Ultra™ Enterprise™ Cluster Service Manual

THE NETWORK IS THE COMPUTER™

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Preface

How This Book Is Organized

This manual provides service instructions for Ultra™ Enterprise™ Cluster systems, including factory-assembled and customer-assembled systems. These instructions are designed for experienced and qualified maintenance personnel.

Part 1—System Information

Chapter 1, **“Product Description,”** describes Enterprise Cluster PDB standard features, internal options, and external options for each system configuration.

Part 2—Troubleshooting

Chapter 2, **“Troubleshooting Overview,“**describes the overall architecture for troubleshooting the system.

Chapter 3, “PDB Cluster Hardware Troubleshooting,” provides procedures for the isolation of various faults relative to major system components.

Chapter 4, **“HA Cluster Hardwareware Troubleshooting,“** provides references to lists of error messages generated by the various software types.

Chapter 5, **“Software Troubleshooting,“** provides software troubleshooting references.

Chapter 6, **“Diagnostics,”** describes online diagnostics and scripts for verifying hardware installation.

Part 3—Preparing for Service

Chapter 7, **“Safety and Tools Requirements,“** provides safety precautions and a list of required tools.

Chapter 8, **“Shutdown and Restart Procedures,“** provides system and individual subsystem shutdown and restart procedures.

Part 4—Subassembly Removal and Replacement

Chapter 9, **“Internal Access,“** provides panel removal procedures necessary to access system components during removal and replacement**.**

Chapter 10, **“Major Subassemblies,“** contains procedures for the removal and replacement of system subassemblies and parts**.**

Part 5—Illustrated Parts Breakdown

Chapter 11, **“Illustrated Parts Breakdown,“** provides illustrations of the major replacement parts in a system and lists part numbers.

Part 6—Appendixes and Index

Appendix A, **“Product Specification,”** provides system product specifications for each Ultra Enterprise system configuration.

Appendix B, “Connector Pinouts and Cabling,” provides a list of pinouts and cabling for items specific to an Ultra Enterprise clustered system.

Appendix C, “SCSI Targeting,” provides SCSI targeting information for SCSI devices specific to an Ultra Enterprise Clustered system.

Appendix D, “SPARCstorage Array Firmware and Device Driver Error Messages,” provides a list of SPARCstorage Array error messages specific to the firmware and device driver.

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 type of information that you might need to use references for includes:

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

See one or more of the following:

- *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 `.login` file. Use `ls -a` to list all files. `machine_name% You have mail.`
`AaBbCc123`	What you type, contrasted with on-screen computer output	`machine_name% su` `Password:`
AaBbCc123	Command-line placeholder: replace with a real name or value	To delete a file, type `rm` *filename.*
AaBbCc123	Book titles, new words or terms, or words to be emphasized	Read Chapter 6 in the *User's Guide.* These are called *class* options. You *must* 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 information that may be helpful to the system administrator and service provider.

Table P-1 List of Related Documentation

Product Family	Title	Part Number
Ultra Enterprise Servers		
3000	***Ultra Enterprise Server 3000 Binder Set***	**825-3388**
Installation	*Ultra Enterprise 3000 Systems Installation Guide*	802-6050
Service	*Ultra Enterprise 3000 System Manual*	802-6051
Safety / EMI	*Ultra Enterprise System Cabinet Regulatory Compliance Guide*	801-3846
4000/5000/6000	***Ultra Enterprise 6000/5000/4000 Binder Set***	**825-3328**
Installation	*Ultra Enterprise 6000/5000/4000 Systems Installation Guide*	801-3844
Service	*Ultra Enterprise 6000/5000/4000 Systems Manual*	801-3845
Safety / EMI	*Ultra Enterprise System Cabinet Regulatory Compliance Guide*	801-3846
SPARCstorage Array 100	***SPARCstorage Array 100 Installation and Service Set***	**825-2513**

Table P-1 List of Related Documentation *(Continued)*

Product Family	Title	Part Number
	SPARCstorage Array Model 100 Series Installation Manual	801-2205
	SPARCstorage Array Model 100 Series Service Manual	801-2206
	SPARCstorage Array Regulatory Compliance Manual	801-7103
	SPARCstorage Array User's Guide Doc Set	**825-2514**
	SPARCstorage Array Configuration Guide	802-2041
	SPARCstorage Array User's Guide	802-2042
	SPARCstorage Array Product Note	802-2043
	Disk Drive Installation Manual for the SPARCstorage Array Model 100 Series	801-2207
SPARCstorage Array 200	*SPARCstorage Array Model 200 Series Installation Manual*	802-2027
	SPARCstorage Array Model 200 Series Service Manual	802-2028
	SPARCstorage Array Battery and PROM Install Note	802-2029
	SPARCstorage Array Model 200 Series Regulatory Compliance Manual	802-2031
Terminal Concentrator	***Terminal Concentrator Binder Set***	**825-2227**
	Terminal Concentrator Installation Notes	801-6127
	Terminal Concentrator General Reference Guide	801-5972
Software	*SMCC SPARC Hardware Platform Guide*	802-5341
	Solstice System Manager Install Manual	802-6135
Diagnostics	*SunVTS Version 2.0 Users Guide*	802-5331
	Solstice SyMON User's Guide	802-5355
Options	*Ultra Enterprise Expansion Cabinet Installation and Service Manual*	802-6084
	Sparcstorage RSM Installation, Operations and Service Manual	802-5062
	Differential SCSI Disk Tray Service Manual	802-7341

Table P-1 List of Related Documentation *(Continued)*

Product Family	Title	Part Number
	Ultra Enterprise X000 Systems Board Installation Guide	802-5030
	Ultra Enterprise CPU Installation Guide	802-5031
	Ultra Enterprise SIMM Installation Guide	802-5032
	Ultra Enterprise Peripheral Power Supply Installation Guide	802-5033
	Ultra Enterprise PCM Installation Guide	802-6244
Ultra Enterprise PDB Clusters	***Ultra Enterprise Cluster PDB Binder Set***	**825-3525**
	Getting Started (roadmap)	802-6782
	Ultra Enterprise Cluster Hardware Site Preparation, Planning and Installation Guide	802-6783
	Ultra Enterprise Cluster PDB System Binder Set	**825-3526**
	Getting Started (roadmap)	*802-6782*
	Ultra Enterprise Cluster PDB Software Planning and Installation Guide	*802-6790*
	Ultra Enterprise Cluster PDB System Administration Guide	802-6784
	Ultra Enterprise PDB Cluster Volume Manager Administration Guide	802-6785
	Ultra Enterprise Cluster Service Manual	802-*6786*
	Ultra Enterprise PDB 1.2 Software (CD insert)	804-5449
	Ultra Enterprise PDB 1.2 Release Notes	802-6793
	Ultra Enterprise Cluster PDB Error Messages	802-6792
Ultra Enterprise HA Clusters	***Ultra Enterprise Cluster High Availability Binder Set***	**825-3589**
	Getting Started (roadmap)	802-7621
	Ultra Enterprise Cluster Hardware Site Preparation, Planning, and Installation Guide	802-*6783*

Table P-1 List of Related Documentation *(Continued)*

Product Family	Title	Part Number
	Solstice HA 1.3 User's Guide	805-0317
	Solstice HA 1.3 Programmer's Guide	805-0318
	Solstice HA 1.3 New Product Information	805-0629

Notes, Cautions, and Warnings

Warning – This equipment contains lethal voltage. 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 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.

Ordering Sun Documents

SunDocs℠ is a distribution program for Sun Microsystems technical documentation. Easy, convenient ordering and quick delivery is available from SunExpress™. You can find a full listing of available documentation on the World Wide Web: `http://www.sun.com/sunexpress/`

Country	Telephone	Fax
United States	1-800-873-7869	1-800-944-0661
United Kingdom	0-800-89-88-88	0-800-89-88-87
France	05-90-61-57	05-90-61-58
Belgium	02-720-09-09	02-725-88-50
Luxembourg	32-2-720-09-09	32-2-725-88-50
Germany	01-30-81-61-91	01-30-81-61-92
The Netherlands	06-022-34-45	06-022-34-46
Sweden	020-79-57-26	020-79-57-27
Switzerland	155-19-26	155-19-27
Japan	0120-33-9096	0120-33-9097

Sun Welcomes Your Comments

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- Email: `smcc-docs@sun.com`
- Fax: SMCC Document Feedback
  1-415-786-6443

Product Description 1

1.1 Standard Features

The Ultra Enterprise clustered systems operate on various Sun4U hardware configurations, including the Enterprise 3000, 4000, 5000 and 6000 systems. These systems are targeted at enterprise-wide, mission-critical database applications.

The Ultra Enterprise clustered systems support several database architectures, PDB (parallel database) and HA (high availability). For information on the database products supported refer to the applicable (PDB or HA) system administration guide.

Clustered systems improve the availability characteristics of databases. A cluster consists of two compute nodes (servers). The two nodes communicate with each other using two private network links. The benefits of coupling database servers are increased performance and higher level of database availability.

The database(s) for these systems are implemented on clustered platforms using redundant SPARCstorage™ Array Model 100 series disk arrays. For expanded systems, the controllers can be either SPARCstorage Array Model 200s or 210s which are used with SPARCstorage RSM™s (removable storage media) unit or 9-Gbyte disk trays. Clustered software maintains a mirror-image database on the disk arrays.

1

The systems are designed for reliability and serviceability, have no single point of failure, and can be repaired and maintained online. See Figure 1-1 through Figure 1-4 for functional block diagrams of clustered systems; see Chapter 11 for the various hardware configurations.

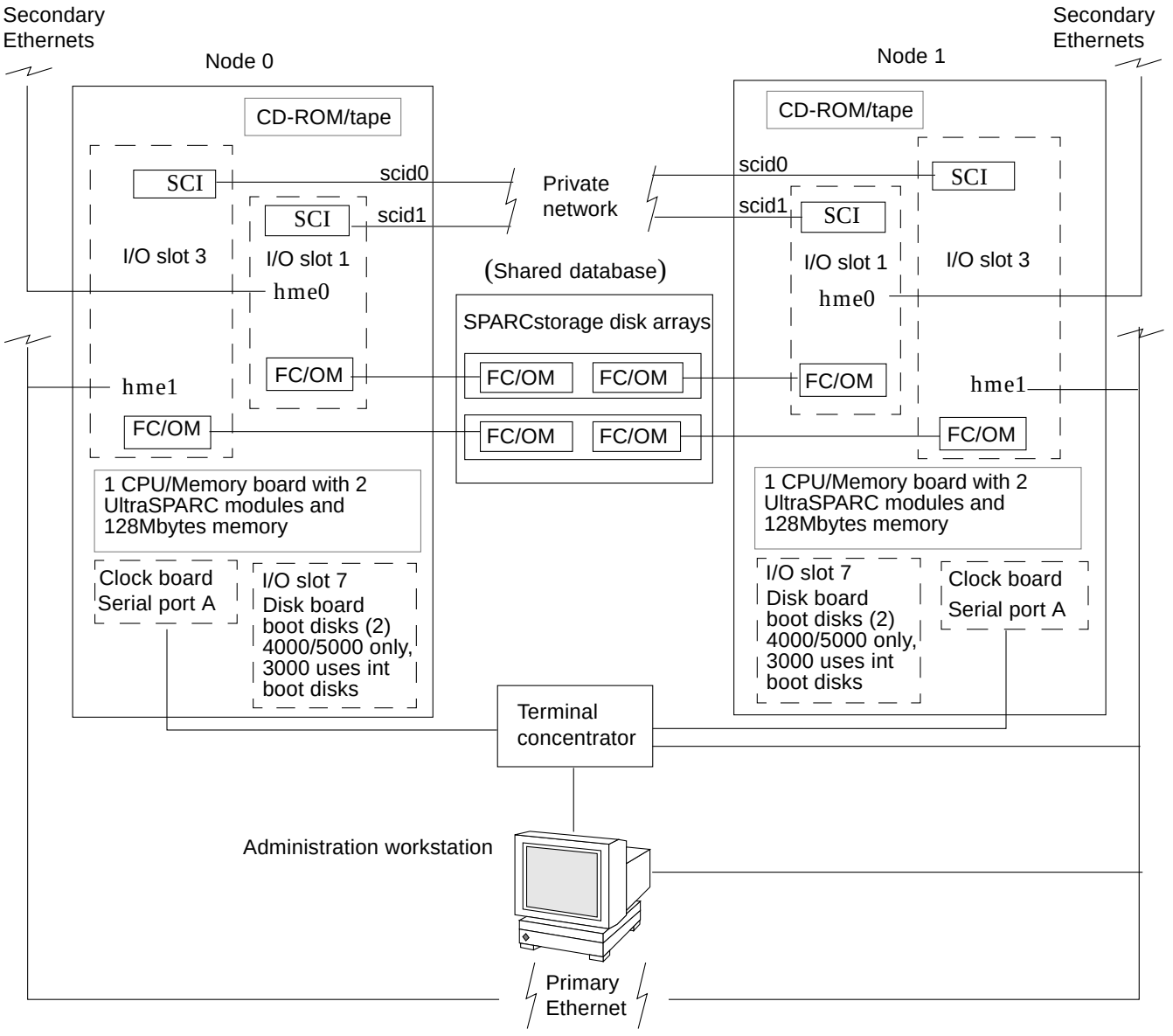


Figure 1-1 Clustered PDB System Based on Enterprise 3000/4000/5000

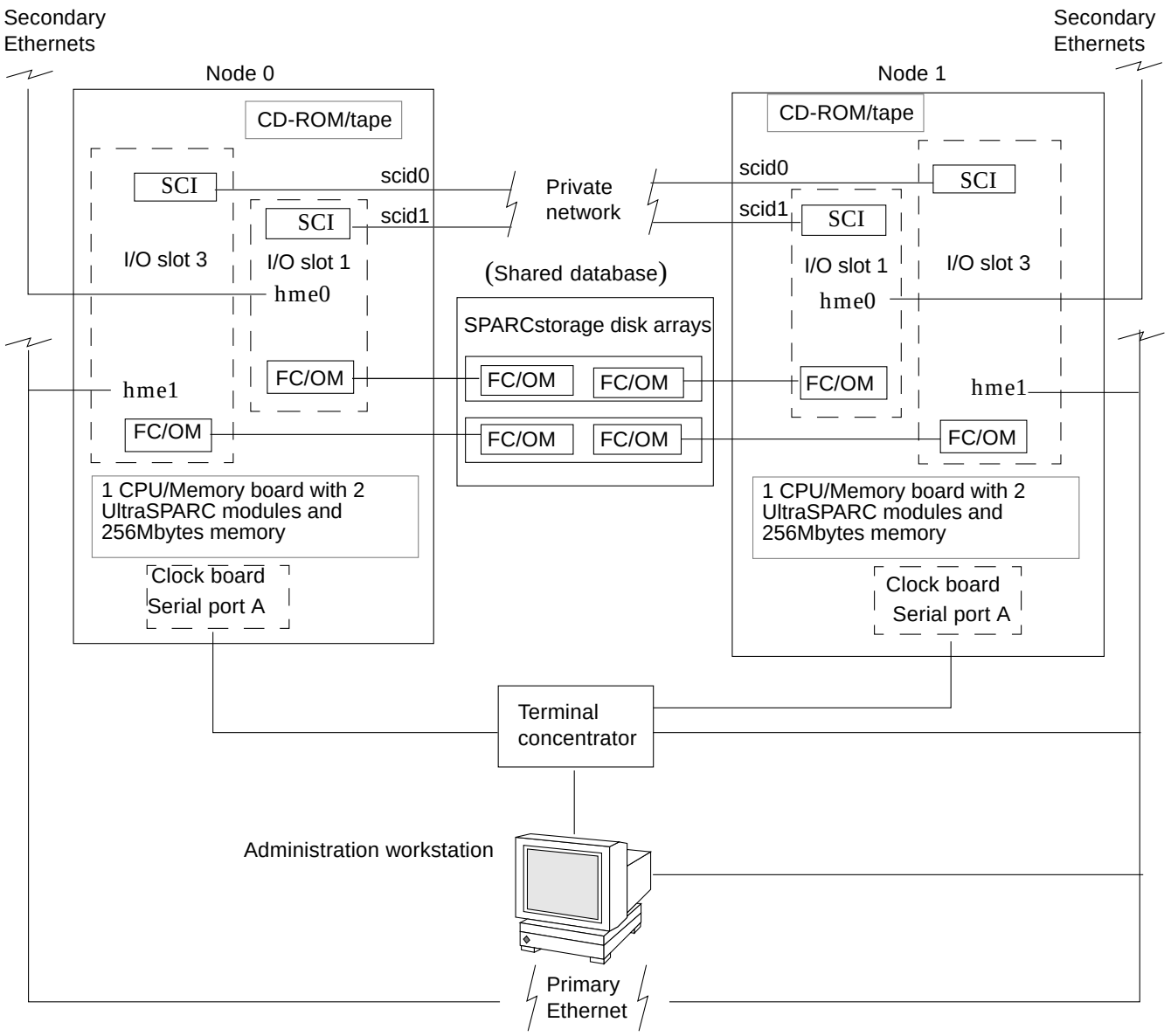


Figure 1-2 Clustered PDB System Based on Enterprise 6000

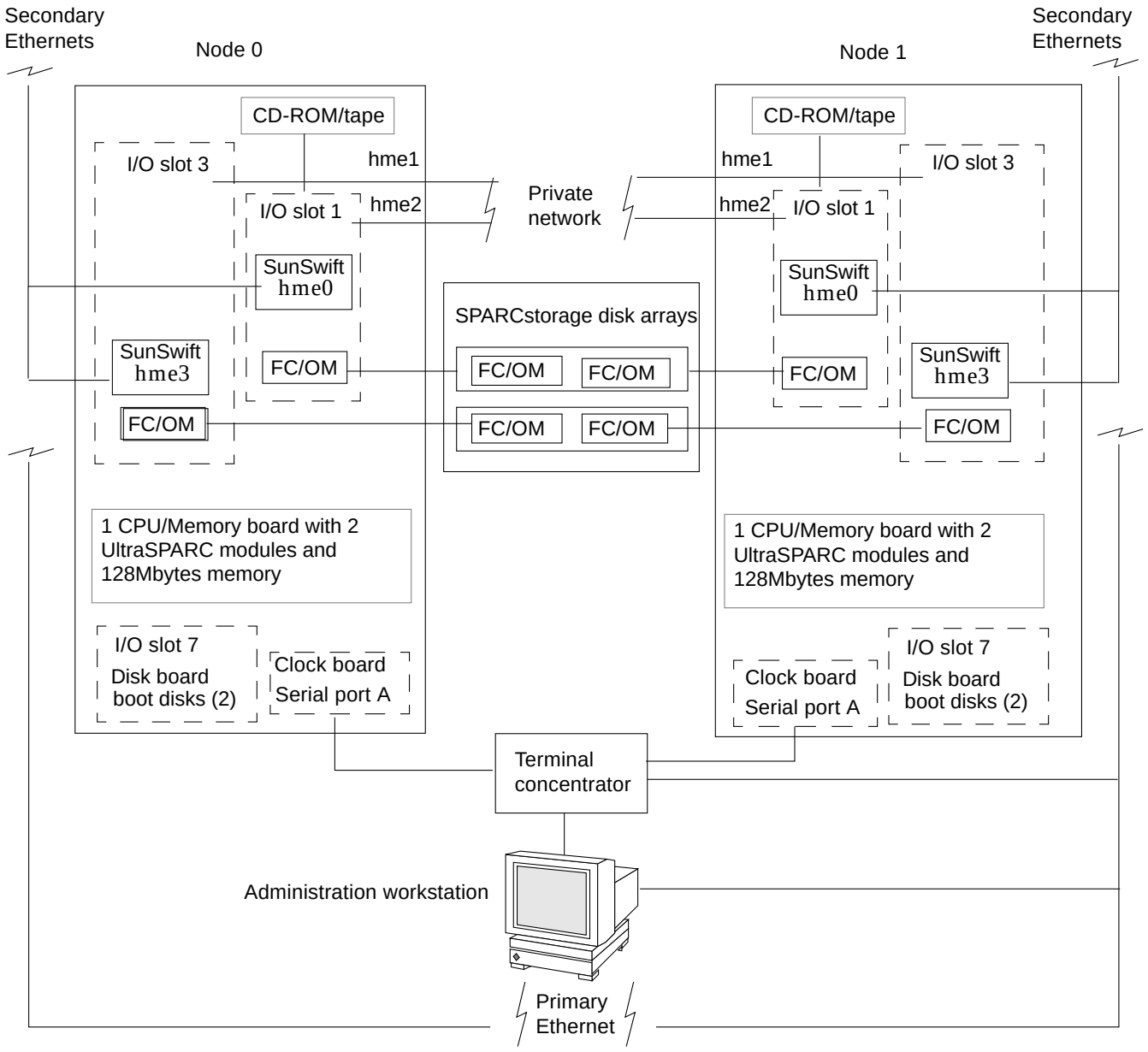


Figure 1-3 Clustered HA System Based on Enterprise 4000/5000

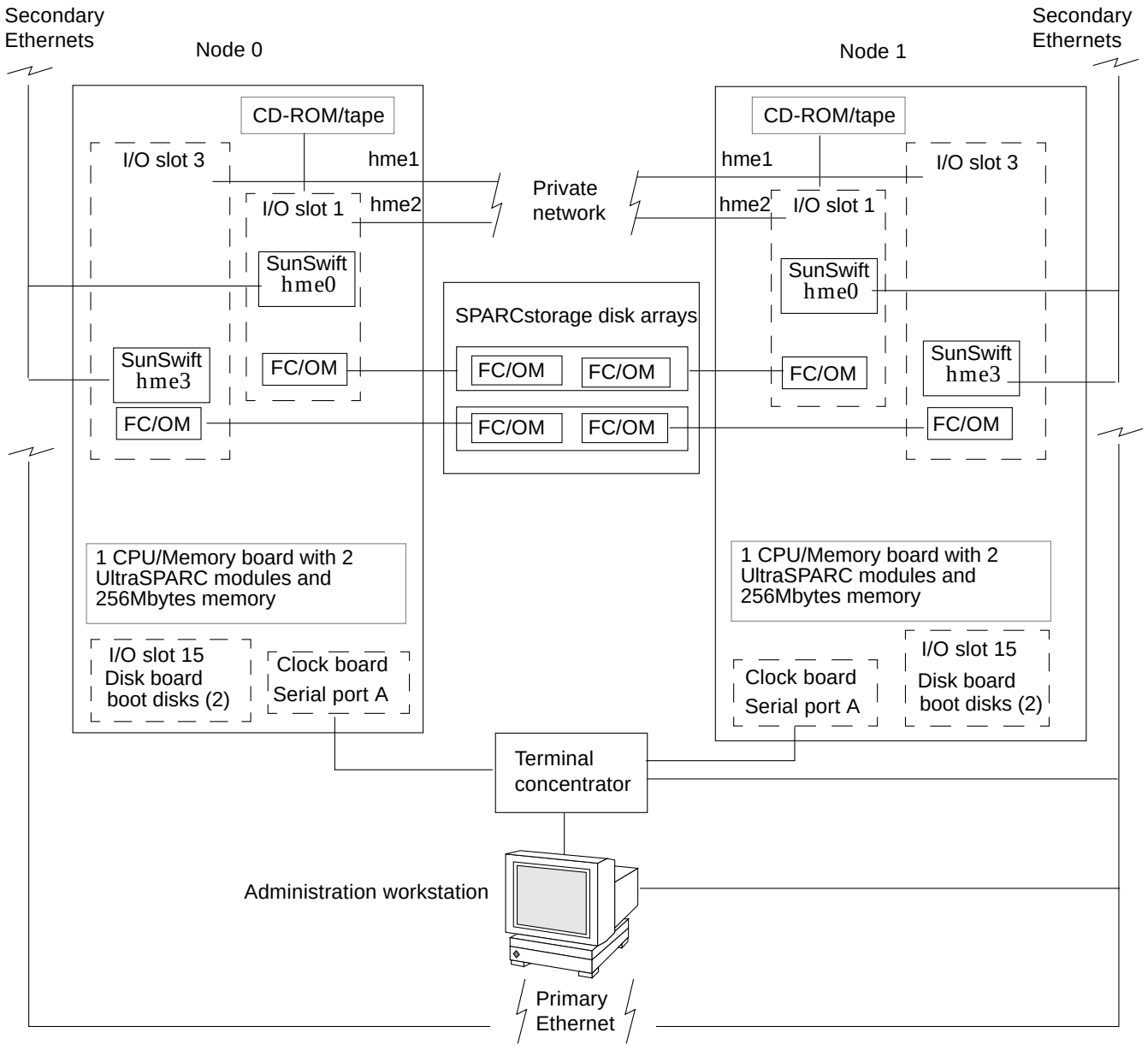


Figure 1-4 Clustered HA System Based on Enterprise 6000

Each server has a disk partition to store its operating system, that is, the / /usr, /ops, and /var file systems. The disk partition for the operating system can be mirrored to improve system availability (although these files are not viewed as a shared resource). Each server boots from its own operating disk partition.

The database volumes are stored on two or more SPARCstorage disk arrays with each disk array cross-connected to both servers via a 25-Mbyte/second full duplex Fibre Channel optical link. Database volumes are mirrored across multiple disk arrays for high availability. The maximum number of storage arrays that can be installed is determined by the number of available optical connection slots on the servers.

1.2 Enterprise 3000, 4000 and 5000 PDB Cluster Configurations

The cluster databases use several types of disk arrays. The main system cabinets utilize SPARCstorage Array Model 112s. For expanded systems, the disk arrays are SPARCstorage Array Model 200s with SPARCstorage RSM units or SPARCstorage Array Model 210s used with 9-Gbyte disk drive trays.

Figure 1-7 through Figure 1-9 depict the Enterprise 5000 hardware required to support the Enterprise PDB software for an Enterprise 5000 based system. Note that these figures depict a system with more than the minimum configuration. The minimum configuration for Enterprise 3000, 4000 and 5000 based systems is:

- Two nodes (based on 3000,4000, or 5000), each containing:
  - One CPU/Memory board with two UltraSPARC™ modules and 128Mbytes RAM
  - Two I/O boards, each with one SCI card and one FC/OM
- Two SCI cables and brackets
- Two SPARCstorage Array Model 112s
- Four fiber-optic cables
- Terminal concentrator with short and long serial cables
- CD-ROM and 8 mm tape drive
- Administration workstation with CD-ROM drive (not shown)

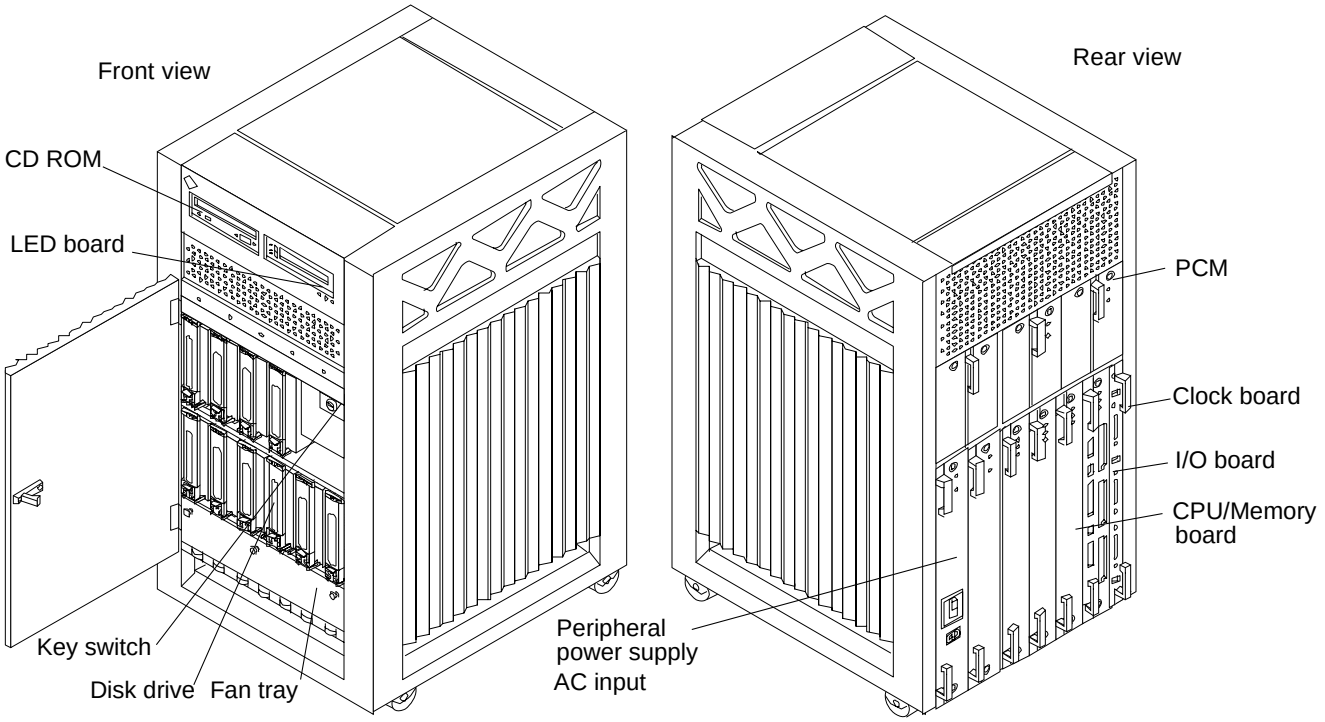


Figure 1-5 Cluster Based on Enterprise 3000s

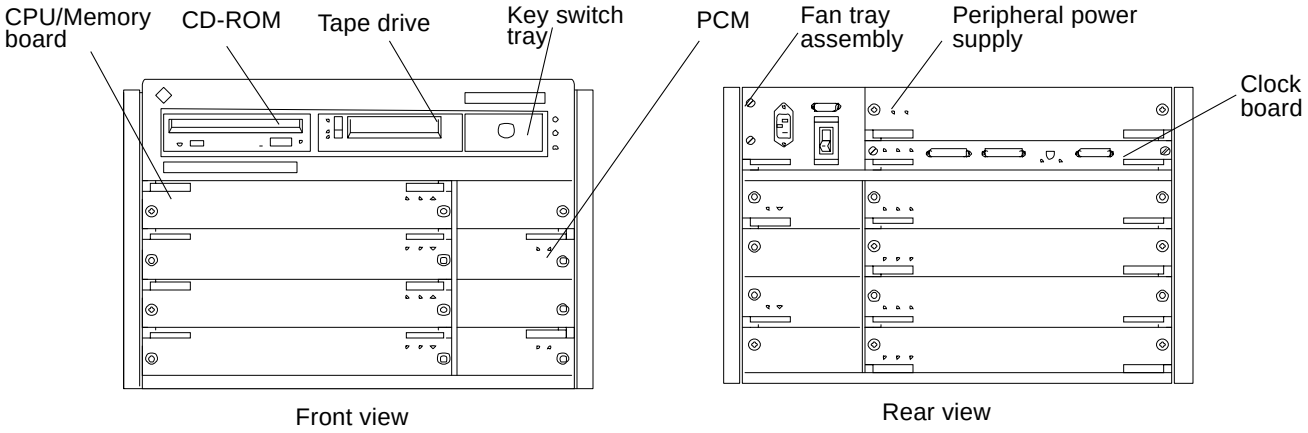


Figure 1-6 Cluster Based on Enterprise 4000s

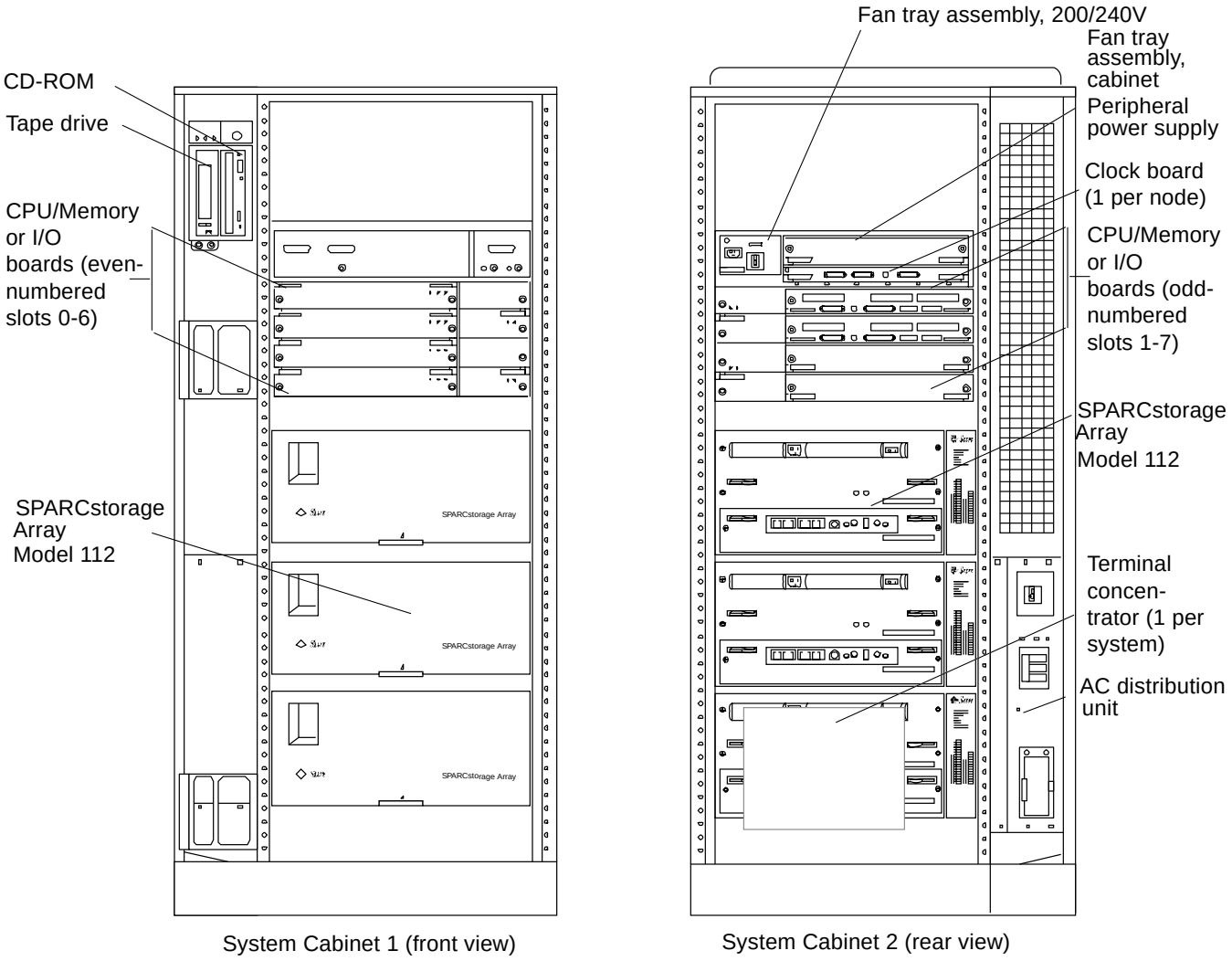


Figure 1-7 Enterprise 5000PDB System Cabinet with Model 100 Series SPARCstorage Arrays

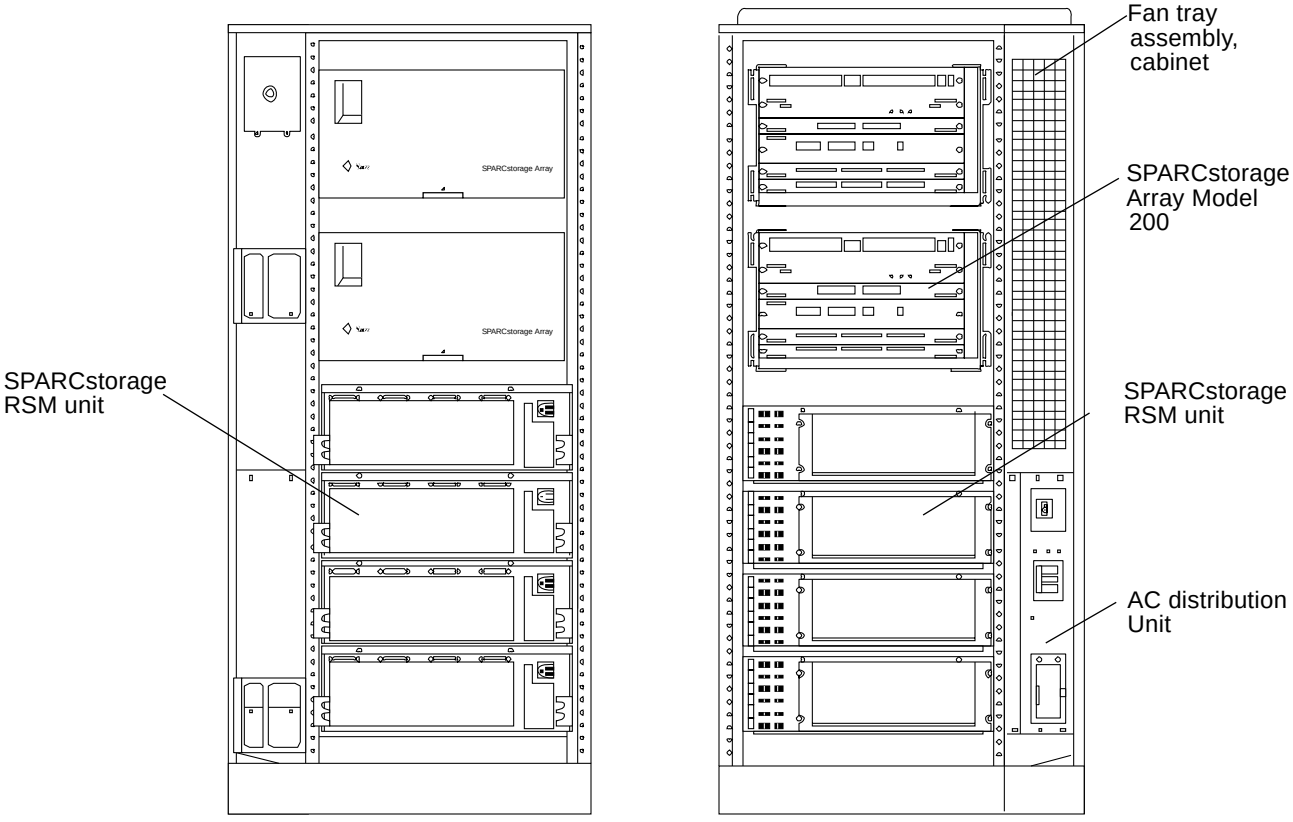


Figure 1-8 Enterprise System Expansion Cabinet with Model 200 Series SPARCstorage Arrays with SPARCstorage RSM units

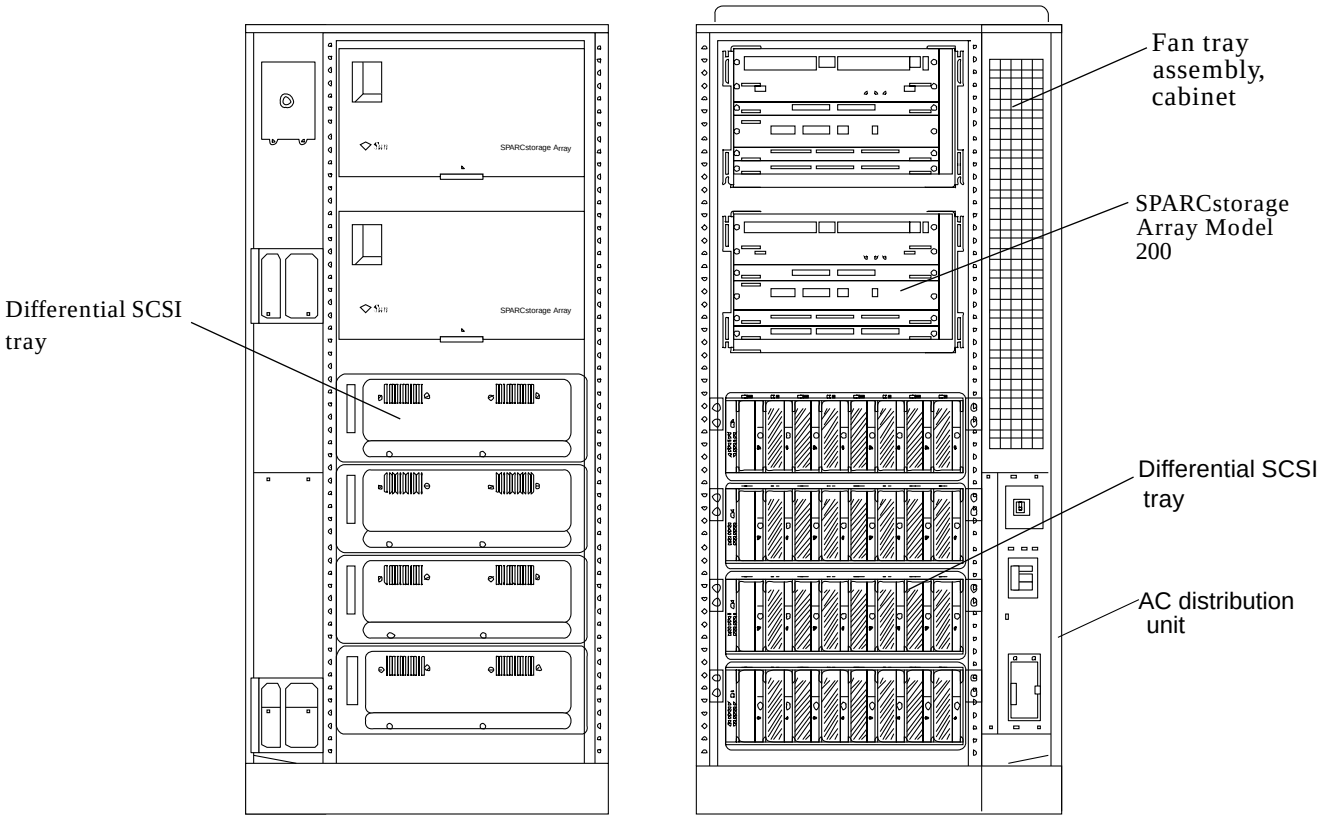


Figure 1-9 Enterprise System Expansion Cabinet with SSA Model 200 Series / Differential SCSI Trays

1.3 Enterprise 6000 PDB Cluster Configurations

The databases for Enterprise 6000 PDB clusters use two types of disk arrays: SPARCstorage Array Model 112s within the system cabinets, and for expanded systems, SPARCstorage Array Model 200s with SPARCstorage RSM units in expansion cabinets.

Figure 1-10, Figure 1-8 and Figure 1-9, depict the Enterprise 6000PDB hardware required to support the Enterprise PDB software. Note that these figures depict a system with more than the minimum configuration. The minimum configuration for Enterprise systems based on the 6000 is:

- Two Enterprise 6000 cabinets, each equipped with:
  - One CPU/Memory board with 256 Mbytes RAM and two UltraSPARC modules
  - Two I/O boards, each with one SCI card and one FC/OM
- Three Power/Cooling Modules
- Two SCI cables and brackets
- Two SPARCstorage Array Model 112s
- Terminal concentrator with short and long serial cables
- Four fibre-optic cables
- CD-ROM and 8-mm tape drive
- Administration workstation with CD-ROM drive (not shown)

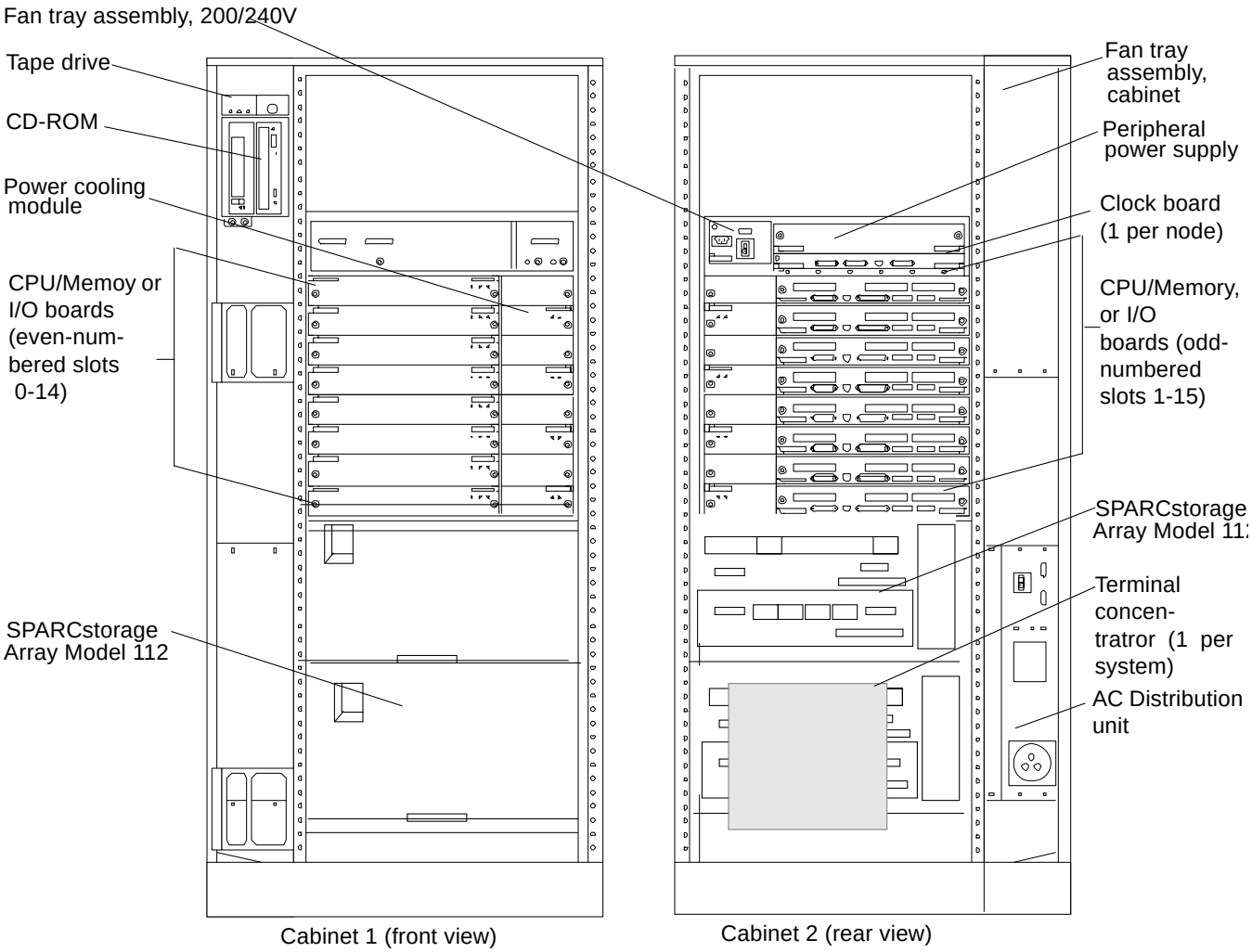


Figure 1-10 Enterprise 6000 PDB Cluster System Cabinets

1.4 Enterprise 4000 and 5000 HA Cluster Configurations

The databases for Enterprise 4000 and 5000 HA clusters use several types of disk arrays. The main system cabinets utilize SPARCstorage Array Model 112s. For expanded systems, the disk arrays are SPARCstorage Array Model 200s with SPARCstorage RSM units (Removable Storage Media) or SPARCstorage Array Model 210s used with 9-Gbyte disk drive trays. See Figure 1-8 and Figure 1-9 on page 11.

Figure 1-11, Figure 1-8 and Figure 1-9, depict the Enterprise 5000 hardware configuration required to support an HA cluster. Note that these figures depict a system with more than the minimum configuration. The minimum configuration for systems based on the Enterprise 4000 and 5000 is:

- Two Enterprise cabinets (4000 or 5000) each equipped with:
  - One CPU/Memory board with two processor modules and 128Mbytes RAM
  - Two I/O boards, each with one SunFastEthernet or SunSwift SBus card, one FC/S SBus card, and one FC/OM
  - One Disk board with two boot disks
- Three Power/Cooling Modules
- Two SCSI terminators
- CD-ROM and 8 mm tape drive
- Two SPARCstorage arrays
- Four fiber-optic cables
- Terminal concentrator with short and long serial cables
- Administration workstation with CD-ROM drive
- Two client net SBus cards (SQEC or similar)

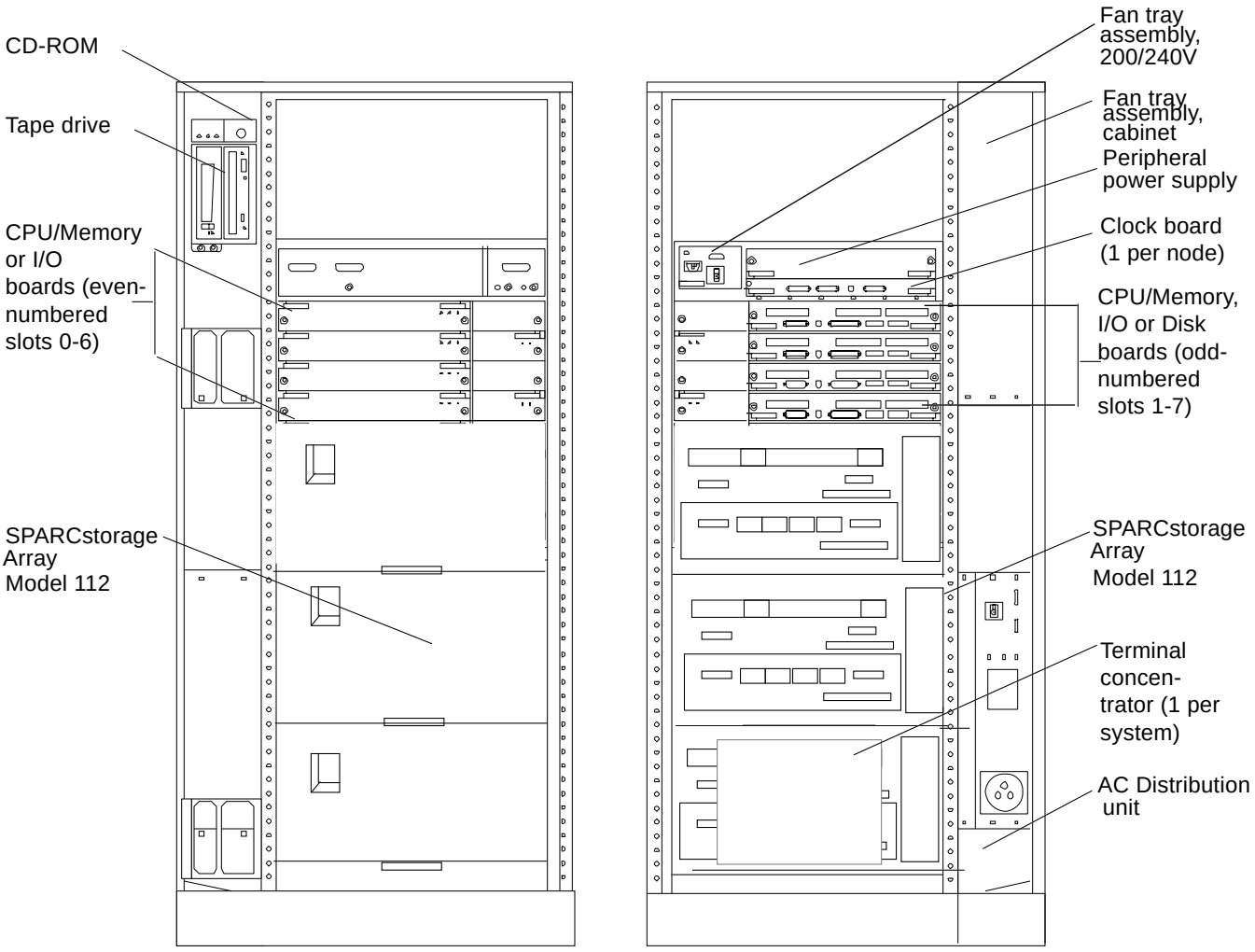


Figure 1-11 Enterprise 5000 HA Cluster System Cabinets

1.5 Enterprise 6000 HA Cluster Configurations

The databases for Enterprise 6000 HA clusters use several types of disk arrays. The main system cabinets utilize SPARCstorage Array Model 112s. For expanded systems, the disk arrays are SPARCstorage Array Model 200s with SPARCstorage RSM units (Removable Storage Media) or SPARCstorage Array Model 210s used with 9-Gbyte disk drive trays. See Figure 1-8 and Figure 1-9 on page 11.

Figure 1-12 shows the Enterprise 6000 server hardware configuration required to support the Solstice™ HA software. Note that this figure depicts a system with more than the minimum configuration. The minimum configuration is:

- Two Enterprise 6000 cabinets, each equipped with:
  - One CPU/Memory board with two processor modules and 256Mbytes RAM
  - Two I/O boards, each with one SunFastEthernet or SunSwift SBus card, one FC/S SBus card, and one FC/OM
  - One Disk board with two boot disks
- Three Power/Cooling Modules
- Two SCSI terminators
- CD-ROM and 8 mm tape drive
- Two SPARCstorage arrays
- Terminal concentrator with short and long serial cables
- Four fiber-optic cables
- Two client net SBus cards (SQEC or similar)
- Administration workstation with CD-ROM drive

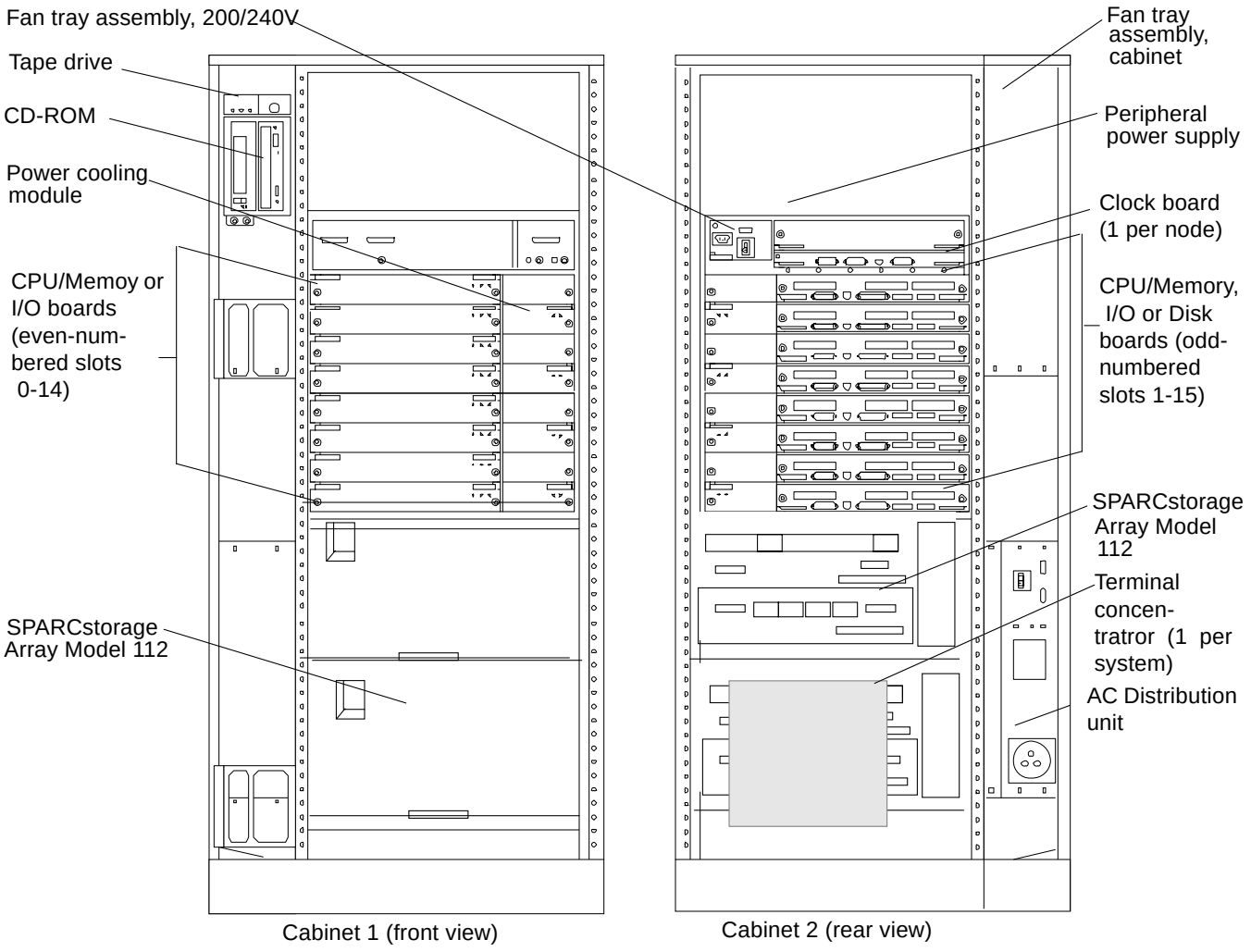


Figure 1-12 Enterprise 6000 HA Cluster System Cabinets

1.6 Internal Options

For a list of internal options available for Enterprise HA or PDB clustered systems, refer to Chapter 2 of the *Ultra Enterprise Cluster Hardware Site Preparation, Planning, and Installation Guide.*

1.7 External Options

For a list of external options available for Enterprise HA or PDB clustered systems, refer to Chapter 2 of the *Ultra Enterprise Cluster Hardware Site Preparation, Planning, and Installation Guide.*

Troubleshooting Overview 2

2.1 Troubleshooting Philosophy

Note – An Enterprise clustered system is composed of redundant, on-line components that can continue system operation even through failure, repair, and relocation of one assembly or device. However, to maintain a high level of availability, failed components should be replaced as soon as possible.

You must take service precautions to maintain cluster operation while you do maintenance. For most hardware repair operations, you must remove the node with the faulty part as indicated in Section 2.2, “Maintenance Authorization”. The surviving node in the cluster will then continue to provide highly available data for both nodes until the faulty node can be repaired and rejoined to the cluster. Additionally, the system administrator may have to perform related software tasks, before and following removal of a node from the cluster.

For example, instances of a database application on a node may have to be halted prior to removing a node from the cluster in order to prevent panicking cluster operation. Or, pertinent software tasks may have to be performed after replacing a disk drive or a controller and prior to or after rejoining a node to the cluster. For these and other software specific tasks, refer to the applicable (HA or PDB) Administration Guide.

2.2 Maintenance Authorization

The site system administrator must be contacted prior to removing or replacing a node from or too the cluster. The system administrator will also perform all necessary related software tasks. The procedures in this manual note points where the system administrator must be contacted. However, the equipment owner's administrative requirements supersede the procedures contained herein.

2.3 Troubleshooting a Remote Site

Use `telnet` to communicate with either node in the cluster via the terminal concentrator. For example:

```
% telnet terminal concentrator name
```

The normal response is:

```
Trying ip_address ...
Connected to tc_lm.
Escape character is '^]'.
```

If you get the following message:

```
telnet: connect: Connection refused
```

two possibilities exist:

- The port is busy (being used by someone else).
- The port is not accepting network connections because the terminal concentrator settings are incorrect. Refer to Section 3.4.1.4, "Resetting the Terminal Concentrator Configuration Parameters."

To isolate and correct the problem, `telnet` to the terminal concentrator and specify the port interactively:

```
% telnet tc_lm 5002
Trying ip_address ...
Connected to tc_lm.
Escape character is '^]'.
```

You may have to press Return to display the following prompts:

```
% Rotaries Defined:
      cli
  Enter Annex port name or number:2
  Port (s) busy, do you wish to wait ? (y/n) [y]:
```

If you see the preceding message, the port is in use. If you see the following message, the port is misconfigured:

```
Port 2
Error: Permission denied
Rotaries Defined:
    cli
Enter Annex port name or number:
```

To correct the problem:

1. Select the command line interpreter and log on as superuser.

2. **In terminal concentrator administrative mode, set the port to slave mode as follows:**

```
Enter Annex port name or number: cli
Annex command line Interpreter  *   Copyright 1991 Xylogics, Inc.
annex: su
password:
annex# admin
Annex administration MICRO-XL-UX R&.0.1, 8 ports
admin: port 2
admin: set port mode slave
You may need to reset the appropriate port, Annex  subsystem, or
reboot the Annex for the changes to take affect.
admin: reset 2
admin:
```

After you reset the port, it will be configured correctly. For additional details on terminal concentrator commands, refer to the *Terminal Concentrator General Reference Guide*, part number 801-5972.

2.4 PDB/HA Differences

There are differences in a cluster database depending upon the type of clustered system: whether shared, as in PDB clusters or nonshared, as in HA clusters. Additionally PDB clusters support a GUI named the Cluster Monitor while HA clusters do not.

There are also differences in the boot disks: PDB clusters support bootable disks within SPARCstorage Arrays while HA clusters support bootable disks on disk boards. Refer to the section for your system type.

2.5 PDB Cluster Troubleshooting

2.5.1 Cluster GUIs

Three graphical user interfaces (GUIs) enable you to facilitate troubleshooting: the Cluster Control Panel (`ccp`), the Cluster Console (`cconsole`), and the Cluster Monitor (`clustmon`). Table 2-1 gives a brief description of each GUI; refer to the *Ultra Enterprise Cluster PDB System Administration Guide* for more detailed information.

Table 2-1 Cluster GUI Descriptions

GUI	Description
Cluster Control Panel	Enables launching of the Cluster Console (`cconsole`, `telnet`, or `crlogin`), the Cluster Monitor (`clustmon`) and other administrative tools.
Cluster Console	Enables execution of commands on multiple nodes simultaneously.
Cluster Monitor	Enables monitoring the current status of all nodes in the cluster.

2.5.2 Troubleshooting Flow

The following troubleshooting procedures are based on console access for both nodes. Refer to the *Ultra Enterprise Cluster PDB System Administration Guide* for console access.

The troubleshooting procedures are based on error messages displayed on the system administrator console, Cluster Monitor, or other sources. In addition, the Cluster Monitor GUI displays information and graphics that can be used to isolate faults. To maintain the system in high-availability mode, follow the troubleshooting procedures in the following order:

Caution – *Do not* connect a keyboard directly to a host processor board. This keyboard would become the default for console input, thus preventing input from the system administration workstation / terminal concentrator serial port. In addition, connecting a keyboard directly into a hot host processor board (that is, while power is applied to the host) panics the Solaris™ operating environment by sending a break signal.

1. Check the system Console or Cluster Monitor messages and troubleshooting instructions to determine the principal assembly at fault.
2. Contact the system administrator to remove the principal assemblies node from the cluster.
3. Isolate the fault to the smallest replaceable component.
4. Shut down the specific disk tray, system node, or terminal concentrator.
5. Replace the defective component.
6. Contact the system administrator to return the node to the cluster.

This troubleshooting flow is further depicted in Figure 2-1.

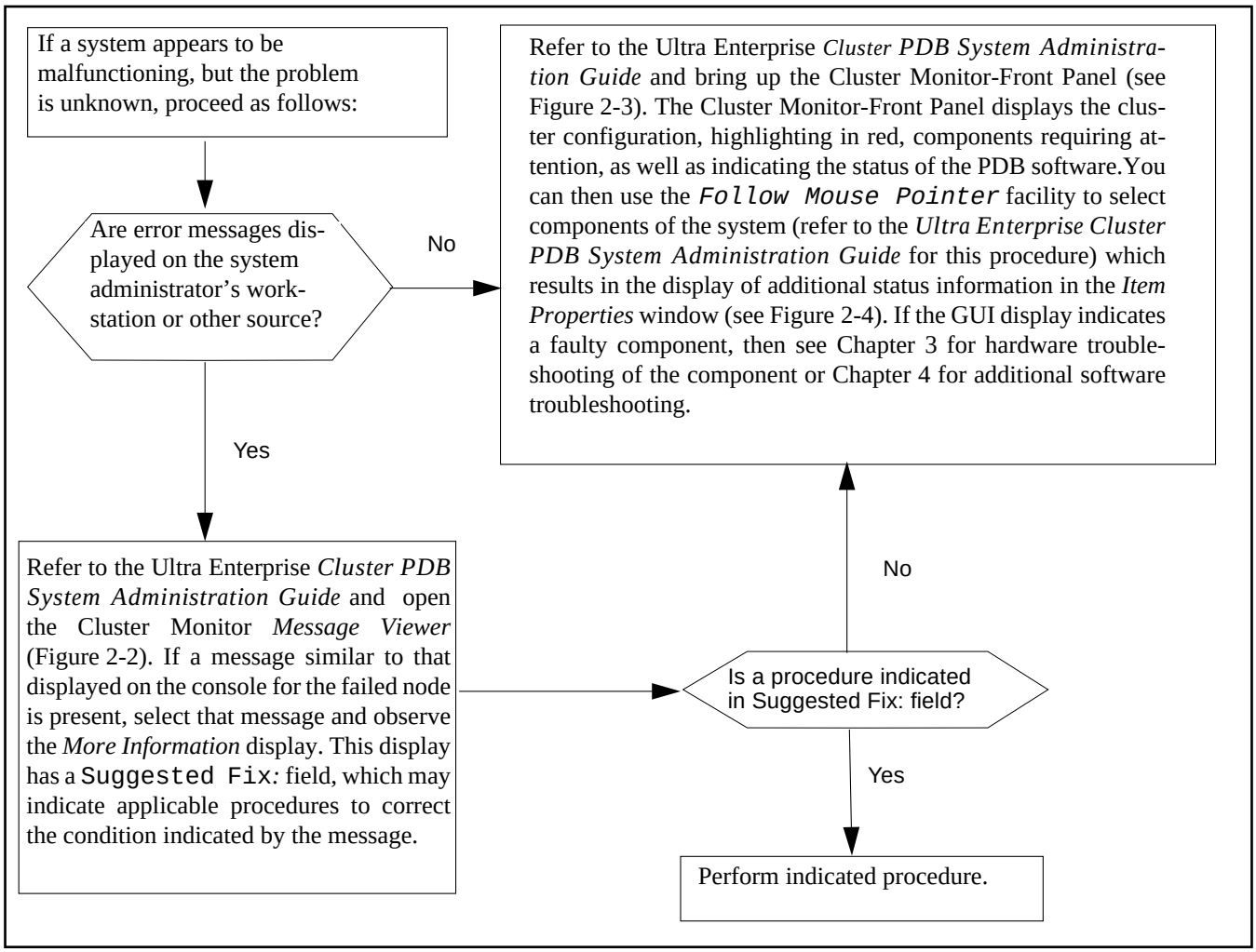


Figure 2-1 Troubleshooting Flow Diagram

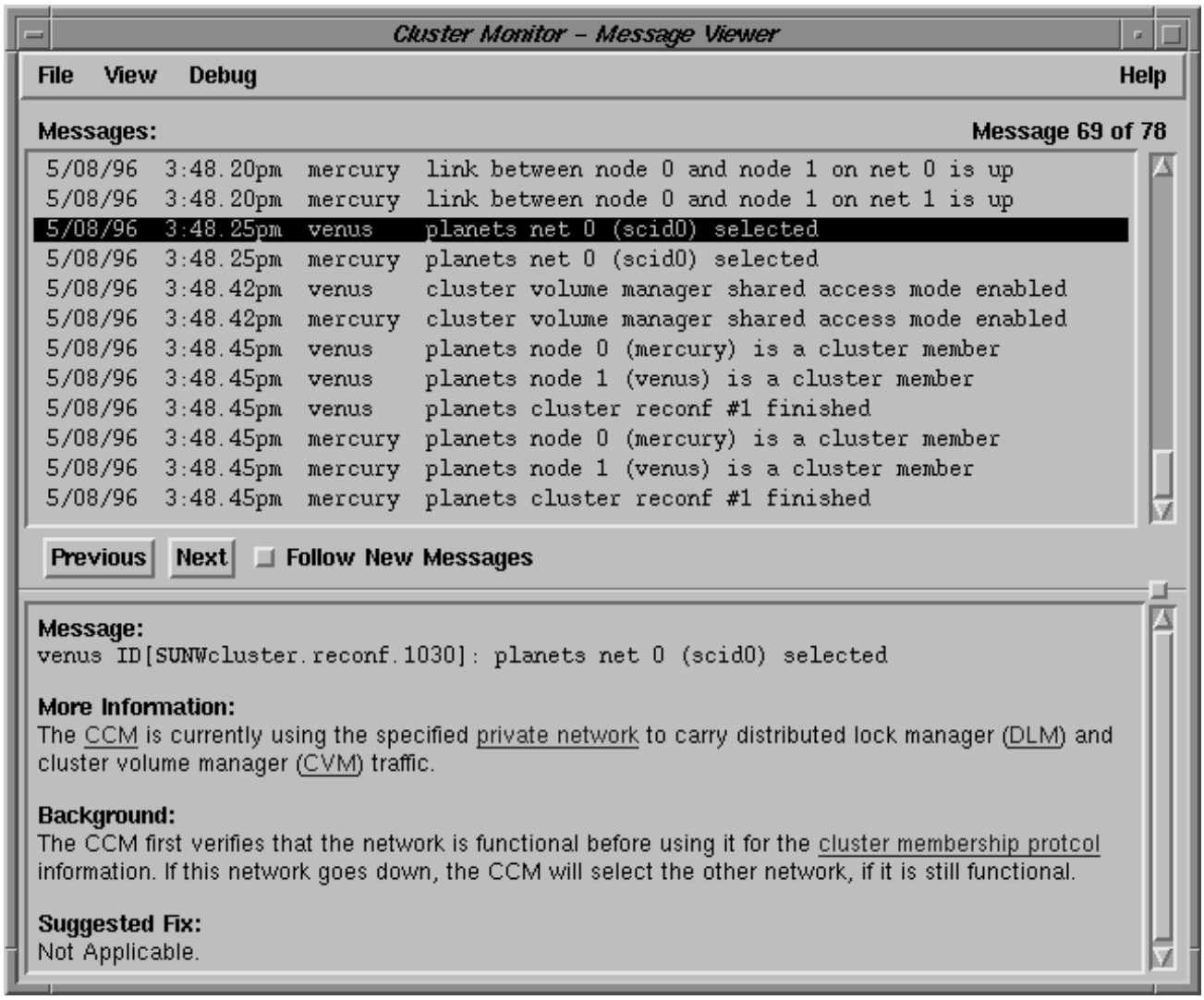


Figure 2-2 Message Viewer Window

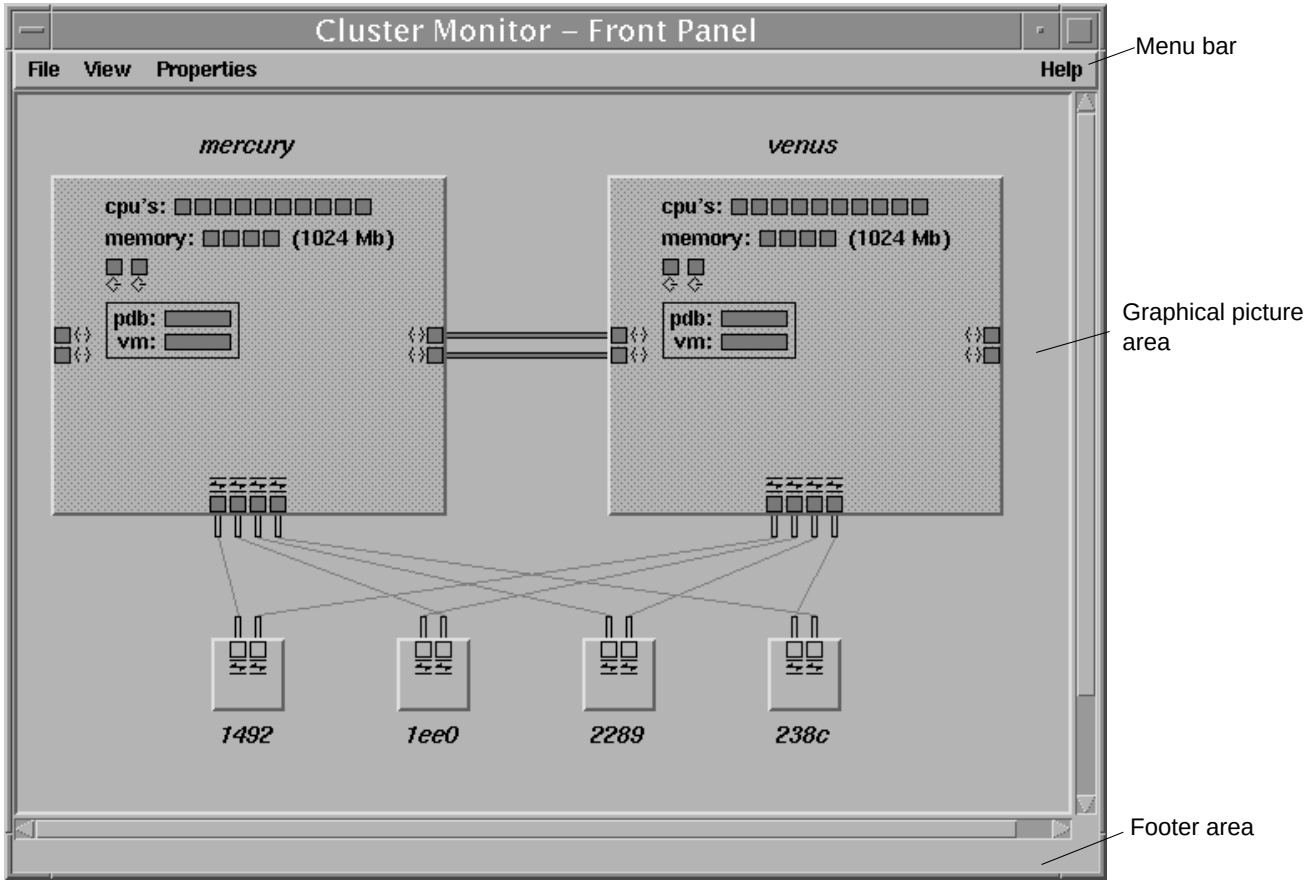


Figure 2-3 Cluster Monitor-Front Panel

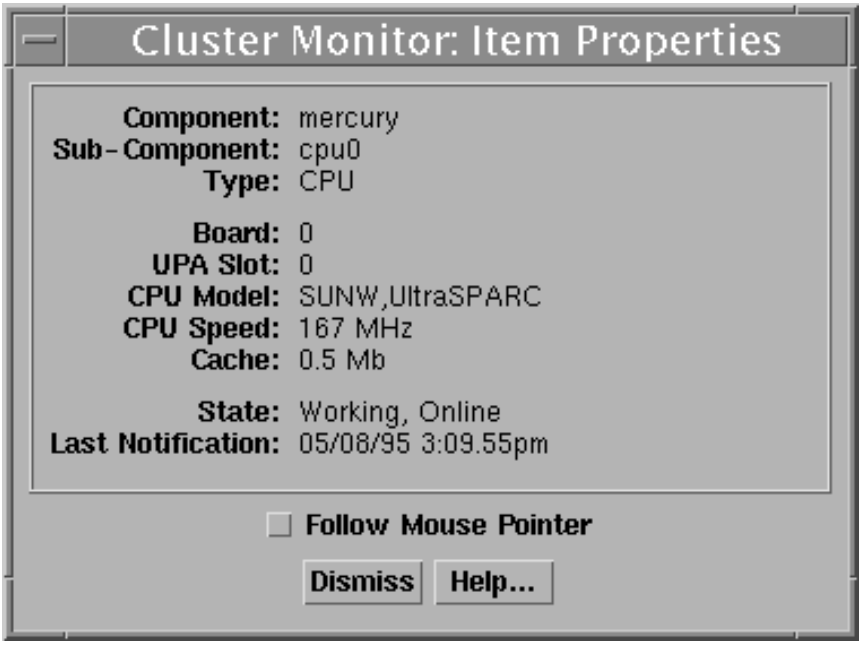


Figure 2-4 Item Properties Window

2.5.3 *Fault Classes and Principal Assemblies*

Enterprise PDB troubleshooting is dependent on several different principal assemblies and classes of faults. The fault classes and their associated assemblies are:

- SPARCstorage Array faults
  - Data disk drives
  - Controllers
  - Optical cables / interfaces
  - Fibre Channel Optical Modules (FC / OM)
- Enterprise 5000 / 6000 faults
  - Boot disks
  - CPU / Memory boards

  - UltraSPARC modules
  - SIMMs
  - I/O boards
  - Fibre Channel Optical Modules (FC/OM)
  - SCI cards
  - Clock boards
  - NVSIMMs
- Cluster Faults
  - Terminal concentrator/serial connections
  - Client net/connections
- Software faults
  - Application program died
  - System crash (panic)
  - Hung system (lock up)
  - Cluster wide failures

All troubleshooting begins at the system console, Cluster Monitor, or other operator information. The system console or Cluster Monitor must be checked regularly by the system administrator.

2.5.4 Error Messages or Symptoms

Table 2-2 Error Messages or Symptons

Error Message or Symptom	Probable Cause	Cluster Service Reference	Troubleshooting Reference
		Processor/Node	
Either node reboots; boot disk failure; `dlm reconfiguration <ioctl nn>` (loss of cluster membership); loss of performance meter response from one node	Enterprise 3000, 4000, 5000, or 6000	Section 3.2, "Node Failures"	*Ultra Enterprise 6000/5000/4000 Systems Manual*
		Private Network	
`scid0 no carrier-transceiver cable problem? ; scid0 no response`	SCI	Section 3.3.1, "Private Interconnect Failure (SCI)	Not applicable
		Client Network	
`qe0 no carrier - transceiver cable problem?; qe0 no response`	client net	Refer to your client network documentation	As applicable
		Public Network	
`hme0 no carrier-transceiver cable problem?; hme0 no response`	Cable	Refer to Chapter 8 (3000), 9 (4000), 10 (5000), or 11(6000), of the *Ultra Enterprise Cluster Hardware Site Preparation, Planning and Installation Guide* for cable detail.	Not applicable

Table 2-2 Error Messages or Symptons *(Continued)*

Error Message or Symptom	Probable Cause	Cluster Service Reference	Troubleshooting Reference
		SPARCstorage Array	
`c2t4d8s2 failed`	Disk drive	Section 3.1, "SPARCstorage Array and Optical Connections Faults"	*SPARCstorage Array Model 100 Series: SPARCstorage Array Model 100 Series Service Manual* *SPARCstorage Array Model 200 Series: SPARCstorage Array Model 200 Series Service Manual* SPARCstorage RSM: *SPARCstorage RSM Installation, Operations, and Service Manual*
		Terminal Concentrator	
No `cconsole` messages for one of the nodes; no `cconsole` messages from either node	Terminal concentrator	Section 3.4, "Terminal Concentrator and Serial Connection Faults"	Not applicable

2.5.5 Device to Troubleshooting Cross-Reference

Table 2-3 cross-references devices to the appropriate troubleshooting manual.

Table 2-3 Device To Troubleshooting Cross-Referencess

Device or Trouble Area	Cross-Reference	Part Number
Array Controller, Fibre Optic Connector, or Fibre Channel Optical Module	Model 100: *SPARCstorage Array Model 100 Series Service Manual, Chapter 2, "Troubleshooting"*	801-2206
	Model 200: *SPARCstorage Array Model 200 Series Service Manual, Chapter 2, "Troubleshooting"*	802-2028
Model 100 Series disk drives	*SPARCstorage Array Model 100 Series Service Manual*	801-2206
Model 200 Series disk drives	SPARCstorage RSM*: SPARCstorage RSM Installation, Operations and Service Manual*	802-5062
	Differential SCSI tray*: Diferential SCSI Disk Tray Service Manual*	800-7341
Terminal concentrator	Section 3.4, "Terminal Concentrator and Serial Connection Faults"	
Enterprise 4000, 5000 or 6000	*Ultra Enterprise 6000/5000/4000 Systems Manual (Part 3, Troubleshooting)*	802-3845
Enterprise 3000	*Ultra Enterprise 3000 System Manual*	802-3388

2.5.6 Device to Replacement Cross-Reference

Table 2-4 Device to Replacement Cross-References

Device	Cross-Reference
SPARCstorage Model 100 Series controller FC/OM battery module fan tray backplane fibre optic cables disk drive trays disk drives	*SPARCstorage Array Model 100 Series Service Manual, Chapter 5*
SPARCstorage Model 200 Series controllers FC/OM battery module fan tray power supply LCD-display module interface modules backplane fiber optic cables	*SPARCstorage Array Model 200 Series Service Manual, Chapter 5*
SPARCstorage Array disk drives	Model 100 Series: *SPARCstorage Array Model 100 Series Service Manual, Chapter 5* SPARCstorage RSM: *SPARCstorage RSM Installation, Operations and Service Manual, Chapter 3* SCSI tray: *Differential SCSI Disk Tray Service Manual, Chapter 2*
Optical Module	*Fibre Channel Optical Module Installation Manual*
SCI card	*Covered in this manual*
CPU/Memory boards	*Ultra Enterprise 6000/5000/4000 Systems Manual, Chapter 3*
I/O boards	*Ultra Enterprise 6000/5000/4000 Systems Manual, Chapter 4*
Clock boards	*Ultra Enterprise 6000/5000/4000 Systems Manual, Chapter 6*
UltraSPARC modules	*Ultra Enterprise 6000/5000/4000 Systems Manual, Chapter 3*
SIMMs	*Ultra Enterprise 6000/5000/4000 Systems Manual, Chapter 3*

Table 2-4 Device to Replacement Cross-References *(Continued)*

Device	Cross-Reference
CD-ROM and tape drives	*Ultra Enterprise 6000/5000/4000 Systems Manual, Chapter 8*
Peripheral power supply and power/cooling module	*Ultra Enterprise 6000/5000/4000 Systems Manual, Chapter 7*
SBus cards	*Ultra Enterprise 6000/5000/4000 Systems Manual, Chapter 4*

2.6 HA Cluster Troubleshooting

2.6.1 Takeover

The Solstice HA software allows one node to takeover when a critical hardware or software failure is detected. When a failure is detected, an error message is generated to the system console and, if required, the service provider is notified (depending upon the system maintenance contract). When a takeover occurs, the node assuming control becomes the I/O master for the disksets on the failed node and redirects the clients of the failed node to itself. The troubleshooting flow for a takeover is further depicted in Figure 2-5.

2.6.2 Switchover

Administrators can manually direct one system to takeover the data services for the other node. This is referred to as a switchover (refer to the *Solstice HA 1.2 Software Administration Guide*).

2.6.3 Failures Where There is no Takeover

For noncritical failures, there is no software takeover. However to continue to provide HA data services, follow the troubleshooting procedures in the following order:

Caution – *Do not* plug a keyboard directly to a node system board. The keyboard would become the default for console input, thus preventing input from the system administration workstation/terminal concentrator serial port. In addition, connecting a keyboard directly into a node system board while power is applied to the node sends a break signal to the Solaris operating environment, just as if you had typed L1-A on the console.

1. You will be contacted by the system administrator to replace a defective part or to further isolate a system defect to a failed part.
2. Request that the system administrator prepare the applicable assembly containing the defective part for service.
3. Isolate fault to the smallest replaceable part.
4. Shut down specific assembly containing defective part.
5. Replace the defective part.
6. Contact system administrator to return the repaired assembly to the cluster.

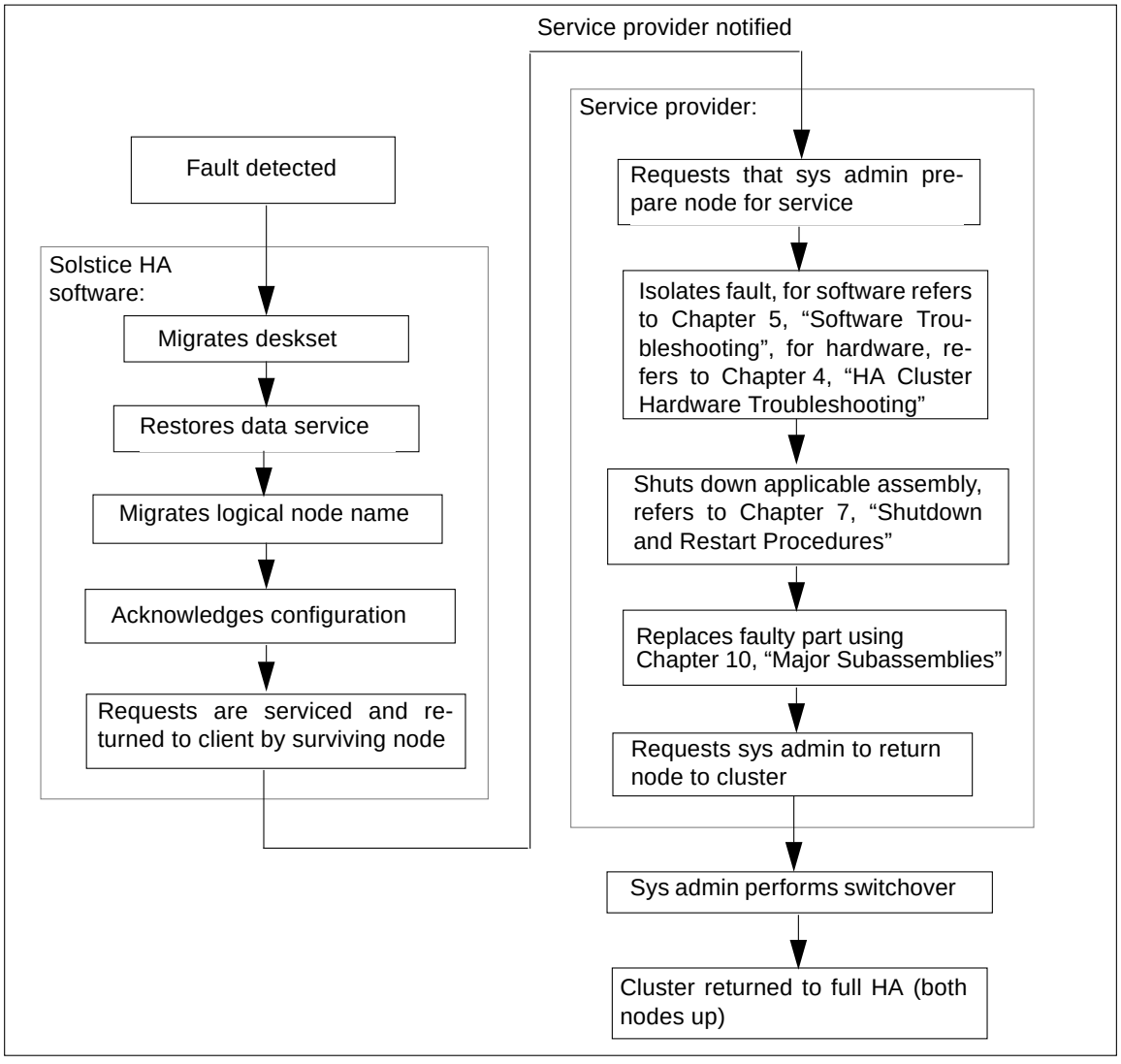


Figure 2-5 Takeover Troubleshooting Flow Diagram

2.6.4 Fault Classes and Principal Assemblies

With the exceptions that HA clusters have no SCI links and no Clustor Monitor, same as that described in Section 2.5.3, “Fault Classes and Principal Assemblies,” for a PDB cluster.

All troubleshooting begins at the system console. Check console regularly, as well as any other source of operator information; for example, the output of the `hastat` command. For more information on the `hastat` command, refer to the *Solstice HA 1.2 Software Administration Guide.*

2.6.5 Error Messages or Symptoms

These are the same as that described in Section 2.5.4, “Error Messages or Symptoms,” for a PDB cluster with the exception that HA clusters do not have a cconsole.

2.6.6 Device to Troubleshooting Cross-Reference

This is the same as that described in Section 2.5.5, “Device to Troubleshooting Cross-Reference,” for a PDB cluster.

2.6.7 Device Replacement Cross-Reference

This is the same as that described in Section 2.5.6, “Device to Replacement Cross-Reference,” for a PDB cluster.

PDB Cluster Hardware Troubleshooting

3

Prior to performing service on components within a node that is joined in an Enterprise PDB cluster, the system administrator must perform certain tasks that are necessary in a high-availability system, refer to the *Ultra Enterprise Cluster PDB System Administration Guide*. The procedures within this chapter, with the exception of the terminal concentrator procedures, are structured to be used with the system administrator's assistance.

3

3.1 SPARCstorage Array and Optical Connections Faults

Note – This section is applicable to either Model 100 or Model 200 series SPARCstorage Arrays regardless of the type of drive trays used.

System console messages indicate a SPARCstorage Array is not communicating with one or both nodes. If the fault is hardware related, the problem could be any one of the components in the I/O path as depicted in Figure 3-1. For example, the defective component could be an FC/S card, FC/OM, or cable on the hosts for either node; or an FC/OM, the controller or I/O interface on the applicable SPARCstorage Array.

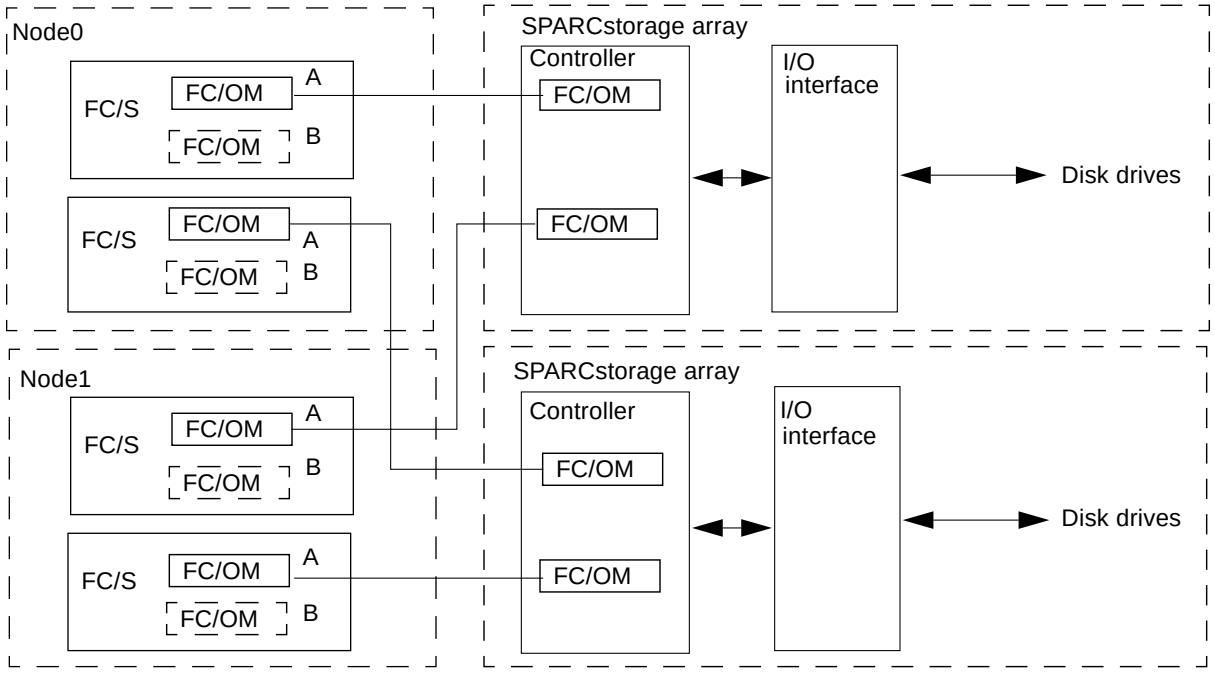


Figure 3-1 I/O Component Path for Typical SPARCstorage Array

To isolate the fault, first try to correlate the console error messages with those listed in the *Ultra Enterprise Cluster PDB Error Messages* guide. In most cases, the error message explanation lists probable causes and corrective action. For example, for a SPARCstorage Array firmware and device driver error of the following type:

```
Transport error: FCP_RSP_SCSI_PORT_ERR
```

The explanation and corrective action is:

```
The firmware on the SPARCstorage Array controller has detected
the failure of the associated SCSI interface chip. Any I/O
operations to drives connected to this particular SCSI bus will
fail. If you see this message, you may have to replace the array
controller.
```

If no related message is found in the PDB Error Messages guide, perform the procedures in the following two sections, if the fault matches the section heading. Otherwise proceed to Section 3.1.4, “SPARCstorage Array Communication Failure” and proceed as directed.

3.1.1 Errors on Both Nodes From Same Physical Disk

Note – Use following procedure to isolate a probable failure of a single disk.

3. **Contact the system administrator and request that the node be prepared for replacement of a disk.**

Note – You should not pull the drives randomly. If there is activity on a drive, request that the system administrator perform the necessary software tasks to stop that activity prior to removing the drive. This can normally be done without bringing down the operating system or the tray that the drive is in.

4. **Replace the defective disk drive by referring to the following references, as applicable:**

- SPARCstorage Array Model 100 Series; Chapter 5 of the *SPARCstorage Array Model 100 Series Service Manual*
- SPARCstorage Array Model 200 Series:
  - For RSM disk drives, use the *SPARCstorage RSM Installation, Operations, and Service Manual*
  - For 9-Gbyte tray disk drives, use the *5.25 Fast/Wide Differential SCSI Disk Drive Installation Manual.*

5. **Contact the system administrator and indicate that the node is ready to be returned to the cluster following disk replacement.**

3.1.2 Errors From Both Nodes on the Same SPARCstorage Array

If errors from the same SPARCstorage Array occur for both nodes, it is likely that the fault is a common point in the SPARCstorage Array I/O path. Using Figure 3-1 as a reference, a probable point of failure would be the SPARCstorage Array controller. Use the following procedure to replace the controller.

1. **Contact the system administrator and request that the node be prepared for replacement of a controller in a SPARCstorage Array.**
2. **Bring the SPARCstorage Array down as described in Chapter 8, “Shutdown and Restart Procedures".**
3. **Replace the controller board as described in Chapter 5 of the applicable (100 or 200 series) SPARCstorage Array Service Manual.**
4. **Bring the SPARCstorage Array tray up as described in Chapter 8, “Shutdown and Restart Procedures".**
5. **Contact the system administrator and indicate that the node is ready to be returned to the cluster following replacement of a controller in a SPARCstorage Array.**

3.1.3 Multiple Disk Errors or Disk Communication Error For One Node Only

If disk errors occur for one node only, it is more than likely that the faulty component is the disk itself or in the disk I/O path for the node receiving the errors, (reference Figure 3-1). Use the following procedure to replace a disk.

1. **Contact the system administrator and request that the node be removed from the cluster and prepared for replacement of a disk.**
2. **Replace the defective disk using the following references as applicable:**

- Model 100 series controllers; Chapter 5 of the *SPARCstorage Array Model 100 Series Service Manual*
- Model 200 series controllers:
  - For RSM disk drives, use the *SPARCstorage RSM Installation, Operations and Service Manual*
  - For 9-GByte tray drives, use the *5.25 Fast/Wide Differential SCSI Disk Drive Installation Manual*

3. **Contact the system administrator and request that the node be returned to the cluster.**
4. **If the disk drive errors still exist after replacing the drive, proceed to the next section and isolate the problem to a component in the I/O path for the disk.**

3.1.4 SPARCstorage Array Communication Failure

If a SPARCstorage Array is not communicating with a node, begin troubleshooting by making a physical inspection as described in the appropriate 100 or 200 series Service manual.

If the physical inspection checks out, then one of the components depicted in Figure 3-1 on page 3 is probably faulty:

Use the following procedure to find the faulty component.

1. **Contact the system administrator and request that the node be prepared for troubleshooting, which will require the shutdown of a SPARCstorage Array.**

2. **Shut down the SPARCstorage Array as described in Chapter 8, “Shutdown and Restart Procedures".**

3. **On the controller board at the rear of the SPARCstorage Array, set the DIAG switch to DIAG EXT.**
   Setting the DIAG switch to DIAG EXT provides more thorough testing, but it also causes the array to take longer to boot.

4. **Press the Reset switch to reset the SPARCstorage Array.**

5. **Check the front panel LCD display and see if a POST code specific to the SPARCstorage Array is displayed in the alphanumerics portion of the LCD display.**
   Figure 3-2 shows the location of the alphanumerics portion of the LCD and Table 3-1 lists the POST codes specific to the SPARCstorage Array.

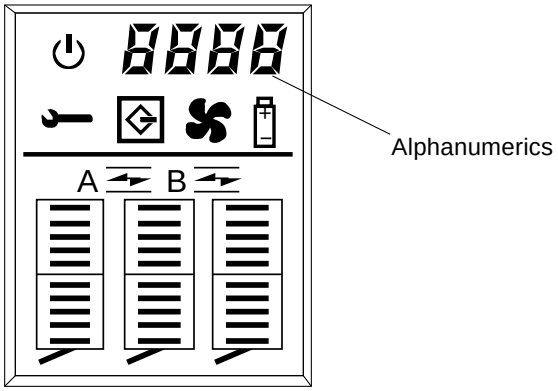


Figure 3-2 LCD Display

Table 3-1 POST Codes

POST Code	Meaning	Action
01	LCD failure	Replace diagnostic display module
08	Fan failure	Replace fan tray
09	Power supply failure	Replace power supply
30	Battery failure	Replace battery module
Any other number	Controller failure	Replace controller

- If you do *not* see a POST code specific to the SPARCstorage Array, set the DIAG switch back to DIAG, then go to step 6.
- If you see a POST code specific to the SPARCstorage Array, set the DIAG switch back to DIAG, then replace the indicated component as described in Chapter 5 of the applicable 100 or 200 series SPARCstorage Array Service Manual. Following repair, contact the system administrator and indicate that the node is ready to be returned to the cluster after component replacement.

6. Become superuser and shutdown the processor for the node.

a. Verify that the system returns to the ok **prompt after the shut down is complete.**

b. If the system displays the > prompt after the shut down, enter n **to display the** ok **prompt.**

7. **At the** `ok` **promp, enter:**

```
ok true diag-switch?
ok true to fcode-dbug?
ok reset
```

8. **The system will immediately boot unless you enter a** `control ]` **to get the telnet prompt and then enter the following:**

```
telnet> send break
```

After the `ok` prompt is displayed enter:

```
ok show-devs
```

You should see output similar to the following.

```
/sbus@12,0/SUNW,soc@d,10000/SUNW,pln@a0000000,78bb37
/sbus@12,0/SUNW,soc@d,10000/SUNW,pln@a0000000,78bb37/SUNW,ssd
/sbus@f,0/QLGC,isp@0,10000
/sbus@f,0/SUNW,fas@3,8800000
/sbus@f,0/SUNW,hme@3,8c00000
/sbus@6,0/SUNW,soc@2,0
/sbus@6,0/SUNW,soc@1,0
```

9. **Locate the lines in the output that give information on the on board soc (indicated by the path with `soc@d` or FC/S cards (indicated by the path with `soc@x,x` installed in the host system.**
   The first *x* in `soc@x,x` tells you which SBus slot the FC/S card is installed in. For example, looking at the output given above, the first line of the output:

```
/sbus@6,0/SUNW,soc@2,0
```

   tells you that an FC/S card is installed in SBus slot 2 in the host system. If the soc is on board the location would be `d` as indicated in the following output:

```
/sbus@12,0/SUNW,soc@d,10000/SUNW,pln@a0000000,78bb37
```

10. **Locate the on board soc or FC/S card connected to the SPARCstorage Array that is not communicating with the host system.**

11. **Determine what the SBus slot number is for that on board soc or FC/S card.**
    Refer to the service manual that came with your host system for more information on SBus slot numbers for your system.

- If you can find an entry in the output for the FC/S or on board soc card installed in that SBus slot, go to Step 12.
- If you *cannot* find an entry in the output for the FC/S card or on board soc card replace the FC/S card in that SBus slot or the I/O board that the on board soc is located on according to the instructions given in the service manual that came with your host system.
- Following replacement of the I/O board or FC/S card, contact the system administrator and indicate that the node is ready to be returned to the cluster following component replacement.

12. **At the** `ok` **prompt, enter:**

```
ok path select-dev
```

where *path* is the entire path given in the line containing the `soc@x,x` or `soc@d` output. Using the previous output as an example, you would enter:

```
ok " /sbus@6,0/SUNW,soc@2,0" select-dev
```

Note – From this point on, if you enter a command incorrectly, and you get the error message "Level 15 Interrupt" or "Data Access Exception," then you must enter the command given in step 12 again to select the FC/S card again.

13. **At the** `ok` **prompt, enter:**

```
ok soc-post
```

- If you see a message saying that the test *passed*, go to step 14.
- If you see a message saying that the test *failed*, replace the FC/S card in that SBus slot or the I/O board that the on board soc is located on, according to the instructions given in the service manual that came with your host system.
- Following replacement of the I/O board or FC/S card, contact the system administrator and indicate that the node is ready to be returned to the cluster following component replacement.

14. **Disconnect the fiber optic cable from FC/OM on the host system.**

15. **Get the loopback connector, Part Number 130-2837-01, from the ship kit and install it in the FC/OM on the host system.**

16. **At the** `ok` **prompt, enter:**

```
ok 40 is frame-dsize
ok 1 is frame-num
ok 1 is sb-burst-size
```

17. **Locate the FC/OM(s) in the FC/S card and determine whether the FC/OM(s) are in slot A or B in the FC/S card.**
    You should be able to see the letters "A" and "B" silkscreened on the outside of the FC/S card.

18. **Probe *only* off the slots that contain an FC/OM.**

Note – Due to a silkscreening error, the "A" and "B" on the outside of the FC/S card are reversed, so the command to probe off slot A will actually probe off slot B and vice versa.

a. If you have an FC/OM in slot A, at the `ok` prompt, enter:

```
ok soc-txrx-extb
```

b. If you have an FC/OM in slot B, at the `ok` prompt, enter:

```
ok soc-txrx-exta
```

- If you see a message saying that the test *passed*, go to step19.
- If you see a message saying that the test *failed*, then replace the FC/OM from the appropriate slot on the FC/S card or the on board soc according to the instructions given in the service manual that came with your host system.
- Following replacement of the FC/OM, contact the system administrator and indicate that the node is ready to be returned to the cluster following component replacement.

Note – Because the SPARCstorage Array diagnostics can check only the FC/OMs on the host system, the next steps in this procedure will call for you to switch the FC/OMs from the SPARCstorage Array with the FC/OMs from the FC/S card or on board soc on the host system.

19. **Remove the loopback connector from the FC/OM on the host system.**

20. **Remove the FC/OM(s) from the FC/S card in the host system.**
    Refer to the service manual that came with your host system for those instructions.

21. **Remove the FC/OM(s) from the SPARCstorage Array, taking care to keep them separate from the FC/OM(s) that you just removed from the host system.**
    Refer to Chapter 5 of the applicable 100 or 200 series SPARCstorage Array service manual for those instructions.

22. **Install the FC/OM(s) from the SPARCstorage Array onto the FC/S card in the host system.**

23. **Install the FC/OM(s) from the FC/S card on the host system into the SPARCstorage Array.**

24. **Install the loopback connector on the FC/OM on the host system.**

25. **Probe *only* off the slots that contain an FC/OM.**

    a. **If you have an FC/OM in the A slot, enter the following at the** `ok` **prompt:**

```
ok soc-txrx-extb
```

    b. **If you have an FC/OM installed in the B slot in the FC/S card, enter the following at the** `ok` **prompt:**

```
ok soc-txrx-exta
```

    - If you see a message saying that the test *passed*, go to step 26.
    - If you see a message saying that the test *failed*, then replace the FC/OM from the approriate slot on the FC/S card or on board soc according to the instructions given in the service manual that came with your host system.
    - Following replacement of the FC/OM, contact the system administrator and indicate that the node is ready to be returned to the cluster following component replacement.

26. **Replace the fiber optic cable.**
    Refer to Chapter 5 of the applicable 100 or 200 series SPARCstorage Array service manual, for those instructions.

27. **Replace the cable and then bring up the applicable SPARCstorage Array, see Chapter 8, “Shutdown and Restart Procedures".**

28. **Contact the system administrator and indicate that the node is ready to be returned to the cluster following component replacement.**
29. **If the host system still cannot communicate with the SPARCstorage Array, contact the system administrator and request that the node be prepared for replacement of a controller in a SPARCstorage Array.**
30. **Bring down the SPARCstorage Array, as described in Chapter 8, "Shutdown and Restart Procedures".**
31. **Replace the array controller.**
32. **Bring up the applicable SPARCstorage Array, as described in Chapter 8, "Shutdown and Restart Procedures".**
33. **Contact the system administrator and indicate that the node is ready to be returned to the cluster following replacement of a controller in a SPARCstorage Array.**

3.2 Node Failures

3.2.1 Loss of Cluster Membership

If the following error message occurs (denoting loss of cluster membership for a node):

```
node 0# dlm reconfiguration < ioctyl nn>
```

♦ **Type the following confirming command query as** `root` **on either** `cconsole`:

```
node 0# clustm dumpstate <clustername>
```

The surviving node will respond with the total cluster membership as follows:

```
current cluster membership   <0,1,or both>

local node ID: <0 or1>
```

A failed node that is not a cluster member will simply time out with no response to the query.

Local node ID corresponds to the `cconsole` for the node on which the command was executed. Nodes in the cluster will give the data response as detailed above; nodes out of the cluster will only give an error response.

3.2.2 CPU/Memory and I/O Board Failures

Messages on the system administrator's console or the Cluster Console for the node will identify the defective board slot. In addition, Enterprise systems have extensive error detection mechanisms and an Automatic System Reconfiguration (ASR) feature that allows 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.

You can also isolate a board fault using the `prtdiag` command as described in Section 3.2.3.1, "Using the prtdiag Command".

This class of faults can be further isolated by referring directly to the troubleshooting procedures in the service manual that came with your host system.

For faulty boards placed in low power mode by the ASR software (outer two green LEDS will not be lit while center yellow LED is lit), perform the following procedure to replace the board or board part.

1. **Contact the system administrator and request that the node be prepared for the removal of a board.**
   Once the node has been prepared then the board can be removed and faulty component(s) replaced, without powering down the associated system.

2. **Replace a defective board or defective board parts as indicated in the appropriate chapter of the service manual that came with your host system.**

3. **Contact the system administrator and indicate that the node is ready to be returned to the cluster following replacement of a board or defective parts on a board.**

3.2.3 *Clock Board Failures*

Messages on the system administrator's console or the Cluster Console for the node will identify the defective board.

Failure of the clock board requires that a node be removed from the cluster and that you power down the node prior to board replacement.

3.2.3.1 `Using the prtdiag` *Command*

`Use the prtdiag` command to locate replaceable board components.

Note – `prtdiag` is a UNIX command. It can be accessed only if the OS is booted and running on the machine in question. `prtdiag` resides in `/usr/platform/sun4u/sbin`.

The following example shows the command and its output; actual output will differ.

```
# /usr/platform/sun4u/sbin/prtdiag
System Configuration:  Sun Microsystems  sun4u 16-slot Ultra
Enterprise 6000
System clock frequency: 83 MHz
Memory size: 512Mb
 CPU Units: Frequency Cache-Size Version
          A: MHz  MB  Impl. Mask  B: MHz  MB  Impl. Mask
            ----------  ----- ----  ----------  ----- ----
Board 0:       167 0.5   10    2.2     167 0.5   10    2.2
Board 2:       167 0.5   10    2.2     167 0.5   10    2.2
Board 4:       167 0.5   10    2.2     167 0.5   10    2.2
         Memory Units: Size, Interleave Factor, Interleave With
          0: MB  Factor:  With:  1: MB  Factor:  With:
         -----  -------  -----  -----  -------  -----
Board 0:   256    4-way     A      256    2-way    B
Board 2:   256    4-way     A      256    2-way    B
Board 4:    64    2-way     C      256    4-way    A
======================IO
Cards=========================================
Board 1, SBus0:
               SBus clock frequency: 25 MHz
               2: QLGC,isp/sd(block)  'QLGC,ISP1000'
              13: SUNW,soc/SUNW,pln   '501-2069'
Board 1, SBus1:
               SBus clock frequency: 25 MHz
               0: QLGC,isp/sd(block)  'QLGC,ISP1000'
               3: SUNW,hme
                  SUNW,fas/sd(block)
Board 3, SBus0:
               SBus clock frequency: 25 MHz
               2: QLGC,isp/sd(block)  'QLGC,ISP1000'
               13: SUNW,soc/SUNW,pln   '501-2069'
Board 3, SBus1:
               SBus clock frequency: 25 MHz
               0: nf
               3: SUNW,hme
                  SUNW,fas/sd(block)
No failures found in System
===========================
No System Faults found
======================
%
```

3.2.3.2 *Using the* `probe scsi` Command

Use this command to verify operation for a new or replacement SCSI-2 device installed in the system.

1. **Become superuser.**
2. **After obtaining authorization to remove system from cluster, use the appropriate command to halt the system.**
3. **Once the system is halted, enter the appropriate command to probe the system for SCSI-2 devices.**

```
ok probe-scsi-all
```

4. **Verify the drive in question is listed.**
   After entering the above command, a list of drives is displayed similar to the following example:

```
Target 2
  Unit 0   Disk     SEAGATE ST32550W SUN2.1G041601308066
                    Copyright (c) 1995 Seagate
                    All rights reserved ASA2
Target 3
  Unit 0   Disk     SEAGATE ST32550W SUN2.1G041601483289
                    Copyright (c) 1995 Seagate
                    All rights reserved ASA2
Target 4
  Unit 0   Disk     SEAGATE ST32550W SUN2.1G041601467679
                    Copyright (c) 1995 Seagate
                    All rights reserved ASA2
Target 5
  Unit 0   Disk     SEAGATE ST32550W SUN2.1G041601470858
                    Copyright (c) 1995 Seagate
                    All rights reserved ASA2
Target 6
  Unit 0   Removable Read Only device     TOSHIBA XM-
5401TASUN4XCD256509/13/95


Target 8
  Unit 0   Disk     SEAGATE ST32550W SUN2.1G041601489016
                    Copyright (c) 1995 Seagate
Target 9
  Unit 0   Disk     SEAGATE ST32550W SUN2.1G041601472974
                    Copyright (c) 1995 Seagate
                    All rights reserved ASA2
```

   The `Target #` lines identify the SCSI-2 addresses of installed devices. If the address is listed for the device in question, installation was successful. If the address is absent, verify that the cables are installed correctly.

5. **Reboot the system using the following command:**

```
ok reset
```

The screen goes blank for several seconds as the system reboots.

3.2.4 *Peripheral Power Supply and Power/Cooling Module Failures*

Messages on the system administrator's console or the Cluster Console for the node will identify the defective power supply or power/cooling module.

Replace a defective peripheral power supply or power/cooling module as indicated in the service manual that came with your host system.

3.3 Network Failures

3.3.1 Private Interconnect Failure (SCI)

Caution – Problems on the private interconnect may be due to temporary communication conditions. A fix on the private interconnect must be verified, with before and after traffic condition measurements, to verify that comparable traffic has been supported. Do not close a problem by a cable replacement without running `% netstat` before and after the fix, saving the output to a mail message to the support organization for record. Compare the traffic conditions in the two `netstat` outputs for similar levels.

System console or Cluster Monitor messages indicate that one of the private interconnect links has failed. Use one of the following procedures, depending upon whether both nodes are up and running in the cluster, or whether neither node is running in a cluster.

3.3.1.1 One or Both Nodes Up and Running in a Cluster

In the following example procedure (Figure 3-3), both nodes are up and running in a cluster, Link 0 has faile, and the software has recovered on Link 1. To find the actual designations for the private interconnect ports on a node, you enter the `ifconfig-a` command on the `cconsole` for the node:

```
# ifconfig -a
lo0: flags=849<UP,LOOPBACK,RUNNING,MULTICAST> mtu 8232
        inet 127.0.0.1 netmask ff000000
hme0: flags=863<UP,BROADCAST,NOTRAILERS,RUNNING,MULTICAST> mtu
1500
        inet 129.146.238.181 netmask ffffff00 broadcast
129.146.238.255
        ether 8:0:20:78:9d:ab
scid0: flags=80e1<UP,NOTRAILERS,RUNNING,NOARP,PRIVATE> mtu 16321
        inet 204.152.65.1 netmask fffffff0
scid0:1: flags=80e1<UP,NOTRAILERS,RUNNING,NOARP,PRIVATE> mtu
16321
        inet 204.152.65.33 netmask fffffff0
scid1: flags=80e1<UP,NOTRAILERS,RUNNING,NOARP,PRIVATE> mtu 16321
        inet 204.152.65.17 netmask fffffff0
```

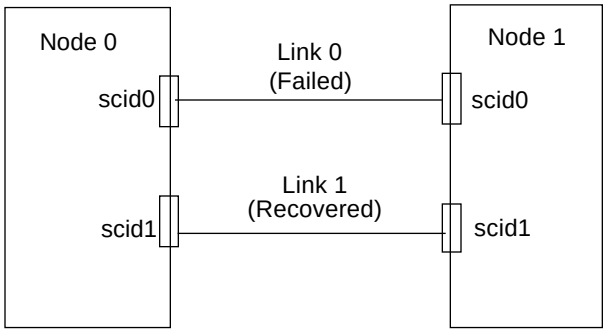


Figure 3-3 Link 0 Failed, Recovered on Link 1

To troubleshoot Link 0 to a defective card or cable, use the following procedure.

Note – In the following procedure, node 1 is removed from the cluster. When there is one node remaining in a cluster, system software will continue sending heartbeat messages across the private links. The following procedure uses these message packets to confirm communication between nodes.

1. **Contact the system administrator and request that a node be prepared for removal from the cluster.**

Note – For this example, assume that the software recovers on node 1.

2. **See Figure 3-4 and remove the Link 1 cable (cable between the scid1 ports of both nodes).**
3. **Connect the Link 0 cable (cable for failed link) between the scid0 port of node 0 and the scid1 port of node 1.**

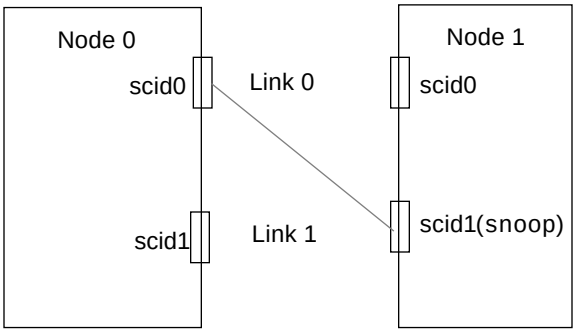


Figure 3-4 Private Interconnect Link 0 Troubleshooting

Note – The next step uses a modified version of the snoop command specifically structured to SCI network interfaces.

4. Use the snoop **command on node 1.**

```
# /opt/SUNWsci/bin/snoop_sci -d scid1
```

5. If the following string is returned as a result of the snoop **command, then the SBus card for the scid0 port on node 1 is most likely defective. This message string indicates that the scid0 port of node 0 as well as the Link 0 cable are functional.**

a. In this instance, request that the system administrator rejoin node 0 to the cluster.

b. Remove node 1 prior to replacing the related SBus card. Once the card is replaced, indicate to the system administrator that node 1 is ready to be returned to the cluster.

```
204.152.65.17-> 204.162.65.18 UDP D=5556 S=5556 LEN=120
```

6. **If the preceding output string is not returned by the** `snoop` **command, then connect the Link 0 cable between the scid1 ports of both nodes and check for the output message string indicated in step 5.**
   The `snoop` initiated in step 4 will continue until halted with a `Ctl C` break.

7. **If the output message string indicated in step 5 is returned, then the scid0 port on node 0 is most likely defective as this message indicates that the Link 0 cable is functional.**

   a. **In this instance, replace the related SBus card in node 0.**

   b. **Notify the system administrator that node 0 is ready to be returned to the cluster.**

8. **If the message string indicated in step 5 is *not* returned, then the Link 0 cable is most likely defective.**

3.3.1.2 Both Nodes Not Running In A Cluster

1. **Use the** `netstat -i` **command on the** `cconsole` **for each node to determine which private links scid0 and/or scid1 are available.**
   In the following examples, both scid0 and scid1 are available on node0 and node 1:

```
node 0 # netstat -i
Name Mtu   Net/Dest         Address       Ipkts   Ierrs  0pkts    0errs Collis  Queue
scid0  16321204.152.65.0    204.152.65.1    6       0       6        0      0       0
scid1  16321204.152.65.16   204.152.65.17   0       0       0        0      0       0
```

```
node 1 # netstat -i
Name    Mtu   Net/Dest        Address      Ipkts   Ierrs  0pkts    0errs Collis  Queue
scid0  16321204.152.65.0     204.152.65.2    6       0       6        0      0       0
scid1  16321204.152.65.16    204.152.65.18   0       0       0        0      0       0
```

2. **If you reboot your system, then manually designate and set the interfaces as follows:**

a. Assuming you have the same configuration as shown in Figure 3-6, for node 0 enter:

```
node 0 # ifconfig scid0 plumb
node 0 # ifconfig scid1 plumb
node 0 # ifconfig scid0 204.152.65.1 netmask 255.255.255.240 private up
node 0 # ifconfig scid1 204.152.65.17 netmask 255.255.255.240 private up
node 0 # ifconfig scid:1 204.152.65.33 netmask 255.255.255.240 private up
```

b. For node 1, enter the following:

```
node 1 # ifconfig scid0 plumb
node 1 # ifconfig scid1 plumb
node 1 # ifconfig scid0 204.152.65.2 netmask 255.255.255.240 private up
node 1 # ifconfig scid1 204.152.65.18 netmask 255.255.255.240 private up
node 0 # ifconfig scid:1 204.152.65.34 netmask 255.255.255.240 private up
```

Note – The following troubleshooting procedure is based on the failure of one link only (one link must be operative).

3. If the `netstat -i` command outputindicates that Link 0 (node 0 scid0 to node 1 scid0) is failing (no entries for scid0 and/or scid1), replace the cable. If the problem still exist, proceed to step 4.

If the `netstat -i` command output indicates that Link 1 (node 0 scid1 port to node 1 scid1 port) is failing, replace the cable. If the problem still exsists, proceed to step 8.

4. **Connect the scid1 port of node 0 to the scid0 port of node 1 as shown in Figure 3-5.**

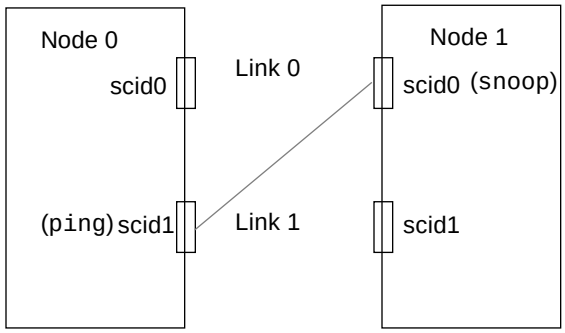


Figure 3-5 Private Interconnect Link 0 Troubleshooting

5. **Use the `ping` and `snoop` commands to check the condition of the interface between the scid1 port of node 0 and the scid0 port of node 1 as shown in the following examples.**

   a. **For node 0 use the `ping` command:**

```
node 0 # ping -i 204.152.65.17 -s 204.152.65.18
```

   b. **For node 1, use the `snoop` command:**

```
node 1 # /opt/sunWsci/bin/snoop_sci -d scid0
```

6. **If the scid0 port on node 1 is operative, then:**

- For node 0 the result of the `ping` command will result in no output summary. However, a control-c break should result in the message string:

```
node 0 # 100% packet loss
```

- For node 1 the use of the `snoop` command should result in the following message string:

```
node 1 # 204.152.65.17 -> 204.152.65.18 ICMP Echo request
```

7. **If the `snoop` command succeeds as described previously, then replace the related SBus card for the scid0 port on node 0. If the `snoop` command does not succeed, replace the SBus card for the scid0 port of node 1.**

8. **Connect the scid0 port of node 0 to the scid1 port of node 1 as shown in Figure 3-6.**

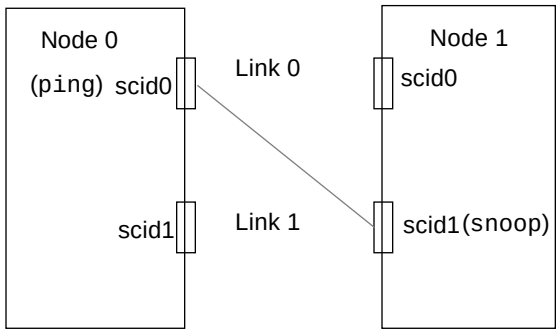


Figure 3-6 Private Interconnect Link 1 Troubleshooting

9. **Use the `ping` and `snoop` commands to check the condition of the interface between the scid0 port of node 0 and the scid1 port of node 1 as shown in the following examples.**

   a. **For node 0 use the `ping` command:**

```
node 0 # ping -i 204.152.65.1 -s 204.152.65.2
```

   b. **For node 1 use the `snoop` command:**

```
node 1 # /opt/SUNWsci/bin/snoop_sci -d scid1
```

10. **If the scid1 port on node 1 is operative, then:**

- For node 0 the result of the `ping` command will result in no output summary. However, a control C break should result in the message string:

```
node 0 # 100% packet loss
```

- For node 1 the use of the `snoop` command should result in the following message string:

```
node 1 # 204.152.65.1 -> 204.152.65.2 ICMP Echo request
```

11. **If the `snoop` command succeeds as described previously, then replace the related SBus card for the scid1 port on node 0. If the `snoop` command does not succeed, replace the related SBus card for the scid1 port of node 1.**

3.3.2 Client Net Failure

System console or Cluster Monitor (PDB clusters only) messages will identify the specific port that has failed. Otherwise, for information on test commands as well as additional troubleshooting, refer to the documentation that came with your client network interface card.

3.4 Terminal Concentrator and Serial Connection Faults

3.4.1 Terminal Concentrator

Note – It is not necessary for either node to be stopped or removed from a cluster when replacing the terminal concentrator.

Isolate terminal concentrator faults using the diagrams depicted in Section 3.4.2.1, “Terminal Concentrator Flow Diagrams” as well as the information contained in the following sections.

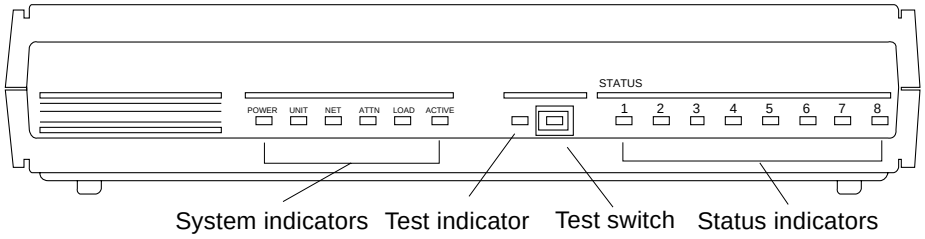


Figure 3-7 Indicator Locations

3.4.1.1 System Indicators

Figure 3-7 depicts the location of terminal concentrator system, test, and status indicators. The system indicators are:

- ***Power*** – ON if unit is receiving AC power and the internal DC power supply is working.
- ***Unit*** – ON if unit successfully passes its self-test.
- ***Net*** – ON when unit successfully transmits test data to and receives test data from the network.
- ***Attn*** – ON when unit requires operator attention. Flashing when unit encounters a problem.
- ***Load*** – ON when the unit is loading or dumping. Flashing when unit is trying to initiate a load.
- ***Active*** – FLASHING when unit successfully transmits data to and receives data from the network; flashing during diagnostics.

The test indicator is located next to the test switch. The indicator lights when the terminal concentrator enters test mode.

The status indicators, numbered 1 to 8, display serial port activity during normal operations. When the terminal concentrator is first configured during the Ultra Enterprise installation, the indicators should all be OFF. If any status indicator lights, there may be a hardware failure.

After POST has passed, the eight status indicators on the terminal concentrator (Figure 3-7) indicate activity on the serial ports. Messages from the host should cause the appropriate port LED (2 through 5) to blink. Text entered into the

cconsole host window should also cause the LED to blink. This can be useful when trying to determine whether the terminal concentrator, host, or cable is bad.

3.4.1.2 *Using the ROM Monitor* `config` *Command*

You can use the ROM monitor command, `config`, to verify the hardware and software revisions of the terminal concentrator.

1. **Press the reset button, and after 5 seconds, press the test button.**
2. **When the** `monitor::` **prompt appears, enter:**

```
monitor: : config <return>

REVISION/CONFIGURATION INFORMATION

 Amount of memory 2 Meg
 Board ID 52 - Serial Number 172743
 REV ROM: Maj Rev 40 Min Rev 0
 ROM Software Rev # 0601
 MLB Type: 8s,V24,FMC,(1)
 EXPANSION Type: None,(15)
 EEPROM size: 32768 bytes
 FLASH PROM (1048576 bytes) is installed
 PARITY option is not installed
 Twisted Pair alternate interface installed
 Number of ports 8
```

3.4.1.3 *Intermittent Router Problems*

There is a procedure you can follow if the following cnditions exsist:

- Terminal concentrator connections made via routers exhibit intermittent problems, while connections from hosts on the same network as the terminal concentrator continue to work normally.
- The terminal concentrator shows no signs of rebooting.

To solve this problem, establish a default route within the terminal concentrator and disable the routed feature.You must disable the routed feature to prevent the default route from being lost. The procedure is as follows:

1. Telnet to the terminal concentrator and become superuser:

```
$ telnet ss-tc
Trying terminal concentrator..
Connected to ss-tc.
Escape character is '^]'.

Rotaries Defined:
    cli

Enter Annex port name or number: cli

Annex Command Line Interpreter   *   Copyright 1991 Xylogics, Inc.

annex:  su
Password:
annex#
```

2. At the terminal concentrator promp, enter:

```
annex# edit config.annex
```

You should see the following as the first line of help text on a screen editor.

```
Ctrl-W: save and exit Ctrl-X: exit Ctrl-F: page down Ctrl-B: page up
```

a. To establish a default route within the terminal concentrator enter the following, where default_router is the IP address for your router:

```
%gateway
net default gateway default_router metric 1 hardwire
```

b. Follow this with a carriage return and then Ctrl-W to save and exit.

3. Disable the router feature using the `set` command:

```
annex#  admin set annex routed n
```

4. **Boot the terminal concentrator:**

```
annex# boot
```

3.4.1.4 *Resetting the Terminal Concentrator Configuration Parameters*

You may need to reset the terminal concentrator configuration information to a known state. One specific case is if you need to recover from an unknown terminal concentrator administrative password.

You can reset the configuration information using the `erase` terminal concentrator ROM monitor command. The `erase` command resets all configuration information to default values; however these defaults are not what were programmed when you initially received your terminal concentrator.

The following procedure shows how to reset all parameters to their defaults and then set the few parameters necessary for use in the Ultra Enterprise 2 environment. For more information, see the *Terminal Concentrator General Reference Guide*.

Before starting, you will need the following:

- A terminal; for example, a Sun Workstation running `tip`(1), located near the terminal concentrator
- The RJ-45 to DB-25 serial cable for connecting the terminal concentrator to your terminal
- An Ethernet connection to the terminal concentrator
- A system from which you can `telnet`(1) to the terminal concentrator

1. **Connect the terminal concentrator console port to a suitable terminal connection in order to perform the following steps.**
   If your terminal connection is a Sun workstation, use the Sun cable and connect the RJ-45 connector to the terminal concentrator console port (port 1) and the DB-25 connector to serial port A on the workstation.

2. **If you are using a workstation and this step was not previously done, edit the `/etc/remote` file to add the following line.**

```
a:dv=/dev/term/a:br#9600:
```

This allows `tip`(1) to connect to serial port A at 9600 baud.

3. **From the workstation, type the following command to connect the workstations serial port A to terminal concentrator port 1.**

```
# tip a
connected
```

Note – Your administration workstation may have a combined serial port labeled SERIAL A/B. In this case, you cannot use the TTY B port without the appropriate splitter cable. See the documentation supplied with your workstation for more information.

4. **Verify that the terminal concentrator power is on.**

5. **Reset the terminal concentrator.**
Depress the Test button (Figure 6-1) for three or more seconds until the Power LED blinks rapidly. Release the button.

6. **Wait for the Test LED to turn off and, within 30 seconds, press the Test button again. Verify that the orange Test LED lights, indicating the unit is in test mode.**
The terminal concentrator performs a self-test that lasts about 30 seconds. Wait for the `monitor::` prompt to appear.

```
System Reset - Entering Monitor Mode
monitor::
```

7. **Use the** `erase` **command to reset the EEPROM memory (configuration information).**

Caution – Do not erase the FLASH memory (self-boot image). Doing so will require reloading of the self-boot image from the Sun network terminal server CD-ROM or from another terminal concentrator, which is beyond the scope of this manual. Alternatively, the entire terminal concentrator can be replaced.

```
monitor:: erase
Erase
  1) EEPROM  (i.e. Configuration information)
  2) FLASH   (i.e. Self boot image)
Enter 1 or 2 :: 1
Erase all non-volatile EEPROM memory? (y/n) [n]:: y

 Erasing 32736 bytes of non-volatile memory. Please wait...

16K->|  Data 0xff
................................................................
................................................................
16K->|  Data 0x0
................................................................
................................................................
 Initialized checksum record installed
 Erasing 32736 bytes of non-volatile memory complete.

monitor::
```

8. **Use the** `addr` **command to assign the IP address, subnet mask, and other network parameters to the terminal concentrator.**
   Some parameters are not critical to the SPARCcluster environment; just accept the defaults, and enter the *subnet mask* appropriate for your network. The *broadcast address* is the IP address of the terminal concentrator with the host portion set to all ones. For example, for a standard class C IP address of 192.9.200.5, the broadcast address would be 192.9.200.255.

```
monitor:: addr
Enter Internet address [<uninitialized>]:: terminal concentrator IP
address
    Internet address: terminal concentrator IP address
Enter Subnet mask [255.255.255.0]:: subnet mask
Enter Preferred load host Internet address [<any host>]::
<return>
Enter Broadcast address [0.0.0.0]:: broadcast address
    Broadcast address: broadcast address

Enter Preferred dump address [0.0.0.0]:: <return>

Select type of IP packet encapsulation (ieee802/ethernet)
[<ethernet>]:: <return>
    Type of IP packet encapsulation: ethernet

Load Broadcast Y/N [Y]:: n
    Load Broadcast: N

monitor::
```

9. **Set the terminal concentrator to boot from itself instead of the network.**
   To do this, use the `sequence` command at the `monitor::` prompt and press Return after verifying the correct settings as follows.

```
monitor:: seq

Enter a list of 1 to 4 interfaces to attempt to use for
downloading code or upline dumping.  Enter them in the order they
should be tried, separated by commas or spaces.  Possible
interfaces are:

    Ethernet: net

    SELF:  self


Enter interface sequence [net]:: self
    Interface sequence: self

monitor::
```

10. **Power cycle the terminal concentrator to reboot it.**
    It takes a minute or two to boot and display the `annex:` prompt.

```
Annex Command Line Interpreter  *  Copyright 1991 Xylogics, Inc.
annex:
```

11. **Become the terminal concentrator superuser and use the `admin` command to enter the administrative mode, indicated by the `admin:` prompt.**
    The superuser password at this step is the IP address set using the `addr` command above, for example, 192.9.200.5.

```
annex: su
Password:      [the password does not display]
annex# admin
Annex administration MICRO-XL-UX R7.0.1, 8 ports
admin :
```

12. Set the following port parameters.

Note – This command line is case sensitive. Be sure to enter this line exactly as shown.

```
admin : set port=1-8 mode slave type dial_in imask_7bits Y
      You may need to reset the appropriate port, Annex subsystem
or reboot the Annex for changes to take effect.
admin :
```

13. Quit the administrative mode and then reboot the terminal concentrator.

```
admin : quit
annex# boot
bootfile: <return>
warning: <return>

    *** Annex (terminal concentrator IP address) shutdown message from port
1 ***
    Annex (terminal concentrator IP address) going down IMMEDIATELY
```

Note – The terminal concentrator will not be available for a minute or two until it completes booting.

14. Quit the `tip` program by pressing Return followed by a tilde (~) and a period (.).

```
<return> ~.
[EOT]
#
```

The return-tilde-period key sequence does not echo as entered, however you will see the tilde (~) after you enter the period.

This terminal concentrator is now ready for `telnet`(1M) use. Confirm that you are able to establish a connection to this terminal concentrator. You may also want to set the superuser password and other site-specific configuration settings. If desired, you may disconnect the serial cable and store it for future use.

3.4.2 Serial Connections

Isolate serial connection faults between the terminal concentrator and each node by using the troubleshooting flow diagrams in the following Section, "Terminal Concentrator Flow Diagrams."

3.4.2.1 Terminal Concentrator Flow Diagrams

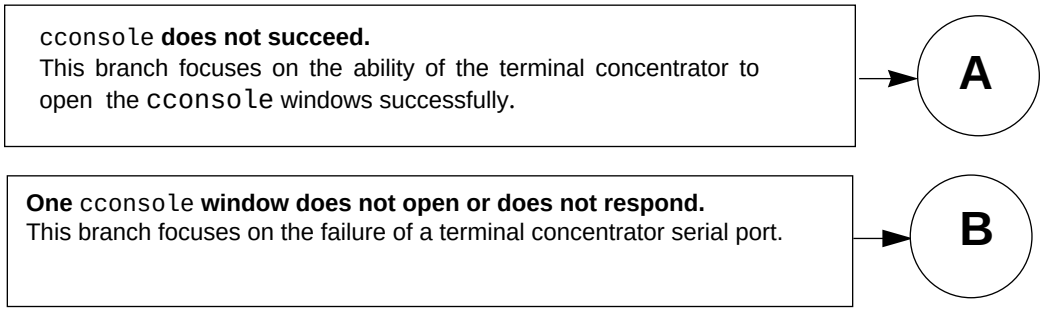


Figure 3-8 Troubleshooting Flow Diagram Overview

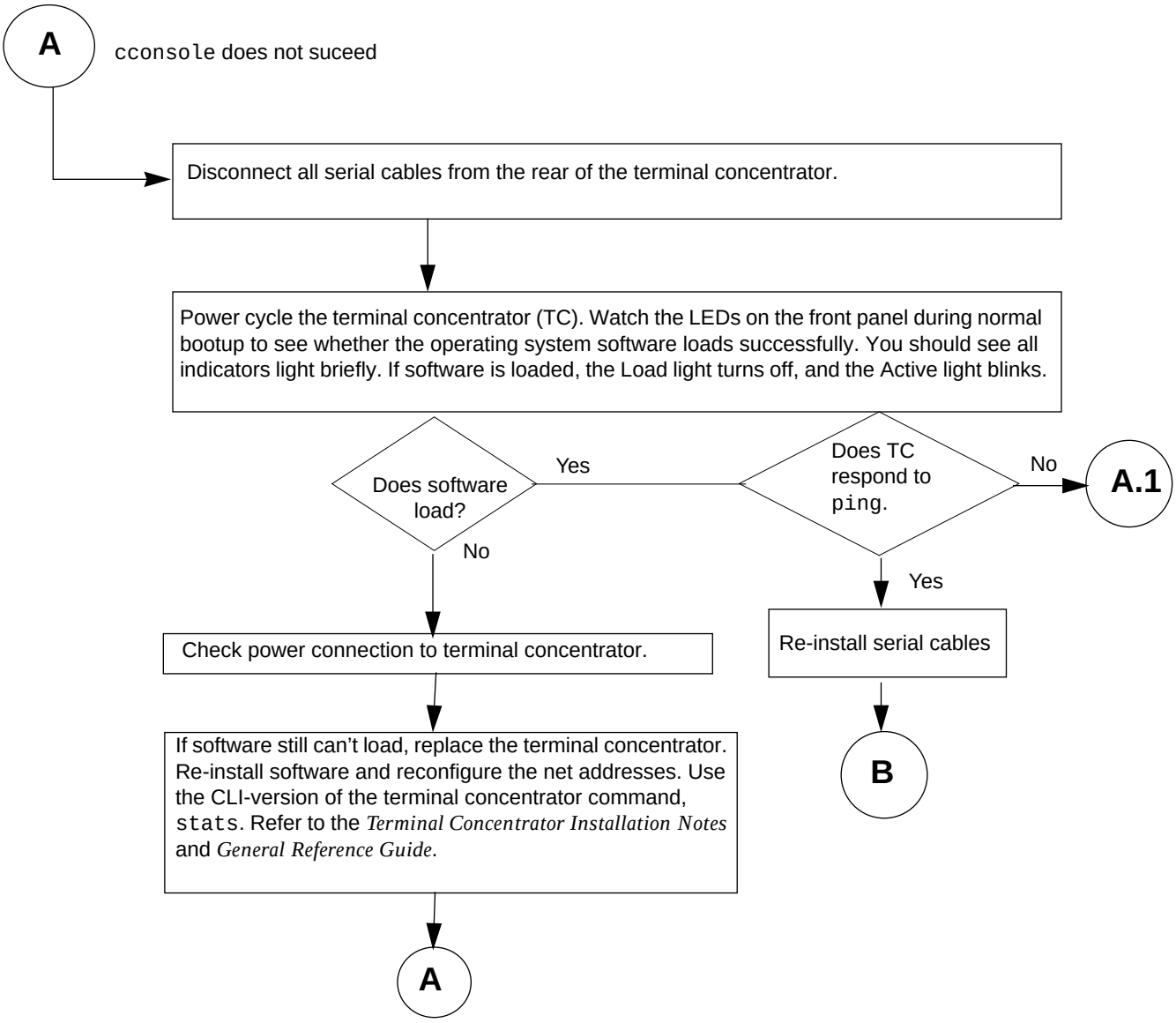


Figure 3-9 Branch A: cconsole Does Not Succeed

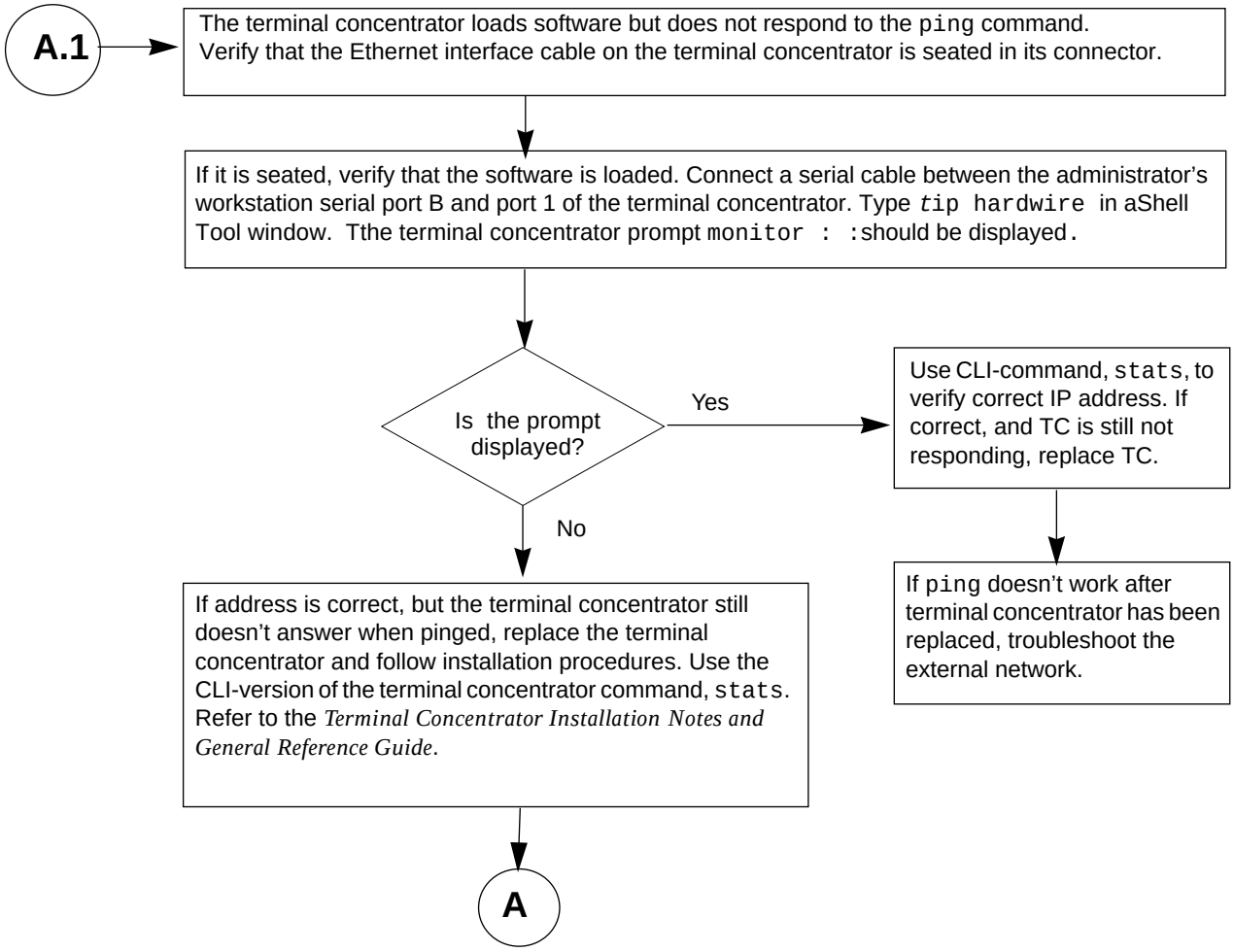


Figure 3-10 Branch A1: Terminal Concentrator Does Not Respond to Ping Command

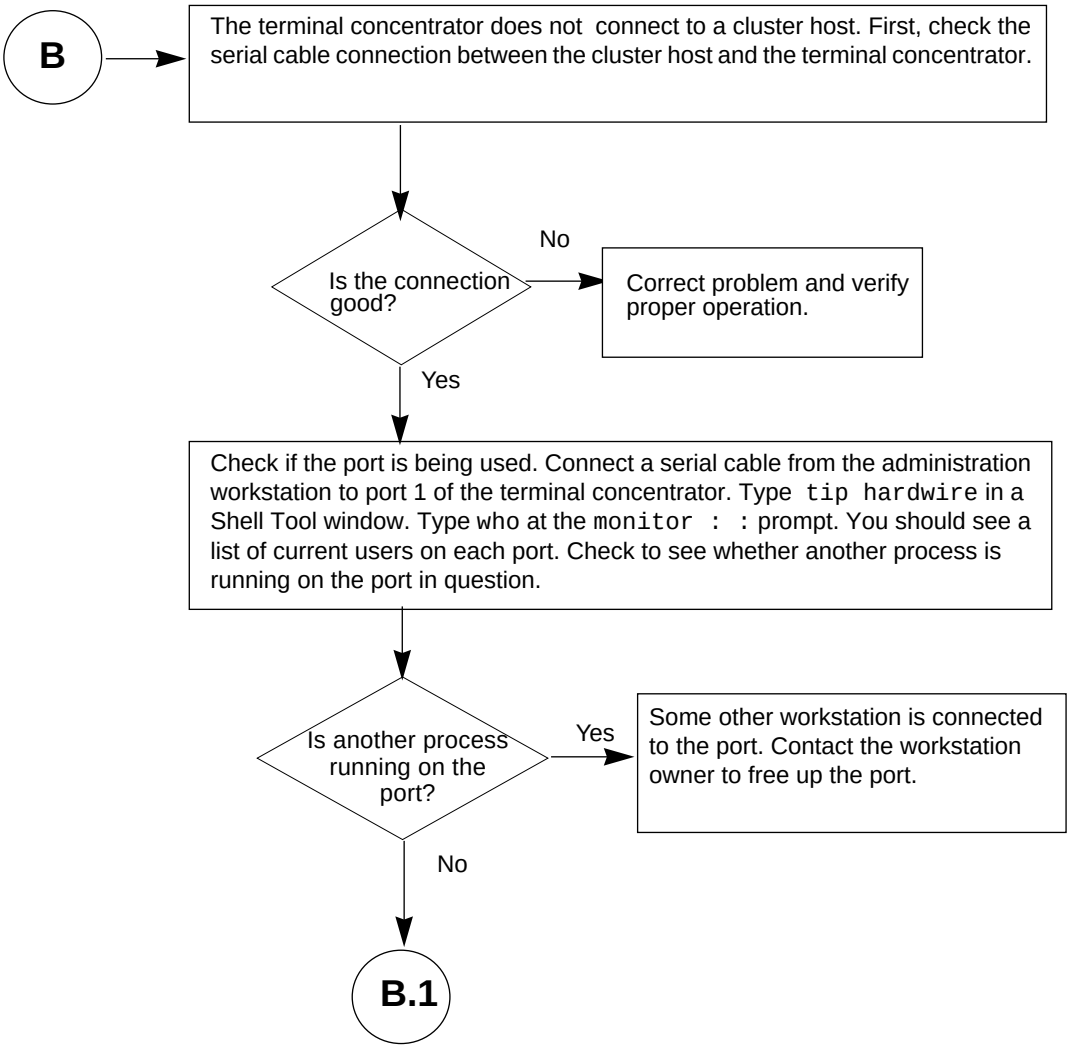


Figure 3-11 Branch B: Terminal Concentrator Cannot Connect to a Host

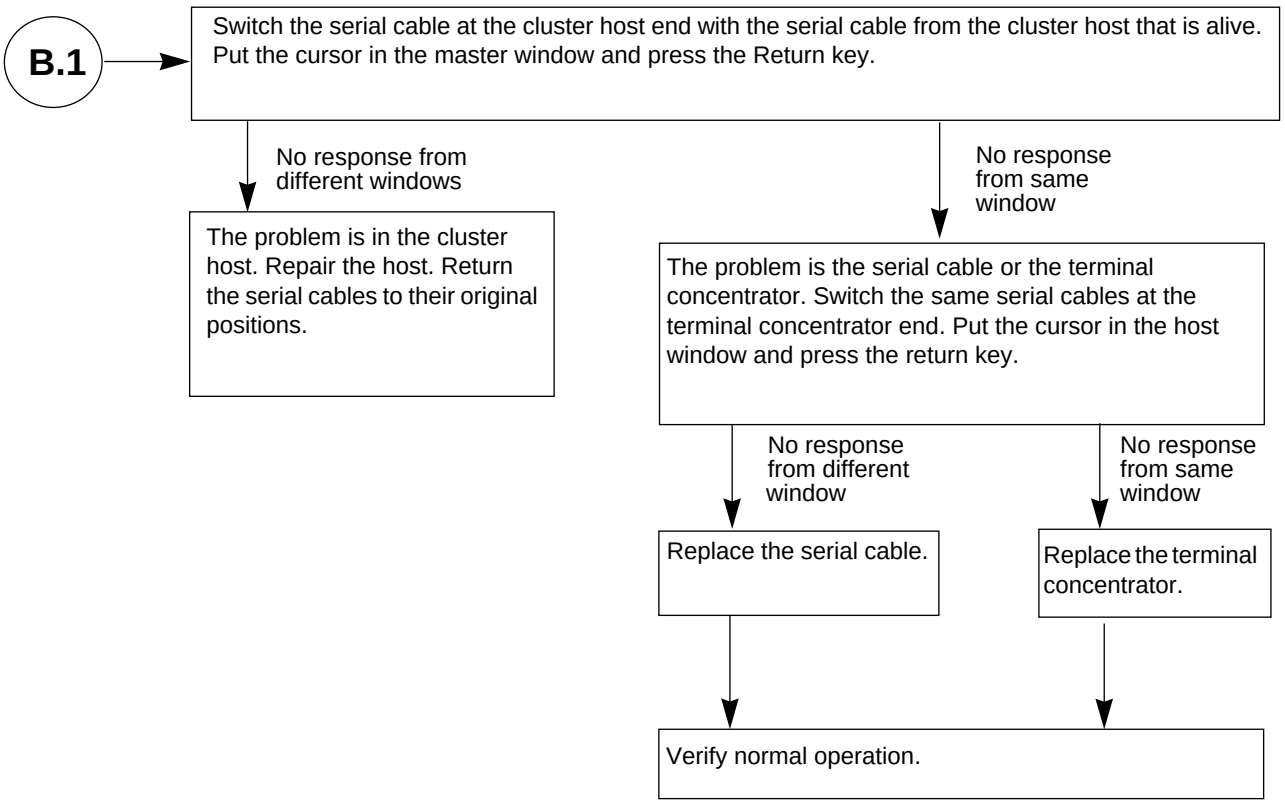


Figure 3-12 Branch B.1: Cconsole Window Is Blank or Not Responding

3.5 Cabling Failures

Refer to Chapter 9 of the *Ultra Enterprise 5000/6000PDB System Site Preparation, Planning and Installation Manual* for details on cabling the terminal concentrator, the private net, and the SPARCstorage Array optical connections.

3.6 CD-ROM and Tape Drive Failures

Messages on the system administrator's console or the Cluster Console for the node will identify the defective drive.

Replace a defective CD-ROM or tape drive as indicated in the service manual that came with your host system.

3

HA Cluster Hardware Troubleshooting

4

Prior to performing service on components within a node that is joined in an HA cluster, the system administrator must perform certain tasks that are necessary in a high availability system, refer to the *Solstice HA 1.2 Cluster Software Administration Guide*. The procedures within this chapter, with the exception of the terminal concentrator procedures, indicate when the system administrator's assistance is needed.

Warning – Be sure you have read and understand Section 4.1, "Solaris Reconfiguration Reboots," before attempting to reconfiguration reboot after hardware component replacement.

The following table lists the procedures contained in this chapter:

4

4.1 Solaris Reconfiguration Reboots

Note – It is not necessary to perform a reconfiguration reboot to add disks to an existing SPARCstorage array. Refer to the *SPARCcluster High Availability Server Software Administration Guide* for this procedure.

Be certain to avoid performing Solaris™ reconfiguration reboots when any hardware (especially a SPARCstorage array or other disks) is not operational (powered off or otherwise defective). You can perform a reconfiguration reboot via the OBP `boot -r` command or, by creating the file `/reconfigure` on the server and then rebooting. In such situations the reconfiguration reboot will remove the nodes in `/devices` and symlinks in `/dev/dsk` and `/dev/rdsk` associated with the disk devices. These disks will become inaccessible to Solaris until a later reconfiguration reboot. A subsequent reconfiguration reboot may not restore the original controller / minor unit numbering and cause Solstice DiskSuite™ to reject the disks. Once the original numbering is restored, Solstice Disksuite will be able to access the associated metadevices.

If all hardware is operational, a reconfiguration reboot can be safely performed to add a SPARCstorage Array to a system. Such arrays must be added symmetrically to both systems (though a temporary unbalance is allowed while the systems are upgraded). Similarly, if all hardware is operational it is safe to perform a reconfiguration reboot to remove hardware.

4.2 SPARCstorage Array and Optical Connections Faults

Note – This section is applicable to either Model 100 or Model 200 series SPARCstorage Arrays, regardless of the type of drive trays used.

System console messages indicate a SPARCstorage array is not communicating with one or both nodes. If the fault is hardware related, the problem could be any one of the components in the I/O path as depicted in Figure 4-1. For example, the defective component could be an FC/S card, FC/OM or cable on the hosts for either node, or an FC/OM, the controller or I/O interface on the applicable SSA.

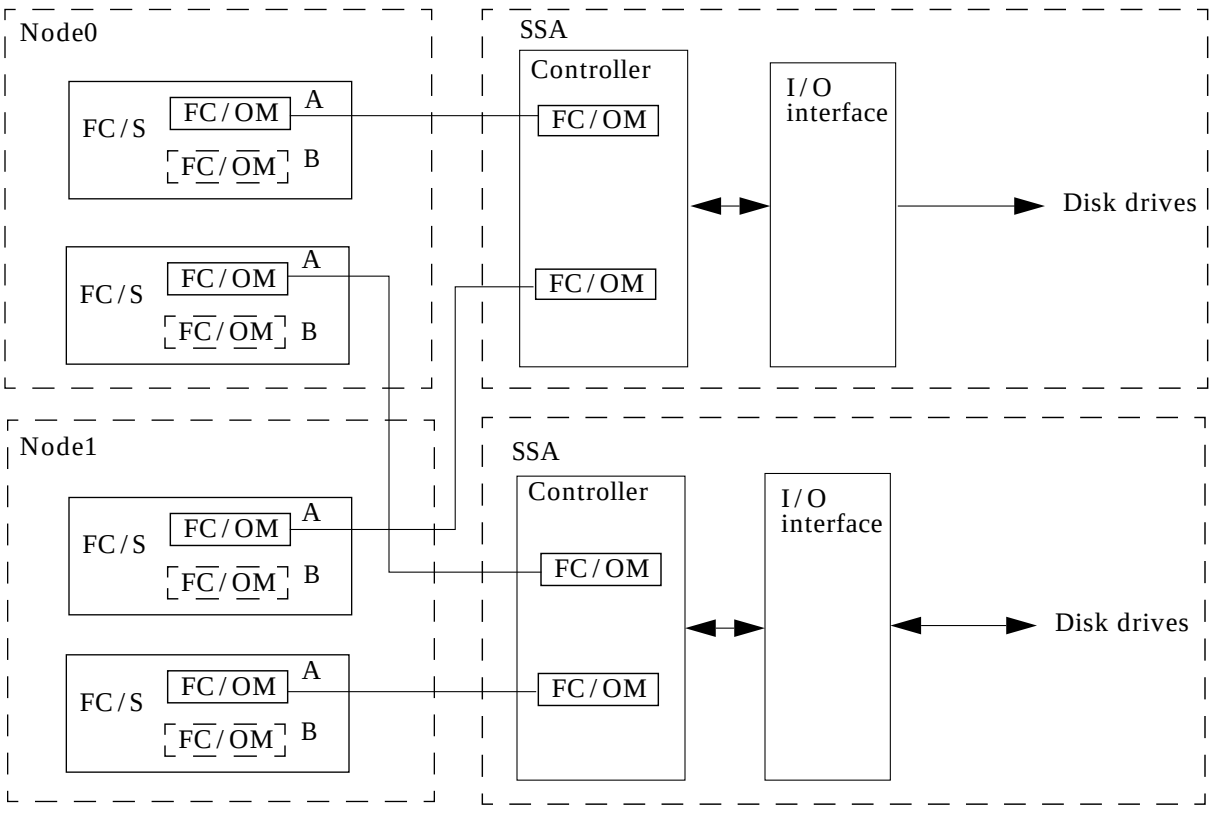


Figure 4-1 I/O Component Path for A Typical SSA Configuration

To isolate the fault, first try to correlate the console error messages with those listed in the *Solstice HA 1.2 Software Administration Guide*. In most case, the error message explanation lists probable causes. For example, for a SPARCctorage Array firmware and device driver error of the following type:

```
Transport error: FCP_RSP_SCSI_PORT_ERR
```

The explanation and corrective action is:

```
The firmware on the SPARCstorage Array controller has detected
the failure of the associated SCSI interface chip. Any I/O
operations to drives connected to this particular SCSI bus will
fail. If you see this message, you may have to replace the array
controller.
```

If no related message is found in the *Solstice HA 1.2 Software Administration Guide*, perform the procedures in the following two sections, if the fault matches the section heading. Otherwise proceed to Section 4.2.3, "SPARCstorage Array Communication Failure" and proceed as directed.

4.2.1 Errors From Both Nodes on the Same SPARCstorage Array

If errors from the same SPARCstorage Array occur for both nodes, it is likely that the fault is a common point in the I/O path for the SSA. Using Figure 4-1 as a reference, a probable point of failure would be the SSA controller. Use the following procedure to replace an SSA controller.

1. **Contact the system administrator and request that the node be prepared for replacement of a controller in a SPARCstorage array.**
2. **Bring the SPARCstorage array down as described in Chapter 8, "Shutdown and Restart Procedures".**
3. **Replace the controller board as described in Chapter 5 of the applicable (100 or 200 series) SPARCstorage Array Service Manual.**
4. **Bring the SPARCstorage array tray up as described in Chapter 8, "Shutdown and Restart Procedures".**

5. **Contact the system administrator and indicate that the node is ready to be returned to the cluster following replacement of a controller in a SPARCstorage array.**

4.2.2 *Multiple Disk Errors or Disk Communication Error For One Node Only*

If disk errors occur for one node only, it is likely that the faulty component is the disk itself or in the disk I/O path for the node receiving the errors, (reference Figure 4-1). Use the following procedure to replace a disk.

1. **Contact the system administrator and request that the node be prepared for the replacement of a disk drive.**
2. **Replace the defective disk using the following references as applicable:**

- SPARCstorage Array Model 100 series controllers; Chapter 5 of the *SPARCstorage Array Model 100 Series Service Manual*
- SPARCstorage Array Model 200 series controllers:
  - For RSM disk drives use the *SPARCstorage RSM Installation, Operations and Service Manual*
  - For 9-GByte tray drives use the *5.25 Fast/Wide Differential SCSI Disk Drive Installation Manual*

3. **Contact the system administrator and request that the node be returned to the cluster.**
4. **If the disk drive errors still exist after replacing the drive, proceed to the next section and isolate the problem to a component in the I/O path for the disk.**

4.2.3 *SPARCstorage Array Communication Failure*

The procedure for a SPARCstorage Array not communicating in an HA cluster is the same as that described for a PDB cluster in Chapter 3, see Section 3.1.4, “SPARCstorage Array Communication Failure”.

4.3 Node Failures

4.3.1 System Board, Control Board, and Boot Disk

For system board, control board, and boot disk failures, messages on the system console will identify the defective node and system board slot. A system board fault can then be further isolated using the `prtdiag` command as described in Section 4.3.2, “prtdiag Command.

You can further isolate this class of faults by referring directly to the troubleshooting procedures in the service manual for the host that came with your system.

After determining which part is defective, perform the following procedure to replace the part:

1. **Contact the system administrator and request that the node be prepared for replacement of a processor part.**
2. **Once the node has been removed from the cluster, shut down part of the system cabinet to replace a defective boot disk, system board, processor module, SBus board, SIMM, and so forth.**
   Refer toChapter 8, “Shutdown and Restart Procedures", and use the applicable shutdown procedure to prevent interrupting other cluster components.
3. **Replace the defective device as indicated in the service manual that came with your host system.**
4. **Bring up the applicable processor, see Chapter 8, “Shutdown and Restart Procedures".**
5. **Contact the system administrator and indicate that the node is ready to be returned to the cluster following replacement of a defective part.**

4.3.2 `prtdiag` Command

Use the `prtdiag` command to locate replaceable board components.

Note – `prtdiag` is a UNIX command. It can be accessed only if the OS is booted and running on the machine in question. `prtdiag` resides in `/usr/platform/sun4d/sbin/prtdiag`.

The following example shows the command and its output; actual output will differ depending upon hardware configuration.

```
$ /usr/platform/sun4d/sbin/prtdiag
System Configuration:  Sun Microsystems  sun4d SPARCserver 1000E
System clock frequency: 50 MHz
Memory size:  128Mb
Number of XDBuses: 1
      CPU Units: Frequency Cache-Size       Memory Units: Group
Size
         A: MHz MB   B: MHz MB         0: MB   1: MB   2: MB   3: MB
            ---------   ---------           -----   -----   ----
-   -----
Board0:      60 1.0     60 1.0          128      0      0      0
Board1:      60 1.0     60 1.0            0      0      0      0
======================SBusCards================================
Board0:        SBus clock frequency: 25 MHz
               0: dma/esp(scsi)         'SUNW,500-2015'
                  lebuffer/le(network)  'SUNW,500-2015'
               1: qec/qe(network)       'SUNW,595-3198'
               2: qec/be(network)       'SUNW,270-2450'
               3: SUNW,soc              '501-2069'

Board1:        SBus clock frequency: 25 MHz
               0: dma/esp(scsi)         'SUNW,500-2015'
                  lebuffer/le(network)  'SUNW,500-2015'
               1: SUNW,soc              '501-2069'
               2: qec/be(network)       'SUNW,270-2450'
               3: SUNW,soc              '501-2069'

No failures found in System
===========================
```

4.3.3 *Using the* `probe scsi` *Command*

Use this command to verify operation for a new or replacement SCSI-2 device installed in the system.

1. **Contact the system administrator and request that the node be removed from the cluster and subsequently halted.**

2. **Once the system is halted, enter the appropriate command to probe the system for SCSI-2 devices.**

   a. To probe all SCSI-2 devices installed in the system, enter:

```
ok probe-scsi-all
```

After entering the `probe-scsi-all` command, a list of drives like the one that follows is displayed. Example shown is for a SPARCcluster 1000 with two system boards 0 and 1. System board 0 has a CD player, a tape, and two SCSI disks; system board 1 has nothing. The probes are off the onboard SCSI -2 host slot (0).

```
/io-unit@f,e0200000/sbi@0,0/dma@0,81000/esp@0,80000
Target 0
  Unit 0   Disk    SEAGATE ST31200N SUN1.05872200568303Copyright
(c) 1994 Seagate All rights reserved 0000
Target 1
  Unit 0   Disk    SEAGATE ST31200N SUN1.05872200471832Copyright
(c) 1994 Seagate All rights reserved 0000
Target 5
  Unit 0   Removable Tape     ARCHIVE Python 28454-XXX4.BL
Target 6
  Unit 0   Removable Read Only device     TOSHIBA XM-
4101TASUNSLCD108404/18/94
```

   b. To confine the probe to SCSI-2 devices hosted by a specific SBus SCSI-2 host, substitute for variables *A* and *B* in the following example, where *A* is the system board number (0-9 for a SC2000 and 0-3 for a SS1000) and *B* is the SCSI-2 host slot (0-3 for the corresponding SBus slot).

```
ok probe-scsi /io-unit@f,eA200000/sbi@0,0/dma@B,81000
```

3. **Verify that the drive in question is listed.**
   The `Target #` lines identify the SCSI-2 addresses of installed devices. If the address is listed for the device in question, installation was successful. If the address is absent, verify that the cables are installed correctly. If the cabling is correct, run the appropriate diagnostics as required.

4. **Reboot the system:**

```
ok reset
```

   The screen goes blank for several seconds as the system reboots.

4.4 Network Failures

4.4.1 Private Network Failure (SunSwift)

Caution – Problems on the private network may be due to temporary communication conditions. A fix on the private network must be verified, with before and after traffic condition measurements, to verify that comparable traffic has been supported. Do not close a problem by a cable replacement without running `netstat` before and after the fix, saving the output to a mail message to the support organization for record. Compare the traffic conditions in the two `netstat` outputs for similar levels.

System console messages indicate that one of the private network links has failed. For example, the output of the `hastat` command will indicate if there are problems with the private network links. Also, the Message Log (at the bottom of the `hastat` display output) or the `/var/adm/messages` file should be checked for private network related error messages. The use of the `hastat` command and the `/var/adm/messages` file is detailed in the *Solstice HA 1.2 Software Administration Guide*.

You can find supplemental troubleshooting information in the *SunSwift Adapter User Guide*. Also, see the following Section 4.4.1.1, “One or Both Nodes Up and Running in a Cluster.”

4.4.1.1 *One or Both Nodes Up and Running in a Cluster*

In the example in , both nodes are up and running in a cluster, private network 0 has failed and the HA software has recovered on private network 1.

To find the actual designations for the private network ports on a node, you use the `netstat -i` command on each node to determine which private links are available. For example, for node 0:

Note – Private link designations may differ depending upon hardware configuration. For example, `hme0` and `hme1` vs `hme1` and `hme2`. Also, if SunFastEthernet is used instead of SunSwif,t then the designations are `be` instead of `hme`.

```
node0# netstat -i
Name  Mtu  Net/Dest      Address        Ipkts  Ierrs Opkts  Oerrs Collis Queue
lo0   8232 loopback      localhost      469183 0     469183 0     0      0
hme0  1500 <public net name>         127661313 68    65520378 1106  1727887 0
hme0:2 1500 <public net name>           0      0     0      0     0      0
hme1  1500 204.152.64.0  node0-priv1    442029 0     444396 0     8948   0
hme2  1500 204.152.65.0  node0-priv2    190625 0     191531 0     0      0
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
```

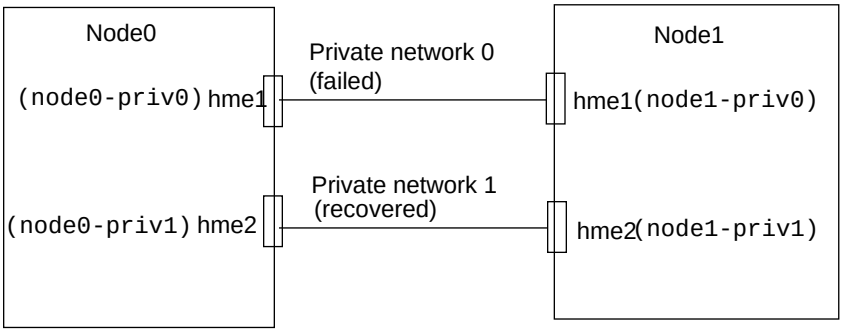


Figure 4-2 Private Network 0 Failure

To troubleshoot private network 0 to a defective card or cable, use the following procedure.

Note – In the following procedure, node 1 is removed from the cluster. When there is one node remaining in a cluster, HA software will continue sending messages across the private nets. The following procedure uses these message packets to confirm communication between the nodes.

---

1. **Contact the system administrator and request that a node be prepared for removal from the cluster.**
2. **For this example, assume that the HA software recovers on node 1. See Figure 4-3 and remove the private network 1 cable (cable between the hme2 ports of both nodes).**
3. **Connect the private network 0 cable (cable for failed network) between the hme1 port of node 0 and the hme2 port of node 1.**

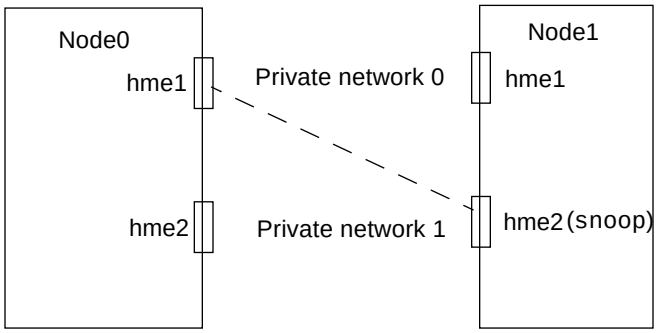


Figure 4-3 Private Network 0 Troubleshooting

4. **Use the** `snoop` **command on node 1:**

```
node1# snoop -d hme2
```

5. **If the following string is returned as a result of the `snoop` command, then the SBus card for the hme1 port on node 1 is most likely defective.This message string indicates that the hme1 port of node 0 as well as the private network 0 cable are functional.**

   a. **In this instance, request that the system administrator rejoin node 0 to the cluster. Remove node 1 prior to replacing the related SBus card.**

   b. **Once the card is replaced, indicate to the system administrator that node 1 is ready to be returned to the cluster.**

```
node0-priv0 -> node1-priv0 UDP D=6666 S=6666 LEN=120
```

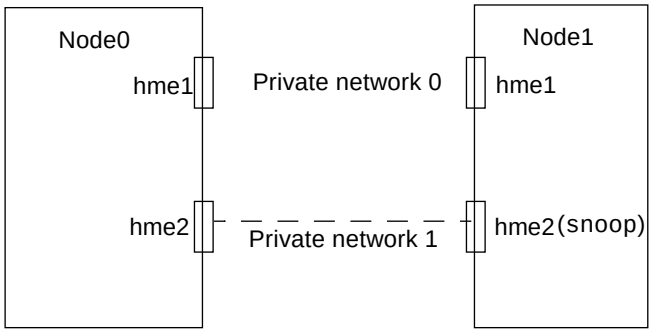


Figure 4-4 Private Network 0 Troubleshooting Continued

6. **If the string indicated in step 5 is not returned by the `snoop` command, then connect the private network 0 cable between the hme2 ports of both nodes.**
   Following this, continue using the `snoop` command on node 1 (`snoop` will be run as initiated in step 4 until interrupted by a `Control C`).

7. **If the message string indicated in step 5 is repeated, then the hme1 port on node 0 is most likely defective, as this message indicates that the private network 0 cable is functional.**

   a. **In this instance, replace the related SBus card in node 0.**

   b. **Indicate to the system administrator that node 0 is ready to be returned to the cluster.**

8. **If the message string indicated in step 5 is *not* returned, then the private network 0 cable is most likely defective.**

4.4.2 Client Net Failure

For information on test commands as well as additional troubleshooting, refer to the documentation that came with your client network interface card.

4.5 Terminal Concentrator and Serial Connection Faults

Same as that described for PDB clusters, see Section 3.4, “Terminal Concentrator and Serial Connection Faults”.

4.6 Cabling Failures

Refer to Chapter 8 (3000), Chapter 9 (4000), Chapter 10 (5000), or Chapter 11 (6000) of the *Ultra Enterprise Cluster Hardware Site Preparation, Planning and Installation Guide* for details on cabling the terminal concentrator, the private network, and the SPARCstorage Array optical connections.

4.7 CD-ROM and Tape Drive Failures

Messages on the system administrator’s console or the cconsole (PDB clusters only) for the node will identify the defective drive.

Replace a defective CD-ROM or tape drive as indicated in the service manual that came with your system.

4

Software Troubleshooting 5

For HA clusters refer to the *Solstice HA 1.3 User's Guide* for information on system software errors as well as system software troubleshooting. Refer to Appendix D for error messages specific to a SPARCstorage Array.

For PDB clusters refer to the *Ultra Enterprise Cluster PDB Error Messages* guide and the *Ultra Enterprise Cluster PDB System Administration Guide* for information on PDB system software errors as well as system software troubleshooting.

5

Diagnostics 6

6.1 On-Line

6.1.1 Solstice SyMON System Monitor

The Solstice™ SyMON™ monitor features a graphical user interface (GUI) display that shows various graphs reflecting system status.

This system monitor is intended to complement network-wide and enterprise-wide system management tools, is accessible through an SNMP interface from network tools such as Solstice SunNet Manager™.

Refer to the online Solstice SyMON User's Guide, Part Number 802-5355, for starting and operating instructions.

6.1.2 Sun VTS

SunVTS™ is one of the online diagnostics tool for an Enterprise clustered system. See Section 6.4, "Running SunVTS."

A utility within SunVTS, `vtsprobe`, enables you to verify installation of system hardware, SPARCstorage Arrays, private net devices, network interfaces and so forth. See Section 6.3, "Verifying Hardware Installation."

In addition, for PDB clusters only, you can isolate faults with the Cluster Monitor GUI displays of information and graphics, see Chapter 2, Section 2.5.2, “Troubleshooting Flow.” The following table lists the procedures in this chapter.

6.2 Determining Cluster Status

You can use the Cluster Monitor GUI (PDB clusters only) information displays to determine the state of the cluster, hardware as well as software. See Chapter 2, “Troubleshooting Overview", and the Figure 2-1 “Troubleshooting Flow Diagram” which contains the procedure.

6.3 Verifying Hardware Installation

There are four prerequisites for the following procedure:

- Both nodes have Solaris 2.5.1 installed.
- Both nodes have SPARCstorage Array package installed.
- Both nodes have routing table established for the private interconnect.
- Both nodes have SUNWvts package installed.

The following steps must be performed on each node:

1. Become superuser and then change directories:

```
# cd /opt/SUNWvts/bin
```

2. Set the following environment variables:

- For a Bourne shell:

```
# BYPASS_FS_PROBE=1;export BYPASS_FS_PROBE
```

- For a C shell:

```
% setenv BYPASS_FS_PROBE=1
```

a. Enter the following command:

```
# ./vtsk
```

Executing the `./vtsk` command starts the SunVTS kernel. The SunVTS kernel will then probe the system devices and await commands from an interface.
The following error message may be displayed if you are executing the `./vtsk command` for the second time, such as when directed to in the final step of this procedure.

```
# "vtsk: SunVTS kernel is already running"
```

If this error message occurs, enter:

```
# ./vts_cmd probe
```

3. **Wait a few minutes to allow `vtsk` to finish system probing and then initiate the `probe_map` by entering the `vtsprobe` command.**
As shown in the following example, the output, which can be lengthy, is redirected to the file `/tmp/probe_map` for later viewing. The `vtsprobe` command without modifiers will produce a console screen output.

```
# ./vtsprobe > /tmp/probe_map
```

4. **Check that the response to the `vtsprobe` command is similar to the following for the private net devices:**

Note – The data listed in the following example is obtained before the private net is configured.

```
Network
      beo(nettest)
      Port Address: Unknown
      Host ID: 80500419
      Domain Name : nn.nn.nn.com
      be1(nettest)
      Port Address: Unknown
      Host ID: 80500419
      Domain Name : nn.nn.nn.com
```

5. **Check that there is a response (under the Network heading) to the `vtsprobe` command for any network interface devices that you have installed.**
   For example, if you have installed an SBus Quad Ethernet Controller, there should be corresponding `qe` entries. Consult the documentation that came with your particular network interface card to determine the correct entry for your device.

6. **Check that the response to the `vtsprobe` command is similar to the following for the SPARCstorage Arrays:**

```
pln0(plntest)
    Worldwide Name: 08002018375f
    Disks Attached: c1t0d0 c1t0d1 c1t1d0 c1t1d1 c1t2d0
    : c1t2d1 c1t3d0 c1t3d1 c1t4d0 c1t4d1
    : c1t5d0 c1t5d1

        pln1(plntest)
    Worldwide Name: 0800201cad8e
    Disks Attached: c2t0d0 c2t0d1 c2t1d0 c2t1d1 c2t2d0
    : c2t2d1 c2t3d0 c2t3d1 c2t4d0 c2t4d1
    : c2t5d0 c2t5d1
```

If the data listed for the SPACstorage Arrays does not match the build configuration, check and correct any cabling errors and then repeat steps 1 through 4.

7. **Check that the response to the `vtsprobe` command is similar to the following for each disk listed under a SPARCstorage Array:**

```
SparcStorageArray(pln0)
    c1t0d0(rawtest)<--- logical name(test name)
        Logical Name: c1t0d0
        Capacity: 1002.09MB
        Controller: pln0

    c1t0d1(rawtest)<--- logical name(test name)
        Logical Name: c1t0d1
        Capacity: 1002.09MB
        Controller: pln0

    c1t1d0(rawtest)<--- logical name(test name)
        Logical Name: c1t1d0
        Capacity: 1002.09MB
        Controller: pln0
```

   If the data listed for the disks does not match that shown under the corresponding SPARCstorage array entry, check and correct the cabling and then repeat steps 1 through 5.

8. **Compare the `probe_maps` generated by each node. Check and verify WWN of each SPARCstorage array. Check and compare disk logical name and capacity for all disks under corresponding SPARCstorage Array.**
   If there is not an identical match, replace disks if necessary.

9. **To run a final system functional check, run SunVTS as indicated in the following section.**

6.4 Running SunVTS

Caution – Do not run SunVTS in conjunction with any system that is also running a database application or PDB or HA software.

To run a final functional test of the system using SunVTS:

1. Become superuser and then change directories:

```
# cd /opt/SUNWvts/bin
```

2. Enter:

```
# ./sunvts -display<admin ws>:0.0
```

The SunVTS GUI is displayed. After the GUI comes up, click the “start” button and allow for one system pass of the SunVTS run. For details of how to run SunVTS, refer to *SunVTS User’s Guide*, Part Number 802-5331.

6

Safety and Tools Requirements 7

7.1 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.
- Only use properly grounded power outlets.
- 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.

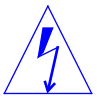
7

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

Table 7-1 Safety Precautions

Item	Problem	Precaution
AC power cord	Electric shock	Unplug the AC cord from the AC wall socket before working inside the system chassis.
Wrist or foot strap	ESD	Wear a conductive wrist strap or foot strap when handling printed circuit boards.
ESD mat	ESD	An approved ESD mat provides protection from static damage when used with a wrist strap or foot strap. The mat also cushions and protects small parts that are attached to printed circuit boards.
Cover panels	System damage and overheating	Re-install all cabinet cover panels after performing any service work on the system.
SBus slot covers	System damage and overheating	Install SBus slot covers in all unused SBus slots.

7.2 Symbols



WARNING

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

CAUTION

There is a risk of personal injury and equipment damage. Follow the instructions.

HOT 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.
	STANDBY	The key lock switch is in the STANDBY position.
	ON	The key lock switch is in the ON position.
	**PROTECTIVE EARTH**	Protective earth conductor.
	**CHASSIS**	Frame or chassis terminal.
	**FUSE REPLACEMENT MARKING**	For continued protection against risk of fire and electric shock, replace ONLY with same type and rating of fuse.

7.3 System Precautions

Prior to servicing this equipment, ensure that you are familiar with the following 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 as described in the *Site Preparation Guide.*
- 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 – DO NOT make mechanical or electrical modifications to the cabinet. Sun Microsystems™ is not responsible for regulatory compliance of modified cabinets.

Caution – Power off the equipment as directed in Chapter 8, “Shutdown and Restart Procedures” before performing any of the procedures described in this book.

Caution – Before servicing a power supply or power sequencer, ensure that the chassis AC power cord is removed from the AC wall socket. However, when servicing low voltage circuitry such as a system board, the AC power cord should remain plugged in to ensure proper grounding.

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.

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.

7.4 Tools Required

The following list represents the minimum of tools and test equipment to service the system cabinet:

- Screwdrivers, Phillips #2 and flat blade
- Screwdriver, slotted, 3/16 inch
- Hex drivers, M-4 and 3/16 inch
- Wrench, 13 mm
- Sun ESD mat
- Grounding wrist strap
- Needlenose pliers
- Removal tool, pin/socket
- Digital multimeter (DMM)

7

Shutdown and Restart Procedures 8

This chapter gives instructions on performing shutdown and startup tasks that must be accomplished prior to the subassembly removal and replacement procedures. These procedures are specifically structured for a high-availability system. At appropriate points, references will indicate that the system administrator be contacted to remove a node in preparation for service or to rejoin a node after servicing. Thus, a node remains in the cluster and the integrity of a high-availability system is maintained.

8

8.1 System Shutdown

Caution – This system shutdown procedure should be used only in case of a catastrophic failure or to facilitate some types of service; for example, in the case of a failed power sequencer. Unless absolutely necessary, do not power off the system using this procedure. Instead proceed to the jump table at the beginning of this chapter and perform the indicated procedure for the system component you want to shut down or start up.

Before you shutdown the system cabinet, request that the system administrator back up the complete system and then bring both nodes down. Once both nodes are down, you can power off and on the system cabinet as indicated in this and the following section:

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. Turn off the system power in this order:**
   a. External drives and expansion cabinets (if any)
   b. System cabinet
   c. Terminal
5. **Turn the front panel key switch to ⏻ (the standby position).**
   See Figure 8-1.

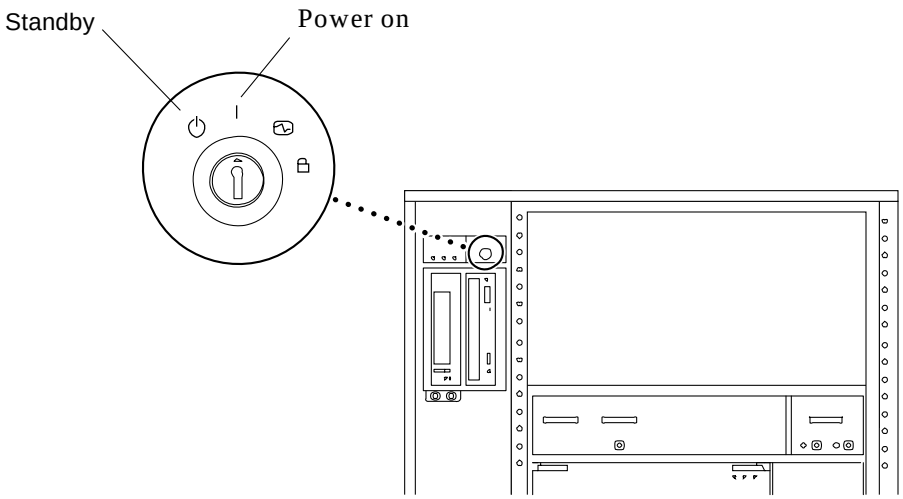


Figure 8-1 Keyswitch Standby Position

Caution – Turn off the power at the AC distribution unit power switch on the rear of the system before attempting to service the system cabinet.

6. **Turn the AC distribution unit power switch to Off.**
   The unit is at the rear of the cabinet. See Figure 8-2.

8.2 System Startup

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 systems installation guide that came with your host system for terminal settings.

1. **Ensure that the system key switch must is turned to ⏻ (the standby position).**
   See Figure 8-1.

Caution – The outlet must be a 200–240 VAC, 30-ampere circuit, intended solely for use by the server cabinet, as described in the site preparation instructions in the *Ultra Enterprise 6000/5000/4000 Systems Installation Guide*. The electrical receptacle must be grounded, and the grounding conductor serving this receptacle must be connected to the earth ground at the service equipment.

2. **Turn the Local/Remote switch down, to** `Local`**.**
   See Figure 8-2.

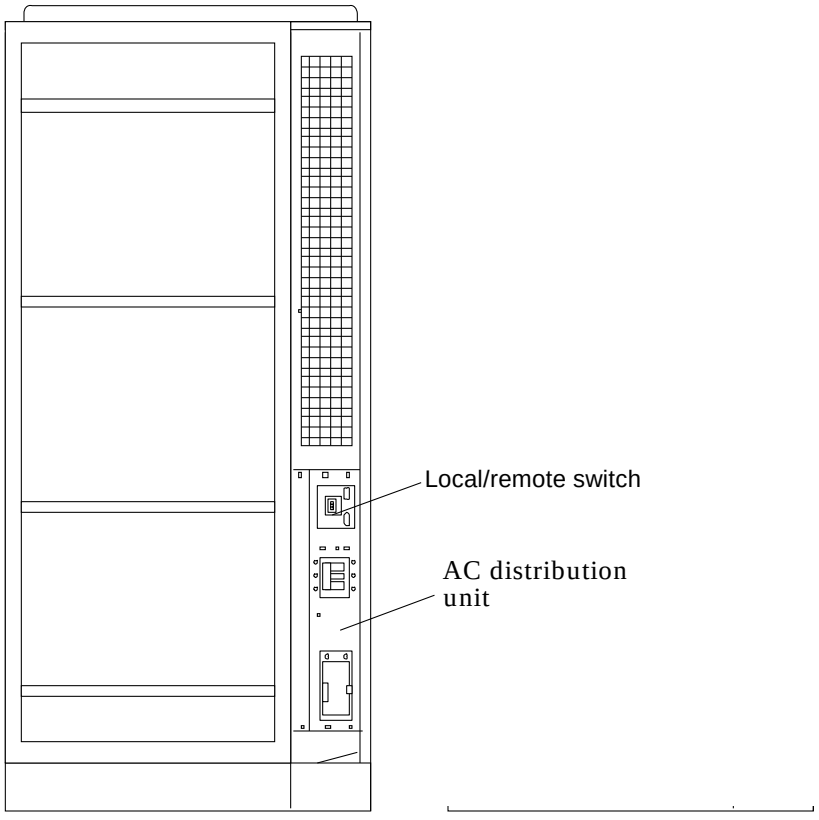


Figure 8-2 AC Distribution Unit

3. **Turn on the AC distribution unit power switch.**
   See Figure 8-2.

4. **Turn on power to the terminal.**
   A terminal is required for viewing system messages.

5. **Turn the key switch to | (the power-on position).**
   See Figure 8-1. 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 the 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.

If the system has two power supplies and one fails, the system will continue to operate. If POST, OpenBoot PROM (OBP), or the operating system detects the power supply failure, a warning message will be displayed on the console:

```
Power supply maintenance should be scheduled.
```

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 reset switch on the clock board.**
   See Figure 8-3.

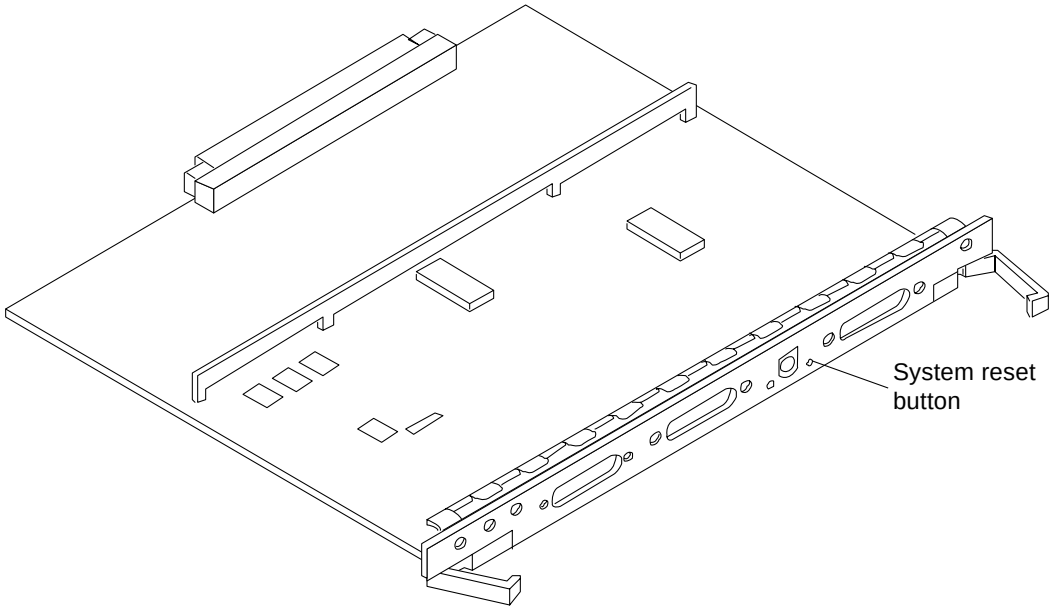


Figure 8-3 System Reset Switch on Clock Board

8. **After the cabinet has been powered on, request that the system administrator return the system to high availability.**

8.3 CPU/Memory, I/O, Disk, and Clock Boards

Note – Since these hardware components of an Enterprise system can be hot-pluggable, it may not be necessary to power down any component except for the board that has a defective part. Check with your local service provider for software support of this feature

1. **Request that the system administrator remove the applicable node from the cluster (if required) and indicate the board that is to be repaired or replaced.**
   If a boot disk drive on a disk board is to be replaced, request that the system administrator perform the necessary software tasks required prior to the replacement of a boot disk (HA clusters only).
2. **Remove, repair, or replace the defective board as indicated in the applicable chapter of the systems manual that came with your host system.**

8.4 Peripheral Power Supply and Power/Cooling Module

Note – Since these hardware components of an Enterprise system can be hot-pluggable, it may not be necessary to power down any component except for the power supply or power/cooling module that has a defective part. Check with your local service provider for software support of this feature

1. **Request that the system administrator remove the applicable node from the cluster (if required) and indicate the power supply or power/cooling module that is to be repaired or replaced.**
2. **Remove, repair, or replace the defective part as indicated in the systems manual that came with your host system.**

8.5 SPARCstorage Disk Arrays

The disk arrays for the database in Enterprise cluster systems contain SPARCstorage Array Model 100 series disks (used in main system cabinets) and SPARCstorage Array Model 200 Series with SPARCstorage RSM units (used in expansion cabinets).

The SPARCstorage Array Model 100 series has controllers and disk drives mounted within a single chassis. The SPARCstorage Array Model 200 Series has the controllers and interface boards mounted in a chassis while the disk drives are mounted separately within SPARCstorage RSM units or 9-Gbyte Fast / Wide Differential SCSI trays.

8.5.1 SPARCstorage Array Model 100 Series

A SPARCstorage Array Model 100 series chassis contains three drive trays, each tray contains ten drives, see Figure 8-4. To replace a single drive or a single drive tray within a SPARCstorage Array, it is not necessary to power down the SPARCstorage Array as well as all drives. Instead, shut down only the drive tray or the tray containing the drive to be replaced, as described in Section 8.5.1.3, “Single Drive or Tray Shutdown.”

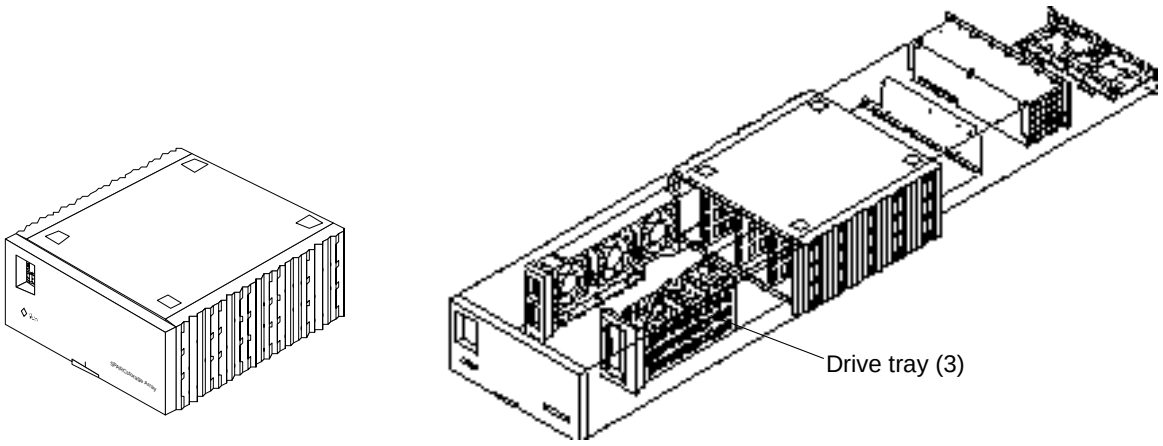


Figure 8-4 SPARCstorage Array Model 100 Series

8.5.1.1 *Complete Array Shutdown*

Caution – Do not disconnect the power cord from the wall socket when you work on the SPARCstorage Array. This connection provides a ground path that prevents damage from uncontrolled electrostatic discharge.

1. **Prior to powering down a complete SPARCstorage Array, you must request that the system administrator:**
   a. **Remove the node for the SSA from the cluster.**
   b. **Halt all I/O processes to the SSA.**
   c. **Power off the three drive trays.**
2. **Once the system administrator has powered down all drive trays in the array, turn off the AC power switch on the rear of the SPARCstorage Array 100 Series chassis.**
   See Figure 8-5.

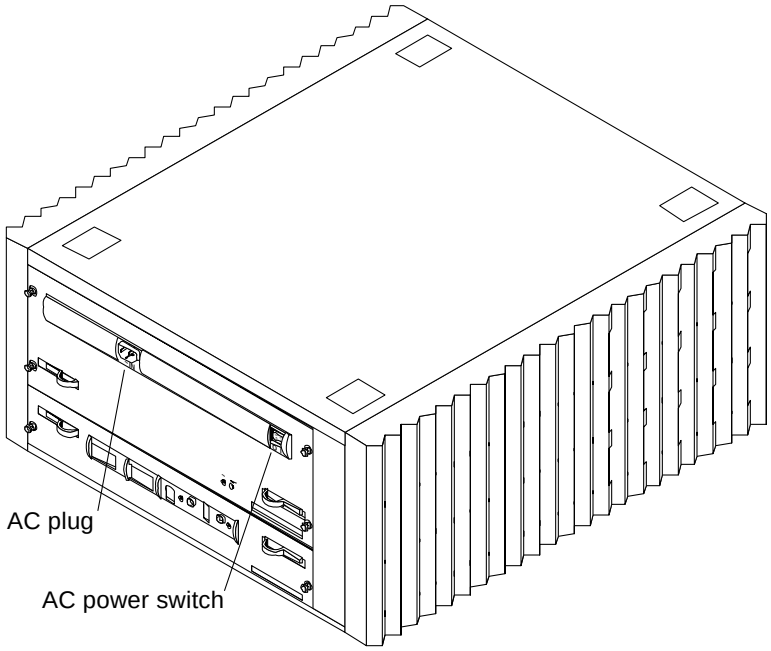


Figure 8-5 SPARCstorage AC Power Switch and AC Plug

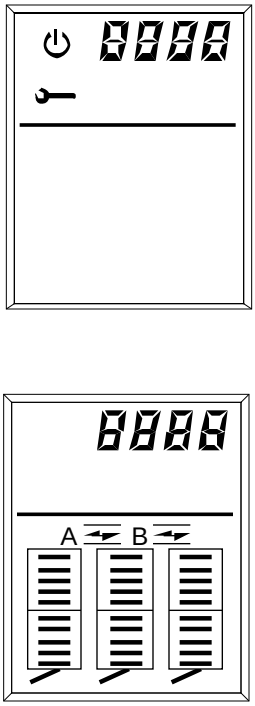
8.5.1.2 *Complete Array Startup*

Warning – Never move the SPARCstorage Array when the power is on. Failure to heed this warning can result in catastrophic disk drive failure. Always power the system off before moving it.

1. **Begin with a safety inspection.**
   Ensure that the SPARCstorage Array AC power switch is off and verify that the power cord is plugged into the chassis and a wall socket. See Figure 8-5.

2. **Turn on the AC power switch on the chassis rear.**
   You should hear the fans begin turning.

3. **Watch the front panel LCD display.**
   When powering on, the LCD displays the icons shown in Figure 8-6.



- During the power-on self-test (POST), the POST and service icons are displayed in the upper left corner of the LCD display. The four alphanumeric LCDs display the code for the currently running POST test.

  If problems are detected during POST, an error code is flashed continuously on the alphanumeric LCDs. See Table 3-1 in Chapter 3 for a listing and explanation of POST error codes.

- After POST is completed, the following will be displayed in this order:
  - The last four digits of the World Wide Name for the particular SPARCstorage Array.
  - One or two fibre icons, which indicate the status of the fibre links.
  - A drive icon (solid bar) for each installed drive in the drive trays.
- During normal operation, you should see the same icons solidly displayed on the front panel display.

Figure 8-6 LCD Display While Powering On the System

It may take some time for a SPARCstorage Array to boot, depending on the following factors:

- Total number of disk drives in the SPARCstorage Array
- Total number of disks drives under CVM control
- Total number of volumes created for the disk drives
- Complexity of the CVM configuration

For example, a SPARCstorage Array with eighteen disk drives and only simple volumes may take 15–30 seconds to boot, while a SPARCstorage Array with thirty disks drives and striped and mirrored volumes may take up to two minutes to boot.

4. **Once POST has completed, request that the system administrator:**
   a. **Restart all drive trays within the array.**
   b. **Rejoin the SSA to the Volume Manager.**
   c. **Rejoin the node to the cluster.**

8.5.1.3 Single Drive or Tray Shutdown

Note – The procedure for a single disk is the same as that for a tray. To replace a disk within a tray, the disk tray must be shut down.

1. **Request that the system administrator:**
   a. **Remove the node for the SPARCstorage Array from the cluster.**
   b. **Halt all I/O processes to the applicable drive tray.**
   c. **Power off the applicable drive tray.**
2. **Once all drives in the tray are stopped, remove the tray to access individual drives for service.**

8.5.1.4 *Single Drive or Tray Startup*

1. **Request that the system administrator:**
   a. **Restart drive tray within the array**
   b. **Rejoin the drive tray to the Volume Manager**
   c. **Rejoin the node to the cluster.**

8.5.2 *SPARCstorage Model 200 Series*

There are two types of disk trays used with Model 200 Series SSAs, see Figure 8-7. SSA Model 200s with RSM units as the disk trays or SPARCstorage Array Model 210s used in conjunction with 9-GByte differential disk trays. A Model 200 Series chassis contains the disk array controller and interface boards; each RSM contains up to seven disk drives, each 9GB drive tray contains up six drives.

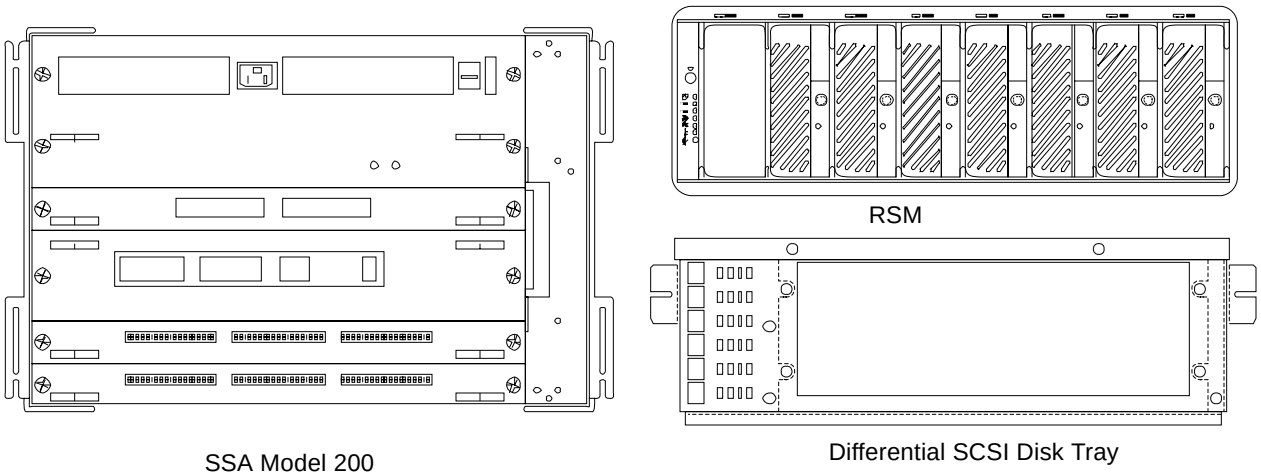


Figure 8-7 SSA Model 200 Series (Controller and Disk Trays)

8.5.2.1 *Complete Array Shutdown*

This procedure details the shutdown of a complete disk array; that is, the SSA Model 200 (controller) as well as the RSM units or 9-Gbyte trays connected to the controller. To shutdown and remove a single drive from an RSM or 9-Gbyte tray, without shutting down the complete array, proceed to Section 8.5.2.3, “Shutdown of a Single Disk Tray”.

Caution – Do not disconnect the power cord from the wall socket or expansion cabinet power distribution outlet if you are planning on working on the SPARCstorage Array. This connection provides a ground path that prevents damage from uncontrolled electrostatic discharge.

1. **Prior to powering down a SPARCstorage Array Model 200, you must first request that the system administrator remove the node from the cluster and then prepare the node for service.**
   The administrator will then perform the necessary software units controlled by the Model 200.

Caution – Do not disconnect the power cord from the facilities outlet when working on the system. This connection provides a ground path that prevents damage from electrostatic discharge.

2. **Once the system administrator has performed all required software tasks, power off each disk tray connected to the SSA Model 200 Series controller:**

   a. **For an RSM; position the Power-on/off switch on the SPARCstorage RSM operator panel to off.**
      See Figure 8-8.

   b. **For a 9-Gbyte disk tray: power off the cabinet PDU providing power to the trays.**

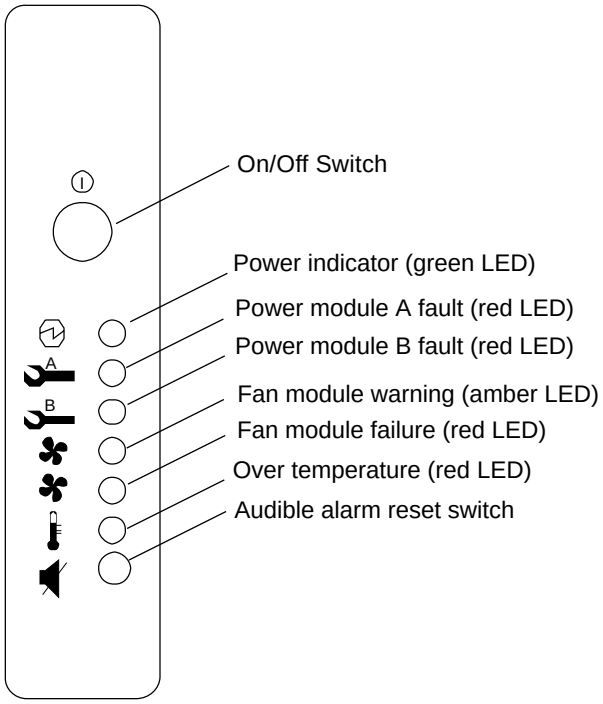


Figure 8-8 SPARCstorage RSM Operator Panel

3. **After all disk trays connected to the SSA have been powered off, turn off the AC power switch on the rear of the SSA chassis.**
   See Figure 8-9.

8.5.2.2 Complete Array Startup

1. **Verify that the power cord from the expansion cabinet socket is connected into the SPARCstorage Array power supply.**
   See Figure 8-9.

2. **Verify that data connections are correct:**

   a. **Complete the fiber-optic cable connections between the SSA Model 200 Series and the host server.**

b. Complete the differential SCSI connections between the SSA Model 200 Series controller and the disk trays.

3. Press the SPARCstorage Array Model 200 Series power supply switch to On.
See Figure 8-9.

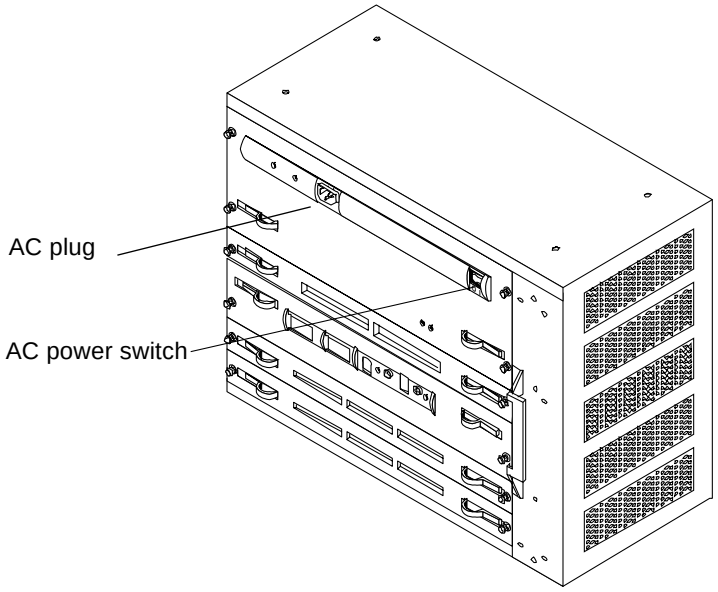


Figure 8-9 SPARCstorage Array Model 200 Series Power Supply Switch

Caution – Never move the system when the power is on. Failure to heed this warning may result in catastrophic disk drive failure. Always power the system off before moving it.

- During the power on selftest (POST), the POST and service icons are displayed on the diagnostic module LCD display. The four alphanumeric LCD characters display the code of the currently running POST test.

  If problems are detected during POST, an error code flashes continuously on the alphanumeric LCDs. For POST error code meanings, see Table 3-1 in Chapter 3.

- After POST is finished, the following will be displayed in this order:
  - The last four digits of the World Wide Name for the particular SPARCstorage Array.
  - One or two fiber icons, which indicate the status of the fiber links.
- During normal operation, you should see the same icons solidly displayed on the front panel display.

4. **Once POST has successfully completed, power on each RSM or 9-Gbyte tray connected to the SSA as applicable:**
   a. **RSM: position the RSM Power on/off switch located on the operator panel to On. See Figure 8-8 on page 8-15.**
   b. **9-Gbyte disk trays: power on the cabinet PDU providing power to the disk trays.**
5. **Request that the system administrator perform the necessary software tasks required to rejoin the disk drives within the array to the Volume Manager, and then rejoin the node to the cluster.**

8.5.2.3 Shutdown of a Single Disk Tray

In some cases it is not necessary to shutdown a complete disk array, that is, the SSA Model 200 controller and any connected disk trays. Instead, a single RSM or 9-Gbyte tray attached to an SSA may be shutdown.

1. **Prior to powering down an RSM or 9-Gbyte tray, you must request that the system administrator remove the node from the cluster and then prepare the node for service.**
   The administrator will then perform the necessary software tasks required by the Volume Manager to halt all I/O processes to the RSM or 9-Gbyte tray that is to be shutdown.
2. **Once the system administrator has performed all necessary software tasks, shutdown the RSM or 9-Gbyte tray as applicable:**
   a. **RSM: position the Power On/Off with on the RSM operator panel to Off.**
   b. **9-Gbyte tray: remove the power cord from the rear of the chassis.**

8.5.2.4 *Startup of a Single Disk Tray*

RSM

1. **Position the Power On/Off switch on the RSM operator panel to On and verify the following:**
   See Figure 8-8 on page 8-15.

- The green power indicator LED on the operator panel lights.
- The green LED directly above each open storage device lights while the drive spins up.
- When a drive has spun up, the LED extinguishes.

2. **Request that the system administrator perform the required software tasks necessary to rejoin the RSM to the Volume Manager, and then rejoin the node to the cluster.**

9-Gbyte Tray

1. **Plug the power cord into the receptacle at the rear of the chassis.**

2. **Once you have powered on the system, the green Ready LEDs on the front of the disk tray will:**

- First flash on and off, then stay off for 0 seconds to approximately 2 minutes (depending on the drive ID).
- Blink while the drive is spinning up.
- Finally, light up for each installed drive.

   See Figure 8-10.

3. **Request that the system administrator perform the required software tasks necessary to rejoin the disk tray to the Volume Manager and then rejoin the node to the cluster.**

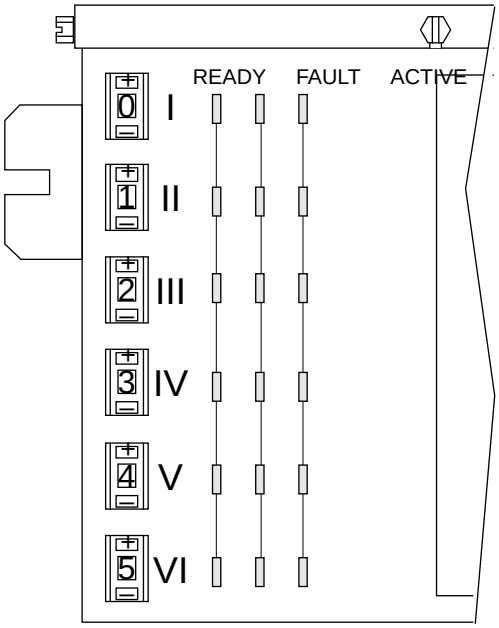


Figure 8-10 LEDs for Differential SCSI Tray

8.6 *Terminal Concentrator*

To power the terminal concentrator on or off, use the power switch on the back panel as depicted in Figure 8-11.

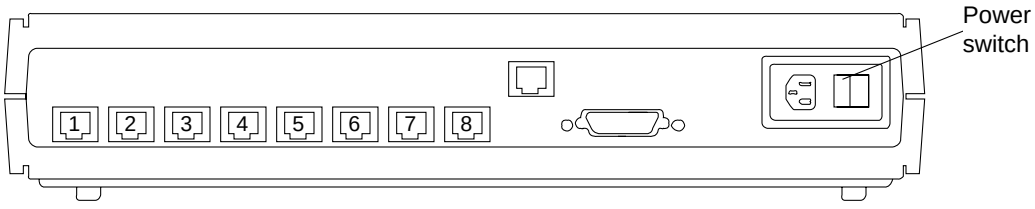


Figure 8-11 Terminal Concentrator (Rear View)

8

Internal Access 9

This chapter contains information about preparing the system for service.

The cabinet server panels in Ultra Enterprise cluster systems are shown in Figure 9-1 through Figure 9-7. The panels consist of the following:

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

9

9.1 Outer Cover Reference Guide

Use Table 9-1 as a guide to determine which panels to remove to access replaceable parts for Ultra Enterprise cluster systems..

Table 9-1 Outer Cover Reference Guide

	CD/Tape Device Door	**Top Bezel**	**Front Hinged Door (3 Vented Panels**	**Rear Screen**	**Left Side Panel**	**Right Side Panel**	**Kick Panel**	**Fan Tray Screen Cover**
SCSI Compartment	X							
Tape Tray or Tape Library		X						
Fan Tray					X			X
Centerplane		X	X	X	X			
Power Distribution Unit					X		X	
External Cables				X			X	
CPU/Memory, I/O or Disk Boards (Front load)			X					
CPU/Memory, I/O or Disk Boards (Rear load)				X				
Differential SCSI Trays			X	X				

9.2 CD-ROM and Tape Device Door

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

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

To close the door, press gently to engage the clasp.

9.3 *Top Front Bezel*

The top front bezel is retained by chassis-mounted ball studs that mate with catches on the panel backside.

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

To remove the bezel:

1. **Grasp the bezel on both sides at the top and pull out far enough to just disengage the ball studs.**
   See Figure 9-1.
2. **Remove the bezel. Set the bezel aside.**

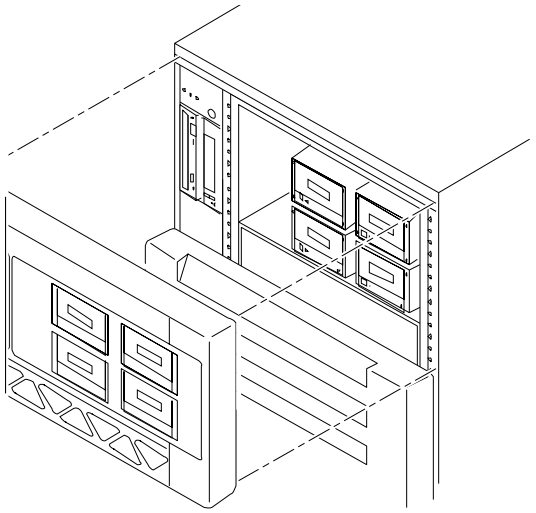


Figure 9-1 Removing the Front Bezel

To replace the bezel:

- **Place the bezel against the chassis with ball studs aligned with the catches on the bezel.**
  Tap or press both sides of the bezel into place.

9.4 Front Panels Hinged Door

To open the hinged door:

1. **Grasp the door handle (purple extruded strip on vent edge) on the right side of the first panel, and firmly pull toward you.**
   See Figure 9-2.

   The door, which consists of three panels, is secured closed by clips and ball-studs at the side opposite of the hinge. The door is released and swings open if pulled firmly.

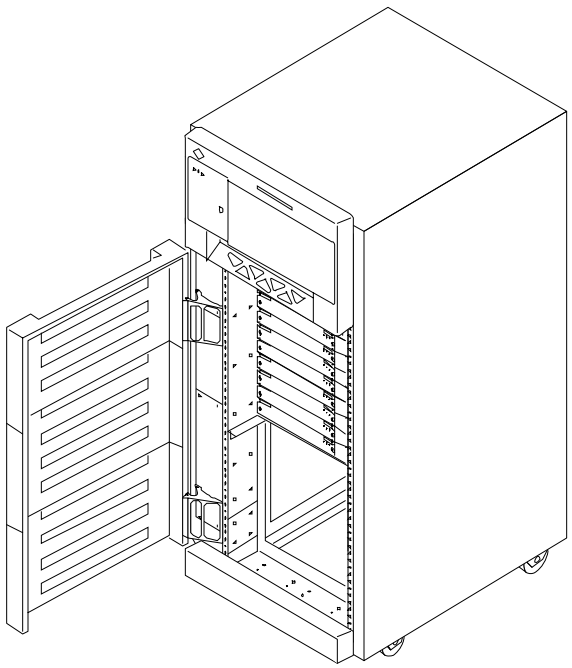


Figure 9-2 Opening the Three-panel Hinged Door

To remove the hinged door:

1. **Remove the top bezel. See Section 9.3, "Top Front Bezel."**
   The top bezel must be removed to provide clearance.

2. **Open the three-panel hinged door wide, past the bracket, and lift it free of the bracket. Set the door aside.**

9.5 *Removing the Rear Screen Panel*

To remove the rear screen panel:

1. **Remove the two #10 Phillips screws securing the panel to the frame.** See Figure 9-3.
2. **Tilt the panel top out and lift it free of the chassis. Set the panel aside.** There is a flange on the bottom of the rear screen.

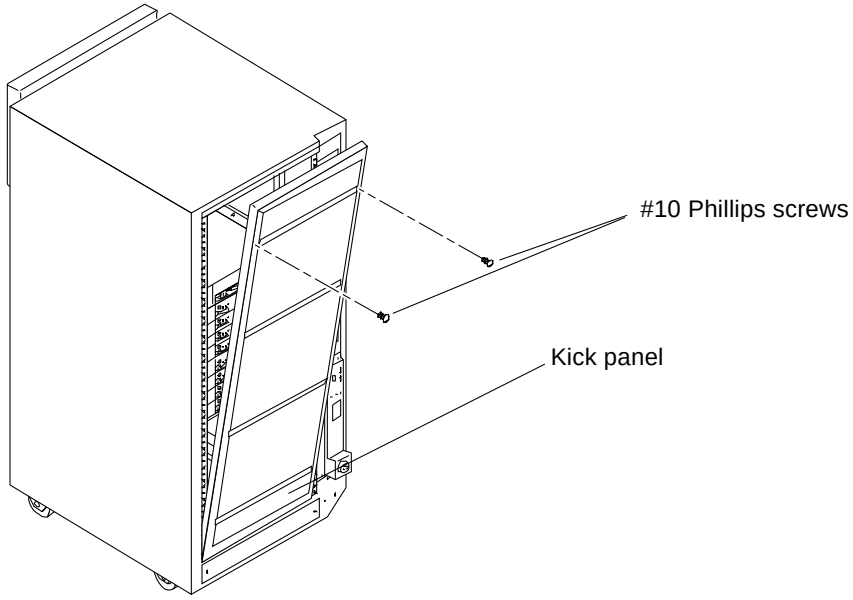


Figure 9-3 Removing the Rear Screen Panel

To replace the rear screen panel:

1. **Insert the panel so the bottom flange engages behind the top of the kick panel.**
2. **Tilt the panel flush against the frame and secure it using Phillips screws.**

9.6 Removing the Side Panels

To remove the left and right side panels:

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

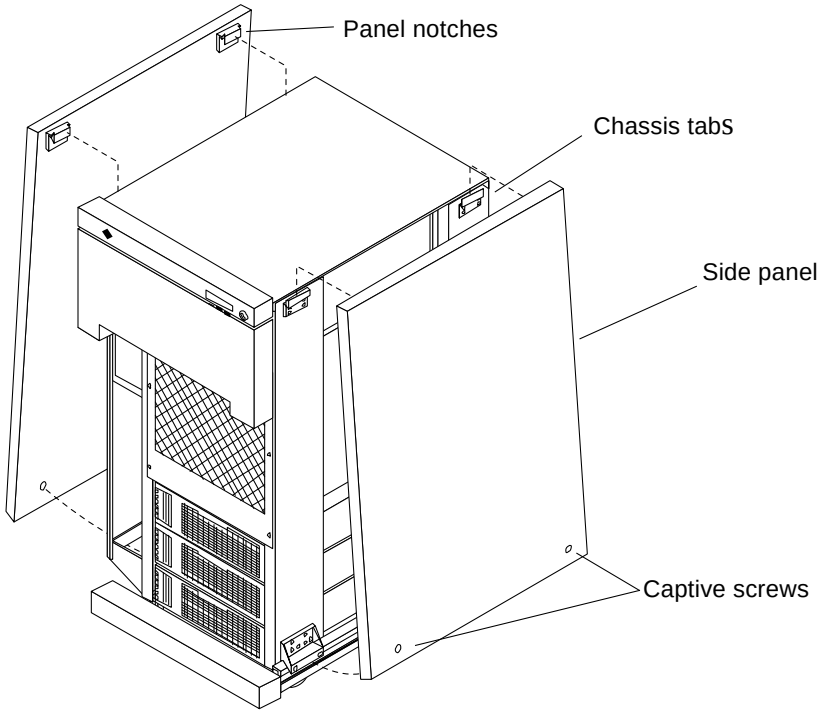


Figure 9-4 Removing the Side Panels

To replace a side panel:

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

9.7 Fan Tray

To remove the screen protecting the fan tray cables:

1. **Loosen the top screw on the left and the three screws on the right.**
   It is not necessary to remove these four screws since the screen has slotted screw holes.
2. **Remove the two bottom screws on the left.**
   Removing these screws will ensure adequate clearance. See Figure 9-5.
3. **Lift the screen up until the slotted screw holes clear the screw heads.**
   Lift out the screen and set it aside.

To replace the fan tray rear screen cover, reverse these instructions.

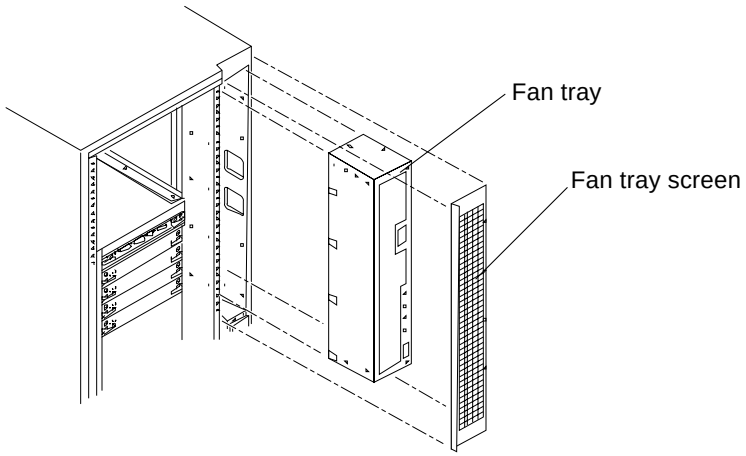


Figure 9-5 Removing the Fan Tray Screen

9.8 Kick Panel

To remove the kick panel:

1. **Loosen the two screws.**
   See Figure 9-6.

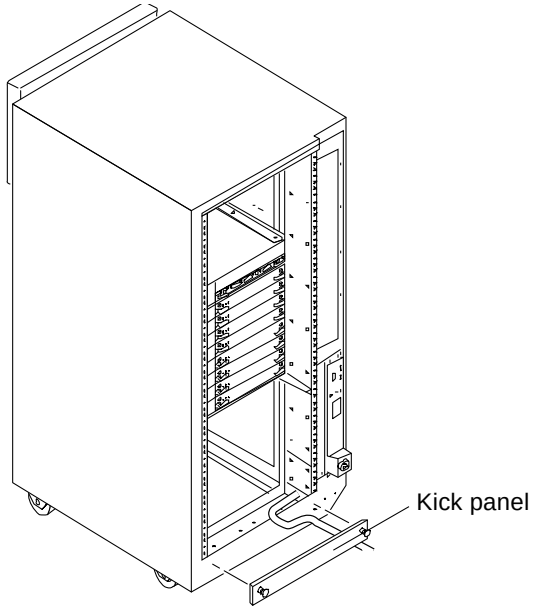


Figure 9-6 Removing the Kick Panel

To replace the kick panel:

1. **Arrange cables (if applicable) neatly behind the kick panel, then fasten the two screws to secure the panel in place.**

9.9 Stabilizer Bar

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

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

1. **Extend the stabilizer bar fully from the bottom of the cabinet.**
   See Figure 9-7.

2. **Screw the two stabilizer bar levelling pads down until they are one eighth to one inch (3 to 6 mm) *above* the floor.**
   Ensure both pads are at equal heights. This clearance allows the stabilizer bar to slide in and out easily, yet catch the cabinet if it should begin to tilt.

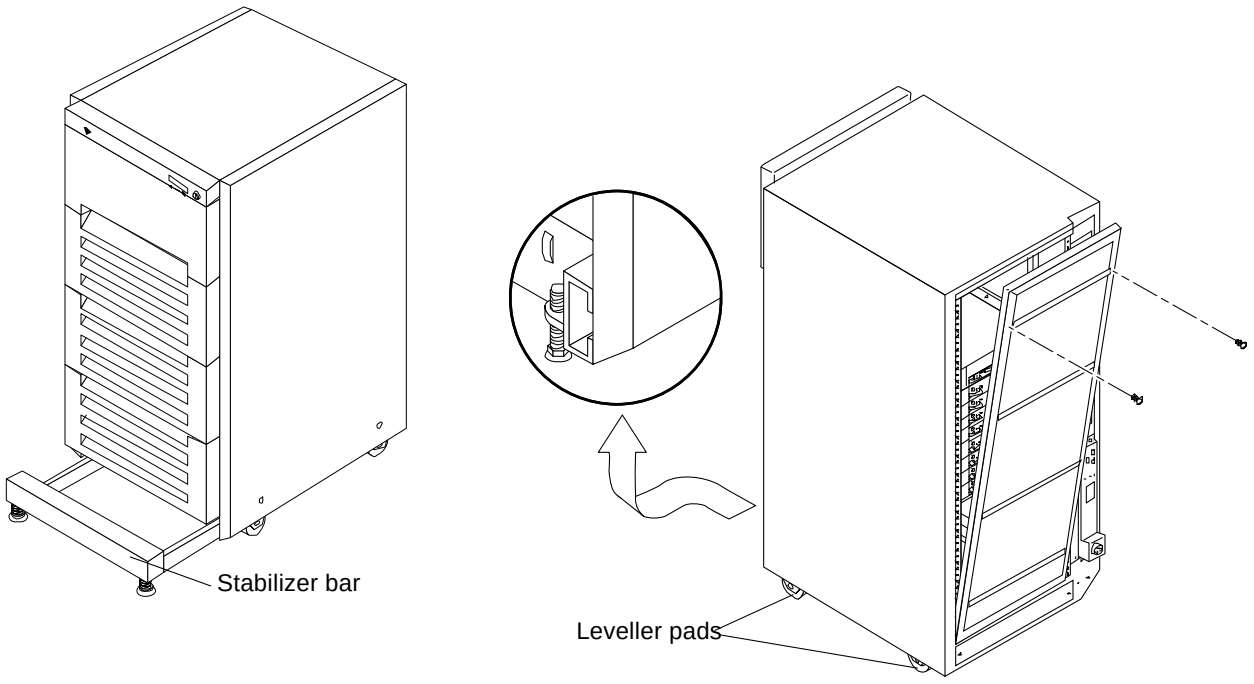


Figure 9-7 Stabilizer Bar and Levelling Pads

9

Major Subassembly Replacement 10

This chapter supplies the information to remove and reinstall the replaceable parts for Enterprise clustered systems.

The following figure depicts the flow for the replacement of typical components of an Enterprise cluster system. Exceptions to this flow are that the replacement procedures for the terminal concentrator and SCI card (PDB clusters only) are covered in this Chapter.

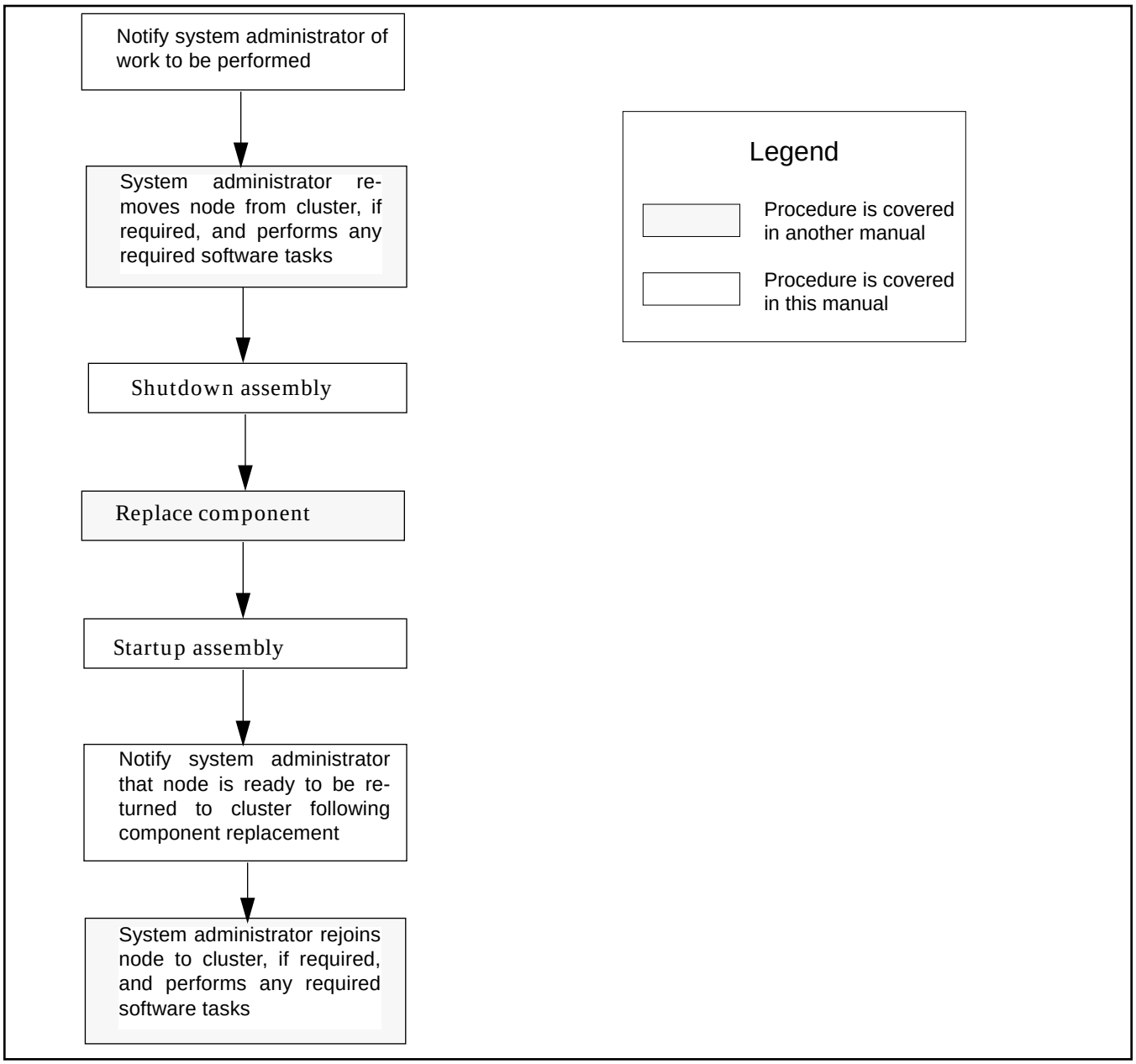


Figure 10-1 Typical Part Replacement Flow

Note that the system administrator must be contacted to remove and rejoin a node from or to the cluster as well as perform any required software tasks. Exceptions to first removing a node from the cluster are when repairing the terminal concentrator, elements of the private interconnect, and certain disk drives which are hot-pluggable.

Note – When replacing parts in an Enterprise cluster system, you will be directed to minimize powering off system components. Do not use the shutdown procedures *in the documentation referenced* in the following procedures; *instead* use the power procedures described in Chapter 8 as directed in the following sections.

10.1 Hot-Plug Feature

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.

At the present time, Enterprise clustered system hardware supports a hot-plug feature which is the ability to remove and reinsert certain components into a powered-up system, despite being “live” or being supplied with electrical power. Check with your local service provider for software support of this feature.

10.2 CPU/Memory, I/O, Disk, and Clock Boards

Note – Since these hardware components of an Enterprise clustered system can be hot-pluggable (see previous section), it may not be necessary to power off any component except for the board that has a defective part. Check with your local service provider for software support of this feature.

1. **Request that the system administrator remove the applicable node from the cluster (if required) and indicate the board that is to be repaired or replaced.**

2. **Once the system administrator has removed the node from the cluster, then the defective part can be removed and repaired or replaced as indicated in the applicable service manual that came with your host system.**

10.3 Peripheral Power Supply and Power/Cooling Module

Note – Since these hardware components of an Enterprise system can be hot-pluggable (see Section 10.1, “Hot-Plug Feature), it may not be necessary to power off any component except for the power supply or power/cooling module that has a defective part. Check with your local service provider for software support of this feature

1. **Request that the system administrator remove the applicable node from the cluster (if required) and indicate the power supply or power/cooling module that is to be repaired or replaced.**
2. **Once the system administrator has removed the node from the cluster, then the defective part can be removed and repaired or replaced as indicated in the systems manual that came with your host system.**

10.4 SPARCstorage Arrays

Two series of disk arrays are used in Enterprise clustered systems, SPARCstorage Array Model 100 and Model 200 Series. The SSA Model 100 Series arrays are mounted in the system cabinets, while the SSA Model 200 Series are used in the expansion cabinets.

SPARCstorage Arrays, their controllers, or the attached trays and disk drives must not be shut down randomly. The following procedures indicate points where the system administrator must be contacted to stop tray or drive activity prior to shutting down components of a SPARCstorage Array.

10.4.1 SSA Model 100 Series

The SPARCstorage Array Model 100 series has the controller and disk drives mounted within a single chassis. The drives are mounted in trays, three trays per chassis, ten drives to each tray.

10.4.1.1 Disk Drives

For Model 100 series SSAs, to replace a single drive in a tray it is not necessary to power down the complete SSA; *instead, you can power off* a single tray as follows:

1. **Contact the system administrator and request that the necessary software tasks applicable to replacing a drive in a Model 100 series tray be performed.**
2. **Replace the drive as described in Chapter 5 of the *SPARCstorage Array Model 100 Series Service Manual*.**
3. **Notify the system administrator that the drive is ready for use.**

10.4.1.2 Trays and Major Subassemblies

1. **Shut disk tray down as described in Chapter 8, "Shutdown and Restart Procedures."**
2. **Replace defective component as described in Chapter 5 of the *SPARCstorage Array Model 100 Series Service Manual.***
   The above document provides procedures for the removal and replacement of the following:

- Fan tray
- Power supply
- Array controller
  - Fibre Channel Optical Module (FC/OM)
  - Battery module
- Backplane
- Fibre optic cables
- Disk drive trays (3)

3. **Bring disk tray up as described in Chapter 8, "Shutdown and Restart Procedures."**

10.4.2 SSA Model 200 Series

The SPARCstorage Array Model 200 Series has the controller and interface boards mounted in a chassis while the disk drives are mounted separately within fast/wide differential SCSI trays, either SPARCstorage RSM units or 9-Gbyte disk trays.

10.4.2.1 SSA Controller Chassis

1. **Shutdown the SSA as described in Chapter 8, "Shutdown and Restart Procedures."**
2. **Replace the defective component as described in Chapter 5 of the *SPARCstorage Array Model 200 Series Service Manual*.**
   The above manual manual provides procedures for the removal and replacement of the following:

- Fan tray
- Power supply
- LCD-display diagnostic module
- Differential SCSI interface modules (2)
- Array controller
  - Fibre Channel Optical Module (FC/OM)
  - Battery module
- Backplane
- Fiber-optic cables

3. **Following replacement of a defective component, start up the SSA as described in Chapter 8, "Shutdown and Restart Procedures."**

10.4.2.2 SPARCstorage RSM Units

Disk Drives

SPARCstorage RSMs have a hot-pluggable featurethat enables removal and replacement of individual disks without removing a node from the cluster. To replace a disk drive:

1. **Contact the system administrator and request that the necessary software tasks applicable to replacement of an RSM disk be performed.**

2. **Once the disk is prepared, replace the disk as described in Chapter 3 of the *SPARCstorage RSM Installation, Operations and Service Manual*.**

3. **Verify the SCSI target address as described in Appendix C, "SCSI Targeting", and then notify the system administrator that the disk is ready for use.**

Subassemblies

1. **To replace components other than a disk drive, shutdown the RSM as described in Chapter 8, "Shutdown and Restart Procedures."**

2. **Replace defective component as described in Chapter 3 of the *SPARCstorage RSM Installation, Operations and Service Manual*.**
   This manual provides procedures for the removal and replacement of the following:

- Redundant cooling module
- Power supply
- I/O board

3. **If the component replaced was a disk, verify the SCSI target address as described in Appendix C, "SCSI Targeting."**

4. **Following replacement of a defective component, startup the RSM as described in Chapter 8, "Shutdown and Restart Procedures."**

10.4.2.3 Differential SCSI Trays

1. **Shut down the tray as described in Chapter 8, "Shutdown and Restart Procedures."**

2. **Refer to the *Differential SCSI Disk Drive Service Manual* and perform as directed to replace a defective component.**
   The above manual provides for the following:

Chapter 1:

- Removal of any required cabinet panels
- Preparing the tray for servicing

Chapter 2, replacement of:

- Power supply
- DC harness cable

- Fan tray
- LED/address board
- LED/address cable
- Device select switch
- SCSI data cable
- Disk drives

3. **If the component replaced was a disk, verify the SCSI target address as described in Appendix C, Section C.3.2, "Differential SCSI Disk Tray Target IDs."**

4. **Following replacement of a defective component, start up the disk tray as described in Chapter 8, "Shutdown and Restart Procedures."**

10.5 Boot Disks (HA Clusters Only)

The boot disks for each node of an Enterprise HA cluster are contained on diskboards. The boards are located in slot 7 and 15 for the Enterprise 5000 and 6000 systems, respectively. To replace a boot disk drive, see to Section 10.2, "CPU/Memory, I/O, Disk, and Clock Boards," on page 10-3" and perform as directed.

10.6 Terminal Concentrator

1. **The terminal concentrator is located on a hinged bracket that is secured to the rear of the cabinet chassis by two screws on the left side.**
   To gain access, remove the two securing screws and then swing the bracket out and to the right as shown in Figure 10-2.

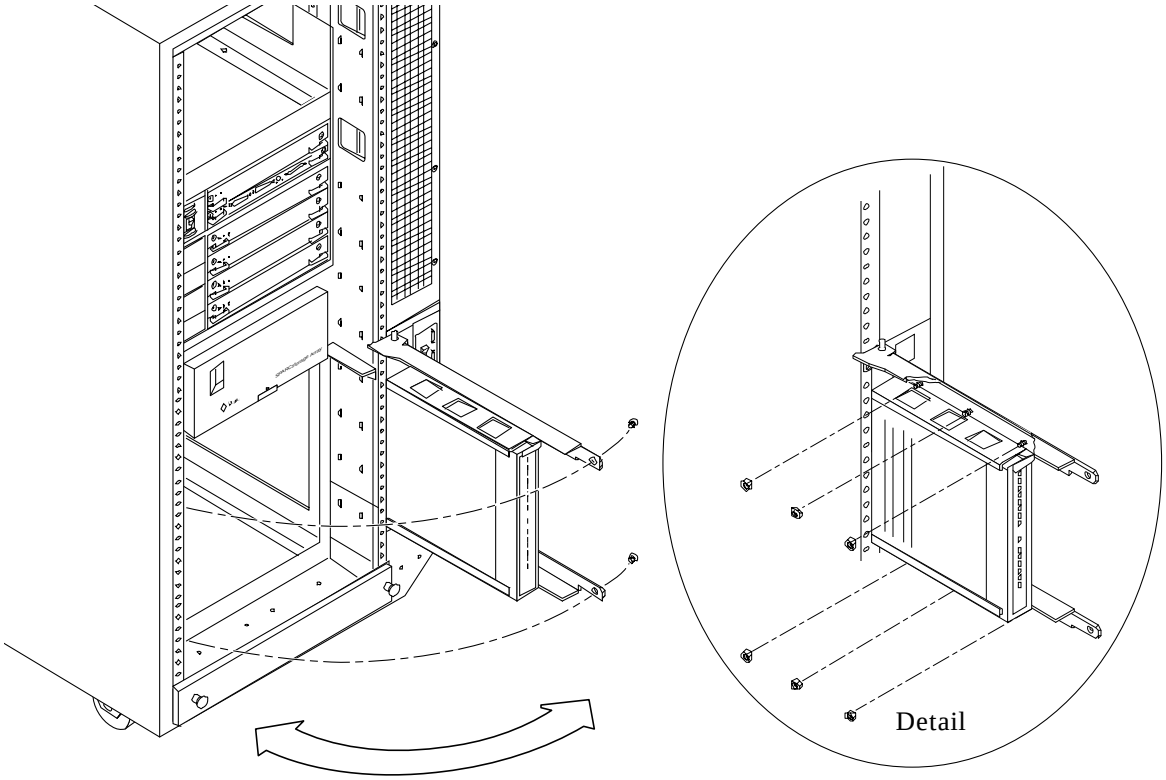


Figure 10-2 Terminal Concentrator Removal/Replacement

2. **Power the terminal concentrator off by using the power switch located on the back panel.**
   See Figure 10-3.

3. **Remove power and serial cables from the terminal concentrator.**
   See Figure 10-3.

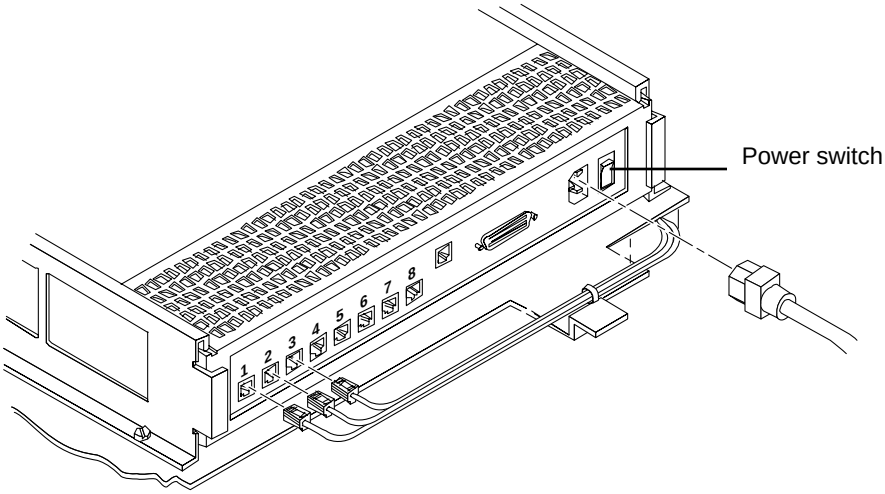


Figure 10-3 Removing/Replacing Terminal Concentrator Cabling

4. **Remove three nuts from each of the terminal concentrator side brackets as shown in the Figure 10-2, Detail, and then remove the terminal concentrator from the cabinet mounting bracket.**

5. **Remove the terminal concentrator, and put it to one side.**

To replace the terminal concentrator, reverse the preceding instructions.

10.7 SCI Cards and Cables (PDB Clusters Only)

There are at least two SCI cards per node in an Enterprise PDB cluster system, one each on separate I/O boards for redundancy. The SCI cards are located in SBus slot 0 of system I/O boards1 and 3. To remove a card or a cable, proceed as follows:

Note – Since the SCI cables are quite stiff, proper strain relief is provided by a cable restraining bracket, which prevents loosening or straining the cable.

---

1. **Request that the system administrator remove the applicable node from the cluster (if required) and indicate the board that is to be repaired or replaced.**

2. **Once the system administrator has placed the defective board in the low power mode, then loosen the thumb screws at either end of the SCI cable restraining bracket.**
   Once the thumb screws are loosened, the bracket can be repositioned slightly to assist in removing a SCI cable, from the bracket or from an SCI card. See Figure 10-4.

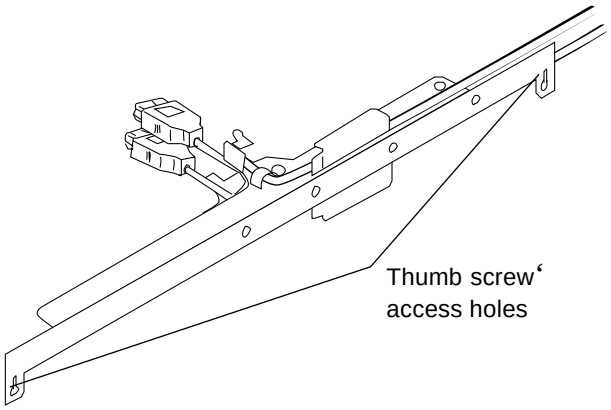


Figure 10-4 SCI Cable Restraining Bracket

3. **Remove the applicable SCI cable(s) from the I/O board connector(s) and then perform as follows:**

- To remove an SCI card, perform as directed in Section 10.2, "CPU/Memory, I/O, Disk, and Clock Boards" to remove the corresponding I/O board.
- To remove a cable only, perform steps 1 and 2 on the second host to remove the opposite end of the cable, and then free the cable from the clamps on the brackets.

4. **Once the defective SCI card or cable is removed, perform as directed:**

- For an SCI card, perform as directed in Section 9.2, to replace the SCI card onto the I/O board and then replace the I/O board as indicated in the systems manual that came with your host system.
- For a cable, replace both ends of the cable to the cable restraining bracket using the clamps provided.

5. **Replace the SCI cables to the I/O board connectors.**
   Finish by tightening the thumb screws on the SCI cable mounting bracket.

10.8 Tape/CD-ROM

Refer to the systems manual that came with your host system for details on removing and replacing the CD-ROM or tape drives.

10.9 Cabling

Refer to the applicable Chapter*of the Ultra Enterprise Cluster Hardware Site Preparation, Planning and Installation Guide* for details on removing and replacing cabling for the terminal concentrator, the private interconnect and the SPARCstorage Array optical connections:

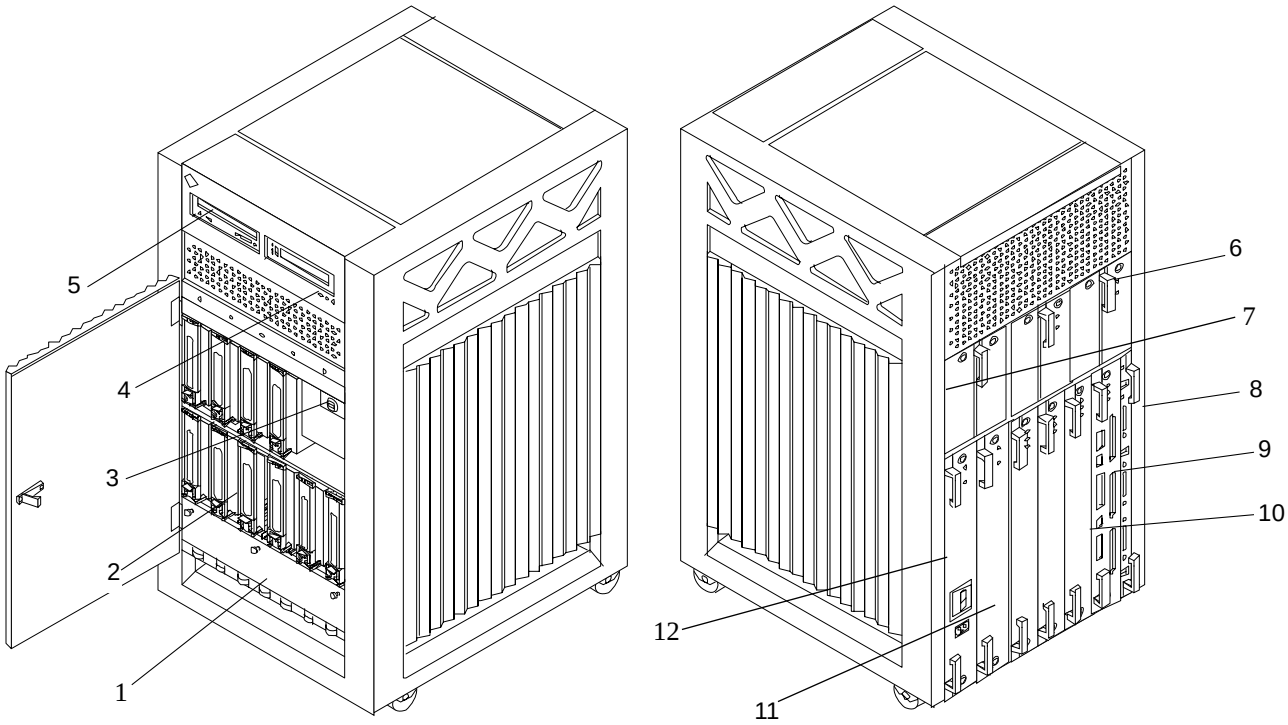
- Chapter 8 for Enterprise 3000 based systems
- Chapter 9 for Enterprise 4000 based systems
- Chapter 10 for Enterprise 5000 based systems
- Chapter 11 for Enterprise 6000 based systems

Illustrated Parts Breakdown 11

The tables and illustrations on the following pages augment the removal and replacement procedures presented in Chapter 10. These figures and tables depict the main hardware components for Enterprise clustered systems based on Ultra Enterprise 3000s, 4000s, 5000s or 6000s.

The tables also provide either a part number, for cluster specific parts, or, for non-specific cluster parts, an exploded view reference where the part number may be found. For procedures and part numbers for replaceable parts within a component listed in the tables, refer to the referenced system or service manual. For example, to find procedures on replaceable parts on a clock board, refer to the systems manual for the host for your system. To find procedures on replaceable parts within a SPARCstorage Array, refer to the applicable service manual.

11



Front view **Rear view**

Figure 11-1 System Based on Enterprise 3000s

Table 11-1 Enterprise 3000 Replaceable Parts List

Key	Description	Part Number or Exploded View Reference
1	Fan tray assembly	Appendix F of the *Ultra Enterprise 3000 System Manual*
2	Disk drive	Appendix F of the *Ultra Enterprise 3000 System Manual*
3	Key switch lock cable	Appendix F of the *Ultra Enterprise 3000 System Manual*
4	LED board	Appendix F of the *Ultra Enterprise 3000 System Manual*
5	Sun CD 4	Appendix F of the *Ultra Enterprise 3000 System Manual*
6	PCM	Appendix F of the *Ultra Enterprise 3000 System Manual*

Table 11-1 Enterprise 3000 Replaceable Parts List *(Continued)*

Key	Description	Part Number or Exploded View Reference
7	Auxiliary fan tray	Appendix F of the *Ultra Enterprise 3000 System Manual*
8	Clock board	Appendix F of the *Ultra Enterprise 3000 System Manual*
9	SBus I/O board	Appendix F of the *Ultra Enterprise 3000 System Manual*
10	Power supply, peripheral/AC input	Appendix F of the *Ultra Enterprise 3000 System Manual*
11	Power supply, peripheral	Appendix F of the *Ultra Enterprise 3000 System Manual*
not shown	Terminal concentrator	370-1434
not shown	Terminal concentrator cabling	Refer to Chapter 8 of the *Ultra Enterprise Cluster Hardware Site Preparation, Planning, and Installation Guide* for cable detail
not shown	(short cable, to workstation)	530-2151
not shown	(long cable, to nodes 1 or 2)	530-2152
not shown	Workstation (SPARCstation 4)	*SPARCstation 4 Service Manual*

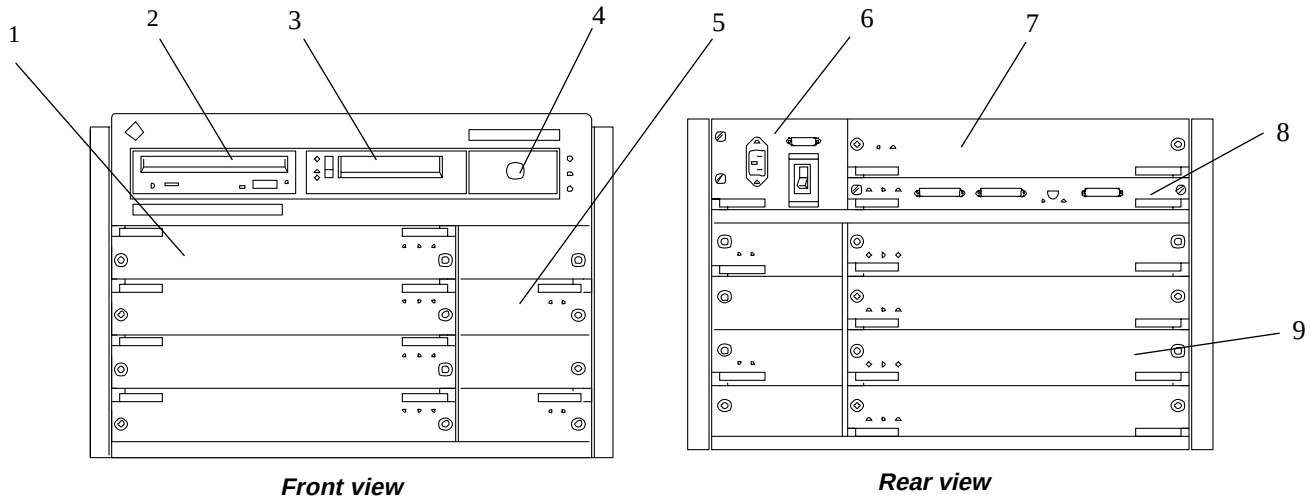


Figure 11-2 System Based on Enterprise 4000

Table 11-2 Enterprise 4000 Replaceable Parts List

Key	Description	Part Number or Exploded View Reference
1	CPU/Memory board	Appendix F of the *Ultra Enterprise 6000/5000/4000Systems Manual*
2	SunCD 4	Appendix F of the *Ultra Enterprise 6000/5000/4000Systems Manual*
3	Tape drive	Appendix F of the *Ultra Enterprise 6000/5000/4000Systems Manual*
4	Key switch tray,	Appendix F of the *Ultra Enterprise 6000/5000/4000Systems Manual*
5	PCM	Appendix F of the *Ultra Enterprise 6000/5000/4000Systems Manual*
6	Fan tray assembly, 100/240V	Appendix F of the *Ultra Enterprise 6000/5000/4000Systems Manual*
7	Power supply, peripheral	Appendix F of the *Ultra Enterprise 6000/5000/4000Systems Manual*
8	Clock board	Appendix F of the *Ultra Enterprise 6000/5000/4000Systems Manual*
9	I/O board	Appendix F of the *Ultra Enterprise 6000/5000/4000Systems Manual*
Not shown	Terminal concentrator	370-1434
Not shown	Terminal concentrator cabling	Refer to Chapter 9 of the *Ultra Enterprise Cluster Hardware Site Preparation, System Planning and Installation Guide* for cable detai.l
Not shown	short cable, to workstation	530-2151
Not shown	long cable, to nodes 0 or 1	530-2152
Not shown	Workstation (SPARCstation 4)	*SPARCstation 4 Service Manual*

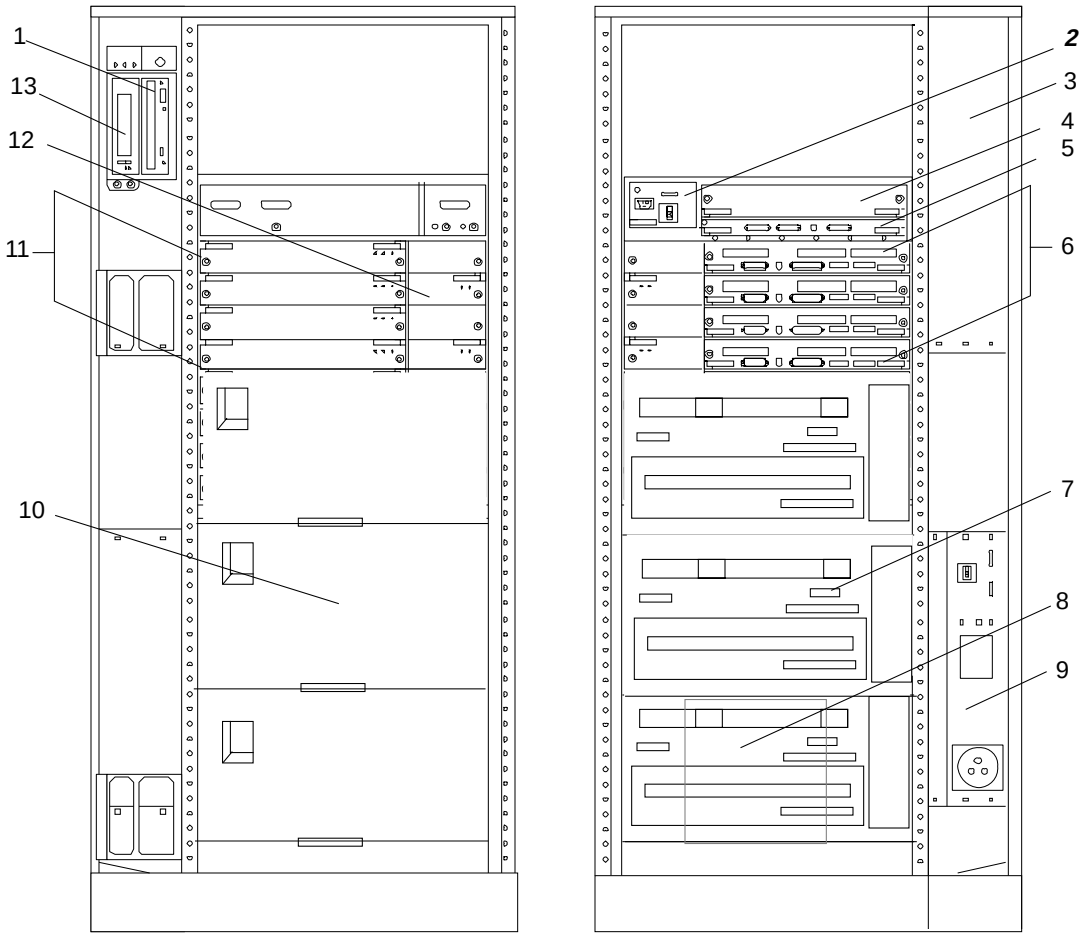


Figure 11-3 System Cabinet Based on Enterprise 5000s with SSA Model 100s

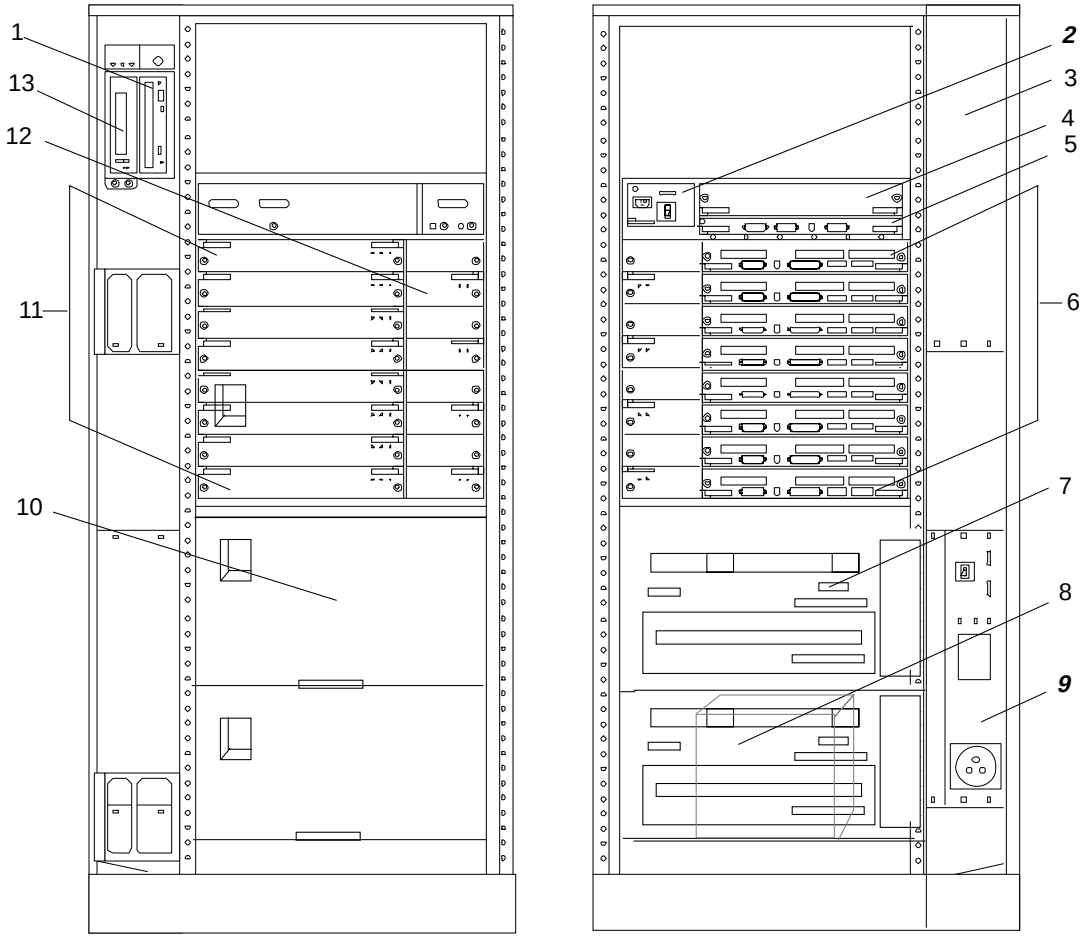


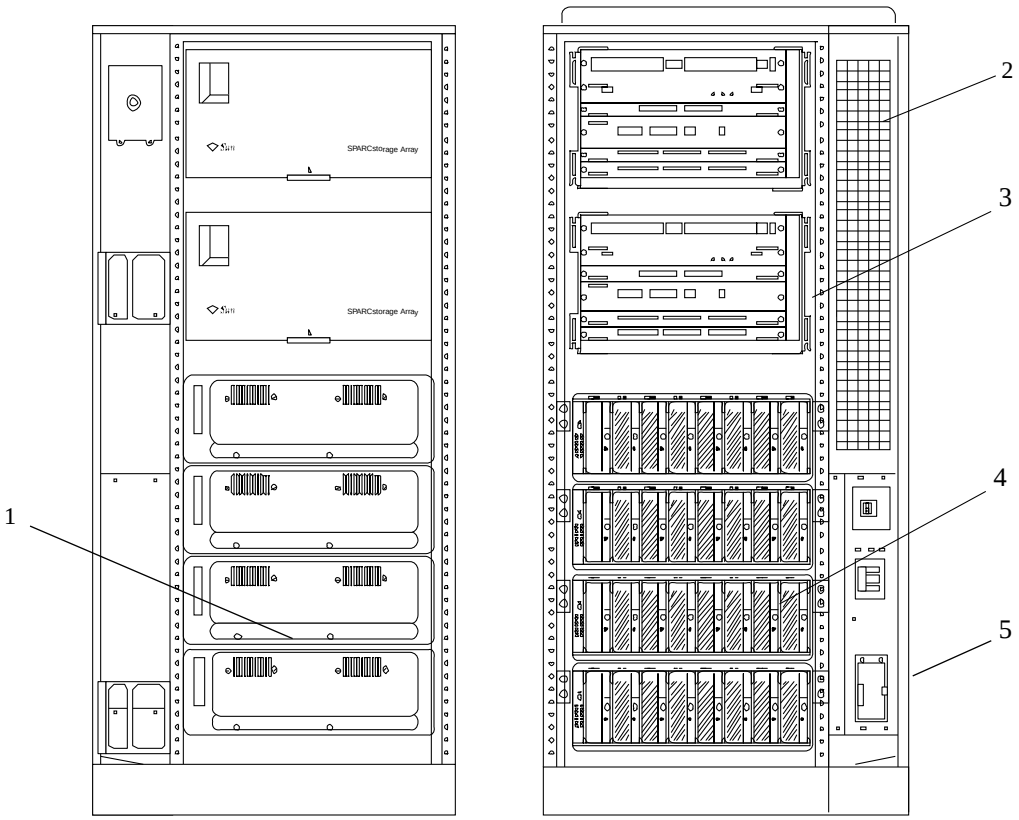
Figure 11-4 System Cabinet Based on Enterprise 6000s with SSA Model 100s

Table 11-3 Enterprise 5000/6000 Replaceable Parts List

Key to Figure 11-3 or Figure 11-4	Description	Part Number or Exploded View Reference
1	CD-ROM	Appendix F of the *Ultra Enterprise 6000/5000/4000 Systems Manual*
2	Fan assembly, 200/240V	Appendix E of the *Ultra Enterprise 6000/5000/4000 Systems Manual*
3	Fan assembly, cabinet	Appendix E of the *Ultra Enterprise 6000/5000/4000 Systems Manual*
4	Peripheral power supply	Appendix F of the *Ultra Enterprise 6000/5000/4000 Systems Manual*
5	Clock board	Appendix F of the *Ultra Enterprise 6000/5000/4000 Systems Manual*
6, 11	CPU/Memory, I/O, or Disk boards	Appendix F of the *Ultra Enterprise 6000/5000/4000 Systems Manual*
7, 10	SPARCstorage array	*SPARCstorage Array Model 100 Series Service Manual*
8	Terminal concentrator	370-1434
Not shown	Terminal concentrator cabling	Refer to Chapter 10 (Enterprise 5000) or Chapter 11 (Enterprise 6000) of the *Ultra Enterprise Cluster Hardware Site Preparation, Planning, and Installation Guide* for cable detail
Not shown	short, to workstation	530-2151
Not shown	long, to nodes 0 or 1	530-2152
9	AC distribution unit	Appendix E of the *Ultra Enterprise 6000/5000/4000 Systems Manual*
12	Power cooling module	Appendix F of the *Ultra Enterprise 6000/5000/4000 Systems Manual*
Not depicted	SunSwift SBus Adapter card	*501-2739*
13	Tape drive	Appendix F of the *Ultra Enterprise 6000/5000/4000 Systems Manual*
Not depicted	SCI card (PDB clusters only)	370-2345

Table 11-3 Enterprise 5000/6000 Replaceable Parts List *(Continued)*

Key to Figure 11-3 or Figure 11-4	Description	Part Number or Exploded View Reference
Not shown	SCI cables (PDB clusters only):	Refer to Chapter 10 (Enterprise 5000) or Chapter 11 (Enterprise 6000) of the *Ultra Enterprise Cluster Hardware Site Preparation, Planning, and Installation Guide* for cable detail.
	2 meter	530-2309
	5 meter	530--2310
	10 meter	530-2311
Not shown	SCI cable bracket	540-2945
Not shown	Fiber-optic cables:	Refer to Chapter 10 (Enterprise 5000) or Chapter 11 (Enterprise 6000) of the *Ultra Enterprise Cluster Hardware Site Preparation, Planning, and Installation Guide* for cable detail.
	15m	537-1006
	2m	537-1004
Not shown	Workstation (SPARCstation 4)	*SPARCstation 4 Service Manual*



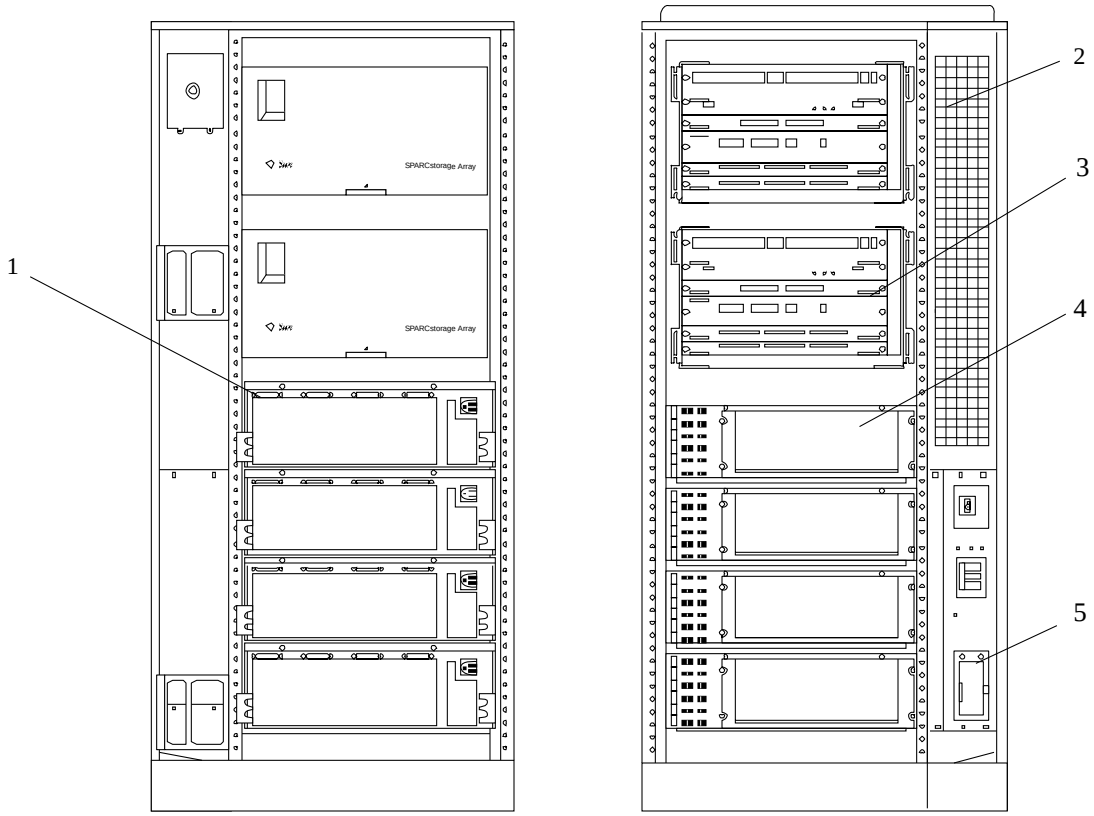
Expansion Cabinet (front view)

Expansion Cabinet 2 (rear view)

Figure 11-5 Enterprise System Expansion Cabinet with SSA Model 200 Series / SPARCstorage RSMs

Table 11-4 Expansion Cabinet Based on SSA Model 200 Series

Key to Figure 11-3	Description	Part Number or Exploded View Reference
1	Disk drive	*SPARCstorage RSM Installlation, Operations, and Service Manual*
2	Fan tray assembly, cabinet	Appendix E of the *Ultra Enterprise 6000/5000/4000 Systems Manual*
3	SSA Model 200	*SPARCstorage Array Model 200 Series Service Manual*
4	SPARCstorage RSM	*SPARCstorage RSM Installation, Operations, and Service Manual*
5	AC distribution unit	Appendix E of the *Ultra Enterprise 6000/5000/4000 Systems Manual*



Expansion Cabinet (front view) Expansion Cabinet (rear view)

Figure 11-6 Enterprise System Expansion Cabinet with SSA Model 200 Series / Differential SCSI Trays

Table 11-5 Expansion Cabinet Based on SSA Model 200 Series

Key (Figure 11-4)	Description	Part Number or Exploded View Reference
1	Disk drive	540-2646 (9-GByte differential wide)
2	Fan tray assembly, cabinet	Appendix E of the *Ultra Enterprise 6000/5000/4000 Systems Manual*
3	SSA Model 200	*SPARCstorage Array Model 200 Series Service Manual*
4	Differential SCSI tray	*Differential SCSI Tray Service Manual*
5	AC distribution unit	Appendix E of the *Ultra Enterprise 6000/5000/4000 Systems Manual*

Product Specifications A

Refer to the *Ultra Enterprise Cluster Hardware Site Preparation, Planning, and Installation Guide.*

A

Connector Pinouts and Cabling B

B.1 SPARCstorage Array Fibre Optic Cables

Refer to the applicable Chapter (Chapter 8 for the 3000, Chapter 9 for the 4000, Chapter 10 for the 5000, or Chapter 11 for the 6000) of the *Ultra Enterprise Cluster Hardware Site Preparation, Planning and Installation Guide* for information on connecting SPARCstorage Arrays to a node using the fiber-optic cables.

B.2 Terminal Concentrator Ports

Refer to the applicable Chapter (Chapter 8 for the 3000, Chapter 9 for the 4000, Chapter 10 for the 5000, or Chapter 11 for the 6000) of the *Ultra Enterprise Cluster Hardware Site Preparation, Planning and Installation Guide* to connect serial port 1 on the terminal concentrator to the system console and the serial ports on your system nodes.

B.2.1 RJ-45 Serial Port Connectors

Port 1 of the terminal concentrator is designated as the console port. Ports 2 and 3 are designated for nodes 0 and 1, respectively. The connector configuration is shown in Figure B-1 and the pin allocations are given in Table B-1.

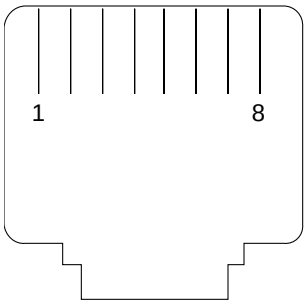


Figure B-1 Serial Port RJ-45 Receptacle

Table B-1 Serial Port Connector Pinout

Pin Number	Signals ports 1-6 (partial modem)	Signals ports 7, 8 (full modem)
1	No connection	RTS
2	DTR	DTR
3	TXD	TXD
4	No connection	CD
5	RXD	RXD
6	GND	GND
7	No connection	DSR
8	CTS	CTS

B.2.2 Public Ethernet Connector

The primary public Ethernet network connects to the 10BASE5 Ethernet transceiver port on the terminal concentrator. The 10BASE5 port is shown in Figure B-2 and the pin allocations are given in Table B-2.

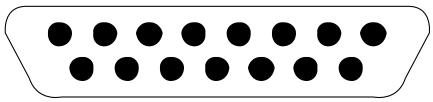


Figure B-2 15-pin 10BASE5 Ethernet Receptacle

Table B-2 10BASE5 Connector Pinout

Pin Number	Signal
1	Chassis ground
2	Collision +
3	Transmit +
4	No connection
5	Receive +
6	Ground (for transceiver power)
7-8	No connection
9	Collision -
10	Transmit -
11	No connection
12	Receive -
13	+ 12 volts (for transceiver power)
14-15	No connection

B.3 Private Network Cables

Both nodes in an Ultra Enterprise cluster system are connected in a private network. PDB clusters use SCI for the private network, HA clusters use SunSwift or SunFast Ethernet™. A maximum cable length of 10 meters is supported. Other cable lengths available are 2 and 5 meters.

Since SCI cables are quite stiff, proper strain relief is provided by a cable restraining bracket, which prevents loosening or straining the cable. See Section 10.7, “SCI Cards and Cables (PDB Clusters Only)” to remove a cable from the cable restraining bracket. Refer to the applicable Chapter (Chapter 8 for the 3000, Chapter 9 for the 4000, Chapter 10 for the 5000, or Chapter 11 for the 6000) of the *Ultra Enterprise Cluster Hardware Site Preparation, Planning, and Installation Guide* to route the SCI cables for your system.

SCSI Targeting

C

C.1 Internal SCSI Tray Target IDs

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

Table C-1 SCSI ID Numbers

Device	ID
CD-ROM	6
Tape drive	5

C.2 SPARCstorage Array Model 100 Series

All disk drive addresses are hardwired in the SPARCstorage Array Model 100 Series. The position of the disk drive in the drive tray automatically sets the SCSI address. See Figure C-1, and substitute the values shown for the address string `ctds` where: c = scsi channel; t = tray; d = disk; s =slice.

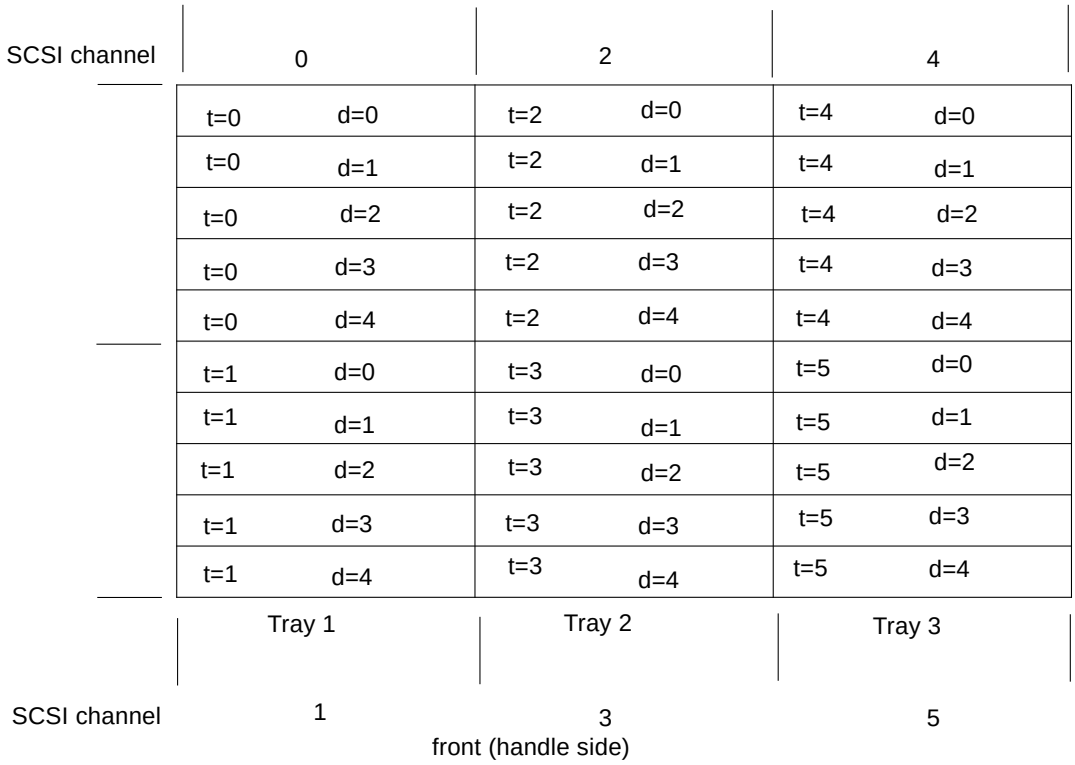


Figure C-1 Model 100 Series SCSI Addresses

C.3 SPARCstorage Array Model 200 Series

C.3.1 RSM SCSI Target IDs

The SCSI target address IDs for an RSM unit are fixed and sequential. See Figure C-2.

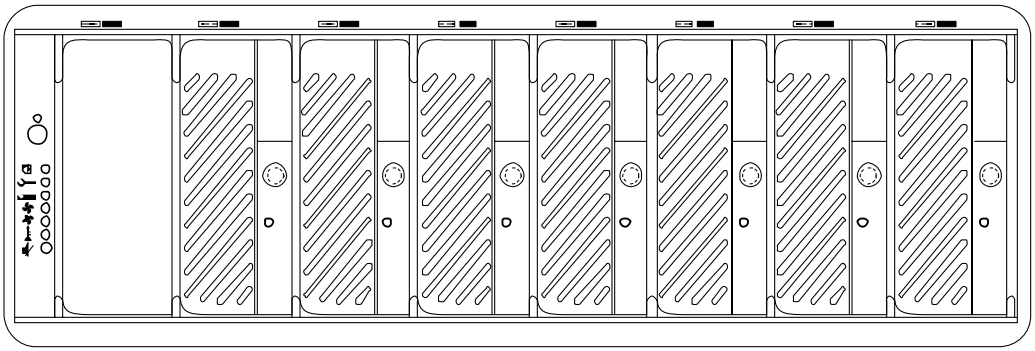


Figure C-2 SPARCstorage RSM Front View with Target Address IDs

C.3.2 Differential SCSI Disk Tray Target IDs

The target IDs for a differential SCSI tray are designated as shown in Figure C-3 and Table C-2.

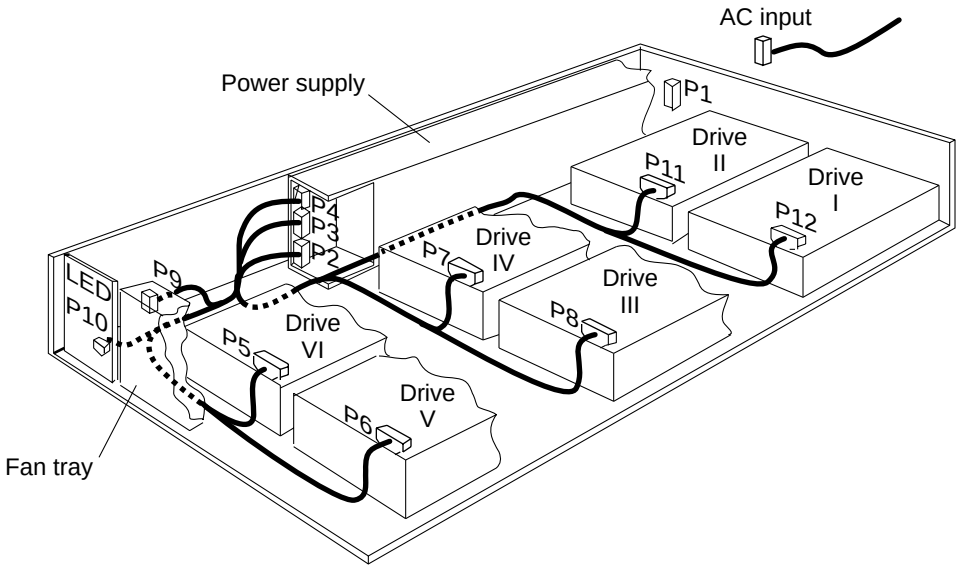


Figure C-3 Differential SCSI Tray Drive Locations

Table C-2 Differential SCSI Tray Target IDs

Tray 1		**Tray 2 (for 5.25" fast/wide differential SCSI Drives with DWIS/S Card Only)**	
Drive Location	**SCSI Address**	**Drive Location**	**SCSI Address**
I	0	I	8
II	1	II	9
III	2	III	10
IV	3	IV	11
V	4	V	12
VI	5	VI	13

C.4 SCSI Cable Length

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.

When calculating the total length of a string, remember to include any cable that is internal to a device housing.

The SCSI cable for the tape and CD-ROM tray is not intended for use with additional external devices.

C

SPARCstorage Array Firmware and Device Driver Error Messages

D

D.1 Message Formats

Error indications from the SPARCstorage Array drivers (pln and soc) are always sent to syslog (`/var/adm/messages`). Additionally, depending on the type of event that generated the message, it may be sent to the console. These messages are limited to significant events like cable disconnections. Messages sent to the console are in the form:

```
[WARNING:]  instance:  <message>
```

The syslog messages may contain additional text. This message ID identifies the message, its producer, and its severity:

```
ID[SUNWssa.soc.messageid.####] instance: <message>
```

Some examples:

```
soc3: Transport error:  Fibre Channel Online Timeout
ID[SUNWssa.soc.link.6010] soc1: port: 0 Fibre Channel is ONLINE
```

In the *PDB Cluster Error Messages Manual* messages are presented with the message ID and the message text, even though the message ID is not displayed on the console. The character # implies a numeric quantity and `...` implies a string of characters or numbers. The prefix `ID[SUNWssa]` is implied and is not shown.

```
soc.link.6010     soc#: port: # Fibre Channel is ONLINE
```

Note that most disk drive and media-related errors will result in messages from the ssd drivers. See the manual pages for `sd(7), pln (7),` and `soc(7)` for information on these messages.

?? Error indications from the SPARCstorage Multipack drivers (pln and soc) are always sent to syslog (`/var/adm/messages`). ???

D.2 System Configuration Errors

This class of errors may occur because of insufficient system resources (for example, not enough memory to complete installation of the driver), or because of hardware restrictions of the machine into which the SPARCstorage Array host adapter is installed.

This class of errors may also occur when your host system encounters a hardware error on the host system board, such as a failed SIMM.

D.2.1 soc Driver

```
soc.attach.4004 soc#: attach failed: bad soft state
soc.attach.4010 soc#: attach failed: unable to map eeprom
soc.attach.4020 soc#: attach failed: unable to map XRAM
soc.attach.4030 soc#: attach failed: unable to map registers
soc.attach.4040 soc#: attach failed: unable to access status register
soc.attach.4050 soc#: attach failed: unable to access hostadapter XRAM
soc.attach.4060 soc#: attach failed: unable to install interrupt handl
soc.attach.4003 soc#: attach failed: alloc soft state
soc.attach.4070 soc#: attach failed: offline packet structure allocat
```

These messages indicate that the initialization of the soc driver was unable to complete due to insufficient system virtual address mapping resources or kernel memory space for some of its internal structures. The host adapter(s) associated with these messages will not be functional.

```
soc.driver.4020   soc#: alloc of request queue failed
soc.driver.4040   soc#: DVMA request queue alloc failed
soc.driver.4050   soc#: alloc of response queue failed
soc.driver.4060   soc#: DVMA response queue alloc failed
soc.driver.4070   soc#: alloc failed
soc.driver.4090   soc#: alloc failed
soc.driver.4100   soc#: DMA address setup failed
soc.driver.4110   soc#: DVMA alloc failed
```

These messages indicate there are not enough system DVMA or kernel heap resources available to complete driver initialization. The associated host adapter(s) will be inoperable if any of these conditions occurs.

```
soc.attach.4001 soc#: attach failed: device in slave-only slot
soc.attach.4002 soc#: attach failed: hilevel interrupt unsupported
soc.driver.4001 soc#: Not self-identifying
```

The SBus slot into which the host adapter is installed cannot support the features required to operate the SPARCstorage Array. The host adapter should be relocated to a different SBus slot. If you see this error message, it's possible that you are running an unsupported configuration (for example, you may have the SPARCstorage Array connected to a server that is not supported).

D.2.1.1 *pln Driver*

```
pln_ctlr_attach: controller struct alloc failed
pln_ctlr_attach: scsi_device alloc failed
pln_ctlr_attach: pln_address alloc failed
pln_ctlr_attach: controller struct alloc failed
pln_ctlr_attach: scsi_device alloc failed
pln_ctlr_attach: pln_address alloc failed
```

The pln driver was unable to obtain enough kernel memory space for some of its internal structures if one of these messages is displayed. The SPARCstorage Array (s) associated with these messages will not be functional.

```
pln_init: mod_install failed error=%d
```

Module installation of the pln driver failed. None of the SPARCstorage Arrays connected to the machine will be operable.

D.3 *Hardware Errors*

Errors under this classification are generally due to hardware failures (transient or permanent), or improper configuration of some subsystem components.

D.3.0.1 soc driver

```
soc.wwn.3010      soc#: No SSA World Wide Name, using defaults
```

The associated SPARCstorage Array has an invalid World Wide Name (WWN). A default World Wide Name is being assumed by the software. The system will still function with a default World Wide Name if only one SSA gives this message (they all would be using the same default WWN). A valid World Wide Name should be programmed into the SPARCstorage Array (refer to the `ssaadm (1m)` man pages and the *Solstice HA 1.2 Administration Guide or the PDB 1.2 System Administration Guide* for more information).

```
soc.wwn.3020     soc#: Could not get port world wide name
```

If there is a failure on the SPARCstorage Array and the driver software is unable to obtain the devices WWN, this message is displayed.

```
soc.wwn.5020     soc#: INCORRECT WWN: Found: ... Expected: ...
```

This message is usually the result of plugging the wrong fibre channel cable into a host adapter. It indicates that the World Wide Name of the device connected to the host adapter does not match the World Wide Name of the device connected when the system was booted.

```
soc.driver.3010  soc#: host adapter fw date code: <not available>
```

This may appear if no date code is present in the host adapter microcode. This situation should not occur under normal circumstances and possibly indicates the use of invalid SPARCstorage Array drivers or a failed host adapter.

For reference, the expected message is:

```
soc.driver.1010   soc#: host adapter fw date code: ...
```

This is printed at boot time to indicate the revision of the microcode loaded into the host adapter.

```
soc.link.4060     soc#: invalid FC packet; ...
```

The soc driver has detected some invalid fields in a packet received from the host adapter. The cause of this is most likely incorrectly functioning hardware (either the host adapter itself or some other SBus hardware).

```
soc.link.4020     soc#: Unsupported Link Service command: ...
soc.link.4030     soc#: Unknown FC-4 command: ...
soc.link.4040     soc#: unsupported FC frame R_CTL: ...
soc.link.4010     soc#: incomplete continuation entry
soc.link.3010     soc#: unknown LS_Command
```

D.3.0.2 pln Driver

```
Transport error:  Received P_RJT status, but no header
Transport error:  Fibre Channel P_RJT
Transport error:  Fibre Channel P_BSY
```

These messages indicate the presence of invalid fields in the fibre channel frames received by the host adapter. This may indicate a fibre channel device other than Sun's fibre channel device for the SPARCstorage Array. The messages may also be caused by a failed host adapter, Fibre Channel Optical Module, fiber-optic cable, or array controller.

```
soc.link.4080 soc#: Connections via Fibre Channel Fabric are unsupported
```

The current SPARCstorage Array software does not support fibre channel fabric (switch) operation. This message indicates that the software has detected the presence of a fabric.

```
soc.login.5010    soc#: Fibre Channel login failed
soc.login.5020    soc#: fabric login failed
soc.login.5030    soc#: N-PORT login not successful
soc.login.5040    soc#: N-PORT login failure
```

These messages may occur if part of the fibre channel link initialization or login procedures fail. Retries of the login procedure will be performed.

```
soc.login.6010    soc#: Fibre Channel login succeeded
```

The soc driver will display this message following a successful fibre channel login procedure (part of link initialization) if the link had previously gone from an operable to an inoperable state. The “login succeeded” message indicates the link has again become fully functional.

```
soc.login.4020    soc#: login retry count exceeded for port: #
soc.login.4040    soc#: login retry count exceeded
```

These errors indicate that the login retry procedure is not working and the port/card associated with the message is terminating the login attempt. The associated SPARCstorage Array will be inaccessible by the system.

Note that the fibre channel specification requires each device to attempt a login to a fibre channel fabric, even though one may not be present. A failure of the fabric login procedure due to link errors (even in a point-to-point topology) may result in the printing of fabric login failure messages even with no fabric present.

```
Link errors detected
```

A number of retryable errors may have occurred on the fibre channel link. This message may be displayed if the number of link errors exceeds the allowable link bit error rate (1 bit/10^{12} bits). If you see this message, clean the fiber-optic cable according to the instructions given in the *SPARCstorage Array 100 Service Manual*. If the problem still exists, replace either the fiber-optic cable or the Fibre Channel Optical Module.

D.3.0.3 *pln Driver*

```
Transport error:  FCP_RSP_CMD_INCOMPLETE
Transport error:  FCP_RSP_CMD_DMA_ERR
Transport error:  FCP_RSP_CMD_TRAN_ERR
Transport error:  FCP_RSP_CMD_RESET
Transport error:  FCP_RSP_CMD_ABORTED
```

An error internal to the SPARCstorage Array controller has occurred during an I/O operation. This may be due to a hardware failure in a SCSI interface of the SPARCstorage Array controller, a failure of the associated SCSI bus (drive tray) in the SPARCstorage Array package, or a faulty disk drive.

```
Transport error:  FCP_RSP_CMD_TIMEOUT
```

The SCSI interface logic on the SPARCstorage Array controller board has timed out on a command issued to a disk drive. This may be caused by a faulty drive, drive tray, or array controller.

```
Transport error:  FCP_RSP_CMD_OVERRUN
```

This error (on an individual I/O operation) may indicate either a hardware failure of a disk drive in the SPARCstorage Array, a failure of the associated drive tray, or a fault in the SCSI interface on the SPARCstorage Array controller. The system will try to access the failed hardware again after you see this message.

```
Transport error:  FCP_RSP_SCSI_PORT_ERR
```

The firmware on the SPARCstorage Array controller has detected the failure of the associated SCSI interface chip. Any I/O operations to drives connected to this particular SCSI bus will fail. If you see this message, you may have to replace the array controller.

```
Transport error:  Fibre Channel Offline
soc.link.6010     soc#: port: # Fibre Channel is ONLINE
```

If you see these messages together, the system was able to recover from the error, so no action is necessary.

```
Transport error:  Fibre Channel Offline
Transport error:  Fibre Channel Online Timeout
```

If you see these messages together, an I/O operation to a SPARCstorage Array drive has failed because the fibre channel link has become inoperable. The driver will detect the transition of the link to an inoperable state and will then initiate a time-out period. Within the time-out period, if the link should become usable again, any waiting I/O operations will be resumed. However, if the time-out should expire before the link becomes operational, any I/O operations will fail.

The time-out message means that the host adapter microcode has detected a time-out on a particular I/O operation. This message will be printed (and the associated I/O operation will fail) only if the retry count of the driver for this class of link errors has been exhausted.

```
Transport error:  CMD_DATA_OVR
Transport error:  Unknown CQ type
Transport error:  Bad SEG CNT
Transport error:  Fibre Channel Invalid X_ID
Transport error:  Fibre Channel Exchange Busy
Transport error:  Insufficient CQEs
Transport error:  ALLOC FAIL
Transport error:  Fibre Channel Invalid S_ID
Transport error:  Fibre Channel Seq Init Error
Transport error:  Unknown FC Status
```

These errors indicate the driver or host adapter microcode has detected a condition from which it cannot recover. The associated I/O operation will fail. This message should be followed or preceded by other error messages; refer to these other error messages to determine what action you should take to fix the problem.

```
Timeout recovery failed, resetting
```

This message may be displayed by the pln driver if the normal I/O timeout error recovery procedures were unsuccessful. In this case, the software will perform a hardware reset of the host adapter and attempt to continue system operation.

```
reset recovery failed
```

This message will be printed only if the hardware reset error recovery has failed, following the failure of normal fibre channel link error recovery. The associated SPARCstorage Array (s) will be inaccessible by the system. This situation should only occur due to failed host adapter hardware.

D.4 Informational Messages

Messages in this category will be used to convey some information about the configuration or state of various SPARCstorage Array subsystem components.

D.4.0.1 soc Driver

```
soc.driver.1010   soc#: host adapter fw date code: ...
```

This string will be printed at boot time to indicate the revision of the microcode loaded into the host adapter.

```
soc.link.6010     soc#: port: # Fibre Channel is ONLINE
soc.link.5010     soc#: port: # Fibre Channel is OFFLINE
```

Under a variety of circumstances, the fibre channel link may appear to the host adapter to have entered an inoperable state. Frequently, such a condition is temporary.

The following are possible causes for the fibre channel link to appear to go “offline”:

- A temporary burst of errors on the fibre cable. In this case, the “OFFLINE” message should be followed by an “ONLINE” message shortly afterwards.
- Unplugging of the fibre channel cable from either the host adapter or the SPARCstorage Array
- Powering off a connected SPARCstorage Array

- Failure of a Fibre Channel Optical Module in either the host adapter or the SPARCstorage Array
- Failure of an optical cable
- Failure of a SPARCstorage Array controller
- Failure of a host adapter card

Note that any pending I/O operations to the SPARCstorage Array will be held by the driver for a period of time (one to two minutes) following a link “off-line” in case the link should return to an operable state, so that pending operations can be completed. However, if sufficient time elapses following the transition of the link to “off-line” without a corresponding “on-line” transition, the driver will fail the I/O operations associated with the formerly connected SPARCstorage Array.

It is normal to see the ONLINE message for each connected SPARCstorage Array when the system is booting.

```
soc.link.1010  soc#: message: ...
```

Peripheral devices on the Fibre Channel (like the SPARCstorage Array) can cause messages to be printed on the system console/syslog under certain circumstances.

Under normal operation at boot time, the SPARCstorage Array will display the revision date of its firmware following a fibre channel login. This message will be of the form:

```
soc.link.1010 soc#: message:SSA EEprom date: Fri May 27 12:35:46 1996
```

Other messages from the controller may indicate the presence of warning or failure conditions detected by the controller firmware.

D.5 Internal Software Errors

These messages may be printed by the driver in a situation where it has detected some inconsistency in the state of the machine. These may sometimes be the result of failed hardware, usually either the SPARCstorage Array host adapter or SBus hardware.

These are not expected to occur under normal operation.

D.5.0.1 soc Driver

```
soc.driver.4010   soc#: Illegal state: SOC_COMPLETE == 0
soc.driver.4030   soc#: too many continuation entries
soc.driver.4080   soc#: no unsolicited commands to get
soc.link.3020     soc#: unknown status: ...
soc.link.4050     soc#: unsolicited: Illegal state: flags: ...
soc.link.4070     soc#: invalid fc_ioclass
soc.login.1010    soc#: reset with resets disabled
```

D.5.0.2 pln Driver

```
ddi_dma_sync failed (rsp)
Invalid transport status
Unknown state change
Grouped disks not supported
pln_scsi_pktfree: freeing free packet
```

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