SPARCcluster 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
SPARCcluster Servers		
SPARCcenter 2000	***SPARCcenter 2000 System Binder Set***	**825-1509**
Installation	*SPARCcenter 2000 Installation Manual*	801-6975
Service	*SPARCcenter 2000 Service Manual*	801-2007
Safety / EMI	*SPARCcenter 2000 Regulatory Compliance Manual*	801-3051
	SPARCcenter 2000 Storage Device User's Guide	801-7009
SPARCserver 1000	***SPARCserver 1000 System Binder Set***	**825-1725**
Installation	*SPARCserver 1000 System Installation Manual*	801-2893
Service	*SPARCserver 1000 System Service Manual*	801-2895
Safety / EMI	*SPARCserver 1000 Regulatory Compliance Manual*	801-2892
	SPARCserver 1000 Storage Device User's Guide	801-2198
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 Serie 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 Reg. 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 Solaris 2.5.1*	802-6530
	Solstice System Manager Install Manual	802-6135
Diagnostics	*SunVTS Version 2.0 Users Guide*	802-5331
	Solstice SyMON User's Guide	802-5355
Options	*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
SPARCcluster PDB Clusters	***SPARCcluster PDB Preparation Binder Set***	**825-3527**
	Getting Started (roadmap)	802-6787
	SPARCcluster System Hardware Site Preparation, Planning and Installation Guide	802-6788
	SPARCcluster PDB System Binder Set	**825-3528**
	Getting Started (roadmap)	802-6787
	Ultra Enterprise Cluster PDB Software Site Planning and Installation Guide	802-6790
	Ultra Enterprise Cluster PDB System Administration Guide	802-6784
	Ultra Enterprise Cluster PDB Volume Manager Administration Guide	802-6785
	SPARCcluster Service Manual	802-6789
	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
SPARCcluster HA Clusters	***SPARCcluster High Availability Preparation Binder Set***	**825-3590**
	Getting Started (roadmap)	802-7619
	SPARCcluster System Hardware Site Preparation, Planning, and Installation Guide	802-6788
	SPARCcluster HA System Binder Set	**825-3591**
	Getting Started (roadmap)	802-7619
	Solstice HA 1.3 User's Guide	805-0317
	Solstice HA 1.3 Programmer's Guide	*802-0318*
	Solstice HA 1.3 New Product Information	802-0629

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[SM] 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

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

Product Description 1

1.1 Standard Features

Clustered systems based on SPARCcluster Sun4D hardware platforms provide a highly scalable, highly available clustered computing platform for the support of PDB™ (parallel database) and HA (High Availability) architectures.

Note – A cluster is comprised of two compute server nodes.

Hardware platforms for the SPARCcluster server family consist of two products, the SPARCcluster 1000 and SPARCcluster 2000 systems. These systems are targeted at enterprise-wide, mission-critical database applications. SPARCcluster clustered systems support several database products. For information on database products supported, refer to the applicable (HA or PDB) Software Administration Guide.

Clustered systems improve the availability characteristics of databases. 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 system database is implemented on 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™ (Removable Storage Media) units or 9-Gbyte disk trays. Clustered software mirrorsthe database on the disk arrays.

1

The system is designed for reliability and serviceability. A cluster consists of two nodes (servers) with no single point of failure, and can be repaired and maintained on line.

Each server has a local disk to store its operating system (that is, the `/`, `/usr`, `/ops` and `var` . file systems). Local disk partitions can be mirrored to improve system availability (although they are not viewed as a shared resource). Each server boots from its local disk.

Each disk array is cross-connected to both servers via a 25-Mbyte/second full duplex Fibre Channel optical link. Data is 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 Sbus slots available on the servers.

The servers and disk arrays can be

- Mounted in a single rack
- Physically located in the same server room
- Physically separated

The maximum distance between a server and disk array is limited to two kilometers by the fiber channel. The maximum distance between the servers is 100 meters. Geographical distribution improves protection of data against catastrophical failure, such as fire, therefore improving overall database availability.

SPARCcluster hardware should be installed in a manner to satisfy data availability requirements. When planning the optimal hardware installation, consider factors such as:

- Immunity from power interruption
- Network infrastructure
- Physical security
- Use of a transaction monitor
- Backup/restore procedure

SPARCcluster hardware configurations can be tailored to meet unique requirements for most users.

1.2 SPARCcluster 1000PDB Configurations

Figure 1-1 shows the minimum SPARCcluster 1000PDB hardware configuration which contains:

- One 56-inch expansion rack
- Two SPARCserver™ 1000s each containing:
  - Two system boards
  - Four processor modules (2/system board)
  - 256-Mbyte RAM
  - Two internal disk drives
- Two SPARCstorage Arrays with extra FC/OM SBus card-one per array
- Four fiber-optic cables
- Four FC/S SBus cards
- Eight FC/OM optical modules
- Terminal concentrator
- Four SunSwift™ cards with local Ethernet cables
- Administration workstation with CD-ROM drive
- Client net SBus card (SQEC or similar)

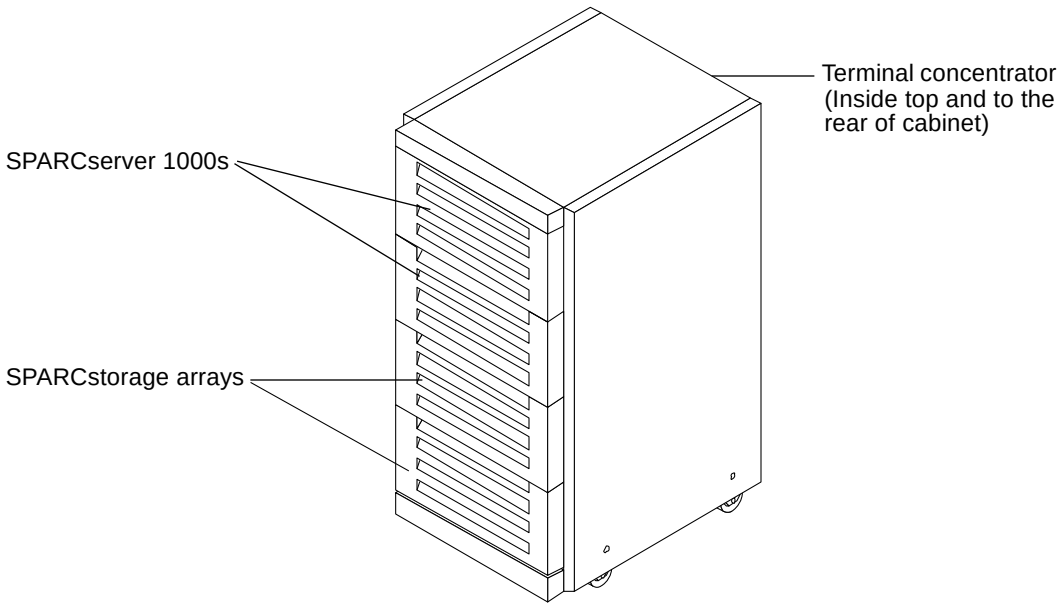


Figure 1-1 SPARCcluster 1000PDB Cabinet

Figure 1-2 depicts a block diagram of the SPARCcluster 1000PDB system.

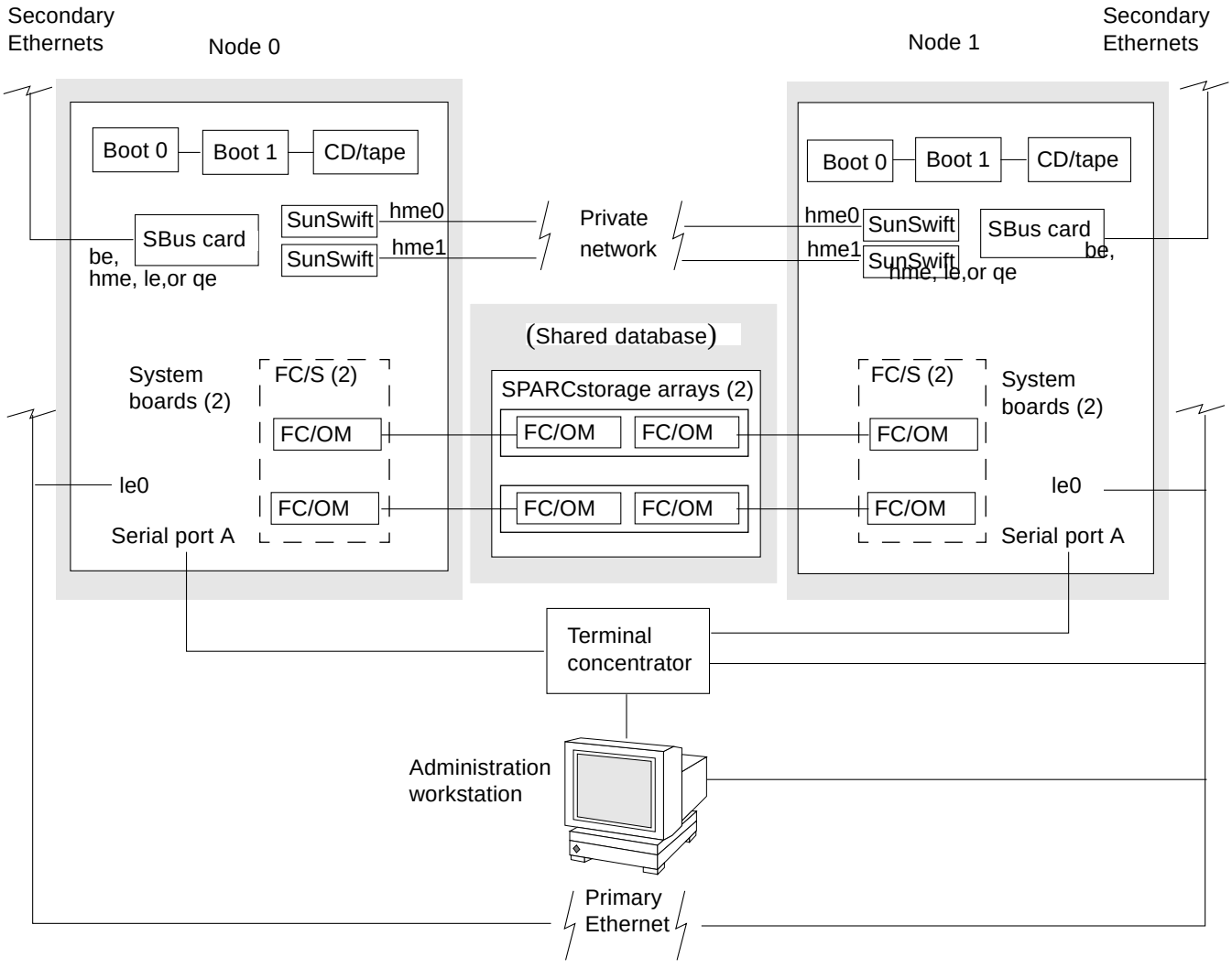


Figure 1-2 SPARCcluster PDB Block Diagram Based on SPARCserver 1000

1.3 SPARCcluster 2000PDB Configurations

Figure 1-3 shows the SPARCcenter 2000 hardware configuration required to support the SPARCcluster PDB software. The minimum configuration is:

- Two SPARCcenter 2000s, each equipped with:
  - Three system boards
  - Four processor modules (2/system board)
  - 512-Mbyte RAM
- Two SPARCstorage arrays
- Four FC/ S SBus cards
- Eight FC/OM optical modules
- Terminal concentrator
- Four fiber-optic cables
- Four SunSwift cards with local Ethernet cables
- Two client net SBus cards (SQEC or similar)
- Administration workstation with CD-ROM drive

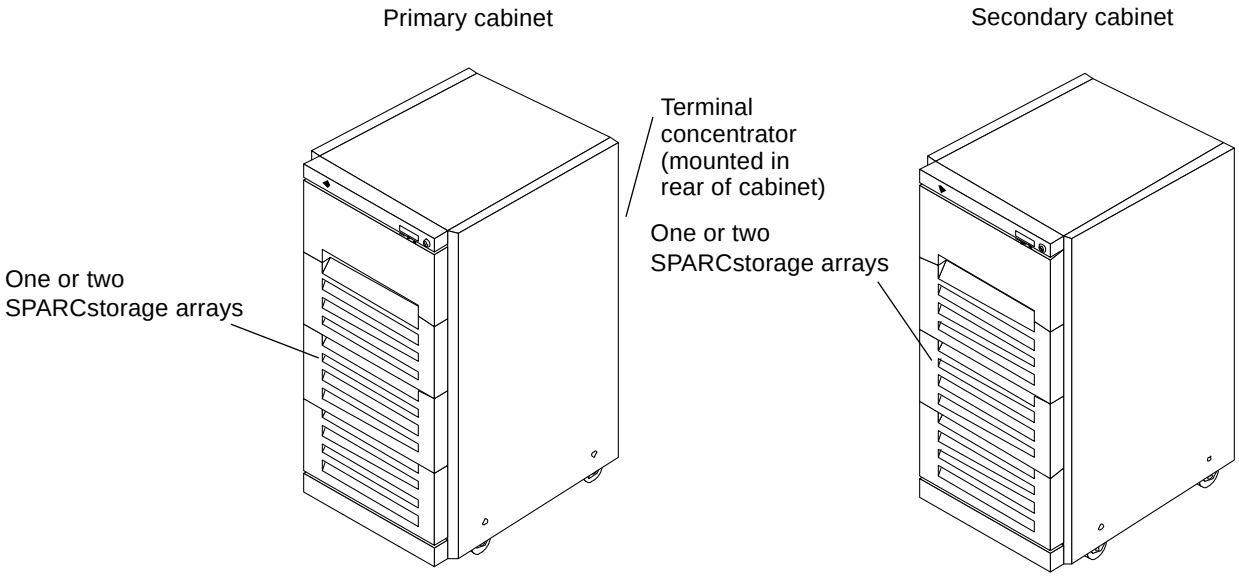


Figure 1-3 SPARCcluster 2000PDB Cabinet

Figure 1-4 is a block diagram of a SPARCcluster PDB system based on the SPARCcenter 2000.

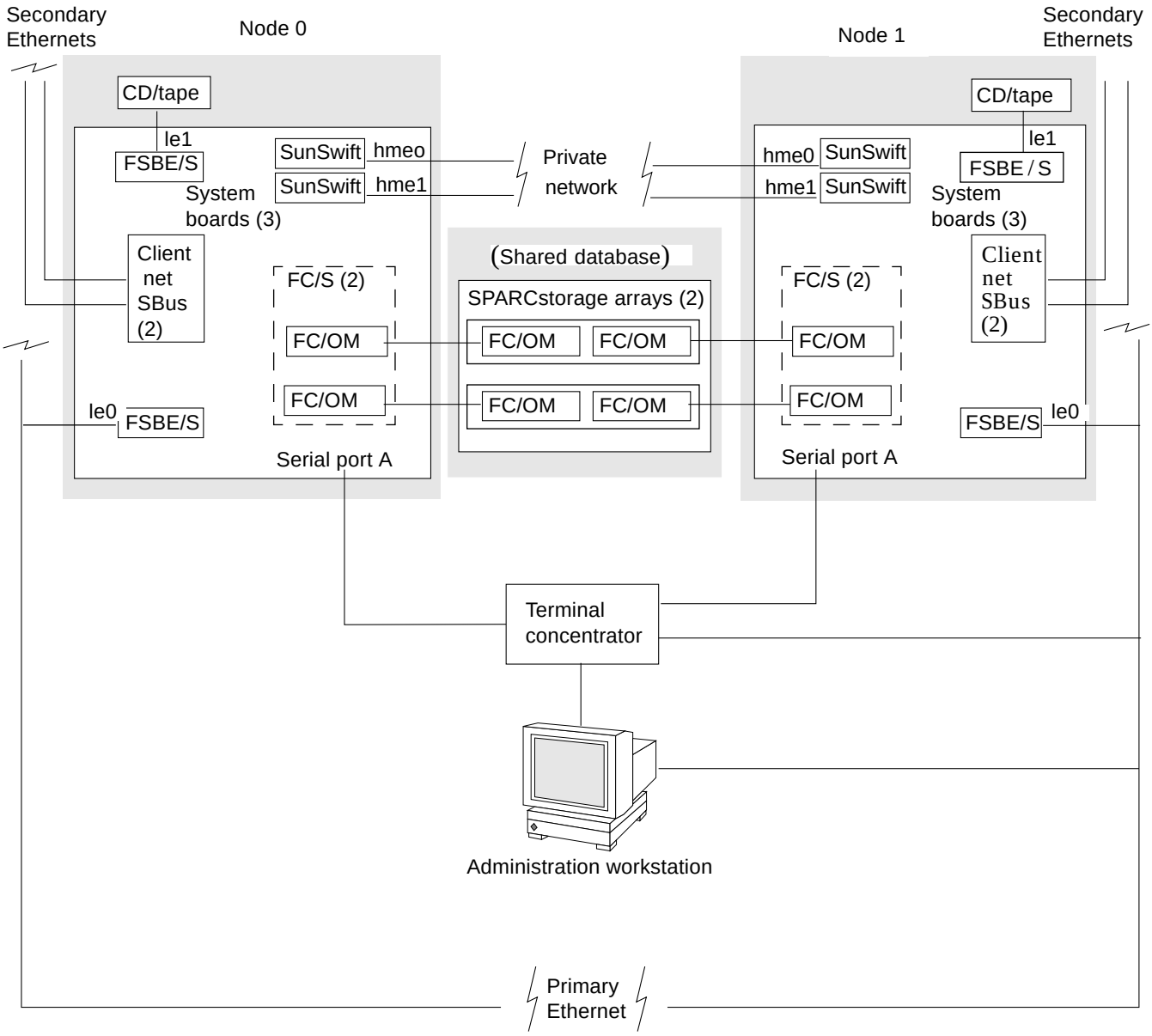


Figure 1-4 SPARCcluster PDB System Based on SPARCcenter 2000

1.4 SPARCcluster 1000HA Server Configuration

Figure 1-5 depicts the SPARCserver 1000 hardware configuration required to support the Solstice™ HA software. Figure 1-6 is a simplified block diagram of a SPARCcluster 1000 based configuration. The minimum configuration is:

- One 56-inch expansion rack
- Two SPARCserver 1000s each containing:
  - Two system boards
  - Four processor modules (2/system board)
  - 128-Mbyte RAM
  - Two internal disk drives
- Two SPARCstorage arrays
- Four fiber optic cables
- Four FC/OM SBus cards
- Terminal concentrator
- Four SunFastEthernet™ cards with local Ethernet cables
- Administration workstation with CD-ROM drive
- Two client net SBus cards (SQEC or similar)

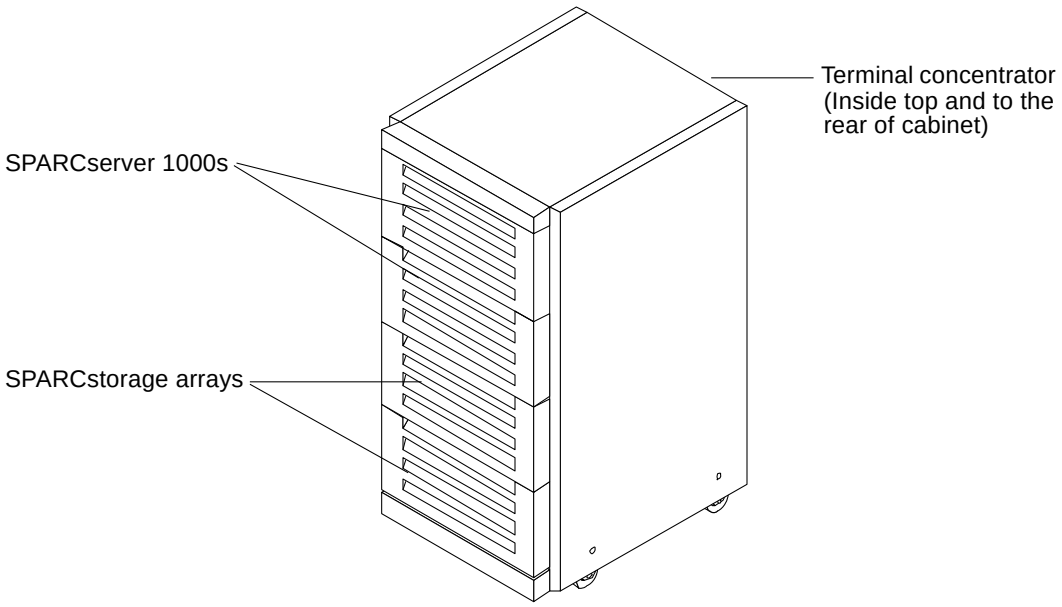


Figure 1-5 SPARCcluster 1000HA Server Cabinet

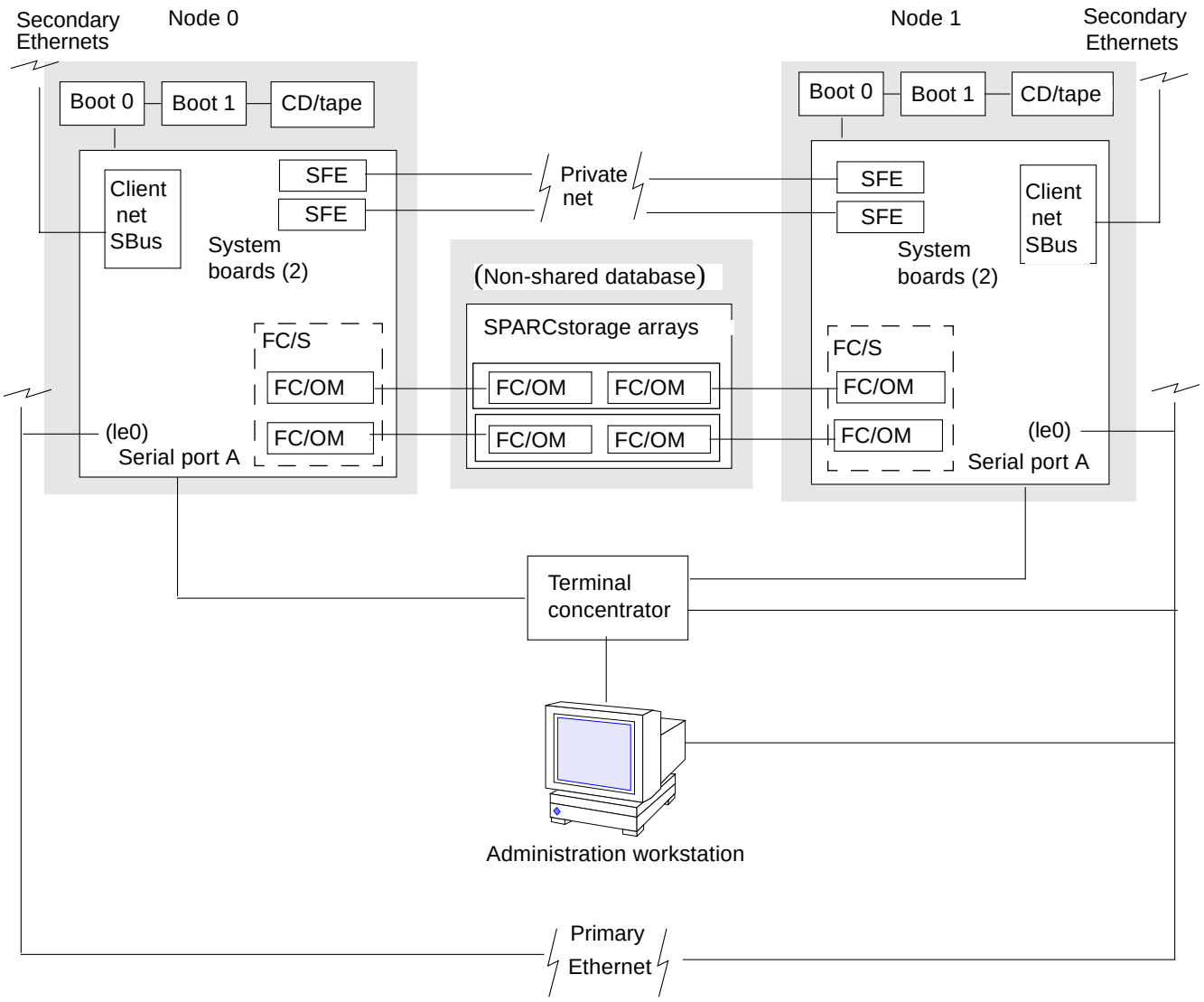


Figure 1-6 SPARCcluster HA Cluster Based on SPARCserver 1000

1.5 SPARCcluster 2000HA Server Configuration

Figure 1-7 shows the SPARCcenter™ 2000 server hardware configuration required to support the Solstice HA software. Figure 1-8 depicts a block diagram of a SPARCcluster 2000 based system. The minimum configuration is:

- Two SPARCcenter 2000s, each equipped with:
  - Three system boards
  - Six processor modules
  - 256-Mbyte RAM
- Two SPARCstorage arrays
- Four FC/OM SBus cards
- Terminal concentrator
- Four fiber optic cables
- Four SunFastEthernet cards with local Ethernet cables
- Four boot disks
- Two client net SBus cards (SQEC or similar)
- Administration workstation with CD-ROM drive

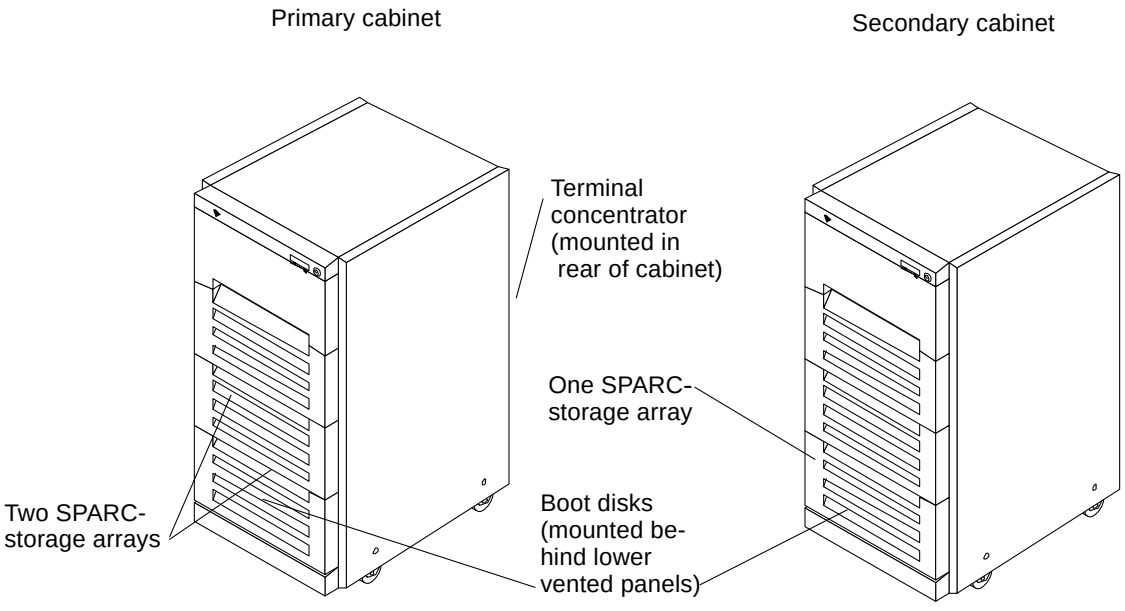


Figure 1-7 SPARCcluster 2000HA Server Cabinets

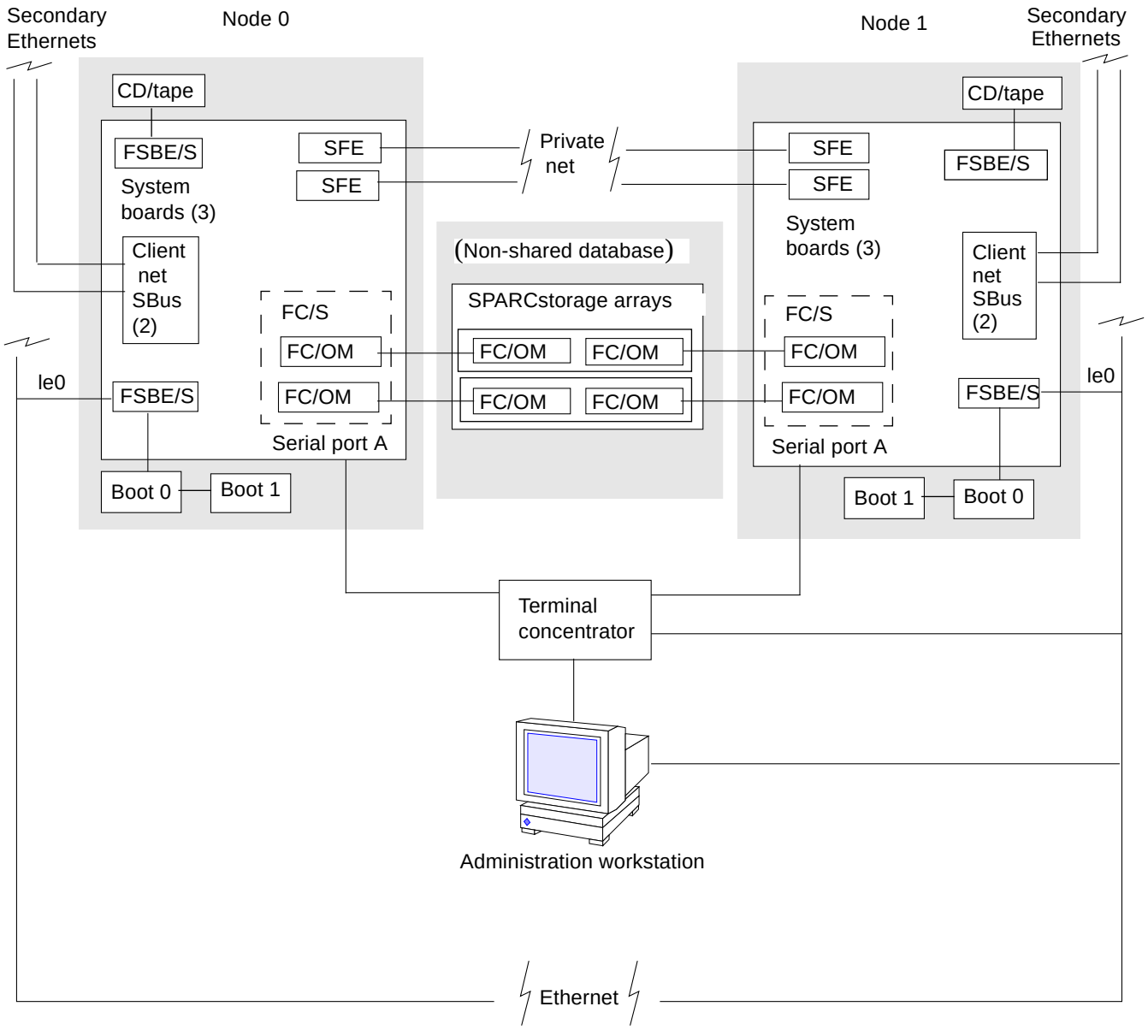


Figure 1-8 SPARCcluster HA Cluster based on SPARCcenter 2000

1.6 Expansion Cabinet with RSM Units and Differential SCSI Trays

For expanded systems, the controllers can be either SPARCstorage Array Model 200s or 210s. The Model 200 Series controllers are used with SPARCstorage RSM (Removable Storage Media) units or 9-Gbyte disk trays. See Figure 1-9 and Figure 1-10.

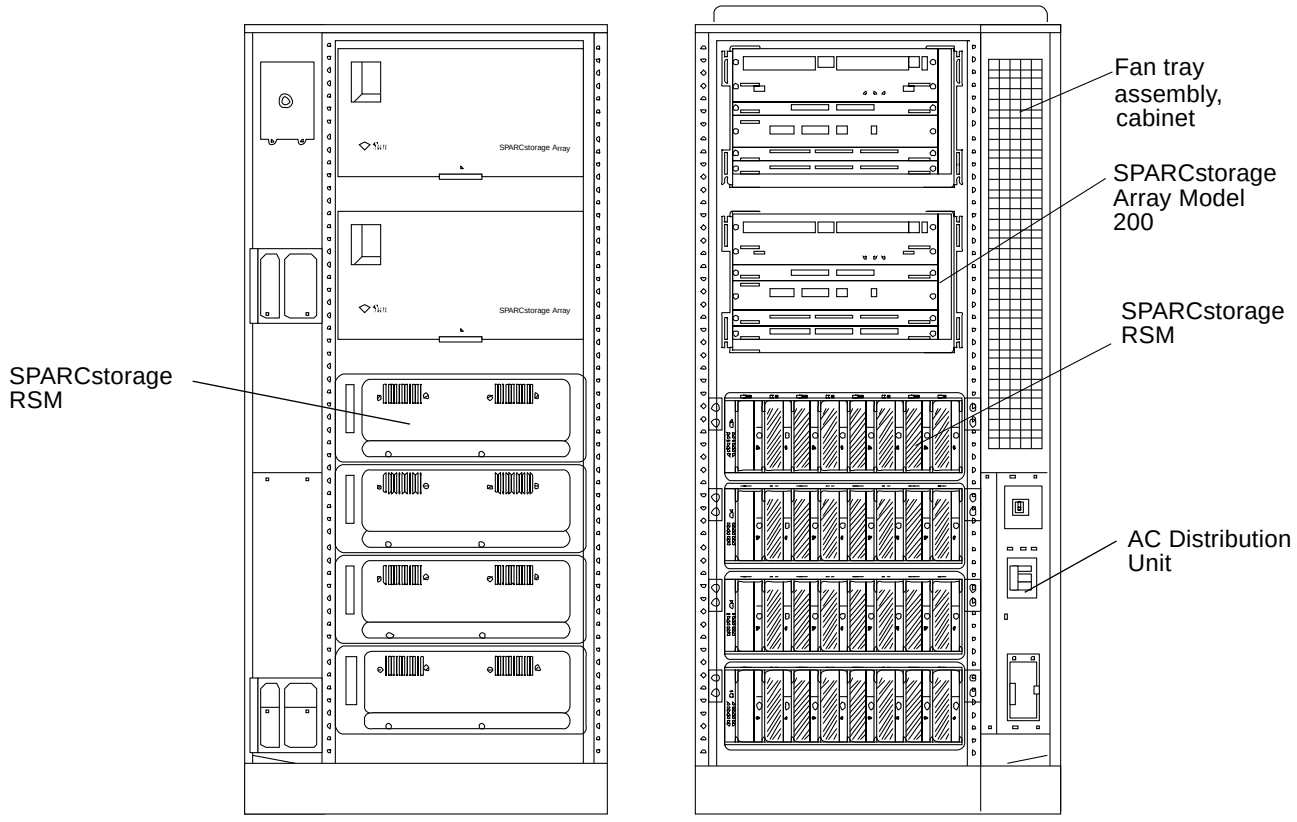


Figure 1-9 SPARCcluster System Expansion Cabinet with SSA Model 200 Series and SPARCstorage RSM Units

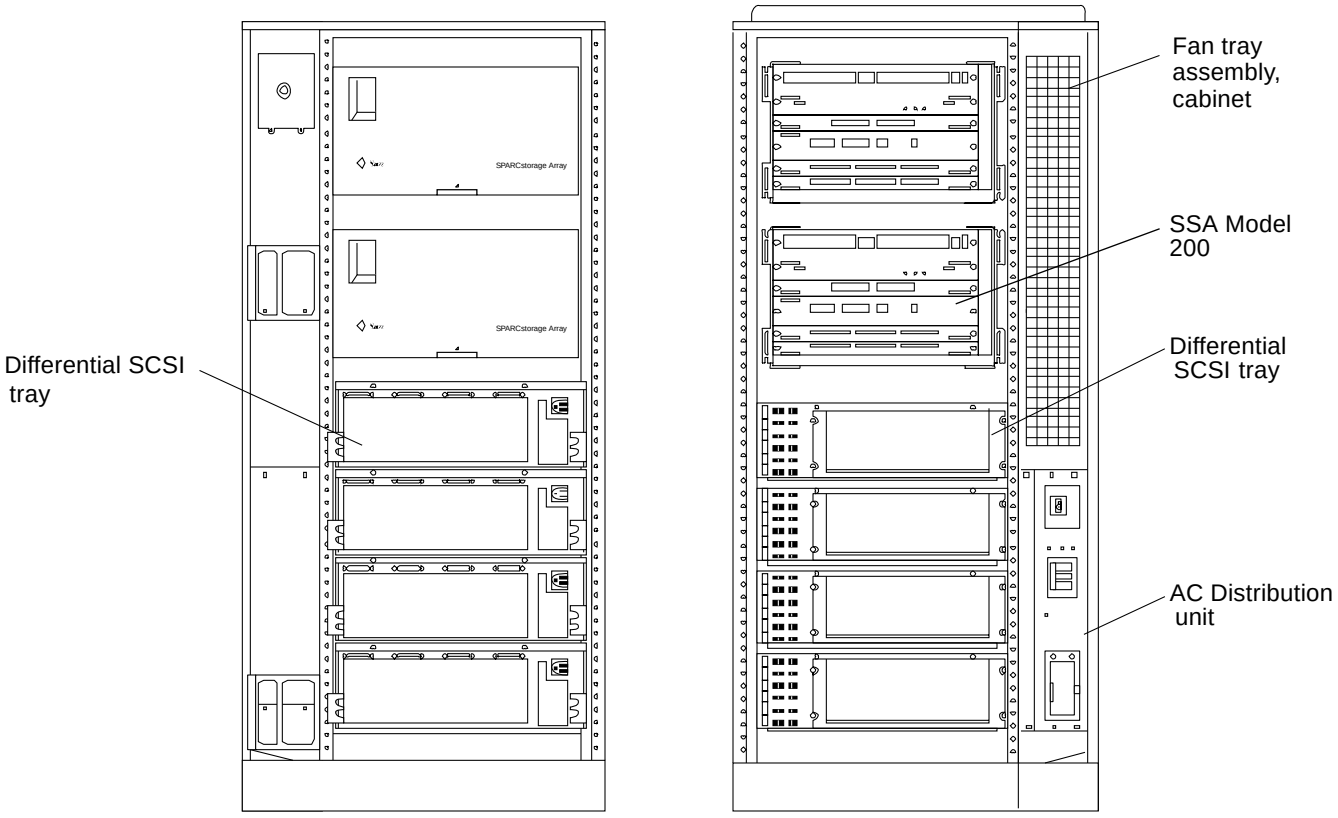


Figure 1-10 SPARCcluster System Expansion Cabinet with SSA Model 200 Series and Differential SCSI Trays

1.7 Internal and External Options

Refer to Chapter 2 of the *SPARCcluster Hardware Site Preparation, Planning, and Installation Guide.*

Troubleshooting Overview 2

2.1 Troubleshooting Philosophy

Note – A SPARCcluster clustered system is comprised of redundant, on-line components, which 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.

A SPARCcluster system is two identical system nodes joined into a cluster. Typically, prior to performing hardware repair, a node will be removed from the cluster. The surviving node in the cluster will then continue to support the client database for both nodes until the faulty node can be repaired and rejoined to the cluster.

2

You must take several service precautions to maintain cluster operation while maintenance is being accomplished. For most hardware repair operations, the node with the faulty part must be removed from the cluster as indicated in the following Section 2.2, “Maintenance Authorization.” Additionally, the system administrator may have to perform related software tasks both before and following removal of a node from the cluster.

For example, instances of the 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) system administration guide.

2.2 Maintenance Authorization

The site system administrator must be contacted to remove a node from the cluster and, after maintenance, to return the node to cluster membership. The procedures in this manual note points where the system administrator must be contacted. However, the equipment owner’s administrative requirements supercede the procedures contained herein.

The following troubleshooting procedures are based on console access for both nodes. Refer to the applicable (HA or PDB) system administration guide for console access.

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 3.3.1.4, “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 Cluster Troubleshooting

2.4.1 Cluster GUIs

Three graphical user interfaces (GUIs) allow the system administrator to facilitate troubleshooting: the Cluster Control Panel (`ccp`), the Cluster Console (`cconsole`), and the Cluster Monitor (`clustmon`). See the following table for a brief description of each GUI; refer to the *SPARCcluster PDB System Administration Guide* for more detailed information.

Table 2-1 Graphical User Interfaces

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.

2.4.2 Troubleshooting Flow

The troubleshooting presented herein is 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 you can use to isolate faults. To maintain the system in high-availability mode, troubleshooting should be accomplished 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 or 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 (PDB clusters only) messages and troubleshooting instructions to determine principle assembly at fault.

2. Contacting system administrator to remove principal assemblies node from 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.

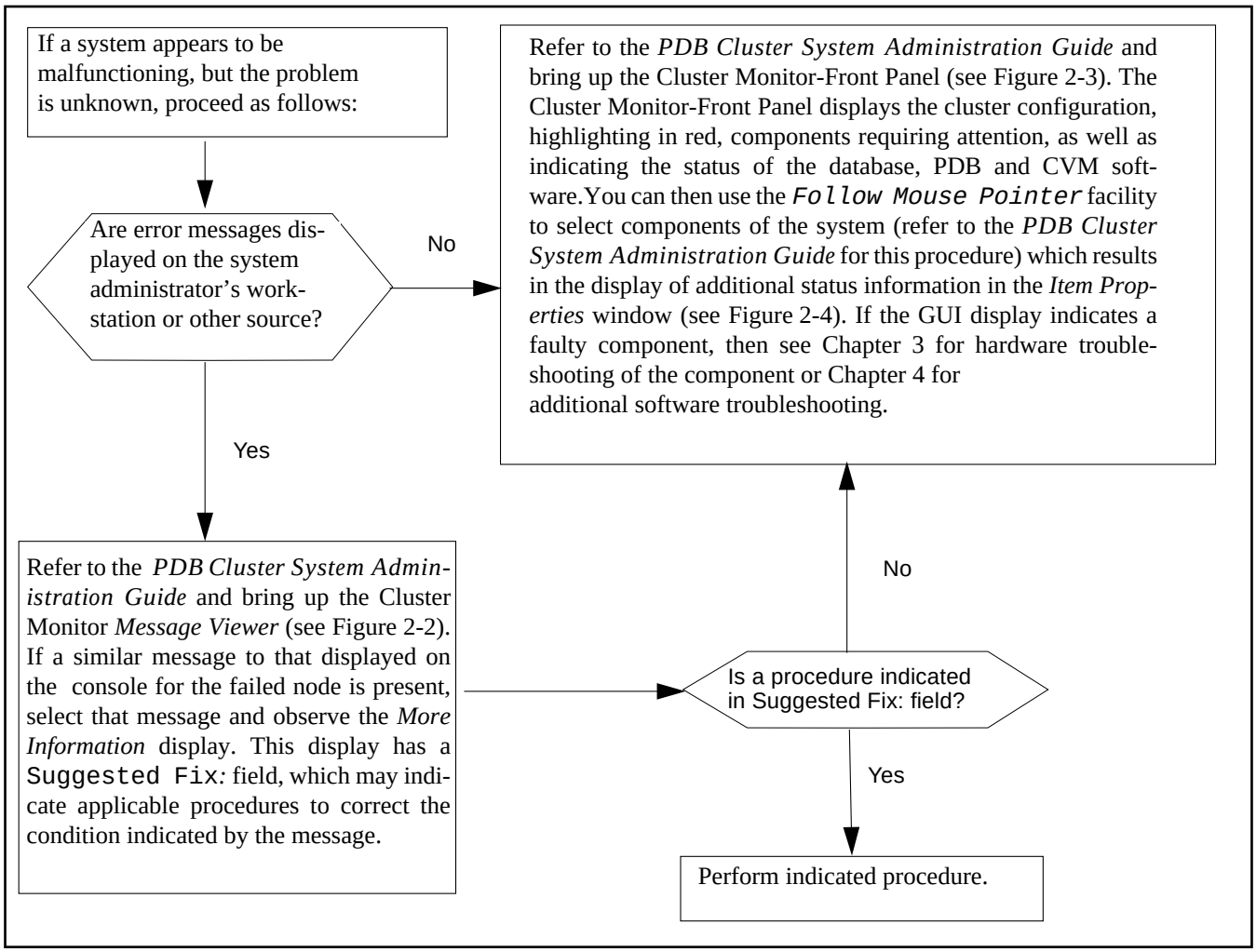


Figure 2-1 Troubleshooting Flow Diagram

Note – If SunFastEthernet is used instead of SunSwift, then the private network designation depicted in the following example will be `be1` instead of `hme1`.

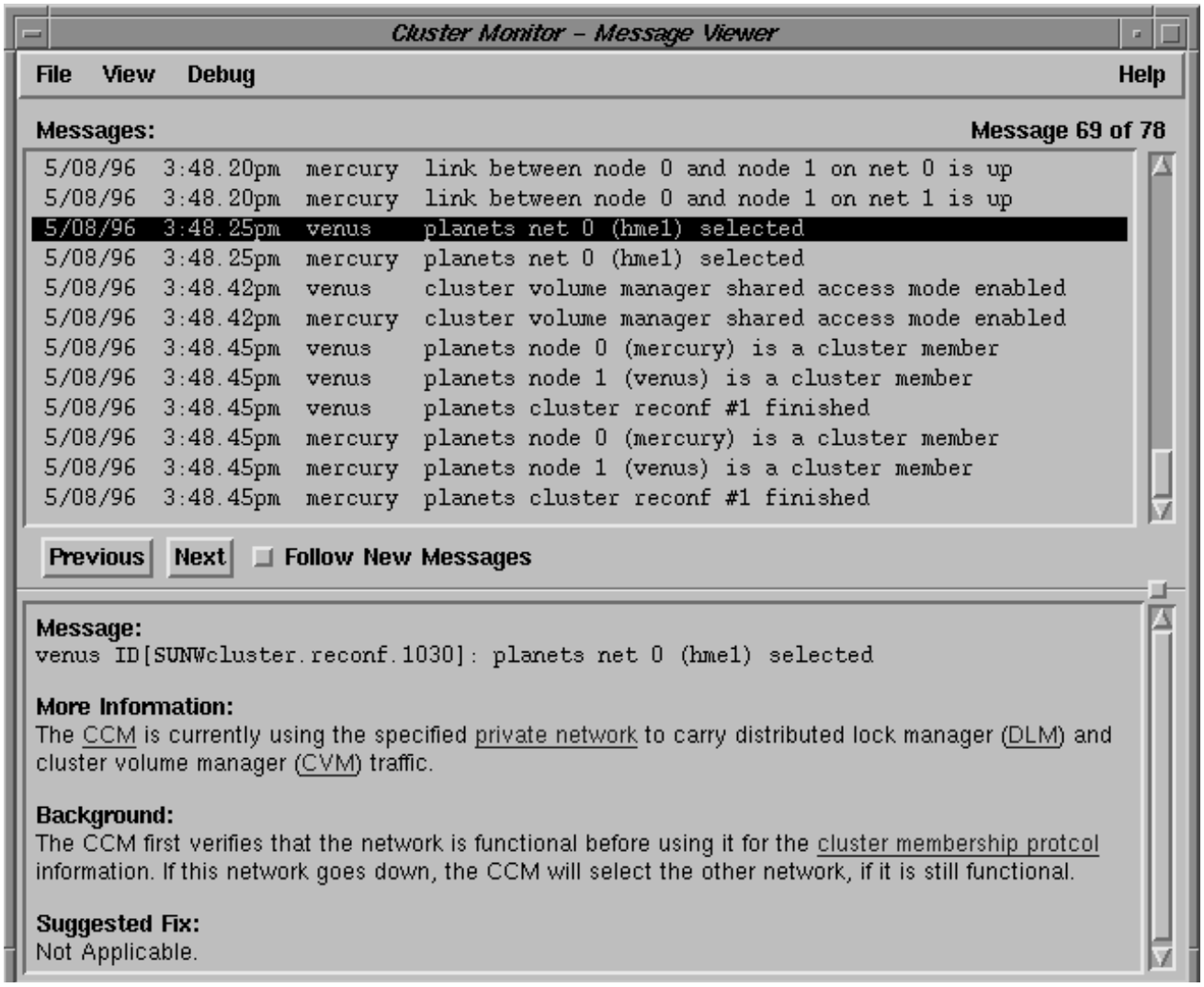


Figure 2-2 Message Viewer Window

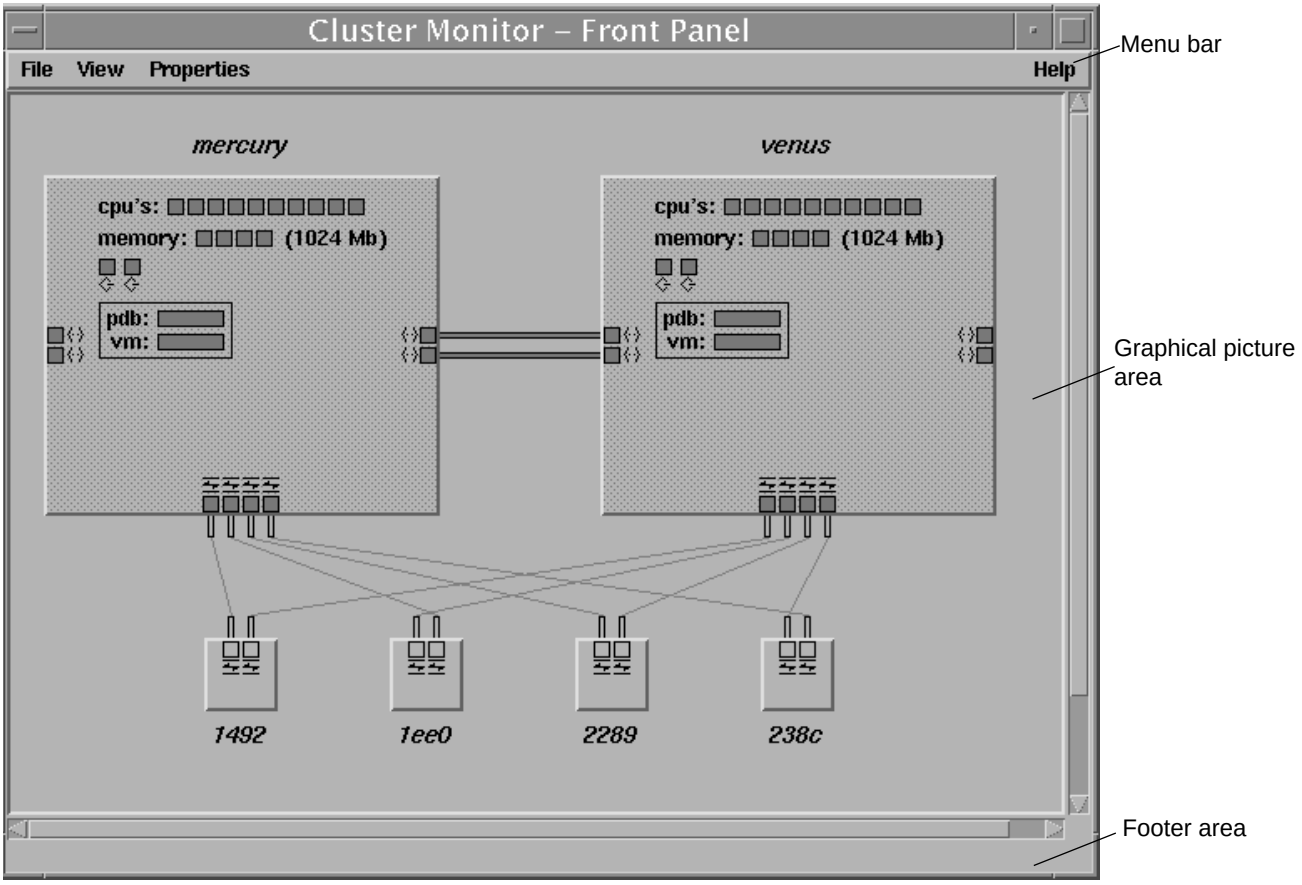


Figure 2-3 Cluster Monitor-Front Panel Window

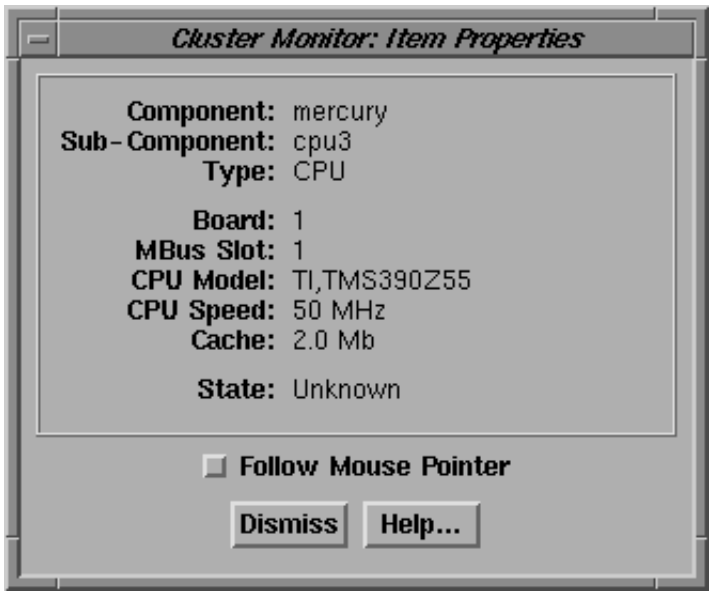


Figure 2-4 Item Properties Window

2.4.3 Fault Classes and Principal Assemblies

SPARCcluster 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 and interfaces
  - Fibre Channel Optical Modules (FC/OM)
- Processor (SPARCcenter 2000 or SPARCserver 1000) faults
  - Boot disk fault
  - System board fault

  - Control board fault
  - NVSIMM fault
  - Private network fault
- Terminal concentrator / serial connections faults
- Client net / connections
- Software faults
  - Application program failed
  - System crash (panic)
  - Hung system (lockup)
  - 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.

2.4.4 Error Messages or Symptoms

Table 2-2 lists error messages or symptoms together with the probable cause and troubleshooting reference.

Table 2-2 Error Message or Symptom

Error Message/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	SPARCcenter 2000 / SPARCserver 1000	Section 3.1.5, "Node Faults"	*SPARCcenter 2000/SPARCserver 1000 System Service Manual*

Table 2-2 Error Message or Symptom *(Continued)*

Error Message/Symptom	Probable Cause	Cluster Service Reference	Troubleshooting Reference
		Private Network	
`hme0 no carrier-transceiver cable problem? ; hme0 no response`	SunSwift	Section 3.2.1, "Private Network Fault"	*SunSwift SBus Adapter User's Guide*
`be0 no carrier-transceiver cable problem? ; be0 no response`	SunFastEthernet	Section 3.2.1, "Private Network Fault"	*SunFastEthernet Adapter User's Guide*
		Client Network	
`qe0 no carrier - transceiver cable problem?; qe0 no response`	client net	Refer to your client network documentation	As applicable
		Public Network	
`le0 no carrier-transceiver cable problem?; le0 no response`	Cable	Chapters 9 (SPARCcluster 1000) and Chapter 10 (SPARCcluster 2000) of the *SPARCcluster System Hardware Site Preparation, Planning and Installation Guide* for cable detail.	Not applicable

Table 2-2 Error Message or Symptom *(Continued)*

Error Message/Symptom	Probable Cause	Cluster Service Reference	Troubleshooting Reference
		SPARCstorage Array	
`c2t4d8s2 failed`; see Appendix A for additional messages	Disk	Section 3.1, "SPARCstorage Array and Optical Connections Faults"	*SSA Model 100 Series: SPARCstorage Array Model 100 Series Service Manual* *SSA 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 3.3, "Terminal Concentrator and Serial Connection Faults"	Not applicable

2.4.5 *Device Troubleshooting Cross-Reference*

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

Table 2-3 Device Troubleshooting Cross-Reference

Device/Trouble Area	Cross Reference	Part Number
Array Controller / Fibre Optic Connector / Fibre Channel Optical Module	*SPARCstorage Array Model 1000 Series Service Manual,* Chapter 2 "Troubleshooting".	801-2206
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 3.3, "Terminal Concentrator and Serial Connection Faults"	N / A

Table 2-3 Device Troubleshooting Cross-Reference *(Continued)*

Device/Trouble Area	Cross Reference	Part Number
SPARCcenter 2000	*SPARCcenter 2000 Service Manual*, Chapter 2, "TroubleshootingOverview".	801-2007
SPARCserver 1000	*SPARCserver 1000 System Service Manual*, Chapter 2, "Troubleshooting Overview".	801-2895
SunSwift adapter	*SunSwift SBus Adapter User's Guide*	802-6021
SunFastEthernet Adapter	*SunFastEthernet SBus Adapter Use's Guide*	802-6022

2.4.6 Device Replacement Cross-Reference

Table 2-4 cross-references devices to replacement procedures.

Table 2-4 Device Replacement Cross-Reference

Device	Cross Reference	Part Number	
		SPARCserver 1000	**SPARCcenter 2000**
SSA 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*	801-2206	801-2206
SSA Model 200 Series controllers FC/OM battery module fan tray power supply LCD-display module interface modules backplane fibre optic cables	*SPARCstorage Array Model 200 Series Service Manual, Chapter 5*	801-2007	801-2007
SPARCstorage Array disk drives	Model 100 Series: *SPARCstorage Array Model 100 Series Service Manual, Chapter 5*	801-2206	801-2206
	SPARCstorage RSM: *SPARCstorzge RSM Installation, Operations and Service Manual, Chapter 3*	802-506	802-5062
	SCSI tray: *Differential SCSI Disk Tray Service Manual, Chapter 2*	800-7341	800-7341

Table 2-4 Device Replacement Cross-Reference *(Continued)*

Device	Cross Reference	Part Number	
		SPARCserver 1000	SPARCcenter 2000
Optical Module	*Fibre Channel Optical Module Installation Manual*	801-6326	801-6326
SunSwift	*SunSwift SBus Adapter User's Guide*	801-6021	801-6021
System board, control board, power supply, SPARC module, boot disk	*SPARCcenter 2000* or *SPARCserver 1000 System Service Manual*	801-2007	801-2895

2.5 HA Cluster Troubleshooting

2.5.1 Takeover

The Solstice HA software enables one node to take over 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, notify the service provider (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.

2.5.2 Switchover

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

2.5.3 Failures Where There is No Takeover

For noncritical failures, there is no software takeover. However to continue to provide HA data services, you should troubleshoot in the following order:

Caution – DO NOT connect a keyboard directly to a node system board. If a keyboard is connected into a system board, it then becomes 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 system, 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 the system administrator to return the repaired assembly to the cluster.

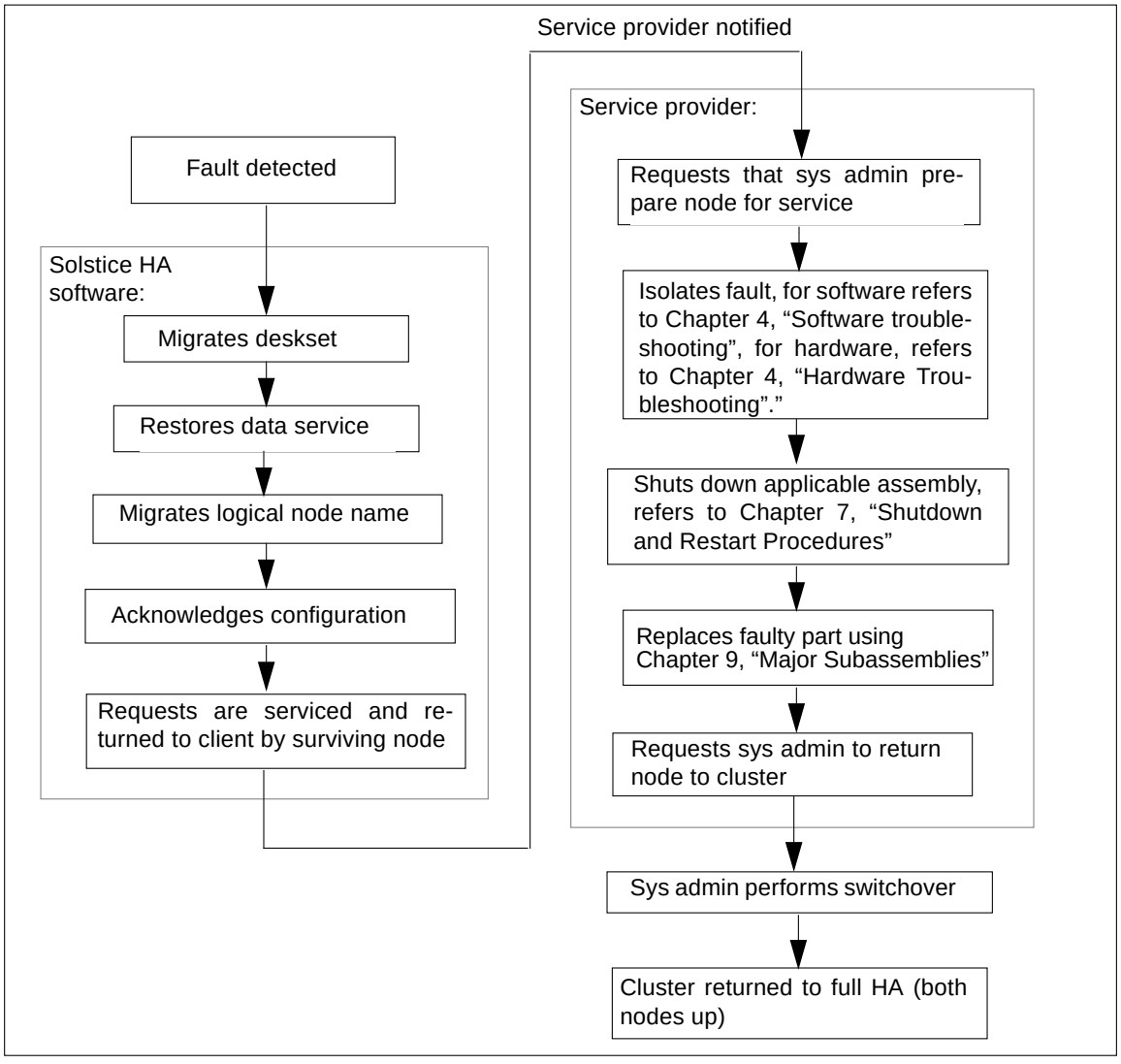


Figure 2-5 Takeover Troubleshooting Flow Diagram

2.5.4 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 2.4.3, “Fault Classes and Principal Assemblies,” for a PDB cluster.

All troubleshooting begins at the system console. You should check the console regularly, and any other source of operator information. For example, regularly check the output of the `hastat` command. For more information on the `hastat` command, refer to the *Solstice HA 1.2 Software Administration Guide.*

2.5.5 Error Messages or Symptoms

Same as that described in Section 2.4.4, “Error Messages or Symptoms,”for a PDB cluster with the exception that HA clusters do not have a cconsole.

2.5.6 Device to Troubleshooting Cross-Reference

Same as that described in Section 2.4.5, “Device Troubleshooting Cross-Reference,” for a PDB cluster.

2.5.7 Device Replacement Cross-Reference

Same as that described in Section 2.4.6, “Device Replacement Cross-Reference,” for a PDB cluster.

2

Hardware Troubleshooting 3

Prior to performing service on components within a node that is joined in a cluster, the system administrator must perform certain tasks that are necessary in a high-availability system, refer to the applicable (PDB or HA) cluster 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 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.

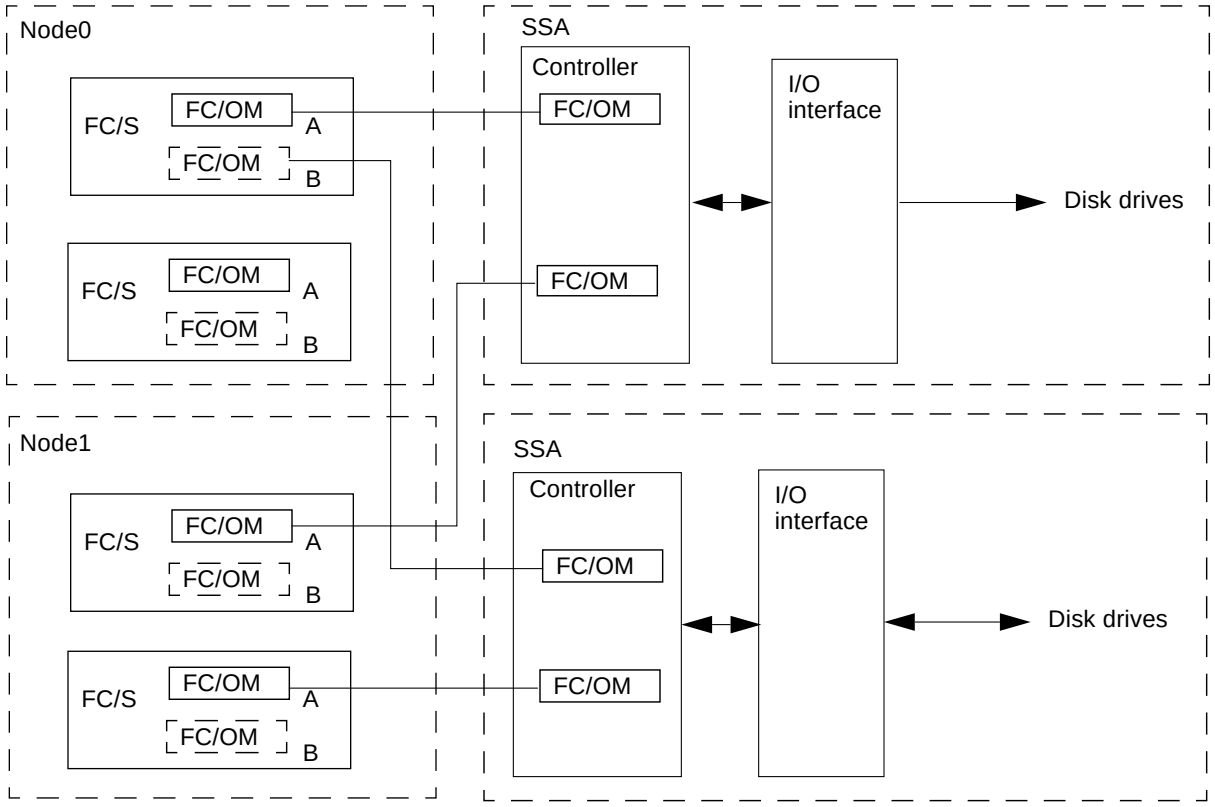


Figure 3-1 I/O Component Path for Typical SSA

To aid in isolating the fault, first try to correlate the console messages with those listed in the *Ultra Enterprise PDB Error Messages* guide for PDB clusters and the *Solstice HA 1.2 Software Administration Guide* for HA clusters. In most cases the error message explanation lists probable causes. 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 above referenced guides, 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 Fault” and proceed as directed.

3.1.1 Both Nodes Indicate Errors From Same Physical Disk

Note – The following procedure isolates 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 – Drives should not be pulled out 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 be done without bringing down the operating system or the tray that the drive is in.

4. **Replace the defective disk drive using the following references as applicable:**

- SSA Model 100 Series; Chapter 5 of the *SPARCstorage Array Model 100 Series Service Manual*
- SSA 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 SSA occur for both nodes it is likely that the fault is a common point in the SSA I/O path. Using Figure 3-1 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 7, "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 7, "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 likely that the faulty component is the disk itself or in the disk I/O path for the node receiving the errors, see Figure 3-1. Use the following procedure to replace a disk.

1. **Contact the system administrator and request that the node be prepared for replacement of a disk.**
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, refer to the next section to isolate the fault to a component in the I/O path for the disk.**

3.1.4 SPARCstorage Array Communication Fault

If a SPARCstorage Array is not communicating with a host system, begin troubleshooting by making a physical inspection as described in the appropriate series service manual for your SSA (Model 100 or 200).

If the node and the SPARCstorage Array subsystem are still not communicating, then one of the components depicted in Figure 3-1 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 7, "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 up.

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.

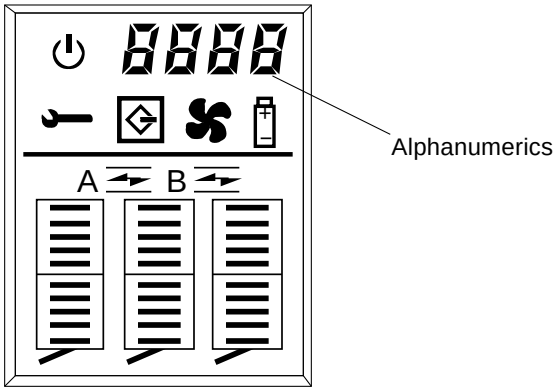


Figure 3-2 LCD Display

Table 3-1 POST Codes

POST Code	Meaning	Action
01	LCD failure	Replace fan tray
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. Contact the system administrator and indicate that the node is ready to be returned to the cluster following component replacement.

6. Become superuser and shut down the processor for the node.

a. Verify that the system returns to the `ok` prompt after the shutdown is complete.

b. If the system goes to the > prompt after the shutdown, enter `n` to display the `ok` prompt.

7. **At the `ok` prompt, 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.

9. **Locate the lines in the output that give information on the FC/S cards installed in the host system.**
You can find those lines by looking for `soc@x,x` in the output. 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:

```
ok /io-unit@f,e0200000/sbi@0,0/SUNW,soc@2,0
```

tells you that an FC/S card is installed in SBus slot 2 in the host system.

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

11. **Determine what the SBus slot number is for that 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 card installed in that SBus slot, go to Step 12.

- If you *cannot* find an entry in the output for the FC/S card installed in that SBus slot, replace the FC/S card in that SBus slot according to the instructions given in the service manual that came with your host system. Following replacement of the 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` output. Using the previous output as an example, you would enter:

```
ok " /io-unit@f,e0200000/sbi@0,0/SUNW,soc@3,0" 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 according to the instructions given in the service manual that came with your host system. Following replacement of the 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 fibre 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. **Enter the following at the** ok **prompt:**

```
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, enter the following at the ok **prompt:**

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

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

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

- If you see a message saying that the test *passed*, go to step 19.
- If you see a message saying that the test *failed*, then replace the FC/OM from the appropriate slot on the FC/S card according to the instructions given in the service manual that came with your host system.

c. Following replacement of the FC/S card, 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 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 Model 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 appropriate slot on the FC/S card according to the instructions given in the service manual that came with your host system.

c. 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 7, "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 7, "Shutdown and Restart Procedures."

31. Replace the array controller.

32. Bring up the applicable SPARCstorage Array, as described in Chapter 7, "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.

3.1.5 Node Faults

3.1.5.1 System Board, Control Board, and Boot Disk Faults

Messages on the system administrator's console or the Cluster Console (PDB clusters only) for the node will identify the defective node and system board slot. You can further isolate a system board fault using the `prtdiag` command as described in Section 3.1.5.3, "Using the prtdiag Command".

This class of faults can also be isolated by referring directly to the troubleshooting procedures in the respective service manual for the system board. Refer to the *SPARCserver 1000 System Service Manual* for a SPARCcluster 1000 based system and the *SPARCcenter 2000 System Service Manual* for a SPARCcluster 2000 based 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, part of the system cabinet may be shut down to replace a defective boot disk, system board, processor module, SBus board, SIMM, and so forth.**
   Use the respective system processor shutdown procedures to prevent interrupting other cluster components.

- SPARCcluster 1000: reference Section 7.1.2, “Processor.”
- SPARCcluster 2000: reference Section 7.2.2, “Processor Shutdown and Startup.”

3. **Replace the defective device as indicated in the applicable service manual.**
   Refer to the *SPARCserver 1000 System Service Manua*l for a SPARCcluster 1000 based system and the *SPARCcenter 2000 Service Manual*, for a SPARCcluster 2000 based system.
4. **Bring up the applicable processor, as described in Chapter 7, “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 processor part.**

3.1.5.2 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.

3.1.5.3 *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/sun4d/sbin/prtdiag`.

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

```
# /usr/platform/sun4d/sbin/prtdiag
System Configuration:  Sun Microsystems  sun4d SPARCcenter 2000
System clock frequency: 40 MHz
Memory size:  384Mb
Number of XDBuses: 2
CPU Units: Frequency Cache-Size        Memory Units: Group Size
 A: MHz MB   B: MHz MB          0: MB   1: MB   2: MB   3: MB
         ---------  ---------        -----   -----   -----   ----
# /usr/platform/sun4d/sbin/prtdiag
```

```
# /usr/platform/sun4d/sbin/prtdiag
Board0:        40 1.0      40 1.0            128       0     128
Board1:        40 1.0      40 1.0             32       0      32
Board2:        40 1.0      40 1.0              0       0       0
Board3:       40 1.0      40 1.0           32      0     32      0
======================SBus Cards==========================
Board0:         SBus clock frequency: 20 MHz
                0: dma/esp(scsi)       'SUNW,500-2015'
                   lebuffer/le(network)'SUNW,500-2015'
                1: qec/be(network)     'SUNW,270-2450'
                2: SUNW,soc            '501-2069'
                3: dma/esp(scsi)       'SUNW,500-2015'
                   lebuffer/le(network)'SUNW,500-2015'
Board1:         SBus clock frequency: 20 MHz
                0: qec/be(network)     'SUNW,270-2450'
                1: SUNW,soc/SUNW,pln   '501-2069'
                2: dma/esp(scsi)       'SUNW,500-1902'
                  lebuffer/le(network)'SUNW,500-1902'
Board2:         SBus clock frequency: 20 MHz
                0: SUNW,soc/SUNW,pln   '501-2069'
                2: dma/esp(scsi)       'SUNW,500-1902'
                   lebuffer/le(network)'SUNW,500-1902'
Board3:         SBus clock frequency: 20 MHz
                1: dma/esp(scsi)       'SUNW,500-1902'
                3: dma/esp(scsi)       'SUNW,500-1902'
                   lebuffer/le(network)'SUNW,500-19902'
No failures found in System
===========================
#
# /usr/platform/sun4d/sbin/prtdiag
```

As shown above, `prtdiag` displays the status of the following system boards and replaceable system board components:

- System boards, by location
- SuperSPARC™ modules, by number, location, and type (identified as operating speed)
- SIMMs, by quantity and locations (identified by group)
- SBus cards, by location and type

3.1.5.4 *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.**
   Once the system is halted, several system messages are displayed. When the messages finish the `ok` prompt is displayed.

3. **Enter the appropriate command to probe the system for SCSI-2 devices.**

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

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

   b. **To confine the probe to SCSI-2 devices hosted by a specific on-board or SBus SCSI-2 host, substitute for variables *A* and *B* in the command below, where *A* is the board number (0-3) and *B* is the SCSI-2 host (0 for on-board SCSI-2,or 1, 2 or 3 for the corresponding SBus slot):**

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

4. **Verify the drive in question is listed.**
   After entering the above command, a list of drives like the one below is displayed:

```
Target 0
      Unit 0 Disk < drive brand name>
Target 3
      Unit 0 Disk < drive brand name>
Target 5
      Unit 0 Tape < drive brand name>
Target 6
      Unit 0 Removable Read Only Device
```

```
Target 0
      Unit 0 Disk < drive brand name>
Target 3
      Unit 0 Disk < drive brand name>
Target 5
      Unit 0 Tape < drive brand name>
Target 6
      Unit 0 Removable Read Only Device
```

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:

```
ok reset
```

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

3.2 Network Faults

3.2.1 Private Network Fault

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.

The private network can be either SunFastEthernet (`be`) or SunSwift (`hme`). Supplemental troubleshooting for private network faults can be found in the applicable (SunSwift™ or SunFastEthernet™) SBus Adapter User’s Guide. Also, one of the following procedures can be utilized, depending upon whether or not both nodes are up and running in the cluster (see Section 3.2.1.1, “One or Both Nodes Up and Running in a Cluster”), or whether neither node is running in a cluster (see Section 3.2.1.2, “Both Nodes Not Running In A Cluster”).

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

Note – As root, use the `pdbfindifs` command to find all network interfaces, `be` designates SunFastEhernet, `hme` designates SunSwift. If the private network is configured with SunFastEthernet instead of SunSwift, then the interface designations given in the following example would be `be0` and `be1` instead of `hme0` and `hme1`.

```
# pdbfindifs -b
hme0 = board# 0 slot# 2
hme1 = board# 1 slot# 2
```

In the following example procedure (see Figure 3-3) both nodes are up and running in a cluster, Link 0 has failed and the software has recovered on Link 1.

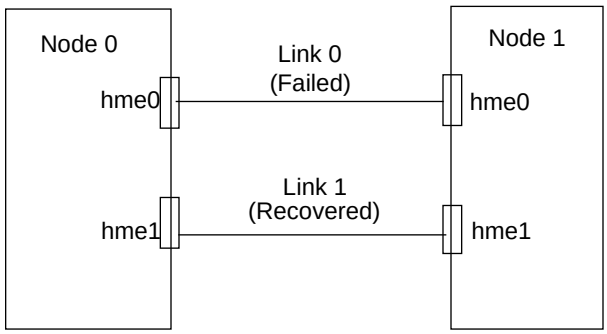


Figure 3-3 Link 0 Failed, Recovered on Link 1

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, software will continue sending 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 hme1 ports of both nodes).**
3. **Connect the Link 0 cable (cable for failed link) between the hme0 port of node 0 and the hme1 port of node 1.**

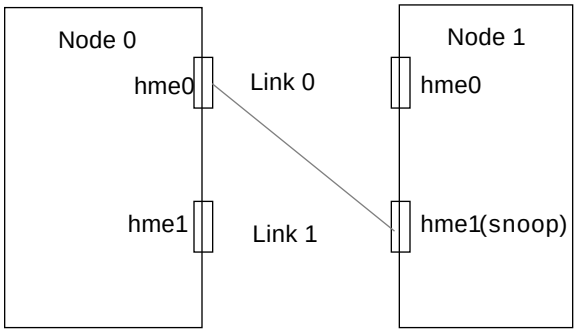


Figure 3-4 Private Network Link 0 Troubleshooting

4. **Use the** snoop **command on node 1 as follows:**

```
# snoop -d hme1
```

5. **If the following string is returned as a result of the** `snoop` **command, then the SBus card for the hme0 port on node 1 is most likely defective. This message string indicates that the hme0 port of node 0 as well as the Link 0 cable are functional.**
   In this instance, request that the system administrator rejoin node 0 to the cluster and then 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.

```
192.100.100.17-> 192.100.100.18 UDP D=5556 S=5556 LEN=120
```

6. **If the preceding string is not returned by the** `snoop` **command, then connect the Link 0 cable between the hme1 ports of both nodes. Following this, use the** `snoop` **command on node 1:**

```
# snoop -d hme1
```

7. **If the message string indicated in step 5 is returned, then the hme0 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.**

3.2.1.2 *Both Nodes Not Running In A Cluster*

1. **Use the** `netstat -i` **command on the** `cconsole` **for each node to determine which private links hme0 and/or hme1 are available.**
   In the following examples, both `hme0` and `hme1` are available on node 0 and node 1.

```
node 0 # netstat -i
Name Mtu   Net/Dest     Address      Ipkts   Ierrs  0pkts    0errs Collis  Queue
hme0  1500 mpk14-092-n   pnode-0-0          642650  0       266563 1     25477   0
hme1  1500 mpk14-092-n   pnode-0-1          642650  0       266563 1     25477   0
```

```
node 1 # netstat -i
Name Mtu   Net/Dest     Address      Ipkts   Ierrs  0pkts    0errs Collis  Queue
hme0  1500 mpk14-092-n   node-1-0          642650 0       266563 1     25477   0
hme1  1500 mpk14-092-n   pnode-1-1          642650  0       266563 1     25477   0
```

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

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

```
node 0 # ifconfig hme0 plumb
node 0 # ifconfig hme1 plumb
node 0 # ifconfig hme0 192.100.100.1 netmask 255.255.255.240 broadcast + - trailers private
up
node 0 # ifconfig hme1 192.100.100.17 netmask 255.255.255.240 broadcast + - trailers private
up
```

b. And, for node 1, enter:

```
node 1 # ifconfig hme0 plumb
node 1 # ifconfig hme1 plumb
node 1 # ifconfig hme0 192.100.100.2 netmask 255.255.255.240 broadcast + - trailers private
up
node 1 # ifconfig hme1 192.100.100.18 netmask 255.255.255.240 broadcast + - trailers 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 output indicates that Link 0 (node 0 hme0 to node 1 hme0) is failing (no entries for hme0 and/or hme1), replace the cable. If the problem still exists then proceed to step 4.**
   If the `netstat -i` command output indicates that Link 1 (node 0 hme1 port to node 1 hme1 port) is failing, replace the cable. If the problem still exists, proceed to step 8.

4. **Connect the hme1 port of node 0 to the hme0 port of node 1 as shown in Figure 3-6.**

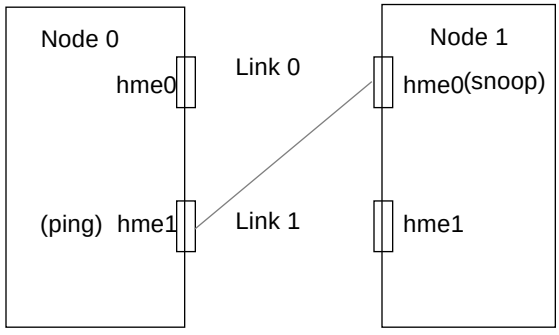


Figure 3-5 Private Network Link 0 Troubleshooting

5. **Use the `ping` and `snoop` commands to check the condition of the interface between the hme1 port of node 0 and the hme0 port of node 1 as shown in the following examples.**

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

```
node 0 # ping -i 192.100.100.17 -s 192.100.100.18
```

For node 1, use the snoop command:

```
node 1 # snoop -d hme0
```

6. If the hme0 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, the use of the snoop command should result in the following message string:

```
node 1 # 192.100.100.17 -> 192.100.100.18 ICMP Echo request
```

7. If the snoop **command succeeds as described previously, then replace the related SBus card for the hme0 port on node 0. If the** snoop **command does not succeed, replace the related SBus card for the hme0 port of node 1.**

8. **Connect the hme0 port of node 0 to the hme1 port of node 1 as shown in Figure 3-6.**

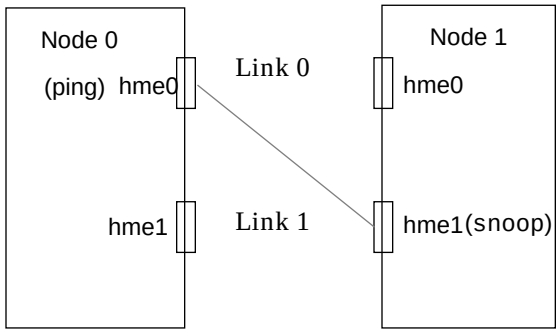


Figure 3-6 Private Network Link 1 Troubleshooting

9. **Use the** `ping` **and** `snoop` **commands to check the condition of the interface between the hme0 port of node 0 and the hme1 port of node 1 as shown in the following examples.**

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

```
node 0 # ping -i 192.100.100.1 -s 192.100.100.2
```

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

```
node 1 # snoop -d hme1
```

10. **If the hme1 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 # 192.100.100.1 -> 192.100.100.2 ICMP Echo request
```

11. **If the** snoop **command succeeds as described previously, then replace the related SBus card for the hme1 port on node 0. If the** snoop **command does not succeed, replace the related SBus card for the hme1 port of node 1.**

3.2.2 Client Net Fault

System console 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.

3.3 Terminal Concentrator and Serial Connection Faults

3.3.1 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 3.3.2.1, “Terminal Concentrator Flow Diagrams” as well as the information contained in the following sections.

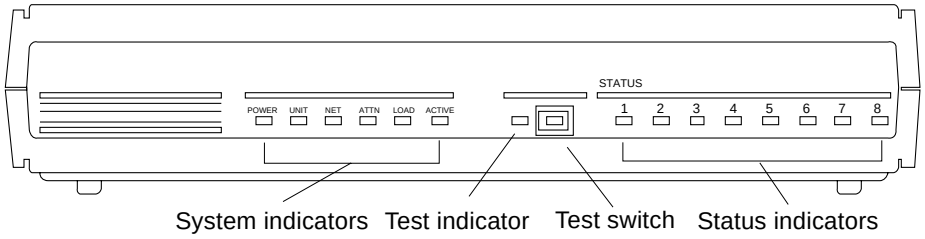


Figure 3-7 Indicator Locations

3.3.1.1 *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 SPARCcluster installation, the indicators should all be OFF. If any status indicator lights, there may be a hardware failure.

After POST has passed, tThe eight status indicators on the terminal concentrator 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.

3.3.1.2 *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
```

3.3.1.3 *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
```

3.3.1.4 *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 cluster 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.

3.3.2 Serial Connections

Isolate serial connections between the terminal concentrator and each node using the troubleshooting flow diagrams in the following Section, “Terminal Concentrator Flow Diagrams.”

3.3.2.1 Terminal Concentrator Flow Diagrams

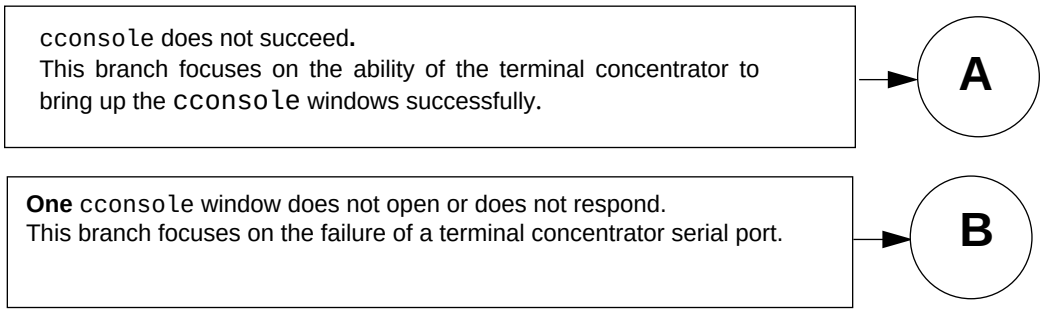


Figure 3-8 Troubleshooting Flow Diagram Overview

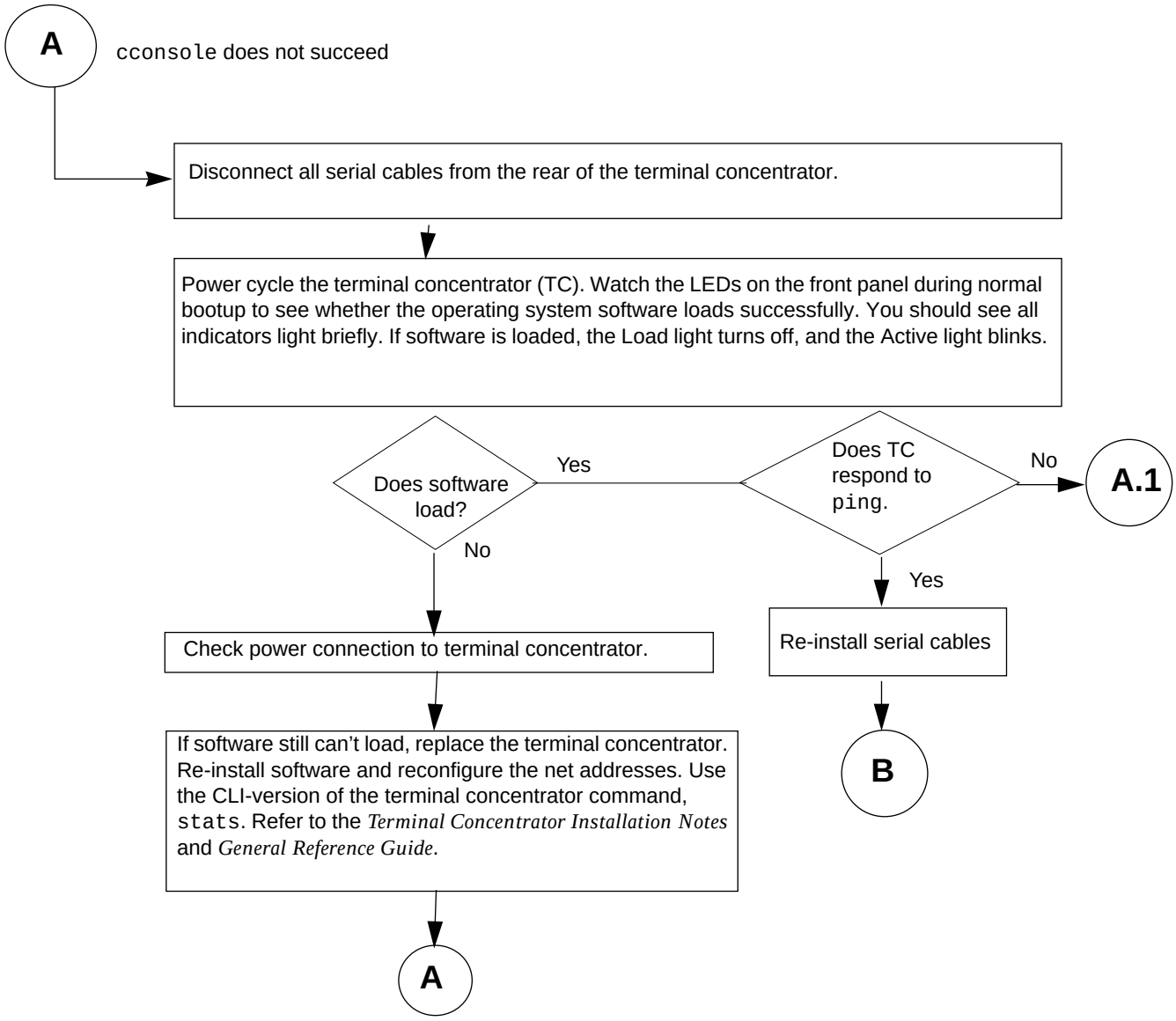


Figure 3-9 Branch A: cconsole Does Not Succeed

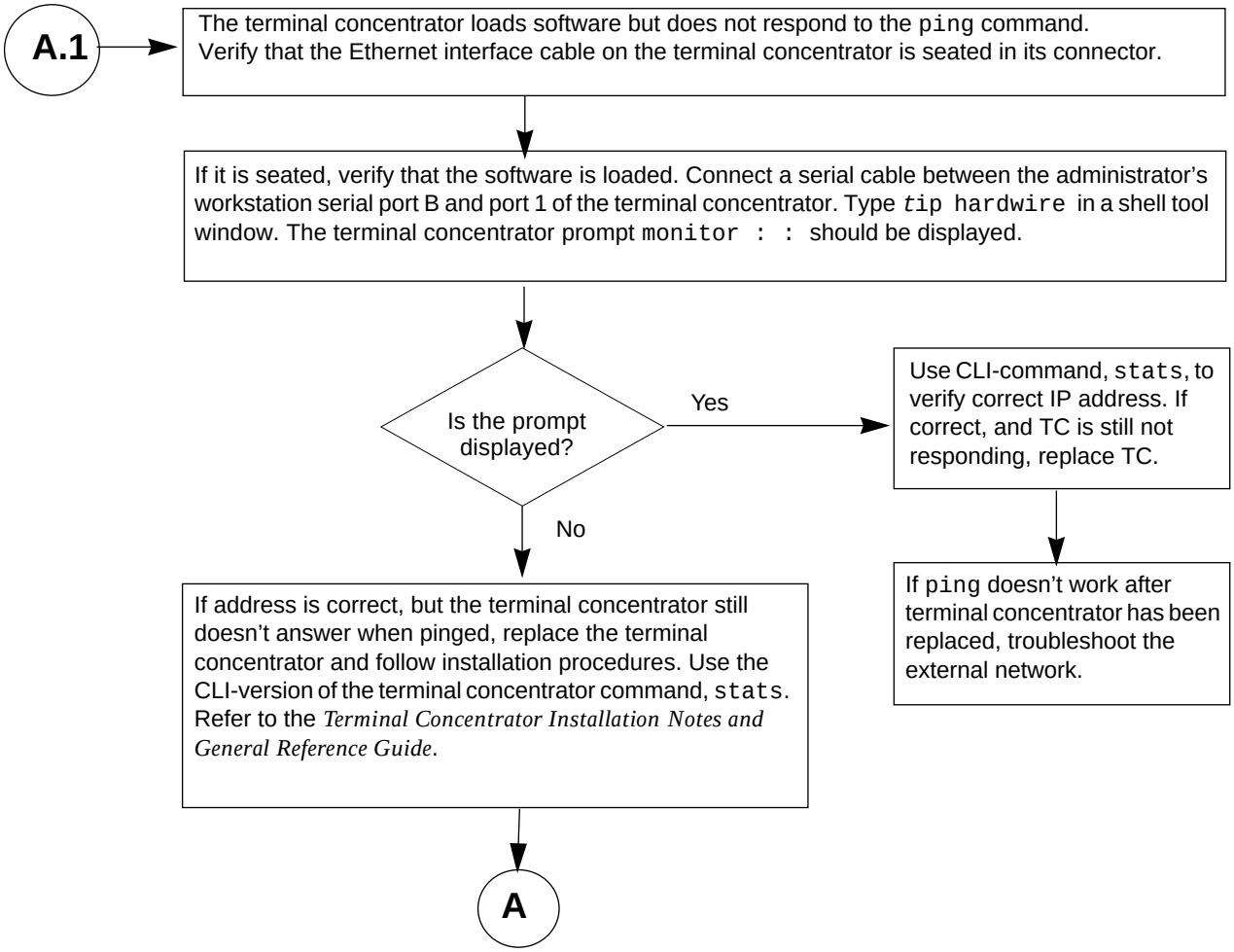


Figure 3-10 Branch A1: Terminal Concentrator Does Not Respond to Ping Command

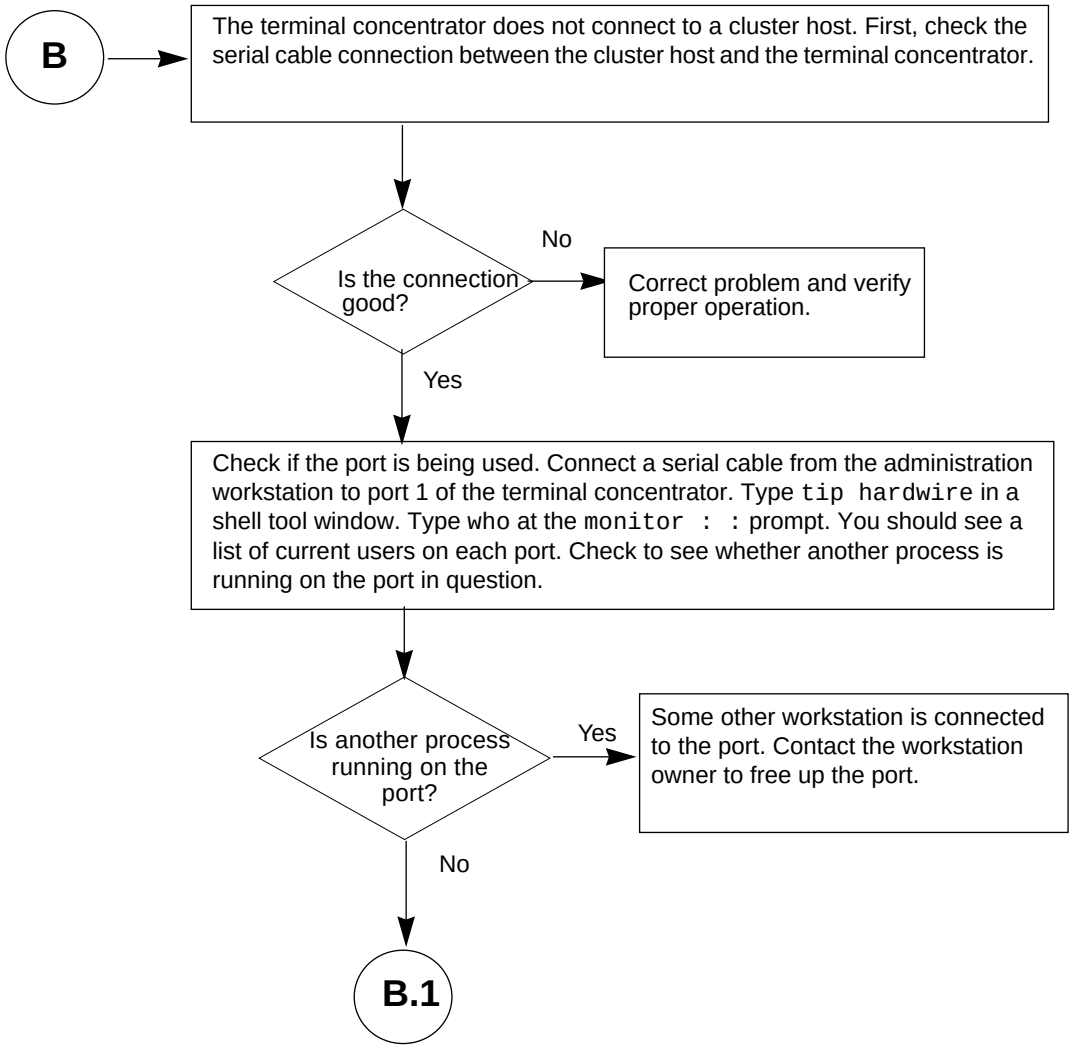


Figure 3-11 Branch B: Terminal Concentrator Cannot Connect to a Host

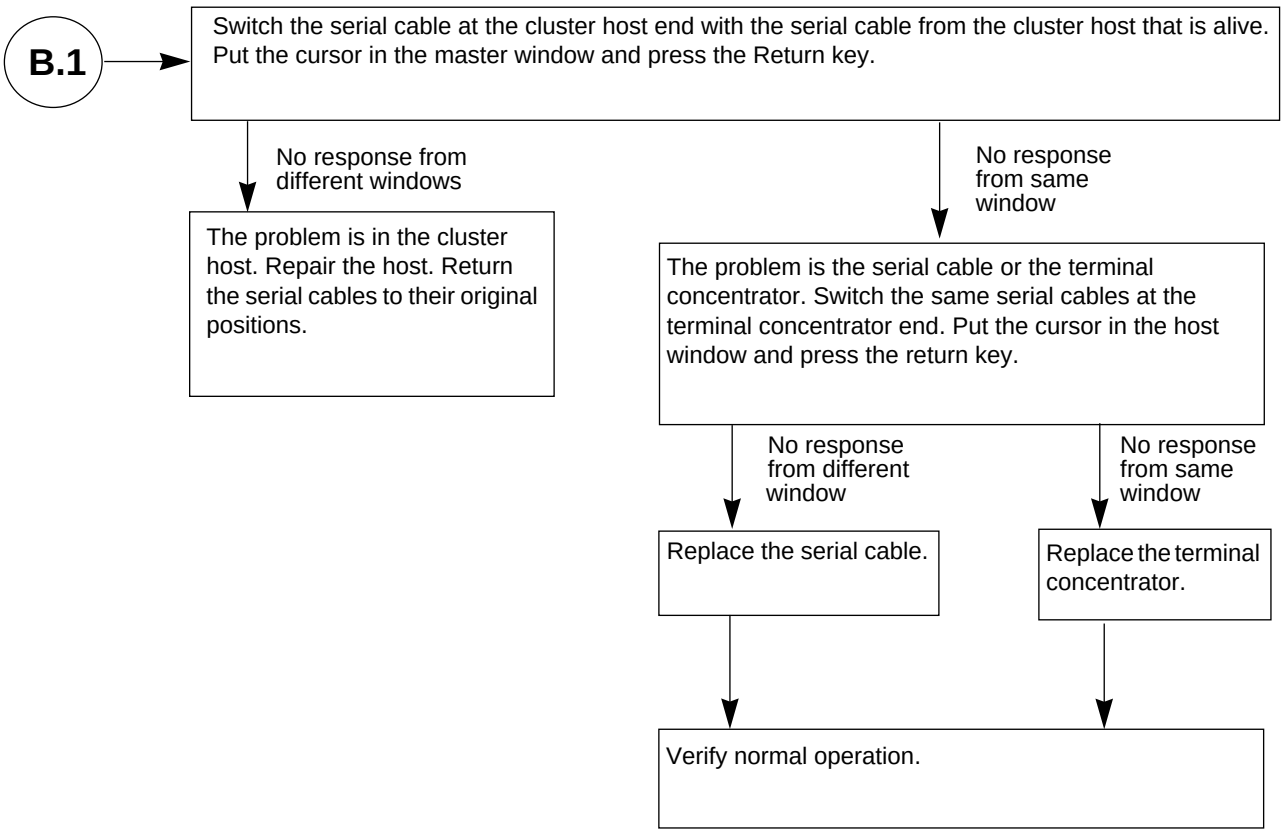


Figure 3-12 Branch B.1: Cconsole Window is Blank orNot Responding

3

Software Troubleshooting 4

For HA clusters refer to the *Solstice HA 1.2 Software Administration 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 *PDB Cluster Software Administration Guide* for information on PDB system software errors as well as system software troubleshooting.

4

Diagnostics 5

5.1 On-Line

SunVT™S is one of the online diagnostics tool for a SPARCcluster based system. See Section 5.4, “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 5.3, “Verifying Hardware Installation.”

In addition, for PDB clusters, you can isolate faults with the Cluster Monitor GUI displays of information and graphics, see Chapter 2, for the applicable (HA or PDB) troubleshooting flow. The following table lists the procedures in this chapter:

5.2 Determining Cluster Status

You can use the Cluster Monitor GUI 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.

5.3 Verifying Hardware Installation

There are four prerequisites:

1. Both nodes have Solaris 2.5.1 installed.
2. Both nodes have SPARCstorage Array package installed.
3. Both nodes have routing table established for the private interconnect.
4. 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
```

3. 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
```

4. **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
```

5. **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
```

6. **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.

7. **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.

8. **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.

9. **Compare the `probe_maps` genArray. 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.

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

5.4 Running SunVTS

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

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.

5

Safety and Tools Requirements 6

6.1 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.

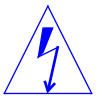
6

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

Table 6-1 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.

6.2 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.

6.3 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 7, “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.

6.4 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)

6

Shutdown and Restart Procedures 7

This chapter gives instructions on performing shutdown and startup tasks for 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.

7.1 SPARCcluster 1000PDB

7.1.1 System Cabinet

Caution – The system cabinet shutdown procedure should be used only in case of a catastrophic failure or to facilitate some types of service; for example, as 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 shut down the system cabinet, request that the system administrator back up the complete system and then bring both nodes down. Once both nodes are down, the system cabinet can be powered off and on as indicated in the following sections:

7.1.1.1 Shutdown

1. **Turn front panel key switch (Figure 7-1) to the Standby position.**

Figure 7-1 Key Switch Positions

2. **Turn AC power off:**
   Turn the AC distribution unit power switch to Off. The switch is at the rear of the cabinet. See Figure 7-2.

Warning – The power must be turned off at the AC distribution unit or there is risk of electrical shock to personnel.

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.

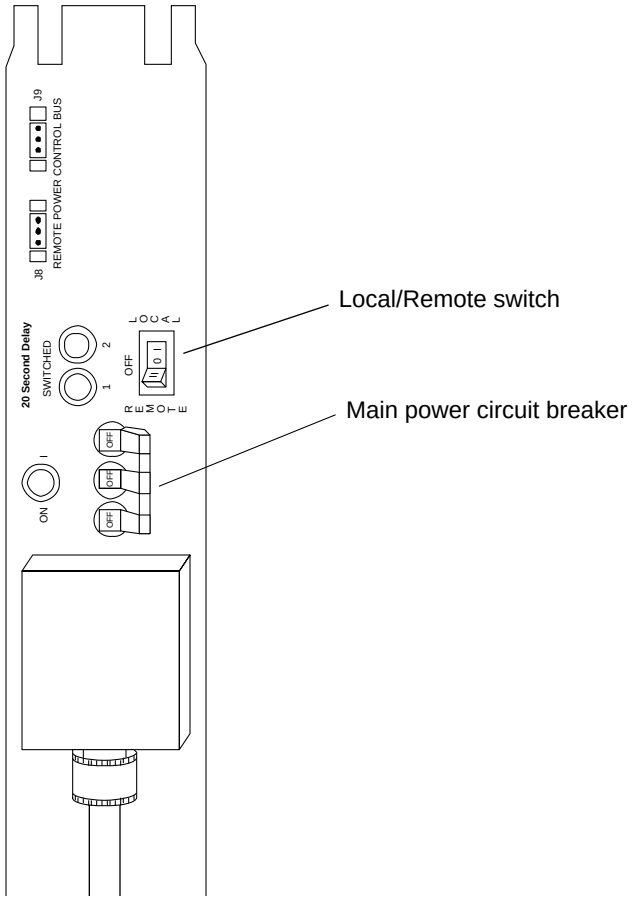


Figure 7-2 AC Distribution Unit Power Switch

7.1.1.2 Startup

1. **Begin with a safety inspection.**
   a. **Ensure the AC power switch on the expansion cabinet rear is off.**
   b. **Verify the power cord is plugged into the correct facilities power outlet.**
2. **Turn the Local/Remote switch to Local.**
   See Figure 7-2.
3. **Turn the AC power switch on the expansion cabinet rear to ON.**
   See Figure 7-2.

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.

4. **Turn the key switch to | (the power-on position).**
   See Figure 7-1. You will hear the fans begin turning.
5. **After the cabinet has been powered on, request that the system administrator return the system to high availability.**

7.1.2 Processor

Before turning off the processor power, request that the system administrator remove the processor for the node from the cluster. Once the node has been removed from the cluster, then the processor can be shut down or started as indicated in the following procedures.

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

7.1.2.1 Shutdown

To shut down the system and give users a shutdown warning:

1. **Back up the system files and data to tape, if necessary.**
2. **Notify users that the system is going down.**
3. **Halt the system using the appropriate commands.**
4. **Wait for the system-halted message and the boot monitor prompt.**
5. **Turn the key switch on the front panel of the server to the Standby position (fully counterclockwise).**
   See Figure 7-3.

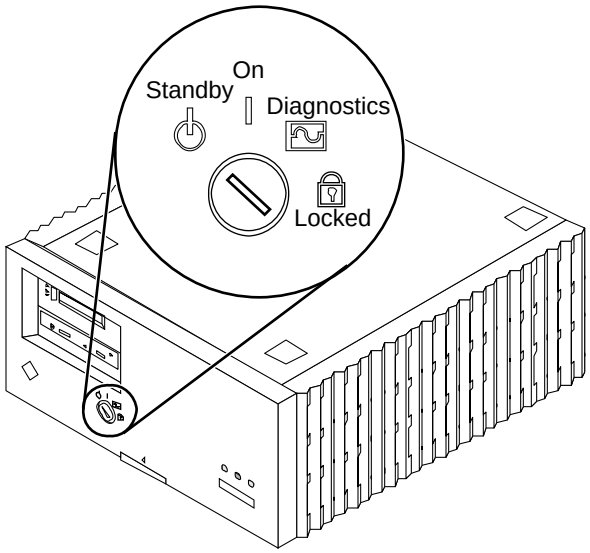


Figure 7-3 Key Switch in the Standby Position

6. **Turn the AC power switch on the system back panel to off.**
   See Figure 7-4.

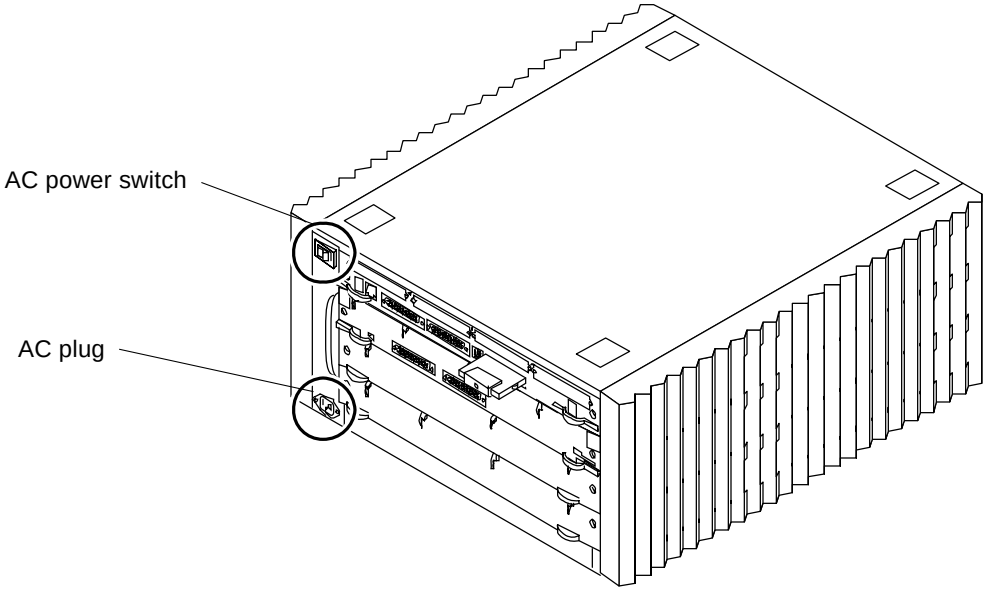


Figure 7-4 Processor AC Power Switch and Plug

7.1.2.2 Startup

1. **Begin with a safety inspection of the system.**
   a. **Ensure the key switch on the front panel is in the Standby position.** See Figure 7-3.
   b. **Ensure the AC power switch on the system rear is off.**
   c. **Verify the power cord is plugged into the server and a wall socket.**
2. **Turn on the TTY terminal.**
3. **Turn on the AC power switch on the rear panel.**
4. **Turn the key switch to the On position.**
   See Figure 7-5. You should see and hear several things happen:
   - Fans begin turning.
   - The left front panel LED (green) turns on immediately to indicate the DC power supply is receiving current.

- The middle front panel LED (yellow) lights while POST runs for approximately 60 seconds. After 60 seconds, this LED turns off if the tests do not fail. If the LED remains lighted after 60 seconds, a test has failed.
- The right front panel LED (green) lights to show that booting is successful and the operating system is running. If this LED does not turn on and the middle LED is on, a severe hardware fault exists.

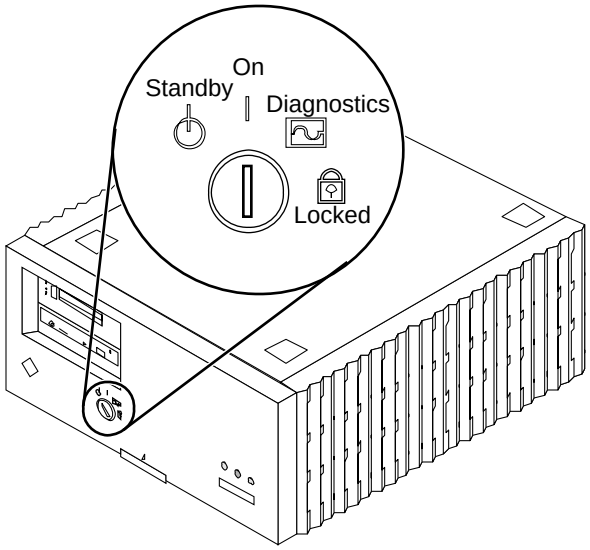


Figure 7-5 Key Switch in On Position

Warning – 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.

5. **Watch the terminal screen for possible error messages from the POST diagnostic program.**
   POST tests subassemblies in the server and some interface paths between subassemblies.

   At the conclusion of testing, POST automatically attempts to reconfigure the system, omitting any parts of the system that have failed diagnostics.

   If there are no faults, or if POST completes a successful reconfiguration of the detected faults, the system boots.

If you wish to run diagnostics again, or if the system hangs, you need to press the reset switch behind the front panel.

1. **To reach and activate the reset switch:**

   a. **Remove the key from the key switch.**

   b. **Remove the front panel. Lift up on the latch at the bottom of the panel.** The top of the front panel rests in a grooved channel on the system top front edge. Once the bottom latch is opened, the front panel lifts off. See Figure 7-6.

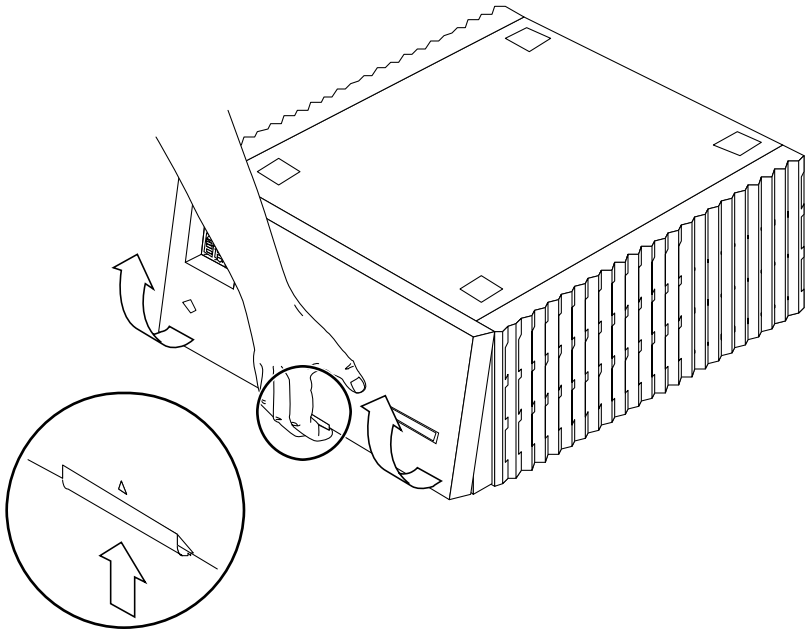


Figure 7-6 Removing the Front Panel

2. **Insert the back of a pencil or other narrow object into the small opening in the center of the metal face plate and press the reset button.** See Figure 7-7.

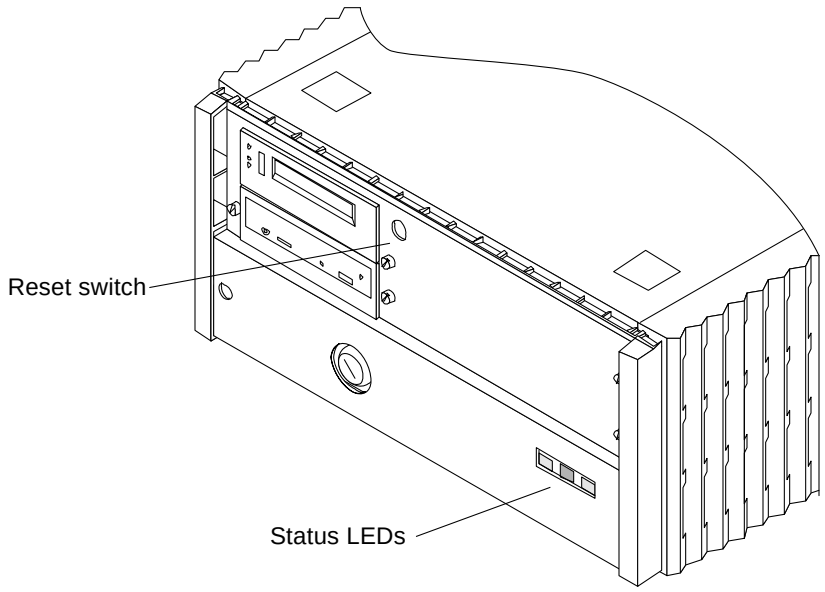


Figure 7-7 Reset Switch (Behind the Front Panel) and Front Panel Status LEDs

3. **After the system is reset, replace the front plastic panel.**
   Rest the top of the front panel in the grooved channel on the top panel. Push in on the lower portion of the front panel until it snaps back into place.

4. **Return the key to the key switch.**

Warning – Once the system is started, do not move or attempt to move the chassis with system power on. Failure to heed this caution may result in catastrophic disk drive failure. Always power the system off completely before attempting a move.

5. **Once the previous steps have been accomplished, request that the system administrator rejoin the node to the cluster.**

7.1.3 SPARCstorage Disk Arrays

The disk arrays for the database in SPARCcluster PDB systems are comprised of 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, either the Model 200s or 210s, 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.

7.1.3.1 SPARCstorage Array Model 100 Series

A Model 100 Series SPARCstorage Array contains three drive trays, each tray contains ten drives, see Figure 7-8. To replace a single drive or a single drive tray within a SPARCstorage Array, it is not necessary to power down the SPARCstorage Array, together with all drives. Instead, shut down only the drive tray or the tray containing the drive to be replaced as described in Section , “Single Drive and Tray Shutdown”.

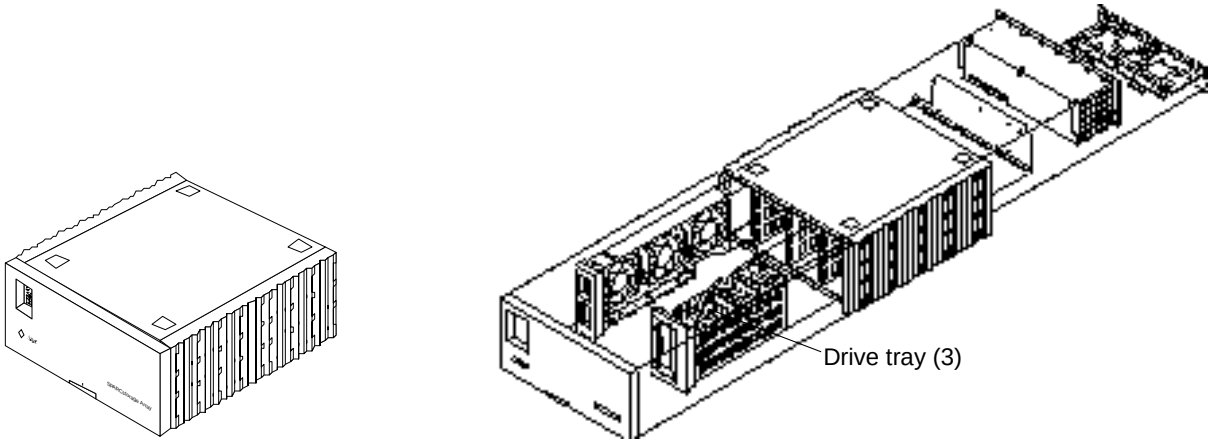


Figure 7-8 SPARCstorage Array Model 100 Series

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 off all drive trays in the array, turn off the AC power switch on the rear of the SPARCstorage Array 100 Series chassis.**
   See Figure 7-9.

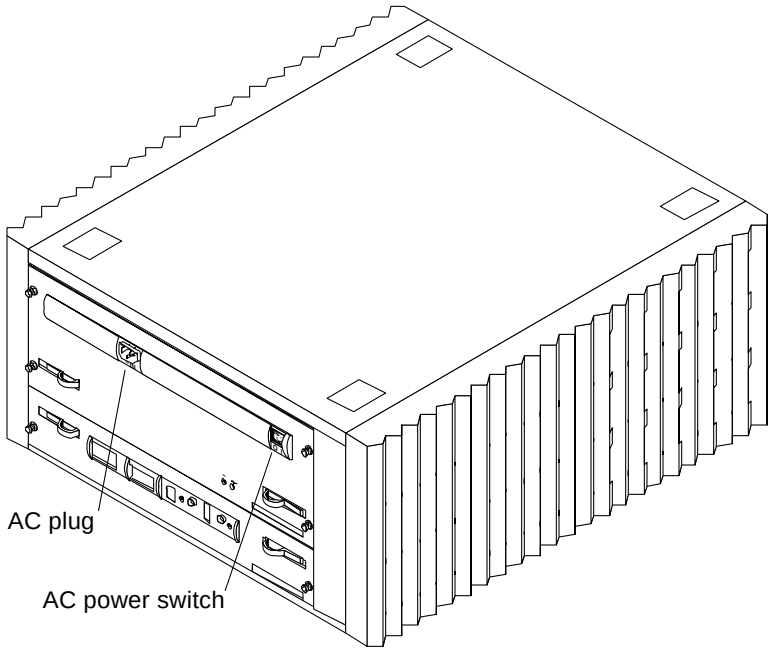
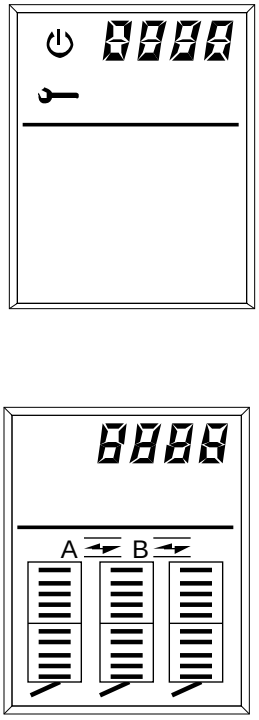


Figure 7-9 SPARCstorage AC Power Switch and AC Plug

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 that the power cord is plugged into the chassis and a wall socket. See Figure 7-9.
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 7-10.



- 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 Section 3.1.4, “SPARCstorage Array Communication Fault” for a listing and explanation of POST errors.

- 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 7-10 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 restart all drive trays within the array and then rejoin the node to the cluster.**

Single Drive and 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.**

Single Drive and 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.**

7.1.3.2 *SPARCstorage Array Model 200 Series*

There are two types of disk trays used with Model 200 Series SSAs, see Figure 7-11. 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 unit contains up to seven disk drives, each 9-Gbyte drive tray contains up six drives.

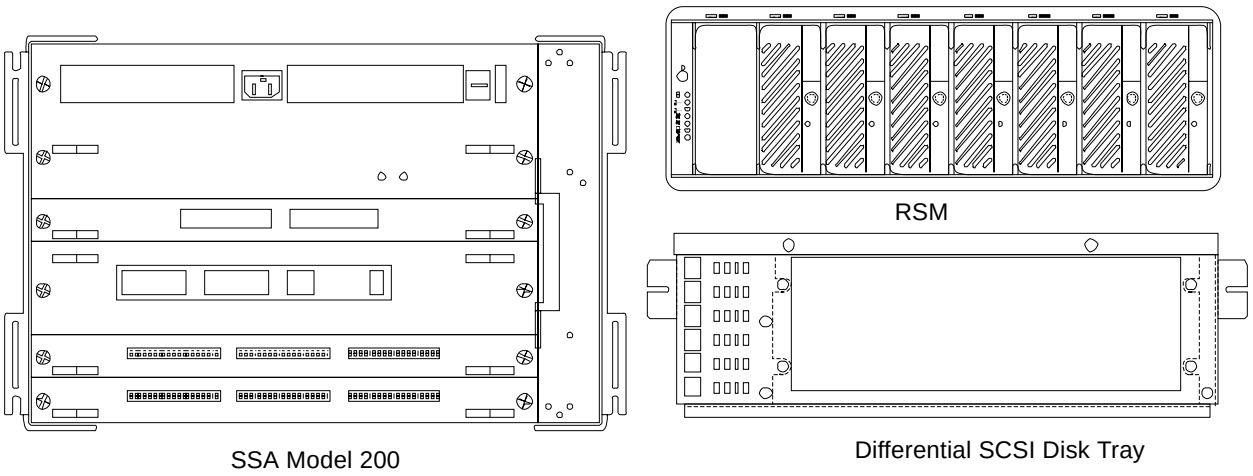


Figure 7-11 SPARCstorage Array Model 2000 Series (Controller and Disk Trays)

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 unit or 9-Gbyte tray, without shutting down the complete array, proceed to the Section , “Single Drive and Tray Shutdown.”

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 off a SPARCstorage Array Model 200, 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 on the RSM 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 7-12.

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

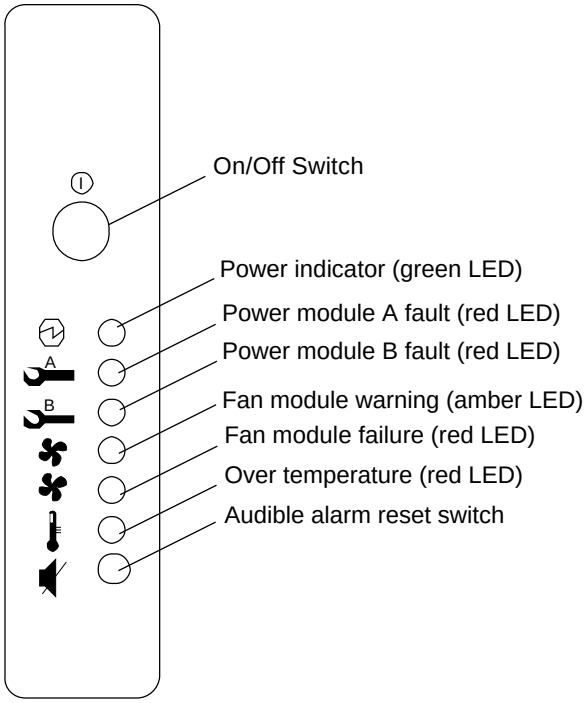


Figure 7-12 SPARCstorage RSM Operator Panel

Complete Array Startup

1. **Verify that the power cord from the expansion cabinet socket is connected into the SPARCstorage Array power supply.**
   See Figure 7-13.

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 7-13.

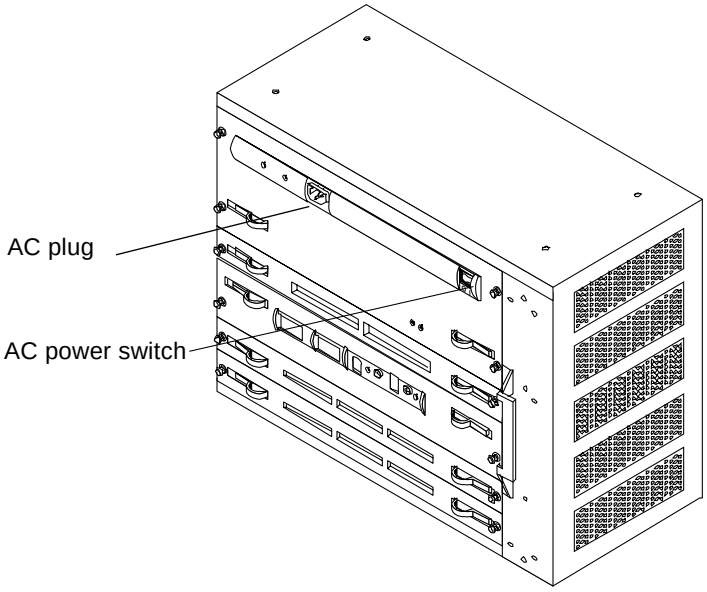


Figure 7-13 SPARCstorage Array Model 200 Series Power Supply Switch

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 7-13 on page 7-18.**
   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.**

Single Disk and Tray Shutdown

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 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 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, shut down 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.**

Single Disk and Tray Startup

RSM

1. **Position the Power On/Off switch on the RSM operator panel to On and verify the following:**
   See Figure 7-12 on page 7-17.

- 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. **Connect 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), then blink while the drive is spinning up, and finally light up for each installed drive.** See Figure 7-14.
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.**

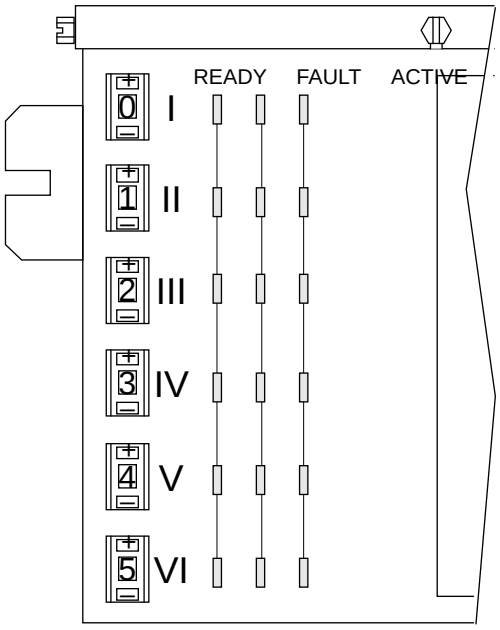


Figure 7-14 LEDs for Differential SCSI Tray

7.1.4 Terminal Concentrator

To power the terminal concentrator on or of, use the power switch on the back panel as depicted in Figure 7-15.

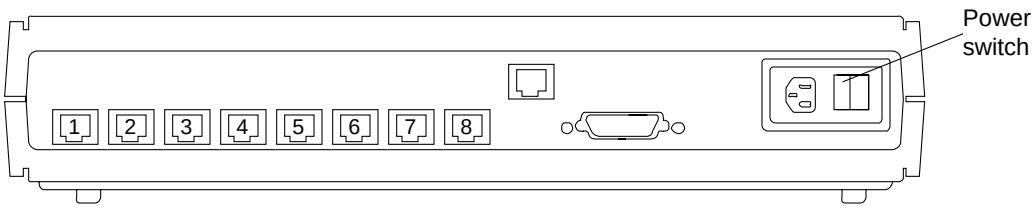


Figure 7-15 Terminal Concentrator (Rear View)

7.2 SPARCcluster 2000PDB

7.2.1 System Cabinet

Caution – The system cabinet shutdown procedure should be used only in case of a catastrophic failure or to facilitate repair; for example, as 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 an down or start up.

Before you shut down the system cabinet, request that the system administrator back up the complete system and then bring both nodes down. Once both nodes are down, the system cabinet can be powered off and on as indicated in the following sections:

7.2.1.1 Shutdown

1. **Turn the front panel key switch to ⏻ (the Standby position).**
   See Figure 7-16.
2. **Turn the AC distribution unit power switch to Off.**
   The unit is at the rear of the cabinet. See Figure 7-17.

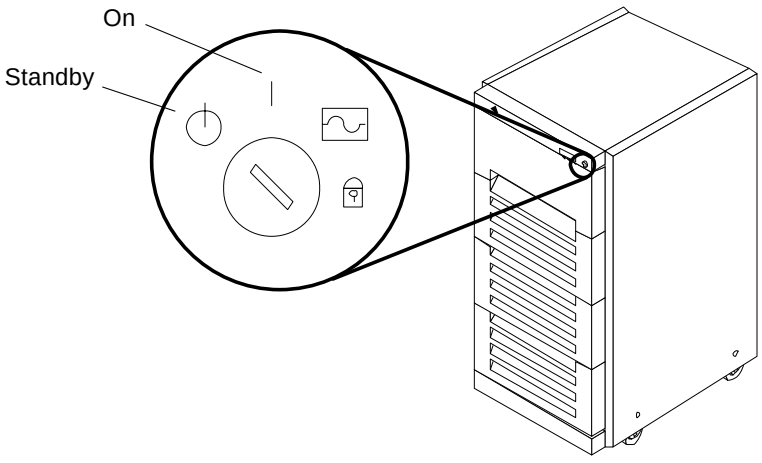


Figure 7-16 Key Switch Positions

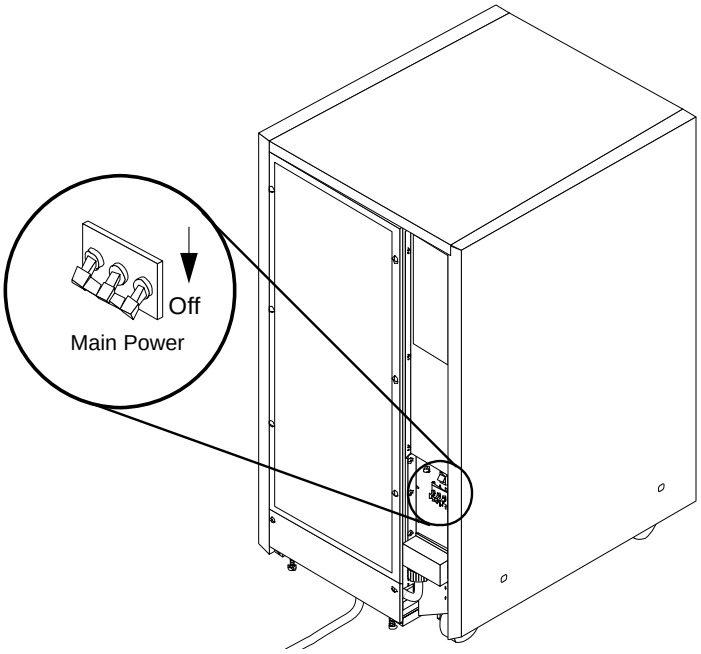


Figure 7-17 AC Distribution Unit Power Switch

7.2.1.2 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 startup. Refer to the *SPARCcenter 2000 Installation* manual for terminal settings.

1. **The system key switch must be turned to ⏻ (the Standby position).**
   See Figure 7-16 on page 7-22.
2. **Turn the Local/Remote switch down, to Local. See Figure 7-18.**
3. **Turn on the power switch on the AC distribution unit.**
   See Figure 7-17 on page 7-23.

4. **Turn on power to the terminal.**

5. **Turn the key switch to | (the power-on position). See Figure 7-16.**
   Several things will happen:

   - The DC-powered blower fan in the top of the cabinet begins turning.
   - 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) lights after POST has ended to show that booting is successful.
   - The terminal beep indicates that the system is ready.
   - The terminal screen lights up upon completion of the internal self test.

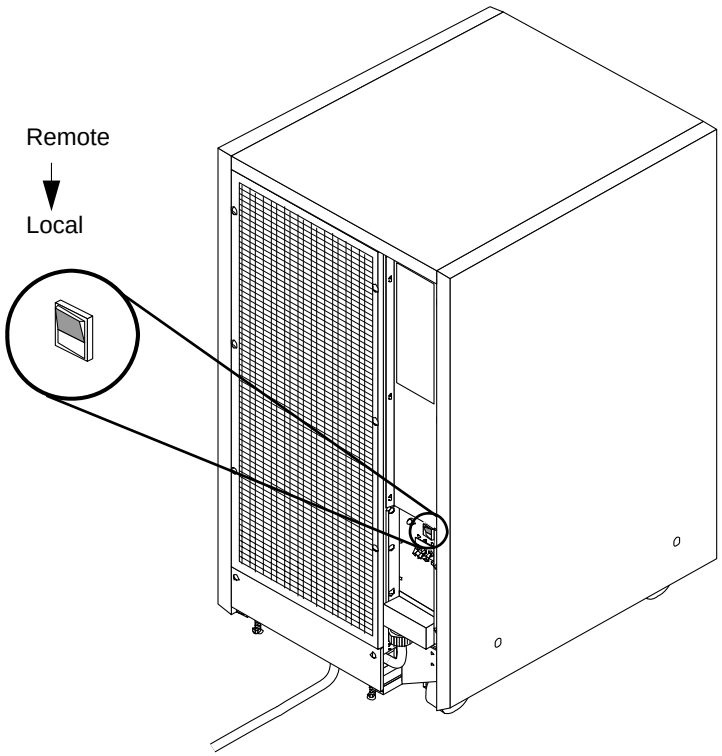


Figure 7-18 Local/Remote Switch Location

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

6. **Watch the terminal screen for any POST error messages.**
   At the conclusion of testing, POST automatically configures the system, omitting any devices that have failed diagnostics. After POST ends, the system will boot using the new configuration.

   If the middle front panel LED remains lit after the system has booted, the system has failed POST.

Note – POST does not test drives or internal parts of SBus cards. To test these devices, run OpenBoot™ PROM (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 back of the front panel.**
   See Figure 7-19.

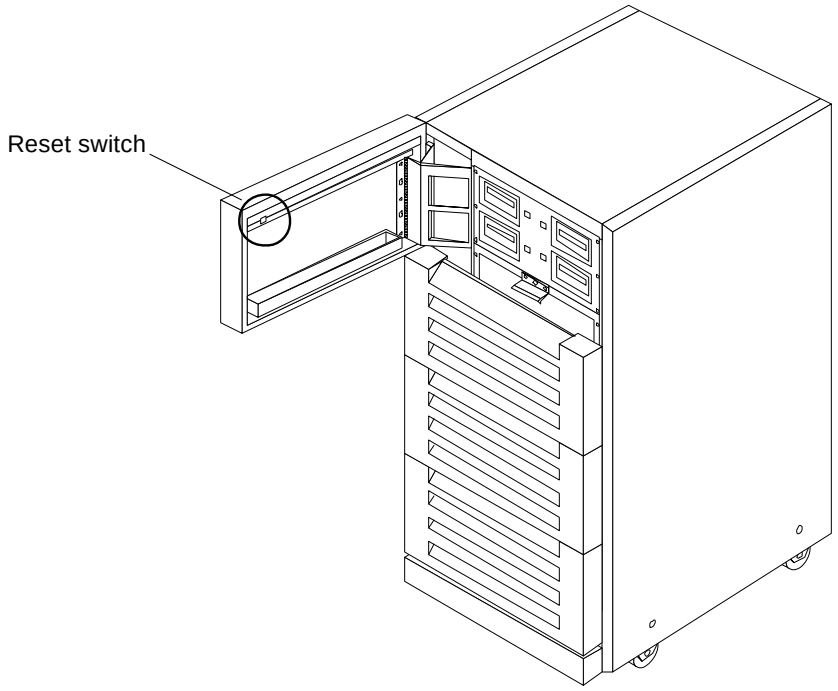


Figure 7-19 System Reset Switch

8. **After the cabinet has been powered on as described in previous steps, power on individual components as directed in the jump table at the beginning of this chapter.**

9. **Once the system cabinet and individual components have been powered on, request that the system administrator return the system to high availability.**

7.2.2 Processor Shutdown and Startup

You can power off a SPARCcluster 2000PDB processor without powering off the associated SPARCstorage Arrays.

1. **Request that the system administrator remove the node for the processor from the cluster and then halt the operating system.**

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

2. **Notify users that the system is going down.**
3. **Halt the system using the appropriate commands.**
4. **Wait for the system-halted message and the boot monitor prompt.**

Caution – Do not use the key switch to power off the system for service.

5. **See Figure 7-20 and remove the Power Supply cover by loosening six screws (it is not necessary to remove the screws).**
   Lift the panel and pull it to the rear.
6. **See Figure 7-20 and position the Local/Remote switch on the AC distribution unit to the LOCAL position.**
   If it is in the remote position, the AC distribution unit and the SPARCstorage Arrays will power off, due to a sensing circuit, when the Power Supply is disconnected.
7. **Disconnect the power cord from the rear of the Power Supply. The logic bay and main blower will power off.**
   You may now service the logic bay as described in the *SPARCcenter 2000 Service Manual*.

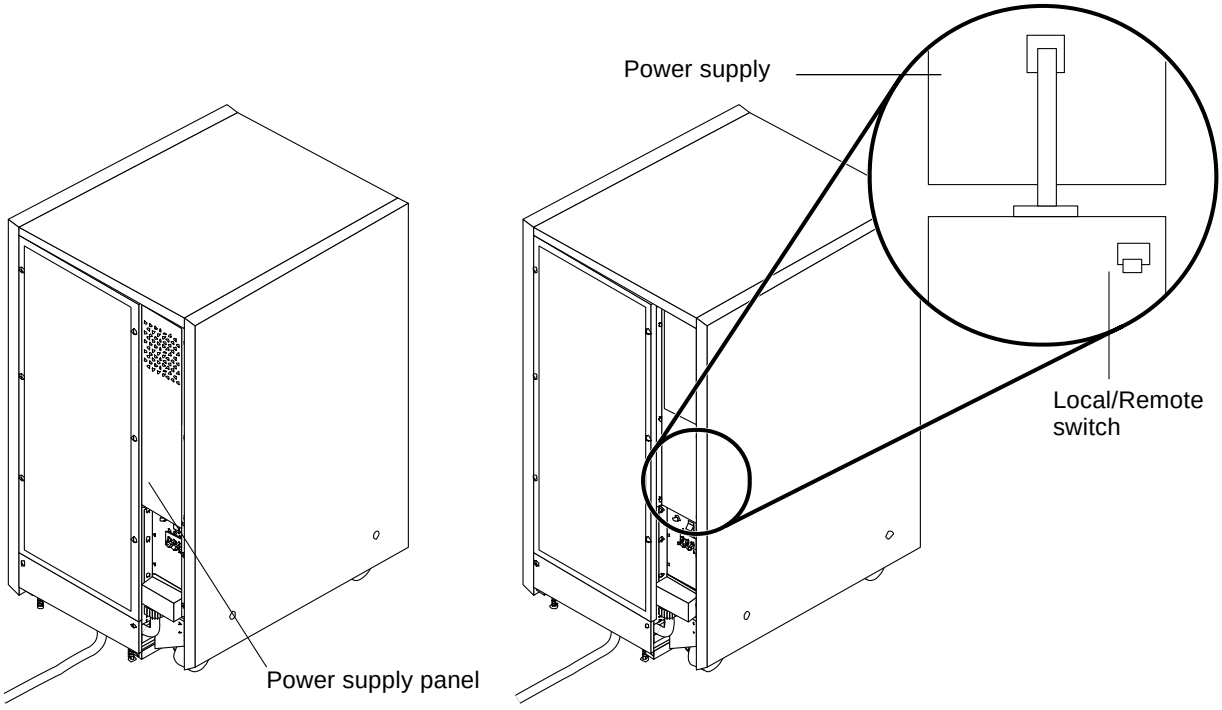


Figure 7-20 Power Supply Cable Location

8. **To restore power, connect the power cord into the Power Supply and then replace the Power Supply cover.**
   Several things will happen:

   - The DC-powered blower fan in the top of the cabinet begins turning.
   - 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) lights after POST has ended to show that booting is successful.
- The terminal beep indicates that the system is ready.
- The terminal screen lights up upon completion of the internal self test.

9. **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 boots using the new configuration.

   If the middle front panel LED remains lit after the system has booted, the system has failed POST.

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

---

10. **To start POST again, or if the system hangs, press the reset switch on the back of the front panel.**
    See Figure 7-7.

11. **Once the previous steps have been accomplished, request that the system administrator rejoin the node to the cluster.**

7.2.3 SPARCstorage Disk Arrays

Same as that described for the SPARCserver 1000PDB system, see Section 7.1.3, “SPARCstorage Disk Arrays.”

7.2.4 Terminal Concentrator

To power the terminal concentrator on or off use the power switch on the back panel as depicted in Figure 7-15.

7

Internal Access 8

This chapter provides procedures for

- Removing panels from the two cabinet types
- Leveling the cabinets

8.1 Removing System and Expansion Cabinet Panels

Note – Power must be turned off before removing panels. For powering off and on procedures, see Chapter 7 “Shutdown and Restart Procedures.”

Cabinet outer panels are shown in Figure 8-1 through Figure 8-4.

Note – The front panels on all cabinets remove in the same way with the following exception: the hinged front panel is absent on the expansion cabinet and SPARCcluster 1000PDB cabinet. Instead, there is a vented front panel.

8.1.1 Opening the Hinged Door (SPARCcluster 2000PDB)

1. **Grasp the door at the upper-right corner and pull towards you firmly.**
   See Figure 8-1. The door is secured by clips and ballstuds at the side opposite of the hinge. The door is released and swings open if pulled firmly.

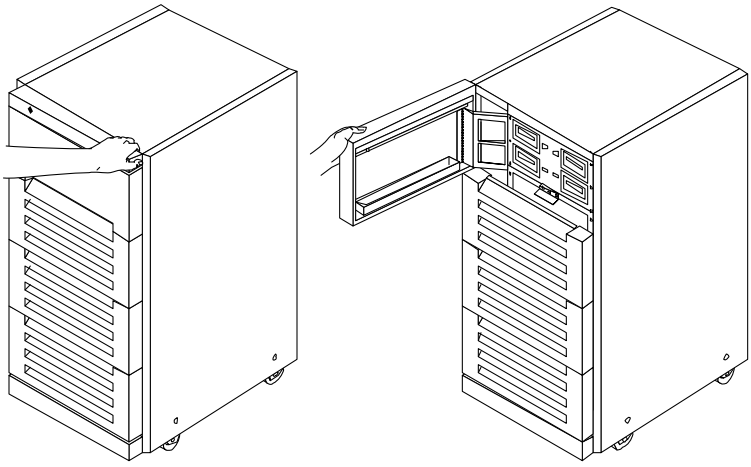


Figure 8-1 Opening the Hinged Door — System Cabinet

8.1.2 Vented Front Panels (SPARCcluster 2000PDB or SPARCcluster 1000PDB)

The three vented front panels remove in the same manner. They are retained by chassis-mounted ball studs that mate with catches on the rearside of the panel.

Caution – Do not remove the vented front panels by twisting off. Such action may break the panel or fasteners. Always support the panels during removal and replacement.

To remove the panels:

1. **Grasp the panel under the vent on one side and pull out far enough to just disengage the ball studs.**
   See Figure 8-2.

2. **Repeat this procedure on the other side of the vent to disengage and remove the panel. Set the panel aside.**

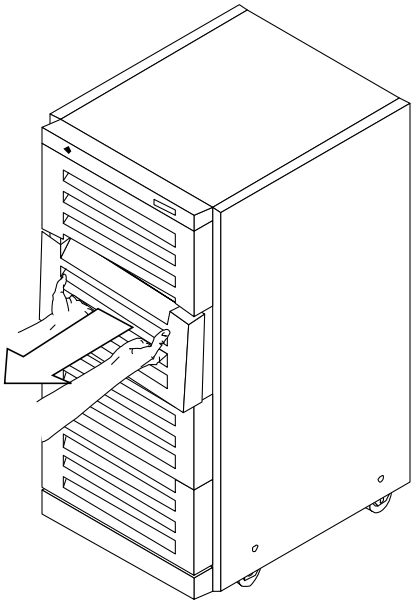


Figure 8-2 Removing the Vented Panels

To replace a panel:

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

8.1.3 *Rear Screen Panel*

To remove the rear screen panel:

1. **Remove the two #10 Phillips screws securing the panel to the frame.** See Figure 8-3.
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.

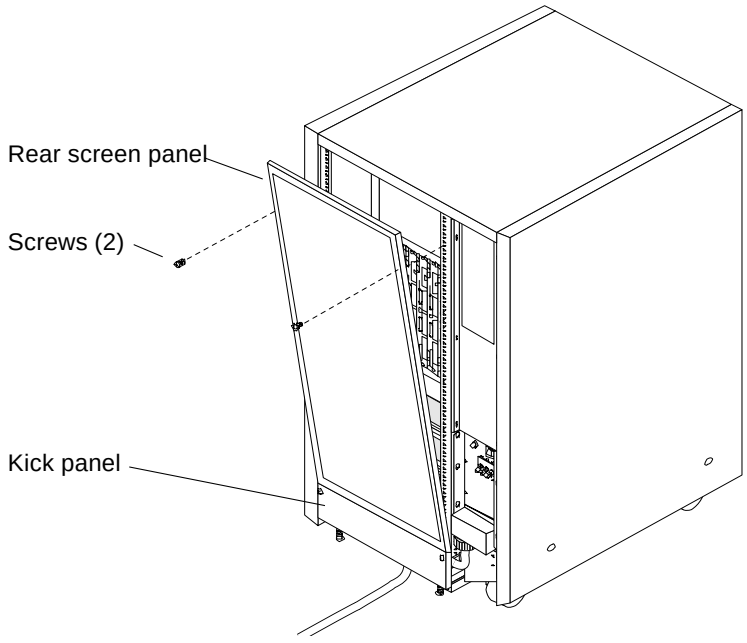


Figure 8-3 Rear Screen Panel Removal

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 using Phillips screws.**

8.1.4 Kick Panel

To remove the kick panel:

1. **Loosen the two captive screws. See Figure 8-4.**

To replace the kick panel:

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

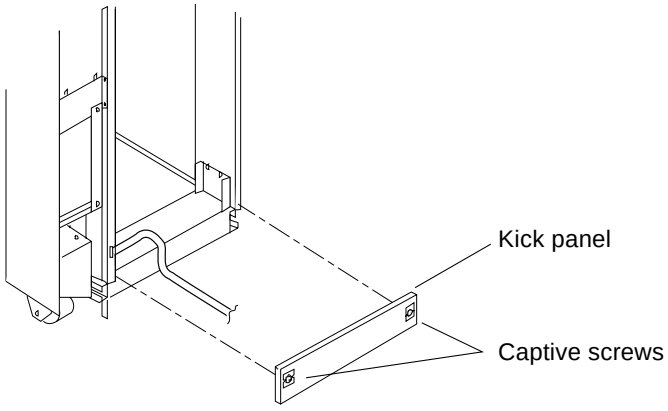


Figure 8-4 Removing the Kick Panel

8.1.5 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. **Grasp the stabilizer bar under the front edge and pull it out to its fully extended position. See Figure 8-5.**

2. **Screw the two stabilizer bar leveling pads down until they are 3 to 6 mm (1/8 to 1/4 inch) *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.

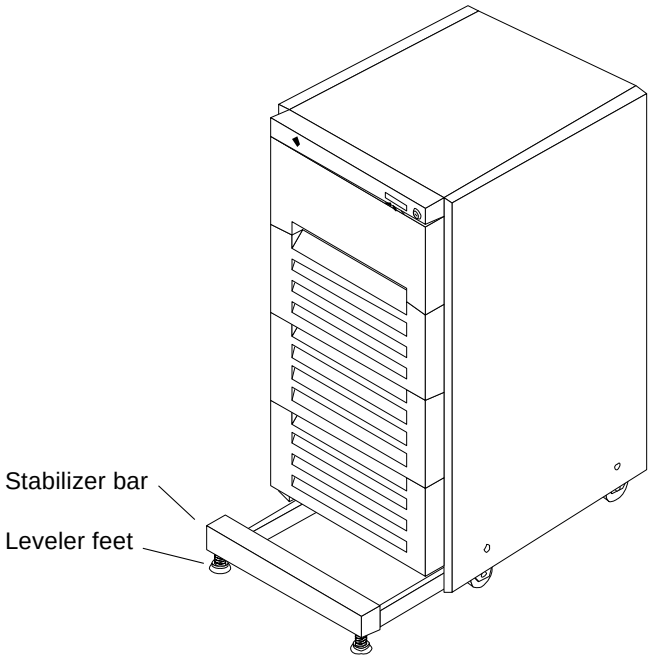


Figure 8-5 Stabilizer Bar

8.2 Leveling the Cabinets

This procedure requires that the screen panel and kick panel be removed. See Section 8.1.3, “Rear Screen Panel,” and Section 8.1.4, “Kick Panel.”

1. **Remove the leveling wrench, located inside the cabinet:**
   Locate the leveling wrench in the upper part of the rack. Unlock the tie wrap and remove the wrench. Press the tie wrap tabs together to loosen the strap.

2. **Remove the kick panel.**
   The kick panel is held by two captive screws.

3. **Use the wrench to lower the four main leveling pads (not the pads on the stabilizer bar).**
   See Figure 8-6. The four main leveling pads are located near the corners of the cabinet. Lower the pads until all four wheels are off the floor.

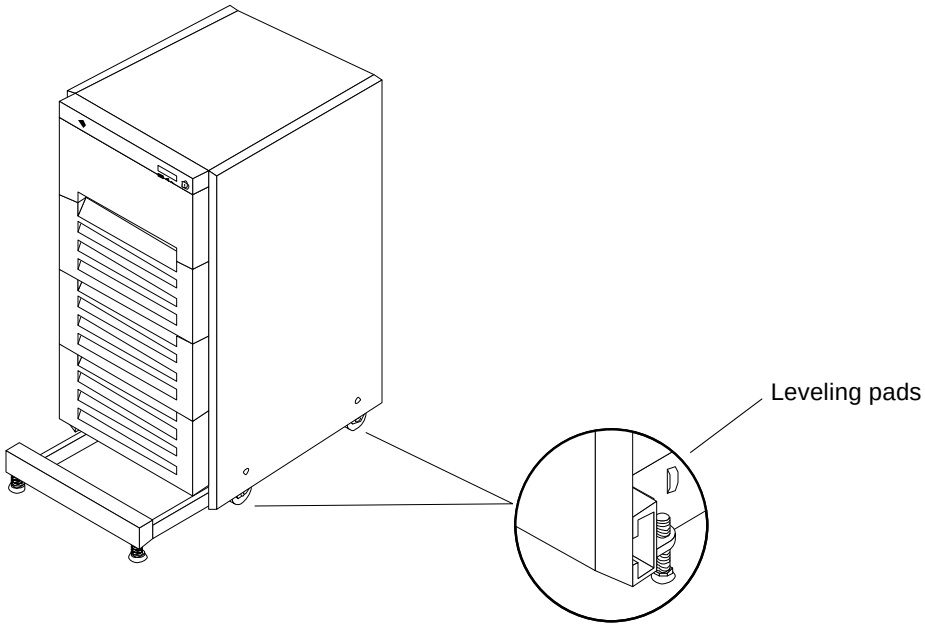


Figure 8-6 Main Leveling Pads

4. **Adjust the two leveling pads on the stabilizer bar:**

   a. **Fully extend the stabilizer bar.**
      See Figure 8-7.

   b. **Screw the pads down until they almost touch the floor.**
      Leave approximately 6 mm (1/4-inch) clearance between the pads and floor. This clearance will prevent tilting of the cabinet, and yet allow you to easily extend or retract the stabilizer bar.

   c. **Slide the stabilizer bar back into the cabinet.**

5. **Restore the wrench to its storage place in the rack.**

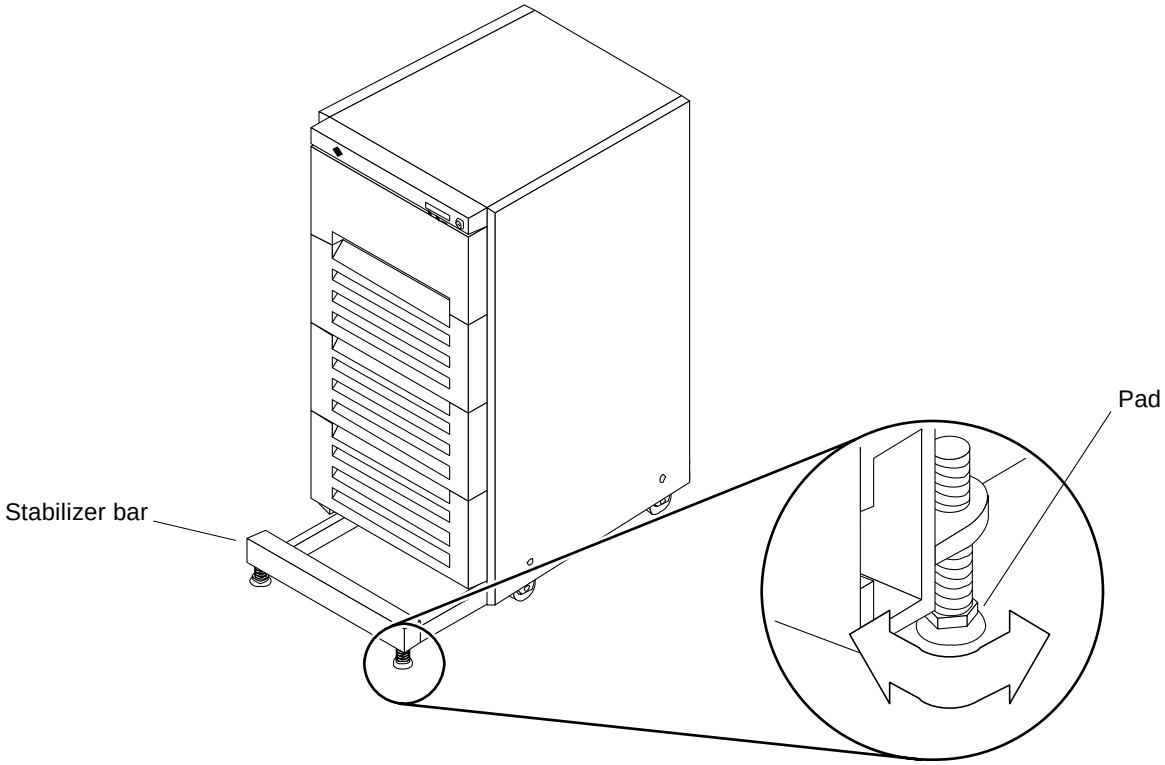


Figure 8-7 Stabilizer Bar Leveling Pads

8.3 Optional Panel Removal

Note – Removing the side panels is not normally required for installation.

To remove the side panel:

1. **Loosen two slot-head captive screws near the panel base.**
   See Figure 8-8.
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.

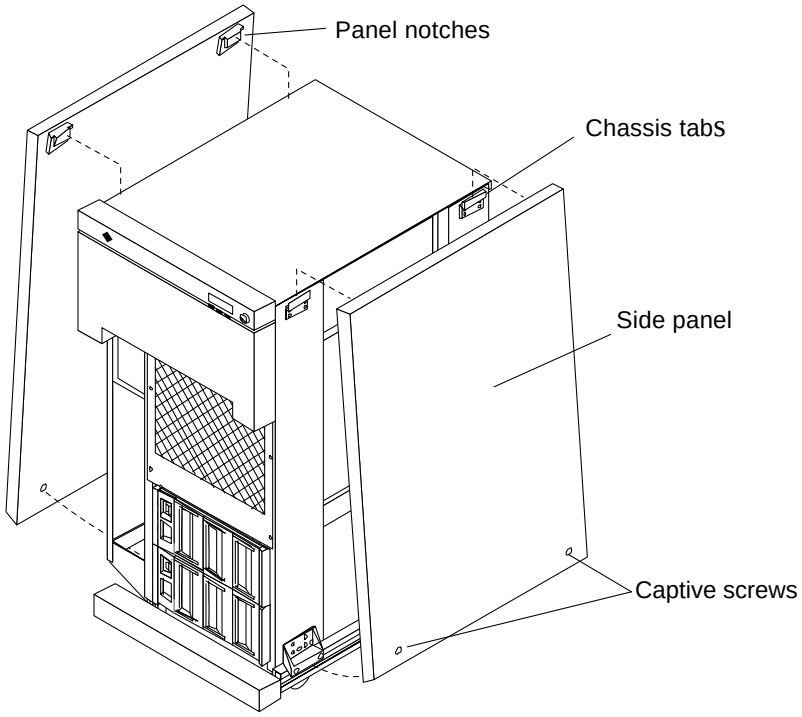


Figure 8-8 Removing the Side Panels

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.**

8

Major Subassembly Replacement 9

This chapter supplies the information necessary to remove and reinstall the replaceable parts for SPARCcluster systems. There are several different system configurations depending upon the processor type and the manner in which the system components are mounted. A SPARCcluster 1000 system can be customer-assembled or rack-mounted. A SPARCcluster 2000 system is rack-mounted only. The contents of this chapter are as follows:

9

9.1 SPARCcluster 1000

9.1.1 System Board and Components

1. **Shut the processor down as described in Chapter 7, "Shutdown and Restart Procedures."**
   Once the processor has been shut down, remove and replace a system board or any replaceable part on the system board by following the procedures described in Chapter 11 of the *SPARCserver 1000 System Service Manual*.

Note – The skins of the SPARCcluster 1000 processors will not be on in rack-mounted, factor-assembled systems.

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2. **After a part or system board has been replaced, power on the processor as indicated in Chapter 7, "Shutdown and Restart Procedures."**

9.1.2 SPARCstorage Arrays

Two series of disk arrays are used in SPARCcluster 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. The SPARCstorage Array Model 100 series has the controller and disk drives mounted within a single chassis. 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.

Note – When replacing parts in a SPARCcluster 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 7 as directed in the following sections.

9.1.3 SSA Model 100 Series

9.1.3.1 Trays, Disk Drives, and Major Subassemblies

1. **Shut the disk tray down as described in Chapter 7, "Shutdown and Restart Procedures."**

2. **Replace defective component as described in Chapter 5 of the *SPARCstorage Array Model 100 Series Service Manual.***
   This 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
- Fiber-optic cables
- Disk drive trays (3)
- Disk drives in the drive trays

3. **Restart the disk tray as described in Chapter 7, "Shutdown and Restart Procedures."**

9.1.4 SSA Model 200 Series

9.1.4.1 SSA Controller Chassis

1. **Shut down the SSA as described in Chapter 7, "Shutdown and Restart Procedures."**

2. **Replace the defective component as described in Chapter 5 of the *SPARCstorage Array Model 200 Series Service Manual.***
   This 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-roptic cables

3. **Following replacement of a defective component, restart the SSA as described in Chapter 7, "Shutdown and Restart Procedures."**

9.1.4.2 SPARCstorage RSM Units

1. **Shut down the RSM as described in Chapter 7, "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:

- Disk Drives
- 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.**

4. **Following replacement of a defective component, restart the RSM as described in Chapter 7, "Shutdown and Restart Procedures."**

9.1.4.3 Differential SCSI Trays

1. **Shut down the tray as described in Chapter 7, "Shutdown and Restart Procedures."**

2. **Refer to the Chapter 2 of 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.**

4. **Following replacement of a defective component, restart the disk tray as described in Chapter 7, "Shutdown and Restart Procedures."**

9.1.5 Blower Assemblies

Two blower assemblies are located in the front lower right side of all SPARCcluster 1000 cabinets. To remove and replace these units:

1. **Remove the two upper vented panels from the front of the cabinet.**
   Grasp each panel under the vent on one side and pull out far enough to just disengage the ball studs. Repeat this procedure on the other side of the vents to disengage and remove the panels. Set the panels aside.

2. **Locate the blower assembly you want to remove, upper or lower.**
   Remove four screws (see Figure 9-1) securing the top and the bottom of the assembly to the cabinet and then remove and tilt the assembly so that you can remove the power cord. Drape the removed power cord on the chassis so it will not be displaced.

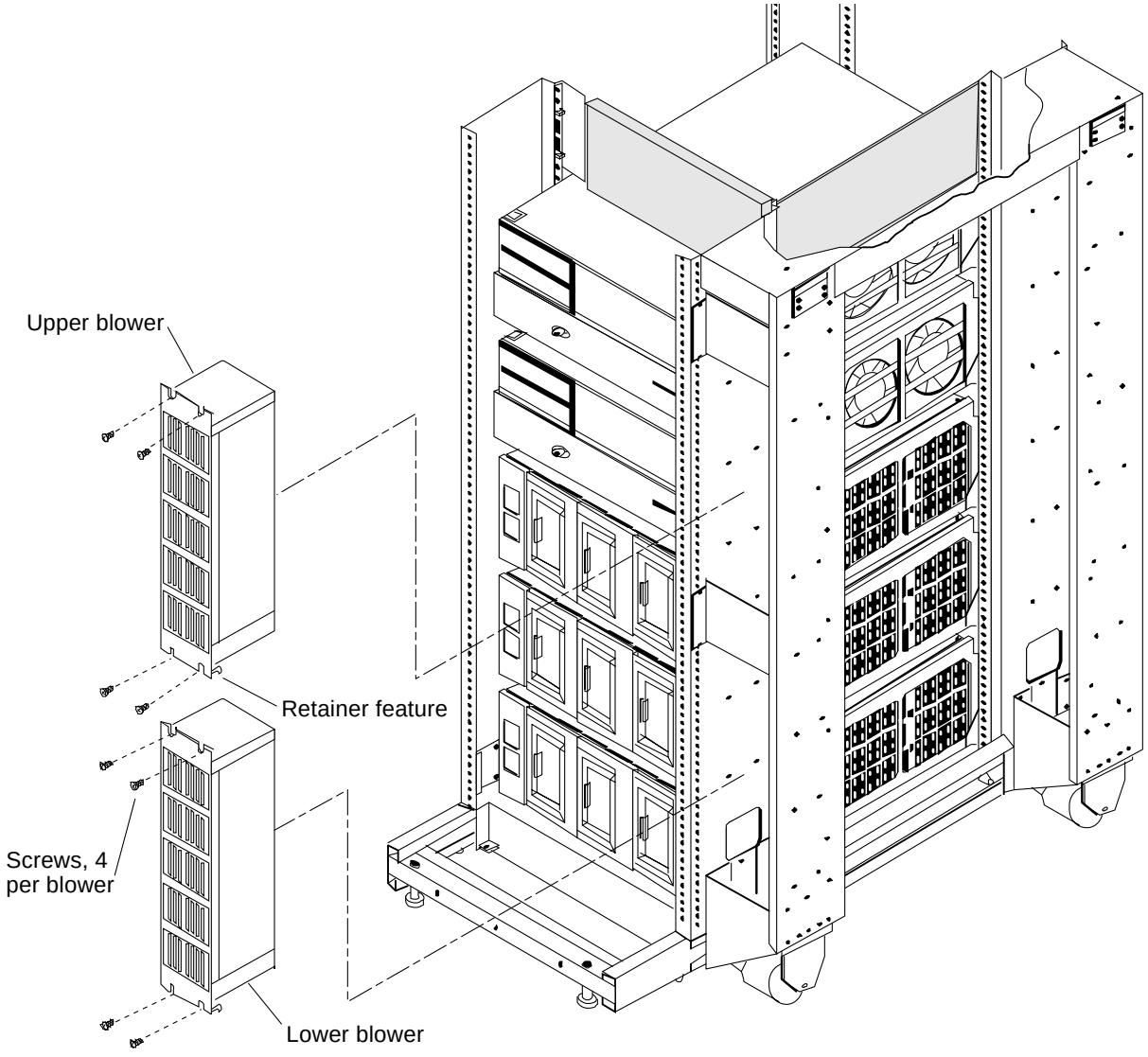


Figure 9-1 Blower Assemblies Removal/Replacement

3. **Connect the power cord (female end) into the rear of the replacement assembly.**
   Tilt the unit and insert the bottom of the blower through the opening so that retainer features at the bottom of the blower assembly engage the sheet metal at the bottom of the opening.

4. **Place the blower flush to the cabinet while replacing the four screws removed in step 2.**

9.1.6 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 right side.**
   To gain access, remove the two securing screws and then swing the bracket out and to the left as shown in Figure 9-2 and Figure 9-3.

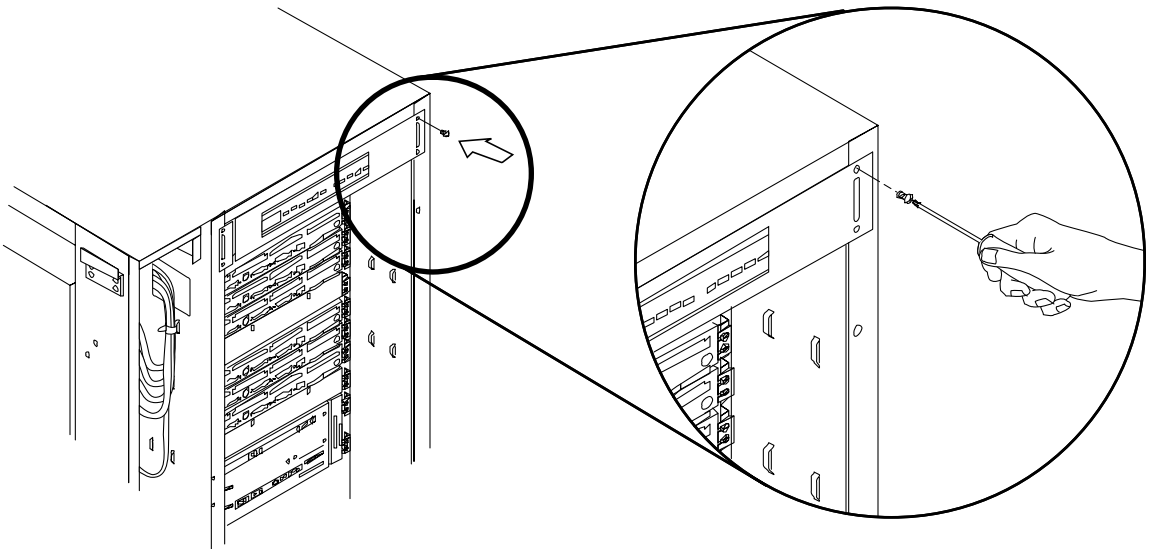


Figure 9-2 Removing Terminal Concentrator Screws

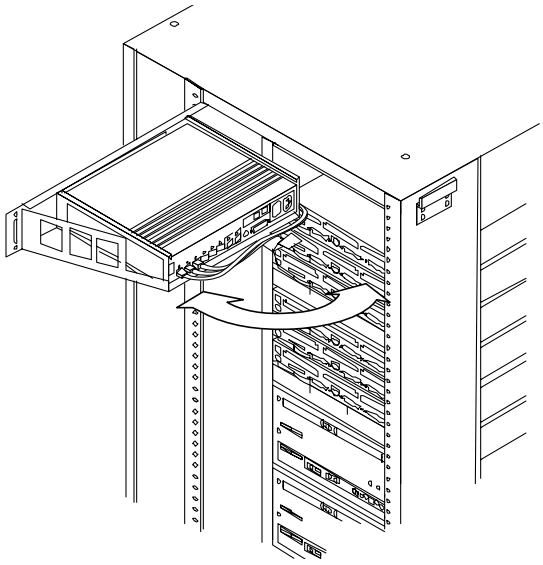


Figure 9-3 Swinging Terminal Concentrator Out of Cabinet

2. **Power the terminal concentrator off by using the power switch located on the back panel, see Figure 9-4.**

3. **Remove power and serial cables from the terminal concentrator as shown in Figure 9-4.**

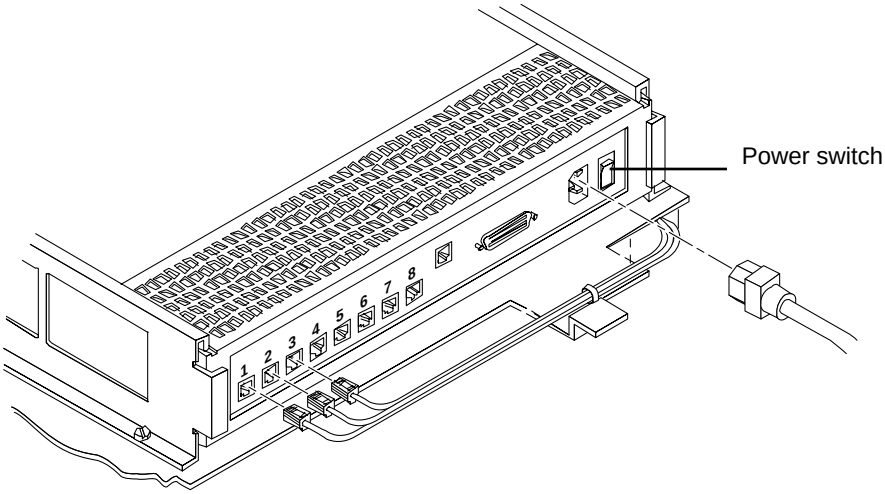


Figure 9-4 Removing/Replacing Terminal Concentrator Cabling

4. **Remove the Phillips screw that secures the terminal concentrator plenum assembly to the bayonet hinge.**
   Refer to detail in Figure 9-5.

5. **Lift the plenum assembly up until it clears the bayonet hinge and is free of the system chassis.**
   Put the plenum assembly on a firm surface.

6. **Remove the three M4 hex-head screws that secure one of the terminal concentrator mounting brackets to the plenum as shown in Figure 9-5.**
   Repeat this operation for the other bracket.

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

To replace the terminal concentrator, reverse the preceding instructions.

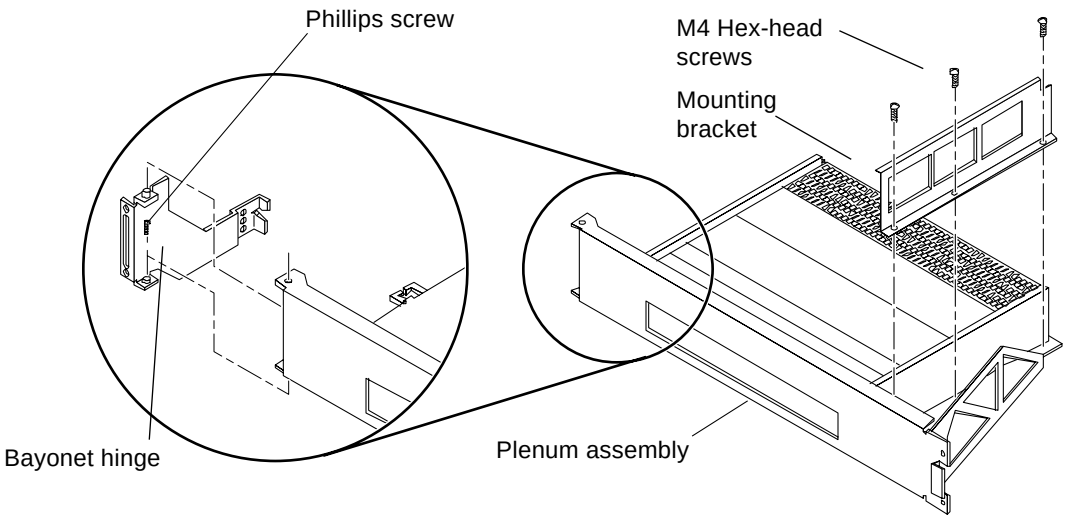


Figure 9-5 Terminal Concentrator Mounting Detail

9.1.7 Cabling

Refer to the *SPARCcluster System Hardware Site Preparation, Planning, and Installation Guide* for details on cabling the terminal concentrator, the private net, and the SPARCstorage Array optical connections.

9.2 SPARCcluster 2000

9.2.1 System Board and Components

1. **Shut the processor down as described in Chapter 7, "Shutdown and Restart Procedures."**
   The procedure in Chapter 7 details the shut down of the processor without shutting down associated SPARCstorage Arrays.

2. **Once the processor has been shutdown, remove and replace a system board or any replaceable part on the system board by following the procedures described in Chapter 11 of the *SPARCcenter 2000 System Service Manual*.**

3. **After a part or system board has been replaced, power on the processor as indicated in Chapter 7, “Shutdown and Restart Procedures.”**

9.2.2 *SPARCstorage Arrays*

Same as for a SPARCcluster 1000 system, as described in Section 9.1.2, “SPARCstorage Arrays,” on page 9-2.

9.2.3 *Terminal Concentrator*

1. **The terminal concentrator is located at the rear of the cabinet on a hinged bracket that is secured to the 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 9-6.
2. **Power the terminal concentrator off by using the power switch located on the back panel of the unit.**
3. **Remove power and serial cables from unit.**
4. **Remove three nuts from each of the terminal concentrator side brackets, and then remove the terminal concentrator from the cabinet mounting bracket as shown in Figure 9-6,**

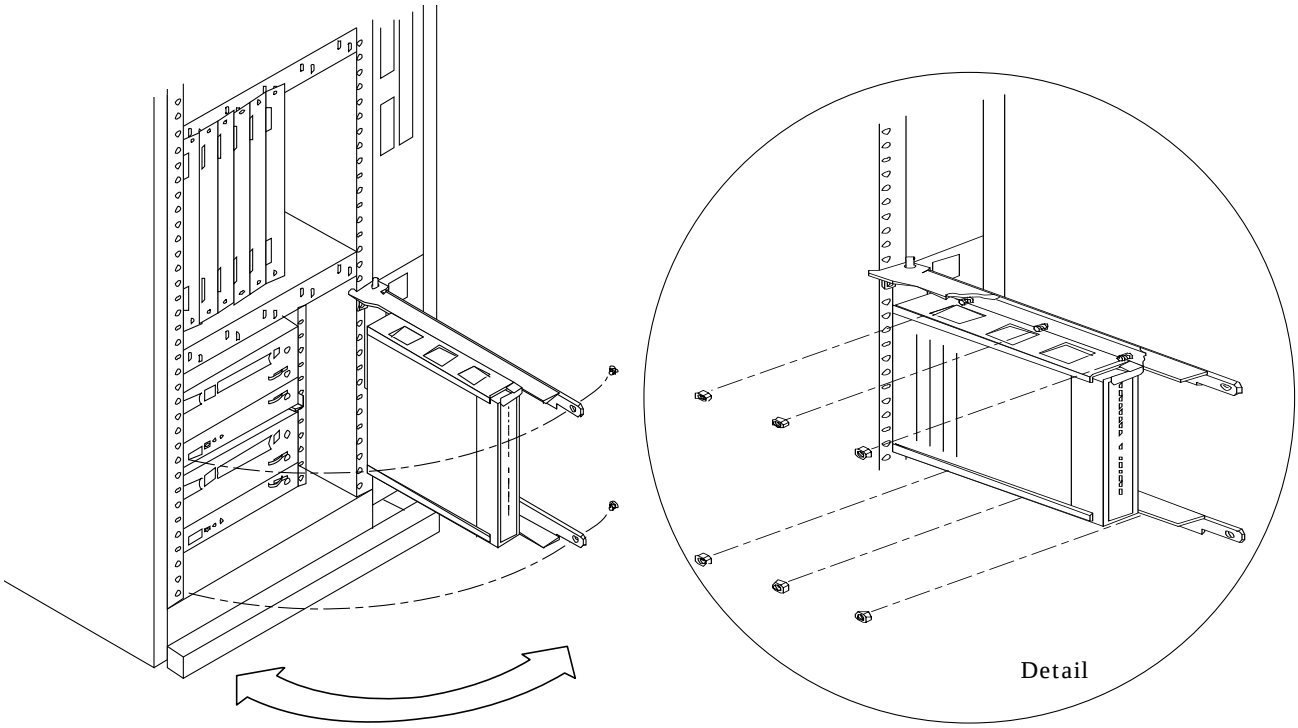


Figure 9-6 Terminal Concentrator Removal/Replacement

5. To replace the terminal concentrator, reverse the preceding steps.

9.2.4 Cabling

Note – To access SPARCstorage Array cabling, first open and swing the terminal concentrator out of the way as described in step 1 of Section 9.2.3, “Terminal Concentrator.”

Refer to Chapter 10 of the *SPARCcluster System Hardware Site Preparation, Planning, and Installation Guide* for details on cabling the terminal concentrator, the private net, and the SPARCstorage Array optical connections.

9

Illustrated Parts Breakdown 10

The tables and illustrations on the following pages augment the removal and replacement procedures. Table 10-1 provides a list of replaceable parts that are unique to a SPARCcluster system. For information on replaceable parts within a principal assembly, see Table 10-2.

Table 10-1 SPARCcluster List of Unique Replacement Parts

Replacement part	**Part Number**	
	SPARCcluster 1000	**SPARCcluster 2000**
SunSwift SBus Adapter	501-2739	501-2739
SunSwift cable:		
Short cable	530-2149	530-2149
Long cable	530-2150	530-2150
Terminal concentrator	370-1434	370-1434
Terminal concentrator cabling:		
(to workstation)	530-2151	530-2151
(to node 0 or 1)	530-2152	530-2152
15m fiber-optic cable	537-1006	537-1006
2m fiber-optic cable	537-1004	537-1004
Fan tray	370-1983	

10

Table 10-2 Principal Assembly Part Replacement Reference

Assembly	Reference	
	SPARCcluster 1000	**SPARCcluster 2000**
Processor	*SPARCserver 1000 System Service Manual*	*SPARCcenter 2000 System Service Manual*
SPARCstorage Array	*SPARCstorage Array Service Manual*	*SPARCstorage Array Service Manual*
Cabinet		
AC Distribution Unit	*SPARCserver 1000 System Service Manual*	*SPARCcenter 2000 Service Manual*
DC power supply	*SPARCserver 1000 System Service Manual*	*SPARCcenter 2000 Service Manual*
Workstation (SPARCstation 4)	*SPARCstation 4 Service Manual*	*SPARCstation 4 Service Manual*

10.1 SPARCcluster 1000

Figure 10-1 depicts the hardware components for a SPARCcluster 1000 system. Table 10-3 lists replaceable parts.

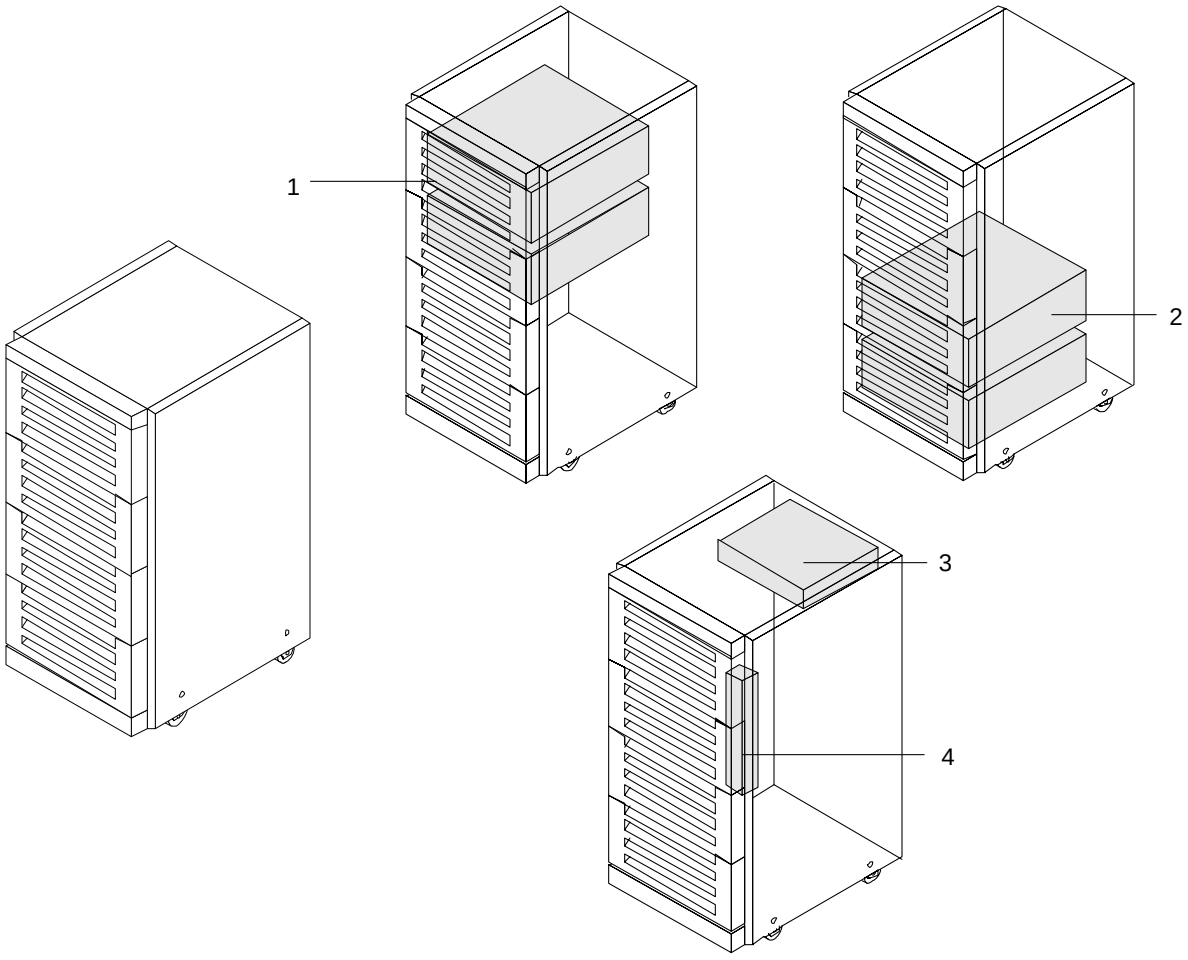


Figure 10-1 SPARCcluster 1000 System

Table 10-3 SPARCcluster 1000 Replaceable Parts List

Key	Description	Part Number or Exploded View Reference
1	SPARCserver 1000	*SPARCserver 1000 System Service Manual*
2	SPARCstorage Array	*SPARCstorage Array Model 100 or 200 Series Service Manual*
	Workstation (SPARCstation 4)	*SPARCstation 4 Service Manual*
3	Terminal concentrator	370-1434
	Terminal concentrator cabling	Refer to the *SPARCcluster Hardware Site Preparation, Planning and Installation Guide* for cable detail
	(to workstation)	530-2151
	(to node 0 or 1)	530-2152
4	Fan tray	370-1983
	Cabinet	
	AC distribution unit	*SPARCserver 1000 System Service Manual*
	SunSwift SBus Adapter	501-2739
	SunSwift private interconnect cables:	Refer tothe *SPARCcluster Hardware Site Preparation, Planning and Installation Guide* for cable detail.
	Short cable	530-2149
	Long cable	530-2150
	Fiber-optic cables:	Refer to the *SPARCcluster Hardware Site Preparation, Planning and Installation Guide* for cable detail.
	15m	537-1006
	2m	537-1004

10.2 SPARCcluster 2000

Figure 10-2 depicts the hardware components of a SPARCcluster 2000 system. Table 10-4 lists replaceable parts.

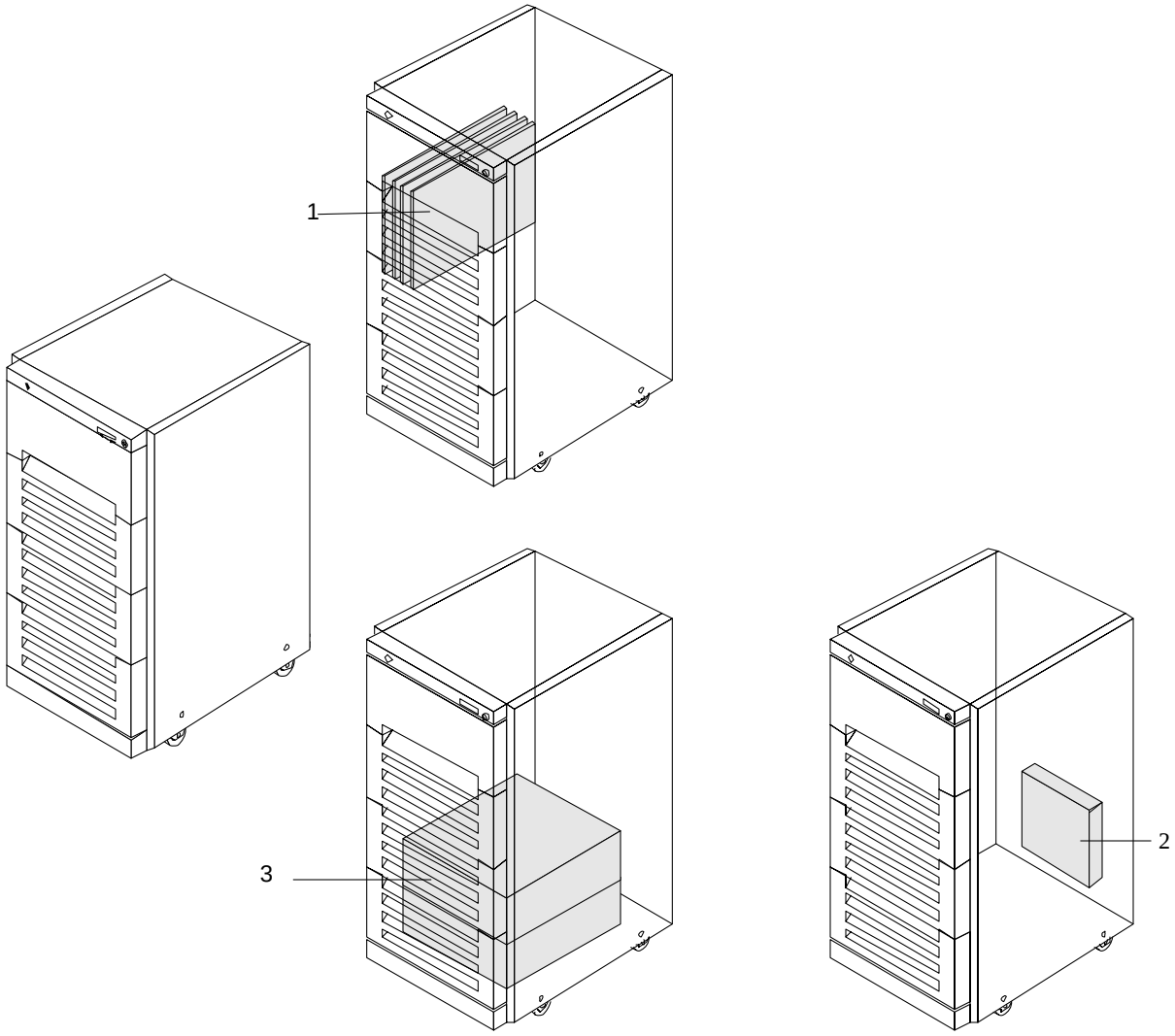


Figure 10-2 SPARCcluster 2000 System

Table 10-4 SPARCcluster 2000 Replaceable Parts List

Key	Description	Part Number or Exploded View Reference
1	System board (4)	*SPARCcenter 2000 System Service Manual*
	Workstation (SPARCstation 4)	*SPARCstation 4 Service Manual*
2	Terminal concentrator	370-1434
	Terminal concentrator cabling:	Refer to the *SPARCcluster Hardware Site Preparation, Planning and Installation Guide* for cable detail.
	(to workstation)	530-2151
	(to node 0 or 1)	530-2152
3	SPARCstorage Array	*SPARCstorage Array Model 100 or 200 Series Service Manual*
	Cabinet	
	AC distribution unit	*SPARCcenter 2000 System Service Manual*
	DC power supply	*SPARCcenter 2000 System Service Manual*
	SunSwift SBus Adapter	501-2739
	SunSwift private interconnect cables:	Refer to the *SPARCcluster Hardware Site Preparation, Planning and Installation Guide* for cable detail.
	Short cable	530-2149
	Long cable	530-2150
	Fiber-optic cables:	Refer to the *SPARCcluster Hardware Site Preparation, Planning and Installation Guide* for cable detail.
	15m	537-1006
	2m	537-1004

10.3 SPARCcluster Expansion Cabinets

Table 10-5 lists replaceable parts for expansion cabinets containing either RSM units or differential SCSI trays. Figure 10-3 and Figure 10-4 depict system expansion cabinets with RSM units and differential SCSI trays, respectively.

Table 10-5 System Expansion Cabinet Replaceable Parts List

Key	Description	Part Number or Exploded View Reference
1	Disk drive	
Figure 10-3	RSM:	SPARCstorage RSM Installation, Operations, and Service Manual
Figure 10-4	SCSI Tray:	540-2646 (9-Gbyte differential wide)
2	Fan tray assy, cabinet	
3	SSA Model 200	*SPARCstorage Array Model 200 Series Service Manual*
4	Drive trays:	
Figure 10-3	SPARCstorage RSM	*SPARCstorage RSM Installation, Operations and Service Manual*
Figure 10-4	Differential SCSI tray	*Differential SCSI Tray Service Manual*
5	AC distribution unit	

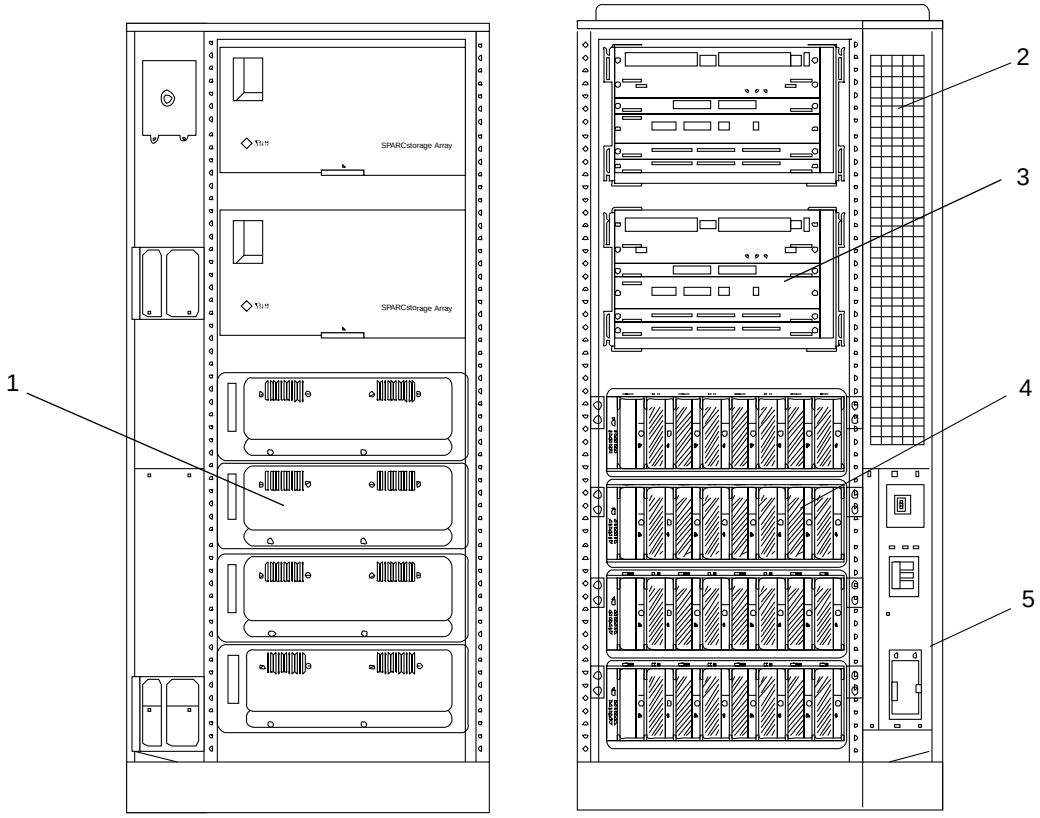
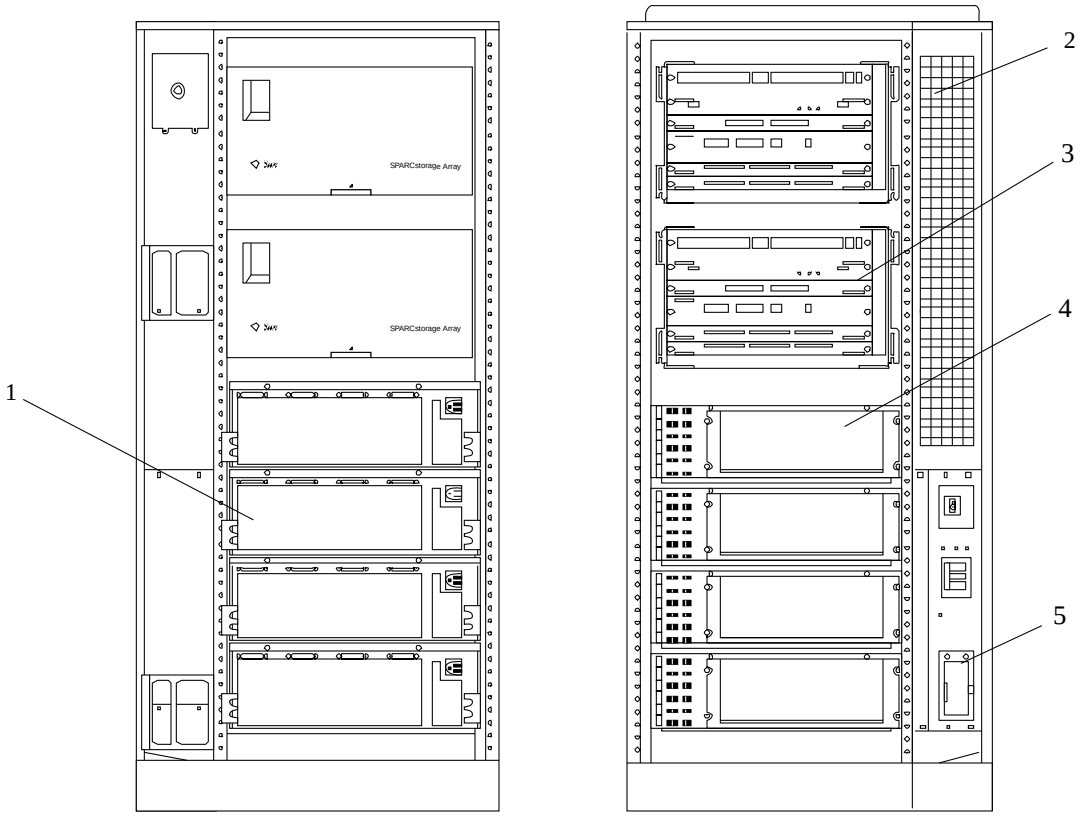


Figure 10-3 System Expansion Cabinet with SSA Model 200 Series and SPARCstorage RSM Units



Expansion Cabinet (front view)

Expansion Cabinet (rear view)

Figure 10-4 System Expansion Cabinet with SSA Model 200 Series and Differential SCSI Trays

10

Product Specifications A

Refer to the *SPARCcluster System Hardware Site Preparation, Planning, and Installation Guide.*

A

Connector Pinouts and Cabling B

B.1 SPARCstorage Array Fiber-Optic Cables

Refer to the *SPARCcluster Hardware Site Preparation, Planning and Installation Guide* for information on connecting SPARCstorage Arrays to a node using the fiber-optic cables. See Chapter 9 for a SPARCcluster 1000 PDB system and Chapter 10 for a SPARCcluster 2000PDB system.

B.2 Terminal Concentrator Ports

Refer to the *SPARCcluster 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. See Chapter 9 for a SPARCcluster 1000PDB system and Chapter 10 for a 2000PDB system.

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.

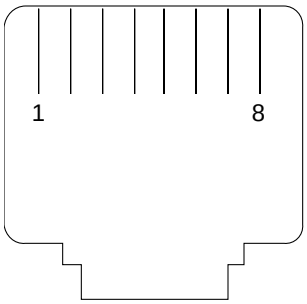


Figure B-1 Serial Port RJ-45 Receptacle

Table B-1 Serial Port Pin/Signal Allocations

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.

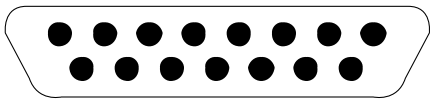


Figure B-2 15-pin 10BASE5 Ethernet Receptacle

Table B-2 10BASE5 Ethernet Transceiver Port Pin/Signal Allocations

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 Interconnect Cable (Short and Long)

Both nodes in a PDB system are connected in a private interconnect using two special (either short or long) Ethernet cables. Refer to the *SPARCcluster Hardware Site Preparation, Planning and Installation Guide* to cable the Private Ethernet on your system. See Chapter 9 for a SPARCcluster 1000PDB system and Chapter 10 for a 2000PDB system. The pinout for these cables is as listed in Table B-3.

Table B-3 Private Ethernet Pinout / Signals

Pin number	Signal	Connects to pin number	Signal
1	Tx+	3	Rx+
2	Tx-	6	Rx+
3	Rx+	1	Tx+
4	No connection		
5	No connection		
6	Rx-	2	Tx-
7	No connection		
8	No connection		

SCSI Targeting

C

C.1 SPARCstorage Array Model 100 Series

The SPARCstorage Array Model 100 Series has three disk drive trays. Each tray has two SCSI ports. In general, disk drives should be distributed evenly across the three trays and six SCSI ports for cooling and SCSI addressing considerations.

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.

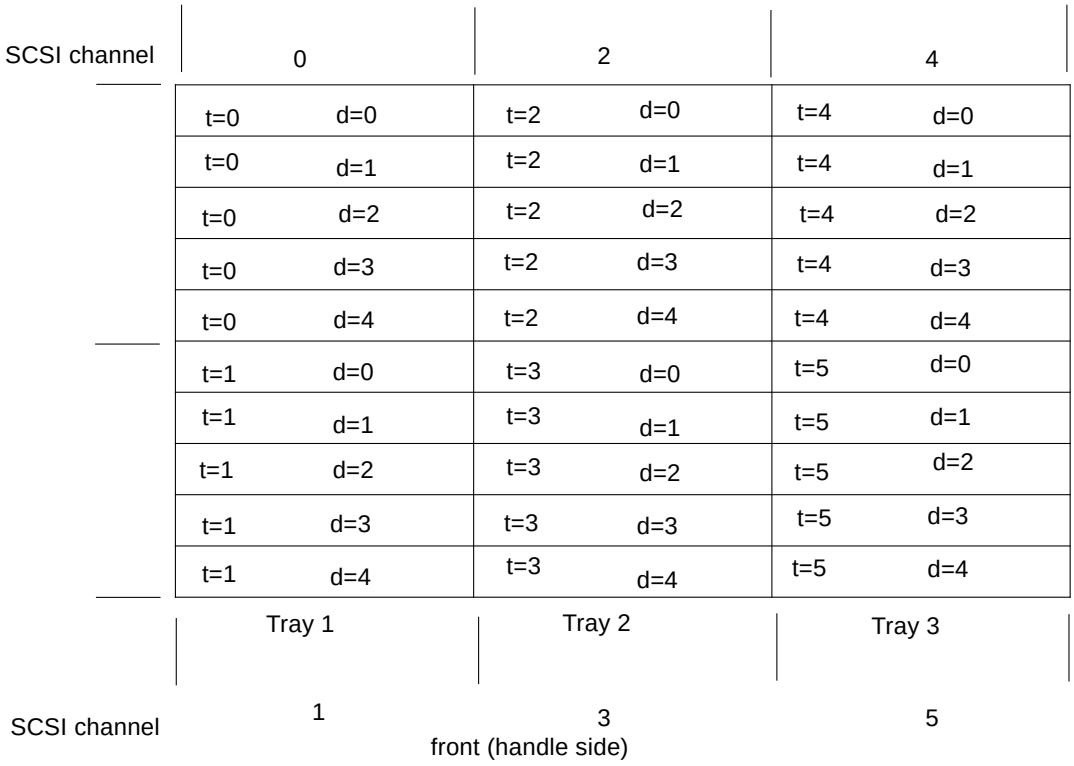


Figure C-1 Model 100 Series SCSI Addresses

C.2 SPARCstorage Array Model 200 Series

C.2.1 RSM SCSI Target IDs

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

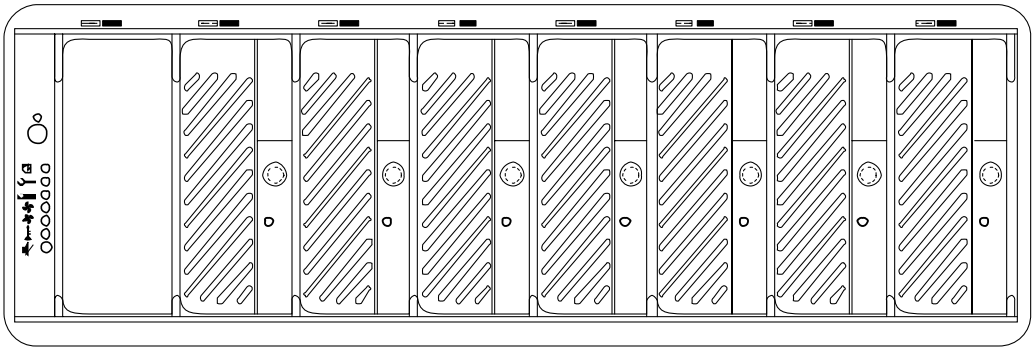


Figure C-2 SPARCstorage RSM Front View with Target Address IDs

C.2.2 Differential SCSI Disk Tray Target IDs

The target IDs for a differential SCSI tray are designated as follows:

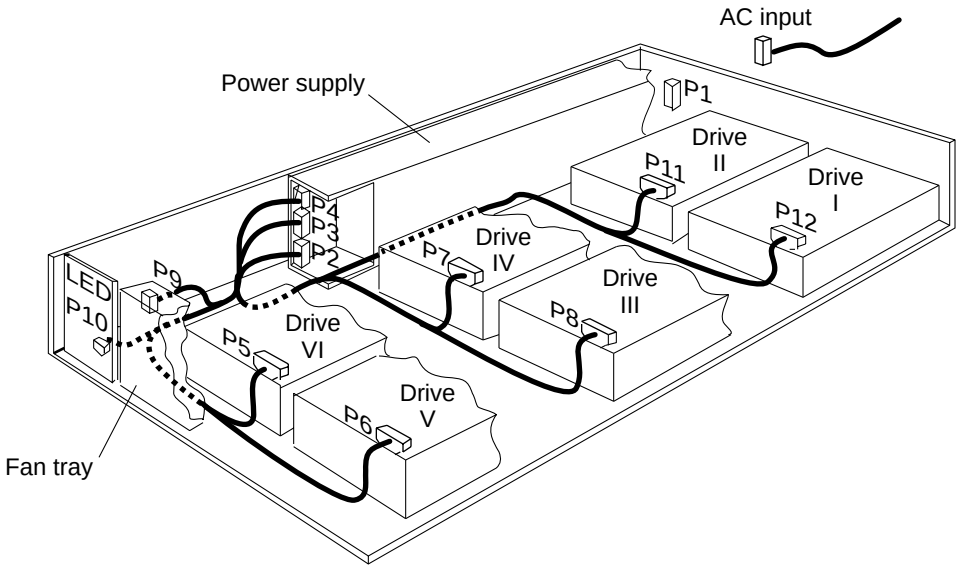


Figure C-3 Differential SCSI Tray Drive Locations

Table C-1 SCSI Addresses for the Differential SCSI Disk Tray

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.3 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.

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
```

Index

T

V