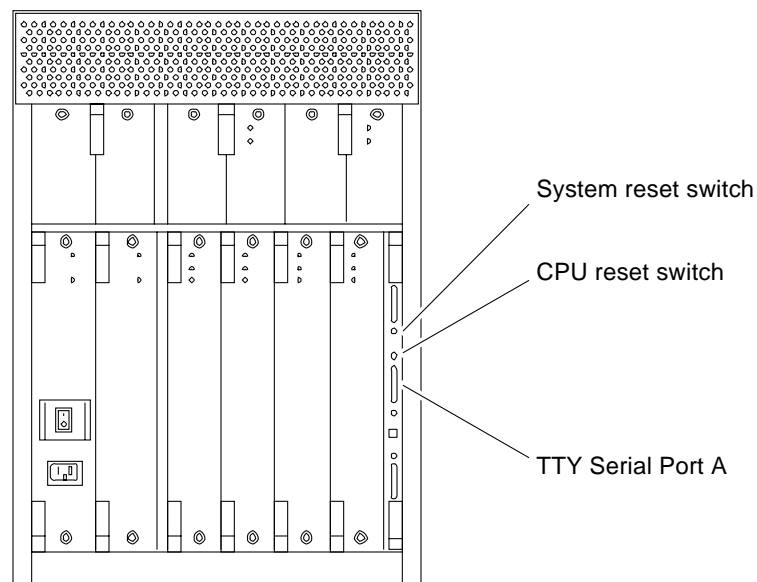


Figure 8-1 Details of the Clock Board

8.2 Reset Switches

In the event that the system hangs, reset the system by pressing the system reset switch (marked ◁) on the clock board. See Figure 8-1.

A second button, the CPU reset switch (marked (CPU) ◁), is useful during software debugging.

8.3 Hardware Indicators

Many LEDs are used to indicate the status of the system.

Figure 8-2 shows the location of the front panel LEDs. In normal operation, two green LEDs are lit. The left green LED, marked with a short vertical bar (|), represents system power. The right green LED, marked with a rotating circle (⦿), shows that the system is running or running normally. When lit, the middle (yellow) LED, marked with a wrench (🔧), signifies that a hardware failure has occurred and service is required.

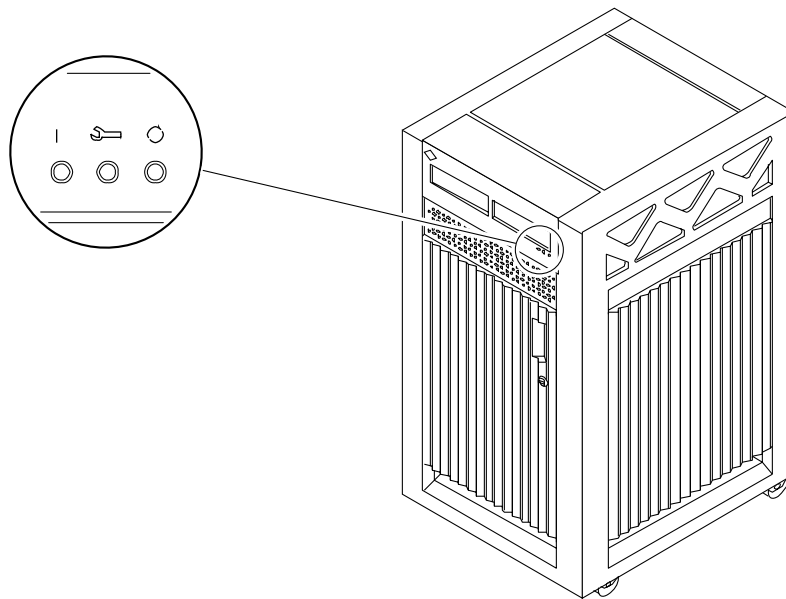





Figure 8-2 Front Panel LEDs

Table 8-1 lists the LED codes for the system front panel.

Table 8-1 System Front Panel LED Codes

Power 	Service 	Running 	Condition
Off	Off	Off	System has no power.
Off	On	Off	Failure mode.
Off	Off	On	Failure mode.
Off	On	On	Failure mode.
On	Off	Off	System is hung, either in POST/OpenBoot or in the operating system.
On	Off	On	Hung in OS.
On	On	Off	(1) Hung in POST/OBP or (2) hung in OS and failed component on board.
On	On	On	(1) Hung in POST/OBP or (2) hung in OS and failed component on board.
On	Off	Flash	OS running.
On	On	Flash	OS running and failed component on board.
On	Flash	Off	Slow flash = POST. Fast flash = OBP.
On	Flash	On	Undefined.

8.3.1 Clock Board LEDs

The three LEDs on the clock board indicate the status of the system. The LED codes are the same as for the front panel, except that the first or top symbol differs slightly. On the clock board the first LED is marked with this symbol  to indicate that the board is receiving electrical power.

8.3.2 CPU/Memory and I/O Board LEDs

The CPU/Memory and I/O boards also have three LEDs. Most of the codes for the CPU/Memory and I/O board LEDs are similar to codes for the system and clock board LEDs. The major exception is the second code (Off-On-Off). For hot-pluggable boards, this code indicates that the board is in low power mode and is ready to remove.



Caution – If the Running LED is lit or flashing, do not remove the board. Electrical shorting will result, damaging the board and the system.

To summarize for the CPU/Memory and I/O boards:

- If no LEDs are lit, there is no electrical power to the board.
- If the green LEDs (⊙ and ⊙) are not lit, the board is ready for removal.
- If no LEDs are flashing, the system is hung.
- The board requires service if the yellow Service LED is lit continuously (not flashing). Note that it is a normal condition for the Service LED to flash during POST testing.

Table 8-2 lists all LED codes for the CPU/Memory and I/O boards.

Table 8-2 LED Codes for the CPU/Memory and I/O Boards

Power ⊙	Service ⚡	Running ⊙	Condition
Off	Off	Off	Board has no electrical power.
Off	On	Off	Board is in low power mode, can be unplugged.
Off	Off	On	Undefined.
Off	On	On	Undefined.
On	Off	Off	System is hung, either in POST/OpenBoot or in the operating system.
On	Off	On	Hung in OS.
On	On	Off	(1) Hung in POST/OBP or (2) hung in OS and failed component on board.
On	On	On	(1) Hung in POST/OBP or (2) hung in OS and failed component on board.
On	Off	Flash	OS running.
On	On	Flash	OS running and failed component on board.
On	Flash	Off	Slow flash = POST. Fast flash = OBP.
On	Flash	On	Undefined.

8.3.3 Power Supplies

There are several types of power supply modules, but all have two LEDs. The locations of the green (power) LED and the yellow (service) LED vary according to the module type.

8.3.3.1 Peripheral Power Supplies

The system has one peripheral power supply/AC unit (PPS/AC), and may also have the optional auxiliary peripheral power supply (PPS). If the auxiliary PPS is not installed, the slot contains a filler panel.

On both the PPS/AC and the PPS, the green Component Power LED is located above the yellow Service LED. The Component Power LED is lit when the power supply is operating, but does not necessarily indicate that the DC outputs are fully within specification. The yellow Service LED is lit when a DC power output has failed or a voltage level is out of specification.

8.3.3.2 Power/Cooling Modules

The system has up to three power/cooling modules (PCMs).

On the PCM, the green Component Power LED is located below the yellow Service LED. Table 8-3 summarizes the LED codes for the PCM.

Table 8-3 PCM LED Codes

Component Power (●)	Service (●)	Condition
Off	Off	No AC input
On	Off	Normal operation
On	On	A fan has failed
Off	On	One or more DC outputs have failed or the voltages are out of specification

8.3.4 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.

8.4 Card Cage Slot Information

When installing a board, remember:

Slot numbers	Board slots are located to the left of the clock board. Board slots are numbered 1, 3, 5, 7 ¹ , from right to left. See Figure 8-3.
Slot functions	Slot 1 must contain an I/O board, connected to the boot disk. Aside from the requirement for the I/O board, all four card cage slots are equivalent.

1. See Section D.1, "Card Cage," for an explanation of the slot numbering.

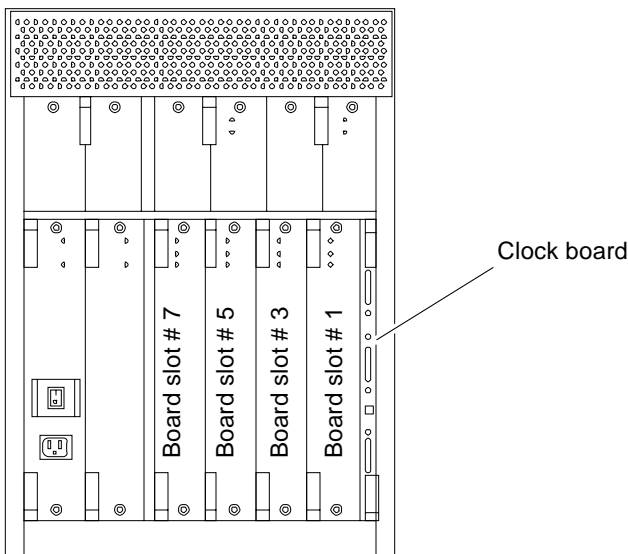


Figure 8-3 Slot Numbers for the Card Cage

For a more complete set of rules for configuring the system, see Appendix D, "Rules for System Configuration."

8.5 Diagnosing Problems and Taking Action

8.5.1 Servicing Obvious Problems

If the Service LED on the system front panel (or the clock board) indicates a hardware failure, find the failing module by looking for a lit Service LED on the individual module.

The system contains a number of hot-pluggable modules. Under limited conditions, these modules can be removed and replaced while the system continues running. (For a general description of the hot-plug feature, see Section 3.3, “Hot-Plug Feature.”)

The hot-pluggable modules include these types: CPU/Memory board, SBus I/O board, Graphics I/O board, and PCM.



Caution – The hot-plug feature requires a functional peripheral power supply. If the peripheral power supply cannot provide current, the hot-pluggable module will be damaged if you attempt to remove or replace it.

If a module fails and there are redundant resources in the system, it may be safe to leave the module in a running system until a replacement part is delivered. For example, if a CPU fails (as indicated perhaps by system messages), but other CPUs continue to function in the system, you can leave the CPU/Memory board in place until a replacement CPU is available. Note that it is particularly helpful to leave a module in place if you do not have a filler panel to replace it.

If you choose to remove a faulty board or PCM, remember that you must fill the vacated slot with a replacement or a filler panel to prevent the system from overheating.

8.5.2 Troubleshooting Less Obvious Problems

When board LED codes do not specify the failing hardware, several types of software programs are available to supply information about the problem. This software includes the SunVTS™ program, the `prtdiag` command, the `prtenv` command, POST and OpenBoot PROM commands, and the SyMON™ program.

8.5.2.1 *SunVTS*

Run SunVTS under the Solaris operating environment, or equivalent.

The SunVTS on-line validation test suite is designed to stress test Sun hardware. 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.

8.5.2.2 *prtdiag Command*

You can use the `prtdiag` command to display:

- System configuration, including information about:
 - Clock frequencies
 - CPUs
 - Memory
 - I/O card types
- Diagnostic information
- Failed field replaceable units (FRUs)

Refer to the `prtdiag` man page for instructions.

8.5.2.3 *History Log Option*

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

8.5.2.4 *Running prtdiag*

To run `prtdiag`, type:

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

or use the `log` option:

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

8.5.3 *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 and I/O 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 PCM is added to the card cage after the system has booted, the new PCM will not work until the system is rebooted, at which time POST reconfigures the system, using the PCMs that are found in the system at that time.

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:

8.5.3.1 `showdevs` *Command*

Use the `showdevs` command to list the devices that are included in the system configuration.

8.5.3.2 `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 8.6.1, “Failure of Network Communications,” for further details.

8.5.3.3 `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.

8.5.3.4 *Reference Documents for POST/OpenBoot*

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

8.5.4 *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* manual, part number 802-5355, for starting and operating instructions.

8.6 *Specific Problems and Solutions*

8.6.1 *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.

Remember also that the TPE and MII ports are not independent circuits and as a result, both ports cannot be used 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 onboard 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— 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 — 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.

8.6.2 Using 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 8-4 Remote Console Commands

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

Key:
 Return = ASCII 0d hexadecimal,
 ~ (tilde) = 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

9

This chapter discusses solutions for these subjects:

<i>No AC/DC Power</i>	<i>page 9-2</i>
<i>System Cannot Boot</i>	<i>page 9-3</i>
<i>Defective CPU/Memory Board</i>	<i>page 9-4</i>
<i>Defective I/O Interface Board</i>	<i>page 9-5</i>
<i>Defective Disk Drive</i>	<i>page 9-6</i>
<i>Defective Power Supplies</i>	<i>page 9-7</i>
<i>Defective Clock Board</i>	<i>page 9-8</i>

9.1 No AC/DC Power

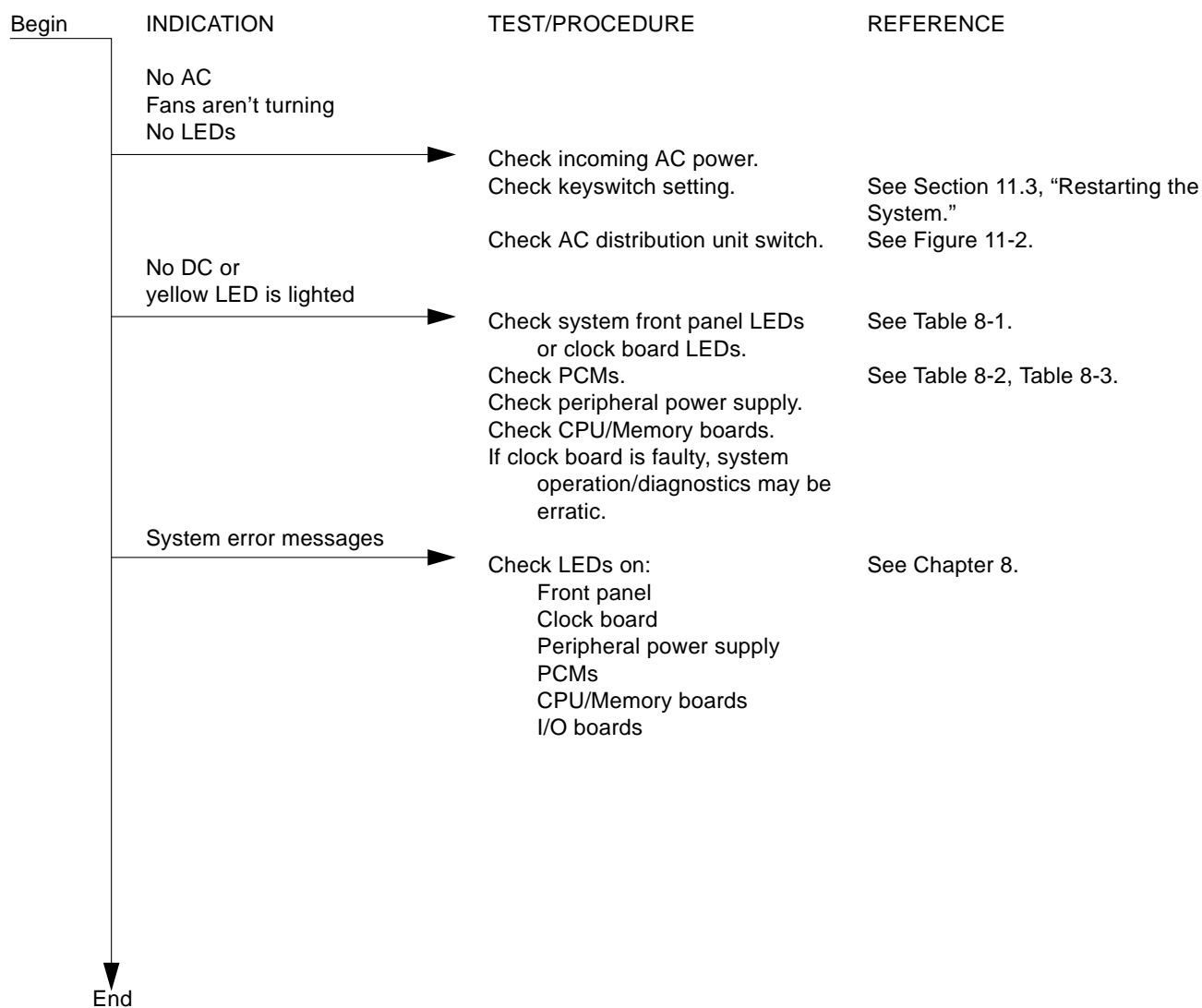


Figure 9-1 Diagnosing AC/DC Power Problems

9.2 System Cannot Boot

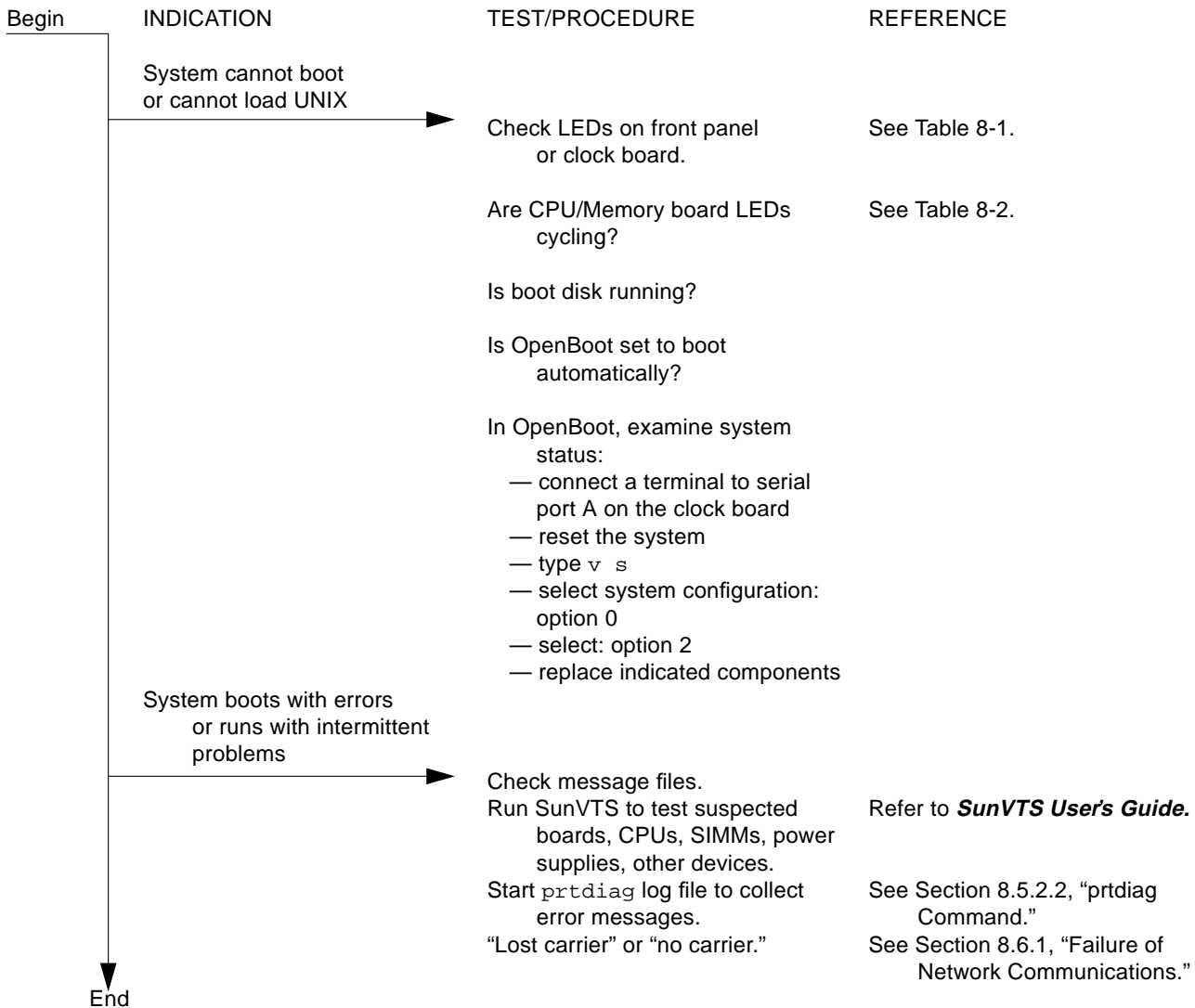


Figure 9-2 Diagnosing Operating System Problems

9.3 Defective CPU/Memory Board

CPU/Memory boards are hot-pluggable.

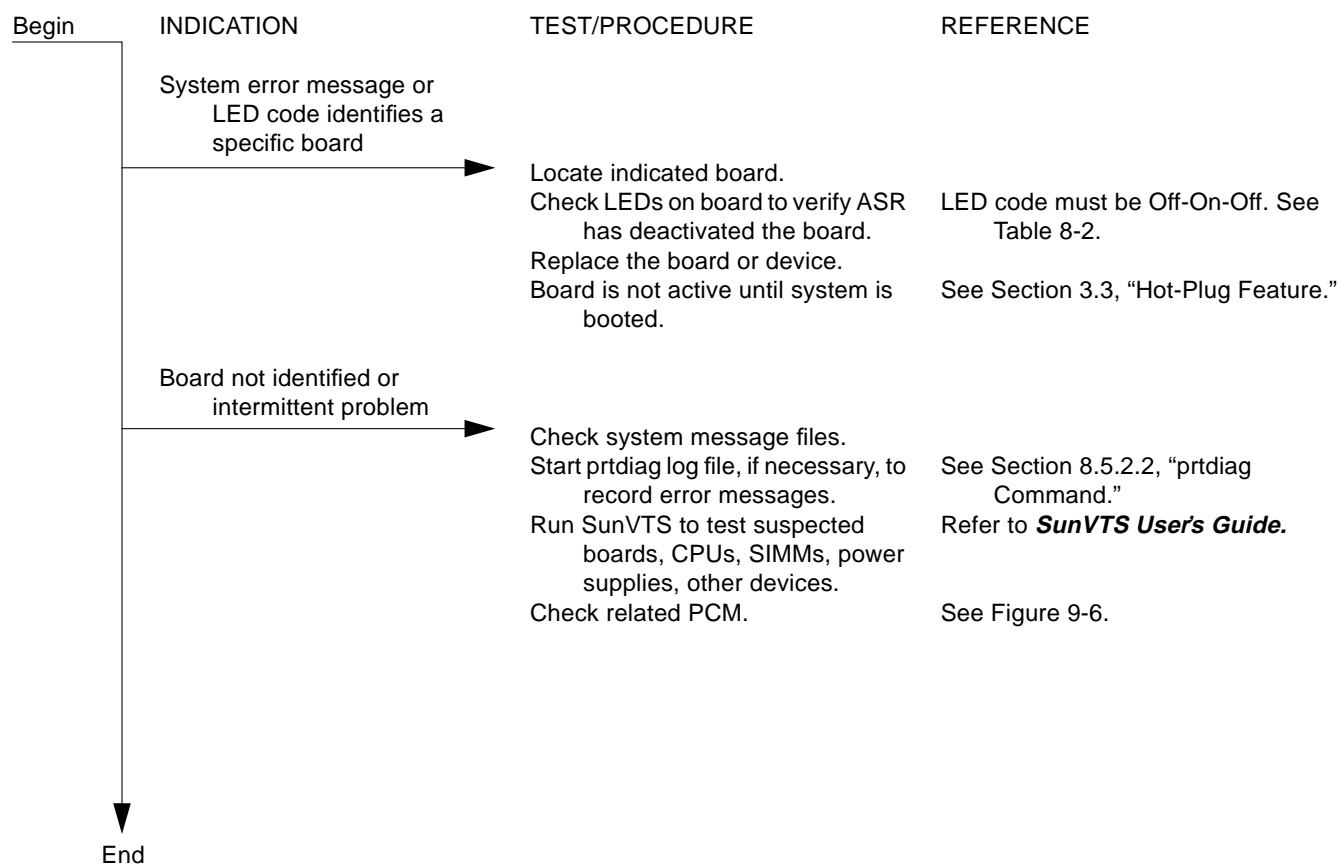


Figure 9-3 Replacing I/O Interface

9.4 Defective I/O Interface Board

Interface boards are hot-pluggable in many instances.

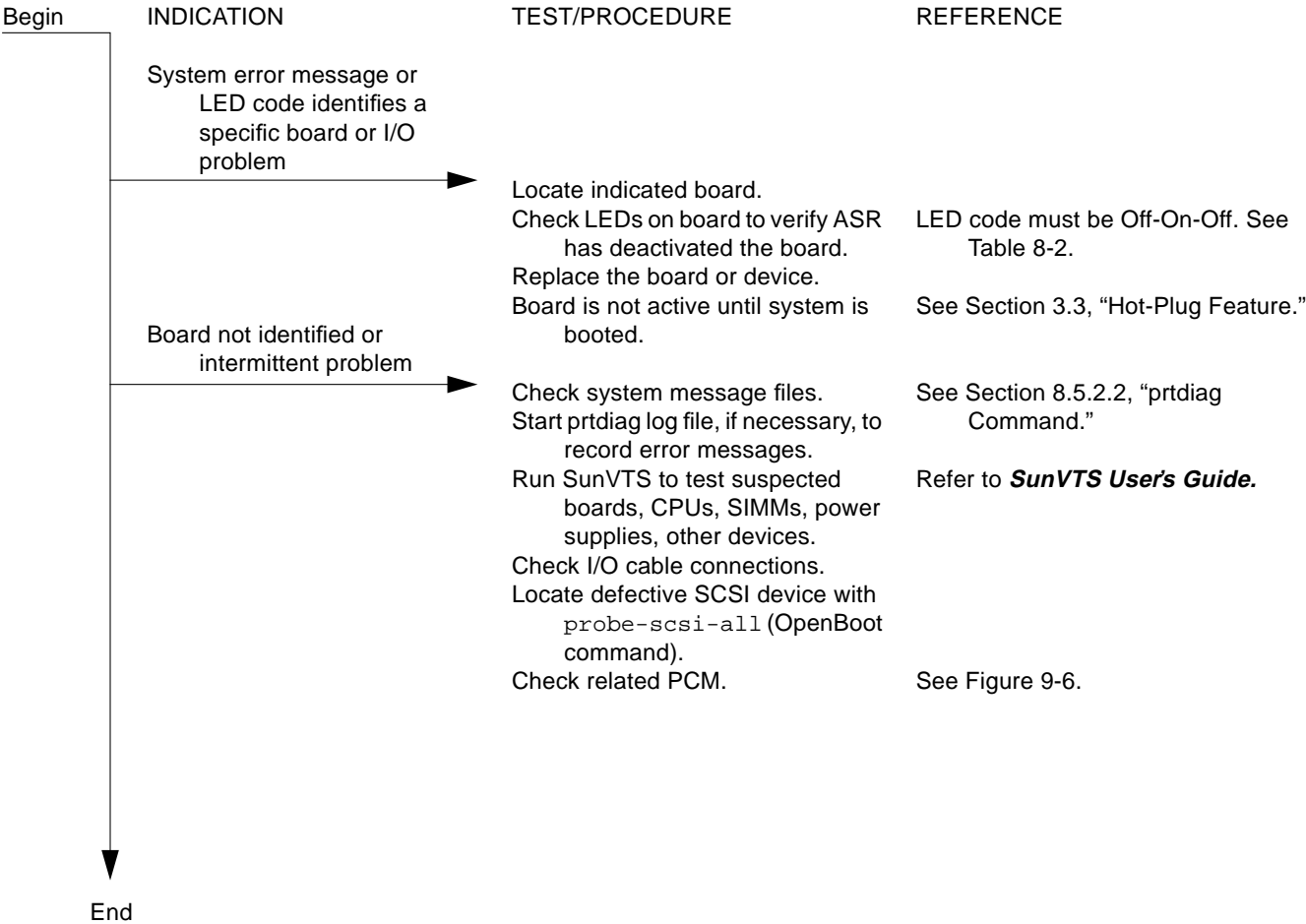


Figure 9-4 Replacing I/O Interface

9.5 Defective Disk Drive

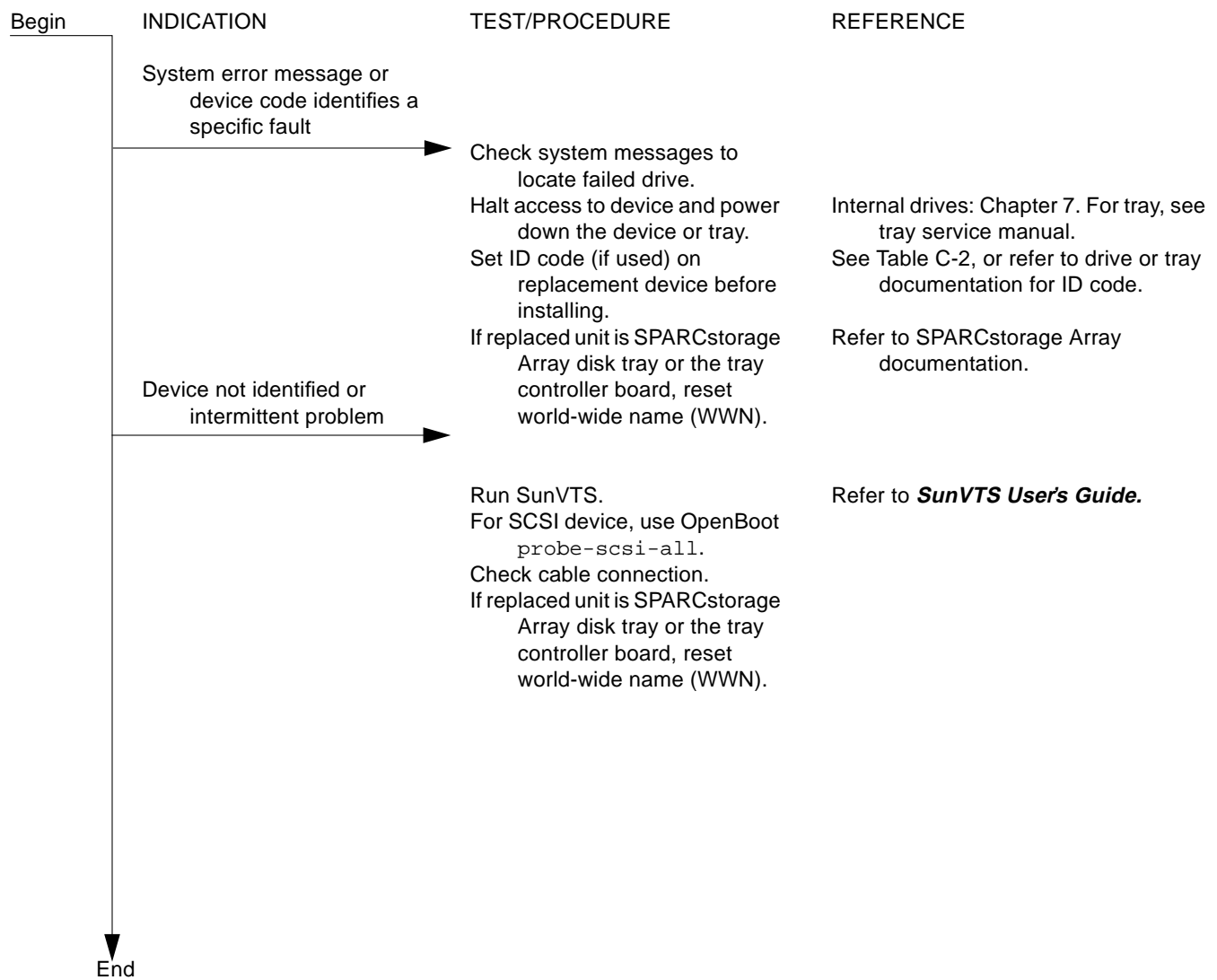


Figure 9-5 Diagnosing Disk Drive Problems

9.6 Defective Power Supplies

The power/cooling modules (PCMs) are hot-pluggable.



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



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

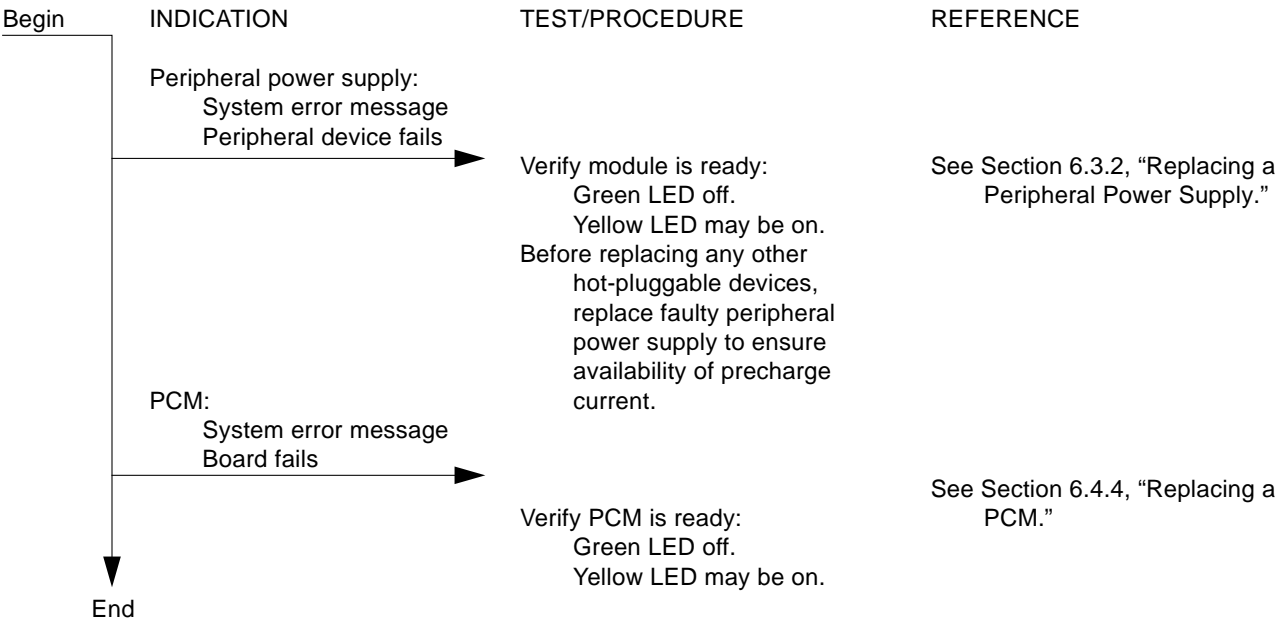


Figure 9-6 Diagnosing Power Supply Problems

9.7 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.

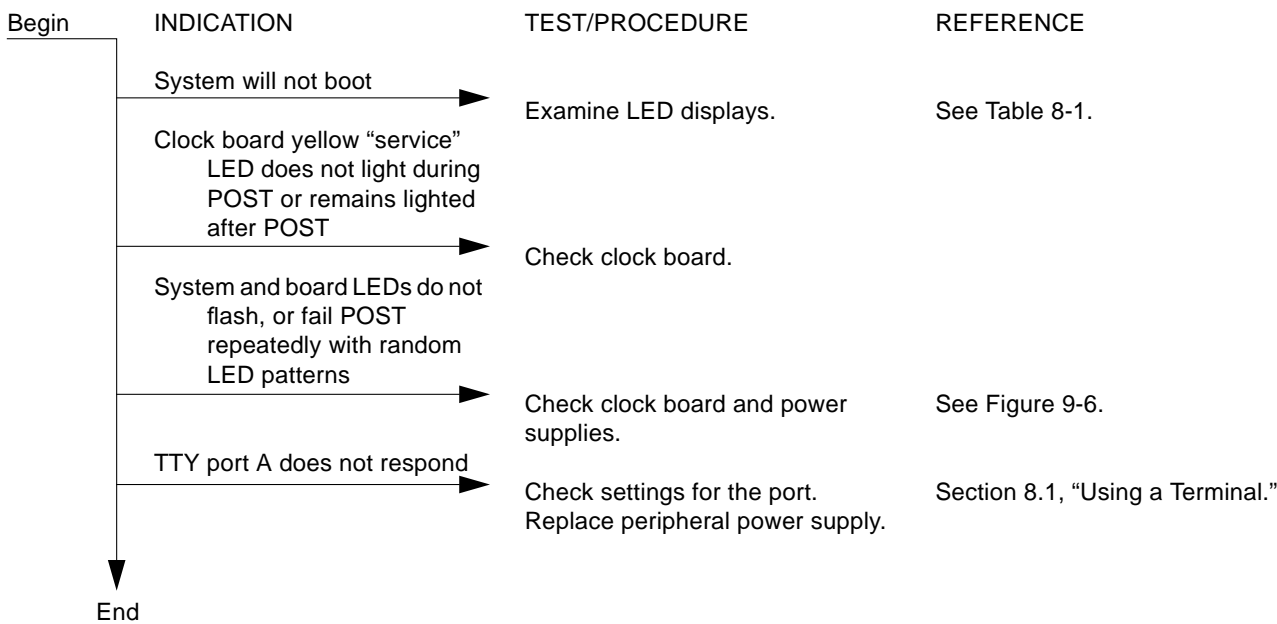


Figure 9-7 Diagnosing a Defective Clock Board

10.1 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.
- Ensure that the voltage and frequency rating of the power outlet you use matches the electrical rating label on the equipment and video monitor.
- Use properly grounded power outlets only.
- 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 10-1 Safety Precautions

Item	Problem	Precaution
Springfingers	Personal injury	The springfingers have sharp edges. Use care when handling springfinger-equipped cabinet screens and boards.
	RFI leakage	Keep springfinger-equipped screens and panels in place when the system is running. These assemblies suppress radio frequency interference (RFI) and are required by law in many localities.
	Damaged springfingers	Look for any broken or twisted springfingers and replace any damaged screen or board with a new assembly.

Table 10-1 Safety Precautions (Continued)

Item	Problem	Precaution
AC power cord	Electric shock	Unplug the AC cord from the AC wall socket before working inside the system chassis.
Wrist strap 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	Attach all cabinet cover panels after performing any service work on the system.
Filler panels	System damage and overheating	Install card cage filler panels in all unused card cage slots. Open slots severely reduce the cooling capability of the system.
SBus slot covers	System damage and overheating	Install SBus slot covers in all unused system board SBus slots. Openings on the backs of system boards reduce the cooling capability of the system.

10.2 Symbols

The following symbols mean:



WARNING

Hazardous voltages are present. To reduce the risk of electrical shock and danger to personal health, follow the instructions.



WARNING

Risk of personal injury. To reduce the risk, follow the instructions.













CAUTION

Risk of equipment damage. To reduce the risk, follow the instructions.



SURFACE

CAUTION: Hot surfaces. Avoid contact. Surfaces are hot and may cause personal injury if touched.

	AC	A terminal to which alternating current or voltage may be applied.
	ON	The principal and stand-by switches are in the ON position; the system is powered on.
	OFF	The principal switch is in the OFF position.
	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	System or board is operating normally.
	LOCKED	Board: 1/4-turn access slot is locked. System: running in secure mode and will not respond to commands from the console. The key can be removed.
	UNLOCKED	Board 1/4-turn access slot is unlocked.
	COMPONENT POWER	Board is receiving DC power.
	SERVICE	System has detected a hardware failure.



PROTECTIVE EARTH

Earth ground.



CHASSIS

Frame or chassis ground.



FUSE REPLACEMENT MARKING

For continued protection against risk of fire and electric shock, replace **ONLY** with fuse of the same type and rating.

10.3 System Precautions

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

Wear antistatic wrist straps when handling any magnetic storage devices or system boards.

Only use properly grounded power outlets.



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



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



Warning – This equipment contains lethal voltages. Accidental contact 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 resulting damage to the equipment.

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

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



Caution – 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.

10.4 Tools Required

This list represents the minimum of tools and test equipment required to service the system cabinet:

- Screwdriver, Phillips #2
- Screwdriver, Phillips #1
- DIP/IC extraction tool
- ESD mat
- Grounding wrist strap
- Needlenose pliers
- Hex driver, 3/32

Powering Off and On

This chapter contains information necessary to prepare the system for servicing. Included are system power off and on, and external cable removal procedures.

<i>Powering Off the System</i>	<i>page 11-1</i>
<i>Removing the External Cables</i>	<i>page 11-3</i>
<i>Restarting the System</i>	<i>page 11-4</i>
<i>Reading Boot Messages</i>	<i>page 11-6</i>

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 8.6.2, “Using a Remote Console,” on page 8-13.

- 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. Use the handle on the front of the Enterprise 3000 system and pull the front door open.
6. Locate the system keyswitch in the upper right corner, and turn the key switch to the Standby position (fully counterclockwise). See Figure 11-1.
7. Turn the AC power switch on the system rear off.
This switch is on the peripheral power supply/AC that is installed in the far left corner. See Figure 11-2.

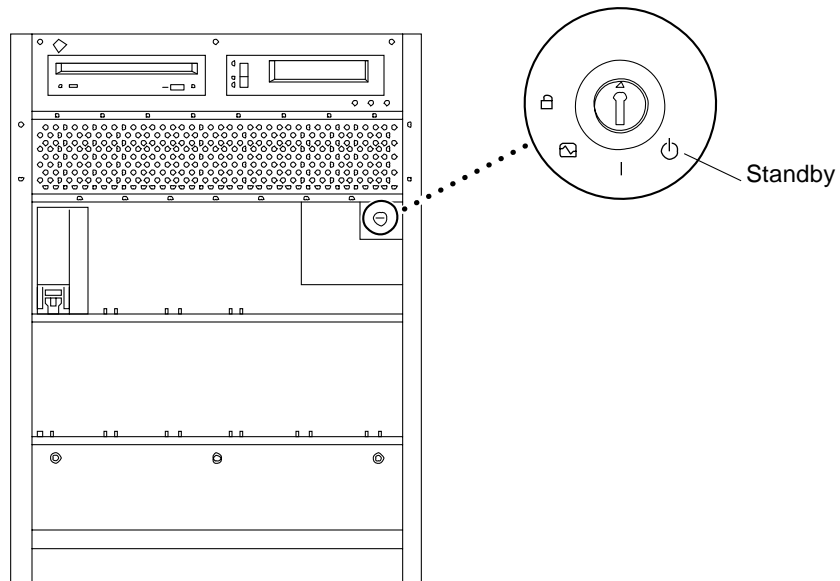


Figure 11-1 Keyswitch Standby Position

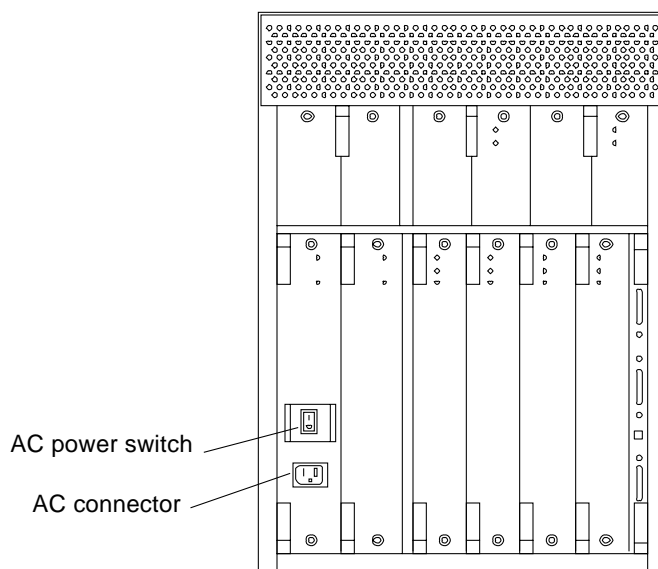


Figure 11-2 AC Power Switch and Power Receptacle

11.2 Removing the External Cables

1. **Position the server for easy access to the rear.**
2. **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.
3. **Mark each cable for identification as you remove it.**
4. **Remove any cable restraints.**
5. **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, install a TTY terminal before continuing the start up. See the *Ultra Enterprise 3000 System Installation Guide*.

1. **Use the handle on the front of the Ultra Enterprise 3000 system and pull the front door open.**
2. **Locate the system keyswitch in the upper right corner, and turn the key switch to the standby position (⏻).**
See Figure 11-1.



Caution – The outlet must be a 100-120 or 200-240 VAC 30-ampere circuit, intended solely for use by the server, as described in the site preparation instructions in the *Ultra Enterprise 3000 System 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.

3. **Turn on the AC power sequencer power switch.**
See Figure 11-2.
4. **Turn on power to the terminal.**
A terminal is required for viewing system messages. For setup instructions, see Section 8.1, “Using a Terminal,” on page 8-1.
5. **Turn the key switch to the power-on position (⏻).**
See Figure 11-1. 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.



Warning – 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 any 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.

See Figure 11-3.

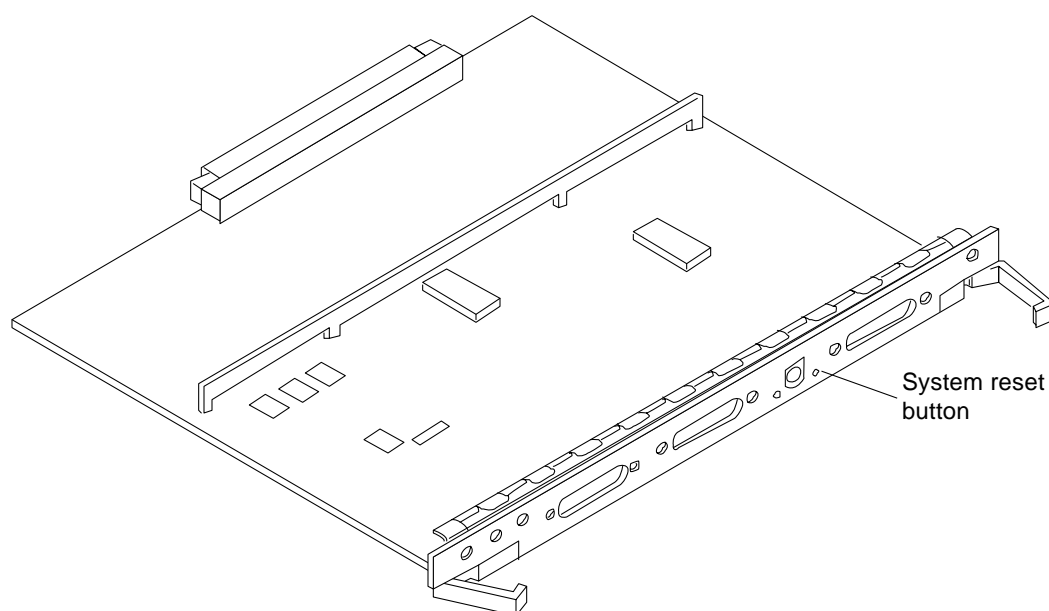


Figure 11-3 System Reset Switch on Clock Board

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 4-20.

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.

```
4-slot Ultra Enterprise 3000, Keyboard Present
OpenBoot -.- FCS, --- MB memory installed, Serial #---.
Ethernet address -:-:--:-:--:-:--:-, Host ID: -----.
```

If there is no terminal on this system, you must check the system status by inspecting LEDs on the front panel. See Figure 11-4.

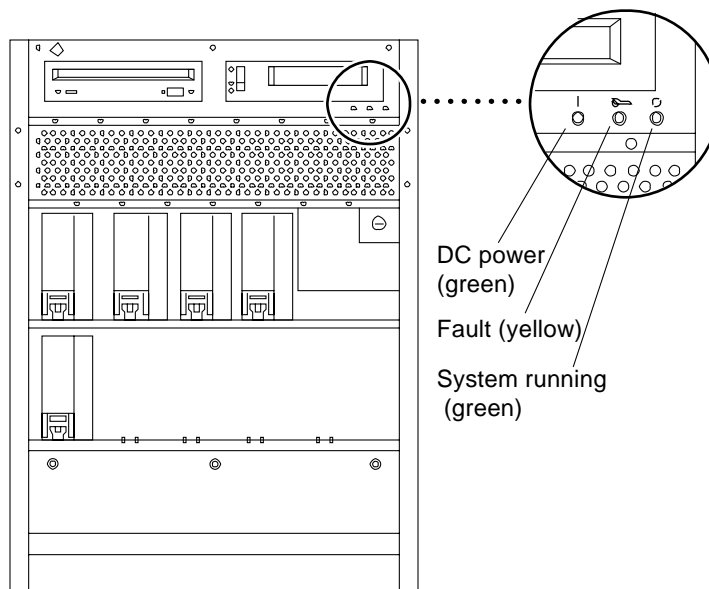


Figure 11-4 Front Panel Status LEDs

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

Table 11-1 LED Status Indicators

LED	Condition
Left 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 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.

<i>Servicing Hot-Pluggable Components</i>	<i>page 12-1</i>
<i>Powering Off the System</i>	<i>page 11-1</i>
<i>Internal Access</i>	<i>page 12-2</i>
<i>Restarting the System</i>	<i>page 11-4</i>

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 3-3.

12.2 Powering Off the System

See Section 11.1, “Powering Off the System.”

12.3 Internal Access

The system has a front bezel that must be removed to access the SCSI tray.

12.3.1 Front Bezel

To remove the front bezel:

- 1. Grasp the front bezel on both sides near the center.**
Place your thumbs on top of the front bezel and place your other fingers at the slight indentations under the front bezel for leverage.
- 2. Pull the front bezel straight out toward you and set it aside.**
See Figure 12-1.

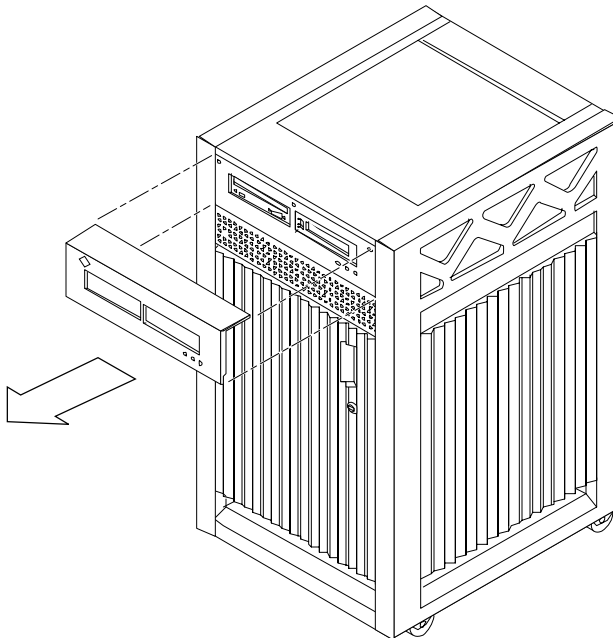


Figure 12-1 Removing the Front Bezel

To replace the front bezel, reverse these instructions.

12.3.2 SCSI Tray

To remove the SCSI tray:

1. **Remove the front bezel.**
2. **Loosen the two captive screws securing the SCSI tray in the chassis.**
3. **Insert a screwdriver or similar instrument in the notch at the bottom center of the tray. Using the screwdriver, slightly pull out the tray.**
See Figure 12-2.
4. **Grasp the SCSI tray and gently pull it from the chassis.**
Disconnect the cables from the back of the tray.
5. **Remove the seven screws on top of the SCSI tray to lift off the tray cover to access CD and tape drives.**

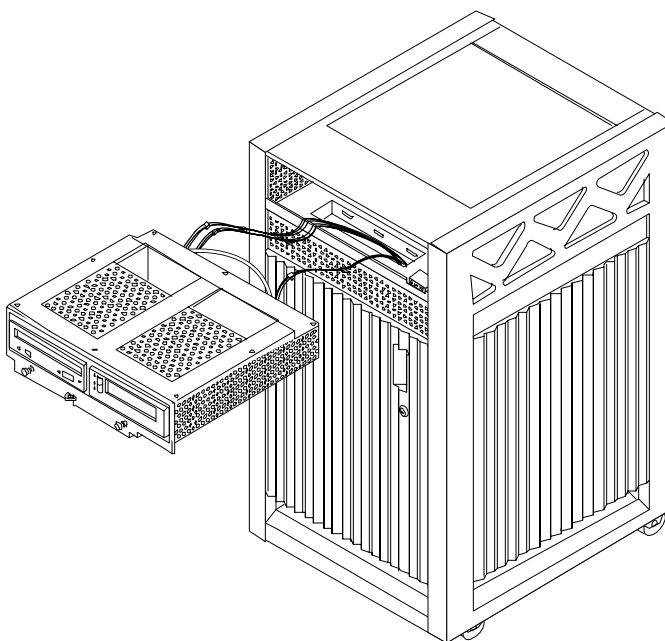


Figure 12-2 Removing the SCSI Tray

To replace the SCSI tray, reverse these procedures.

12.4 Powering On the System

See Section 11.3, “Restarting the System,” to power on after all panels have been replaced.

Specifications



A.1 Physical Specifications

Table A-1 System Physical Specifications

	U.S.	Metric
Height	25.5 in	64.5 cm
Width	17 in	43.2 cm
Depth	23.5 in	59.7 cm
Weight	160 lb, approx	72.7 kg, approx
Power cord	6 ft	1.8 m

Table A-2 Clearance and Service Access

	U.S.	Metric
Front	18 in	45.7 cm
Rear	18 in	45.7 cm
Left	6 in	15 cm
Right	6 in	15 cm

Table A-3 Shipping Specifications

	U.S.	Metric
Height	34 in	86 cm
Width	29 in	74 cm
Depth	22.5 in	57 cm
Weight	185 lb, approx	84 kg, approx

A.2 Electrical Specifications

Table A-4 Server Electrical Specifications

Parameter		Value
Input current	Voltage range	100-120 Vac or 200-240 Vac
	Current, maximum	8.5A
	Current frequency range	47-63 Hz
Input power rating	Total continuous power	750W
Volt-Ampere rating		825 VA
BTU rating		2600 BTU
Power factor		0.92 - 0.96
Plug type	U.S.	NEMA 5-15P
	International	10A, single phase IEC 320, C14

A.3 *Environmental Requirements*

Table A-5 Temperature, Humidity, and Altitude Limits

	Operating	Nonoperating
Temperature	41F to 104F (5C to 40C)	-4F to 140F (-20C to 60C)
Humidity	20% to 80% RH noncondensing, 27C max wb	93% RH
Altitude	9,843 ft (3 km)	39,370 ft (12 km)

Functional Description



The 4-slot Enterprise 3000 server is part of the Ultra Enterprise X000 server family, which includes the 16-slot and 8-slot cabinet servers and an 8-slot standalone server.

All systems feature shared-memory multiprocessors and use the same boards, power/cooling modules (PCMs), and operating software.

B.1 System Packaging

This section describes the standalone enclosure. See Figure B-1.

The front of the cabinet contains the CD-ROM/tape drives, the keyswitch, the internal disk drives, and the fan tray.

The rear of the cabinet contains the AC power switch, the peripheral power supply, the clock board, the board slots, and the PCM slots. PCM slot 5 may contain either an auxiliary fan tray or a spare PCM.

Air circulation inside the cabinet is provided by the fans in the power supplies. The PCMs have two fans each. The fans provide cooling for the power supply itself, plus two adjacent board slots. PCM slot 5 must contain either a fan tray or a spare PCM. These fans cool the peripheral power supply.

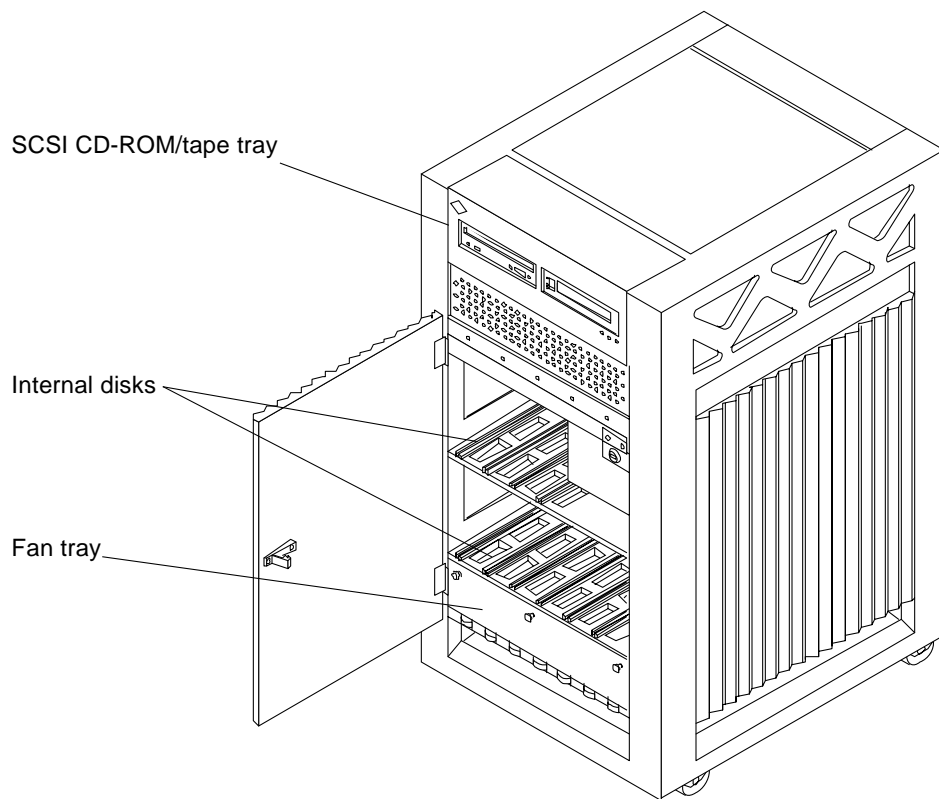


Figure B-1 4-Slot Enterprise 3000 Cabinet

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

B.1.1 Board Types

1. The CPU/Memory board supports up to two UltraSPARC CPU modules and 16 SIMM slots.
2. The SBus I/O board includes two separate SBuses, each controlled by a separate SYSIO ASIC. The board provides a total of three SBus slots for plug-in cards, two slots for fiber interface modules. The remaining slots are used for onboard devices.

3. The Graphics I/O board provides an SBus with two SBus slots and several onboard devices. This board also has a specialized slot for devices such as the graphics (UPA) card, a high performance frame buffer.

The Enterprise X000 servers feature a high-speed (2.6 Gbyte per second) centerplane bus, which includes separate address and data buses.

Logically, there is no difference between board slots and each can accept any board type. However, whenever possible, I/O boards should be located on the back side of the centerplane for easy access to interface cables, which are usually routed to the rear of the cabinet.

Figure B-2 illustrates the bus structure of 4-slot Enterprise 3000 Server.

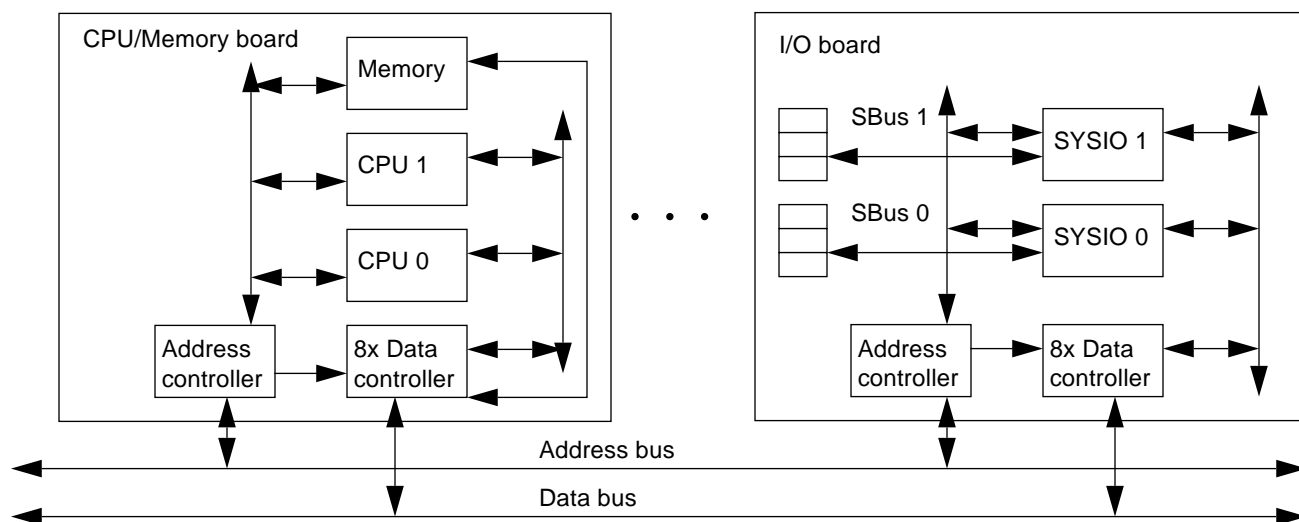


Figure B-2 Bus Structure

B.2 Board Hot-Swapping Procedures

The CPU/Memory board and the I/O boards are hot-swappable 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. (There are three status LEDs on each board. See Table 8-2 for the board LED codes.)

When the left green LED is off, it is safe to remove the board.

B.3 CPU/Memory Board

The system will support up to three CPU/Memory boards.

The CPU/Memory board supports up to 2 CPU modules and 16 SIMMs. The CPU/Memory board is shown in Figure B-3.

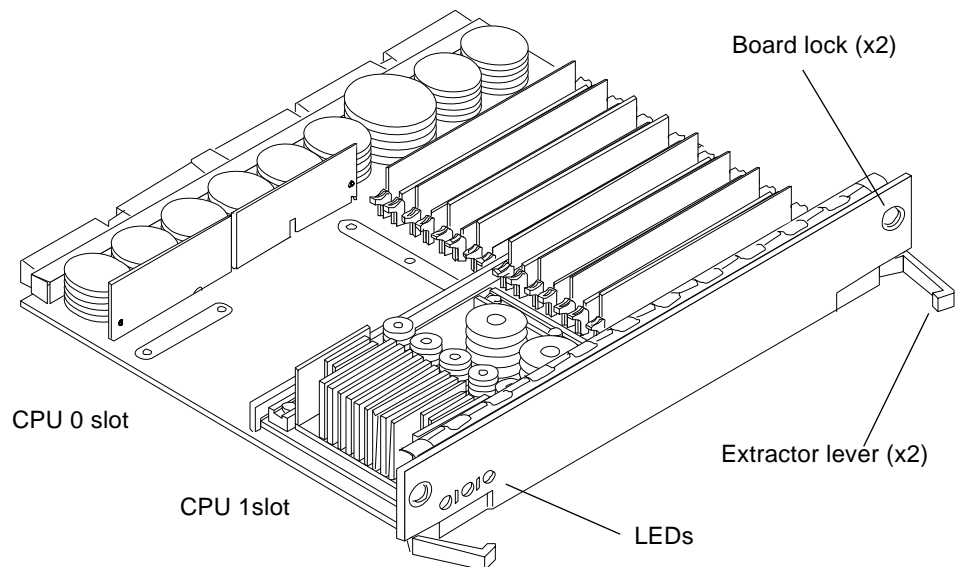


Figure B-3 CPU/Memory Board

All empty card cage slots must have a filler panel installed.

B.3.1 CPU Modules

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

The order 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.

Table B-1 shows slot locations for the example of five CPUs on three CPU/Memory boards. Note that slot 1 is reserved for the I/O board.

Table B-1 Locations for Five CPUs on Three Boards

Board Slot Number	PROC 0	PROC 1
3	in	in
5	in	in
7	in	—

B.3.2 System Master

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.3.3 SIMMs

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

B.3.3.1 Slot Locations

SIMMs must be installed in full banks of eight. Figure B-4 shows the slot numbers for bank 0 and bank 1.

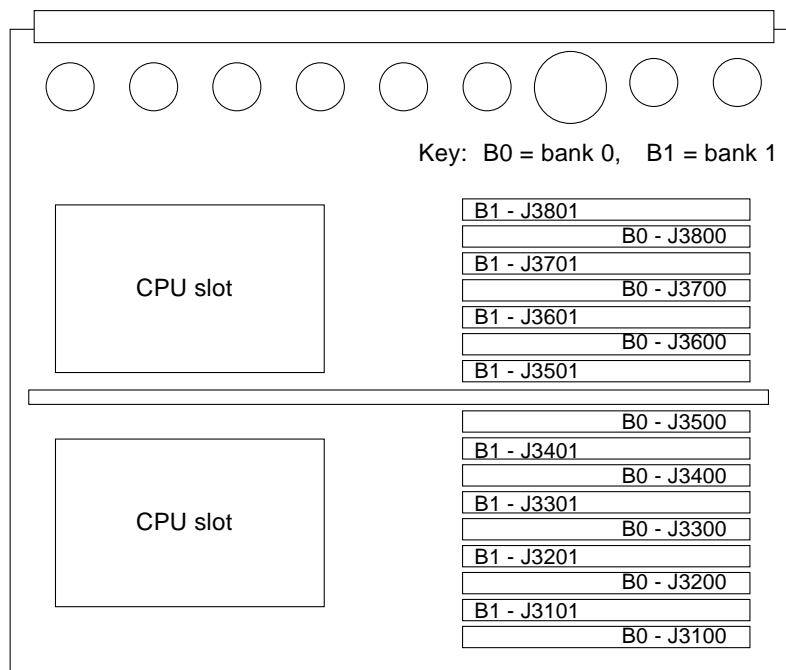


Figure B-4 SIMM Slot Locations

B.3.3.2 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.

B.4 I/O Boards

Two types of I/O boards are available:

- The SBus I/O board has three SBus connectors. A dual-wide SBus card can be mounted using two of the connectors.
- The Graphics I/O board has two SBus slots and one universal peripheral adapter (UPA) connector. This board does not accept a dual-wide SBus card.

An I/O board should be present in slot 1. This is the only slot that allows access to internal SCSI devices.

B.4.1 SBus I/O Board

The SBus version of the I/O board includes two SYSIO ASICs. Each ASIC provides two SBuses. Three SBus slots are available on this board for plug-in boards. The remaining SBus slots are used for onboard devices such as 10/100 Mbyte/second twisted-pair Ethernet, Fast/Wide SCSI, Fibre Channel interfaces. See Figure B-5.

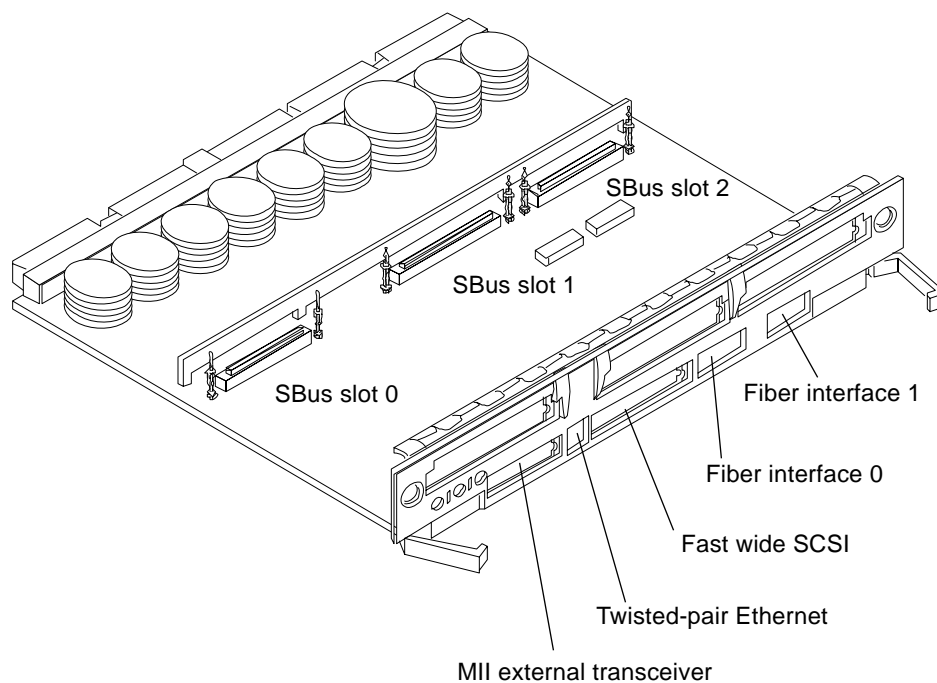


Figure B-5 SBus I/O Board

All empty card cage slots must have a filler panel installed.

B.4.2 Graphics I/O Board

The graphics version of the I/O board includes one UPA-64 Slave Frame Buffer and one SYSIO ASIC that provides one SBus for two SBus slots for two plug-in cards. The remaining SBus slots are used for onboard devices such as 10/100 Mbyte/second twisted-pair Ethernet, Fast/Wide SCSI, Fibre Channel interfaces. See Figure B-6.

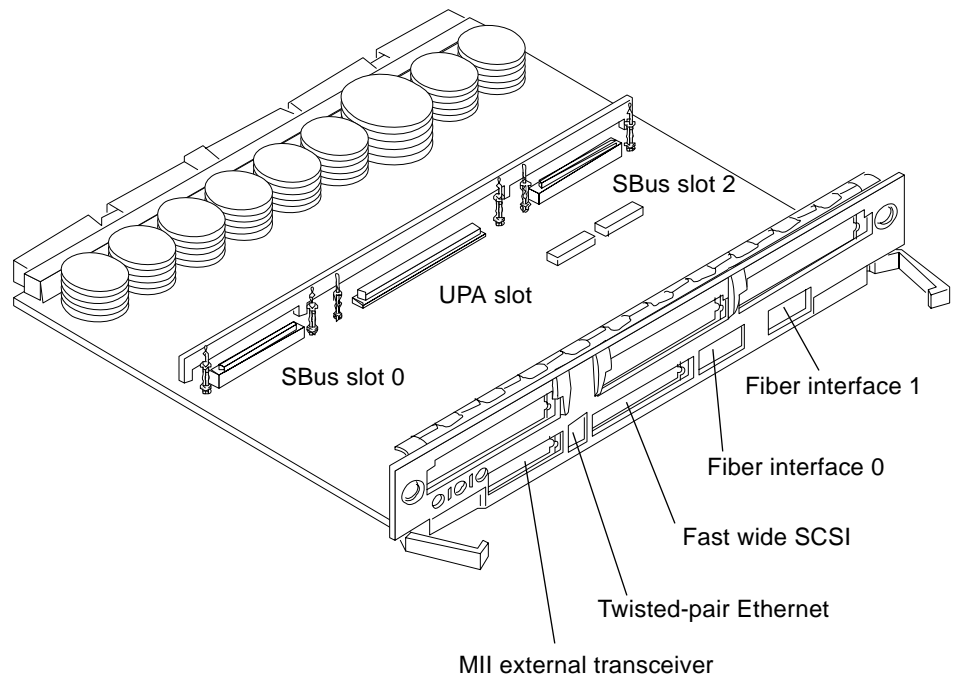


Figure B-6 Graphics I/O Board

All empty card cage slots must have a filler panel installed.

B.5 Power/Cooling Modules

The system has a maximum capacity of three power/cooling modules (PCMs). The PCM slots are not numbered.

The PCMs also provide cooling air for the boards. The slot above any board must have a PCM to provide cooling air.

The slot above the peripheral power supply may have either a PCM or a fan tray.

These PCMs are all of the same type, and current from an individual PCM is available to the entire centerplane.

There must be at least one PCM for every two boards.

With automatic system reconfiguration (ASR), you can hot-plug a PCM if there is a spare PCM. That is, while a PCM is out of the system, the remaining PCMs must be able to provide sufficient airflow and electrical power.

B.6 Peripheral Power Supply/AC

The system has one peripheral power supply/AC input (PPS/AC). The PPS/AC has the AC switch and AC cable socket. The PPS/AC is also known to the system software as PPS 0.

The peripheral power supply provides DC power for the CD-ROM/tape tray and precharge power for hot-plugging boards and PCMs.

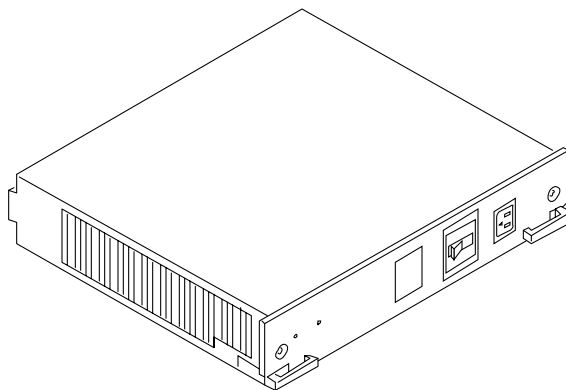


Figure B-7 Peripheral Power Supply/AC

To the right of the PPS/AC is a slot for an optional auxiliary peripheral power supply (PPS). The PPS is also known to the system software as PPS 1. The PPS supplies redundant current for the peripheral devices.

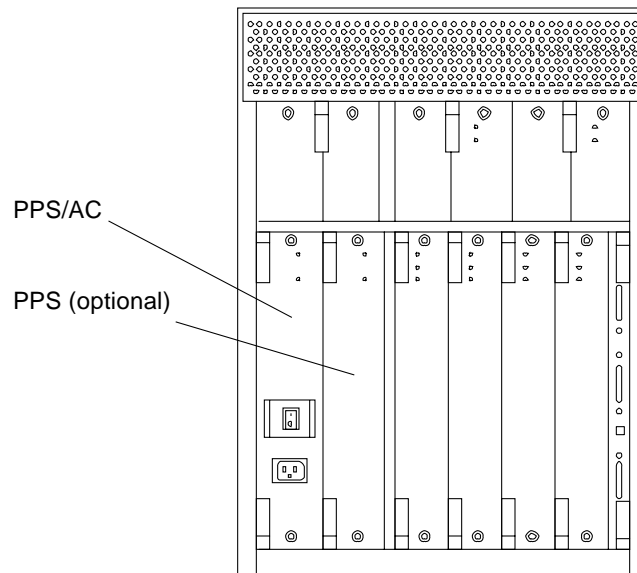


Figure B-8 Locations of the PPS/AC and PPS

The PPS is also used in the larger 16-slot and 8-slot Enterprise X000 servers. In the Enterprise 3000 server, only the PPS/AC provides precharge current for the hot-plug function.

B.7 Clock Board

The clock board (see Figure B-9) is located at the right side of the card cage.

The clock board receives cooling air from the PCM located above the two board slots on the right side of the card cage.

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

The processor clock frequency is set to match the lowest-frequency processor in the system. 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 clock board also includes central devices including serial ports, keyboard and mouse, and a time of day (TOD) chip.

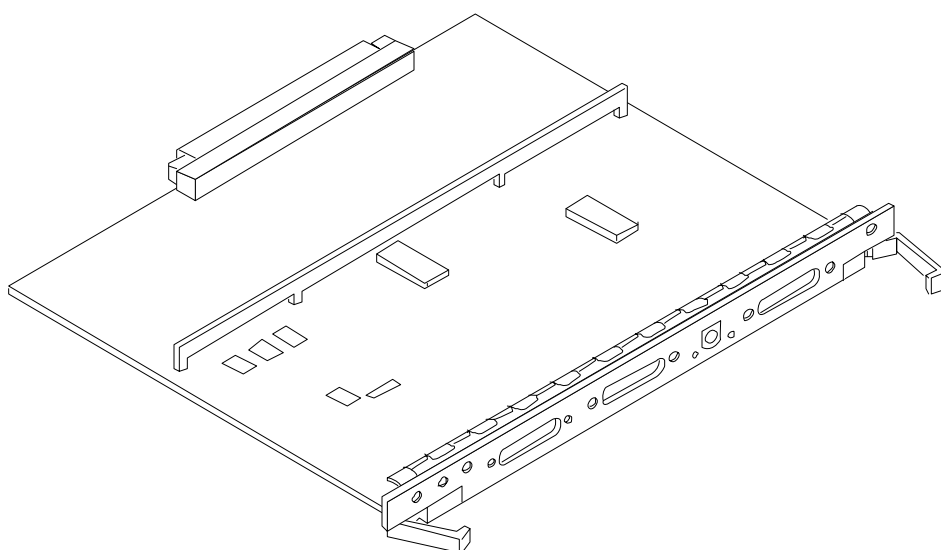


Figure B-9 Clock Board

B.8 Network Interfaces

Each I/O board has an onboard Ethernet circuit, connected to an RJ-45 twisted-pair connector and a 40-pin media independent interface (MII) connector. The circuit automatically adapts to 10 Mbit or 100 Mbit at the twisted-pair port. The 100 Mbit MII connector accepts external Ethernet transceivers. If a transceiver is attached to the MII connector, the twisted-pair connector is disabled.

Ethernet SBus interface cards may also be added to one or more I/O boards for additional networks.

B.9 Internal Disk Drives

The 4-slot standalone Enterprise 3000 server has a capacity of 10 internal SCSI disk drives. SCSI ID addresses are set automatically and are determined by slot location.

B.10 CD-ROM/Tape Drive

The SCSI tray at the front of the system accepts two optional SCSI drives, such as CD-ROM and tape drives. See Appendix C for SCSI ID addressing.

B.11 Expansion Cabinets

The Enterprise 3000 system supports Fibre Channel and differential SCSI interface disk storage options.

SCSI Devices



C.1 SCSI Target ID Number Addressing

C.1.1 SCSI Drive Tray

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

Table C-1 SCSI Tray Default SCSI ID Numbers

Device	ID
CD-ROM drive	6
Tape drive	5

C.1.2 Internal Disk Drives

The default SCSI ID numbers for internal disk drives are:

Table C-2 Internal Disk Drive Default SCSI ID Numbers

Drive Slot	ID Number
0	0
1	1
2	2
3	3

Table C-2 Internal Disk Drive Default SCSI ID Numbers (Continued)

Drive Slot	ID Number
10	10
11	11
12	12
13	13
14	14
15	15

C.2 Device Naming Conventions

SCSI devices are identified by path names or aliases.

A full path name can be of the form, `/sbus@1f,0/cgsix@1,0`.

A short path name does not include address information. For example, the full path name shown above can be shortened to `/sbus/cgsix`. This form of name can be ambiguous if more than one of the devices is installed.

An alias is another form of short name. Some common aliases are:

Table C-3 Examples of Alias Names

Alias	Full Path Name
net	<code>/sbus@3,0/SUNW,hme@3,8c00000</code>
cdrom	<code>/sbus@3,0/SUNW,fas@3,8800000/sd@6,0:f</code>
ttya	<code>/central/fhc/zs@0,902000:a</code>
ttyb	<code>/central/fhc/zs@0,902000:b</code>
screen	<code>/SUNW,ffb@2,0</code>

Use the OpenBoot `devalias` command to list current aliases.

C.3 SCSI Cable Length

Do not attach any external SCSI devices to the onboard SCSI connector of the I/O board in card cage slot 1. To add external SCSI devices, use the SBus slots on the I/O board, or add a second I/O board.

The maximum combined length for a string of SCSI cables is six meters for non-differential cables. For differential SCSI cables, the maximum is 25 meters.

The maximum combined length for a string of SCSI cables is six 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-4 lists measurements for Enterprise servers.

Table C-4 Internal SCSI Lengths (Approximate)

Location	Internal Length
SBus I/O board	0.43 meter
Graphics I/O board	0.43 meter

C.4 SCSI Termination

The I/O board in slot 1 of any Enterprise server must be terminated. This slot connects to the internal SCSI disk drives and the optional internal CD-ROM and tape drives.

The SCSI bus on an I/O board in any other slot must be terminated only if SCSI devices are connected to that board.

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

In the card cage, board slots are numbered from right to left: 1, 3, 5, and 7.¹ See Figure D-1.

In most respects, all four board slots in the card cage are interchangeable. However, slot 1 is the only slot that is physically connected in the card cage to the SCSI bus on the centerplane. Slot 1 is therefore normally reserved for an I/O board, since the CPU/Memory board does not have a SCSI bus controller.

The centerplane SCSI bus connects to the ten internal disk drive slots and (through a SCSI cable) to the SCSI CD-ROM/tape drive tray.

1. This unconventional numbering system is derived from the slot numbering used in the general card cage design of the Enterprise server family. The Enterprise 3000 server card cage is based on the Enterprise 4000 card cage, which is double-sided, with even-numbered slots (0, 2, 4, 6) on the front and odd-numbered slots (1, 3, 5, 7) on the back. The Enterprise 3000 card cage uses the system internal SCSI bus (slot 1), which in turn dictated the use of the back half of the Enterprise 4000 card cage design.

D.2 I/O Boards

1. An I/O board must always be in slot 1. This is the only slot that allows direct access to the internal SCSI devices. **(Requirement)**
2. Up to three graphics (UPA) cards are supported in a system. **(Maximum)**
3. The SCSI bus on the I/O board in slot 1 must be terminated because it connects to the internal system SCSI bus. **(Requirement)**
4. 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.

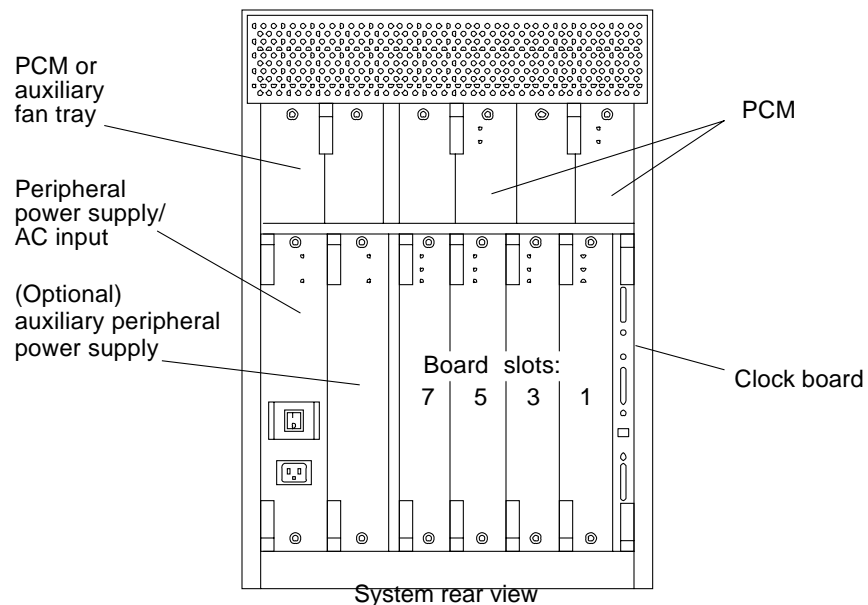


Figure D-1 Board Slots and Power Supply Locations

D.3 CPU/Memory Boards

1. When configured at the factory, a CPU/Memory board is installed in the second slot (slot 3) of the four board slots. See Figure D-1. As noted earlier, slot 1 is reserved for an I/O board.
2. The Enterprise 3000 server supports up to three CPU/Memory boards.
(Maximum)

D.4 Power Supplies and Fan Cooling

1. If you add a CPU/Memory board or I/O board to the card cage, the slot directly above the board must contain a power/cooling module (PCM). **(Requirement.)** If necessary, install a PCM in that slot. The fans in the PCM are the only source of cooling air for the board slot.
2. All unused slots must contain a filler panel to avoid loss of cooling air.
(Requirement)
3. Under some circumstances, you can remove a PCM 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 down the system first.
4. The peripheral power supply/AC input (PPS/AC) must be fully functional if you replace a hot-pluggable board or PCM. **(Requirement.)** Only the PPS/AC provides precharge current to the system. If the PPS/AC cannot supply precharge current, the hot-pluggable module will be damaged.
5. The slot above the PPS/AC must contain either a PCM or an auxiliary fan tray. **(Requirement)**
6. The auxiliary peripheral power supply (PPS 1) is an option. The PPS 1 is located to the right of the PPS/AC. If a PPS 1 is not present, the slot contains a filler panel.
7. PPS 1 does not provide precharge current.

D.5 Filler Panels

1. Board filler panels are required for all unused board slots. **(Requirement)**
2. PCM filler panels are required for all unused PCM bays. **(Requirement)**

D.6 SBus Cards

1. Only the SBus I/O board accepts a double-wide SBus card (in SBus slots 1 and 2). The location of SBus slot 0 prevents its use with double-wide cards.
2. The Graphics I/O board does not accept double-wide SBus cards. The middle card connector does not fit SBus cards.

D.7 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—all CPUs run at the lowest common frequency.
3. The order 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 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
3	in	in
5	in	in
7	in	—

D.8 Memory Modules

1. The SIMMs are 168-pin, JEDEC-standard devices. Do not use other types of memory modules.
2. Do not mix 8, 32, or 128 Mbyte SIMMs in the same bank. **(Requirement.)** All SIMMs in a bank (eight SIMMs) must have the same capacity.

3. Note that two banks of SIMM slots on a CPU/Memory board are interleaved. A bank is composed of eight alternating SIMM slots.
4. 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.9 Cabling

D.9.1 SCSI

1. Do not attach any external SCSI devices to the onboard SCSI connector of the I/O board in card cage slot 1. **(Requirement)**
2. To add external SCSI devices, use the SBus slots on the I/O board, or add a second I/O board. You may use either an SBus I/O board or a Graphics I/O board.
3. The maximum length for a chain of single-ended (non-differential) SCSI cables is 6.0 meters (20 feet). **(Maximum)**
4. The maximum length for a chain of differential SCSI cables is 25 meters (82 feet). **(Maximum)**

D.9.2 Ethernet

1. The main Ethernet should be connected to the I/O board in slot 1.
2. Each I/O board has one Ethernet circuit with both TPE and MII connectors. Only one type of connector may be used at a time.
3. After slot 1 is connected to a network, additional Ethernet connections may be made to I/O boards or SBus cards in any other card cage slot.

D.9.3 Video Interface

1. A system that is operated with a monitor can use a graphics adapter mounted on either a Graphics I/O board or an SBus I/O board. The Sun Creator and Creator 3D Graphics I/O boards are available.
2. Up to three Graphics I/O boards are supported in a system.

D.10 CD-ROM/Tape Drive SCSI Tray

The SCSI tray is located at the upper front of the cabinet. Various CD-ROM and tape drive options are available. A SCSI cable connects the tray to card cage slot 1 on the centerplane.

D.11 Disk Drives

Disk drive slots are located at the front of the cabinet. In the upper row, the disk drive slot numbers are 0, 1, 2, and 3, numbered from left to right. See Figure D-2.

To avoid potential numbering conflicts on the wide SCSI bus, disk drives in the lower row are numbered 10 through 15. Slot 10 is at the left, followed at the right by slots 11, 12, 13, 14, and 15.

All disk drives connect through the centerplane to the SCSI bus of card cage slot 1.

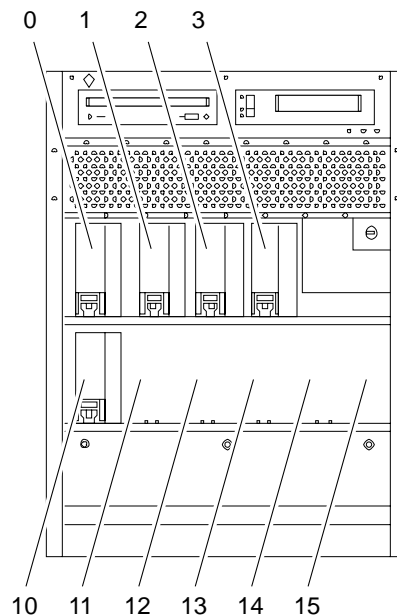


Figure D-2 Disk Drive Slot Numbers

Non-Chassis Field Replaceable Units (FRUs)



See 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, cable, SCSI tray data	530-2220	page E-10
Assembly, cable, power, DC	530-2221	page E-10
Assembly, cable, key switch PWB centerplane	530-2226	page E-11
Centerplane	501-2939	page E-18
Fan tray assembly	540-2756	page E-2
Fan tray assembly, auxiliary	540-2757	page E-3
Key switch lock cable assembly	530-2148	page E-14
LED board	501-2599	page E-17

E.1 Fan Tray Assembly

To remove the fan tray assembly:

- 1. Pull open the front door of the Enterprise 3000 system.**
- 2. Locate the fan tray assembly at the bottom of the system.**
- 3. Loosen the three captive screws securing the fan tray assembly in the chassis.**
See Figure E-1.

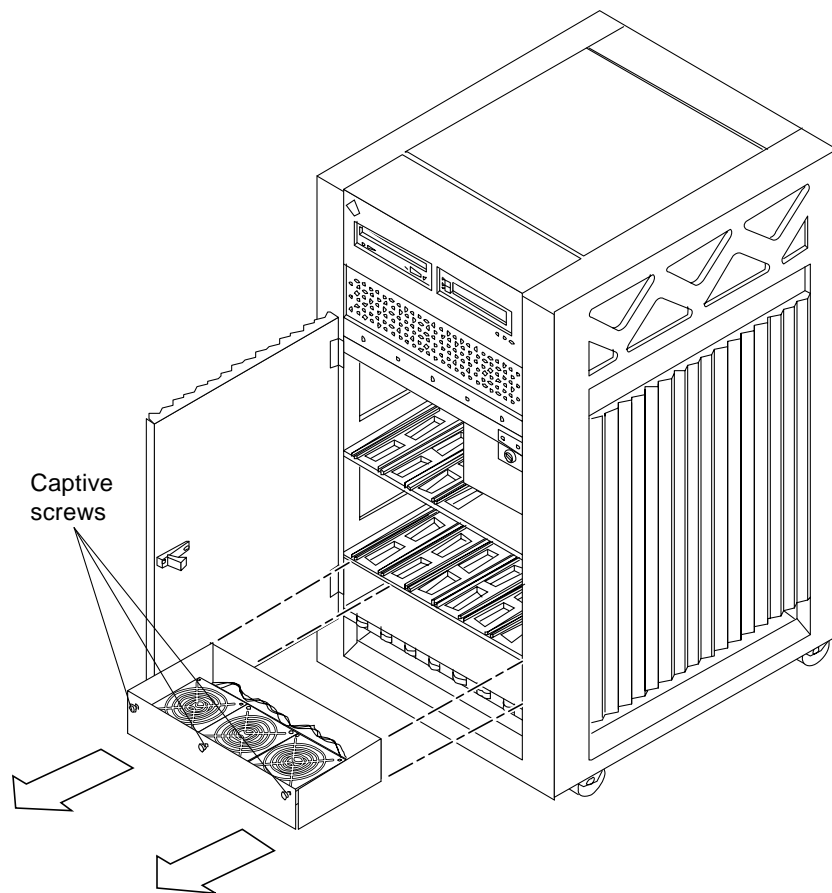


Figure E-1 Removing the Fan Tray Assembly

4. Gently pull the fan tray assembly from the chassis and set it aside.

To replace the fan tray assembly:

1. Gently insert the fan tray assembly in the bottom of the Enterprise 3000 system.

See Figure E-1.



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 three captive screws securing the fan tray assembly to the chassis.
3. Close the front door of the Enterprise 3000 system.

E.2 Auxiliary Fan Tray Assembly

To remove the auxiliary fan tray assembly:

1. Locate the auxiliary fan tray assembly at the back of the system.
Viewed from the rear of the system, the auxiliary fan tray is on the upper left side of the chassis.
2. Release the auxiliary fan tray from the system chassis by inserting a Phillips #1 screwdriver into each quarter-turn access slot and turning to the unlocked position.
See Figure E-2.

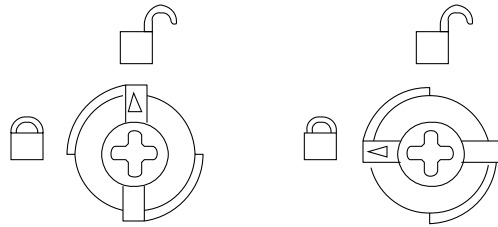


Figure E-2 Unlocking and Locking Quarter-Turn Access Slots

- 3. Pull the end of the extraction lever outward to release the auxiliary fan tray assembly from the centerplane.**
See Figure E-3.

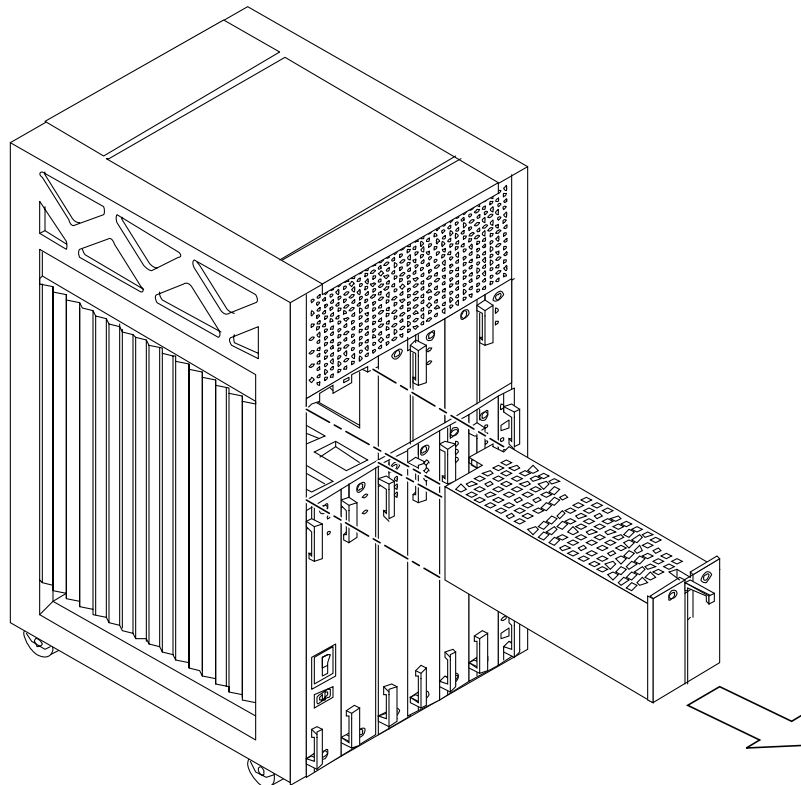


Figure E-3 Removing the Auxiliary Fan Tray

4. **Slowly remove the auxiliary fan tray assembly from the chassis and set it aside.**

To replace the auxiliary fan tray assembly:

1. **Carefully insert the auxiliary fan tray into the slot at the back of the Enterprise 3000 system.**
 - Ensure that the extraction lever is in the outward position.
 - Orient the auxiliary fan tray with the extraction lever on the outside edge of the Enterprise 3000 system.See Figure E-3.
2. **Slide the auxiliary fan tray assembly toward the centerplane.**

The auxiliary fan tray assembly will not seat fully unless the lever is in this starting position.



Caution – DO NOT FORCE the auxiliary fan tray assembly into the slot; this can cause damage to the auxiliary fan tray and system.

The auxiliary 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 auxiliary fan tray assembly.

3. **Swing the extraction lever inward to the locked position to seat the auxiliary fan tray assembly.**

Do not press on the front panel of the auxiliary fan tray assembly to seat it; doing so will damage the connector pins.
4. **Lock the auxiliary fan tray 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 E-2.

E.3 Removing the Front and Side Panels

Complete the following section as a prerequisite if you are removing one of the following subassemblies:

- SCSI tray data and DC power cable assemblies
- Key switch PWB centerplane cable assembly
- Key switch lock cable assembly
- LED board

- Centerplane

To remove the side panels and front bezel:

1. Completely power off the Enterprise 3000 system.

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

2. Remove the side panels.

- Grasp the bottom of the side panel in the center and pull the panel out slightly until the snap disengages.
- Simultaneously lift the side panel up and out.

See Figure E-4.

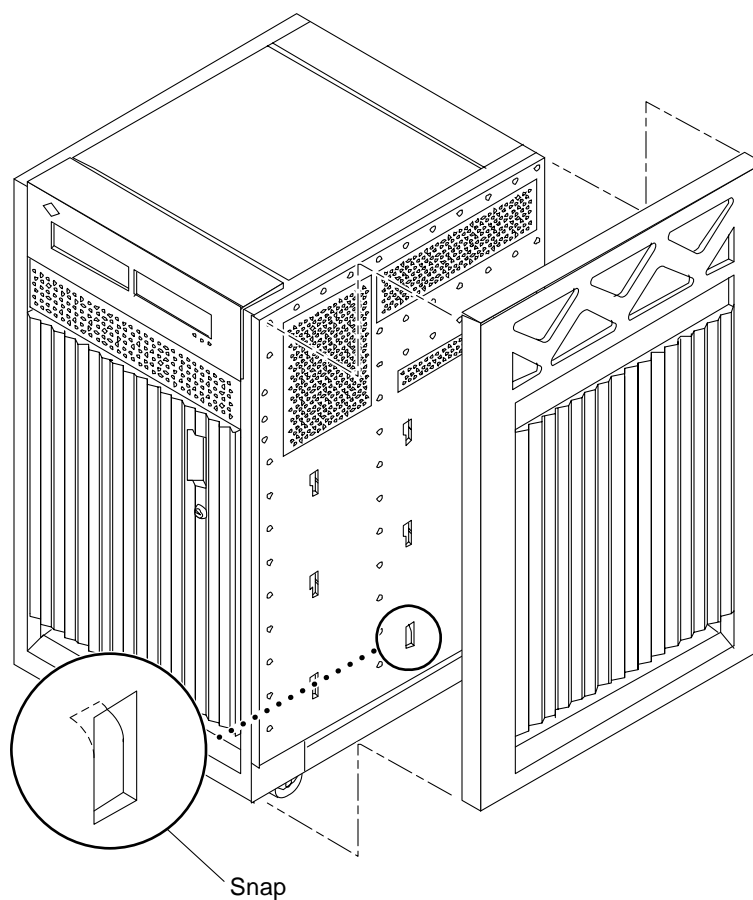


Figure E-4 Removing the Side Panel

3. Grasp the front bezel on both sides near the center.

Place your thumbs on top of the front bezel and place your other fingers at the slight indentations under the front bezel.

4. Pull the front bezel straight out toward you and set it aside.

Pull back slightly on the top with your thumbs. See Figure E-5.

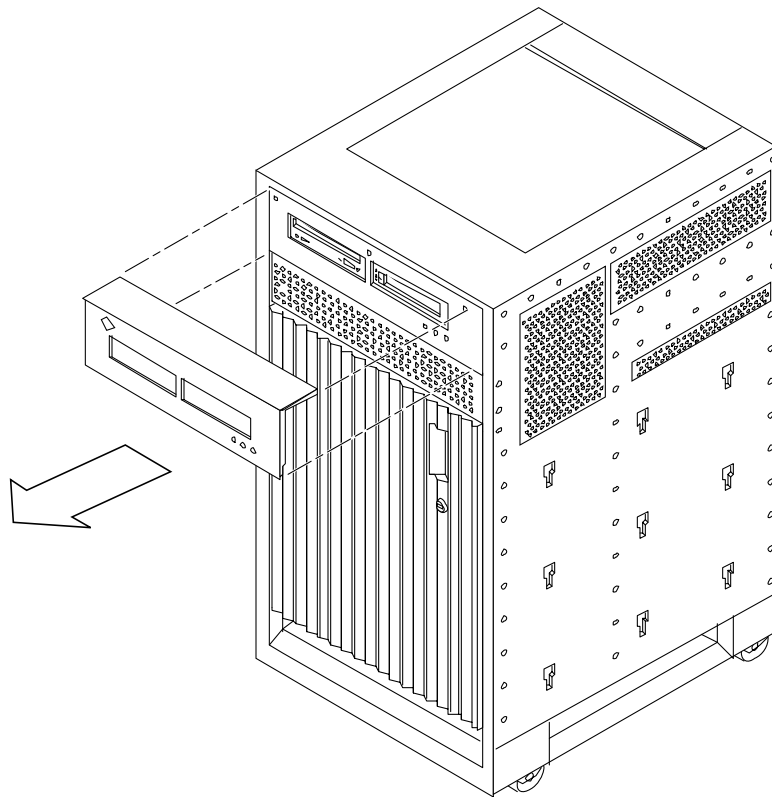


Figure E-5 Removing the Front Bezel

To remove the SCSI tray and front decorative panel:

1. Loosen the two captive screws securing the SCSI tray in the chassis.
2. Insert a screwdriver or similar instrument in the notch at the bottom center of the SCSI tray. Using the screwdriver, slightly pull out the SCSI tray.
3. Grasp the SCSI tray and gently pull it from the chassis.
See Figure E-6.

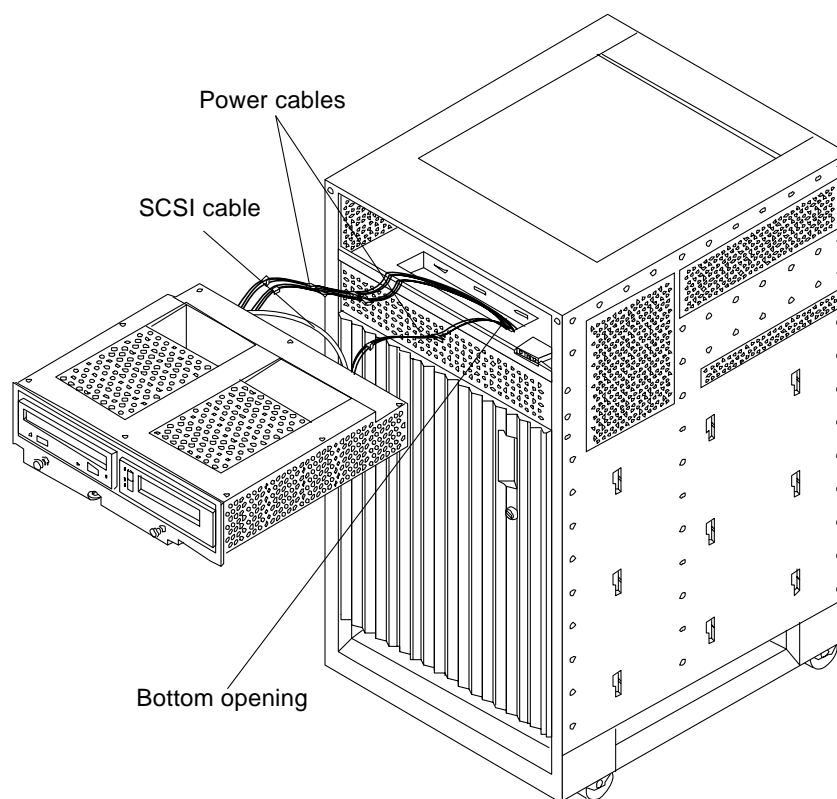


Figure E-6 Removing the SCSI Tray

Note – If you are not replacing the SCSI cables or the centerplane, you may simply flip over the SCSI tray and rest it on the top of the Enterprise 3000 system.

4. If you are replacing SCSI cables or the centerplane, disconnect the cables from the back of the SCSI tray.
5. Open the front door of the Enterprise 3000 system.
 - If you are replacing the centerplane, go to Section E.3.5, “Centerplane,” on page E-18.
 - Otherwise, continue with Step 6.

6. **Remove the screws securing the front decorative (perforated) panel in the chassis.**
There are eight screws on the top, seven screws on the bottom, and three screws on each side of the front decorative panel.
7. **Grasp the front decorative panel and set it aside.**

E.3.1 SCSI Tray Data and DC Power Cable Assemblies

To remove the data and power cables:

1. **Remove the panels covering the data and power cables.**
Complete the steps in Section E.3, "Removing the Front and Side Panels."
2. **Reach through the space previously occupied by the front decorative (perforated) panel and disconnect the SCSI cables from the centerplane.**
3. **Cut the cable ties that secure the cables to the chassis.**
4. **Remove the cables.**

To replace the data and power cables:

1. **Connect the cables to the back of the SCSI tray.**

Note – The SCSI data and power cables are keyed so that the cables fit into the connectors in only one direction and cannot be reversed.

2. **Place the cables through the chassis opening vacated by the SCSI tray.**
Drop the cables through the bottom opening.
The cables should be visible through the opening normally covered by the front decorative (perforated) panel. See Figure E-6.
3. **Reach through the space normally covered by the front decorative panel and connect the cables to the centerplane.**
See Figure E-7.

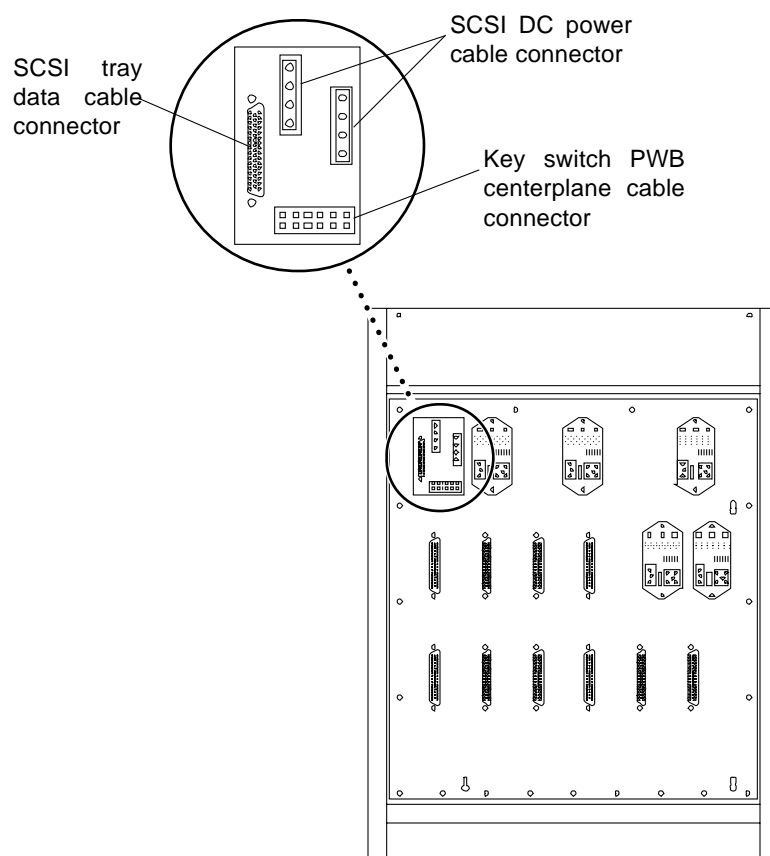


Figure E-7 Cable Connectors on the Centerplane

4. Replace the panels covering the data and power cables.

Complete the steps in Section E.4, “Replacing the Front and Side Panels.”

E.3.2 Key Switch PWB Centerplane Cable Assembly

To remove the key switch PWB centerplane cable assembly:

1. Remove the panels covering the key switch printed wiring board (PWB) centerplane cable.

Complete the steps in Section E.3, “Removing the Front and Side Panels.”

2. **Disconnect the key switch PWB centerplane cable from the centerplane.**
See Figure E-8.

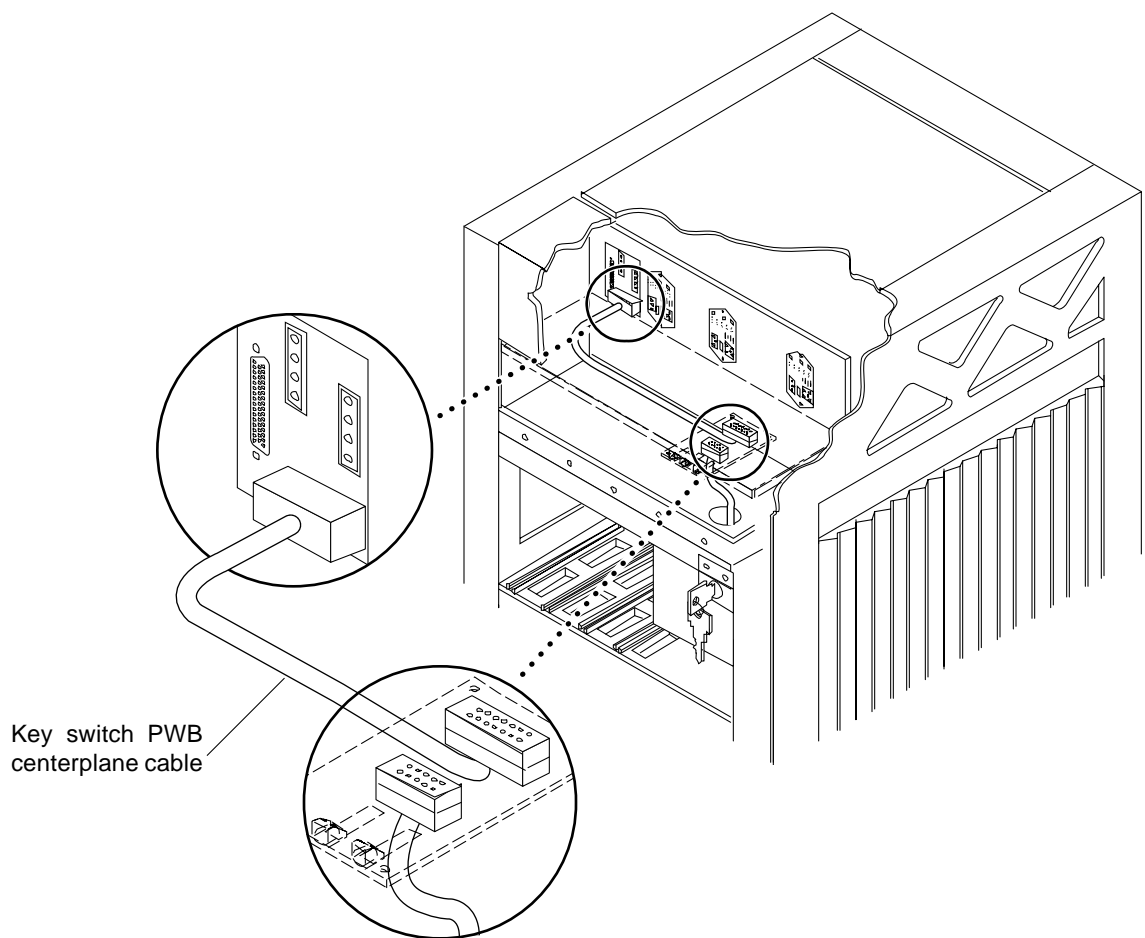


Figure E-8 Key Switch PWB Centerplane Cable

3. **Disconnect the key switch PWB centerplane cable from the LED board.**
 - a. **Pull forward on the two locking tabs securing the cable to the LED board.**
The key switch PWB centerplane cable is in back of the key switch lock cable assembly. See Figure E-9.

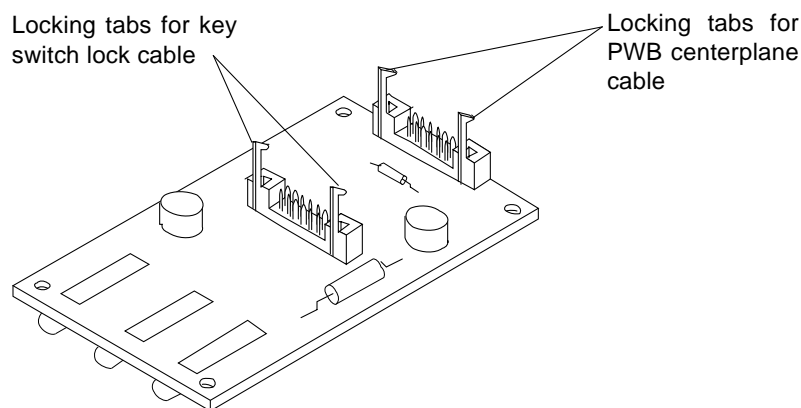


Figure E-9 Locking Tabs on the LED Board

b. Disconnect the cable.

4. Cut the cable tie and remove the key switch PWB centerplane cable.

To replace the key switch PWB centerplane cable assembly:

Note – Both ends of the key switch printed wiring board (PWB) centerplane cable are keyed so that the cable fits into the connector in only one direction and cannot be reversed.

1. Connect the key switch PWB centerplane cable to the LED board.

a. Connect the cable.

The key switch PWB centerplane cable is in back of the key switch lock cable assembly. See Figure E-8.

b. Push back on the two locking tabs and secure the cable to the LED board.

The two locking tabs fit over the connector, securing the key switch PWB centerplane cable to the LED board. See Figure E-9.

2. Connect the other end of the key switch PWB centerplane cable to the centerplane.

3. Use a cable tie and secure the key switch PWB centerplane cable to the chassis.

- 4. Replace the panels covering the key switch lock assembly.**
Complete the steps in Section E.4, “Replacing the Front and Side Panels.”

E.3.3 Key Switch Lock Cable Assembly

To remove the key switch lock cable assembly:

- 1. Remove the panels covering the key switch lock cable assembly.**
Complete the steps in Section E.3, “Removing the Front and Side Panels.”
- 2. Disconnect the key switch lock cable from the LED board.**
 - a. Pull forward on the two locking tabs securing the cable to the LED board.**
The key switch lock cable is in front of the key switch PWB centerplane cable. See Figure E-9.
 - b. Disconnect the cable.**
- 3. Remove the two screws that attach the key switch lock assembly to the chassis.**
- 4. Twist the key switch lock assembly to the left and pull it forward and out away from the chassis.**
The key switch lock assembly has a hook that sits on the bracket in the chassis. You need to turn the assembly so that the hook clears the bracket before the key switch lock assembly can be removed. See Figure E-10.

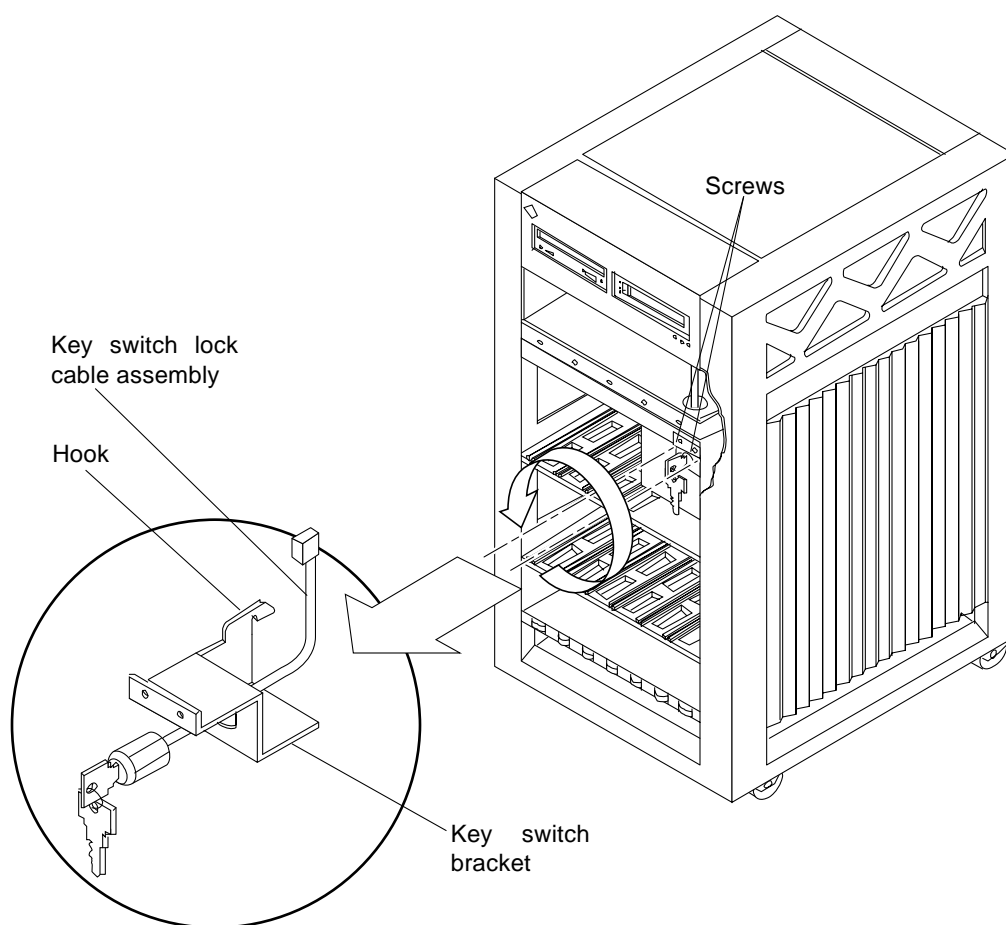


Figure E-10 Removing the Key Switch Lock Cable Assembly

5. Separate the key switch lock cable from the key switch bracket.

- a. Remove the U-shaped key switch keeper by pulling it straight out away from the key switch lock assembly.**
The key switch keeper is located on the inside of the key switch bracket and secures the cable to the bracket.
- b. Remove the key switch lock cable by pulling it through the keyhole.**
See Figure E-10.

To replace the key switch lock cable assembly:

1. **Secure the key switch lock cable to the key switch bracket.**
 - a. **Insert the key switch lock cable into the keyhole of the key switch bracket.**

Position the key switch lock cable so that the arrow on the front of the cable assembly is turned upward. See Figure E-10.
 - b. **Secure the key switch lock cable to the bracket using the key switch keeper.**

Slip the key switch keeper into the groove on the cable to secure the cable to the bracket.
2. **Twist the key switch lock assembly to the left and thread it through the round hole in the right front side of the chassis.**
3. **Twist the key switch lock assembly to the right so that the hook rests on the bracket in the chassis.**

See Figure E-10.
4. **Replace the two screws that attach the key switch lock assembly to the chassis.**
5. **Connect the key switch lock cable to the LED board.**

Note – The key switch lock cable is keyed so that the cable fits into the connector in only one direction and cannot be reversed.

- a. **Connect the cable.**

The key switch lock cable is in front of the key switch PWB centerplane cable. See Figure E-9.
- b. **Push back on the two locking tabs and secure the cable to the LED board.**

The two locking tabs fit over the connector, securing the key switch lock cable assembly to the LED board.
6. **Replace the panels covering the key switch lock assembly.**

Complete the steps in Section E.4, “Replacing the Front and Side Panels.”

E.3.4 LED Board

Note – Use a short Phillips screwdriver to complete this procedure.

To remove the LED board:

- 1. Remove the panels covering the LED board.**
Complete the steps in Section E.3, “Removing the Front and Side Panels.”
- 2. Disconnect the key switch lock and PWB centerplane cables from the LED board.**
See Figure E-9.
 - a. Pull forward on the two locking tabs securing the cables to the LED board.**
 - b. Disconnect the cables.**
- 3. Remove the four screws securing the LED board to the chassis.**
There is one screw in each corner of the LED board.
- 4. Remove the LED board.**

To replace the LED board:

- 1. Orient the LED board so that the three LEDs are visible through the chassis window cutout.**
- 2. Insert a screw into the front right corner of the LED board.**
Use this screw as a guide and place the LED board against the chassis.
- 3. Slightly tighten the first screw and attach this corner of the LED board to the chassis.**
- 4. Replace the three other screws that attach the LED board to the chassis.**
- 5. Tighten all four screws.**
- 6. Connect the key switch lock and PWB centerplane cables to the LED board.**
See Figure E-9.

Note – The key switch lock and PWB centerplane cables are keyed so that the cables fit into the connectors in only one direction and cannot be reversed.

a. Connect the cables.

The key switch lock cable is in front of the key switch PWB centerplane cable.

b. Push back on the locking tabs and secure the cables to the LED board.

The two locking tabs fit over the connector, securing the cable assembly to the LED board.

7. Replace the panels covering the LED board.

Complete the steps in Section E.4, “Replacing the Front and Side Panels.”

E.3.5 Centerplane

To remove the Centerplane:

1. Remove the panels covering the front of the chassis.

Complete the steps in Section E.3, “Removing the Front and Side Panels.”

2. Remove all the disk drives.

See Chapter 7, “Internal SCSI and Storage Devices,” for information on removing disk drives.

3. Remove the fan tray assembly.

See Section E.1, “Fan Tray Assembly,” for information on removing the fan tray assembly.

4. Remove the 15 screws on each side that secure the front chassis to the main chassis.

See Figure E-11.

5. Remove the two screws on the top front corners that secure the front chassis to the main chassis.

See Figure E-11.

6. Gently pull out the front chassis and set it aside.

7. Disconnect all the cables from the centerplane.

- a. **Disconnect the SCSI tray data and DC power cable assemblies.**
See Section E.3.1, “SCSI Tray Data and DC Power Cable Assemblies,” for information on disconnecting these cables.
- b. **Disconnect the key switch PWB centerplane cable assembly.**
See Section E.3.2, “Key Switch PWB Centerplane Cable Assembly,” for information on disconnecting this cable.

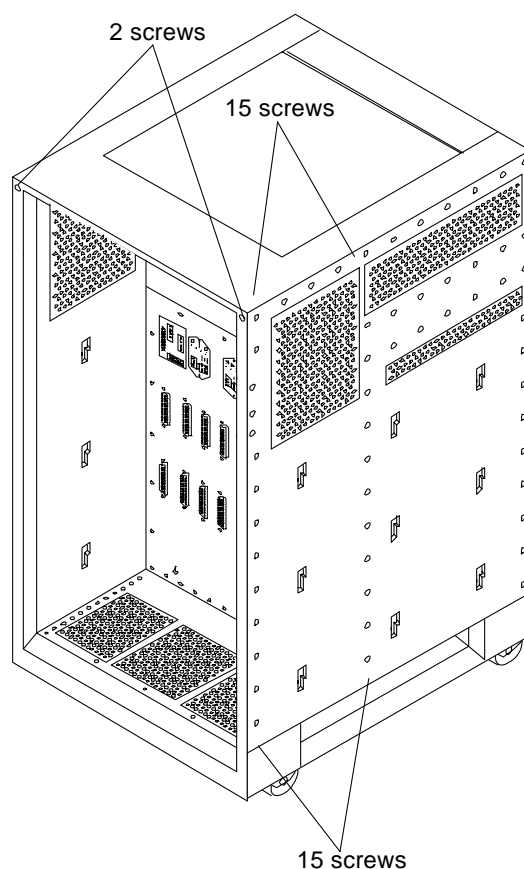


Figure E-11 Enterprise 3000 System Without the Front Chassis

8. Disconnect all the boards from the centerplane.

See Chapter 3, "CPU/Memory Boards and Components," Chapter 4, "I/O Boards and Components," and Chapter 5, "Clock Board," for information on removing the boards.

9. Disconnect the peripheral power supplies from the centerplane.

See Chapter 6, "Power Supplies," for information on removing the peripheral power supplies.

10. Disconnect the PCMs from the centerplane.

See Chapter 6, "Power Supplies," for information on removing the PCMs.

11. If present, disconnect the auxiliary fan tray from the centerplane.

See Section E.2, "Auxiliary Fan Tray Assembly," for information on removing the auxiliary fan tray.

12. If present, disconnect all the filler panels from the centerplane.

- a. With a Phillips #1 screwdriver, turn the arrows to the unlocked position in the quarter-turn access slots on the filler panels.**

See Figure E-2.

- b. Pull out and disengage the filler panels from the centerplane.**

13. From the front of the system, remove the 24 screws securing the centerplane to the main chassis.

14. Remove the centerplane.

To replace the centerplane:

1. Replace the 24 screws securing the centerplane to the main chassis.

2. Replace and secure the front chassis to the centerplane.

Use the three guide pins to align the front chassis with the centerplane.

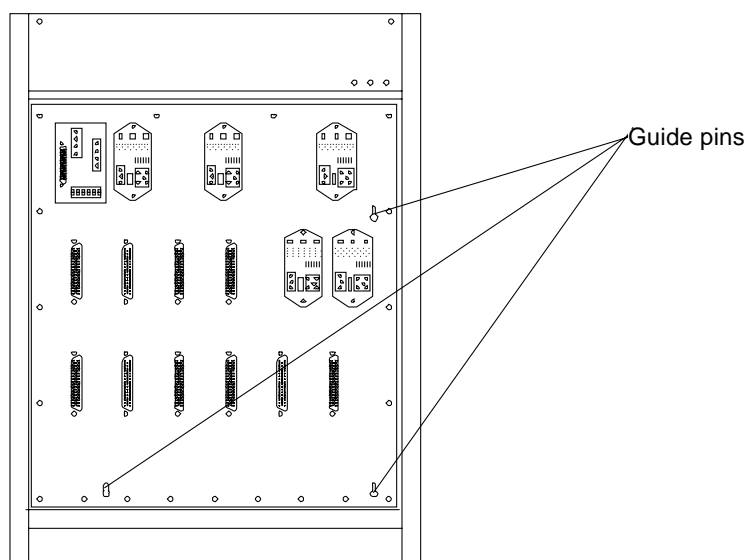


Figure E-12 Centerplane Guide Pins

3. **Replace the two screws on the top front corners that secure the front chassis to the main chassis.**
See Figure E-11.
4. **Replace the 15 screws on each side that secure the front chassis to the main chassis.**
See Figure E-11.
5. **Connect all the cables to the centerplane.**
 - a. **Connect the key switch PWB centerplane cable assembly.**
See Section E.3.2, “Key Switch PWB Centerplane Cable Assembly,” for information on connecting this cable.
 - b. **Connect the SCSI tray data and DC power cable assemblies.**
See Section E.3.1, “SCSI Tray Data and DC Power Cable Assemblies,” for information on connecting these cables.
6. **If present, connect the auxiliary fan tray to the centerplane.**
See Section E.2, “Auxiliary Fan Tray Assembly,” for information on replacing the auxiliary fan tray.

7. Connect the PCMs to the centerplane.

See Chapter 6, “Power Supplies,” for information on replacing the PCMs.

8. Connect the peripheral power supplies to the centerplane.

See Chapter 6, “Power Supplies,” for information on replacing the peripheral power supplies.

9. Connect all the boards to the centerplane.

See Chapter 3, “CPU/Memory Boards and Components,” Chapter 4, “I/O Boards and Components,” and Chapter 5, “Clock Board,” for information on replacing the boards.

10. Replace all the filler panels.

a. Slide the filler panels toward the centerplane.

Ensure that the arrows in the quarter-turn access slots point to the unlocked position.

The filler panel should insert and seat smoothly. If it binds, remove it, and inspect the slot for any obvious obstructions.

b. With a Phillips #1 screwdriver, turn the arrows in the quarter-turn access slots to the locked position.

See Figure E-2.

11. Replace all the disk drives.

See Chapter 7, “Internal SCSI and Storage Devices,” for information on replacing the disk drives.

12. Replace the fan tray assembly.

See Section E.1, “Fan Tray Assembly,” for information on replacing the fan tray assembly.

13. Replace the panels covering the front of the chassis.

Complete the steps in Section E.4, “Replacing the Front and Side Panels.”

E.4 Replacing the Front and Side Panels

To replace the SCSI tray and front decorative panel:

1. Replace the front decorative (perforated) panel.

There are eight screws on the top, seven screws on the bottom, and three screws on each side of the front decorative panel.

2. Close the front door of the Enterprise 3000 system.
3. If necessary, connect the SCSI cables to the back of the SCSI tray.
4. Replace the SCSI tray into the chassis opening at the front of the Enterprise 3000 system.
5. Tighten the two captive screws securing the SCSI tray in the chassis.

To replace the front bezel and side panels:

1. Place the front bezel against the chassis.
Press the panel into place.
See Figure E-5.
2. Replace the side panels.
 - a. Place the side panel alongside the chassis
The top edge of the side panel should be approximately 1 inch higher than the chassis.
 - b. Slide the side panel down until it snaps into place.
See Figure E-4.
3. Power on the Enterprise 3000 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.

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 is 540-2756. Although the individual fans in the assembly may have a separate part number, the part number you should use when placing your order is 540-2756 for the entire assembly.

Note – For information about additional capacity drives and other replacement options, contact your sales representative.

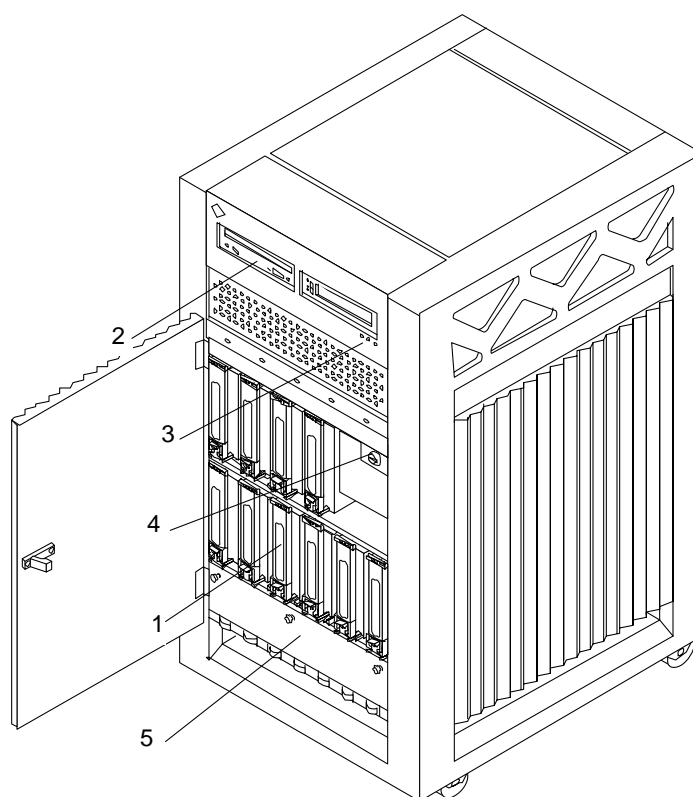
Table F-1 List of Replaceable Components (1 of 2)

General Category	Description	Part Number	Page
Fan tray	Fan tray assembly	540-2756	page F-18
	Fan tray assembly, auxiliary	540-2757	page F-19
	Centerplane assembly	501-2939	page F-8
	Disk drive	540-2815	page F-17
SCSI devices	Terminator, 68 pin	150-2267	page F-19
	Sun CD 4	370-2203	page F-16
	4/8 Gbyte 4 mm tape drive	370-2177	
	4 mm DDS2 auto loader	370-2180	
	2.5 Gbyte QIC tape	370-2202	
	SCSI tray data cable assembly	530-2220	page F-16
	SCSI DC power cable assembly	530-2221	page F-16
	Key switch lock cable assembly	530-2148	page F-6
	Key switch tray, LED board	501-2599	page F-8
	Key switch PWB centerplane cable assembly	530-2226	
	Power supply, peripheral	300-1301	page F-9
	Power supply, peripheral with AC input	300-1307	page F-10
Power	Power/cooling module (PCM)	300-1260	page F-9
	Peripheral power supply filler panel	540-2759	
	PCM filler panel	540-2593	
	CPU/Memory board assembly	501-2976	page F-11
	6 ns, 512 Kbyte CPU module	501-2941	page F-11
Boards	6 ns, 1 Mbyte CPU module	501-2959	page F-11
	6 ns, 2 Mbyte CPU module	501-2974	page F-11
	Assembly, DRAM, 1MX72, JEDEC, SIMM, 60 ns	501-2652	page F-11
	Assembly, DRAM, 4MX72, JEDEC, SIMM, 60 ns	501-2653	page F-11

Table F-1 List of Replaceable Components (2 of 2)

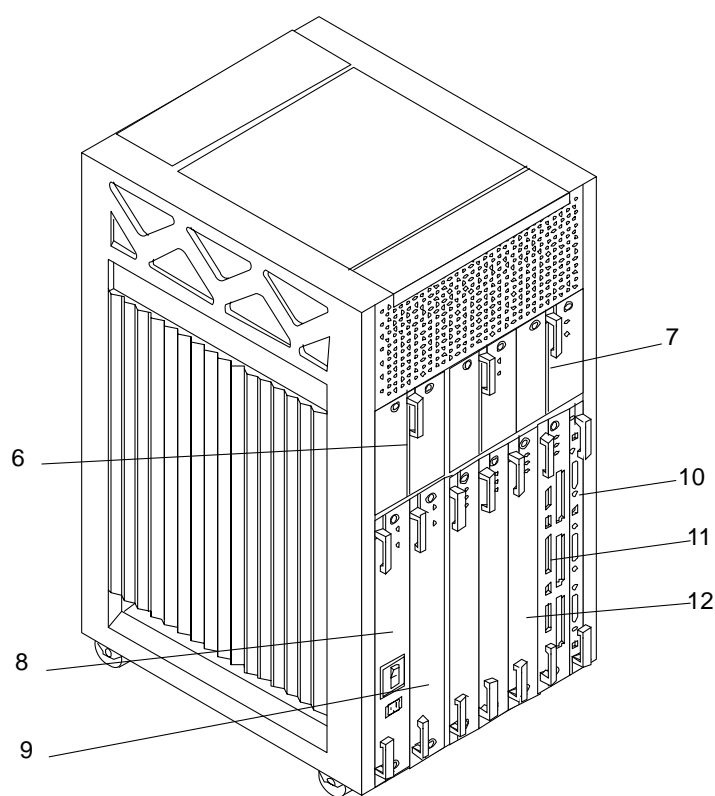
General Category	Description	Part Number	Page
	Assembly, DRAM, 16MX72, JEDEC, SIMM, 60 ns	501-2654	page F-11
	SBus I/O board assembly	501-2977	page F-12
	Graphics I/O board assembly	501-2749	page F-13
	Optical link card	370-1426	
	DFB, FFB Graphics Card, 67 MHz	501-4126	
	SFB, FFB Graphics Card, 67 MHz	501-4127	
	Clock board assembly	501-2975	page F-14
	Board, filler panel	540-2592	page F-15

Table F-2 Front View



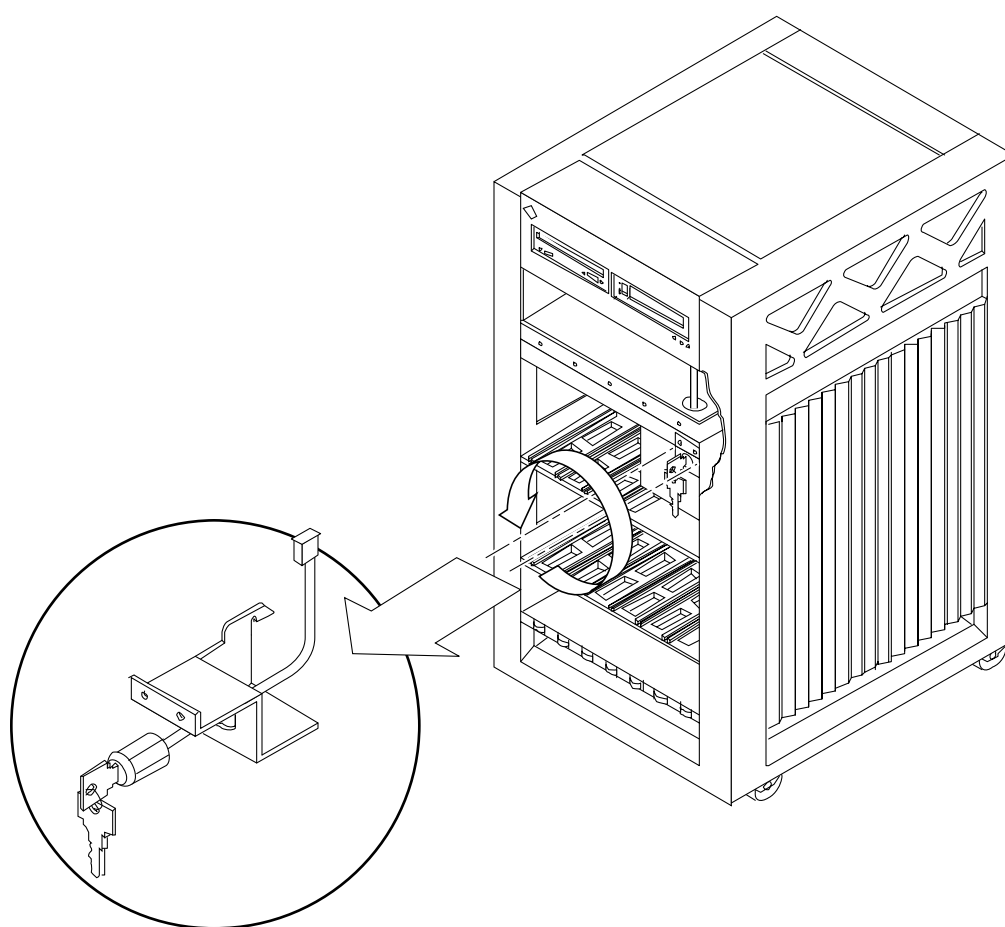
Key	Description	Part Number
1	Disk drive	540-2815
2	Sun CD 4	370-2203
3	LED board	501-2599
4	Key switch lock cable	530-2148
5	Fan tray assembly	540-2756

Table F-3 Rear View



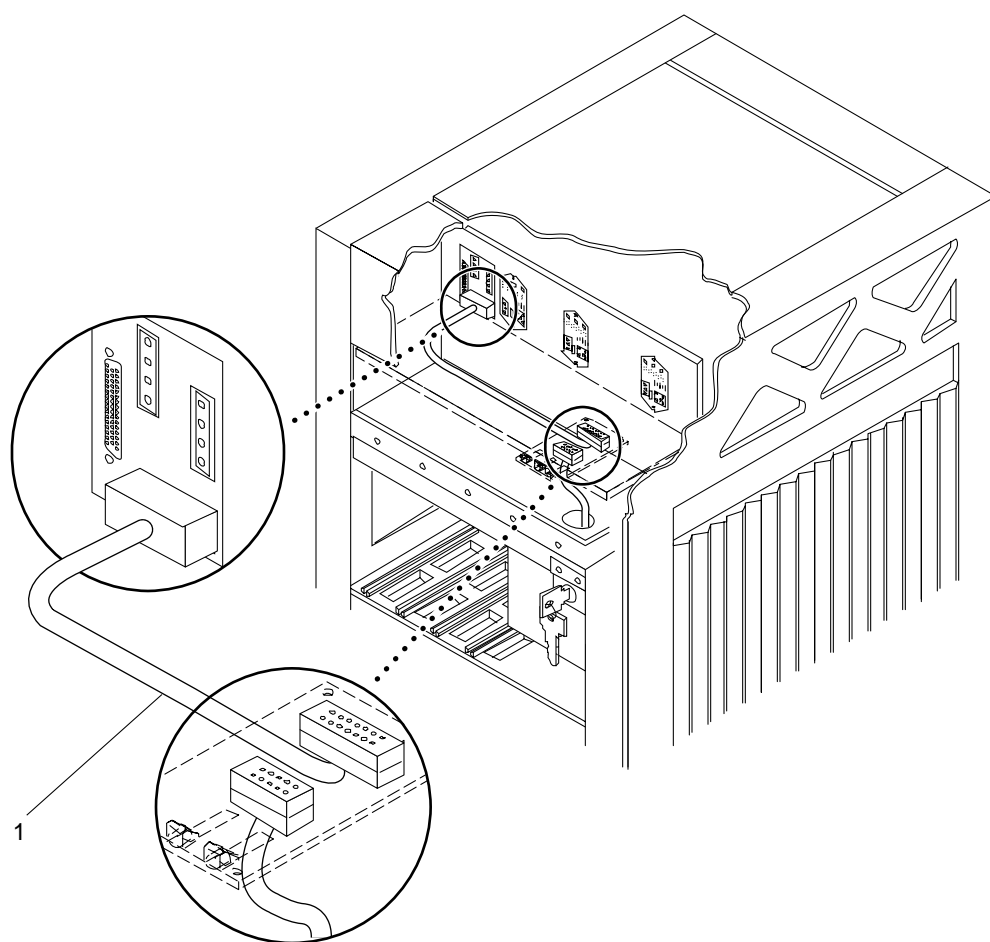
Key	Description	Part Number
6	Auxiliary fan tray	540-2757
7	PCM	300-1260
8	Power supply, peripheral/AC input	300-1307
9	Power supply, peripheral	300-1301
10	Clock board assembly	501-2975
11	SBus I/O board assembly	501-2977
12	CPU/Memory board assembly	501-2976

Table F-4 Key Switch Lock Cable Assembly



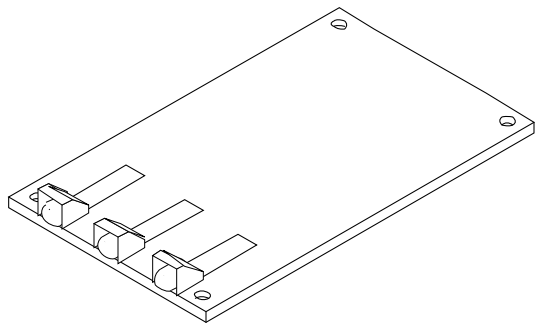
Description	Part Number
Key switch lock cable assembly	530-2148

Table F-5 Key Switch PWB Centerplane Cable Assembly



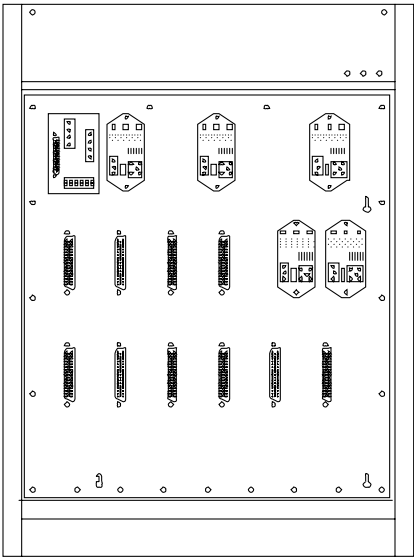
Key	Description	Part Number
1	Key switch PWB centerplane cable assembly	530-2226

Table F-6 Key Switch Tray, LED Board



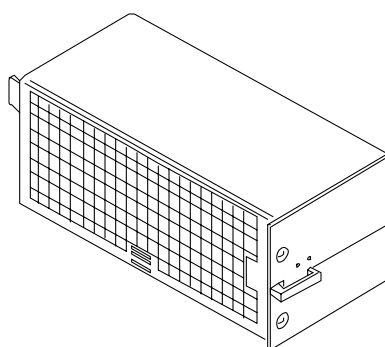
Description	Part Number
LED board	501-2599

Table F-7 Centerplane Assembly



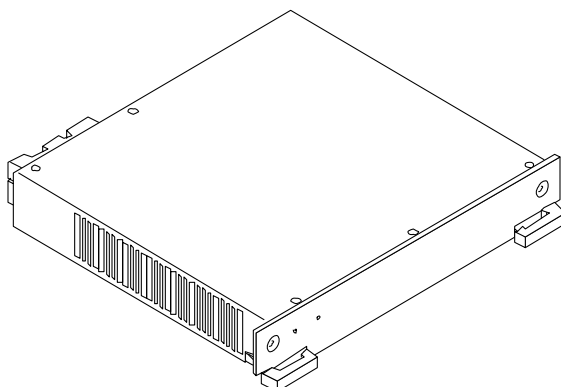
Description	Part Number
Centerplane assembly	501-2939

Table F-8 PCM



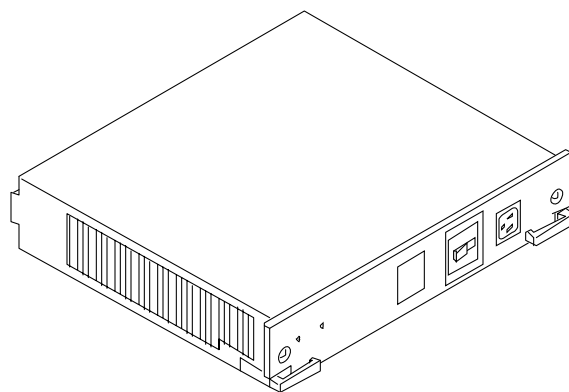
Description	Part Number
PCM	300-1260

Table F-9 Peripheral Power Supply



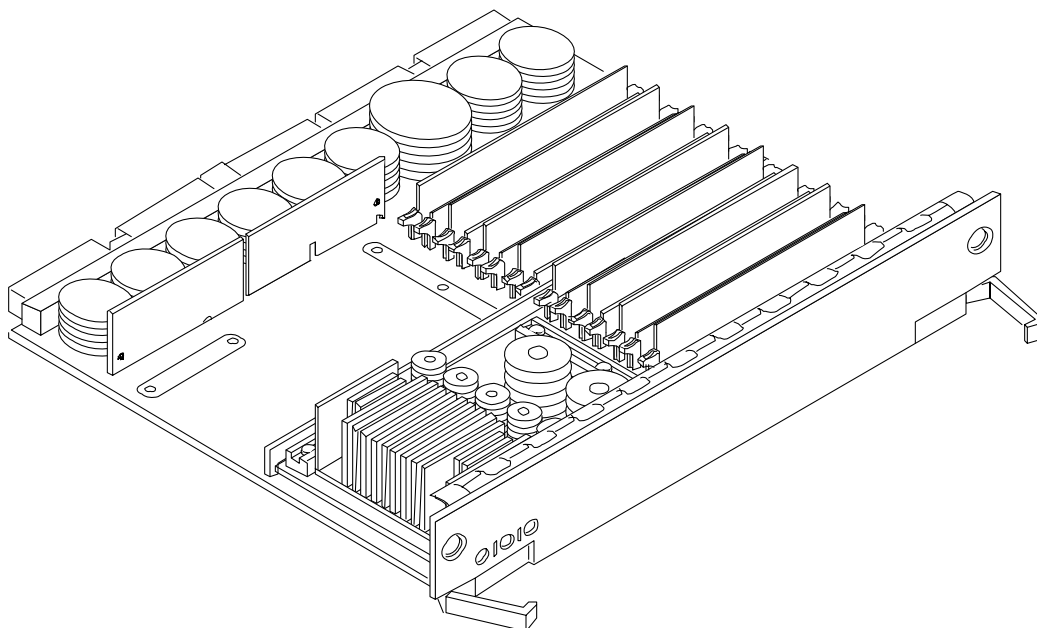
Description	Part Number
Power supply, peripheral	300-1301

Table F-10 Peripheral Power Supply/AC Input



Description	Part Number
Power supply, peripheral with AC input	300-1307

Table F-11 CPU/Memory Board Assembly

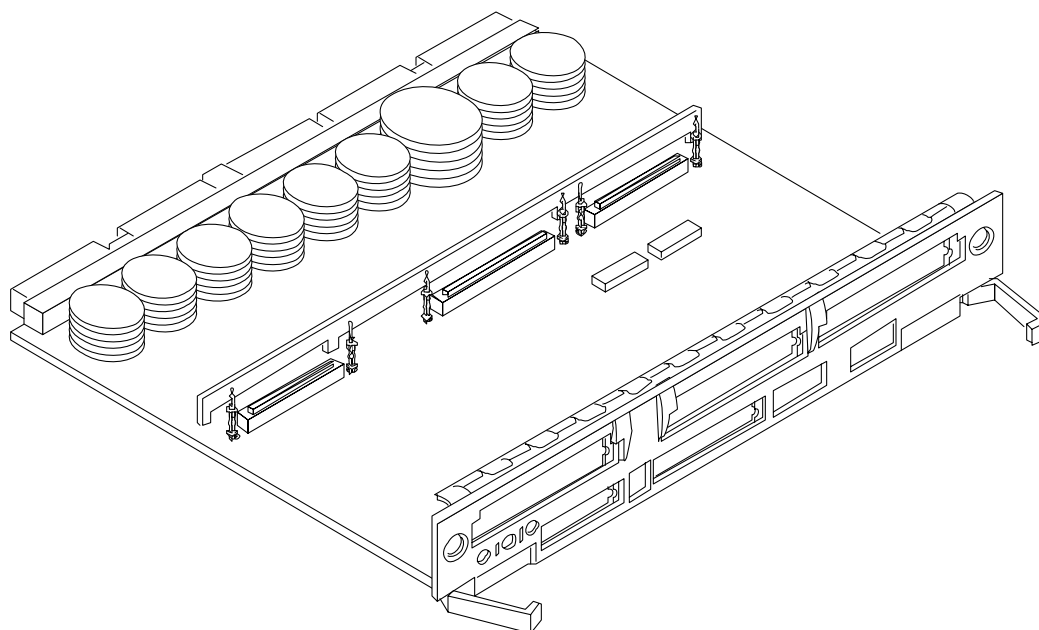


Description

CPU/Memory board assembly

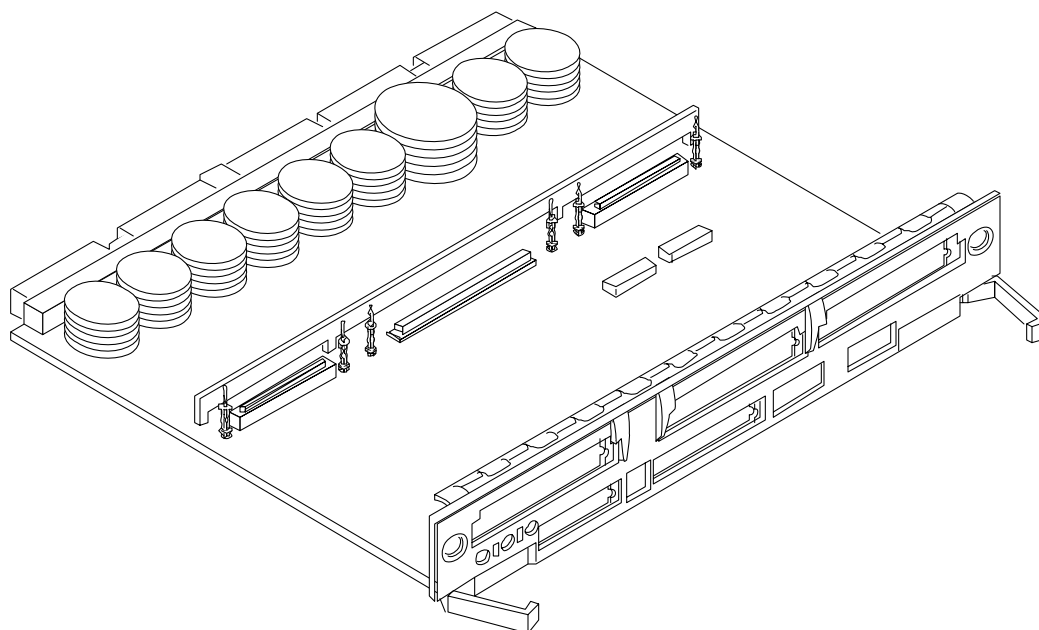
Part Number501-2976

Table F-12 SBus I/O Board Assembly



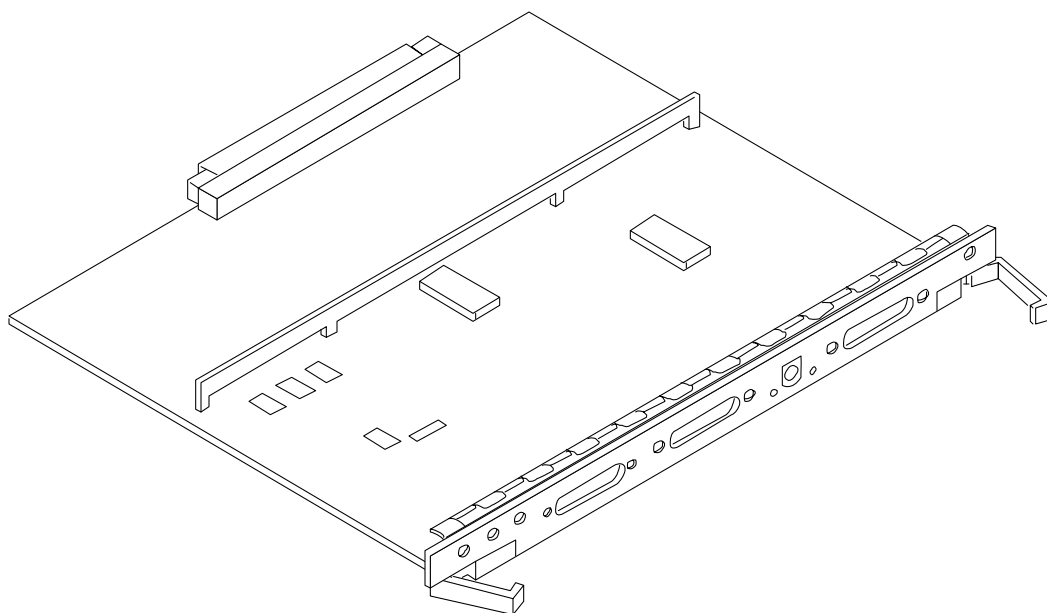
Description	Part Number
SBus I/O board assembly	501-2977

Table F-13 Graphics I/O Board Assembly



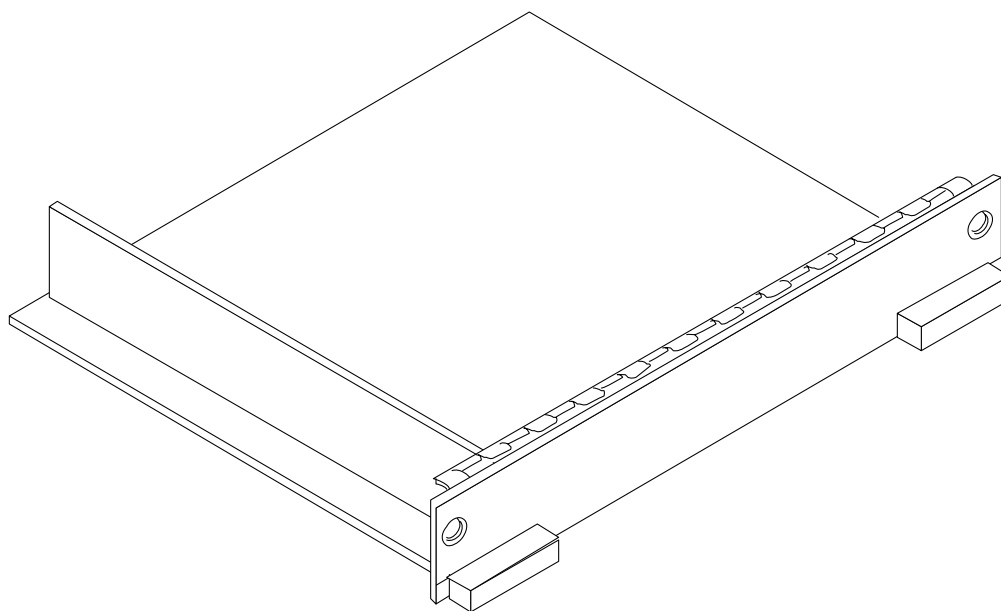
Description	Part Number
Graphics I/O board assembly	501-2749

Table F-14 Clock Board Assembly



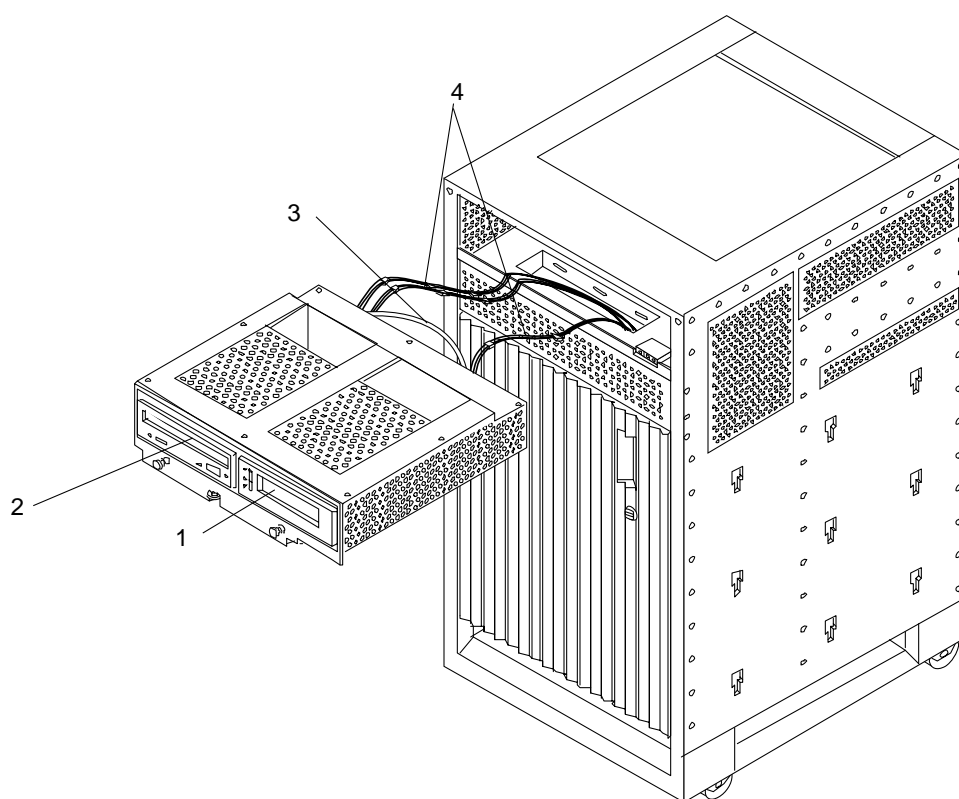
Description	Part Number
Clock board assembly	501-2975

Table F-15 Filler Board Panel Assembly



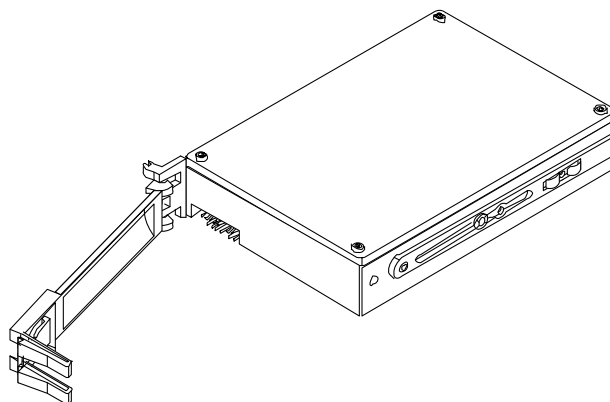
Description	Part Number
Filler panel board assembly	540-2592

Table F-16 SCSI Tray Assembly



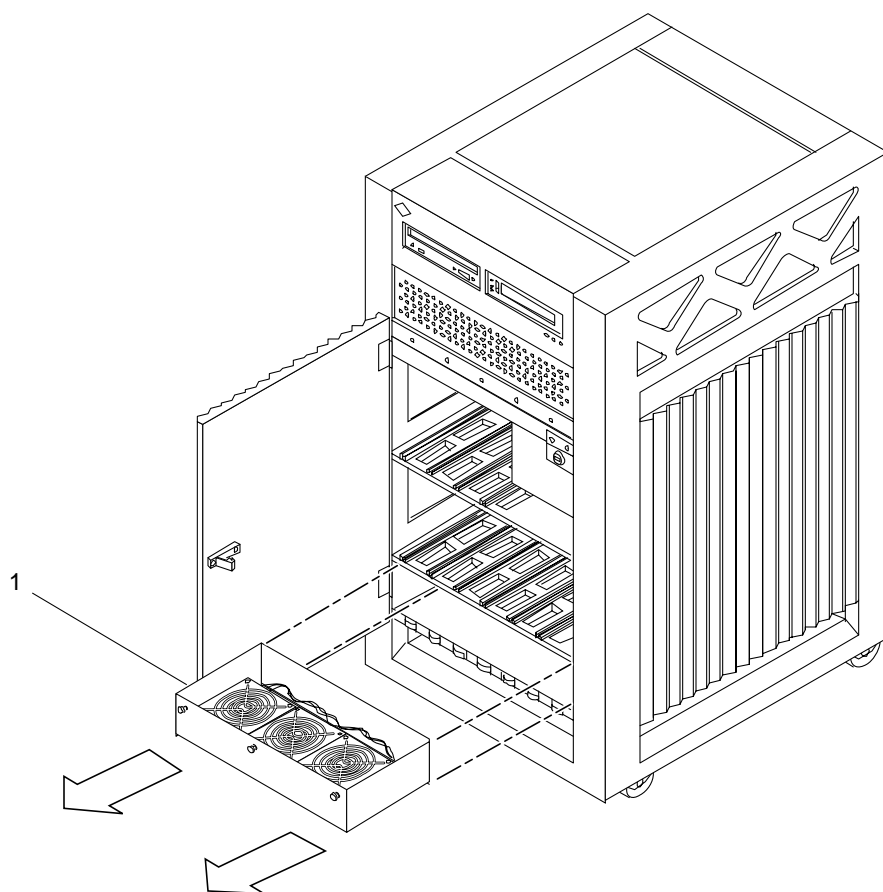
Key	Description	Part Number
1	Tape drive	
2	Sun CD 4	370-2203
3	SCSI tray data cable assembly	530-2220
4	SCSI DC power cable assembly	530-2221

Table F-17 Disk Drive



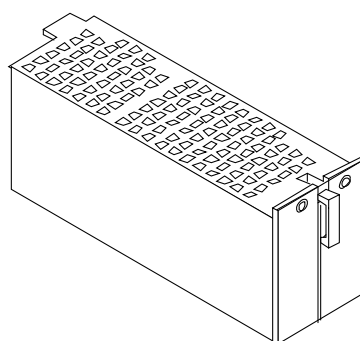
Description	Part Number
Disk drive	540-2815

Table F-18 Fan Tray Assembly



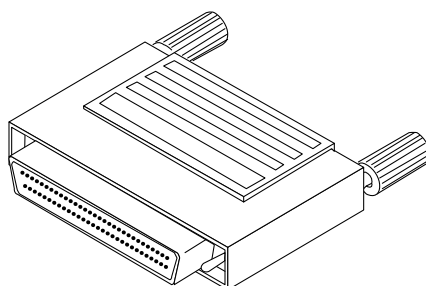
Key	Description	Part Number
1	Fan tray assembly	540-2756

Table F-19 Auxiliary Fan Tray Assembly



Description	Part Number
Auxiliary fan tray assembly	540-2757

Table F-20 68 Pin Terminator



Description	Part Number
68 pin terminator	150-2267

Connectors



<i>CPU/Memory Board</i>	<i>page G-1</i>
<i>I/O Boards</i>	<i>page G-5</i>
<i>Clock Board</i>	<i>page G-11</i>

G.1 CPU/Memory Board

Figure G-1 shows the locations of the centerplane and CPU module connectors.

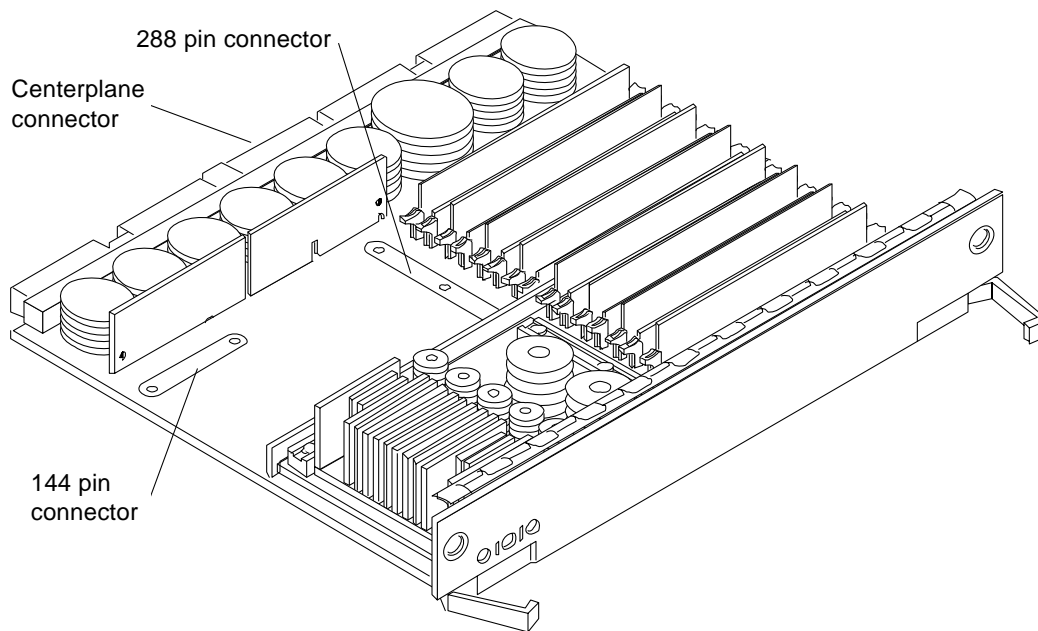


Figure G-1 CPU/Memory Board Connector Locations

G.1.1 Centerplane Connector

Note – Information for the CPU/Memory board centerplane connector also applies to the I/O board centerplane connector.

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.

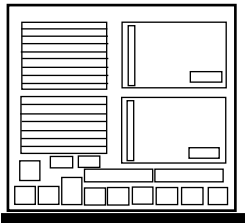


Figure G-2 CPU/Memory Board Centerplane Connector Location

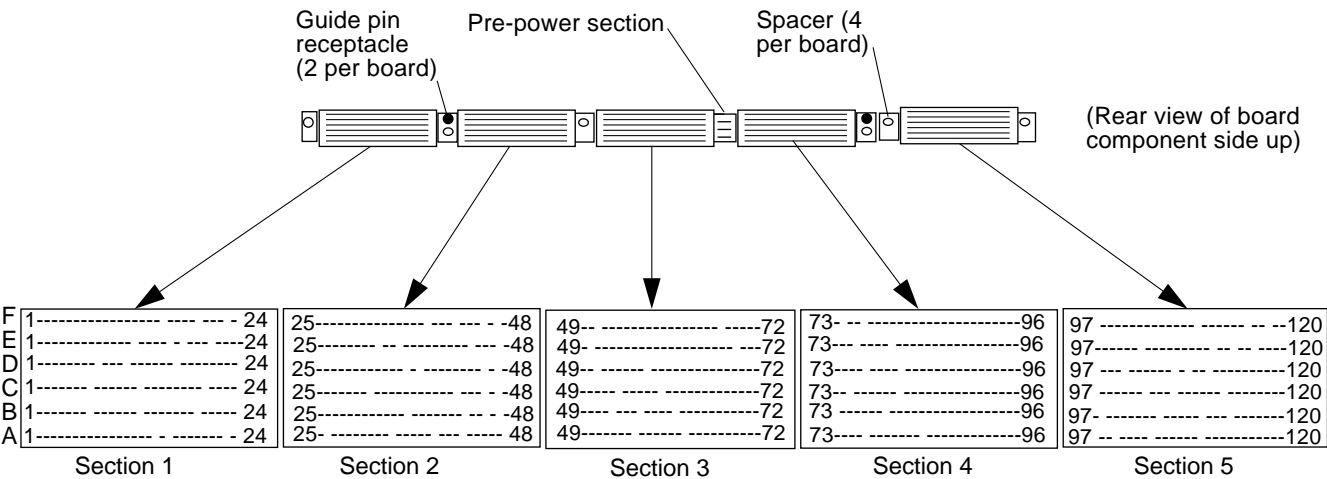


Figure G-3 Centerplane Connector Detail

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-7.

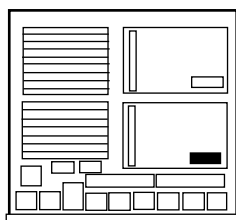


Figure G-4 CPU Module 0 Connector (144 Pin) Location

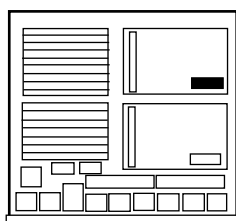


Figure G-5 CPU Module 1 Connector (144 Pin) Location

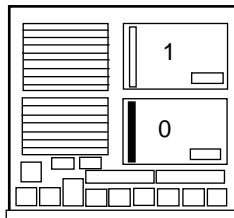


Figure G-6 CPU Module 0 Connector (288 Pin) Location

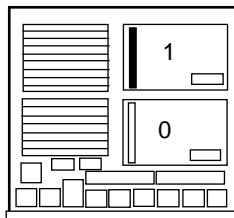


Figure G-7 CPU Module 1 Connector (288 Pin) Location

G.2 I/O Boards

Figure G-8 and Figure G-9 show the locations of the connectors on the SBus I/O and Graphics I/O boards.

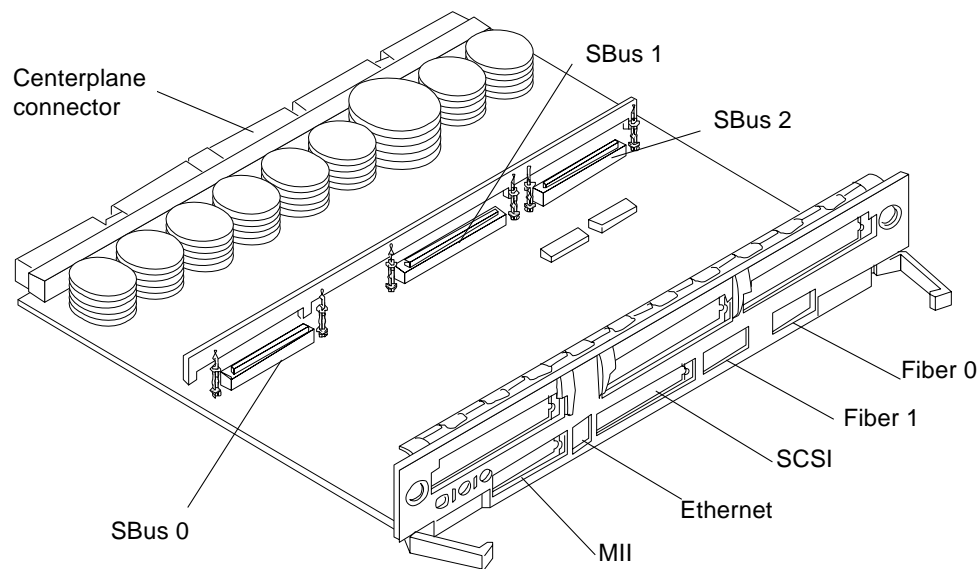


Figure G-8 SBus I/O Board Connector Locations

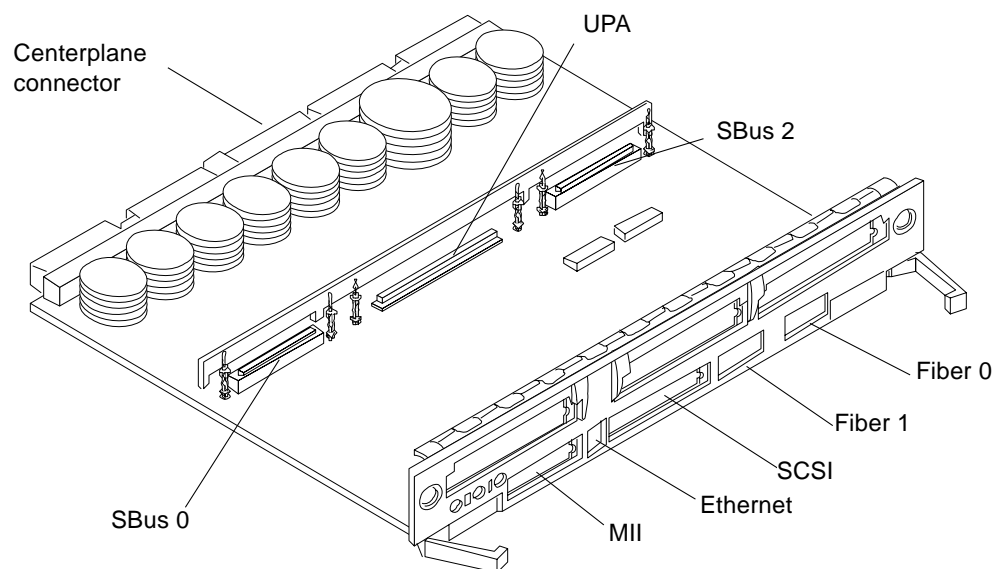


Figure G-9 Graphics I/O Board Connector Locations

G.2.1 Centerplane Connector

See Section G.1.1, “Centerplane Connector,” on page G-2. Information for the CPU/Memory board centerplane and the I/O boards centerplane is the same.

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-10, Figure G-11, and Figure G-12.

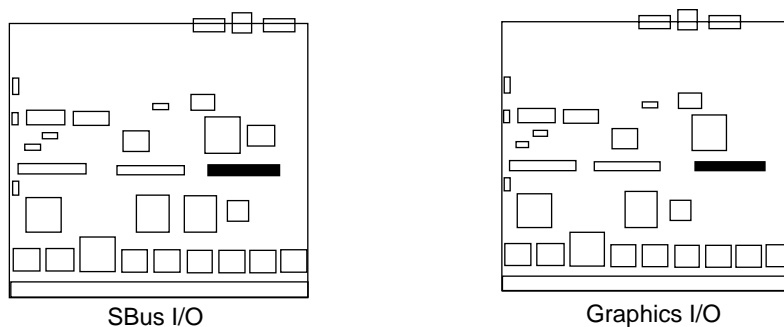


Figure G-10 I/O Board SBus 0 Connector Locations

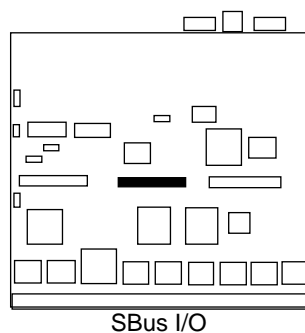


Figure G-11 I/O Board SBus 1 Connector Location

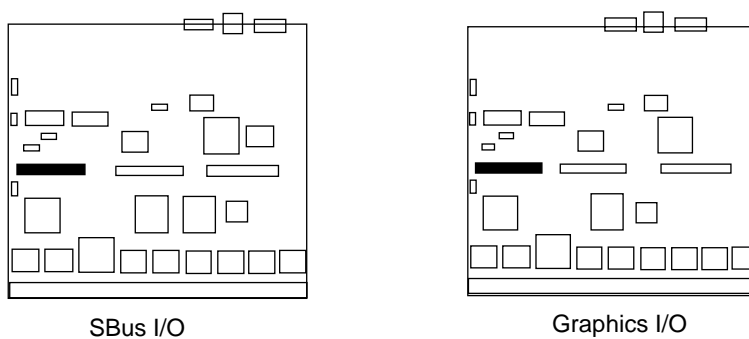


Figure G-12 I/O Board SBus 2 Connector Locations

G.2.3 UPA Connector Location

The Graphics I/O board has one UPA connector.

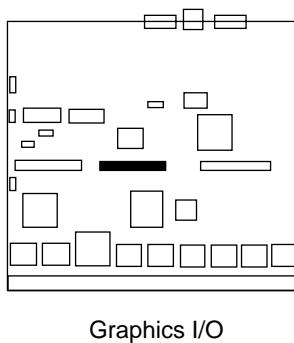


Figure G-13 Graphics I/O Board UPA Connector Location

G.2.4 Ethernet Connector (TPE)

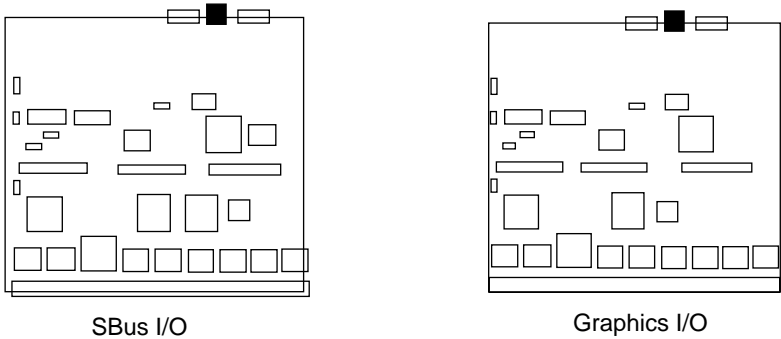


Figure G-14 I/O Board Ethernet Connector Locations

G.2.5 MII Connector

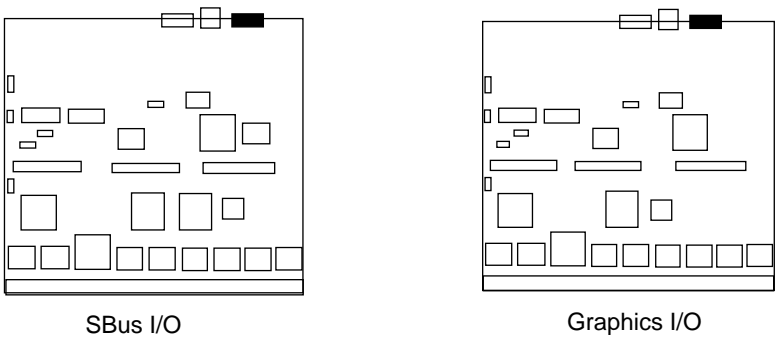


Figure G-15 I/O Board MII Connector Locations

G.2.6 Fiber Interface Connectors

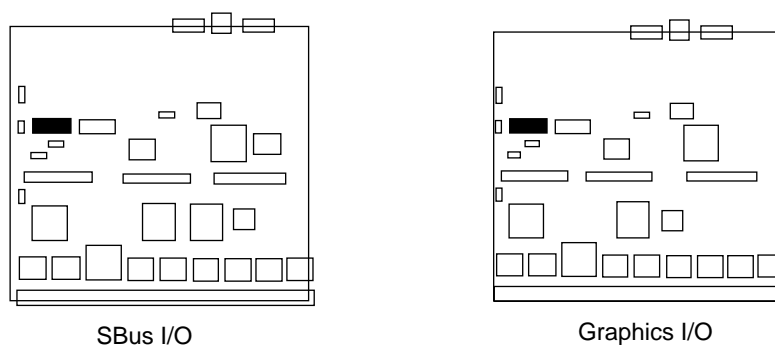


Figure G-16 I/O Board Fiber 0 Interface Connector Locations

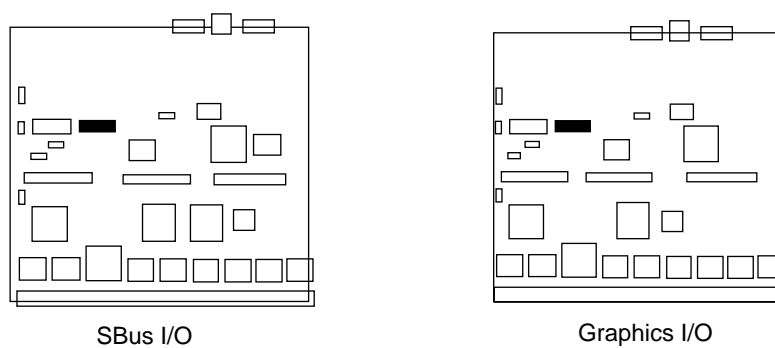


Figure G-17 I/O Board Fiber 1 Interface Connector Locations

G.2.6.1 SCSI Connector

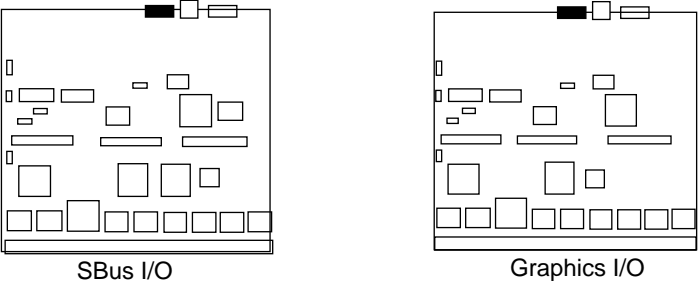


Figure G-18 I/O Board SCSI Connector Locations

G.3 Clock Board

Figure G-19 shows the clock board connector locations.

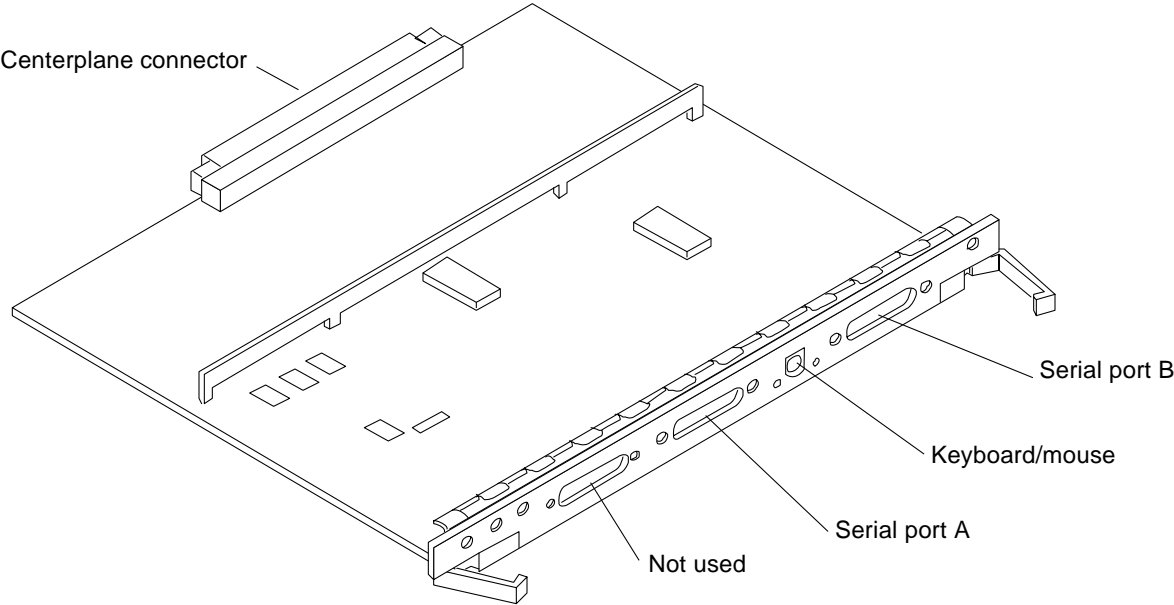


Figure G-19 Clock Board Connector Locations

G.3.1 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.

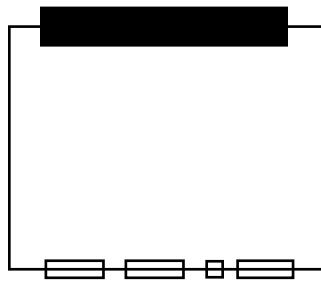


Figure G-20 Clock Board Centerplane Connector Location

G.3.2 Serial Port Connectors

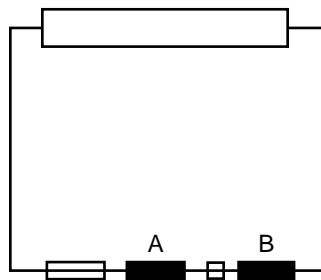


Figure G-21 Clock Board Serial Port Connectors Locations

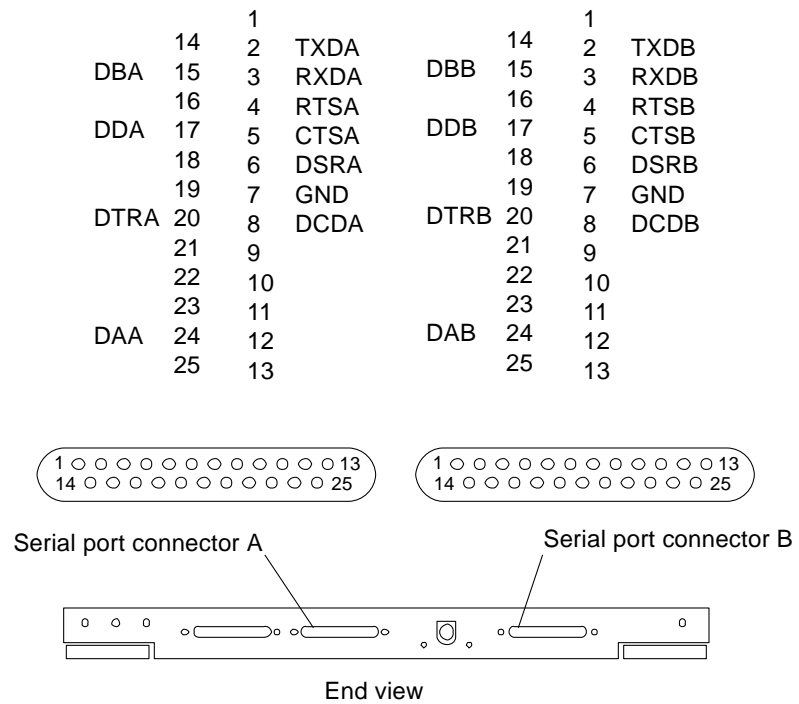


Figure G-22 Serial Port A and B Connector Pinouts

G.3.3 Keyboard and Mouse Connector

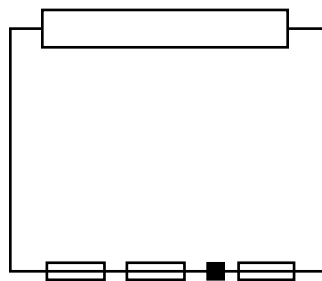


Figure G-23 Clock Board Keyboard/Mouse Connector Location

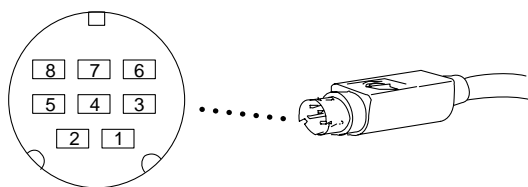


Figure G-24 Keyboard and Mouse Connector Pinouts

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